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Circular11

Environmental Product Declaration

Average EPD

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

Acoustic Barrier

Circular11

Programme
EPD Square | www.epdsquare.com

Programme operator
EPD Square, s.r.o.

EPD Registration number
SQ 00-010

Publication date
14.09.2024

Valid until
13.09.2029

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General information

Product
Acoustic Barrier

Program operator
EPD Square, s.r.o.
Karadžičova 16, 811 09, Bratislava, Slovakia
Email: info@epdsquare.com

Registration number
SQ 00-010

Publication date
14.09.2024

Valid until date
13.09.2029

Owner of the declaration
Circular11
Contact person: Benjamin Gibbons
Email: ben@circular11.com

Manufacturer
Circular11
Ham Lane, High Mead Farm,
Wimborne Minster, BH22 9DR,
England, GB
Email: info@circular11.com

Place of production
Wimborne Minster, England

Product Category Rules (PCR)
The CEN standard EN 15804+A2 serves as the core PCR. In addition, EPD Square PCR v1.0, 2024 is used.EPD Square PCR v1.0, 2024

Declared/Functional unit
1 m^2

Mass per DU
56 kg

UN CPC code
3925 - Builders' ware of plastics

Geographical scope
United Kingdom/Europe

Year of study
2023

Comparability
EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in the context of the building.

EPD author
Sarah Curpen, Silvia Vilčeková

Verification type
Independent verification of the declaration and data, according to ISO14025:2006
Internal: ☐
External: ☒

Verified by
Elisabet Amat Guasch

The owner of the declaration shall be liable for the underlying information and evidence.
EPD Square shall not be liable with respect to manufacturer, life cycle assessment data and evidence.

System boundaries

Cradle to gate with options, modules C1–C4, module D and with additional modules. The additional modules are A4–A5.

Modules declared and geographical scope

	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	✓	✓	✓	✓	✓	MND	MND	MND	MND	MND	MND	MND	✓	✓	✓	✓	✓
Geography	UK	UK	UK	UK	UK	-	-	-	-	-	-	-	UK	UK	UK	UK	UK

MND : Modules not declared

Description of Organization

Circular11 turns low-grade plastic waste into building materials and home products, in order to create an end-market for the contaminated and film-based plastics that make up between 50 and 80% of global packaging waste. Especially in emerging markets, most of this is openly burnt or leaked into the ocean. Circular11 uses composite and bio-composite technology to valorise this waste, creating locally useful products that can be recycled again and again, and thereby making closed-loop, local circular economies that are accessible to communities anywhere in the world.

Product information

Product name
Acoustic Barrier

Product description
The acoustic barrier is an innovative solution designed to mitigate noise pollution, constructed primarily from low-grade plastic. This plastic, which would otherwise be destined for municipal incineration, is repurposed to create a sustainable and eco-friendly noise reduction system. The barrier efficiently absorbs and blocks sound waves, enhancing the acoustic environment of the surrounding area.

Product application
Acoustic isolation

Technical Specifications
BS EN 14388 – 2005
BS EN 1793-2
Acoustic performance: B3
Height: 3m
Width: 3m
Thickness: 158mm

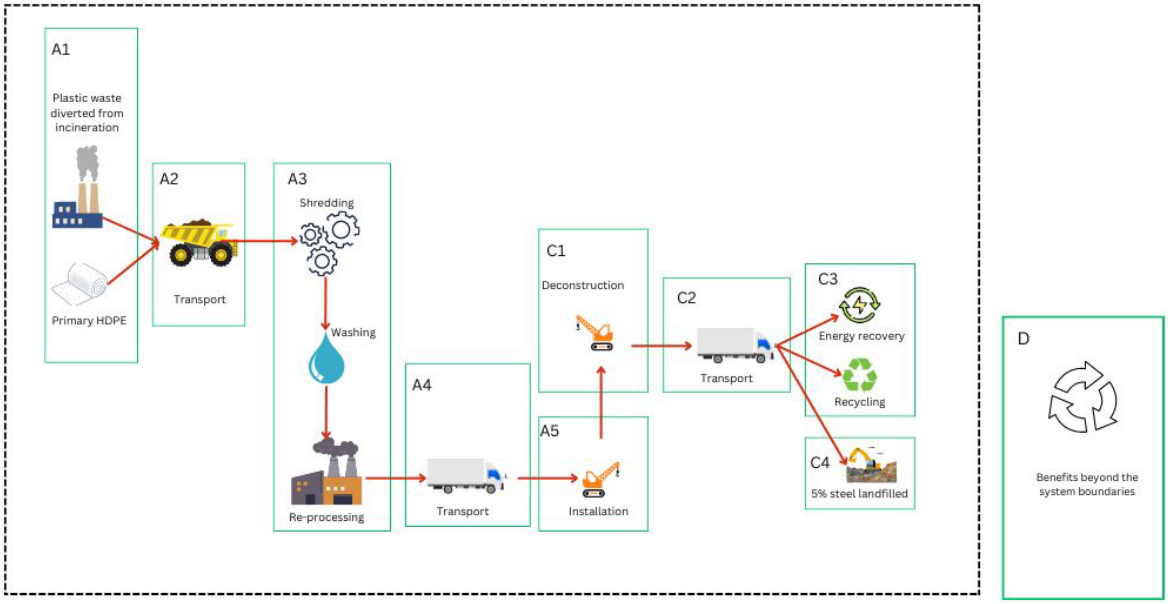
Geographical scope
United Kingdom/Europe

Product contents information

Product components	Weight, kg	Post-consumer material, weight-%	Renewable material, weight-%
Mixed low-grade plastic (polypropylene, polystyrene, polyethylene)	27-32	100	-
High grade plastic (HDPE)	3.8-9.4	-	-
UV Stabiliser	0.56	-	-
Masterbatch	0.37	-	-
Coupling agent	0.37	-	-
Steel	18.5	76	-
Zinc coating	0.029		-
TOTAL	56	45	

Manufacturing process

The primary raw material is sourced from plastic incineration facilities in the form of mix plastic waste consisting of polyethylene, polystyrene and polypropylene. High density polyethylene is also brough to the manufacturing plant in the form of granules. UV stabilizer, colours and polymer additives are added to the mix to form new plastic mixture. H struts and I beams are connected to the acoustic barrier on site. Each raw material is brought in separately to the manufacturing location from various locations within the United Kingdom. The low-grade plastic is shredded. washed, melted, and turned into pelletized. High grade plastic arrives at the factory as pellets. Additives, high grade and low-grade plastic pellets are combined to create new products which are extruded. The final product is shipped as is without packaging. The H-steel beams and I-steel beams are connected to the acoustic barrier on site.



Life cycle assessment (LCA)

The composition of acoustic barrier varies as it is largely dependent on the post-consumer plastic available from the different facilities where the plastic is gathered. As such an average EPD is conducted based on the minimum post-consumer plastic and maximum post-consumer plastic content scenarios. In the minimum case, 27 kg low grade plastic is combined with 9.4 kg of high-grade plastic. In the maximum case, 32 kg of low-grade plastic is combined with 3.8 kg high-grade plastic.

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.

Allocation, estimations, and assumptions

Allocation is based on annual production rate and made with high accuracy and precision. The values for 1 m^2 of the products which are used within this study are calculated by considering the total product weight per annual production. In the production plant, several kinds of products are produced; since the production processes of these products are similar, the annual production percentages are taken into consideration for allocation. According to the ratio of the annual production of the declared product to the total annual production at the factory, the annual total energy consumption, packaging materials and the generated waste per the declared product are allocated. Subsequently, the produced products output fixed to 1 m^2 and the corresponding amount of product is used in the calculations.

Database(s) and LCA software

This EPD has been created using One Click LCA Pre-Verified EPD Generator. Ecoinvent v3.8 and One Click LCA databases were used as sources of environmental data.

LCA scenario and additional environmental information

Manufacturing energy scenario

Electricity data source and quality	United Kingdom, residual mix
Electricity CO2e / kWh	0.6
Energy data source and quality	LCA study for country specific electricity mixes based on IEA, OneClickLCA 2024

Transportation scenario (A4)

Transportation impacts that occurred from final product delivery to the construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions. The transport distances to various delivery sites are given below and are based on delivery records for 2023.

Vehicle type used for transport	Truck 7.5-16 ton, euro 6
Distance to the construction site	192 km
Capacity utilization	50%

Installation (A5)

The installation of acoustic barriers requires use of crane for lifting and placing the product in place. This estimated crane time for installation is 0.25 hr/m^2.

Use Phase (B1-B7)

The modules for use phase (B1-B7) are not included in the LCA.

End of Life (C1, C2, C3, C4)

Acoustics barrier is un-installed using the crane. It is assumed that the uninstallation crane time is the same as the installation time that is 0.25hr/m^2. The steel parts of the barrier and plastic parts are sorted. The steel and plastic components are transported to steel/plastic recycling facility located 220 km away from construction site. According to the British plastic federation, 92% of plastic waste is collected and sent to plastic recycling facility where plastic is recycled via chemical processing. The remaining 8% is assumed to be treated as municipal waste and is therefore incinerated. Steel has a recycling rate of 95% and 5% is landfill. The plastic collected as mixed construction waste is sent to an incineration facility located 50 km away.

	Value	Unit
Collected separately - steel	17.5	kg
Collected separately - plastic	34.5	
Collected as mixed construction waste	3	kg
Reuse	-	kg
Recycling	52.9	kg
Energy recovery	3	kg
To landfill - steel	0.92	kg

LCA results

Mandatory impact category indicators – EN 15804+A2, PEF 3.0

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO2 eq.	2.9E+01	1.8E+00	1.2E+01	4.3E+01	1.3E+01	1.0E+01	1.0E+01	2.5E+00	1.2E+01	5.0E-03	-6.7E+01
GWP-fossil	kg CO2 eq.	2.9E+01	1.8E+00	1.2E+01	4.3E+01	1.3E+01	1.0E+01	1.0E+01	2.5E+00	1.0E+01	5.0E-03	-6.7E+01
GWP-biogenic	kg CO2 eq.	2.8E-01	8.3E-04	6.4E-03	2.8E-01	3.0E-03	1.9E-03	1.9E-03	1.1E-03	1.4E+00	3.3E-06	3.4E-03
GWP-LULUC	kg CO2 eq.	3.9E-02	8.7E-04	6.0E-04	4.0E-02	2.1E-03	1.0E-03	1.0E-03	1.2E-03	3.7E-03	4.7E-06	-2.2E-03
ODP	kg CFC11 eq.	2.4E-06	4.1E-07	1.4E-06	4.1E-06	2.8E-06	2.2E-06	2.2E-06	5.6E-07	3.4E-07	2.0E-09	2.2E-07
AP	mol H^+ eq.	1.7E-01	5.1E-03	4.2E-02	2.2E-01	1.2E-01	1.1E-01	1.1E-01	7.1E-03	2.1E-02	4.7E-05	-4.1E-02
EP-freshwater	kg P eq.	1.6E-03	1.5E-05	2.2E-07	1.6E-03	5.4E-05	3.5E-05	3.5E-05	2.0E-05	9.4E-05	5.3E-08	-6.8E-05
EP-marine	kg N eq.	2.6E-02	9.8E-04	1.1E-02	3.8E-02	4.9E-02	4.8E-02	4.8E-02	1.4E-03	9.1E-03	1.6E-05	-1.1E-02
EP-terrestrial	mol N eq.	2.9E-01	1.1E-02	1.2E-01	4.3E-01	5.4E-01	5.3E-01	5.3E-01	1.5E-02	8.4E-02	1.8E-04	-1.2E-01
POCP	kg NMVOC eq.	1.0E-01	4.2E-03	3.5E-02	1.4E-01	1.5E-01	1.5E-01	1.5E-01	5.8E-03	2.4E-02	5.2E-05	-4.7E-02
ADP-M&M	kg Sb eq.	1.1E-03	8.6E-06	8.3E-08	1.1E-03	1.6E-05	5.3E-06	5.3E-06	1.2E-05	3.4E-05	1.2E-08	-1.2E-04
ADP-fossil	MJ	4.4E+02	2.7E+01	4.1E-02	4.7E+02	1.7E+02	1.4E+02	1.4E+02	3.7E+01	3.2E+01	1.4E-01	3.9E+01
WDP	m^3	2.5E+01	1.4E-01	8.9E+00	3.4E+01	5.6E-01	3.8E-01	3.8E-01	1.9E-01	1.0E+00	4.4E-04	-3.8E+00

GWP-total: Global Warming Potential; 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; See "additional requirements" for indicator given as PO4 eq. EP-marine: Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-terrestrial: Eutrophication potential, Accumulated Exceedance; POCP: Formation potential of tropospheric ozone; ADP-M&M: Abiotic depletion potential for non-fossil resources (minerals and metals); ADP-fossil: Abiotic depletion potential for fossil resources; WDP: Water deprivation potential, deprivation weighted water consumption

Additional voluntary impact indicators – EN 15804+A2, PEF 3.0

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	Disease incidence	2.4E-06	1.2E-07	1.6E-07	2.7E-06	3.1E-06	2.9E-06	2.9E-06	1.7E-07	4.7E-07	9.5E-10	-5.2E-07
IRP	kBq U235 eq.	6.2E+00	1.5E-01	4.0E+00	1.0E+01	8.3E-01	6.5E-01	6.5E-01	2.0E-01	2.5E-01	6.2E-04	-2.8E-02
ETP-fw	CTUe	1.0E+03	2.3E+01	9.0E+01	1.1E+03	1.1E+02	8.5E+01	8.5E+01	3.2E+01	2.5E+02	9.0E-02	-4.0E+02
HTP-c	CTUh	7.1E-07	8.1E-10	1.4E-09	7.1E-07	4.3E-09	3.3E-09	3.3E-09	1.1E-09	8.5E-09	2.2E-12	-2.4E-08
HTP-nc	CTUh	9.8E-07	2.2E-08	3.7E-08	1.0E-06	8.9E-08	6.1E-08	6.1E-08	3.0E-08	8.9E-08	5.9E-11	9.2E-07
SQP	Dimensionless	1.5E+02	1.6E+01	2.6E+00	1.7E+02	3.9E+01	1.8E+01	1.8E+01	2.2E+01	3.5E+01	2.9E-01	-3.0E+01

PM: Particulate matter emissions; IRP: Ionising radiation, human health; ETP-fw: Ecotoxicity (freshwater); ETP-c: Human toxicity, cancer effects; HTP-nc: Human toxicity, non-cancer effects; SQP: Land use related impacts / soil quality

Resource use indicators

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
RPEE	MJ	3.8E+01	4.6E-01	4.5E+00	4.3E+01	1.4E+00	8.1E-01	8.1E-01	6.3E-01	2.2E+00	1.2E-03	-6.3E+00
RPEM	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TPE	MJ	3.8E+01	4.6E-01	4.5E+00	4.3E+01	1.4E+00	8.1E-01	8.1E-01	6.3E-01	2.2E+00	1.2E-03	-6.3E+00
NRPE	MJ	4.3E+02	2.7E+01	2.6E+02	7.2E+02	1.7E+02	1.4E+02	1.4E+02	3.7E+01	3.2E+01	1.4E-01	3.9E+01
NRPM	MJ	5.4E+02	0.0E+00	0.0E+00	5.4E+02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
TRPE	MJ	9.7E+02	2.7E+01	2.6E+02	1.3E+03	1.7E+02	1.4E+02	1.4E+02	3.7E+01	3.2E+01	1.4E-01	3.9E+01
SM	kg	5.0E+01	1.1E-02	2.8E-04	5.0E+01	6.9E-02	5.5E-02	5.5E-02	1.5E-02	1.2E-01	2.9E-05	3.1E+00
RSF	MJ	3.1E-03	1.3E-04	2.3E-06	3.2E-03	3.4E-04	1.8E-04	1.8E-04	1.7E-04	9.7E-04	7.5E-07	-1.5E-03
NRSF	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
W	m^3	6.6E-01	3.8E-03	1.0E-01	7.6E-01	1.3E-02	8.6E-03	8.6E-03	5.2E-03	2.6E-02	1.5E-04	-1.3E-01

RPEE: Renewable primary energy resources used as energy carrier; RPEM: Renewable primary energy resources used as raw materials; TPE: Total use of renewable primary energy resources; NRPE: Non-renewable primary energy resources used as energy carrier; NRPM: Non-renewable primary energy resources used as materials; TRPE: Total use of non-renewable primary energy resources; SM: Use of secondary materials; RSF: Use of renewable secondary fuels; NRSF: Use of non-renewable secondary fuels; W: Use of net fresh water

Waste indicators

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
HW	kg	1.2E+01	3.5E-02	8.1E-02	1.2E+01	2.3E-01	1.9E-01	1.9E-01	4.8E-02	0.0E+00	0.0E+00	-3.5E+00
NHW	kg	1.0E+02	6.4E-01	2.4E+00	1.1E+02	2.1E+00	1.3E+00	1.3E+00	8.7E-01	0.0E+00	9.5E-01	-6.2E+01
RW	kg	2.0E-03	1.8E-04	1.6E-03	3.9E-03	1.2E-03	9.9E-04	9.9E-04	2.5E-04	0.0E+00	0.0E+00	3.2E-04

HW: Hazardous waste disposed; NHW: Non-hazardous waste disposed; RW: Radioactive waste disposed

Output flow indicators

Parameter	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
CR	kg	0.0E+00	0.0E+00	8.6E-02	8.6E-02	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
MR	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	5.2E+01	0.0E+00	0.0E+00
MER	kg	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.0E+00	0.0E+00	0.0E+00
EEE	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
ETE	MJ	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

CR: Components for reuse; MR: Materials for recycling; MER: Materials for energy recovery; EEE: Exported electric energy; ETE: Exported thermal energy

Information describing biogenic carbon content at factory gate

Biogenic carbon content	Value	Unit
Biogenic carbon content in product	-	kg C
Biogenic carbon content in the accompanying packaging	-	kg C

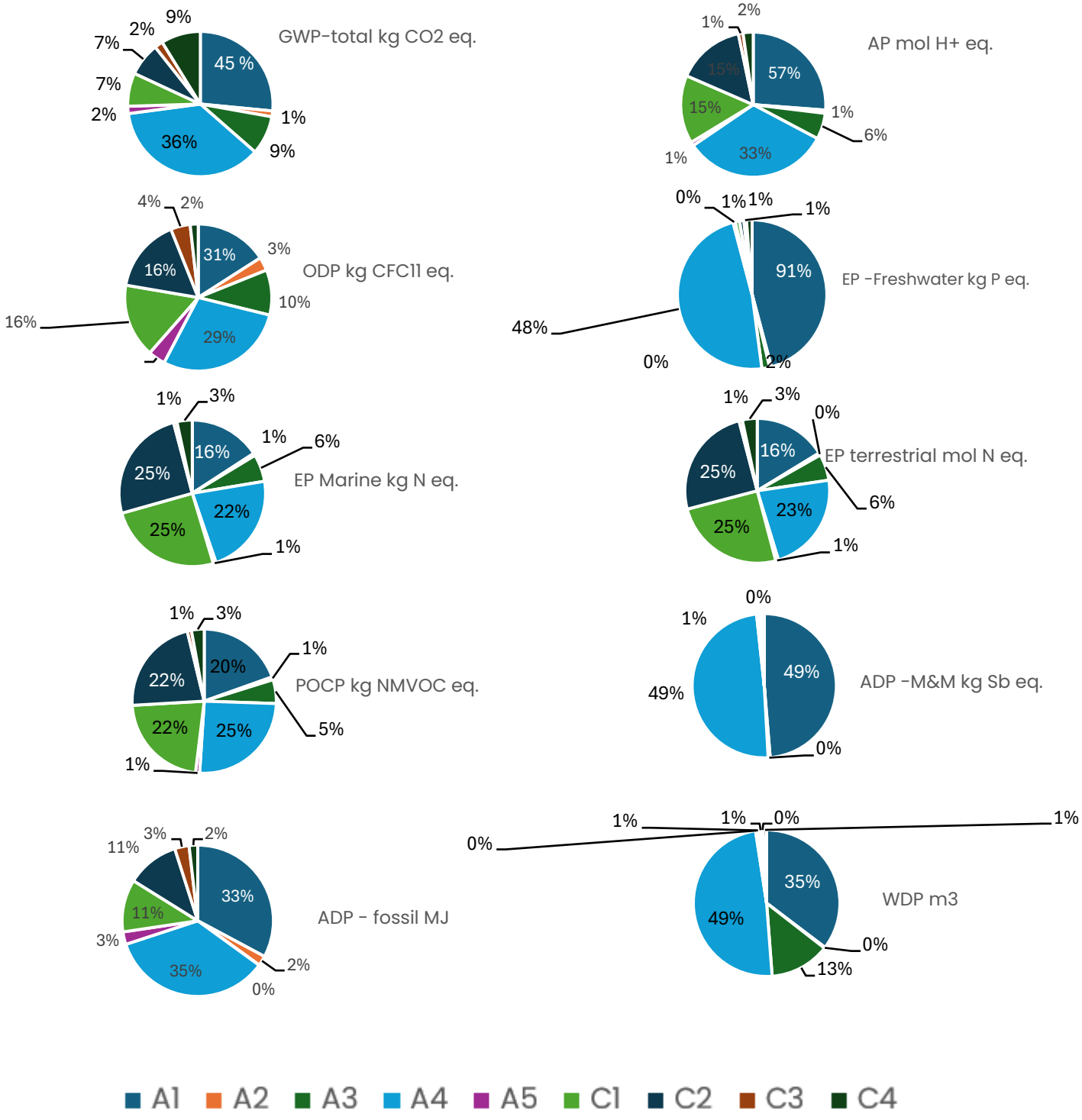
Specific data (GWP-GHG) and data variation for A1-A3

Specific data and data variation	
Specific data	>90%
Variation - product	<10%
Variation - site	Not relevant

Hazardous substances

☒ The product does not contain any REACH SVHC substances in amounts greater than 0.1 %.

Graphical Results



Contact information

Programme operator
EPD Square, s.r.o
Karadžičova 16, 811 09, Bratislava, Slovakia
Email: info@epdsquare.com

EPD owner
Circular11
Contact person: Benjamin Gibbons
Email: ben@circular11.com
Website: https://circular11.com/

Author of Life Cycle Assessment (LCA)
Sarah Curpen, Silvia Vilčeková
Email: curpen@salvis.sk, vilcekova@salvis.sk

EPD verifier
Elisabet Amat Guasch
Email: eamat@greenize.es

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Environmental labels and declarations – General principles

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

EN 15804:2012+A2:2019
Sustainability of construction works - Environmental product declaration - Core rules for the product category of construction products

ISO 21930:2007
Sustainability in building construction - Environmental declaration of building products

EPD Square PCR v.1.0, 2024

EPD Square, General Programme Instructions v.1, 2024

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

LCA background report 10.06.2024

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Annex

Environmental impacts – EN 15804+A1, CML/ISO 21930

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO2 eq.	2.9E+01	1.8E+00	1.2E+01	4.2E+01	1.3E+01	1.0E+01	1.0E+01	2.5E+00	1.1E+01	4.9E-03	-6.6E+01
ODP	kg CFC11 eq.	2.1E-06	3.2E-07	1.1E-06	3.4E-06	2.2E-06	1.8E-06	1.8E-06	4.5E-07	2.8E-07	1.6E-09	1.4E-07
AP	kg SO_2 eq.	1.4E-01	4.2E-03	3.1E-02	1.8E-01	8.3E-02	7.8E-02	7.8E-02	5.8E-03	1.6E-02	3.6E-05	-3.3E-02
EP	kg PO_4 eq.	7.0E-02	9.6E-04	5.6E-03	7.6E-02	1.9E-02	1.8E-02	1.8E-02	1.3E-03	1.3E-02	7.7E-06	-2.0E-02
POCP	kg C_2H_4 eq.	1.0E-02	2.2E-04	1.4E-03	1.2E-02	2.0E-03	1.7E-03	1.7E-03	3.0E-04	9.7E-04	1.5E-06	-3.8E-03
ADP-M&M	kg Sb eq.	1.0E-03	8.4E-06	1.4E-05	1.1E-03	1.6E-05	5.2E-06	5.2E-06	1.1E-05	3.4E-05	1.1E-08	-1.2E-04
ADP-fossil	MJ	4.4E+02	2.7E+01	2.6E+02	7.3E+02	1.7E+02	1.4E+02	1.4E+02	3.7E+01	3.2E+01	1.4E-01	3.9E+01

***GWP**: Global Warming Potential; **ODP**: Depletion potential of the stratospheric ozone layer; **AP**: Acidification potential, Accumulated Exceedance; **EP**: Eutrophication potential, fraction of nutrients reaching freshwater end compartment; See "additional requirements" for indicator given as PO4 eq.; **POCP**: Formation potential of tropospheric ozone; **ADP-M&MI**: Abiotic depletion potential for non-fossil resources (minerals and metals); **ADP**-fossil: Abiotic depletion potential for fossil resources;*

Environmental impacts – GWP-GHG

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP - GHG	kg CO2e	2.9E+01	1.8E+00	1.2E+01	4.3E+01	1.3E+01	1.0E+01	1.0E+01	2.5E+00	1.0E+01	5.0E-03	-6.7E+01

GWP- GHG: Global Warming Potential, greenhouse gases