

Environmental Product Declaration

Foam Glass Gravel

Glavel, Inc.

In accordance with ISO 14025 and ISO 21930:2017

Production Facility
Essex, VT

EPD Program Name: Smart EPD Program

Refer to the EPD Library at www.smartepd.com for the latest EPD listing information.

Declared Unit = 1 cubic meter

GLOBAL WARMING POTENTIAL
Total greenhouse gas emissions from cradle to gate (A1-A3) **19.3** kg CO₂-Eq

ACID RAIN
Airborne emissions that enter the atmosphere and transform into acids. **0.08** kg SO₂-Eq

ALGAE BLOOM
Chemicals leaching into aquatic ecosystems. **0.11** kg N-Eq

SMOG
Harmful low-level ozone created from volatile organic compounds (VOCs) **1.70** kg O₃-Eq

OZONE THINNING
Ozone thinning caused by human-made chemicals entering the stratosphere. **7.5e-7** kg CFC-11-Eq



SmartEPD-2025-062-0470-01.2



Expiration Date
May 02, 2030

Last Updated
May 05, 2025

Refer to the EPD Library at www.smartepd.com for the latest EPD listing information



General Information

Glavel

50 Lakeside Ave, Suite 740 Burlington VT 05401

802-540-0843

info@glavel.com

glavel.com



Product Name:	Foam Glass Gravel
Declared Unit:	1 m3 (Loose Bulk Density = 0.12g/cm3, Measured Production Density = 0.29g/cm3)
Declaration Number:	SmartEPD-2025-062-0470-01.2
Date of Issue:	May 02, 2025
Expiration:	May 02, 2030
Last updated:	May 05, 2025
EPD Scope:	Cradle to gate A1 - A3
Market(s) of Applicability:	North America

General Organization Information

Glavel is a foam glass gravel manufacturer based in Essex, Vermont. Foam glass gravel is a lightweight, insulating aggregate that replaces foam board insulation, geofoam, and other lightweight fills in construction and industrial applications.

Further information can be found at: <https://www.glavel.com/>

Limitations, Liability and Ownership

The environmental impact results of foam glass gravel in this document are based on a declared unit and therefore do not provide sufficient information to establish comparisons. The results shall not be used for comparisons without knowledge of how the physical properties of the foam glass gravel impact the precise function at the construction level. The environmental impact results shall be converted to a functional unit basis before any comparison is attempted. See Section 3.10 for additional EPD comparability guidelines. Environmental declarations from different programs (ISO 14025) may not be comparable.

Reference Standards

Standard(s):	ISO 14025 and ISO 21930
Core PCR:	Smart EPD® Part A Product Category Rules for Building and Construction Products and Services, 1000, v1.2 Date of issue: March 14, 2025 Valid until: March 14, 2030
Sub-category PCR review panel:	Contact Smart EPD for more information.
General Program Instructions:	Smart EPD General Program Instructions v.2.0, March 2025

Verification Information

LCA Author/Creator:	Dorian Krausz Pathways dorian@pathwaysai.co
EPD Program Operator:	Smart EPD info@smarteprd.com www.smarteprd.com 585 Grove St., Ste. 145, Herndon, VA 20170, USA
Verification:	Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071: Sarah Curpen curpen1996@gmail.com Independent external verification of EPD, according to ISO 14025 and reference PCR(s): Sarah Curpen curpen1996@gmail.com

External

External

Product Information

Declared Unit:	1 m3 (Loose Bulk Density = 0.12g/cm3, Measured Production Density = 0.29g/cm3)
Mass:	117 kg
Product Specificity:	Product Average Product Specific
Variation in GWP Result (Products):	0% to 0%
Variation in GWP Result (Facilities):	0% to 0%

Product Description

Foam glass gravel is a lightweight, thermally insulating bulk aggregate made from recycled glass.

Further information can be found at: <https://www.glavel.com/>

Product Specifications

Product Classification Codes:	UNSPSC - 30111803
	Masterformat - 31 05 16
	EC3 - Aggregates

Material Composition

Material/Component Category	Origin	% Mass
Recycled Glass Powder	Canada	84.3
Foaming Agent Dry Ingredients	US	7.9
Water	US	7.8

Hazardous Materials
No regulated hazardous or dangerous substances are included in this product.

EPD Data Specificity

Primary Data Year:	2024
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Averaging:
Averaging was not conducted for this EPD.

System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	ND
	A5	Assembly / Install	ND

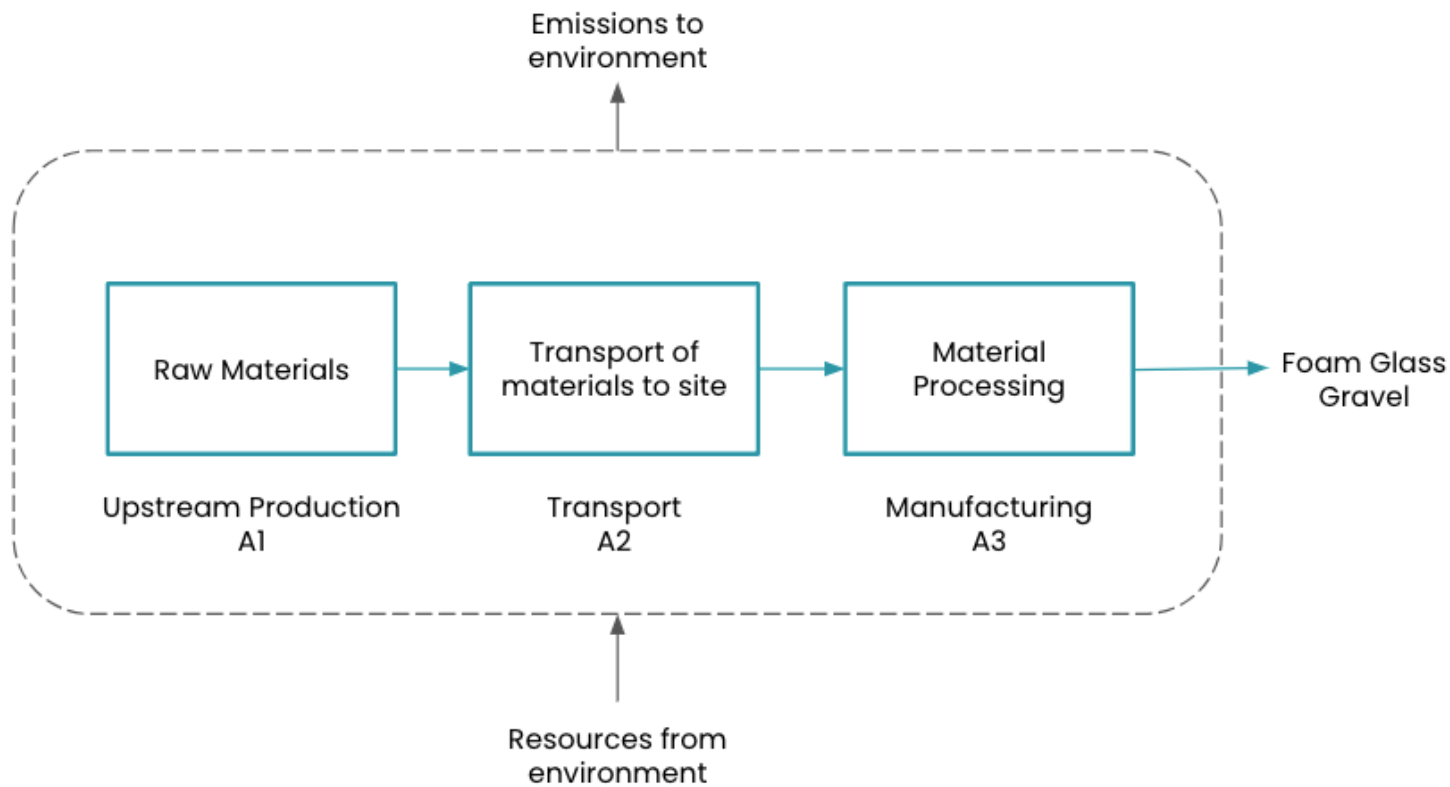
Use	B1	Use	ND
	B2	Maintenance	ND
	B3	Repair	ND
	B4	Replacement	ND
	B5	Refurbishment	ND
	B6	Operational Energy Use	ND
	B7	Operational Water Use	ND
End of Life	C1	Deconstruction	ND
	C2	Transport	ND
	C3	Waste Processing	ND
	C4	Disposal	ND
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	ND

Note:
ND = Module not declared

Plants

 GLAVEL, Inc 131 Red Pine Circle, Essex Junction, VT, USA

Product Flow Diagram



Software And Database

- LCA Software:

Pathways v. 1.0
- LCI Foreground Database(s):
- LCI Background Database(s):

Ecoinvent v. 3.10 | GLO, RoW, US-NPCC | US LCI v. FY21.Q3.01

A foreground LCI database is the database used to model the primary, site-specific data collected for this EPD. A background LCI database is the database used to model generic or non-specific data.

Data Quality

The key requirement for data quality is that data be as accurate and representative as possible. The requirements are based on the ISO 14040:2006 and ISO 14044:2006 standard. To fulfill these requirements and to ensure reliable results, primary data in combination with representative, secondary literature, and consistent background life cycle inventory (LCI) information from Ecoinvent version 3.10 (Wernet, et al., 2016) and other sources were used.

Data Sources

Material/Process Category	Module	Material/Process Name	Inventory Dataset Name	Dataset Geographic Region	Reporting Period/Year Dataset Represents	Reference	Amount (if relevant)	Unit
Electricity	A3	Custom Dataset built for Green Mountain Power	Ecoinvent 3.10 datasets for renewable energy	VT, USA	2024	ND	ND	ND
Diesel	A3	Diesel	market for diesel, burned in building machine	GLO	2024	ND	ND	ND
Recycled Glass Powder	A1	Custom Dataset using treated, unsorted glass datasets and crushing datasets	Ecoinvent 3.10	RoW	2024	ND	ND	ND
Foaming Agent	A1	Custom Dataset	Ecoinvent 3.10	RoW	2024	ND	ND	ND
Water	A1	Water	tap water production, conventional treatment	RoW	2024	ND	ND	ND

Life Cycle Module Description

Foam Glass Gravel goes through a series of processing steps after the recycled glass powder enters the facility. The recycled glass powder is combined with a foaming agent before being heated in a kiln. The glass softens at high temperatures and sinters into a foam glass slab while the foaming agent off-gases and creates a network of closed cell micropores. The foam glass slab exits the kiln and begins fracturing into aggregate due to the thermal stress from leaving the kiln and hitting ambient temperatures.

Glavel's kilns have been electrified and powered with renewable energy, contributing to a low embodied carbon material.

LCA Discussion

Allocation Procedure

Allocation was conducted in accordance with the hierarchy outlined in ISO 14044:2006. However, no allocation was necessary, as Foam Glass Gravel is the sole manufactured product, with no co-products.

Cut-off Procedure

No cut-off criteria were defined for this analysis. All available energy and material flow data were included in accordance with the system boundary. Proxy data were used as needed in the model to capture all considered life cycle impacts, aligning with ISO requirements for data completeness.

Renewable Electricity

Energy Attribute Certificates (EACs) such as Renewable Energy Certificates (RECs) or Power Purchase Agreements (PPAs) are included in the baseline reported results:	✓ Yes
Electricity Source:	Offsite
Renewable type(s):	Hydro, Nuclear, Solar, Wind, Wood, Biogas
Percent of EPD Owner's product-related electricity covered:	100 %
Commitment pledged for entire EPD validity period:	✓ Yes
Electricity accounting methodology:	Location-based

Results

Environmental Impact Assessment Results

IPCC AR6 GWP 100, TRACI 2.1

per 1 m3 of product (Loose Bulk Density = 0.12g/cm3, Measured Production Density = 0.29g/cm3).

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Impact Category	Method	Indicator	A1	A2	A3	A1 - A3
GWP-total	IPCC AR6 GWP 100	ND	1.25e+1	4.39e+0	2.44e+0	1.93e+1
ODP	TRACI 2.1	ND	6.48e-7	6.71e-8	3.92e-8	7.54e-7
AP	TRACI 2.1	ND	6.00e-2	2.00e-2	1.00e-2	8.00e-2
EP	TRACI 2.1	ND	9.00e-2	1.00e-2	6.14e-3	1.10e-1
PM	TRACI 2.1	ND	1.16e+0	6.30e-1	3.40e-1	2.13e+0

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not

comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Resource Use Indicator

per 1 m3 of product (Loose Bulk Density = 0.12g/cm3, Measured Production Density = 0.29g/cm3).

Indicator	Unit	A1	A2	A3	A1 - A3
RPRE	MJ	2.77e+1	-1.05e-14	2.85e+2	3.13e+2
RPRM	MJ	1.15e+1	ND	ND	1.15e+1
NRPRE	MJ	1.27e+2	-9.61e-14	4.43e+2	5.69e+2
NRPRM	MJ	6.40e+0	ND	ND	6.40e+0
ADP-fossil	MJ	1.25e+2	-8.80e-14	2.91e+1	1.54e+2
SM	kg	5.00e-2	ND	6.00e-2	1.10e-1
RSF	MJ	4.27e-3	ND	4.67e-4	4.74e-3
NRSF	MJ	0	0	0	0
FW	m3	3.90e-1	ND	1.88e+0	2.27e+0
RE	MJ	2.40e-1	ND	1.00e-2	2.50e-1

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRM or PENRM = Total non-renewable primary resources with energy content, SM = Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators

per 1 m3 of product (Loose Bulk Density = 0.12g/cm3, Measured Production Density = 0.29g/cm3).

Indicator	Unit	A1	A2	A3	A1 - A3
HWD	kg	1.02e+0	ND	2.90e-1	1.31e+0
NHWD	kg	2.58e+1	ND	3.69e+0	2.95e+1
HLRW	kg	4.91e-5	ND	1.16e-3	1.21e-3
ILLRW	kg	1.24e-4	ND	4.22e-3	4.34e-3
MFR	kg	3.76e-3	ND	9.67e-3	1.34e-2
MER	kg	2.88e-5	ND	3.89e-6	3.27e-5
EEE	MJ	6.00e-2	ND	7.91e-3	6.79e-2

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

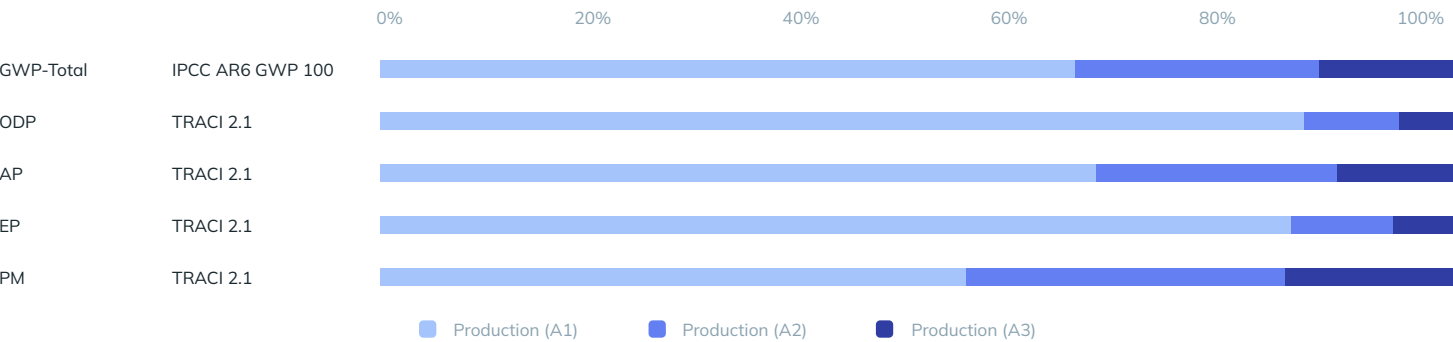
Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the

product system, EET = Exported thermal energy.

Interpretation

The LCA results demonstrate that the raw materials (A1) are the dominant contributors across impact categories, particularly for global warming potential (GWP), accounting for 65% of total emissions. Transportation (A2) represents between 20-25% of the GWP, primarily due to transporting the recycled glass powder to the manufacturing facility in VT. Manufacturing processes (A3) contribute between 10-15% of GWP, primarily due to the heating of the raw materials in the kiln.



References

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- Wernet, G., Bauer, C., Steubing, B., Reinhard, J., Moreno-Ruiz, E., & Weidema, B. (2016). The ecoinvent database version 3 (part I): overview and methodology. *The International Journal of Life Cycle Assessment*, 1218-1230.