

Environmental Product Declaration

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

MAPEPLAN PLUS *(PVC-P Waterproofing Membranes)*

POLYGLASS S.p.A.

Programme:	The International EPD [®] System; www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-01106
Publication date	2018-06-14
Valid until:	2028-06-29
Revision date:	2023-06-30
Geographical scope:	<i>Global</i>

1. Company description / Goal & Scope

The Company's headquarter is located in Ponte di Piave, Treviso (Italy). Over 90.000 m² of surface, 25.000 m² covered. The plant has 4 production lines of polymer-bitumen membranes, 3 production lines of synthetic PVC-P and TPO/FPO membranes.

In October 2008 Polyglass was taken over by the MAPEI Group, an international Company in the chemical industry for construction, with 67 production plants in 5 continents, in 32 countries.

Polyglass SpA is ISO 14001 certified since 2010 and ISO 9001 since 1995 and ISO 45001 since 2022.

The goal of the study has been to provide necessary data and documentation to produce an EPD according to the requirements of PCR according to EN 15804:2014 and PCR Environdec, version 2.0, date 2015-03-03 and to have more comprehension about the environmental impacts related to Mapeplan Plus, manufactured in Polyglass SpA located in Ponte di Piave (TV - Italy), including packaging of the finished products.

Target audiences of the study are customers and other parties with an interest in the environmental impacts of **MAPEPLAN PLUS**.

This analysis shall not support comparative assertions intended to be disclosed to the public.

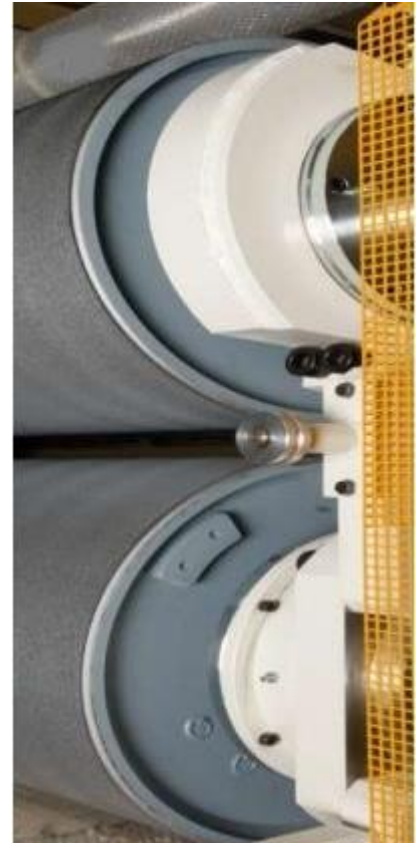


Figure 1: Production equipment

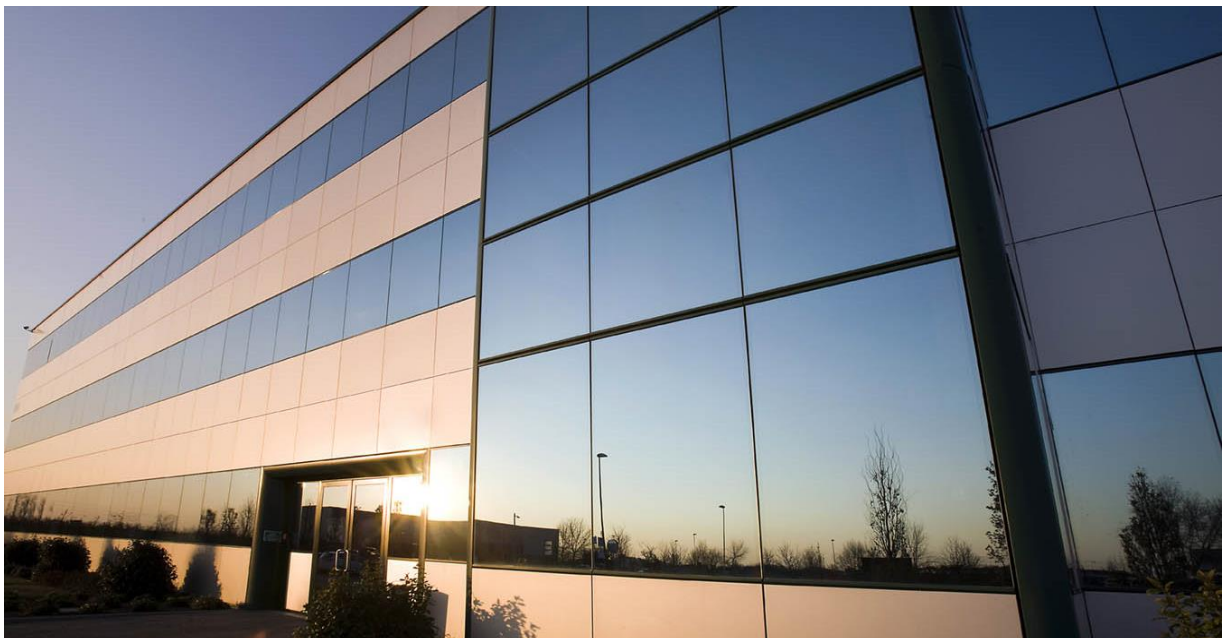


Figure 2: Polyglass S.p.A. head quarter

2. Product description

Mapeplan Plus is a synthetic roofing waterproofing membrane in PVC-P produced in one multiextrusion coating process, with high quality raw materials, reinforced with polyester net.

Mapeplan Plus is compliant with EN 13956 ("Flexible sheets for waterproofing – Plastic and rubber sheets for roof waterproofing – Definitions and characteristics"), and is sold with different packaging, as follow:

- Pallet: 14 rolls per pallet
- Length of rolls: 20 m and 15 m (according to the thickness)
- Width of rolls: 1,60 m



Figure 3: Membrane MAPEPLAN PLUS on fully exposed roof

3. Content declaration

The main components and ancillary materials of Mapeplan Plus are the following:

Table 1: Composition

Materials	Percentage (%) by mass
Polyvinyl chloride (PVC)	40 – 60
Plasticizers	20 – 40
Fillers	5 – 10
Pigments	0 – 5
Reinforcing materials	0 – 5
Other additives	0 – 5
Packaging	Percentage (%) by mass
Pallet (WOOD)	< 3%
Cardboard	< 3%
Plastic PP	< 3%
Plastic PE	< 0,5%

The product does not contain a concentration higher than 0,1% (by unit weight) of either carcinogenic substances or substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency.

4. Declared Unit and RSL (Reference Service Life):

The declared unit is 1m² of packaged finished product having a 1,5 mm thickness.

Packaging materials include:

- Wooden pallet
- Cardboard
- LDPE used as wrapping material
- PP

The reference service life of the roofing membrane, according to Polyglass experience, is estimated at least 30 years, if professionally installed and properly used.

5. System Boundaries & additional technical information:

The approach is “cradle to gate” (A1–A3) with modules C1–C4 and module D..

The following modules have been considered:

- A1-A3 (production stage): extraction and transport of raw materials, packaging included, production process
- A4-A5 (Construction process stage): transport of the finished product to final customers and installation into the building
- C1-C4 (End-of-life stage): de-construction, demolition (C1), transport to waste processing (C2), waste processing for reuse, recovery and/or recycling (C3), disposal (C4)

Table 2: System boundaries (X=included, MND= module not declared)

	Product stage			Constructi on process stage		Use stage							End of life stage				Resour ce recove ry 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	X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	EU, IT	EU, IT	IT	EU	EU	-	-	-	-	-	-	-	EU, IT	EU, IT	EU	EU	IT
Specific data	> 90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	Not-relevant					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	Not-relevant					-	-	-	-	-	-	-	-	-	-	-	-

A brief description of production process, is the following:

The production process of PVC-P roofing membranes is a multi-extrusion coating process. The production plant produces roofing membranes with an internal reinforcing material made of glass matt or polyester net.

PVC powders are mixed inside a heated turbomixer with other additives and liquid plasticizers. The mixture is then cooled at 40 °C and stored under mixing. The mixture is drained inside a hopper by a vacuum equipment and sent to the extruders. Reinforcing material is integrated inside the roofing membrane during multi-extrusion

coating process. The hot liquid compound comes out from the extruders and is combined with the reinforced material.

The membrane is cooled and finally sent to the packaging area, ready to ship.

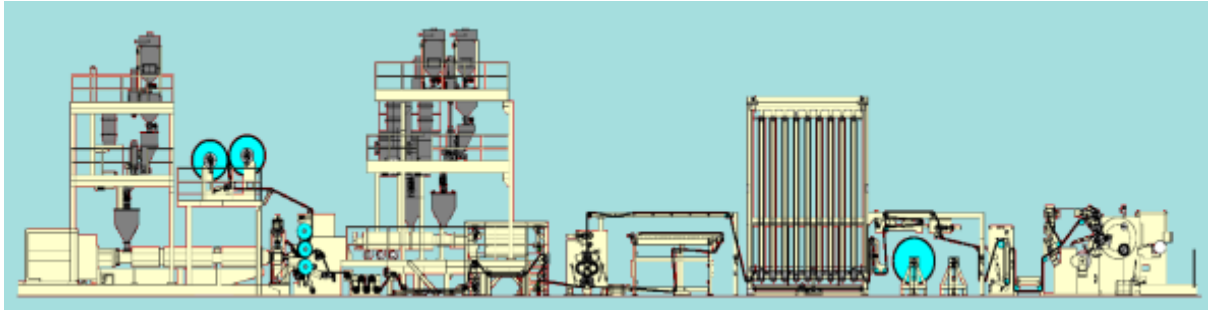


Figure 4: Production process detail

Table 3: Transport to the building site (A4) (referred to 1Kg of finished product)

Scenario information	Value	Unit
Means of transport: truck-trailer euro 5, gross weight 34-40 t, payload capacity 27 t		
Litres of fuel	0,002	l/100km
Transport distance (truck)	1300	km
Transport distance (ship)	500	km
Capacity utilisation (including empty runs)	85	%
Gross density of products transported	-	kg/m ³
Capacity utilisation volume factor	100	%

Table 4: Installation into the building (A5) (referred to 1Kg of finished product)

Scenario information	Value	Unit
Ancillary materials for installation	0	kg
Water use	0	m ³
Other resources use	0	kg
Electricity for installation	0,131	MJ
Material loss (membrane)	3	%
Overlaps (membrane)	5,5	%
Waste materials on building site before waste processing, generated by the product's installation (specified by type)	0,00034 (PP) 0,0026 (PE) 0,048 (wood) 0,03 (Membrane Loss)	kg
Output materials (specified by type) as result of waste processing at the building site e.g. of collection for recycling, for energy recovery, disposal (specified by route)	0,081 (Incineration)	kg
Direct emission to ambient air, soil and water	0	kg

Table 5: End of Life (C1-C4) (referred to 1Kg of finished product)

Scenario information	Value	Unit
Collected separately	1	m ²
Collected with mixed construction waste	0	m ²
Reuse	0	m ²
Recycling	0	m ²
Energy recovery	0	m ²
Landfill	1	m ²
Transport to recycling	0	km
Transport to landfill	150	km

6. Cut-off rules & allocation

Criteria for the exclusion of inputs and outputs (cut-off rules) in the LCA and information modules and any additional information are intended to support an efficient calculation procedure. They are not applied to hide data.

The following procedure is followed for the exclusion of inputs and outputs:

- All inputs and outputs to a unit process are included in the calculation, for which data are available.
- Less than 1 % of the total mass inputs / outputs of the unit process A1 and A3, are cut off (see table 6).

Input flows are covered for over 99% of the formula.

Table 6: Cut-off criteria

Process excluded from study	Cut-off criteria	Quantified contribution from process
A3: production (auxiliary materials)	less than 10 ⁻⁵ Kg / Kg of finished product	less than 10 ⁻⁵ Kg / Kg of finished product
A3: production (particle emissions to air / not compliant finished product)	Less than 10 ⁻⁴ Kg / Kg of finished product	Less than 10 ⁻⁴ Kg / Kg of finished product

For the allocation procedure and principles, consider the following table (Table 7):

Table 7: Allocation procedure and principles

Module	Allocation Principle
A1	All data are referred to 1m ² of product <ul style="list-style-type: none"> • A1: electricity is allocated to the reference line production
A3	All data are referred to 1m ² of packaged product <ul style="list-style-type: none"> • A3-wastes: all data are allocated to the reference line production

7. Environmental performance & interpretation

The following tables show the environmental impacts for the products considered according to the requirements of EN15804:2012+A2:2019/AC:2021.

The results are referred to the declared unit (see § 4). The additional environmental indicators are not declared.

MAPEPLAN PLUS (1 m² of product packaged)

Table 8: MAPEPLAN PLUS– Potential environmental impact – mandatory indicators according to en 15804 referred to 1 m² of packaged finished product

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP_{TOTAL}	(kg CO ₂ eq.)	3,87E+00	1,49E-01	6,60E-01	0,00E+00	2,30E-02	6,91E-03	2,87E-02	0,00E+00
GWP _{FOSSIL}	(kg CO ₂ eq.)	3,88E+00	1,48E-01	2,62E-01	0,00E+00	2,28E-02	0,00E+00	2,85E-02	0,00E+00
GWP _{BIOGENIC}	(kg CO ₂ eq.)	-3,15E-02	4,27E-04	3,98E-01	0,00E+00	8,09E-05	6,91E-03	9,60E-05	0,00E+00
GWP _{LULUC}	(kg CO ₂ eq.)	1,89E-02	7,47E-04	6,22E-06	0,00E+00	1,55E-04	0,00E+00	5,26E-05	0,00E+00
ODP	(kg CFC 11 eq.)	1,30E-06	8,87E-15	2,37E-13	0,00E+00	2,26E-15	0,00E+00	6,70E-14	0,00E+00
AP	(mol H ⁺ eq.)	1,72E-02	1,32E-03	1,59E-04	0,00E+00	1,25E-04	0,00E+00	2,02E-04	0,00E+00
EP _{FRESHWATER}	(kg P eq.)	1,51E-03	4,03E-07	6,24E-08	0,00E+00	8,23E-08	0,00E+00	4,83E-08	0,00E+00
EP _{MARINE}	(kg N eq.)	4,11E-03	5,14E-04	5,69E-05	0,00E+00	6,05E-05	0,00E+00	5,17E-05	0,00E+00
EP _{TERRESTRIAL}	(mol N eq.)	4,26E-02	5,68E-03	6,43E-04	0,00E+00	6,72E-04	0,00E+00	5,68E-04	0,00E+00
POCP	(kg NMVOC eq.)	1,28E-02	1,12E-03	1,49E-04	0,00E+00	1,17E-04	0,00E+00	1,57E-04	0,00E+00
ADP _{MINERALS&METALS*}	(kg Sb eq.)	6,91E-03	1,17E-08	4,66E-09	0,00E+00	2,32E-09	0,00E+00	2,92E-09	0,00E+00
ADP _{FOSSIL*}	(MJ)	8,40E+01	1,97E+00	3,57E-01	0,00E+00	3,02E-01	0,00E+00	3,74E-01	0,00E+00
WDP*	(m ³ world eq.)	2,03E+00	1,23E-03	3,41E-02	0,00E+00	2,58E-04	0,00E+00	3,13E-03	0,00E+00

GWP_{TOTAL}: Global Warming Potential total; **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; **EP_{FRESHWATER}**: Eutrophication Potential, freshwater; **EP_{MARINE}**: Eutrophication Potential, marine; **EP_{TERRESTRIAL}**: Eutrophication Potential, terrestrial; **POCP**: Formation potential of tropospheric ozone; **ADP_{MINERALS&METALS*}**: Abiotic Depletion Potential for non-fossil resources; **ADP_{FOSSIL*}**: Abiotic Depletion Potential for fossil resources; **WDP***: Water Deprivation Potential.

*The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is a limited experience with the indicator.

Table 9: MAPEPLAN PLUS – Potential environmental impact – additional mandatory and voluntary indicators referred to 1 m² of packaged finished product

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG	(kg CO ₂ eq.)	3,76E+00	1,46E-01	2,62E-01	0,00E+00	2,25E-02	0,00E+00	2,81E-02	0,00E+00
GWP-GHG: The indicator includes all greenhouse gases included in GWP-total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.									

Table 10: MAPEPLAN PLUS – Use of resources referred to 1 m² of packaged finished product

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	5,47E+00	1,02E-01	1,59E-01	0,00E+00	2,10E-02	0,00E+00	5,61E-02	0,00E+00
PERM	MJ	1,80E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	MJ	7,27E+00	1,02E-01	1,59E-01	0,00E+00	2,10E-02	0,00E+00	5,61E-02	0,00E+00
PENRE	MJ	8,40E+01	1,97E+00	3,57E-01	0,00E+00	3,04E-01	0,00E+00	3,74E-01	0,00E+00
PENRM	MJ	1,35E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	MJ	8,42E+01	1,97E+00	3,57E-01	0,00E+00	3,04E-01	0,00E+00	3,74E-01	0,00E+00
SM*	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
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	m ³	4,76E-02	1,16E-04	8,62E-04	0,00E+00	2,42E-05	0,00E+00	9,49E-05	0,00E+00
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 (primary energy and primary energy resources used as raw materials); 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 (primary energy and primary energy resources used as raw materials); SM: Use of secondary material; RSF: Use of renewable secondary fuels; NRSF: Use of non-renewable secondary fuels; FW: Net use of fresh water.									

*Referred only to 1 m² of product without packaging

Table 11 :MAPEPLAN PLUS – Waste production and output flows referred to 1 m² of packaged finished product

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
HWD	kg	7,83E-04	9,31E-12	3,23E-11	0,00E+00	1,61E-12	0,00E+00	1,92E-11	0,00E+00
NHWD	kg	1,32E-02	2,74E-04	3,41E-02	0,00E+00	4,95E-05	0,00E+00	1,91E+00	0,00E+00

RWD	kg	4,35E-04	2,41E-06	4,39E-05	0,00E+00	5,64E-07	0,00E+00	4,16E-06	0,00E+00
Components for re-use	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
Materials for recycling	kg	9,47E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for energy recovery	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
Exported energy, electricity	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
Exported energy, thermal	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
HWD: Hazardous waste disposed; NHWD: Non-Hazardous waste disposed; RWD: Radioactive waste disposed									

Table 12: MAPEPLAN PLUS – Information on biogenic carbon content at the factory gate referred to 1 m² of packaged finished product

Indicator	Unit	Quantity
Biogenic Carbon Content in packaging	kg C	0,00E+00
Biogenic carbon content in product	kg C	4,14E-02

To calculate results for different thicknesses (1,5, 1,8, and 2,0), please use following multiplicative coefficients for the environmental indicators considered (EI_x):

Table 13: Calculation rules for Environmental Categories of different thickness

	1,5 mm thickness	1,8 mm thickness	2,0 mm thickness
Mapeplan Plus	$EI_{1,5} \cdot 1$	$EI_{1,5} \cdot 1,2$	$EI_{1,5} \cdot 1,33$

$EI_{1,5}$: Environmental Indicator for Mapeplan Plus with 1,5 mm thickness

The tables above show the absolute results for each environmental impact category. It can be seen that the production phase (A1-A3) makes the largest contribution in each category up to a maximum contribution of 90% in some impact categories.

The A5 module, on the other hand, does not have a negligible impact, especially when referring to the biogenic carbon impact category. In fact, the A5 module accounts for the disposal impacts of packaging, which is the main contributor to the biogenic carbon content.

Again in terms of biogenic carbon, it can be seen that the negative impacts of modules A1 and A3 are offset by the positive impacts of A5 due to packaging disposal.

Below are details of the relative contributions of the individual modules for some of the impact categories considered.

Table 14: Environmental Impact as percentage

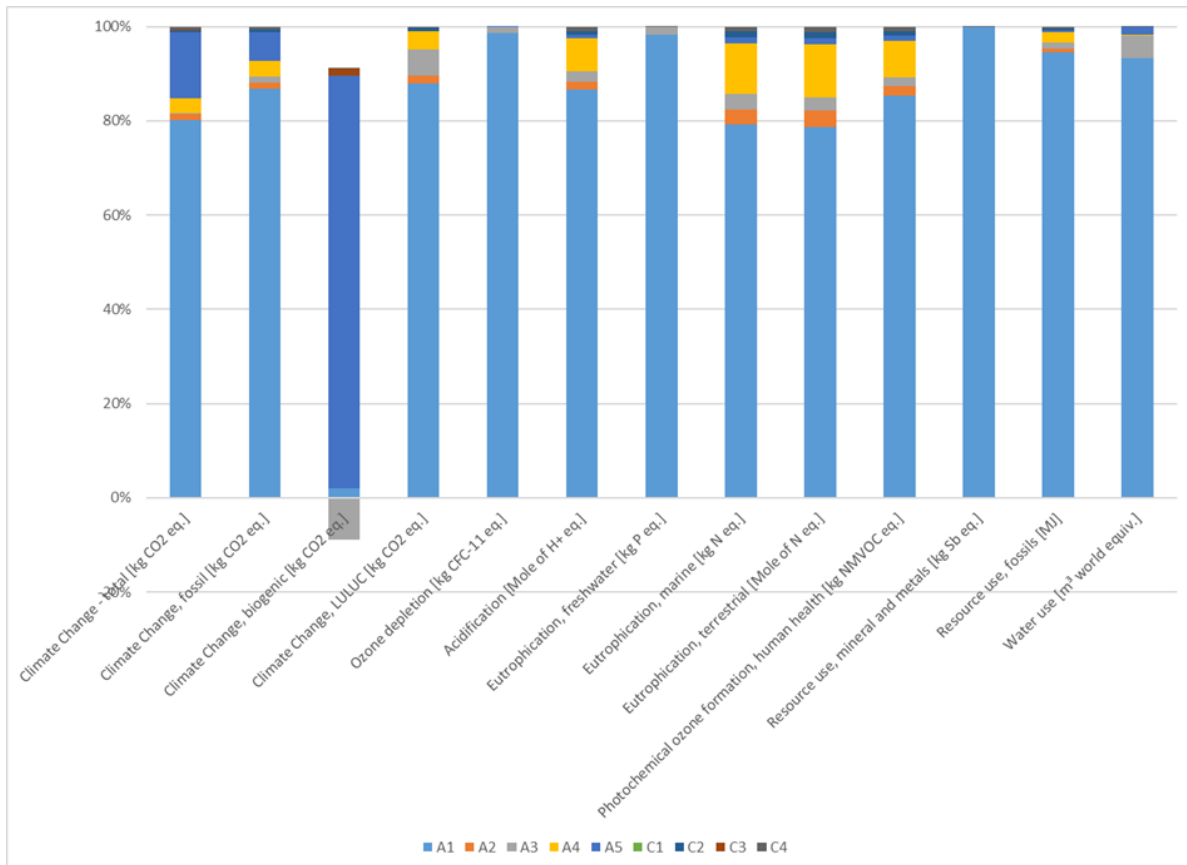
More details about electrical mix used in this EPD (Italian grid mix – 2011), is shown below:

Table 15: Electricity Mix - Italy - 2011

Data source	Amount	GWP	Unit
Residual electricity grid mix (IT) – 2021	AIB	0,515*	kg CO ₂ -eqv/kWh

*CML2001 – Aug. 2016

This data represents the average country specific electricity supply for final consumers, including electricity own consumption, transmission/distribution losses and electricity imports from neighbouring countries. The national energy carrier mixes used for electricity production, the power plant efficiency data, shares on direct to combined heat and power generation (CHP), as well as transmission/distribution losses and own consumption are taken from official statistics (International Energy Agency) for the corresponding reference year.



8. Data Quality

Table 16: Data quality

Dataset & Geographical reference	Database (source)	Temporary reference
A1		
TPO compounds	Ecoinvent 3.8	2021
Polymers	Sphera Database	2021
Reinforcing material	Sphera Database	2021
Fillers	Sphera Database	2021
Additives	Ecoinvent Database 3.8	2021
Residual electricity grid mix (IT)	AIB; Sphera Database	2021
A2 (Transport)		
Truck transport (27ton payload – GLO)	Sphera Database	2021
Diesel for transport (EU)	Sphera Database	2018
A3 (production)		
Packaging (EU)	Sphera Database & Ecoinvent 3.8 & PlasticsEurope	2005 – 2021
Diesel for transport (EU)	Sphera Database	2018
A4 (Transport)		
Truck transport (27ton payload – GLO)	Sphera Database	2021
Diesel for transport (EU)	Sphera Database	2018
Ocean ship (27500 DWT payload – GLO)	Sphera Database	2021
Heavy fuel oil for ship transport (EU)	Sphera Database	2018
A5 (Installation)		
Commercial waste in municipal waste incineration plant (EU)	Sphera Database	2021
Electricity grid mix (EU)	Sphera Database	2018
C1-C4 (End of Life)		
Truck transport (9,3 ton payload – GLO)	Sphera Database	2021
Diesel for transport (EU)	Sphera Database	2018
Construction waste dumping (EU)	Sphera Database	2021

All data included in table above refer to a period between 2005 and 2021; the most relevant ones are specific from supplier, while the others (i.e. transport and minor contribution dataset), come from European and global databases.

All datasets are not more than 10 years old according to EN 15804 §6.3.8.2 “Data quality requirements”.

Unique exception is due to one packaging component coming from PlasticsEurope database.

Primary data concern the year 2021 and represent the whole annual production.

The Quality level concerning datasets used in the EPD can be considered as “very good” or “good” according to Annex E of the EN 15804 (current version); the only exception is represented by a packaging component which has a quality level classified as “poor” in terms of time representativeness.

9. Additional Information

The finished product is potentially suitable for disassembly through selective demolition.

10. Differences versus previous version

In this version, new primary data referred to 2021 has been adopted. New modelling in application stage (A5) has been developed added in chapter 5. Moreover, additional data quality information has been included in chapter 8. Chapter 9: Disassembly, has been added. Minor editorial changes have been made in the document. Since new version of GPI and PCR have been considered, results have been revised and updated. Disclaimer in cover page has been added.

11. Verification and Registration

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804. For further information about comparability, see EN 15804 and ISO 14025.

CEN standard EN15804 served as the core PCR	
PCR:	PCR 2019:14 Construction products (EN 15804:A2), Version 1.11, 2021-02-05, UN CPC code 54
PCR review was conducted by:	The Technical Committee of the International EPD® System. See www.environdec.com/TC for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact .
Independent verification of the declaration and data, according to ISO 14025	<input checked="" type="checkbox"/> EPD Process Certification (Internal) <input type="checkbox"/> EPD Verification (external)
Third party verifier:	Certiquality S.r.l. Number of accreditations: 003H rev15
Accredited or approved by:	Accredia
Procedure for follow-up of data during EPD validity involves third-party verifier	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

References

- EN13956 Flexible sheets for waterproofing - Plastic and rubber sheets for roof waterproofing - Definitions and characteristics
- EN 15804: SUSTAINABILITY OF CONSTRUCTION WORKS - ENVIRONMENTAL PRODUCT DECLARATIONS - CORE RULES FOR THE PRODUCT CATEGORY OF CONSTRUCTION PRODUCTS
- EUROPEAN RESIDUAL MIXES VERSION 1.0, 2022-05-31 (AIB: ASSOCIATION OF ISSUING BODIES)
- GENERAL PROGRAMME INSTRUCTIONS OF THE INTERNATIONAL EPD_R SYSTEM. VERSION 3.01

- ISO 14025 ENVIRONMENTAL LABELS AND DECLARATIONS - TYPE III ENVIRONMENTAL DECLARATIONS - PRINCIPLES AND PROCEDURES
- ISO 14044 ENVIRONMENTAL MANAGEMENT – LIFE CYCLE ASSESSMENT – REQUIREMENTS AND GUIDELINES
- PCR 2019:14 CONSTRUCTION PRODUCTS (EN 15804: A2), UN CPC CODE 54; VERSION 1.11

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