Environmental Product Declaration

as per ISO 14025 and EN 15804

Declaration Holder:	Mitsubishi Polyester Film GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Registration number:	EPD-Mitsubishi Polyester-307-EN (Rev.1_19.07.2023)
Date of issue:	03.05.2023
Valid to:	03.05.2028

ALPOLIC™ Composites

Average product from the product range ALPOLIC™ A1 and A2 ACM, ALPOLIC™ fr ACM and ALPOLIC™ real anodised

1. General indication

Mitsubishi Polyester Film GmbH

Programme operator
Kiwa-Ecobility Experts
Kiwa GmbH
Voltastr. 5
13355 Berlin
Germany

Registration number
EPD-Mitsubishi Polyester-307-EN
(Rev.1_19.07.2023)

This declaration is based on Product Category Rules
Environmental product declaration requirements for aluminium and aluminium alloy surface systems (2019-07-01)

Date of issue
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Valid to
03.05.2028

Frank Huppertz
(Head of Kiwa-Ecobility Experts)

Prof. Dr Frank Heimbecher
(Chairman of the independent expert committee – Kiwa-Ecobility Experts)

ALPOLIC™ Composites

Owner of the declaration
Mitsubishi Polyester Film GmbH
Alpolic Division
Kasteler Street 45
65203 Wiesbaden
Germany

Scope
1 m^2 ALPOLIC composite material

Validity range
ALPOLIC composites are manufactured by Mitsubishi Polyester Film GmbH - Alpolic Division, based in Wiesbaden. An average product from the product range ALPOLIC™ A1 and A2 ACM, ALPOLIC™ fr ACM and ALPOLIC™ real anodised was considered. The environmental impacts were shown for the product with the highest raw density.
The declaration owner is liable for the underlying information and evidence, any liability of Kiwa-Ecobility Experts with regard to manufacturer information, LCA data and evidence is excluded.

Verification
The European standard EN 15804+A2:2019 serves as the core PCR.

Independent verification of the declaration and data according to ISO 14025:2006

☐internal ☒external

Julian Rickert
(Third party verifier)

2. Product

2.1 Product description

ALPOLIC™ Composites are thin panels consisting of two thin aluminium plates on both sides and a thermoplastic or mineral-filled, fire-retardant core. The already painted aluminium surfaces are provided with an adhesive film and subsequently laminated with the core material.

ALPOLIC™ products offer a huge range of surface types, colours and gloss levels for buildings. They are coated with robust and stable polymer paint to keep surfaces fresh after decades of exposure to the elements. At the same time, ALPOLIC™ composites offer the rigidity of heavy sheet metal in a lightweight composite material.

2.2 Application

ALPOLIC™ composites are ideal for architectural projects, they can be easily processed into complex shapes and are easy to install. At the same time, they offer excellent flatness, durability, stability, vibration damping and ease of maintenance. This makes them suitable for curtain walls, rainscreen systems and other architectural cladding applications.

ALPOLIC™ can be machined with standard woodworking or metalworking tools without the need for special tools. Cutting, grooving, punching, drilling, bending, rolling and many other manufacturing techniques can be easily performed to create an almost unlimited variety of complex shapes and forms.

2.3 Technical data

The technical data of ALPOLIC™ composites with a nominal thickness of 4 mm can be found in the following table.

Designation	ALPOLIC™ / fr ACM	ALPOLIC™ A2 ACM	ALPOLIC™ A1 ACM	ALPOLIC™ / fr reAL anodised	Unit
Specific weight	7,6	8,3	8,6	7,6	kg/m^2
Temperature coefficient of expansion according to ASTM D696	24	19	21	24	x 10 /°C^{-6}
Deflection temperature according to ASTM D648	116	110	115	116	°C
Tensile strength according to ASTM E8	49	43	48	49	MPa, N/mm^2
0.2% Yield strength according to ASTM E8	44	41	47	44	MPa, N/mm^2
Elongation according to ASTM E8	5	3,8	2,7	5	%
Modulus of elasticity according to ASTM C393	39,8	38,5	45,6	39	GPa, kN/mm^2
Impact resistance according to D732	32	37	44	32	MPa, N/mm^2
Sound transmission losses according to ASTM E413	27	27	27	27	dB

Metal thickness with equivalent stiffness	3,3	3,3	3,3	3,3	mm
Minimum bending radius	100	600	2500	N.a.	mm
*** Source: ALPOLIC / Product Information & Technical Data / EN / 01/2019 Mitsubishi Polyester Film GmbH**					

2.4 Placing on the market

ALPOLIC™ Aluminium composite materials are used in accordance with the general building authority approval.

2.5 Raw materials

The ALPOLIC™ composites consist of thin aluminium coils on both sides and a thermoplastic or mineral-filled, fire-retardant core. The already painted aluminium surfaces are provided with an adhesive film and then laminated with the core material.

Raw materials	Unit	Value
Aluminium coils	M.-%	39
Core material	M.-%	60
PE-based protective and adhesive film	M.-%	1

There is no biogenic carbon in the products.
The product does not contain any substances from the "Candidate List of Substances of Very High Concern for Authorisation" (SVHC).

2.6 Manufacturing

ALPOLIC™ Aluminium Composites (ACM) are manufactured in Wiesbaden, Germany. The product is manufactured by continuously bonding two aluminium coils on either side of an extruded thermoplastic or mineral-filled fire-retardant thermoplastic core. The aluminium surfaces have been pre-finished and coil-coated in various paint finishes before bonding.

2.7 Packing

ALPOLIC™ Aluminium composite materials (ACM) are palletised.

2.8 Reference Service Life (RSL for short)

Since the scope of the study does not consider the entire life cycle of the composite, the specification of the reference service life is voluntary. According to /BBSR Table 2017 / No. 335.811, metal cladding made of painted aluminium achieves the reference service life of over 50 years.

2.9 Other information

The company website can be reached at the following address: https://www.alpolic.eu/en.

3. LCA: Calculation rules

3.1 Declared unit

In accordance with the PCR Part B: Environmental Product Declaration Requirements for Aluminium and Aluminium Alloy Composites, 1 m^2 ALPOLIC™ is chosen as the declared unit.
Since an average product with a specific weight per unit area of 7.6 to 8.6 kg/m^2 is considered, weighted weight per unit area is considered.

Product	Unit	Value
Declared unit	1	m^2
Basis weight	7,8	kg/m^2
Conversion factor to 1 kg	0,13	

3.2 System boundary

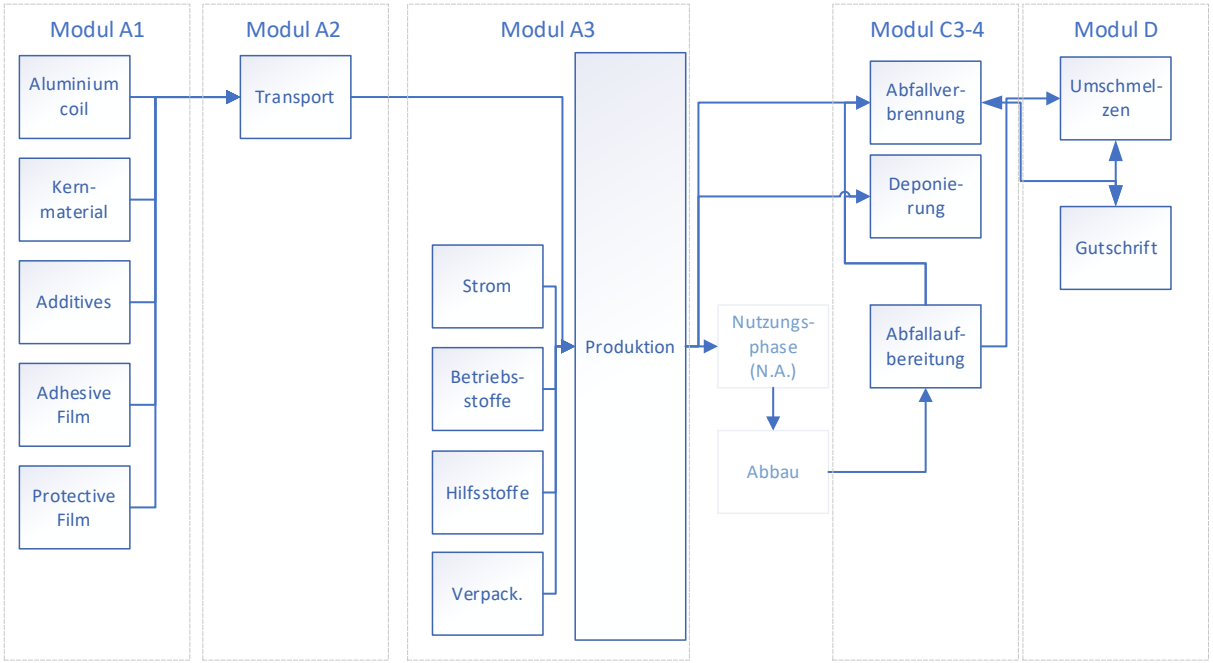

Illustration 1: System boundaries

The environmental product declaration is a cradle-to-gate EPD with consideration of additional life phases, i.e. all potential environmental impacts of the product from the cradle to the factory gate and the disposal phases waste treatment and landfill are considered. According to DIN EN 15804, this corresponds to the product phases A1-A3 as well as C3-4 and D.
The system boundaries include the following inputs and outputs:

Module	Module declared	within the System boundary	Outside the system boundary
A1 Raw material supply	X	Aluminium, core material (organic and mineral), other additives and auxiliary materials	
A2 Transport	X	Transport from dealer to factory /Transport from	

		manufacturer to factory by truck or ship	
A3 Production	X	Power supply, compressed air, water, packaging	Administration building, disposal of office waste
C3 Waste treatment	x	Shredder and sorting machine	
C4 Disposal	x	Landfilling, waste incineration with energy recovery	
D Credits and loads outside the System boundary	x	Reclassification and credit	

3.3 Estimates and assumptions

Some of the aluminium consumed has a secondary content of 50 - 60% or > 50%. 50% was assumed in each case, which corresponds to a worst-case scenario. In the case of PE-based adhesive and protective films, rubber and resin components are partly specified in the product data sheets. For simplification and due to the low overall relevance to the result, it was assumed that the films consist exclusively of PE. For the disposal of the composites, it is assumed that the aluminium portion is recycled. Thermal recycling was assumed for the plastic portion of the core material, and landfilling was assumed for the remainder.

3.4 Cut-off criteria

For the process modules A1 to A3, all process-specific data were collected. All flows could be assigned potential environmental impacts through the database.

3.5 Reference period and geographical reference area

The production data have been recorded for the operating year 2021. The geographical reference area is Germany (Wiesbaden).

3.6 Data quality

The data quality of the life cycle inventory is assessed based on its precision (measured, calculated, literature values or estimated), completeness (e.g. unreported emissions), consistency (degree of uniformity of the methods used) and representativeness (geographical, temporal, technological).
To address these aspects and thus ensure reliable results, first-hand industry data were used together with consistent background data from the GaBi Sphera databases (version 2022.1) and the integrated Ecoinvent v3.8 database.

3.7 Allocation

Allocations were avoided.

3.8 Comparability

In principle, a comparison or evaluation of EPD data is only possible if all data sets to be compared were created according to EN 15804 and the building context or the product-specific performance characteristics are taken into account.

The background database used is GaBi 10 ts from Sphera, database version 2022.1 and the integrated Ecoinvent v3.8.

4. LCA: scenarios and additional technical information

The following technical information is the basis for the declared modules. They can be used for modelling specific scenarios in the context of a building assessment.

End of life cycle (C1 to C4 and D)

Module C				Module D
Designation	Value	Unit		
Separately collected waste (1m)^2	7,76	kg	Input from undeclared C1 - output material for module C3 shredder and sorting	-
Recycling (C3)	2,74	kg	Aluminium scrap for further processing (shredder and sorting - C3)	Remelt or credit (from C3)
Energy recovery (C4)	1,17	kg	Organic core for combustion (C4)	Electricity and heat credit (from C4)
Landfill (C4)	3,85	kg	Inorganic core for landfill (C4)	-

5. LCA: Results

The following tables show the results of the impact assessment indicators, resource consumption, waste and other production flows. The results presented here refer to the declared average product.

Disclaimer on ADP-e, ADP-f, WDP, ETP-fw, 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.

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	Construction / installation processes	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste treatment	Disposal	Re-use, recovery, recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	MND	MND	MNR	MNR	MNR	MNR	MNR	MNR	MNR	MND	MND	X	X	X
X=Module declared | MND=Module not declared | MNR=Module not relevant																

LCA results - Indicators to describe environmental impacts based on impact assessment (LCIA): 1 m² ALPOLIC™ (EN 15804+A2)								
Parameter	**Unit**	**A1**	**A2**	**A3**	**C3**	**C4**	**D**	**Total A1-A3**
Core indicators								
GWP-total	kg CO2 eqv,	1,57E+01	6,45E-01	3,16E-01	2,73E+00	5,63E-02	-1,05E+01	1,66E+01
GWP-f	kg CO2 eqv,	1,56E+01	6,44E-01	4,95E-01	2,72E+00	5,79E-02	-1,04E+01	1,68E+01
GWP-b	kg CO2 eqv,	3,08E-02	-1,09E-04	-1,79E-01	1,10E-03	-1,71E-03	-4,09E-02	-1,49E-01
GWP-luluc	kg CO2 eqv,	3,58E-03	1,25E-03	3,37E-04	3,53E-05	1,07E-04	-2,07E-03	5,17E-03
ODP	kg CFC 11 eqv,	1,69E-08	5,97E-14	3,59E-10	2,00E-12	1,38E-13	-9,41E-11	1,72E-08
AP	mol H+ eqv,	5,53E-02	1,60E-02	6,61E-04	8,58E-04	4,10E-04	-3,73E-02	7,20E-02
EP-fw	kg P eqv,	9,47E-05	7,44E-07	6,77E-07	3,97E-07	9,85E-08	-7,98E-06	9,61E-05
EP-m	kg N eqv,	9,89E-03	4,26E-03	2,10E-04	2,66E-04	1,05E-04	-5,57E-03	1,44E-02
EP-T	mol N eqv,	1,07E-01	4,68E-02	2,23E-03	4,00E-03	1,15E-03	-6,05E-02	1,56E-01
POCP	kg NMVOC eqv,	3,15E-02	1,19E-02	5,71E-04	6,90E-04	3,19E-04	-1,70E-02	4,40E-02
ADP-mm	kg Sb-eqv,	8,42E-06	2,91E-08	3,65E-07	4,32E-08	5,97E-09	-2,98E-06	8,82E-06
ADP-f	MJ	2,86E+02	8,42E+00	6,83E+00	1,30E+00	7,58E-01	-1,51E+02	3,01E+02
WDP	m3 world eqv,	1,28E+00	2,49E-03	3,77E-02	2,74E-01	6,33E-03	-4,20E-01	1,32E+00
Additional indicators								
PM	disease incidence	7.82E-07	2.71E-07	2.84E-08	4,86E-09	5,05E-09	-5.88E-07	1.08E-06
IRP	kBq U235 eqv,	3,58E+00	1,08E-03	4,75E-02	8,37E-03	9,06E-04	-3,14E+00	3,63E+00
ETP-fw	CTUe	1,13E+02	5,02E+00	2,04E+00	5,32E-01	4,25E-01	-5,36E+01	1,20E+02
HTP-c	CTUh	7,02E-09	9,20E-11	3,30E-09	4,03E-11	6,49E-11	-2,70E-09	1,04E-08
HTP-nc	CTUh	1,54E-07	4,26E-09	3,37E-09	2,16E-09	7,18E-09	-7,50E-08	1,61E-07
SQP	Pt	1,93E+01	1,04E+00	3,30E+01	6,47E-01	1,65E-01	-8,93E+00	5,33E+01

ADP-mm= Abiotic depletion potential for non-fossil resources | ADP-f=Abiotic depletion for fossil resources potential | AP= Acidification potential, Accumulated Exceedance | **EP-fw** = Eutrophication potential, fraction of nutrients reaching freshwater end compartment | EP-m= Eutrophication potential, fraction of nutrients reaching marine end compartment| EP-T= Eutrophication potential, Accumulated Exceedance | GWP-b=Global Warming Potential biogenic | GWP-f=Global Warming Potential fossil fuels | GWP-luluc=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 | WDP=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

LCA results - indicators describing resource use and environmental information derived from life cycle inventory (LCI): 1 m² ALPOLIC™ (EN 15804+A2)								
Parameter	**Unit**	**A1**	**A2**	**A3**	**C3**	**C4**	**D**	**Total A1-A3**
PERE	MJ	7,97E+01	1,91E-01	3,13E+00	9,18E-01	1,14E-01	-7,24E+01	8,30E+01
PERM	MJ	1,15E-04	0,00E+00	2,67E-04	1,82E-14	3,00E-15	-3,13E-13	3,82E-04
PERT	MJ	7,97E+01	1,91E-01	3,13E+00	9,18E-01	1,14E-01	-7,24E+01	8,30E+01
PENRE	MJ	2,86E+02	8,43E+00	6,83E+00	1,30E+00	7,59E-01	-1,51E+02	3,01E+02
PENRM	MJ	4,91E+01	0,00E+00	5,75E+00	1,80E-14	3,00E-15	-3,13E-13	5,49E+01
PENRT	MJ	2,86E+02	8,43E+00	6,83E+00	1,30E+00	7,59E-01	-1,51E+02	3,01E+02
SM	kg	1,51E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,51E+00
RSF	MJ	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
FW	m^3	1,49E-01	2,21E-04	2,42E-02	6,65E-03	1,92E-04	-1,14E-01	1,73E-01
HWD	kg	1,12E-07	2,54E-11	5,81E-10	1,63E-10	3,90E-11	-8,80E-08	1,13E-07
NHWD	kg	4,88E+00	6,97E-04	3,49E-03	5,75E-02	3,88E+00	-2,77E+00	4,88E+00
RWD	kg	1,85E-02	7,09E-06	5,84E-04	8,41E-05	8,32E-06	-1,58E-02	1,91E-02
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MFR	kg	0,00E+00	0,00E+00	2,61E-01	2,72E+00	0,00E+00	0,00E+00	2,61E-01
MER	kg	0,00E+00	0,00E+00	5,03E-02	1,17E+00	0,00E+00	0,00E+00	5,03E-02
EE	MJ	0,00E+00	0,00E+00	6,37E-01	1,48E+01	0,00E+00	0,00E+00	6,37E-01

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 |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 | **EE=Exported** energy

LCA results - information on biogenic carbon content at the factory gate: 1 m² ALPOLIC™ (EN 15804+A2)		
Parameter	**Unit**	**Biogenic carbon content at the factory gate**
Biogenic carbon content in the product	kg C	0,00E+00
Biogenic carbon content in the associated packaging	kg C	4,99E-02
NOTE 1 kg of biogenic carbon is equivalent to 44/12 kg of CO2.		

6. LCA: Interpretation

6.1 Dominance analysis

The impact categories are dominated by the provision of raw materials, especially aluminium (see Figure 2).

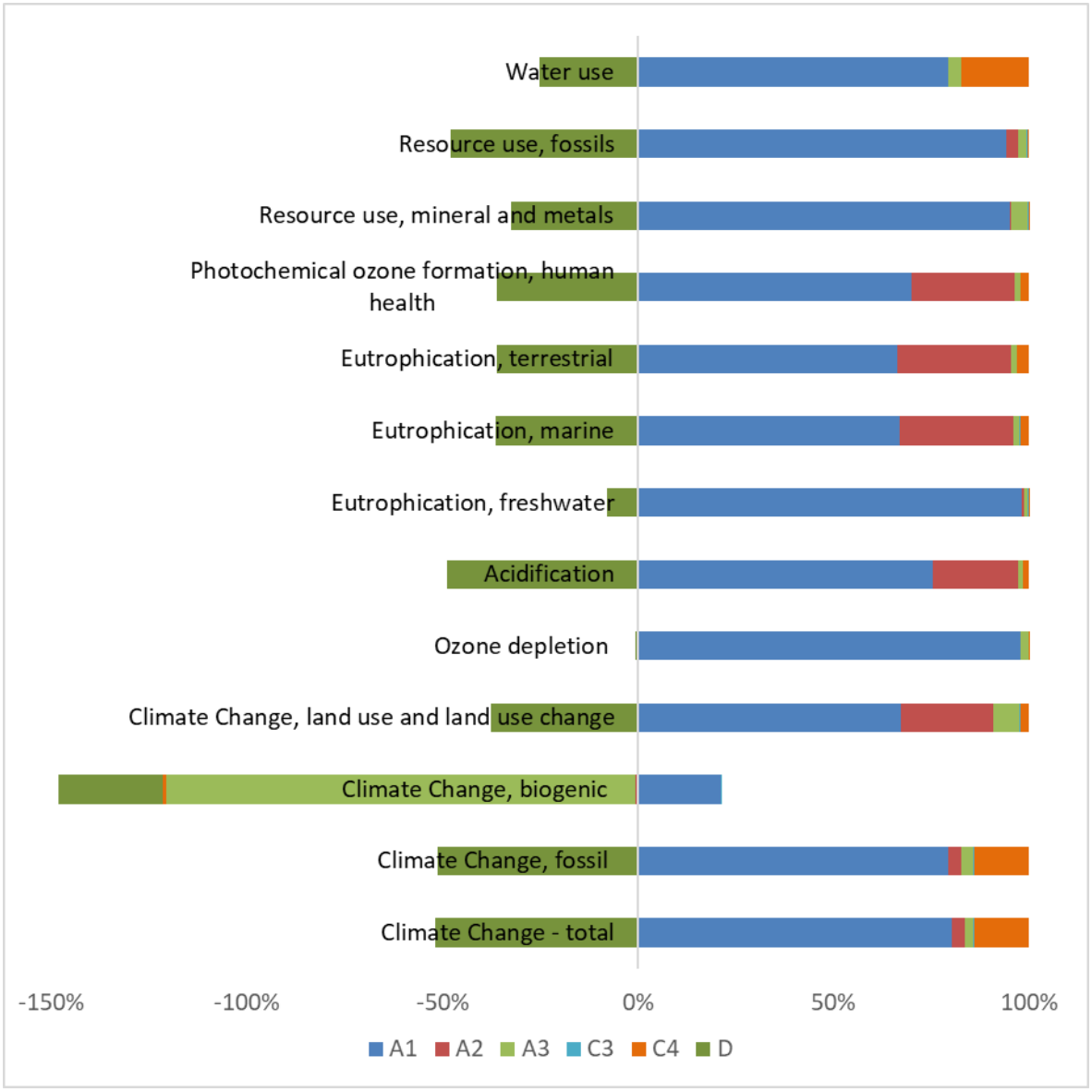

Figure 2 Dominance analysis of the modules

In the GWP, 81% of the climate-relevant emissions are caused by the provision of aluminium, approx. 3% each are due to transport and production. Wood pallet represents the largest part of the A3 biogenic CO2 input (minus value). However, this has a minimal impact on the total effect in the "Climate Change" (see "Climate Change - total"). Waste treatment (thermal utilisation of plastics and landfilling of the mineral part) also has a relevant influence in the impact category climate change and a minimal contribution of approx. 2-3% to acidification, eutrophication and photochemical ozone formation. The raw materials (A1) have a much stronger influence on the following impact categories, each with over 80%:

-Climate Change - total [kg CO2 eq.]

-Ozone depletion [kg CFC-11 eq.]

-Eutrophication, freshwater [kg P eq.]
-Resource use, mineral and metals [kg Sb eq.]
-Resource use, fossils [MJ]
-Water use [m³ world equiv.]
In the case of acidification, a good 20% is caused by transport, while in the case of eutrophication (all subcategories) the figure is as high as 29%. Packaging and production (A3) have an insignificant influence on the results in all categories (<5%).
Module "D" can achieve a saving of the total impact between 1 and 50% (eutrophication, climate change), if applicable.

6.2 Data quality

Overall, the data quality can be classified as good. All relevant process-specific data could be collected in the farm data collection. Consistent data records from the Gabi database were available for almost all inputs and outputs (GaBi 2022.2 + Ecoinvent 3.8). The background data fulfil the requirements of EN 15804+A2. The production data have been recorded for the operating year 2021. The quantities of raw materials, consumables and supplies used as well as the energy consumption have been recorded for the entire operating year. The life cycle assessment was carried out for all listed product items. A good representativeness of the data for the declared average product can be assumed (see Table 1; grade 1 - excellent quality, grade>4 insufficient quality).

Table 1

Criteria\Modules	A1	A2	A3	C4	C5	D
Precision	2	2	2	3	3	3
temporal representativity	1	1	1	1	1	3
Technological representativity	1	1	1	1	1	1
Geographical representativity	1	1	1	1	1	1
Overall grade	1.25	1.25	1.25	1.5	1.5	2.0

7. References

NMD STICHTING NATIONAL ENVIRONMENTAL DATABASE: Environmental Performance Assessment Method for Construction; 1.1 (March 2022); Rijswijk
Protocol EPD-online - 25011.16.03.015 - Protocol EPD online - NMD, version 1.2, November 2016, NIBE

Standards and norms

ISO 14040:2006, Environmental management - Life cycle assessment - Principles and framework

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

ISO 14025:2006: Environmental labels and declarations - Type III environmental declarations - Principles and procedures EN 13249

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

PCR A: General Program Category Rules for Construction Products from the EPD program Kiwa-Ecobility Experts, R.0_2021-07-16

PCR B: PCR B - Requirements on the Environmental Product Declarations for construction steel products (Edition 2020-03-13 (draft)

	Publisher Kiwa-Ecobility Experts Voltastr. 5 13355 Berlin Germany	Tel. Mail Web	+49 (0) 30 467761 52 DE.Ecobility.Experts@kiwa.com https://www.kiwa.com/de/de/themes/ecobility-experts/ecobility-experts/
	Programme operator Kiwa-Ecobility Experts Voltastr. 5 13355 Berlin Germany	Tel. Mail Web	+49 (0) 30 467761 52 DE.Ecobility.Experts@kiwa.com https://www.kiwa.com/de/de/themes/ecobility-experts/ecobility-experts/
	LCA Practitioner Dr Bálint Simon Mitsubishi Chemical Europe GmbH Shooting street 47 40549 Düsseldorf Germany	Tel. Mail Web	+49 211 52054 0 info@mc-e.de https://eu.mitsubishi-chemical.com/
	Owner of the declaration Mitsubishi Polyester Film GmbH Alpolic Division Kasteler Street 45 65203 Wiesbaden Germany	Tel. Mail Web	+49(0)6119623482 info-alpolic@mcgc.com https://www.alpolic.eu/

Kiwa-Ecobility Experts is established member of the