Environmental Product Declaration

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ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025 / ISO 21930

VitriCel

Green Gravels

Programme: RTS EPD, www.cer.rts.fi/en/
Programme operator: RTS EPD
EPD registration number:
Publication date:
Valid until:
Geographical scope:

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com.

GENERAL INFORMATION

MANUFACTURER INFORMATION

Manufacturer	Green Gravels OÜ
Address	Radisti tee 1, Soodevahe, 75322, Harjumaa, Estonia Factory location: Krossi tee 6, Järvakandi, Estonia
Contact details	timo@gravels.ee
Website	www.gravels.ee

PRODUCT IDENTIFICATION

Product name	VitriCel
Place(s) of production	Järvakandi, Estonia

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but registered in different EPD programmes may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison.

EPD INFORMATION

EPD program operator	RTS EPD
EPD standards	This EPD is in accordance with EN 15804+A2 and ISO 14025 standards.
Product category rules	The CEN standard EN 15804 serves as the core PCR.
EPD author	Christof Uisk
EPD verification	Independent verification of this EPD and data, according to ISO 14025: £ Internal certification þ External verification
Verification date	
EPD verifier	Mari Kirss, Rangi Maja OÜ
EPD number	
Publishing date	
EPD valid until	

GRAVELS

PRODUCT INFORMATION

PRODUCT DESCRIPTION

Foam glass gravel is compression-resistant, lightweight, and thermally insulating which makes it useful in different construction areas.

PRODUCT APPLICATION

In building construction foam glass gravel is used as a filling and insulating material. It is used for the insulation and drainage in the construction of solid floors.

In infrastructure and landscaping it has the same function: it reduces the pressure on fragile grounds and other constructions. Foam glass gravel can be used as a durable thermal insulation material. It is used as a lightweight and/or insulating filling material in:

- street and road construction or repair
- the embankments of bridges and viaducts
- sports grounds and outdoor constructions
- backfilling of retaining walls and port construction
- outdoor pipe insulation etc.

PRODUCT STANDARDS

- EVS-EN 13285:2018 – Unbound mixtures - Specifications
- EVS-EN 13055:2018 – Lightweight aggregates

TECHNICAL SPECIFICATIONS

Parameter	Value
Thermal conductivity, dry material [λD]	0,097 W/mK
Thermal conductivity, wet, drained [λ]	0,107 W/mK
Grain size	10-63 mm
Bulk density	197±10% kg/m^3
Volume change during compaction	15-25%

ADDITIONAL TECHNICAL INFORMATION

Further information can be found at www.gravels.ee

PRODUCT RAW MATERIAL COMPOSITION

Product material	Weight, %
Waste glass cullet	96-98%
Silicon carbide	0-2%
Kaolin	0-2%

Packaging material	Mass, kg
Polypropylene	1.8

SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

GRAVELS

PRODUCT LIFE-CYCLE

MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

Foam glass gravel is packed in 1 m^3 big bags. Larger quantities are delivered as bulk material. All big bags are returned to the manufacturer and reused in other deliveries.

TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

Emissions rising in A4 constitute less than 20% of GWP emissions in A1-A3 and are as such excluded from the model.

Module A5 is not declared.

PRODUCT USE AND MAINTENANCE (B1-B7)

This EPD does not cover the use phase as there are no use phase emissions.

Air, soil, and water impacts during the use phase have not been studied.

PRODUCT END OF LIFE (C1-C4, D)

No changes to the material's physical or chemical composition take place during the use phase and as such, are reusable if dismantled with care. All typical applications are available on subsequent uses of the foam glass in Estonia.

Module C1 represents the demolition/deconstruction process, the fuel consumptions for which are assumed to be negligible.

The end-of-life scenario data originates from Estonia, but the potential to reuse foam glass gravel is globally relevant.

It is assumed that 95% of gravel is collected for re-use and the rest is collected with construction waste.

MANUFACTURING PROCESS

- **Collection:** glass cullet arrives at the facility, where it is sorted and dried;
- **Crushing:** the mostly dry cullet is directed to a large tumbler, where it is crushed into smaller particles depending on the intended use of the current batch;
- **Mixing:** the appropriate amount of silicon carbide is added to the mix;
- **Foaming:** the mixture is directed to a slowly moving belt, where it is dried in 12 sequential heating chambers, where gasses are released and the material achieves its foam-like structure;
- **Sizing:** as the slabs of foam glass gravel fall off the belt, they break apart into easy to transport chunks, where they are gathered and set aside for transportation.
- **Packing:** an excavator is used to fill up large bed truck or the gravel is packed into big bags.

LIFE-CYCLE ASSESSMENT

LIFE-CYCLE ASSESSMENT INFORMATION

Period for data	14.02.2022 - 01.08.2023

A period longer than one calendar year was chosen to ensure representative data amidst some stops in the production process in 2022.

DECLARED AND FUNCTIONAL UNIT

Declared unit	1 m^3
Mass per declared unit	197 kg

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate.

Biogenic carbon content in product, kg C	-
Biogenic carbon content in packaging, kg C	-

SYSTEM BOUNDARY

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D	D	D
x	x	x	MND	MND	MND	MND	MND	MND	MND	MND	MND	x	x	x	x	x	x	x
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstr./demol.	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR.

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation.

In this study, as per EN 15804, allocation is conducted in the following order;

1. Allocation should be avoided.
2. Allocation should be based on physical properties (e.g. mass, volume) when the difference in revenue is small.
3. Allocation should be based on economic values.

No allocation was used in this LCA study.

GRAVELS

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks. Note: additional environmental impact data may be presented in annexes.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total[1)]	kg CO_2e	5,69E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	9,26E-01	0E0	1,23E-01	-5.41E+01
GWP – fossil	kg CO_2e	5,68E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	9,25E-01	0E0	1,22E-01	-5.40E+01
GWP – biogenic	kg CO_2e	7,19E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,58E-04	0E0	5,83E-05	-6.83E-02
GWP – LULUC	kg CO_2e	3,10E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,41E-04	0E0	2,56E-04	-2.95E-02
Ozone depletion pot.	kg CFC-$_{11}$e	1,11E-05	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	2,13E-07	0E0	3,54E-08	-1.05E-05
Acidification potential	mol H^+e	2,71E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,92E-03	0E0	1,09E-03	-2.57E-01
EP-freshwater	kg Pe	9,74E-04	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	7,57E-06	0E0	1,10E-06	-9.25E-04
EP-marine	kg Ne	4,11E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,16E-03	0E0	4,20E-04	-3.90E-02
EP-terrestrial	mol Ne	4,48E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,28E-02	0E0	4,61E-03	-4.26E-01
POCP ("smog")[2)]	kg NMVOCe	1,45E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	4,11E-03	0E0	1,30E-03	-1.38E-01
ADP-minerals & metals[3)]	kg Sbe	5,62E-05	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	2,17E-06	0E0	2,52E-07	-5.34E-05
ADP-fossil resources	MJ	9,35E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,39E+01	0E0	2,40E+00	-8.88E+02
Water use[4)]	m^3e depr.	6,69E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	6,22E-02	0E0	8,55E-03	-6.36E+00

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	2,13E-06	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,07E-07	0E0	9,76E-08	-2.02E-06
Ionizing radiation[5)]	kBq U235e	7,67E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	6,62E-02	0E0	1,11E-02	-7.29E+00
Ecotoxicity (freshwater)	CTUe	4,98E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,25E+01	0E0	1,69E+00	-4.73E+02
Human toxicity, cancer	CTUh	2,85E-08	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,07E-10	0E0	5,29E-11	-2.71E-08
Human tox. non-cancer	CTUh	2,85E-07	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,24E-08	0E0	1,27E-09	-2.71E-07

SQP[6]	-	2,18E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,60E+01	0E0	3,51E+00	-2.07E+02

EN 15804+A2 disclaimer for Ionizing radiation, human health. This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator; 7) SQP = Land use related impacts/soil quality.

USE OF NATURAL RESOURCES

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy[7]	MJ	5,24E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,57E-01	0E0	0E0	-4.98E+01
Renew. PER as material	MJ	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0,00E+00	0E0	0E0	0.00E+00
Total use of renew. PER	MJ	5,24E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,57E-01	0E0	0E0	-4.98E+01
Non-re. PER as energy	MJ	6,92E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,39E+01	0E0	0E0	-6.57E+02
Non-re. PER as material	MJ	3,00E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	-1,82E+01	0E0	-2.85E+01
Total use of non-re. PER	MJ	7,22E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,39E+01	-1,82E+01	0E0	-6.86E+02
Secondary materials	kg	1,95E02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,86E-03	0E0	0E0	5.85E0
Renew. secondary fuels	MJ	1,02E-03	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,89E-05	0E0	0E0	-9.69E-04
Non-ren. secondary fuels	MJ	0,00E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0,00E+00	0E0	0E0	0E0
Use of net fresh water	m^3	2,14E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,80E-03	0E0	0E0	-0.2033

PER = Primary energy resources

END OF LIFE – WASTE

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	1,85E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,84E-02	0E0	3,17E-03	-1.76E+00
Non-hazardous waste	kg	4,27E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,03E-01	0E0	4,04E-02	-4.06E+01
Radioactive waste	kg	5,23E-03	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	9,29E-05	0E0	1,61E-05	-4.97E-03

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	1,87E+02	0E0	0E0
Materials for recycling	kg	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

Materials for energy recovery	kg	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported electrical energy	MJ	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0
Exported thermal energy	MJ	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	0E0	0E0	0E0	0E0

KEY INFORMATION TABLE (RTS) – KEY INFORMATION PER KG OF PRODUCT

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total	kg CO_2e	1,43E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	4,47E-3	0E0	6,23E-04	-1.36E-01
ADP-minerals & metals	kg Sbe	2,80E-07	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,01E-8	0E0	1,26E-09	-2.66E-07
ADP-fossil	MJ	1,50E+00	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	6,71E-2	0E0	1,22E-02	-1.43E+00
Water use	m^3e depr.	2,33E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3E-4	0E0	4,34E-05	-2.21E-02
Secondary materials	kg	1,95E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,86E-5	0E0	3,70E-06	5.85E0
Biog. C in product[8)]	kg C	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	N/A	N/A	N/A	N/A	0E0
Biog. C in packaging	kg C	0E0	MND	MND	MND	MND	MND	MND	MND	MND	MND	N/A	N/A	N/A	N/A	0E0

GRAVELS

ANNEX 1 : ENVIRONMENTAL IMPACTS – EN15804+A1, CML / ISO 21930

Impact category	Unit	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO_2e	5,61E+01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	9,16E-01	5,61E+01	0E0	5.33E+01
Ozone depletion Pot.	kg $CFC_{-11}e$	8,98E-06	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,69E-07	8,98E-06	0E0	8.53E-06
Acidification	kg SO_2e	2,29E-01	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	3,04E-03	2,29E-01	0E0	2.18E-01
Eutrophication	kg PO_4^3e	6,45E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	6,93E-04	6,45E-02	0E0	6.13E-02
POCP ("smog")	kg C_2H_4e	1,03E-02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,19E-04	1,03E-02	0E0	9.79E-03
ADP-elements	kg Sbe	5,51E-05	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	2,10E-06	5,51E-05	0E0	5.23E-05
ADP-fossil	MJ	9,33E+02	MND	MND	MND	MND	MND	MND	MND	MND	MND	0E0	1,39E+01	9,33E+02	0E0	8.86E+02

GRAVELS

SCENARIO DOCUMENTATION

Manufacturing energy scenario documentation

Scenario parameter	Value
Electricity data source and quality	Ecoinvent 3.8: Market for electricity, medium voltage (Europe, Estonia)
Electricity $kgCO_2e$ / kWh	0.88
Heating data source and quality	Ecoinvent 3.8: Market for heat, district or industrial, natural gas (Europe, Estonia)
Industrial heating $kgCO_2e$ / MJ	0.052

End of life scenario documentation

Scenario parameter	Value
Collection process – kg collected separately	187.15
Collection process – kg collected with mixed waste	9.85
Recovery process – kg for re-use	187.15
Recovery process – kg for recycling	0
Recovery process – kg for energy recovery	0
Disposal (total) – kg for final deposition	9.85
Scenario assumptions e.g. transportation	50 km

BIBLIOGRAPHY

ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations. Principles and procedures.

ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.

ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.

ISO 21930:2017 Sustainability in buildings and civil engineering works — Core rules for environmental product declarations of construction products and services.

Ecoinvent database v3.8 (2021) and One Click LCA database.

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

ABOUT THE MANUFACTURER

In Järvakandi, the historic glass capital of Estonia, continues the development of the local class cluster. A foam glass gravel factory was established in the industrial area of Järvakandi. It will make an important contribution to solving the glass waste problems of Estonia.

The foam glass gravel factory will recycle circa 11 000 tons of glass waste annually. Initially the factory will produce 60 000 m3 foam glass gravel per year.

EPD AUTHOR AND CONTRIBUTORS

Manufacturer	Green Gravels OÜ
EPD author	Christof Uisk
EPD verifier	Mari Kirss, Rangi Maja OÜ
EPD program operator	RTS EPD
Background data	This EPD is based on Ecoinvent 3.8 (Allocation, cut-off, EN15804) and One Click LCA databases.
LCA software	The LCA and EPD have been created using One Click LCA Pre-Verified EPD Generator.

GRAVELS

VERIFICATION STATEMENT

VERIFICATION PROCESS FOR THIS EPD

This EPD has been verified in accordance with ISO 14025 by an independent, third-party verifier by reviewing results, documents and compliancy with EN 15804, ISO 14025 and ISO 14040/14044, following the process and checklists of the program operator for:

- This Environmental Product Declaration
- The Life-Cycle Assessment used in this EPD
- The background report (project report) for this EPD

Why does verification transparency matter? Read more online.

VERIFICATION OVERVIEW

Following independent third party has verified this specific EPD:

EPD verification information	Answer
Independent EPD verifier	Mari Kirss
EPD verification started on	12.09.2023
EPD verification completed on	16.11.2023

Author & tool verification	Answer
EPD author	Christof Uisk
EPD author training completion	01.02.2022
EPD Generator module	One Click LCa
Software verification date	17 January 2021

THIRD-PARTY VERIFICATION STATEMENT

I hereby confirm that, following detailed examination, I have not established any relevant deviations by the studied Environmental Product Declaration (EPD), its LCA and project report, in terms of

- the data collected and used in the LCA calculations,
- the way the LCA-based calculations have been carried out,
- the presentation of environmental data in the EPD, and
- other additional environmental information, as present

with respect to the procedural and methodological requirements in ISO 14025:2010 and EN 15804:2012+A2:2019.

I confirm that the company-specific data has been examined as regards plausibility and consistency; the declaration owner is responsible for its factual integrity and legal compliance.

I confirm that I have sufficient knowledge and experience of construction products, this specific product category, the construction industry, relevant standards, and the geographical area of the EPD to carry out this verification.

I confirm my independence in my role as verifier; I have not been involved in the execution of the LCA or in the development of the declaration and have no conflicts of interest regarding this verification.

Signed,

Mari Kirss