Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Extensive Green Roof Vegetation Mat: VegTech Sedummatta med biokol

From Veg Tech AB

Programme:	The International EPD® System, www.environdec.com
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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

Programme information

Programme:	The International EPD® System
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Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR): Construction products, 2019:14, Version 1.2.5

PCR review was conducted by: *The Technical Committee of the International EPD® System.* Claudia A. Peña. *Contact via info@environdec.com*

Life Cycle Assessment (LCA)

LCA accountability: *Amy Stockwell and Anna Liljenroth, CarbonZero AB*

Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

☒ EPD verification by individual verifier

Third-party verifier: *Vladimír Kočí, LCA Studio, Czech Republic*

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves third party verifier:

☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, 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. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Veg Tech AB

Contact: Mia Frisk mia.frisk@vegtech.se Veg Tech AB, Fagerås 1, 342 52 Vislanda, Sweden

Description of the organisation: VegTech is the leading supplier of vegetation technology in the Nordic region and is a part of Nordic Waterproofing Group. VegTech grow, develop and supply buildings and cities with multifunctional plant systems that contribute to stormwater management, improve water quality and benefit biodiversity.

Name and location of production site(s): Vislanda, Sweden

Product information

Product name: Extensive Green Roof Component: VegTech Sedummatta med biokol (sedum mat with biochar)

Application:
A green roof can be installed for different purposes; it provides many different benefits. For example, green roofs delay and reduce the amount of stormwater, counteract urban heat islands, benefit biodiversity and add value to residents since greenery has a positive effect on their well-being.

VegTech Sedummatta is installed together with different water retention and drainage components that together will form an extensive sedum roof. The choice of remaining components is made so that the build-up is suitable to the specific roof and project requirements. For descriptions of VegTech standard build-ups, please visit vegtech.se.

VegTech extensive green roof systems have high water retention capacity and are easy to install. If properly installed and maintained, the sedum roof can last as long as the life of the building.

Product description:
Only a brief product description is included in this EPD. For further information and detailed product documentation, please visit www.vegtech.se.

The sedum mat consists of vegetation, a mineral growth media (substrate) containing biochar and a load-bearing structure (carrier) that reinforces the substrate and protects against erosion. The shrink-free carrier consists of a three-dimensional loop network with a non-woven geotextile thermally bound on the underside and is stable over time.
The growing media is optimized for the conditions that prevail on roofs. The use of biochar in the substrate entails soil-improving properties that are especially important for greenery in urban environments. Biochar is also a potential carbon sink. (See further information in section “Additional information”). The vegetation consists of drought-resistant species from the Crassulaceae family adapted to the Nordic climate. The sedum mat is cultivated in open fields by VegTech in Sweden
VegTech Sedummatta med biokol has been assigned fire resistance class B_{ROOF}(t2) for roof coverings exposed to external fire in accordance with the procedures given in EN 13501-5:2016.

LCA information

Functional unit / declared unit: 1 m^2 of VegTech Sedummatta med biokol.

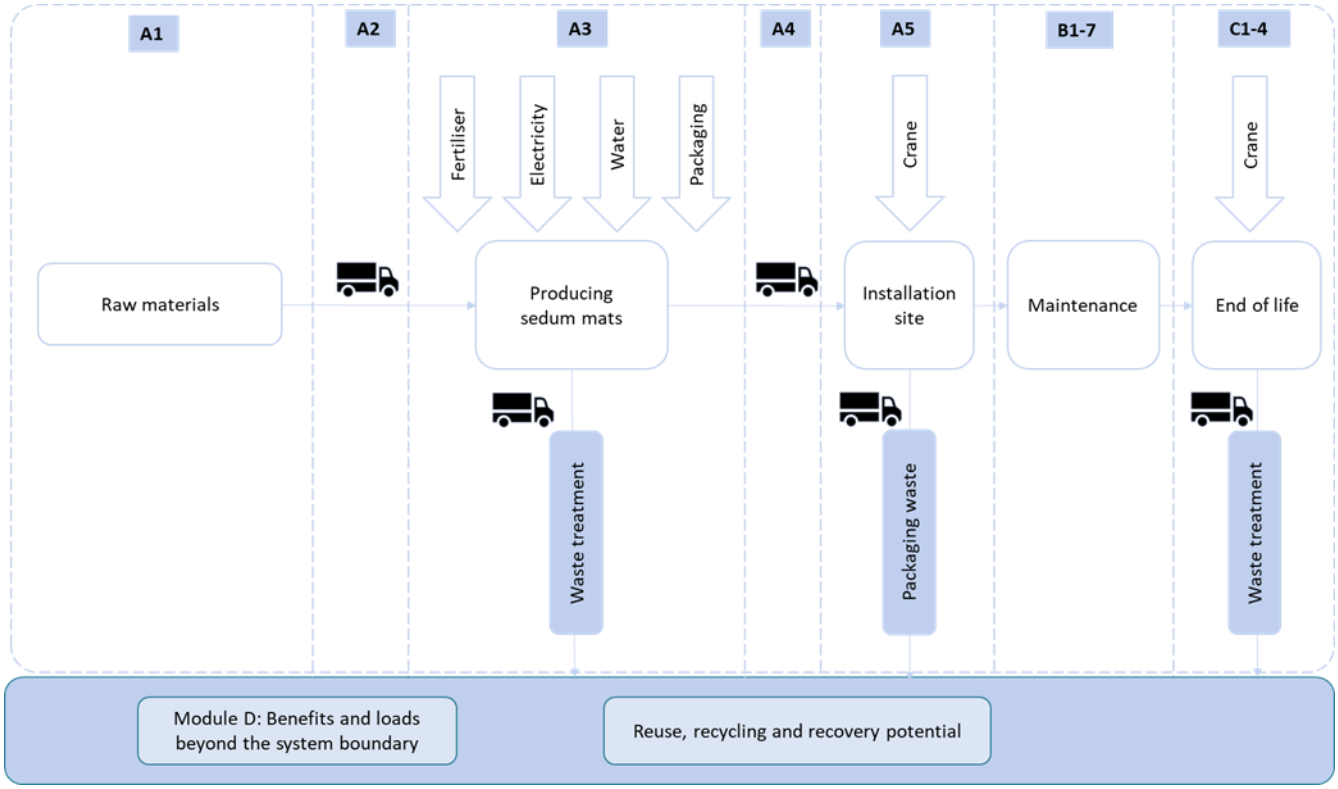
Reference service life:
If properly mounted and maintained, the vegetation is gradually rejuvenated and VegTech green roof systems can have the same service life as the building. Thus, a set reference service life cannot be determined.

Time representativeness: The year studied for this EPD is 2022.

Database(s) and LCA software used:
LCA for Experts v 10.7.0.183 (previously called GaBi) with an integrated Ecoinvent database 3.8.

Description of system boundaries:
Cradle to gate with options, modules A1-A5, B2, C1-C4, D.
The maintenance module B2 comprises all maintenance activities required to sustain the useability of the product during its installed lifetime. The B-module is calculated and presented per 1 year. All other parts of the B module are assumed to be 0.

System diagram:



Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	X	X	-	X*	-	-	-	-	-	X	X	X	X	X
Geography	EU	EU	SE	SE	SE	-	SE	-	-	-	-	-	SE	SE	SE	SE	SE
Specific data used	2 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	0 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0 %			-	-	-	-	-	-	-	-	-	-	-	-	-	-

* B2 module is annual

LCA: additional technical information

The following information describes the different modules of the EPD.

Production stage (A1-A3)

The sedum mat consists of vegetation, a mineral growth media (substrate) containing biochar and a load-bearing structure (carrier) that reinforces the substrate and protects against erosion. These are combined and the vegetation is grown at the manufacturing site in Sweden.

Transport to user (A4)

The transport scenario is based on an estimate of 300km for customers in Sweden.

Type	Capacity utilisation	Type of vehicle	Distance	Fuel consumption
Truck	61%	Average truck trailer with a 27 t payload	300 km	1.59 E-02 kg/tkm

Installation (A5)

Module A5 covers the installation of the product at a construction site. The product is lifted to installation altitude using either a crane-truck or an electrical tower crane, depending on the installation site. A scenario where half of each installation method is applied. The A5 module also includes waste from packaging and installation, which is assumed to be incinerated.

Resource	Amount	Unit /m^2
Diesel	1.76 E-02	kg
Electricity	2.12 E-02	MJ
Water	5.00 E+00	kg
Waste to incineration	2.06 E-01	kg

Maintenance (B2)

The results presented for module B2 refer to one year of usage. This is due to the full B module not being declared and that no reference service life has been determined. For calculating the full life cycle impact, the results in B2 hence need to be multiplied with the assessed time period of interest.

The maintenance module B2 is calculated for one year. VegTech sedum mat with biochar only needs to be fertilised every second year; the amount of fertiliser in the table below is the yearly average.

Resource	Amount	Unit /m^2
Fertiliser	1.5 E-02	kg
Water	2.5 E+00	l

End of life (C1-C3)
Deconstruction of the green roof system is done manually, where crane can be used to bring the waste to ground level if the altitude is high. Materials are separated and sent to composting for compostable material, and the rest is treated per Swedish Statistics end of life data with an assumed transport distance of 100km.

Resource	Amount	Unit /m²
Diesel	1.76 E-02	kg
Waste for composting	5.17 E+00	kg
Inert waste for composting	2.41 E+01	kg
Waste for incineration	2.07 E+00	kg
Plastic for recycling	1.05 E-01	kg

End of life (C4)
No waste was assumed to be sent to the landfill. Here, the virtual emission of biogenic carbon from the product is included.

Benefits beyond the system boundary (D)
Here, credits for producing energy during incineration and recycled materials in C3 are included. For recycled materials, a 10% loss is assumed, and biomaterials are assumed to be composted.

Content information

Product components	Weight (dry), kg	Post-consumer material, weight-%	Biogenic material	
			weight-%	kg C/m²
Substrate	26.9	0	4 %	1.13
Carrier	0.39	0	0	0
Plants	0.42	0	44 %	0.18
Other	0.81	0	0	0
TOTAL	28.6	0	4 %	1.31
Packaging materials	**Weight (dry), kg**	**Weight-% (versus the product)**	**Weight biogenic carbon, kg C/ m²**	
Pallet	1.00	3.4 %	0.52	
Plastic film	0.003	0.01 %	0	
TOTAL	1.00	3.4 %	0.52	

There are no dangerous substances from the candidate list of SVHC for authorisation.

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	3,62E-01	7.12E-01	2.24E+00	1.04E-02	1.64E-03	2,26E-01	5.04E+00	9.48E-01	-6.63E+00
GWP-fossil	kg CO_2 eq.	6.73E+00	7.04E-01	2.29E-01	1.04E-02	1.64E-03	2.24E-01	1.62E+00	0	-1.99E+00
GWP-biogenic	kg CO_2 eq.	-6.37E+00	1.07E-03	2.01E+00	3.69E-05	5.51E-07	3.39E-04	3.41E+00	9.48E-01	-4.63E+00
GWP- luluc	kg CO_2 eq.	5.81E-03	6.50E-03	1.32E-05	5.53E-06	1.64E-07	2.07E-03	1.88E-04	0	-1.43E-04
ODP	kg CFC 11 eq.	1.34E-06	6.86E-14	2.55E-08	1.91E-14	3.54E-10	2.63E-14	6.25E-13	0	-3.43E-10
AP	mol H^+ eq.	1.51E-02	1.33E-03	1.36E-03	2.63E-05	1.72E-05	4.23E-04	3.00E-03	0	-2.70E-03
EP-freshwater	kg P eq.	2.83E-04	2.57E-06	3.78E-06	2.74E-07	5.13E-08	8.21E-07	-1.05E-06	0	-3.36E-06
EP-marine	kg N eq.	4.02E-03	5.49E-04	5.94E-04	9.37E-06	7.62E-06	1.75E-04	1.11E-03	0	-7.67E-04
EP-terrestrial	mol N eq.	4.05E-02	6.27E-03	6.57E-03	1.17E-04	8.35E-05	1.99E-03	1.53E-02	0	-7.49E-03
POCP	kg NMVOC eq.	1.30E-02	1.18E-03	1.77E-03	1.03E-05	2.30E-05	3.77E-04	3.03E-03	0	-2.30E-03
ADP-minerals & metals*	kg Sb eq.	7.57E-06	4.58E-08	6.16E-08	3.67E-09	8.52E-10	1.47E-08	6.96E-10	0	-1.38E-07
ADP-fossil*	MJ	1.17E+02	9.59E+00	2.10E+00	1.56E-01	2.26E-02	3.07E+00	1.81E+00	0	-3.84E+01
WDP*	m^3	1.74E+00	8.42E-03	2.52E-01	1.10E-02	5.57E-05	2.88E-03	4.26E-01	0	-1.36E-01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption									

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

Resource use indicators

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
PERE	MJ	2.55E+01	7.13E-01	7.03E-02	1.37E-02	1.28E-04	2.50E-01	-6.73E-01	0	-8.37E+00
PERM	MJ	5.47E+01	0	0	0	0	0	0	0	0
PERT	MJ	8.02E+01	7.13E-01	7.03E-02	1.37E-02	1.28E-04	2.50E-01	-6.73E-01	0	-8.37E+00
PENRE	MJ	9.13E+01	9.61E+00	2.10E+00	1.56E-01	2.26E-02	3.08E+00	1.81E+00	0	-3.84E+01
PENRM	MJ	2.51E+01	0	0	0	0	0	0	0	0
PENRT	MJ	1.17E+02	9.61E+00	2.10E+00	1.56E-01	2.26E-02	3.08E+00	1.81E+00	0	-3.84E+01
SM	kg	0	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0
FW	m^3	3.25E-01	7.99E-04	5.89E-03	2.43E-03	1.30E-06	2.88E-04	1.01E-02	0	-7.38E-03
Acronyms	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water									

Waste indicators

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1.11E-08	2.75E-11	1.54E-11	1.94E-11	0	3.71E-12	8.01E-11	0	-2.65E-09
Non-hazardous waste disposed	kg	5.78E-01	1.43E-03	2.53E-02	7.31E-04	0	4.85E-04	1.03E-01	0	-1.73E-02
Radioactive waste disposed	kg	1.05E-03	2.65E-05	3.36E-05	3.45E-06	0	1.74E-05	6.02E-05	0	-2.08E-03

Output flow indicators

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
Components for re-use	kg	0	0	1.25E+00	0	0	0	0	0	0
Material for recycling	kg	4.70E-03	0		0	0	0	1.05E-01	0	0
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0
Exported energy, electricity	MJ	0	0	2.54E-01	0	0	0	6.39E+00	0	0
Exported energy, thermal	MJ	0	0	5.78E-01	0	0	0	1.15E+01	0	0

Additional mandatory and voluntary impact category indicators

Indicator	Unit	A1-A3	A4	A5	B2	C1	C2	C3	C4	D
GWP-GHG	kg CO_2 eq.	6.76E+00	7.13E-01	2.29E-01	1.04E-02	1.64E-03	2.27E-01	1.62E+00	0	-2.00E+00

Additional environmental information

General information about biochar

Biochar is a porous, carbonaceous material produced by the pyrolysis of plant biomass. If applied in such a way that the contained carbon remains stored long-term, it is a carbon sink. Since 2018, the IPCC has recognized biochar as a CDR-method (Carbon Dioxide Removal) that can achieve negative emissions.

Biochar entails many benefits when used in a plant bed; it enhances the water and nutrient retention ability, improves soil structure, increases microbial activity and counteracts compaction.

Biochar contributes to a more efficient use of fertilisers The nutrients can be captured and retained in the growing medium until the plants have had time to absorb them. This minimizes the risk of nutrient leakage.

For further information, please visit www.biokol.org and www.european-biochar.org/en.

Biochar in VegTech Sedummatta med biokol

The PCR 2019:14 construction products does not allow credits due to the permanent storage of biogenic carbon. The sum of the sequestered and emitted biogenic carbon must always be zero over the product's life cycle. If the biogenic carbon content of the product is permanently stored, then a virtual emission of biogenic carbon has to be added. In this EPD, the virtual biogenic carbon emission of the product is included in C4.

The amount of biochar in VegTech Sedummatta corresponds to the following carbon sequestration:

Material	Mass kg/m^2	Biogenic carbon sequestered kg C/m^2	Biogenic CO_2 sequestered kg CO_2e/m^2
Biochar	3.42E-01	3.17E-01	1.16E+00

Separate climate impact for the carrier

According to the current regulation (November 2023) from Boverket (the Swedish National Board of Housing, Building and Planning), the climate declaration for new buildings should include green roof components except substrate and vegetation. (Please note that the Swedish regulation can be changed before the expiration date of this EPD).
The impact of total climate change just for the carrier in module A1-A3 is as follows:
GWP Total 2.91 kg CO_2e per m^2 and GWP-GHG 2.89 kg CO_2e per m^2.
Since the carrier is an integrated part of the sedum mat, separate figures for the remaining modules cannot be declared.

References

EN 15804:2012+A2	Sustainability of construction works – Environmental product declaration – Core rules for the product category of constructions products
EPD International (2021)	General Programme Instructions of the International EPD® System, version 4.0
ISO 14020:2022	International Standard ISO 14020 – Environmental statements and programmes for products – Principles and general requirements
ISO 14025:2006	International Standard ISO 14025 – Environmental labels and declarations — Type III environmental declarations — Principles and procedures
ISO 14040:2006	International Standard ISO 14040: Environmental Management – Life cycle assessment – Principles and framework. Second edition 2006-07-01.
ISO 14044:2006	International Standard ISO 14044: Environmental Management – Life cycle assessment – Requirements and Guidelines.
PCR 2019:14	PCR 2019:14. v1.2.5. Construction products.
Swedish Statistics	https://www.statistikdatabasen.scb.se/pxweb/en/ssd/START__MI__MI0305/MI0305T003/table/tableViewLayout1/ visited 2023-10-10

Version history

Version 1: 2023-12-08	Original version
Version 2: 2026-02-04	Adjustments made regarding primary energy indicators, the indicator results for GWP-GHG and changes in results for GWP-biogenic for transports. Also, some references to other PCRs were removed. Specific data was added.

Contact information

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