Environmental Product Declaration

IN ACCORDANCE WITH ISO 14025 AND EN 15804+A2

Program Operator: Smart EPD®
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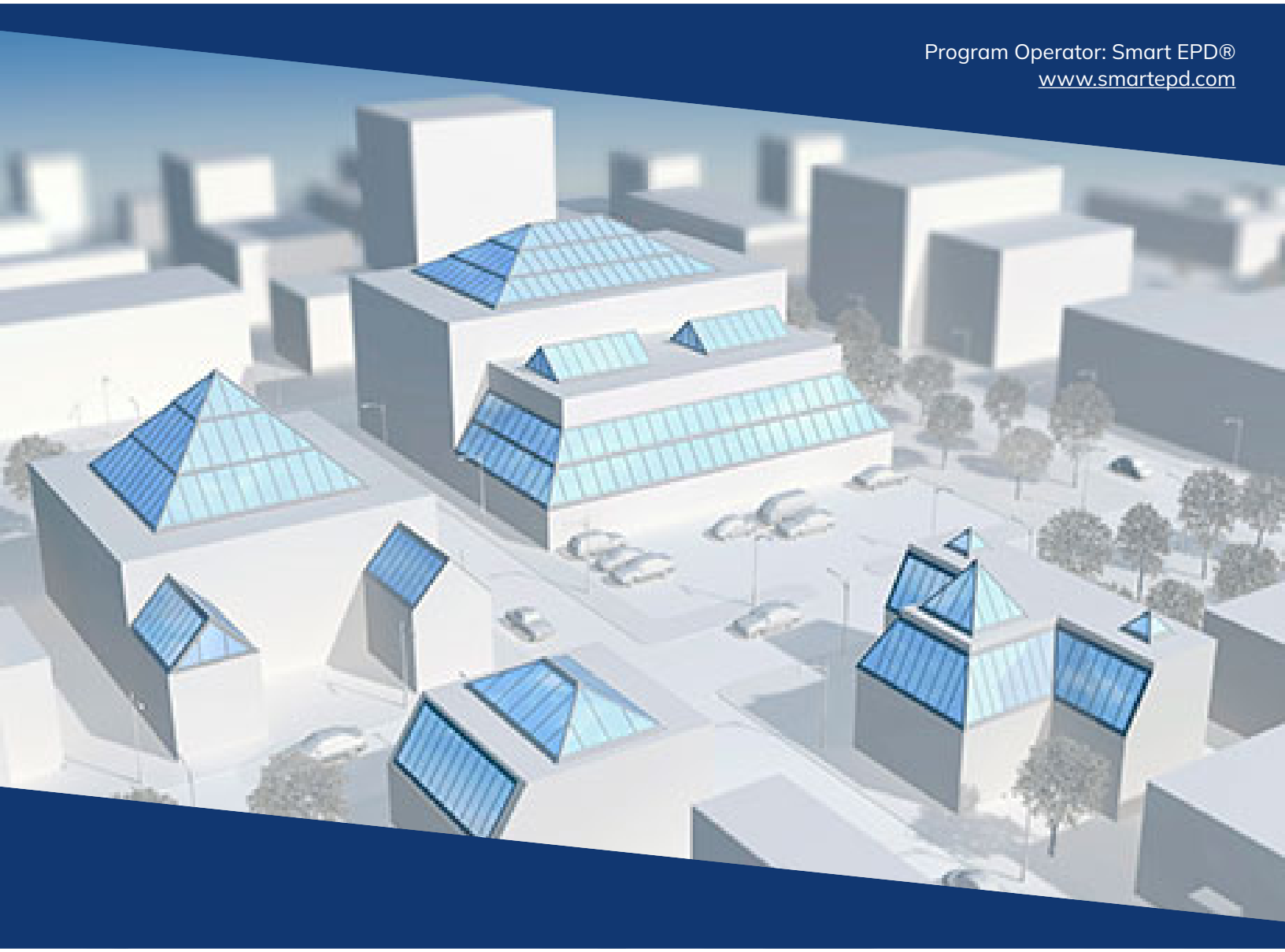

Glazing Panels - Triple Glazed

Date of Issue	Expiration date	Last updated
Jul 30, 2025	**Jul 30, 2030**	**Jul 30, 2025**

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General Information

VELUX

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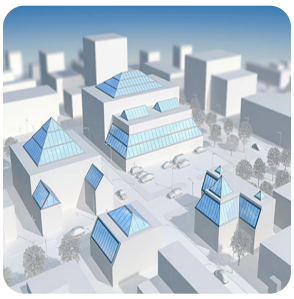


Product Name:	Glazing Panels - Triple Glazed
Declared Unit:	1 m2 of a window ≤ 2,3 m² (reference dimensions according to EN 17213: 1,23 m × 1,48 m)
Declaration Number:	SmartEPD-2025-001-0563-01
Date of Issue:	July 30, 2025
Expiration:	July 30, 2030
Last updated:	July 30, 2025
EPD Scope:	Cradle to gate with other options A1 - A3, A4, A5, C1 - C4, D
Market(s) of Applicability:	Europe

General Organization Information

VELUX is a Danish manufacturing company that specializes in roof windows, skylights, sun tunnels and related accessories. The company is headquartered in Hrsholm, Denmark and is a part of VKR Holding A/S. VELUX Group is a founding partner of the global Active House Alliance.
Further information can be found at: https://www.velux.com

Limitations, Liability, and Ownership

Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. The EPD owner has sole ownership, liability, and responsibility for the EPD.

Reference Standards

Standard(s):	ISO 14025 and EN 15804+A2
Core PCR:	IBU PCR for Building-Related Products and Services Part A v1.4 v.1.4 Date of issue: April 15, 2024
Sub-category PCR:	IBU Part B: Requirements on the EPD for Windows and Doors v.1.0/1.7/1.4 Date of issue: January 25, 2021 Valid until: January 25, 2026

Sub-category PCR review panel:	Contact Smart EPD for more information.
General Program Instructions:	Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

LCA Author/Creator:	Juan David Villegas | juan@parqhq.com
EPD Program Operator:	Smart EPD | info@smartepd.com | www.smartepd.com 585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA
Verification:	Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071: External Rifat Karim | Independent Consultant | rifat.chimique@gmail.com Independent external verification of EPD, according to ISO 14025 and reference PCR(s): External Rifat Karim | Independent Consultant | rifat.chimique@gmail.com

Product Information

Declared Unit:	1 m2 of a window ≤ 2,3 m² (reference dimensions according to EN 17213: 1,23 m × 1,48 m)
Mass:	62.8992 kg
Reference Service Life:	30 Years
Product Specificity:	✗ Product Average ✓ Product Specific

Product Description

A bespoke glass system with slim and shallow profiles for optimal daylight influx. VELUX Glazing Panels enable the creation of a wide range of rooflight designs from flush installations in a pitched roof to pyramids on a flat roof.
Further information can be found at: https://commercial.velux.co.uk/products/glass-roof-systems/glazing-panels

Product Specifications

Product Classification Codes:	EC3 - Openings -> TranslucentWallAndRoofAssemblies

Material Composition

Material/Component Category	Origin	% Mass
Blind rivets, nuts , screws, plates	LTU, DNK	1.7
Gaskets, washers	LTU, DNK	1.3
Glazing	LTU	84.16
Profiles, support brackets, tubes and strips	DNK, LVA	12.84

Packaging Material	Origin	kg Mass
Cardboard		0.1
Pallet		0.06
Plastic cover		0.5

Biogenic Carbon Content	kg C per m2
Biogenic carbon content in product	None
Biogenic carbon content in accompanying packaging	0.08

Hazardous Materials
No regulated hazardous or dangerous substances are included in this product.

EPD Data Specificity

Primary Data Year: Jan 1, 2024 - Dec 31, 2025

Manufacturing Specificity:

- ✗ Industry Average
- ✗ Manufacturer Average
- ✓ Facility Specific

Averaging:

Averaging was not conducted for this EPD

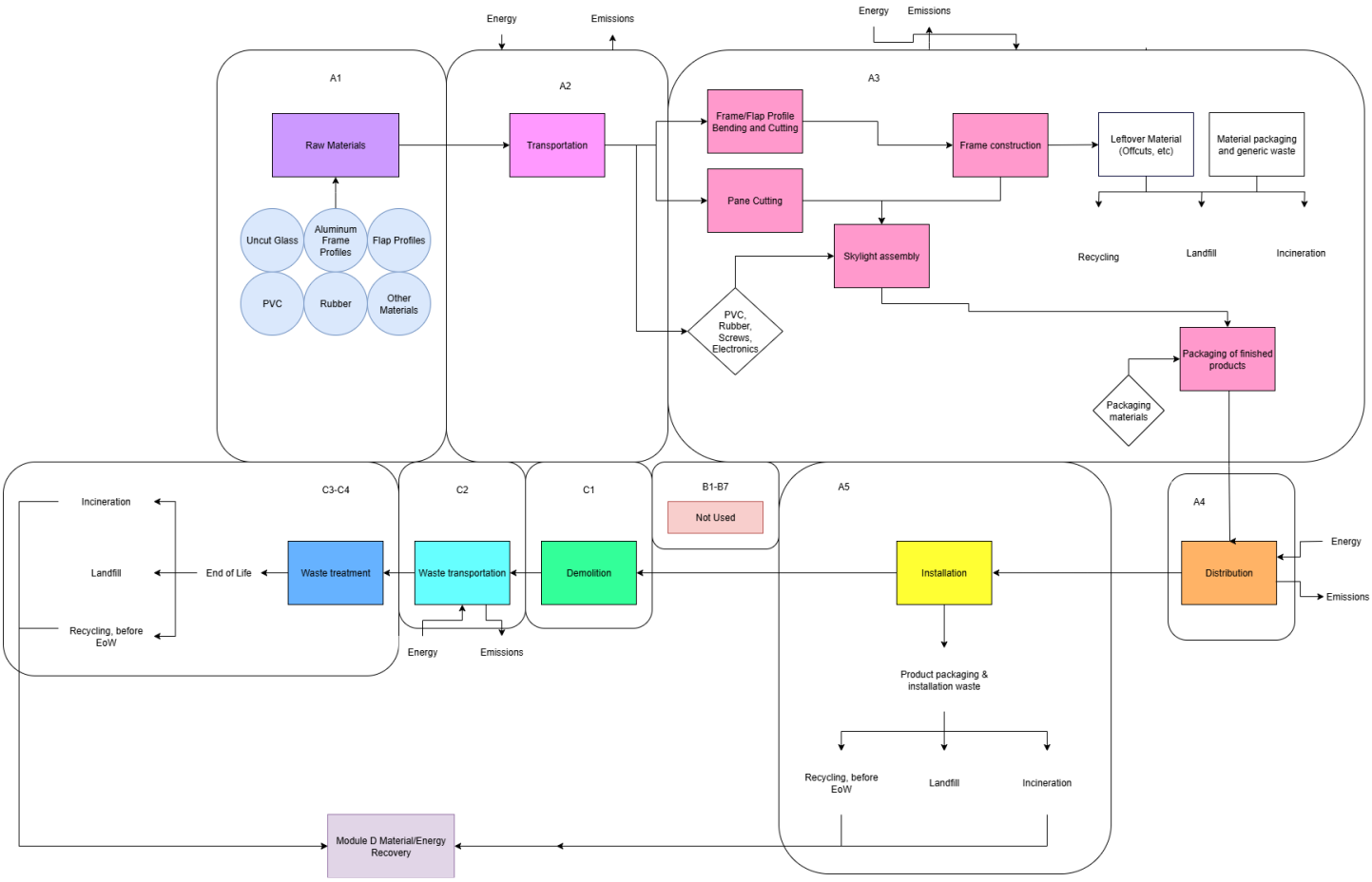
System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	✓
	A5	Assembly / Install	✓
Use	B1	Use	ND
	B2	Maintenance	ND
	B3	Repair	ND
	B4	Replacement	ND
	B5	Refurbishment	ND
	B6	Operational Energy Use	ND
	B7	Operational Water Use	ND
End of Life	C1	Deconstruction	✓
	C2	Transport	✓
	C3	Waste Processing	✓
	C4	Disposal	✓
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	✓

Plants

Voerde, DE
Alte Hünxer Str. 179, 46562 Voerde (Niederrhein)-Friedrichsfeld, Germany

Product Flow Diagram



VELUX product manufacturing begins when flap profile parts, uncut glazing, aluminum or plastic profiles, vertical end pieces, and other small components such as screws and gaskets are bent, cut, welded, and assembled into complete flaps and skylight systems. If needed, extra components like DSL grids and electronic parts for home-automation systems are custom-cut and assembled to specification. Once manufacturing is finished, products are delivered to distribution centers and then transported to the end user by truck.

Software and Database

LCA Software:	SimaPro v. 9.5
LCI Foreground Database(s):	Ecoinvent v. 3.9.1
LCI Background Database(s):	Ecoinvent v. 3.9.1

Data Quality

Precision & Completeness

• **Precision:** Inventory data were directly measured, calculated, or conservatively estimated from primary sources using consistent units and QA checks. Background processes from ecoinvent v3 were adopted with their documented uncertainty/precision metadata where available, preserving a transparent record of data quality.

• **Completeness:** The product system's mass balance and inventory completeness were thoroughly checked. Some exclusions were made in line with the PCR requirements, such as personnel impacts, R&D activities, business travel, and point-of-sale infrastructure. However, no data were intentionally omitted.

Consistency and Reproducibility

• **Consistency:** Primary data for all modules were consistently gathered aiming at the highest level of detail possible. Background processes were modeled mainly with the ecoinvent database. The same allocation rules, cut-off criteria, and impact assessment methods were applied throughout, ensuring methodological coherence and consistent data quality across the entire LCA model.

• **Reproducibility:** This study ensures reproducibility by providing comprehensive disclosure of inputoutput data, dataset choices, and modeling approaches. A knowledgeable third party should be able to approximate the results using the same data and modeling methods.

Representativeness

• **Temporal:** Primary data were collected for a 12-month period representing the 2024 calendar year to ensure the representativeness of post-consumer content. Secondary data from the ecoinvent v3 database are typically representative of recent years.

• **Geographical:** Primary data represent VELUX's production facilities. Where applicable, differences in electric grid mix were considered using appropriate secondary data. The use of country-specific data ensures high geographical representativeness, and proxy data were only used when country-specific data were unavailable.

• **Technological:** Both primary and secondary data were tailored to the specific technologies studied, ensuring high technological representativeness.

Life Cycle Module Descriptions

Modules A1A3: The LCA model covers the manufacture of raw materials and components for VELUX products (A1) which are then transported to VELUX facilities by truck (A2). The manufacturing stage (A3) begins with receipt of these materials, which are bent, cut, welded, and assembled into finished flaps and skylight systems. When required, additional parts like DSL grids and electronic components for home-automation systems are custom-cut and assembled to order.

Modules A4A5: Once manufacture is completed, products are shipped to distribution centers and then to the end user by truck (A4). For installation (A5), a 3% material installation loss was assumed. This module includes disposal of that waste and of the product packaging.

Modules C1C4 and D: At end of life (C1C4), the product is assumed to be collected, and each waste stream (e.g., aluminum, glass, PVC) is handled separatelylandfilled, recycled, or incinerated with energy recovery. Loads and benefits beyond the system boundary are considered in Module D (e.g., displacement of virgin materials and electricity).

LCA Discussion

Allocation Procedure

Allocation of co-products was avoided, to the extent possible, based on the guidance given in ISO 14044:2006, 4.3, and in EN 15804+A2:2019. Energy use at the facility level was allocated by the amount of product produced. The manufacturing process does not consume water or generate wastewater or air emissions, other than those from fuel combustion. Solid waste was estimated using packaging masses and material losses and allocated following the polluter pays principle.

Cut-off Procedure

The system boundary was defined based on relevance to the goal of the study. For the raw material (A1) and process related inputs (A3), all available energy and material flow data have been included in the model.

Renewable Electricity

Energy Attribute Certificates (EACs) such as Renewable Energy Certificates (RECs) or Power Purchase Agreements (PPAs) are included in the baseline reported results:	✕ No

Scenarios

Transport to the building/construction site (A4)

A4 Module

Fuel Type:	Diesel
Vehicle Type:	Truck and Trailer
Transport Distance:	150 km
Capacity Utilization:	33 %
Packaging Mass:	0.6673 kg
Weight of products transported:	63.57 kg
Capacity utilization volume factor:	1
Assumptions for scenario development:	Transport distance includes finished product to distribution center and distribution center to point of sale.

Installation in to the building/construction site (A5)

A5 Module

Installation Scrap Rate Assumed:	3 %
Product Lost per Declared/Functional Unit:	1.887 kg
Mass of Packaging Waste Specified by Type:	0.6673 kg
Biogenic Carbon Contained in Packaging:	0.07686 kg
Assumptions for scenario development:	

End of Life (C1 - C4)

C1 - C4 Modules

Collection Process

Collected with Mixed Construction Waste:	62.9 kg

Recovery

Recycling:	23.88 kg
Landfill:	37.01 kg
Incineration:	2.012 kg

Reuse, Recovery and / or Recycling Potentials & Relevant Scenario Information (D)

D Module

Recycling Rate of Product:	0.3796 %
Recycled Content of Product:	0.1002 %
Net Energy Benefit from Material Flow Declared in C3 for Energy Recovery:	166.9 MJ
Further assumptions for scenario development:	Energy recovery from incineration assumes 18% electrical efficiency and 31% thermal

Results

Environmental Impact Assessment Results

EF 3.1

per 1 m2 of product of a window ≤ 2,3 m² (reference dimensions according to EN 17213: 1,23 m × 1,48 m) .

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

Impact Category	Method	Unit	A1A2A3	A4	A5	C1	C2	C3	C4	D
GWP-total	EF 3.1	kg CO2 eq	1.35e+2	1.50e-2	5.28e+0	0	5.21e-1	4.24e+0	1.06e-1	-4.83e+1
GWP-biogenic	EF 3.1	kg CO2 eq	1.57e+0	1.20e-5	1.49e-1	0	4.15e-4	3.32e-4	2.38e-5	2.32e-1
GWP-fossil	EF 3.1	kg CO2 eq	1.34e+2	1.50e-2	5.13e+0	0	5.20e-1	4.24e+0	1.06e-1	-4.85e+1
GWP-luluc	EF 3.1	kg CO2 eq	1.25e-1	7.33e-6	3.78e-3	0	2.54e-4	3.42e-5	1.26e-5	-7.52e-2
ODP	EF 3.1	kg CFC11 eq	4.63e-6	3.41e-10	1.41e-7	0	1.18e-8	4.43e-9	1.59e-9	-8.80e-7
AP	EF 3.1	mol H+ eq	8.80e-1	3.72e-5	2.68e-2	0	1.29e-3	9.84e-4	9.56e-4	-3.45e-1
EP-freshwater	EF 3.1	kg P eq	2.82e-2	1.11e-6	8.52e-4	0	3.84e-5	1.31e-5	5.38e-6	-1.33e-2
EP-marine	EF 3.1	kg N eq	1.63e-1	1.01e-5	5.08e-3	0	3.51e-4	5.58e-4	4.29e-4	-5.76e-2
EP-terrestrial	EF 3.1	mol N eq	1.80e+0	1.04e-4	5.55e-2	0	3.60e-3	4.77e-3	4.66e-3	-6.50e-1
POCP	EF 3.1	kg NMVOC eq	5.58e-1	6.07e-5	1.72e-2	0	2.10e-3	1.21e-3	1.40e-3	-2.03e-1
ADP-minerals&metals	EF 3.1	kg Sb eq	1.18e-3	4.20e-8	3.56e-5	0	1.46e-6	2.12e-7	3.79e-8	-9.20e-5
ADP-fossil	EF 3.1	MJ	1.79e+3	2.28e-1	5.43e+1	0	7.90e+0	8.44e-1	1.36e+0	-5.40e+2
WDP	EF 3.1	m3 depriv.	3.49e+1	1.09e-3	1.10e+0	0	3.77e-2	1.90e-1	3.02e-3	-6.56e+0

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Resource Use Indicators

per 1 m2 of product of a window ≤ 2,3 m² (reference dimensions according to EN 17213: 1,23 m × 1,48 m) .

Indicator	Unit	A1A2A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	1.28e+2	3.34e-3	3.84e+0	0	1.16e-1	3.32e-2	1.12e-2	-4.95e+1
PERM	MJ	0	0	0	0	0	0	0	0
PERT	MJ	1.28e+2	3.34e-3	3.84e+0	0	1.16e-1	3.32e-2	1.12e-2	-4.95e+1
PENRE	MJ	1.79e+3	2.28e-1	5.43e+1	0	7.90e+0	8.44e-1	1.36e+0	-5.40e+2
PENRM	MJ	4.90e-1	9.62e-6	1.47e-2	0	3.33e-4	3.67e-5	1.59e-5	-1.22e-1
PENRT	MJ	1.79e+3	2.28e-1	5.43e+1	0	7.90e+0	8.44e-1	1.36e+0	-5.40e+2
SM	kg	0	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0
FW	m3	1.04e+0	3.09e-5	3.29e-2	0	1.07e-3	6.01e-3	7.27e-5	-2.65e-1

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM = Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators

per 1 m2 of product of a window ≤ 2,3 m² (reference dimensions according to EN 17213: 1,23 m × 1,48 m) .

Indicator	Unit	A1A2A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	0	0	0	0	0	0	0	0
NHWD	kg	4.94e-1	0	1.23e+0	0	0	0	3.70e+1	0
RWD	kg	2.18e-3	6.95e-8	6.57e-5	0	2.41e-6	4.14e-7	1.60e-7	-6.79e-4
CRU	kg	0	0	0	0	0	0	0	0
MFR	kg	6.54e-1	0	8.27e-1	0	0	0	2.39e+1	-2.47e+1
MER	kg	9.26e-1	0	5.60e-1	0	0	2.01e+0	0	-2.54e+0

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Carbon Emissions and Removals

per 1 m2 of product of a window ≤ 2,3 m² (reference dimensions according to EN 17213: 1,23 m × 1,48 m) .

Indicator	Unit	A1A2A3	A4	A5	C1	C2	C3	C4	D
Bio Carbon Removal from Product	kg C	0	0	0	0	0	0	0	0
Bio Carbon Emission from Product	kg C	0	0	0	0	0	0	0	0
Bio Carbon Removal from Packaging	kg C	-2.61e-1	0	0	0	0	0	0	0
Bio Carbon Emission from Packaging	kg C	1.84e-1	0	7.69e-2	0	0	0	0	0
Bio Carbon Emission from Waste during Manufacturing (renewable source)	kg C	0	0	0	0	0	0	0	0
Calcination Carbon Removal	kg C	0	0	0	0	0	0	0	0
Carbonation Carbon Emission	kg C	0	0	0	0	0	0	0	0
Carbon Emission from Waste during Manufacturing (non-renewable source)	kg C	0	0	0	0	0	0	0	0

Note:

Not all abbreviated indicators listed below may be present in the results above. The inclusion of indicators varies based on PCR requirements.

Abbreviations:

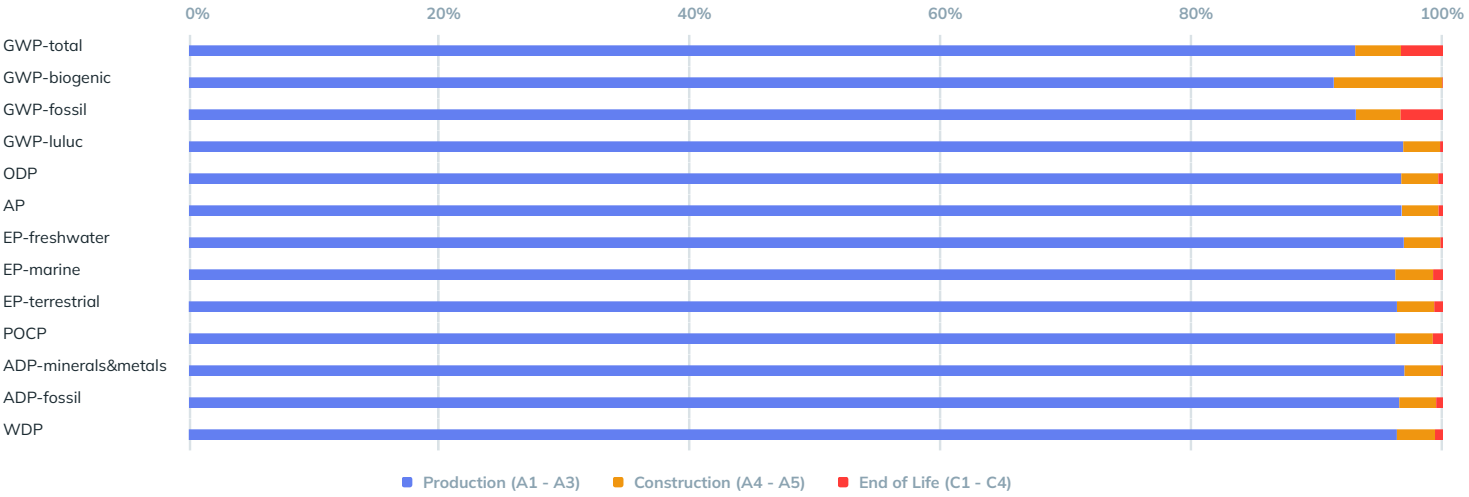
BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

Interpretation

• The manufacturing of the products in this analysis involves the direct procurement of raw materials from suppliers. These materials are then transported to manufacturing facilities in the EU where they are stored, processed, and combined to produce finished products. Notably, the product stage (stage 1) has the highest impact contribution, mainly attributed to the combined environmental impacts associated with raw material manufacturing and energy used in manufacturing the products.

• For products with significant manufacturing energy impacts, the shift to renewable energy sources is recommended.

• Given that the raw materials used in product manufacturing have a significant impact, exploration of opportunities to substitute these materials with alternatives that have a lower environmental impact. Additionally, consideration should be given to collaborating with suppliers who employ sustainable manufacturing techniques or integrate more renewable energy into their production processes. Such initiatives can lead to more environmentally friendly products and further enhance the sustainability of the products in this analysis.



Additional Environmental Information

None

Further Information

Name	Unit	Value
Heat transfer coefficient glass acc. to EN 674 / EN 675	W/(m²K)	0.5
Heat transfer coefficient window acc. to EN 674 / EN 675	W/(m²K)	~1.0
Total energy transmittance	%	50
Joint permeability coefficient acc. to EN 1026	m³/mh	< 2.6
Water tightness acc. EN 12208 unprotected / protected	class	E1200
Deflection as a result of wind loads acc. to EN 12211	mm	< L/300
Mounting type (sealing system)	–	Installed on bespoke sub-construction
Noise protection against external noise acc. DIN EN ISO 10140 and DIN EN ISO 717	dB	~38
Air permeability acc. EN 12207	class	Class 4
Resistance against wind loads acc. DIN EN 12211	mm	C5
Radiation properties acc. EN 410 or 133631 and 2: Total energy transmittance g	%	50
Radiation properties EN 410 or 133631 and 2: Light transmisson level rv	%	73
Reaction to fire	class	B-s1,d0

References

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