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-Kiwa-EE-000425-EN
Date of issue:	10.04.2025
Valid to:	10.04.2030

1. General information

Mitsubishi Polyester Film GmbH

Programme operator
Kiwa-Ecobility Experts
Kiwa GmbH, Ecobility Experts
Wattstraße 11-13
13355 Berlin
Germany

Registration number
EPD-Kiwa-EE-000425-EN

This declaration is based on Product Category Rules
Environmental product declaration requirements for aluminium and aluminium alloy surface systems

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Raoul Mancke
(Head of program operations, Kiwa-Ecobility Experts)

Gupta Kripanshi
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ALPOLIC™ composite panels

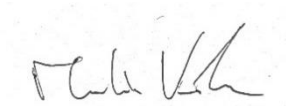
Owner of the declaration
Mitsubishi Polyester Film GmbH
Alpolic Division
Kasteler Straße 45
65203 Wiesbaden
Germany

Scope
1 m^2 composite panels (at least 85% recycled aluminum by weight)

Validity range
ALPOLIC aluminium composite panels are manufactured by Mitsubishi Polyester Film GmbH - Alpolic Division, based in Wiesbaden. An average product from the range ALPOLIC R85™ A1 und A2 ACM, ALPOLIC R85™ fr ACM und ALPOLIC R85™ real anodized was considered. The environmental impacts were shown for the product with the average 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 EN15804:2012 +A2:2019 serves as the core PCR.
Independent verification of the declaration and data according to ISO 14025:2011-10

☐intern ☒extern



Martin Koehrer
(Third party verifier)

2. Product

2.1 Product description

ALPOLIC™ Composites are thin panels consisting of two thin aluminium plates (in this case at least 85 % by weight of recycled aluminum) 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 fluoropolymer paint to keep surfaces fresh after decades of exposure to the elements. At the same time, ALPOLIC™ composite panels offer the rigidity of heavy sheet metal in a lightweight composite material.

2.2 Application

ALPOLIC™ composite panels 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™ composite panels with a nominal thickness of 4 mm can be found in the following table.

Designation	ALPOLIC R85™ / fr ACM	ALPOLIC R85™ A2 ACM	ALPOLIC R85™ A1 ACM	ALPOLIC R85™ / fr reAL Anodised	Unit
Specific weight	7.6	8.3	8.3	7.6	kg/m^2
Temperature coefficient of expansion according to ASTM D696	24	19	21	24	$x\ 10^{-6}/°C$
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	27	27	27	27	dB

ASTM E413					
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 Base materials / Ancillary materials

Die ALPOLIC™- composite panels 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 material	Unit	Value
Aluminium coils	M.-%	34
Core material	M.-%	64
PE-based protective and adhesive film	M.-%	2

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 (Extrusion of the thermoplastic core, lamination with the aluminum coils, transport within the plant, A3).

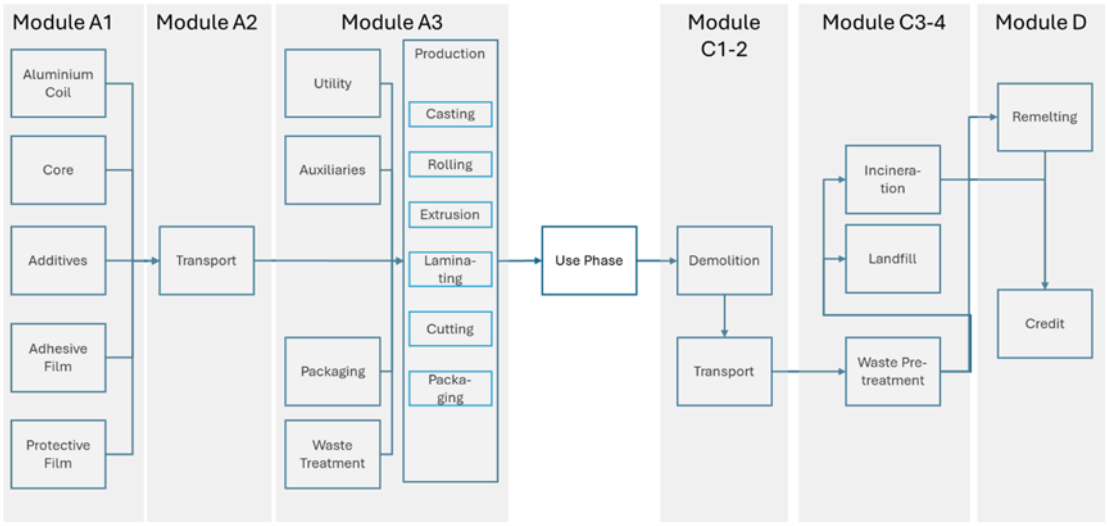


Figure 1: System boundaries

2.7 Packaging

ALPOLIC™ Aluminium composite materials (ACM) are palletised.

2.8 Reference Service Life (short: RSL)

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 1 m^2 ALPOLIC™ is chosen as the declared unit.
Since an average product with a specific unit weight of 7.6 bis 8.3 kg/m^2 is considered, weighted grammage is used.

Product	Unit	Value
Declared unit	1	m^2
Grammage	7.76	kg/m^2
Conversion factor to 1 kg	0.13	

3.2 System boundary

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 Manufacturing	X	Power supply, compressed air, water, packaging	Administration building, disposal of office waste
C1 Deconstruction/Demolition	X	Building demolition	
C2 Transport (Waste for treatment)	X	Waste transportation	
C3 Waste processing	X	Shredder and sorting machine	
C4 Disposal	X	Landfilling, waste incineration with energy recovery	
D Benefits and loads beyond the system boundaries	X	Remelting and credit	

3.3 Estimates and assumptions

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 composite panels, it is assumed that the aluminium portion is recycled. Thermal recycling was assumed for the plastic portion of the core material, while the remainder was assumed to be landfilled.

3.4 Additional information, electricity used

The electricity was purchased externally and has a global warming potential of 0.648 kg CO2eq/kWh (IPCC AR6 exl. Biogenic GHG). For the calculation of the electricity mix the market-based approach was used.

3.5 Cut-off criteria

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

3.6 Reference period and geographical reference area

The production data was collected in the operating year 2021 (01.01.2021-31.12.2021) and updated in 2023 (01.01.2023-31.12.2023). The geographical reference area is Germany (Wiesbaden).

3.7 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 Sphera LCA-FE database (Version 2024.1) and the integrated Ecoinvent v3.8 database.

3.8 Allocation

Allocations were avoided.

3.9 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 Sphera LCA FE v. 10.8.0.14, database version 2024.1 and the integrated Ecoinvent v3.8 database.

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 (C1-2) (1m^2)	7.76	kg	Input from undeclared B – material for Module C1 Consumption from demolition: 0.179 MJ Diesel/qm Composite panel) and Module C2 (Consumption of transportation: 0.159 tkm/m^2)	-
Recycling (C3)	2.74	kg	Aluminium scrap for further processing (shredder and sorting– C3, Consumption: 0.419 MJ electricity/qm waste) (Lassesson, (2008))	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 process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ Demolition	Transport	Waste treatment	Disposal	Reuse, recovery and recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x	X	X	X
X=Module declared | ND=Module not declared																

LCA results - Indicators to describe environmental impacts based on impact assessment (LCIA): 1 m² ALPOLIC™ (EN 15804+A2)										
Parameter	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**	**Total A1-A3**
Core indicators										
GWP-total	kg CO2 eqv.	1.02E+01	8.40E-01	3.30E-01	1.67E-01	1.64E-02	2.72E+00	5.81E-02	-3.80E+00	1.14E+01
GWP-f	kg CO2 eqv.	1.02E+01	8.42E-01	5.10E-01	1.76E-01	1.62E-02	2.72E+00	5.81E-02	-3.78E+00	1.16E+01
GWP-b	kg CO2 eqv.	6.18E-03	-7.01E-03	-1.80E-01	-1.20E-02	-1.40E-04	8.20E-04	-3.99E-04	-1.72E-02	-1.81E-01
GWP-luluc	kg CO2 eqv.	3.10E-03	4.68E-03	4.92E-04	3.16E-03	2.75E-04	5.42E-05	3.49E-04	-7.65E-04	8.27E-03
ODP	kg CFC 11 eqv.	1.68E-08	8.68E-14	3.59E-10	3.84E-14	1.65E-15	2.03E-12	1.58E-13	-3.92E-11	1.72E-08
AP	mol H+ eqv.	3.25E-02	1.89E-02	7.09E-04	1.66E-03	1.01E-04	8.61E-04	4.12E-04	-1.13E-02	5.20E-02
EP-fw	kg P eqv.	9.25E-05	1.29E-06	7.00E-07	4.43E-07	6.99E-08	4.17E-07	1.32E-07	-4.63E-06	9.44E-05
EP-m	kg N eqv.	8.12E-03	4.68E-03	2.09E-04	8.09E-04	4.95E-05	2.66E-04	1.06E-04	-1.88E-03	1.30E-02
EP-T	mol N eqv.	8.75E-02	5.14E-02	2.23E-03	8.94E-03	5.49E-04	3.99E-03	1.17E-03	-2.04E-02	1.41E-01
POCP	kg NMVOC eqv.	2.58E-02	1.33E-02	5.78E-04	2.39E-03	9.48E-05	6.90E-04	3.25E-04	-5.59E-03	3.97E-02
ADP-mm	kg Sb-eqv.	6.30E-06	2.87E-08	3.25E-07	2.79E-08	1.39E-09	1.41E-08	3.77E-09	-1.13E-06	6.66E-06
ADP-f	MJ	2.10E+02	1.07E+01	7.06E+00	2.14E+00	2.14E-01	1.35E+00	7.66E-01	-5.58E+01	2.27E+02
WDP	m3 world eqv.	1.16E+00	4.74E-03	3.81E-02	1.16E-03	2.44E-04	2.75E-01	6.63E-03	-1.29E-01	1.20E+00
Additional indicators										
PM	disease incidence	6.09E-07	3.36E-07	2.87E-08	4.90E-08	6.47E-10	4.93E-09	5.17E-09	-1.70E-07	9.74E-07
IRP	kBq U235 eqv.	1.38E+00	1.13E-03	4.71E-02	2.95E-04	3.86E-05	8.92E-03	9.03E-04	-9.26E-01	1.42E+00
ETP-fw	CTUe	7.05E+01	6.50E+00	1.99E+00	1.74E+00	1.57E-01	5.09E-01	4.41E-01	-1.14E+01	7.90E+01
HTP-c	CTUh	5.61E-09	1.17E-10	3.30E-09	4.00E-11	3.16E-12	4.22E-11	1.04E-11	-9.18E-10	9.02E-09
HTP-nc	CTUh	1.33E-07	3.96E-09	2.52E-09	1.43E-09	1.41E-10	1.48E-09	4.03E-10	-2.29E-08	1.39E-07
SQP	Pt	1.78E+01	1.81E+00	3.30E+01	1.43E+00	1.06E-01	6.92E-01	2.18E-01	-6.21E+00	5.26E+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 ecosys-tems | **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**	**C1**	**C2**	**C3**	**C4**	**D**	**Total A1-A3**
PERE	MJ	3.53E+01	3.32E-01	3.15E+00	2.32E-01	1.81E-02	9.52E-01	1.34E-01	-2.61E+01	3.88E+01
PERM	MJ	1.77E-04	0.00E+00	2.67E-04	2.67E-04	2.67E-04	-2.80E-14	-4.00E-15	-4.09E-13	4.44E-04
PERT	MJ	3.53E+01	3.32E-01	3.15E+00	2.32E-01	1.81E-02	9.52E-01	1.34E-01	-2.61E+01	3.88E+01
PENRE	MJ	2.08E+02	1.06E+01	7.06E+00	2.14E+00	2.14E-01	1.35E+00	7.66E-01	-5.58E+01	2.25E+02
PENRM	MJ	1.77E-04	0.00E+00	2.67E-04	2.67E-04	2.67E-04	-2.80E-14	-4.00E-15	-4.09E-13	4.44E-04
PENRT	MJ	2.08E+02	1.06E+01	7.06E+00	2.14E+00	2.14E-01	1.35E+00	7.66E-01	-5.58E+01	2.25E+02
SM	kg	2.56E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.56E+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	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	0.00E+00
FW	m^3	7.16E-02	3.74E-04	2.42E-02	2.21E-04	2.03E-05	6.65E-03	2.03E-04	-3.36E-02	9.62E-02
HWD	kg	6.20E-08	2.00E-10	3.09E-09	9.11E-11	6.91E-12	2.17E-09	1.92E-10	-2.72E-08	6.53E-08
NHWD	kg	5.69E+00	8.65E-04	3.36E-03	3.54E-04	3.32E-05	5.78E-02	3.88E+00	-7.78E-01	5.70E+00
RWD	kg	7.56E-03	7.96E-06	5.80E-04	2.89E-06	2.76E-07	8.42E-05	7.92E-06	-4.93E-03	8.15E-03
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	0.00E+00
MFR	kg	0.00E+00	0.00E+00	2.61E-01	0.00E+00	0.00E+00	2.72E+00	0.00E+00	0.00E+00	2.61E-01
MER	kg	0.00E+00	0.00E+00	5.03E-02	0.00E+00	0.00E+00	1.17E+00	0.00E+00	0.00E+00	5.03E-02
EEE	MJ	0.00E+00	0.00E+00	1.93E-01	0.00E+00	0.00E+00	4.48E+00	0.00E+00	0.00E+00	1.93E-01
EET	MJ	0.00E+00	0.00E+00	4.44E-01	0.00E+00	0.00E+00	1.03E+01	0.00E+00	0.00E+00	4.44E-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 | **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 | **EEE**=Exported energy (electric) | **EET**=Exported energy (thermal)

LCA results - information on biogenic carbon content: 1 m^2 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 CO_2.		

6.1 Dominance analysis

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

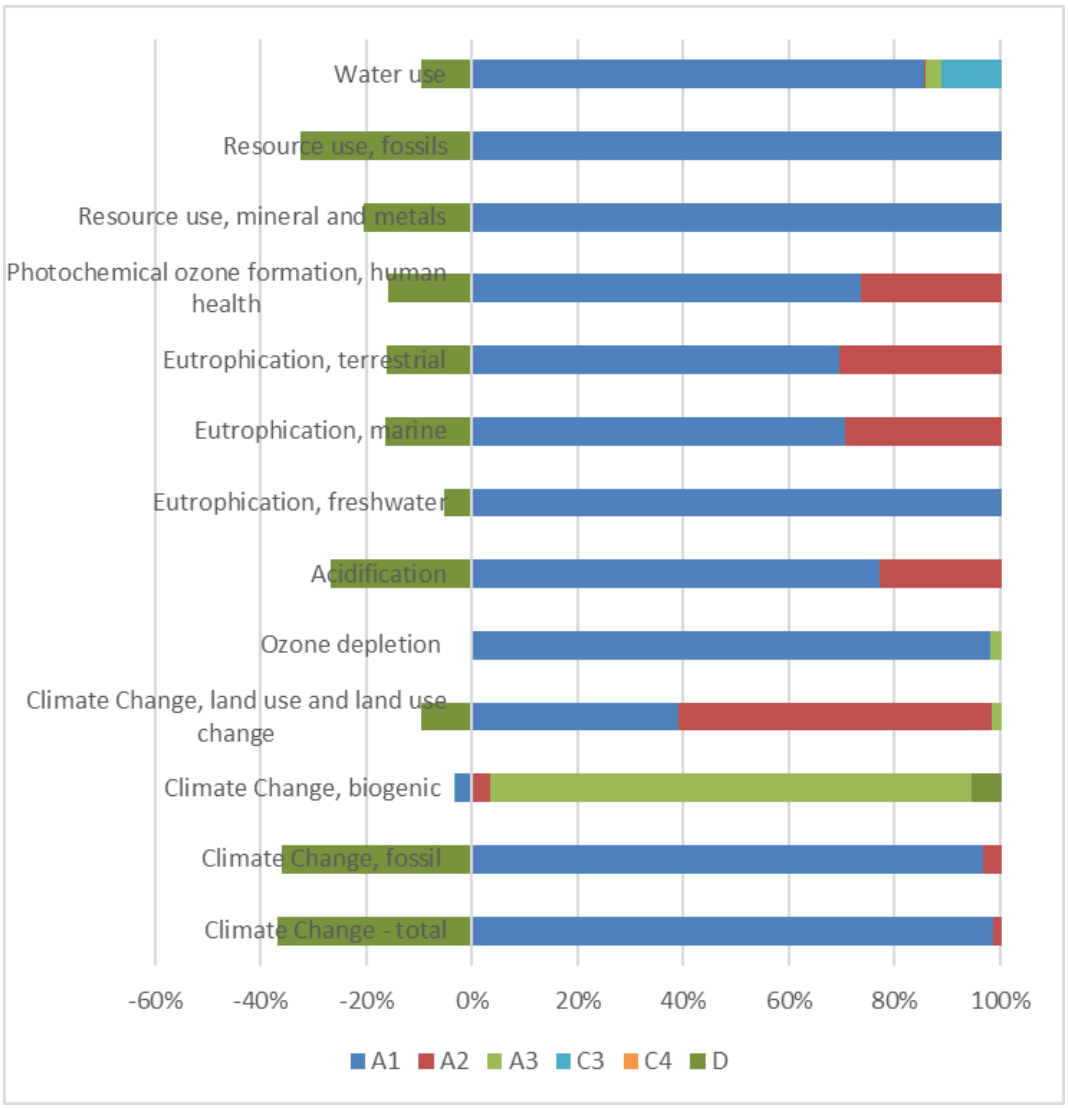


Figure 2: Dominance analysis of the modules

In the case of GWP, approx. 50% of climate-relevant emissions are caused by the provision of aluminum, with transport and production each accounting for approx. 6%. Wood pallet represents the largest part of the A3 biogenic CO2 input (negative value). However, this has a minimal effect on the overall impact, see “Climate Change - total”. Waste treatment (thermal utilization of plastic and landfilling of the mineral part) also has a relevant influence in the climate change impact category as well as 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, with over 80% in each case:

- 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.]

A good 22% of the Acidification indicator is caused by transport, while the share for Eutrophication (all subcategories) is 25%. Packaging and production (A3) has an insignificant impact on the results in all categories (<5%).

Module "D" can achieve a reduction of the total impact between 1 and 37% (eutrophication - climate change). This value has decreased compared to products with a lower content of 50% recycled aluminum. This can be explained by allocation procedures, i.e. the amount of aluminum scrap produced must first be subtracted from the amount of scrap used. The more "scrap" is used in the product, the less is left for the credit in Module D. The EPD values were reported based on the product average. The variability of the results was analyzed using the area produced as a distribution factor. The variability differs depending on the impact category. This can be explained by the use of different core materials (polyethylene-based or inorganic). However, the "Climate Change" category is dominated by aluminum and shows a variability of less than 10% between product types.

6.2 Data quality

Overall, the data quality is good. All relevant process-specific data could be collected in the operational data collection. Consistent data sets from the Gabi database were available for almost all inputs and outputs (GaBi 2024.1 + ecoinvent 3.8 "cut-off by classification"). The background data comply with the requirements of EN 15804+A2. Product data was collected for the 2021 operational year and updated in 2023. The quantities of raw materials, consumables and supplies used and the energy consumption were recorded for the entire operating year. The Life Cycle Assessment was performed for all listed product items. It can be assumed that the data is highly representative of the declared average product (grade 1 - excellent quality, grade >4 - unsatisfactory quality).

Criteria\Module	A1	A2	A3	C4	C5	D
Precision	2	2	2	3	3	3
Temporal representativeness	1	1	2	1	1	3
Technological representativeness	1	1	1	1	1	1
Geographical representativeness	1	1	1	1	1	1
Overall score	1.25	1.25	1.5	1.5	1.5	2.0

7. References

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

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