Environmental Product Declaration

as per ISO 14025 and EN 15804

Owner of the declaration:	Officine Maccaferri S.p.A.
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Kiwa-EE-000470-EN
Issue date:	05.12.2025
Valid to:	05.12.2030

EBS MAC and EBS MAC A

Gravity Gabions Walls

1. General information

Officine Maccaferri S.p.A.

EBS MAC and EBS MAC A

Programme operator:
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Kiwa GmbH, Ecobility Experts
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Owner of the declaration:
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20122 Milano (MI) – Italy

Registration number:
EPD-Kiwa-EE-000XXX-EN

Declared product / declared unit:
The declared unit is 1 kg of Expeditionary Barrier Systems – EBS MAC worst-case product

This declaration is based on the Product Category Rules:
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (PCR A)
Kiwa-Ecobility Experts (Kiwa-EE) – Product Category Rules for steel construction products, Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13 (PCR B)

Scope:
EBS MAC and EBS MAC A are a high-quality and durable cellular containment structures. Available in a range of sizes, EBS MAC and EBS MAC A can be filled on site with available filling material to provide a modular gravity gabion wall, and the units can be stacked to form taller structures, if needed. The worst-case scenario product EPD type (representative EPD) is cradle-to-gate with option module A4, module A5, modules C1-C4, and module D.
Kiwa-Ecobility Experts assumes no liability for manufacturer's information, LCA data and evidence.

Issue date:
11.12.2025

Valid to:
11.12.2030

Verification:
The European standard EN 15804+A2:2019 serves as the core PCR.
Independent verification of the declaration and data, according to EN ISO 14025:2010.

☐internal ☒external

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Dr. Ing. Morteza Nikravan
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2. Product

2.1 Product description

EBS MAC and EBS MAC A, whose difference is described in section 2.6, are Expeditionary Barrier Systems, developed as a multicellular structure made of welded wire mesh internally lined with a non-woven geotextile that holds the locally available filling material inside each cell. Each lining is overlapped with the adjacent one and attached to the top edge of the unit, while the lower part of the fabric is left loose to be folded internally on site to form a soil retention seal. The geotextile is specifically engineered to provide extended UV resistance compared to normal non-woven geotextiles. EBS MAC units are joined longitudinally, by using connecting pins to obtain the required length of the structure and vertically/transversally using hog rings.

2.2 Application (Intended Use of the product)

The main purpose of this product is to enable rapid deployment of gravity gabion walls and structures in challenging and remote environments where standard engineering solutions may not be available. An example of the above mentioned applications is shown in the picture above, where EBS MAC is used as a retaining wall during the installation of a pipeline, and below, where EBS MAC units are installed to provide protection against a forecasted flood emergency.

2.3 Reference Service Life (RSL)

The typical service life is up to 50 years depending on the environmental site condition.

2.4 Technical data

Characteristics	Value	Unit
Available Nominal Length	From 1.22 to 33.00	m
Available Nominal Height	From 0.61 to 2.74	m
Durability	Depending on environmental conditions	

2.5 Substances of very high concern

EBS MAC and EBS MAC A do not contain SVHC.

2.6 Base materials / Ancillary materials

The product family includes two variants: EBS MAC and EBS MAC A. Both are Expeditionary Barrier Systems (EBS) composed of a steel welded mesh (steel panel) combined with a polypropylene non-woven geotextile. The only distinction between the two is the origin of the geotextile: in the EBS MAC A variant, the geotextile is sourced from the United States of America. Apart from this, the materials and the manufacturing processes are identical. The steel wire rod used in the steel component is 100% from Electric Arc Furnace (EAF). The worst-case scenario EPD product is reported below.

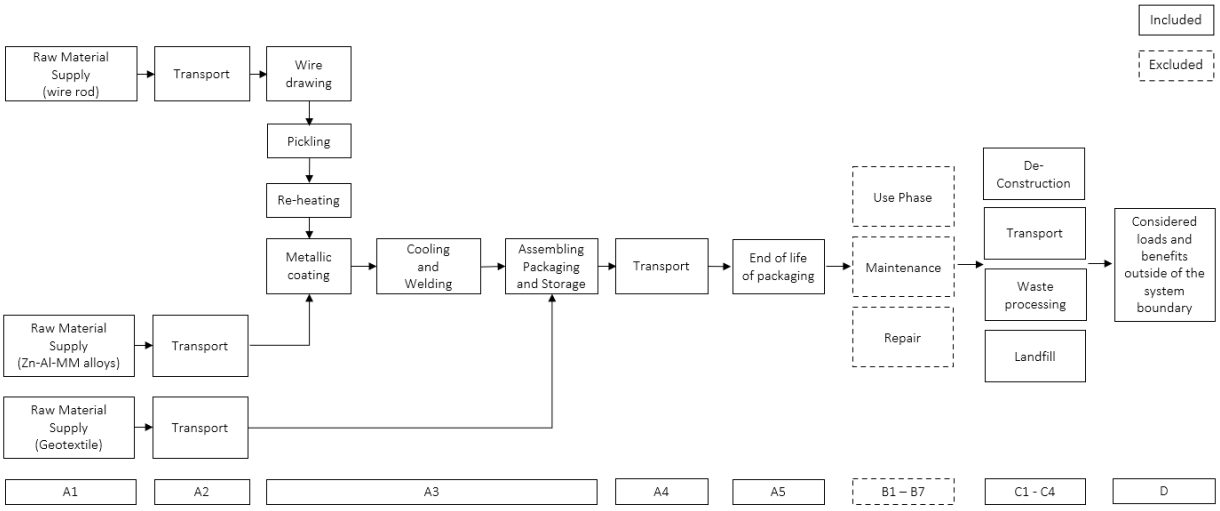
Raw material	Unit	Value
Steel welded panels (galvanized steel)	kg	0.886
Non-woven geotextile	kg	0.114

The reference CPC code is 412 “Products of iron or steel”.

2.7 Manufacturing

The manufacturing and assembling are carried out in two plants in the Parma area (Italy).

The assembly process includes the coupling of the connection components and the galvanized welded mesh together with high durability non-woven geotextile.



2.8 Other Information

Further technical characteristics and information of the EBS MAC and EBS MAC A are published on the Maccaferri website (https://www.maccaferri.com/).

3. LCA: Calculation rules

3.1 Declared unit

In accordance with the PCR B, 1 kg of the worst-case product is chosen as the declared unit.

3.2 Scope of declaration and system boundaries

This EPD follows a cradle-to-gate approach with module A4, module A5, modules C1-C4 and module D.

Module A5 has been considered only for the end-of-life of the distribution packaging, since the installation process is highly dependent on the context in which the operation takes place. More precisely, the following processes were accounted for in each module:

A1 - Production of raw materials used in the products, as well as the production of energy carriers used in the production process.

A2 - Transport of raw materials to the manufacturing site and internal handling.

A3 - Manufacturing and assembling of the EBS MAC and EBS MAC A which includes the manufacturing steps reported in section 2.7 as well as the production of the distribution packaging and of the ancillary material. In addition, the treatment of waste generated from the manufacturing processes are accounted for.

A4 - Transport from the manufacturer to the place of use (2100 km by truck, Central Europe).

A5 - End-of-life of the distribution packaging.

C1 - Disassembly of EBS MAC and EBS MAC A which was considered performed with manual operations and therefore equal to zero.

C2 - Transport from collection point to waste processing and disposal site (100 km by truck).

C3 - Shredding and sorting of fractions for recycling.

C4 - Landfill of material fractions not recycled.

D - Benefit due to the avoided production of electrical and thermal energy resulting from the incineration of the wood and plastic component of the distribution packaging.

Description of the system boundary																
Product stage			Construction process stage		Use stage							End of life stage				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from manufacturer to place of use	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction / demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
X=Module declared | MND=Module not declared																

3.3 Geographical reference area

All process-specific data was collected for the operating year 2024. Geographical reference area is global.

3.4 Cut-off Criteria

The cut-off applied relates to the packaging of chemicals products and lubricating oil used in the production process. All flows contributing to more than 1% of the total mass, energy or environmental impact of the system have been included in the life cycle assessment. In total, the cut-off processes do not contribute more than 5% to the impact categories considered.

3.5 Allocation

A mass allocation based on the total weight of the production volumes has been applied for the energy consumption and general waste of the manufacturing process and for the energy consumption of the assembling processes.

3.6 Data collection and reference time period

Specific data were collected from the plant in Parma area considering an annual average referred to 2024, whereas the most updated selected generic datasets available in the LCI database (LCA for Experts 2023.2) were used for the other modules. Thus, in line with PCR A requirements, manufacturer-specific data is not older than 5 years and generic data is not older than 10 years.

3.7 Estimates and assumptions

The main assumptions are related to distances of inbound and background transportations. It was also assumed that liquid and gas auxiliaries are unpacked and supplied in tanker trucks.

3.8 Power Mix

For electricity modelling, since a contract covered by a guarantee of origin with the supplier has not been provided, the Italian electricity consumption mix was used as requested by the location-based approach. The GWP-total value of the electricity used is 0.368 kg CO2 eq./kWh.

3.9 Comparability

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2. For the evaluation of the comparability, the following aspects must be considered in particular: PCR used , functional or declared

unit, geographical reference, definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), end of life scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPDs programs may differ. A comparability needs to be evaluated. For further guidance see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

4. LCA: Scenarios and additional technical information

EBS MAC and EBS MAC A are composed of steel panels and geotextile. The dismantling of the barrier is performed manually, for this reason C1 is considered equal to zero. The removed panels and geotextile are then sent for shredding on a truck EURO 5 (module C2). The shredding operation is considered for the steel panels only (module C3), with a loss of 5% sent to landfill. The entire mass of removed geotextile is assumed to be landfilled as well, whereas the remaining treated steel is sent for recycling (module D).

Processes	Unit (expressed per FU or DU of components, products or materials and by type of material)	EBS MAC worst-case product
Collection process specified by type	kg collected separately	Steel: 0.88 kg
		Plastic: 0.12 kg
		Wood: 0.04 kg
Recovery system specified by type	kg for recycling	Steel: 0.84 kg
	kg for recycling	Wood: 0.01 kg
	kg for energy recovery	Plastic: 0.01 kg
	kg for energy recovery	Wood: 0.02 kg
Disposal specified by type	kg product or material for final deposition	Landfill (Steel): 0.04 kg
		Landfill (Plastic): 0.11 kg
		Landfill (Wood): 0.01 kg

5. LCA: Results

The following tables show the results of the impact assessment indicators, resource use, waste and other output streams. The results presented here refer to the declared average product.

LCA results - Indicators describing environmental impacts based on the impact assessment (LCIA): 1 kg of EBS MAC worst-case product (EN 15804+A2)									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
		Core environmental impact indicators (EN 15804+A2)							
GWP-total	kg CO2 eqv.	9.65E-01	1.79E-01	6.35E-02	0.00E+00	8.51E-03	2.17E-02	7.86E-03	-1.11E-02
GWP-f	kg CO2 eqv.	9.54E-01	1.77E-01	1.54E-02	0.00E+00	8.43E-03	2.14E-02	7.85E-03	-1.10E-02
GWP-b	kg CO2 eqv.	1.01E-02	4.10E-04	4.81E-02	0.00E+00	0.00E+00	2.99E-04	0.00E+00	-4.97E-05
GWP-luc	kg CO2 eqv.	5.47E-04	1.68E-03	4.61E-06	0.00E+00	7.80E-05	3.41E-06	6.56E-06	-7.12E-07
ODP	kg CFC 11 eqv.	1.23E-11	2.36E-14	6.64E-15	0.00E+00	7.38E-16	5.87E-13	1.33E-14	-8.48E-14
AP	mol H+ eqv.	2.53E-03	1.16E-03	1.34E-05	0.00E+00	4.43E-05	3.28E-05	2.38E-05	-1.36E-05
EPfr	kg P eqv.	3.88E-06	6.62E-07	4.21E-08	0.00E+00	3.07E-08	1.28E-07	1.51E-06	-1.75E-08
EPmar	kg N eqv.	7.50E-04	5.70E-04	1.12E-05	0.00E+00	2.14E-05	1.07E-05	5.45E-06	-4.01E-06
EPter	mol N eqv.	8.07E-03	6.31E-03	5.74E-05	0.00E+00	2.38E-04	1.11E-04	5.98E-05	-4.29E-05
POCP	kg NMVOC eqv.	2.28E-03	1.10E-03	2.06E-05	0.00E+00	4.19E-05	2.57E-05	1.73E-05	-1.12E-05
ADP-e	kg Sb-eqv.	1.97E-05	1.20E-08	9.50E-11	0.00E+00	5.47E-10	3.91E-09	2.09E-10	-7.77E-10
ADP-f	MJ	1.93E+01	2.47E+00	3.08E-02	0.00E+00	1.15E-01	3.03E-01	1.17E-01	-2.03E-01
WU	m3 world eqv.	1.28E-01	2.19E-03	4.09E-03	0.00E+00	9.71E-05	6.15E-04	-1.07E-04	-1.02E-03
		Additional environmental impact indicators (EN 15804+A2)							
PM	disease incidence	3.81E-08	4.32E-09	1.11E-10	0.00E+00	2.07E-10	2.59E-10	2.31E-10	-1.16E-10
IR	kBq U235 eqv.	1.11E-01	6.91E-04	1.10E-04	0.00E+00	2.14E-05	3.12E-03	2.06E-04	-2.55E-03
ETP-fw	CTUe	8.55E+00	1.77E+00	3.69E-02	0.00E+00	8.07E-02	1.15E-01	1.00E-01	-2.77E-02
HTP-c	CTUh	3.60E-10	3.59E-11	1.13E-12	0.00E+00	1.63E-12	1.84E-11	5.16E-12	-2.23E-12
HTP-nc	CTUh	1.56E-08	1.60E-09	1.13E-10	0.00E+00	7.19E-11	8.24E-11	4.13E-10	-5.55E-11
SQP	Pt	1.45E+01	1.03E+00	6.65E-03	0.00E+00	4.78E-02	1.98E-01	1.02E-02	-3.81E-02

ADP-e= Abiotic depletion potential for non-fossil resources | **ADP-f**=Abiotic depletion for fossil resources potential | **AP**= Acidification potential, Accumulated Exceedance | **EPfr** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment | **EPmar**= Eutrophication potential, fraction of nutrients reaching marine end compartment| **EPter**= Eutrophication potential, Accumulated Exceedance | **GWP-b**=Global Warming Potential biogenic | **GWP-f**=Global Warming Potential fossil fuels | **GWP-luc**=Global Warming Potential land use and land use change |**GWP-total**=Global Warming Potential total| **ODP**=Depletion potential of the stratospheric ozone layer |**POCP**=Formation potential of tropospheric ozone | **WU**=Water (user) deprivation potential, deprivation- weighted water consumption | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems | **HTP-c**=Potential Toxic Unit for Humans toxicity, cancer | **HTP-nc**= Potential Toxic Unit for humans, non-cancer | **IRP**=Potential Human exposure efficiency relative to U235, human health | **PM**=Potential incidence of disease due to Particulate Matter emissions | **SQP**=Potential soil quality index

Disclaimer on ADP-e, ADP-f, WU, ETP-fr, HTP-c, HTP-nc, SQP: The results of these environmental impact indicators must be used with caution, as the uncertainties in these results are high or as there is limited experience with the indicator.

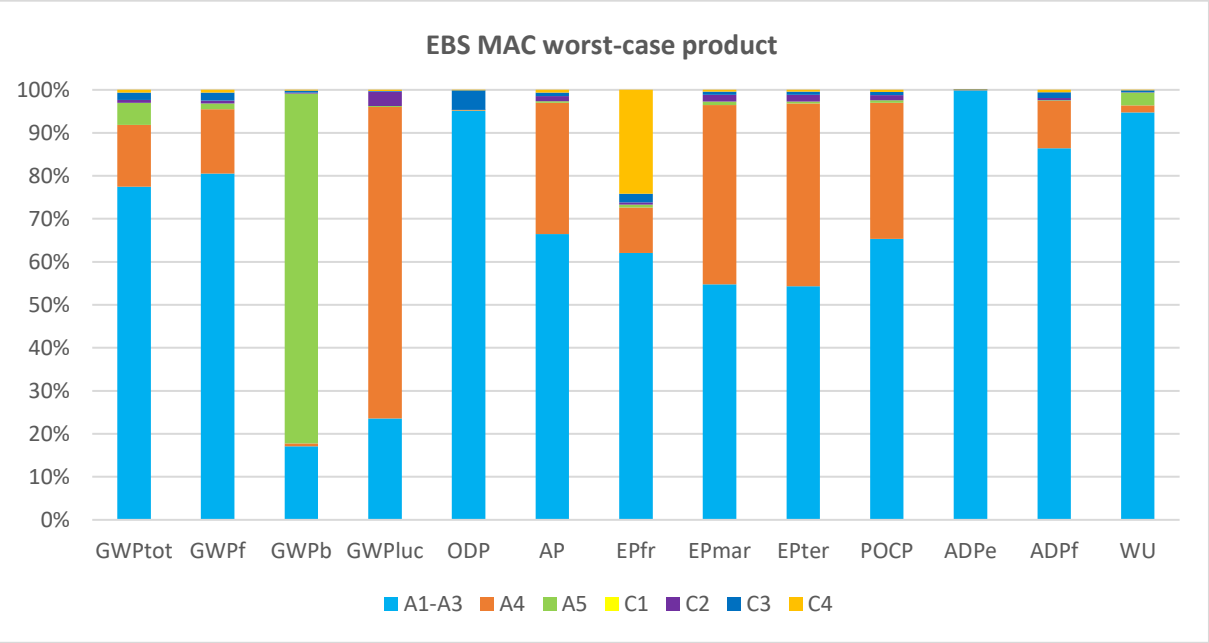
Disclaimer on IR: This impact category mainly addresses the potential effect of low dose ionizing radiation on human health in the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents and occupational exposures, nor does it consider radioactive waste disposal in underground facilities. Potential ionizing radiation from soil, radon, and some building materials is also not measured by this indicator.

LCA results - Indicators describing resource use and environmental information derived from life cycle inventory (LCI): 1 kg of EBS MAC worst-case product (EN 15804+A2)									
Parameter	**Unit**	**A1-A3**	**A4**	**A5**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	7.82E+00	1.80E-01	4.57E-03	0.00E+00	8.11E-03	2.85E-01	1.06E-02	-5.78E-02
PERM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	7.82E+00	1.80E-01	4.57E-03	0.00E+00	8.11E-03	2.85E-01	1.06E-02	-5.78E-02
PENRE	MJ	1.44E+01	2.48E+00	3.08E-02	0.00E+00	1.15E-01	3.03E-01	1.18E-01	-2.03E-01
PENRM	MJ	4.92E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	1.93E+01	2.48E+00	3.08E-02	0.00E+00	1.15E-01	3.03E-01	1.18E-01	-2.03E-01
SM	Kg	8.90E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	M3	5.91E-03	1.97E-04	9.73E-05	0.00E+00	8.93E-06	9.98E-05	1.27E-06	-4.68E-05
HWD	Kg	2.49E-07	7.67E-12	1.33E-12	0.00E+00	4.25E-13	-5.91E-11	9.87E-12	-1.14E-11
NHWD	Kg	6.34E-02	3.77E-04	9.43E-03	0.00E+00	1.66E-05	2.78E-04	1.16E-01	-9.90E-05
RWD	Kg	7.84E-04	4.63E-06	7.30E-07	0.00E+00	1.48E-07	2.95E-05	1.39E-06	-1.53E-05
CRU	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	Kg	5.44E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	Kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.20E-02
EET	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-2.49E-02
EEE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-4.46E-02
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 resources | SM=Use of secondary material | RSF=Use of renewable secondary fuels | NRSF=Use of non-renewable secondary fuels | FW=Use of fresh water | HWD=Hazardous waste disposed | NHWD=Non-hazardous waste disposed | RWD=Radioactive waste disposed | CRU=Components for re-use | MFR=Materials for recycling | MER=Materials for energy recovery | EET=Exported energy, thermal | EE=Exported energy, electrical									

LCA results - information on biogenic carbon content at the factory gate: 1 kg of EBS MAC worst-case product (EN 15804+A2)		
Parameter	**Unit**	**Value**
biogenic carbon content in product	kg C	0
biogenic carbon content in accompanying packaging	kg C	6.00E-2
NOTE 1 kg biogenic carbon is equivalent to 44/12 kg CO2		

6. LCA: Interpretation

The analysis of each module's contribution to the impacts of the EBS MAC worst-case product is shown in the graph below. These considerations are applicable to all EBS MAC and EBS MAC A products sold by Officine Maccaferri. The impacts are driven by modules A1-A3, whereas modules A4-A5 contribute significantly to the marine and terrestrial eutrophication impact categories (around 42%) due to transportation processes.. The contribution of modules C1-C4 across all analyzed impact categories is around 5%, except for EPfr, whose impacts (27%) are driven by the product disposal in landfills due to phosphorous and phosphate emissions during the landfill process. The contribution of module D is negligible (<2%) compared to modules A1-A3.



7. References

EN 15804	EN 15804:2012+A2:2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products
ISO 14025	ISO 14025:2010 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
ISO 14040	ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework
ISO 14044	ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines
PCR A	Kiwa-Ecobility Experts, Berlin, 2022: PCR A – General Program Category Rules for Construction Products from the EPD programme of Kiwa-Ecobility Experts; Version 2.1
PCR B	Kiwa-Ecobility Experts, Berlin, 2020: PCR B – Product Category Rules for steel construction products, Requirements on the Environmental Product Declarations for steel construction products; Version 2020-03-13 (draft)
Ecoinnovazione; 2025.	Technical report: LCA study of engineered barrier system products (EBS) for civil engineering works.
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