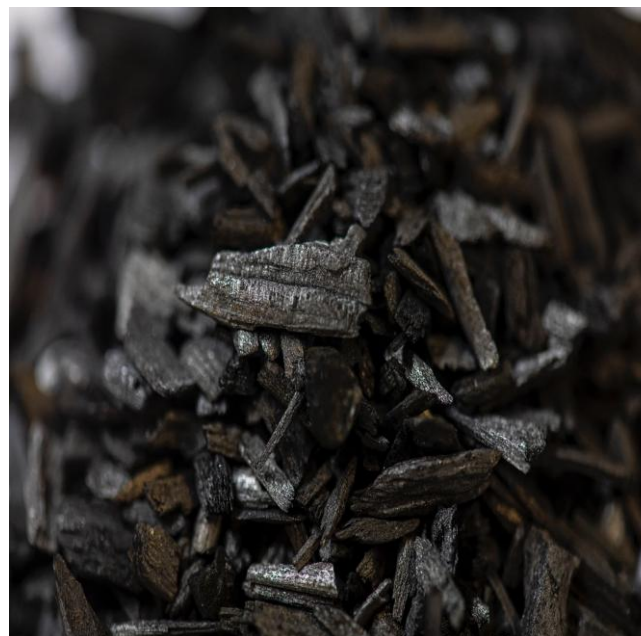




ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 14025

Biochar - UoN
University of Nottingham



EPD HUB, HUB-6343

Published on 17.05.2026, last updated on 17.05.2026, valid until 16.05.2031

Life Cycle Assessment study has been performed in accordance with the requirements of EN 15804, EPD Hub PCR version 1.2 (24 Mar 2025) and JRC characterization factors EF 3.1.

GENERAL INFORMATION

MANUFACTURER

Manufacturer	University of Nottingham
Address	Western Access Road, Immingham Dock, Immingham, South Humberside, DN40 2QR
Contact details	colin.snape@nottingham.ac.uk
Website	https://www.nottingham.ac.uk/

This EPD is intended for business-to-business and/or business-to-consumer communication. The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	EPD Hub, hub@epdhub.com
Reference standard	EN 15804:2012+A2:2019/AC:2021 and ISO 14025
PCR	EPD Hub Core PCR Version 1.2, 24 Mar 2025
Sector	Construction product
Category of EPD	Third party verified EPD
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4-A5, and modules C1-C4, D
EPD author	Dr Gareth Davies, Senior Scientist Tunley Environmental. Third party produced EPD (external to the organisation).
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal verification <input checked="" type="checkbox"/> External verification
EPD verifier	Vera Durão, as an authorised verifier acting for EPD Hub Limited

PRODUCT

Product name	Biochar - UoN
Additional labels	Asphalt
Product reference	-
Place(s) of raw material origin	United Kingdom
Place of production	Western Access Road, Immingham Dock, Immingham, South Humberside, DN40 2QR
Place(s) of installation and use	United Kingdom
Period for data	2025 Calendar Year
Averaging in EPD	No grouping
Variation in GWP-fossil for A1-A3 (%)	-
GTIN (Global Trade Item Number)	-
NOBB (Norwegian Building Product Database)	-
A1-A3 Specific data (%)	48.3

ENVIRONMENTAL DATA SUMMARY

Declared unit	One tonne of biochar product, plus packaging
Declared unit mass	1000 kg
Mass of packaging	3.7 kg
GWP-fossil, A1-A3 (kgCO ₂ e)	750
GWP-total, A1-A3 (kgCO ₂ e)	-607
Secondary material, inputs (%)	0.23
Total energy use, A1-A3 (kWh)	3520
Net freshwater use, A1-A3 (m ³)	11

PRODUCT AND MANUFACTURER

ABOUT THE MANUFACTURER

An internal operation within the University of Nottingham is producing biochar; the University of Nottingham is a UK based public research university with a strong focus on environmental science, engineering, and sustainable technology development.

PRODUCT DESCRIPTION

Biochar is a porous carbonaceous material produced from biomass through carbonisation. The product is intended for use as a biochar material in construction related applications, where its carbon content, alkaline character and porous structure provide relevant material functionality.

Received biochar has a moisture content of approximately 61 wt.% due to hygroscopic behaviour. The biochar has a low bulk density of approximately 300 kg/m³. Specific characteristics of biochar vary depending on particle fraction and moisture conditions. The ash content of the biochar is approximately 12 wt.% on a dry basis.

The biochar is generally characterised by high carbon content, with representative dry basis values of approximately 86 wt.% total carbon and 85 wt.% organic carbon. It has a low molar H:Corg ratio of approximately 0.16, and a low O:C ratio of approximately 0.02. The material is alkaline, with pH of approximately 9. Testing is performed for relevant physical properties, chemical composition, heavy metals, nutrients, PAHs, dioxins, furans and PCBs using recognised DIN, EN and ISO methods.

Further information can be found at: <https://www.nottingham.ac.uk/>

PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	-	-
Minerals	-	-
Fossil materials	-	-
Bio-based materials	100	United Kingdom. West Sussex.

BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	375
Biogenic carbon content in packaging, kg C	0

FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	One tonne of biochar product, plus packaging
Mass per declared unit	1000 kg
Functional unit	-
Reference service life	-

SUBSTANCES, REACH - VERY HIGH CONCERN

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

PRODUCT LIFE-CYCLE

SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

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		
x	x	x	x	x	ND	ND	ND	ND	ND	ND	ND	x	x	x	x	x		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Not declared = ND.

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.

A market-based approach is used in modelling the electricity mix utilized in the factory.

For the A1 module a yield of 35 wt.% based on dry input mass is considered. 25% of the final biochar product mass is water. Consequently, for a yield of 750 kg of dry biochar product an input mass of 2,143 kg is required. 2.75% of the dry input is grass at 59 kg, with a moisture content of 80% this required a wet input mass of 295 kg of grass cuttings. The remaining 97.25% of dry input mass is from green waste at 2,084 kg with a moisture content of 50% requires a wet input mass of 4,168 kg of green waste. Packaging materials in the A3 module are estimated based on a rubble bag of weight 0.81 kg with a volume of 0.73 m³ using the density of the biochar product at 300 kg/m³. This requires a mass of 3.7 kg polypropylene rubble bags for the transportation of 1 tonne of biochar product. The 250 kg of water which are added after processing are considered within the A3 module.

For the A2 module grass cuttings and green waste are locally sourced and transported to the pyrolysis plant. Grass cuttings (295 kg/DU) are transported 52.9 km. Green waste (4168 kg/DU) is transported 53.3 km. Distances are based on the trial operation pyrolysis plant. Both are transported in 16-32 tonne HGVs. Rubble packaging bags (3.7 kg/DU) are assumed to be transported 100 km. The grass cuttings and green waste are dried and then pyrolysed into biochar. After processing, water is added to the dry biochar, and it is transported in 1 tonne capacity polypropylene bags in heavy duty vehicles.

Within the remaining A3 module for manufacturing the pyrolysis process requires 20 kWh of natural gas per tonne of wet input material. It additionally requires 130 kWh of electricity per tonne of wet input material. This is multiplied by the total wet input mass at 4.46 tonne to get 89 and 580 kWh of natural gas and electricity per declared unit.

In addition, lighting is included as a supporting process, with an estimated demand of 3 kW during operation. Annual operation is estimated at 8,000 hours, with an estimated annual production of 3,000 tonne. Therefore, requiring 2.66 hours per tonne. Consequently energy for lighting is estimated at 8 kWh.

During pyrolysis losses of the dry input mass of 1,392.9 kg is calculated based on the yield and dry input weight. All of this is a direct release of biogenic greenhouse gases during pyrolysis. There is no additional manufacturing waste generated during processing. Consequently, no waste processing or transportation is considered in this module.

In the A1-A3 a significant portion of biogenic sequestration is reported. Within biochar a significant portion of this biogenic carbon would be stored for more than 100 years. However, EN 15804+A2 does not allow credits due to the delayed emissions or permanent storage of biogenic carbon when calculating results. Consequently a virtual biogenic release equal to the sequestration is placed into the end-of-life module.

The use of green energy in manufacturing is demonstrated through contractual instruments (GOs, RECs, etc.), and its use is ensured throughout the validity period of this EPD.

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.

The biochar is transported to a construction site where it is used in asphalt as a filler material for road applications. This involves the use diesel fuel for of heavy-duty vehicles and electricity for application of the biochar in asphalt mixes.

For the A4 module on transportation to site is estimated at 200 km for the 1,003.7 kg of product plus packaging. This equates to 200.7 tonne.km of freighting per tonne of biochar product. Transportation assumes the use of a 16-32 tonne lorry (EURO 5) with a 50% load factor.

For the A5 module installation is based on average installation processes. This equates to 0.5 litres of diesel consumption in a telehandler, 12.7 kWh of electricity consumption in a grinding-ball mill, 5 kWh of consumption in a disc pelletizer, and 26.6 kWh of electricity consumption in a pug mill. All of this is for the installation of 1 tonne of biochar in asphalt.

Installation waste covers only the polypropylene sacks used to transport the biochar. These are modelled as send of incineration with energy recovery. 120 km of travel in a 16-32 tonne lorry (EURO 5) with a 50% load factor is applied.

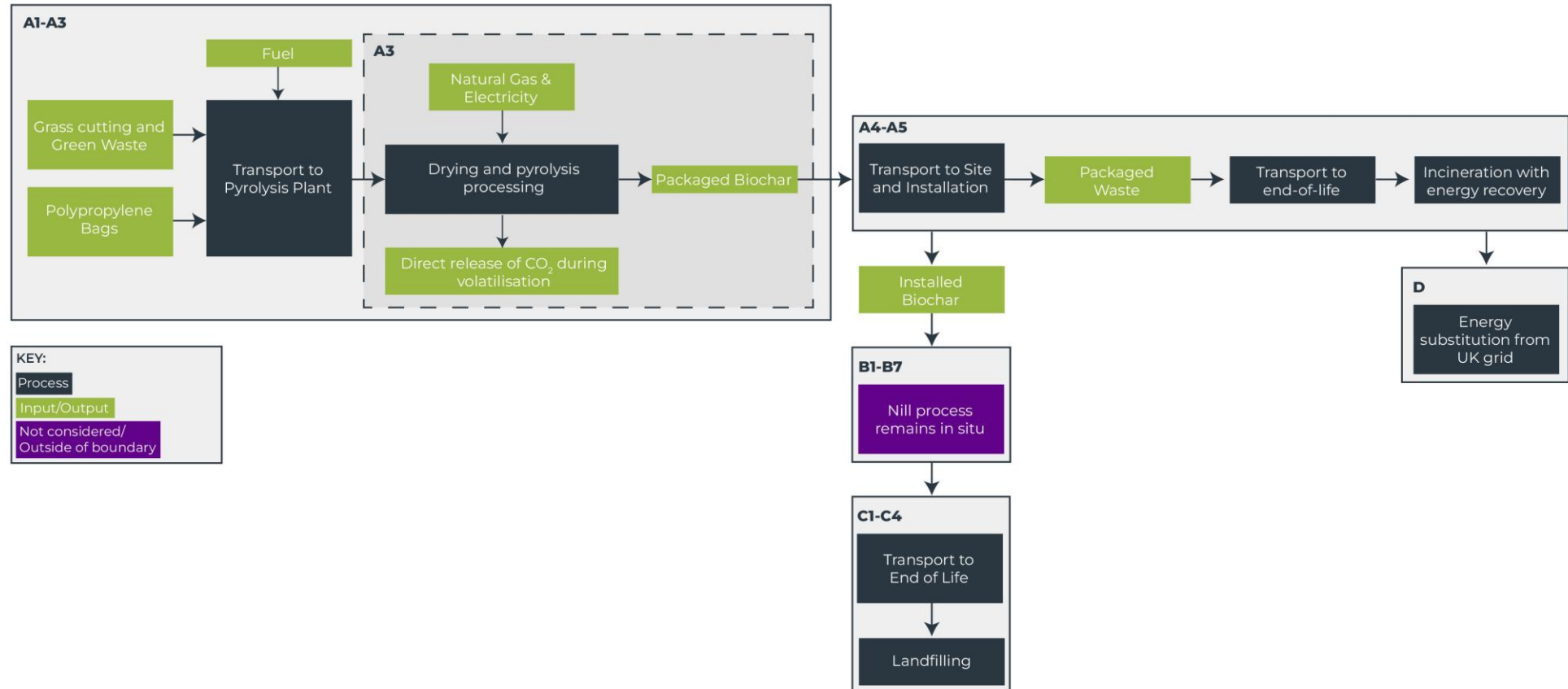
PRODUCT END OF LIFE (C1-C4, D)

At end of life, the biochar is assumed to remain incorporated within the asphalt material. As the specific end of life route is not known, a conservative scenario is modelled. The scenario assumes demolition of the asphalt containing the biochar, transport of the material 80 km by 16 to 32 tonne HGV to a local landfill, and disposal to landfill. Demolition is modelled using 10 kWh of diesel consumption per tonne of material. Landfill compaction is modelled using 1.6 kWh per tonne. Retention in place and recycling with reclaimed asphalt pavement are not included in the scenario declared.

Module C4 includes an accounting release of the biogenic carbon stored in the biochar to balance the biogenic carbon uptake reported in the product stage, in accordance with EN 15804+A2. This is a modelling assumption and does not represent a specific physical release process at end of life.

For module D the energy recovery from the incineration of polypropylene bags is modelled. An energy density of 44 MJ/kg is applied to the 3.7 kg of material. An energy recovery rate and conversion to electricity is applied at 22%. This is applied as substitution of energy from the UK national grid at a calculated energy value of 35.8 MJ.

MANUFACTURING PROCESS



LIFE-CYCLE ASSESSMENT

CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard 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.

The production of capital equipment, construction activities, and infrastructure, maintenance and operation of capital equipment, personnel-related activities, energy and water use related to company management and sales activities are excluded.

- Employee's commuting and homeworking to the manufacturing facility is excluded from the analysis.
- Business travel related to regular business operations is excluded from the analysis.
- Capital goods and infrastructure related to the construction of buildings and equipment at the manufacturing facility.
- Small tools and consumables with low mass and spend e.g. hand tools.

VALIDATION OF DATA

Data collection for production, transport, and packaging was conducted using time and site-specific information, as defined in the general information section on page 1 and 2. Upstream process calculations rely on generic data as defined in the Bibliography section. Manufacturer-provided specific and generic data were used for the product's manufacturing stage.

ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	Not applicable
Ancillary materials	Not applicable
Manufacturing energy and waste	Allocated by mass or volume

- Packaging use is estimated based on a biochar density of 300 kg/m³ and a volume of propylene bag at 0.729 m³ with the mass of one polypropylene bag equating to 0.81 kg.
- A proxy factor is utilised for the biogenic balancing. This represents the dry input of the biogenic material in two separate processes. One of which covers the volatilised material, and one represents the carbon sequestered in the biochar.
- An estimated upstream transport of 100 km is used for the polypropylene bags.
- Energy of lighting is estimated at 3 kW per hour of plant operation.
- Downstream installation distance is regional to the UK and assumed at 200 km.

PRODUCT & MANUFACTURING SITES GROUPING

Type of grouping	No grouping
Grouping method	Not applicable
Variation in GWP-fossil for A1-A3, %	-

This EPD is product and factory specific.

LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator for EPD Hub V3 and EPD Process Certification v3.2.5. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.10.1/3.11/3.12 and One Click LCA databases as sources of environmental data. Allocation used in Ecoinvent 3.10.1/3.11/3.12 environmental data sources follow the methodology 'allocation, Cut-off, EN 15804+A2'.

End of life scenarios and assumptions on transportation modelled according to:

- Erlandsson M, Peterson D, 2015. Klimatpåverkan för byggnader med olika energiprestanda. Underlagsrapport till kontrollstation 2015. IVL Swedish Environmental Research Institute report number U5176, May 27th 2015.
- OVAM, 2018. Environmental profile of building elements
- RICS, Whole life carbon assessment for the built environment, 2nd ed., September 2023, version 3, August 2024.

ENVIRONMENTAL IMPACT DATA

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total ¹⁾	kg CO ₂ e	-3.99E+03	3.99E+01	3.34E+03	-6.07E+02	2.16E+01	2.47E+01	ND	ND	ND	ND	ND	ND	ND	3.62E+00	1.14E+01	0.00E+00	1.36E+03	-2.95E+00
GWP – fossil	kg CO ₂ e	3.81E+02	3.93E+01	3.30E+02	7.50E+02	2.16E+01	2.40E+01	ND	ND	ND	ND	ND	ND	ND	3.62E+00	1.08E+01	0.00E+00	5.84E-01	-2.79E+00
GWP – biogenic	kg CO ₂ e	-4.37E+03	0.00E+00	3.01E+03	-1.36E+03	0.00E+00	7.03E-01	ND	ND	ND	ND	ND	ND	ND	6.90E-04	1.97E-01	0.00E+00	1.36E+03	-1.58E-01
GWP – LULUC	kg CO ₂ e	1.13E+00	6.03E-01	3.22E-02	1.77E+00	9.67E-03	1.64E-02	ND	ND	ND	ND	ND	ND	ND	3.71E-04	4.18E-01	0.00E+00	5.98E-05	-3.63E-03
Ozone depletion pot.	kg CFC-11e	4.32E-06	9.27E-07	1.25E-05	1.77E-05	3.19E-07	5.80E-07	ND	ND	ND	ND	ND	ND	ND	5.38E-08	4.26E-07	0.00E+00	8.66E-09	-1.24E-07
Acidification potential	mol H ⁺ e	4.83E+00	1.30E-01	7.80E-01	5.74E+00	7.37E-02	4.98E-02	ND	ND	ND	ND	ND	ND	ND	3.24E-02	3.41E-02	0.00E+00	5.22E-03	-7.24E-03
EP-freshwater ²⁾	kg Pe	1.29E-01	3.22E-03	6.82E-02	2.01E-01	1.68E-03	1.48E-03	ND	ND	ND	ND	ND	ND	ND	1.17E-04	8.75E-04	0.00E+00	1.88E-05	-3.15E-04
EP-marine	kg Ne	1.28E+00	4.80E-02	1.94E-01	1.52E+00	2.42E-02	1.68E-02	ND	ND	ND	ND	ND	ND	ND	1.51E-02	1.54E-02	0.00E+00	2.43E-03	-1.94E-03
EP-terrestrial	mol Ne	1.92E+01	4.69E-01	1.98E+00	2.17E+01	2.63E-01	1.83E-01	ND	ND	ND	ND	ND	ND	ND	1.65E-01	1.30E-01	0.00E+00	2.66E-02	-2.12E-02
POCP (“smog”) ³⁾	kg NMVOCe	2.93E+00	1.83E-01	6.51E-01	3.76E+00	1.09E-01	5.48E-02	ND	ND	ND	ND	ND	ND	ND	4.94E-02	5.16E-02	0.00E+00	7.96E-03	-6.38E-03
ADP-minerals & metals ⁴⁾	kg Sbe	1.44E-03	1.39E-04	4.97E-04	2.07E-03	6.03E-05	3.41E-05	ND	ND	ND	ND	ND	ND	ND	1.30E-06	4.21E-05	0.00E+00	2.10E-07	-7.43E-06
ADP-fossil resources	MJ	5.17E+03	5.57E+02	6.32E+03	1.21E+04	3.14E+02	3.45E+02	ND	ND	ND	ND	ND	ND	ND	4.72E+01	1.54E+02	0.00E+00	7.60E+00	-7.18E+01
Water use ⁵⁾	m ³ e depr.	3.41E+02	3.21E+00	1.49E+02	4.93E+02	1.55E+00	3.18E+00	ND	ND	ND	ND	ND	ND	ND	1.21E-01	1.12E+00	0.00E+00	1.96E-02	-6.43E-01

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, EF 3.1

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	7.86E-05	3.37E-06	3.59E-06	8.55E-05	2.16E-06	6.65E-07	ND	ND	ND	ND	ND	ND	ND	9.25E-07	1.03E-06	0.00E+00	1.49E-07	-4.35E-08
Ionizing radiation ⁶⁾	kBq 11235e	2.15E+01	4.64E-01	1.24E+02	1.46E+02	2.73E-01	1.04E+01	ND	ND	ND	ND	ND	ND	ND	2.01E-02	1.29E-01	0.00E+00	3.23E-03	-2.32E+00
Ecotoxicity (freshwater)	CTUe	2.03E+03	3.22E+02	5.03E+03	7.38E+03	4.44E+01	2.01E+02	ND	ND	ND	ND	ND	ND	ND	2.69E+01	5.89E+01	0.00E+00	4.34E+00	-4.17E+01
Human toxicity, cancer	CTUh	1.72E-06	7.58E-09	3.36E-08	1.76E-06	3.57E-09	2.11E-09	ND	ND	ND	ND	ND	ND	ND	3.69E-10	2.38E-09	0.00E+00	5.95E-11	-3.68E-10
Human tox. non-cancer	CTUh	-5.50E-06	3.79E-07	1.14E-06	-3.97E-06	2.03E-07	7.30E-08	ND	ND	ND	ND	ND	ND	ND	5.80E-09	1.15E-07	0.00E+00	9.35E-10	-1.25E-08
SQP ⁷⁾	-	1.26E+05	4.33E+02	5.38E+02	1.27E+05	3.16E+02	8.62E+01	ND	ND	ND	ND	ND	ND	ND	3.12E+00	1.64E+02	0.00E+00	5.03E-01	-1.88E+01

6) 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	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy ⁸⁾	MJ	3.65E+02	9.38E+00	3.97E+02	7.71E+02	4.30E+00	6.85E+01	ND	ND	ND	ND	ND	ND	ND	2.96E-01	3.35E+00	0.00E+00	4.77E-02	-1.53E+01
Renew. PER as material	MJ	2.14E+04	0.00E+00	-1.39E+04	7.49E+03	0.00E+00	-1.41E-01	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	-7.49E+03	0.00E+00
Total use of renew. PER	MJ	2.18E+04	9.38E+00	-1.35E+04	8.26E+03	4.30E+00	6.84E+01	ND	ND	ND	ND	ND	ND	ND	2.96E-01	3.35E+00	0.00E+00	-7.49E+03	-1.53E+01
Non-re. PER as energy	MJ	5.18E+03	5.61E+02	6.15E+03	1.19E+04	3.14E+02	2.24E+02	ND	ND	ND	ND	ND	ND	ND	4.72E+01	1.57E+02	0.00E+00	7.60E+00	-7.18E+01
Non-re. PER as material	MJ	0.00E+00	0.00E+00	1.71E+02	1.71E+02	0.00E+00	-1.71E+02	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-re. PER	MJ	5.18E+03	5.61E+02	6.32E+03	1.21E+04	3.14E+02	5.30E+01	ND	ND	ND	ND	ND	ND	ND	4.72E+01	1.57E+02	0.00E+00	7.60E+00	-7.18E+01
Secondary materials	kg	2.26E+00	2.55E-01	5.45E-01	3.06E+00	1.33E-01	4.67E-02	ND	ND	ND	ND	ND	ND	ND	1.95E-02	7.29E-02	0.00E+00	3.15E-03	-7.87E-03
Renew. secondary fuels	MJ	2.17E+01	3.30E-03	2.16E-03	2.17E+01	1.70E-03	2.08E-04	ND	ND	ND	ND	ND	ND	ND	5.12E-05	9.66E-04	0.00E+00	8.24E-06	-3.81E-05
Non-ren. secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of net fresh water	m ³	9.92E+00	1.01E-01	9.98E-01	1.10E+01	4.64E-02	6.82E-02	ND	ND	ND	ND	ND	ND	ND	3.02E-03	3.96E-02	0.00E+00	4.87E-04	-1.45E-02

8) PER = Primary energy resources.

END OF LIFE – WASTE

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	6.98E+01	1.30E+00	1.47E+01	8.58E+01	5.31E-01	5.54E-01	ND	ND	ND	ND	ND	ND	ND	5.29E-02	1.13E+00	0.00E+00	8.52E-03	-9.85E-02
Non-hazardous waste	kg	7.23E+02	2.09E+01	3.55E+02	1.10E+03	9.83E+00	1.23E+01	ND	ND	ND	ND	ND	ND	ND	7.71E-01	1.60E+01	0.00E+00	1.24E-01	-1.79E+00
Radioactive waste	kg	5.20E-03	1.13E-04	2.66E-02	3.19E-02	6.68E-05	2.26E-03	ND	ND	ND	ND	ND	ND	ND	4.93E-06	3.11E-05	0.00E+00	7.94E-07	-5.08E-04

END OF LIFE – OUTPUT FLOWS

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	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	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy rec	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	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	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy – Electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy – Heat	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO ₂ e	3.81E+02	3.97E+01	3.28E+02	7.48E+02	2.15E+01	2.39E+01	ND	ND	ND	ND	ND	ND	ND	3.60E+00	1.12E+01	0.00E+00	5.81E-01	-2.79E+00
Ozone depletion Pot.	kg CFC ₁₁ e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acidification	kg SO ₂ e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Eutrophication	kg PO ₄ ³ e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
POCP (“smog”)	kg C ₂ H ₄ e	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADP-elements	kg Sbe	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
ADP-fossil	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	ND	ND	ND	ND	ND	ND	ND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

ADDITIONAL INDICATOR – GWP-GHG

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP-GHG ⁹⁾	kg CO ₂ e	3.82E+02	3.99E+01	3.30E+02	7.52E+02	2.16E+01	2.40E+01	ND	ND	ND	ND	ND	ND	ND	3.62E+00	1.12E+01	0.00E+00	5.84E-01	-2.79E+00

9) This indicator includes all greenhouse gases excluding biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. In addition, the characterisation factors for the flows – CH₄ fossil, CH₄ biogenic and Dinitrogen monoxide – were updated. This indicator is identical to the GWP-total of EN 15804:2012+A2:2019 except that the characterisation factor for biogenic CO₂ is set to zero

SCENARIO DOCUMENTATION

DATA SOURCES

Manufacturing energy scenario documentation

1. Heat production, natural gas, at boiler modulating <100kW, Albania, Ecoinvent, 0.0770 kgCO₂e/MJ
2. Natural gas, World, One Click LCA, 0.26 kgCO₂e/kWh
3. Electricity, medium voltage, residual mix, United Kingdom, Ecoinvent, 0.47 kgCO₂e/kWh
4. Electricity, medium voltage, residual mix, United Kingdom, Ecoinvent, 0.47 kgCO₂e/kWh

Transport scenario documentation - A4 (Transport resources)

1. Market for transport, freight, lorry >32 metric ton, EURO5, 200 km

Transport to the building site (A4) - Scenario documentation

Scenario parameter	Value
Capacity utilization (including empty return) %	-
Bulk density of transported products	3.01E+02
Volume capacity utilization factor	-

Installation at the building site (A5) - Scenario documentation

Scenario parameter	Value
Energy: type and consumption (MJ or kWh)	Diesel, 17.9 MJ Electricity, 44.3 kWh
Water use (m ³)	-
Ancillary materials: type and mass (kg)	-
Waste materials: type and mass (kg)	3.7 kg polypropylene from product
Waste materials: output routes	Polypropylene, 3.7 kg incineration
Direct emissions (kg)	-

End of life (C1-C4) - Scenario documentation

Scenario information	Value
Collection process: collected separately (kg)	-
Collection process: Mixed waste (kg)	-
Recovery: re-use (kg)	0
Recovery: recycling (kg)	0
Recovery: energy recovery (kg)	0
Disposal (kg)	1000
Scenario assumptions e.g. transportation (mode, km) & other	80 km 16-32 tonne HGV

THIRD-PARTY VERIFICATION STATEMENT

EPD Hub declares that this EPD is verified in accordance with ISO 14025 by an independent, third-party verifier. The project report on the Life Cycle Assessment and the report(s) on features of environmental relevance are filed at EPD Hub. EPD Hub PCR and ECO Platform verification checklist are used.

EPD Hub is not able to identify any unjustified deviations from the PCR and EN 15804+A2 in the Environmental Product Declaration and its project report.

EPD Hub maintains its independence as a third-party body; it was not involved in the execution of the LCA or in the development of the declaration and has no conflicts of interest regarding this verification.

The company-specific data and upstream and downstream data have been examined as regards plausibility and consistency. The publisher is responsible for ensuring the factual integrity and legal compliance of this declaration.

The software used in creation of this LCA and EPD is verified by EPD Hub to conform to the procedural and methodological requirements outlined in ISO 14025:2010, ISO 14040/14044, EN 15804+A2, and EPD Hub Core Product Category Rules and General Program Instructions.

Verified tools

Tool verifier: Magaly Gonzalez Vazquez

Tool verification validity: 27 March 2025 - 26 March 2028

Vera Durão, as an authorised verifier acting for EPD Hub Limited

17.05.2026

