Environmental Product Declaration

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

SANDWICH PANEL WITH STEEL COATING AND POLYURETHANE INSULATING CORE EXPANDED

PAN URANIA S.P.A.

Programme EPD:	The International EPD® System, www.environdec.com
Program operator:	EPD International AB
Reference GPI:	General Programme Instructions IES v3.01
Reference PCR:	PCR 2019:14 v1.1 “Construction products”, CPC: 541
Registration number EPD:	S-P-003362
Approval date:	2021-02-24
Pubblication date:	2021-05-05
Validity date:	2026-02-24
Geographical scope:	Global

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Summary

General information 3
Programme information 3
Information LCA 6

RINA
HEAD OFFICE
Via Corsica, 12
16128 GENOVA

ENVIRONMENTAL PRODUCT DECLARATION (EPD)

VALIDATION IN COMPLIANCE

WITH THE REQUIREMENTS GENERAL PROGRAMME INSTRUCTIONS FOR EPD V. 3.0

71

Laura Severino
Sustainability & Food Certification Compliance, Head

RINA Services S.p.A.

Genoa, 24/2/2021

General information

Programme information

Programma:	The International EPD® System
Indirizzo:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Sito web:	www.environdec.com
E-mail:	info@environdec.com

ISO standard ISO 21930 and CEN standard EN 15804 serves as the core Product Category Rules (PCR)
Product category rules (PCR): PCR 2019:14 Construction products, version 1.1; CPC code: 541
PCR review was conducted by: The Technical Committee of the International EPD® System. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/contact.
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ▪ External □ Internal covering □ EPD process certification ▪ EPD verification
Third party verifier: RINA Italy *In case of certification bodies:* Accredited by: Accredia *In case of individual verifiers:* Approved by: The International EPD® System Technical Committee, supported by the Secretariat
Procedure for follow-up during EPD validity involves third party verifier: ▪ Yes □ No

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.

Company information

Owner of the EPD: Pan Urania S.P.A, www.panurania.com

Contact: Sig. Andrea di Marco.

tel. +39 055 80 55 1

fax +39 055 80 78 421

mob.: +39 335 75 48 608

E-mail: andrea.dimarco@urania.group

Description of the organisation:

Pan Urania S.p.A., thanks to its 40 years of experience, is a leader in the production of modular panels for walls, false ceilings and floors for prefabricated, industrial, civil, commercial buildings and for the construction of clean rooms.

Forty years ago, a small company, with courage and foresight, started the production of panels, in collaboration with its customers and developing various products with them.

The production over the years has been gradually growing both in the diversification of products and the relative turnover. This has allowed Pan Urania to be known and exported to many European countries, but also to other continents.

Pan Urania's know-out is at the service of those looking for quality products, easy to use with thermal, acoustic, mechanical and fireproof performance. Particular attention has always been paid to producing panels that during assembly did not require reworking such as dimensional cuts, allowing to speed up installation / assembly operations and reduce waste (avoiding processing waste), without sacrificing time and resources. for on-site adaptations. The customization of the panels is a characteristic of the product, color, shape, size, greater resistance, specific materials, are some of the parameters used for the construction of the panel. The company is based in the Municipality of Barberino Tavarnelle where there are production plants that guarantee excellent technological efficiency performance as well as a timely control of the environmental impact. The production is also carried out with the help of photovoltaic systems that cover 60% of the electricity needs, a cogeneration system that produces industrial hot water for heating the presses serving some systems, in addition, electricity is produced from the gas combustion. fed into the network. The company is committed in the environmental field to reduce the use of packaging, favoring recovery packaging and as far as possible composed of recyclable materials. The lighting of both the production rooms and the offices are all LED technology.

Certifications related to the product and the management system

The product covered by this EPD is CE marked in accordance with the EN 14509: 2013 standard; it can have fire reaction class B, s3-d0 and B, s2-d0 according to the EN 13501-1 standard; it can have class A according to the ASTM E84 standard.

Pan Urania has implemented an integrated management system certified UNI EN ISO 9001: 2015 - EN ISO 14001: 2015 - EN ISO 45001: 2018.

Name and place of production

Pan Urania S.P.A, Via Cristoforo Colombo 15/17/19 Barberino Tavarnelle (FI).

Product information

Product name

Sandwich panel with steel cladding and polyurethane foam core.

Figure 2. Sandwich panel

Product identification

Foamed insulation panel for the building envelope

Product description

The insulating sandwich panels consist of two external metal sheet supports, made of steel with a metal layer protected from corrosion by galvanizing and pre-painting, which enclose an insulating core in polyurethane foam obtained from the esothermal reaction between isocyanate and polyol.

The insulating panels can be used for roofs and walls of industrial, commercial and civil buildings. They are light, versatile and easy to assemble and guarantee thermal and acoustic insulation, solidity, airtightness and safety in case of fire. Pan Urania offers an extremely wide production range of metal panels, which includes different thicknesses and surface finishes to create customized solutions.

The manufacturing process of Pan Urania panels is divided into several stages, ranging from the acquisition of raw materials to the packaging of the finished product. The manufacture of the panels is carried out by means of a batch process, schematized in figure 3.

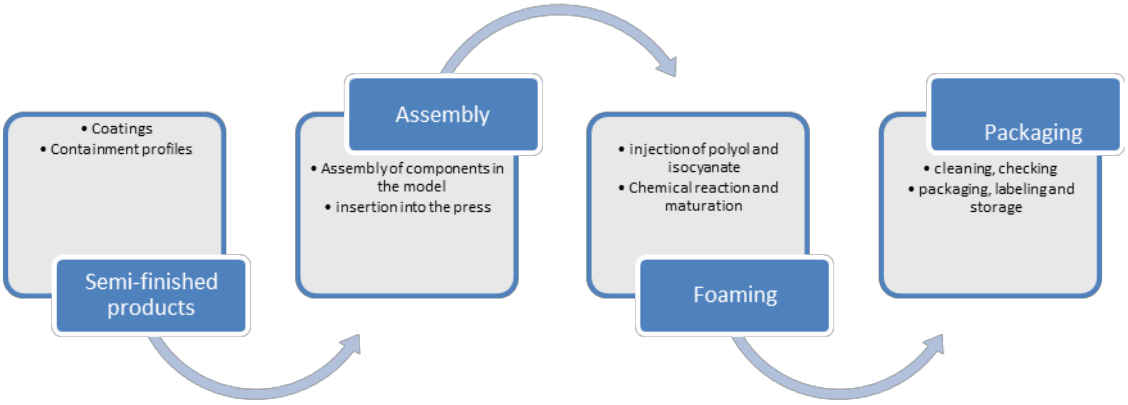

Figure 3. Productive process.

Depending on the conditions of use, sandwich panels with steel cladding have an estimated life of 40/45 years, as defined on the basis of the methodology for evaluating the durability of building components developed by the German Federal Research Institution BBSR (Federal Institute for Building Research, Urban Affairs and Territorial Development). Pan Urania insulating panels also have high thermal insulating characteristics. The performances vary according to the thickness of the panel:

- Panel thickness 40 mm: 0,54 W/m2K
- Panel thickness 60 mm: 0,37 W/m^{2}K
- Panel thickness 80 mm: 0,28 W/m^{2}K

The panels do not contain SVHC substances included in the ECHA Candidate List in concentrations greater than 0.1% by mass.

Information LCA

LCA database and software used

The LCA analysis was conducted using the SimaPro 9.1 software and the Ecoinvent v.3.6 database.

Functional unit / declared unit:

The declared unit is represented by 1m2 of panel P1 produced, for three variants of thickness: 40 mm, 60 mm and 80 mm.

Description of system boundaries:

In this study, a "cradle-to-gate with options" approach was followed, therefore the analysis includes the production and procurement of raw materials, the panel production process, the distribution of the packaged product and the disposal of panel and packaging.

Table 1 shows the phases of the product life cycle and the information modules considered for the evaluation of construction products according to PCR 2019: 14 v1.1 and EN 15804.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				ADDITIONAL INFORMATION
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
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
X	X	X	X	nd	nd	nd	nd	nd	nd	nd	nd	X	X	X	X	X

Table 1: Information modules for building scale assessment according to UNI EN 15804.

Module B (use phase) is not included in the system boundaries, while as regards modules C1 and C3, the de-construction / demolition and waste treatment activities are carried out manually so the related environmental impacts are negligible.

Module D, relating to information on the potential for reuse / recovery / recycling, is assessed considering the benefit of the avoided impact of future extractions and production of raw materials, brought about by the recycling of the main materials (steel). The processes necessary to make the materials of the product (at the end of life) new raw materials for subsequent life cycles are considered.

Specifically, in this study, the upstream processes, upstream of production, include the extraction and production of raw materials for the panel and packaging and the generation of primary energy (Figure 4).

In the Core processes (modules A2-A3), i.e. with reference to the plant, transport to the gate of the production site, the production of the panel and its packaging are included.

The downstream processes (modules A4-C1-C2-C3-C4), downstream of production, include the distribution of the packaged product, the transport of the panel and its packaging to the waste collection site and their subsequent disposal.

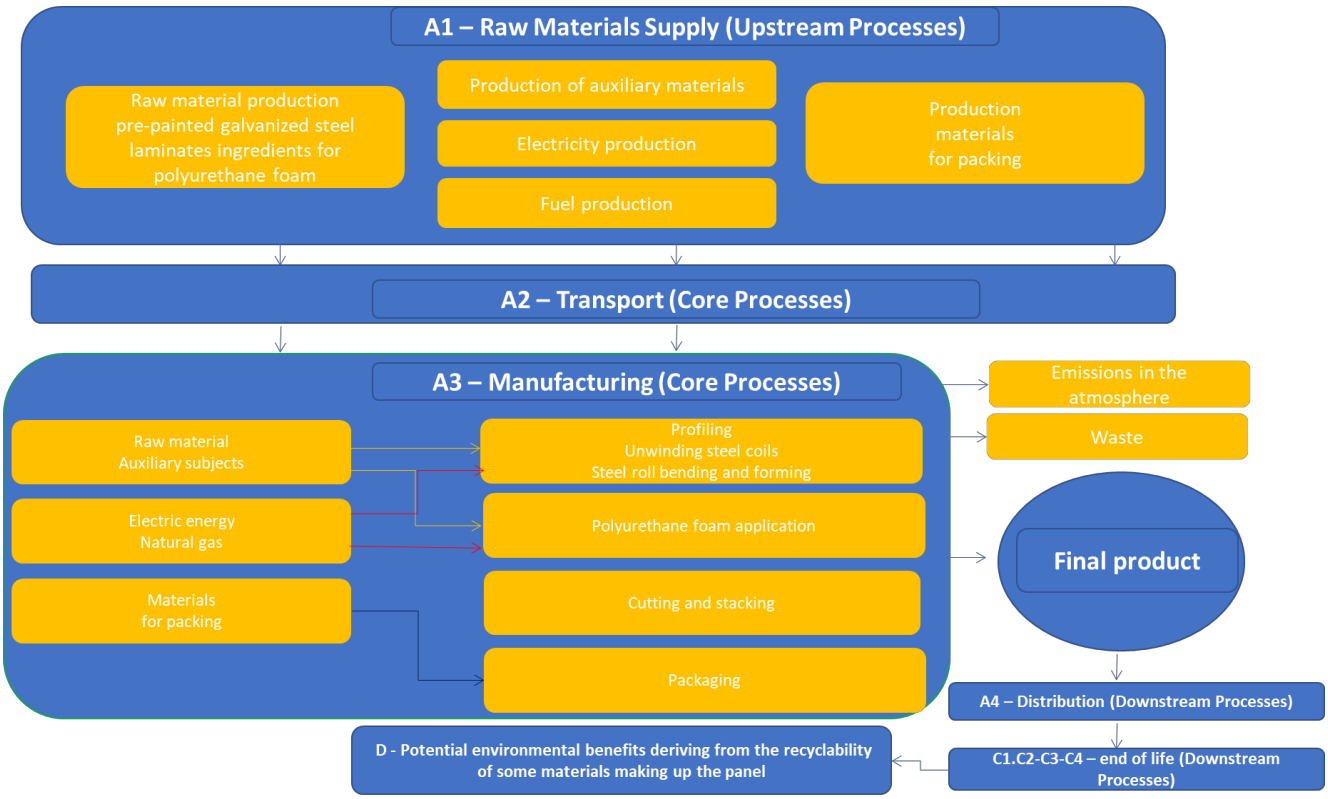

Figure 4. System boundaries according to PCR 2019: 14 v1.1.

Time representative ness

The primary data provided by the company regarding the product in question refer to the year 2019, while the secondary data used in the study come from the ecoinvent v3.6 database and literature data.

Geographic representativeness

Pan Urania's headquarters are in Barberino Tavarnelle in the province of Florence. The origin of the raw materials is communicated through bill of materials. Since the components of the analyzed panel are produced in Italy and the article is also sold in Italy, the study refers to the national situation.

Allocation rules

The processes that affect the environmental profile of the product during its life cycle must be allocated within the life cycle module in which the process takes place. In this way, the sum of the allocated inflows and outflows corresponds to the sum of the inflows and outflows: double counting is avoided and no omission of incoming and outgoing flows occurs.

For virgin resources, raw materials and production processes are included. No allocation is made for materials subject to recycling. The recycling process is included for the input of recycled resources. Outputs subject to recycling are considered inputs for the next life cycle.

The life cycle analysis considers, in accordance with EN 15804, at least 95% of the total mass and energy flows per module. Proxy data can be used in case data gaps exist, as long as their contribution in the environmental performance assessment does not exceed 10% for each impact category.

Data quality

The primary data were extrapolated through the information present within the Integrated Quality - Environment - Company Safety System in order to have all the information of the production process: from the purchase of resources and utilities to the environmental data relating to the production phase.

Primary data from safety data sheets were used for polyol and isocyanate. Primary data from EPD and LCA reports from suppliers were used for data relating to steel production and its external treatments. Primary data were used for the packaging of the finished product.

Inventory

The inventory flows are similar for all the thicknesses of the products studied.

For the transport of all raw materials, reference was made to the distances and types of vehicles used from the actual place of production to the company site, assuming - according to the product - the various types of vehicles and related capacities (Euro 4 - Capacity <16 T and Euro 5 - Capacity 16-32 T).

As regards the energy data (consumption of electricity and methane), the data monitored by the Quality Environment Safety System were used, re-proportioned on the basis of the annual production of the P1 family panels by adapting the energy mix present in the Ecoinvent database in SimaPro according to the individual energy sources declared in the bill. In the study of consumption, the contribution of energy from the photovoltaic system and from a methane cogenerator, both systems installed at the production site, was also considered.

Total waste consumption and production were then allocated for each type of panel based on the percentage of production.

For the distribution and disposal of the product, the sales figures for 2019 were considered, taking into account the countries in which up to 80% of the production of P1 panels is distributed. 20% of the remaining production sent to other states has been redistributed on 80%. The type of vehicle for transporting goods was also assumed to be a Euro 5 truck with a capacity of 16-32 T and the distance from the company headquarters to the country's capital.

A distance of 100 km was assumed between the waste production site and that of destination and a type of Euro 4 transport vehicle with a capacity of 16-32 T.

The threshold allowed by the PCR to use a maximum of 10% proxy data in the study (generic data) is respected for all impact categories.

Environmental impact assessment

The EN 15804 + A2 method developed by PRé in SimaPro on the basis of the UNI EN 15804 standard was used to evaluate the environmental performance of the product. The impact results are divided into the contribution of the processes to the different product phases considered. The environmental indicators indicated by the PCR 2019: 14 v1.1 consist of:

- Impact categories: global warming (total / fossil fuels / biogenic carbon / land use), ozone depletion, acidification, eutrophication (surface water / marine environment / terrestrial environment), photochemical oxidation, depletion of abiotic resources, depletion of abiotic resources (fossil fuels), atmospheric particles, use of water;
- Resource use indicators: consumption of resources (renewable and non-renewable) and fresh water;
- Waste indicators: hazardous waste, non-hazardous waste and radioactive waste;
- Other indicators: ecotoxicity, human toxicity (carcinogenic effects), human toxicity (non-carcinogenic effects), land use.

Information on materials

The range of products included in this study includes sandwich panels in sheet metal with insulating core in polyurethane foam with panel dimensions considered equal to 1200x2500xsp. (Mm). The prepainted galvanized sheet coatings have a thickness of 0.45 mm and the junction profiles are in PVC with male / female junction. The characteristics of the panel for the various thicknesses are shown in table 2.

panel thickness (mm)	cladding weight (kg / m2 panel)	filling foam nominal density (kg / m3)	weight of the male joint profile (Kg / m2 panel)	weight of the female joint profile (Kg / m2 panel)	foam weight (Kg / m2 panel)	total panel weight (kg / m2)
40	3,555	40	0,004	0,228	1,6	8,902
60	3,555	40	0,007	0,366	2,4	9,843
80	3,555	40	0,015	0,609	3,2	10,894

Table 2: Characteristics of the sandwich panel.

Table 3 quantifies all the materials that contribute to making 1m^2 of packaged panel for the three thicknesses considered.

Materiali del prodotto	Panel 40 mm		Panel 60 mm		Panel 80 mm	
	kg	%	kg	%	kg	%
Steel	7.10	79.5	7.10	71.9	7.10	65.0
Isocyanate	0.896	10.0	1.34	13.6	1.79	16.4
Polyol	0.704	7.9	1.06	10.7	1.40	12.9
PVC	0.232	2.6	0.373	3.8	0.624	5.7
TOTAL	**8.93**	**100**	**9.87**	**100**	**10.92**	**100**
Packaging materials	**kg**	**%**	**kg**	**%**	**kg**	**%**
Wood	1.00	73.7	1.43	73.7	2.00	73.6
MDF	0.163	12.0	0.233	12.0	0.326	12.0
Steel	0.114	8.4	0.163	8.4	0.229	8.4
Nylon	0.034	2.5	0.048	2.5	0.067	2.5
Polystyrene	0.026	1.9	0.038	1.9	0.053	1.9
Cardboard	0.013	0.9	0.018	0.9	0.026	0.9
Polyethylene	0.008	0.6	0.011	0.6	0.015	0.6
TOTAL	**1.36**	**100**	**1.94**	**100**	**2.72**	**100**

Table 3: Materials per 1m2 of sandwich panel

Environmental Information

The environmental indicators indicated by the PCR 2019: 14 v1.1 consist of:

- Impact categories: global warming (total, excluding biogenic carbon), global warming (fossil fuels), global warming (biogenic carbon), global warming (land use), ozone depletion, acidification, eutrophication (surface water), eutrophication (marine environment), eutrophication (terrestrial environment), photochemical oxidation, depletion of abiotic resources, depletion of abiotic resources (fossil fuels), atmospheric particulate, use of water;
- Resource use indicators: consumption of resources (renewable and non-renewable) and fresh water;
- Waste indicators: hazardous waste, non-hazardous waste and radioactive waste;
- Other indicators: ecotoxicity, human toxicity (carcinogenic effects), human toxicity (non-carcinogenic effects), land use.

The results of the LCIA (Lyfe Cycle Impact Assessment) analysis are shown below in the tables, where the indicators are divided into the contribution of the processes to the different product phases considered.

Panel 40 mm

Categoria d'impatto	Unità	A1	A2	A3	A4	C1	C2	C3	C4	D
Climate change (GWP – GHG)	kg CO2 eq	3,46E+01	3,09E-01	1,53E+00	1,88E+00	0,00E+00	1,70E-01	0,00E+00	8,02E-01	1,65E-03
Climate change total	kg CO2 eq	3,29E+01	3,12E-01	1,59E+00	1,90E+00	0,00E+00	1,72E-01	0,00E+00	1,15E+00	1,01E-02
Climate change - Fossil	kg CO2 eq	3,52E+01	3,12E-01	1,57E+00	1,90E+00	0,00E+00	1,72E-01	0,00E+00	7,80E-01	7,80E-04
Climate change - Biogenic	kg CO2 eq	-2,41E+00	1,81E-04	1,75E-02	1,02E-03	0,00E+00	9,16E-05	0,00E+00	3,72E-01	9,49E-03
Climate change - Land use and LU change	kg CO2 eq	1,09E-01	1,05E-04	1,84E-04	6,70E-04	0,00E+00	6,00E-05	0,00E+00	4,85E-05	-1,25E-04
Ozone depletion	kg CFC11 eq	3,25E-06	7,16E-08	2,82E-07	4,35E-07	0,00E+00	3,90E-08	0,00E+00	2,34E-08	1,42E-08
Ionising radiation	kBq U-235 eq	2,11E+00	2,44E-02	3,86E-02	1,49E-01	0,00E+00	1,33E-02	0,00E+00	6,65E-03	-1,05E-02
Photochemical ozone formation	kg NMVOC eq	7,71E-02	1,39E-03	2,33E-03	1,04E-02	0,00E+00	7,05E-04	0,00E+00	6,30E-04	-4,92E-04
Particulate matter	disease inc.	1,85E-06	2,34E-08	1,11E-08	1,38E-07	0,00E+00	1,20E-08	0,00E+00	5,94E-09	-1,32E-08
Human toxicity, non-cancer	CTUh	1,44E-06	4,18E-09	7,16E-09	2,52E-08	0,00E+00	2,26E-09	0,00E+00	3,16E-09	-9,14E-09
Human toxicity, cancer	CTUh	1,24E-07	1,04E-10	2,07E-10	6,50E-10	0,00E+00	5,83E-11	0,00E+00	2,81E-10	-1,82E-10
Acidification	mol H+ eq	2,37E-01	1,35E-03	3,31E-03	9,68E-03	0,00E+00	7,02E-04	0,00E+00	5,58E-04	-1,15E-03
Eutrophication, freshwater	kg P eq	1,27E-02	2,27E-05	1,41E-04	1,40E-04	0,00E+00	1,26E-05	0,00E+00	2,16E-05	-1,27E-04
Eutrophication, freshwater*	Kg PO4(3-)	3,90E-02	6,98E-05	4,32E-04	4,31E-04	0,00E+00	3,86E-05	0,00E+00	6,62E-05	-3,90E-04
Eutrophication, marine	kg N eq	2,55E-02	4,19E-04	6,63E-04	3,32E-03	0,00E+00	2,10E-04	0,00E+00	1,91E-03	-1,63E-04
Eutrophication, terrestrial	mol N eq	5,51E-01	4,59E-03	7,49E-03	3,63E-02	0,00E+00	2,30E-03	0,00E+00	2,23E-03	-1,94E-03
Ecotoxicity, freshwater	CTUe	9,09E+02	3,80E+00	9,18E+00	2,31E+01	0,00E+00	2,07E+00	0,00E+00	8,14E+00	-7,77E+00
Land use	Pt	2,58E+02	3,78E+00	1,58E+00	1,99E+01	0,00E+00	1,78E+00	0,00E+00	1,14E+00	-2,85E+00
Water use	m3 depriv.	1,07E+01	1,37E-02	2,15E-01	8,05E-02	0,00E+00	7,21E-03	0,00E+00	3,48E-02	-1,59E-02
Resource use, fossils	MJ	4,29E+02	4,75E+00	2,31E+01	2,89E+01	0,00E+00	2,59E+00	0,00E+00	8,54E-01	2,31E-01
Resource use, minerals and metals	kg Sb eq	1,41E-02	7,75E-06	9,36E-06	5,19E-05	0,00E+00	4,65E-06	0,00E+00	8,29E-07	-4,60E-06
Energy Resource, Renewable	MJ	6,09E+01	6,53E-02	4,03E+00	4,08E-01	0,00E+00	3,65E-02	0,00E+00	5,91E-02	-3,21E-01
Raw Materials Resource, Renewable	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
Total Resource, Renewable	MJ	6,09E+01	6,53E-02	4,03E+00	4,08E-01	0,00E+00	3,65E-02	0,00E+00	5,91E-02	-3,21E-01
Energy Resource, Non renewable	MJ	1,19E+02	9,31E-05	7,21E-05	6,13E-04	0,00E+00	5,49E-05	0,00E+00	1,23E-05	1,57E-05
Raw Materials Resource, Non renewable	MJ	3,36E+02	5,04E+00	2,55E+01	3,07E+01	0,00E+00	2,75E+00	0,00E+00	9,08E-01	2,50E-01

Total Resource, Non renewable	MJ	4,55E+02	5,04E+00	2,55E+01	3,07E+01	0,00E+00	2,75E+00	0,00E+00	9,08E-01	2,50E-01
Use of secondary materials	kg	6,70E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total amount of water	m3	-1,79E+03	-6,61E+00	-1,05E+02	-3,96E+01	0,00E+00	-3,54E+00	0,00E+00	-7,91E+00	1,76E+01
Non Hazardous waste	kg	2,54E+00	2,70E-01	3,19E-02	1,38E+00	0,00E+00	1,24E-01	0,00E+00	1,91E+00	5,33E-02
Hazardous waste	kg	4,74E-02	1,22E-05	7,65E-05	7,57E-05	0,00E+00	6,78E-06	0,00E+00	1,52E-06	-2,93E-07
Radioactive waste	kg	2,28E-03	3,24E-05	1,31E-05	1,97E-04	0,00E+00	1,77E-05	0,00E+00	4,23E-06	3,61E-06

Table 4 - Results of the characterization of 1 m2 of panel, 40mm.

*: the EN 15804 + A2 method available in the software used expresses the Eutrophication, freshwater category as Kg P eq., since PCRs also require Kg PO4 (3-) as the unit of measurement, the multiplication factor of 3.07 was used

Panel 60 mm

Categoria d'impatto	Unità	A1	A2	A3	A4	C1	C2	C3	C4	D
Climate change (GWP – GHG)	kg CO2 eq	3,96E+01	4,31E-01	1,53E+00	2,06E+00	0,00E+00	1,95E-01	0,00E+00	1,30E+00	1,65E-03
Climate change total	kg CO2 eq	3,72E+01	4,36E-01	1,59E+00	2,08E+00	0,00E+00	1,97E-01	0,00E+00	1,74E+00	1,01E-02
Climate change - Fossil	kg CO2 eq	4,05E+01	4,36E-01	1,57E+00	2,08E+00	0,00E+00	1,97E-01	0,00E+00	1,28E+00	7,80E-04
Climate change - Biogenic	kg CO2 eq	-3,48E+00	2,46E-04	1,75E-02	1,12E-03	0,00E+00	1,05E-04	0,00E+00	4,60E-01	9,49E-03
Climate change - Land use and LU change	kg CO2 eq	1,60E-01	1,48E-04	1,84E-04	7,33E-04	0,00E+00	6,88E-05	0,00E+00	8,10E-05	-1,25E-04
Ozone depletion	kg CFC11 eq	4,20E-06	9,96E-08	2,82E-07	4,76E-07	0,00E+00	4,47E-08	0,00E+00	3,85E-08	1,42E-08
Ionising radiation	kBq U-235 eq	2,66E+00	3,40E-02	3,86E-02	1,63E-01	0,00E+00	1,53E-02	0,00E+00	1,09E-02	-1,05E-02
Photochemical ozone formation	kg NMVOC eq	9,95E-02	1,90E-03	2,33E-03	1,13E-02	0,00E+00	8,07E-04	0,00E+00	9,25E-04	-4,92E-04
Particulate matter	disease inc.	2,17E-06	3,20E-08	1,11E-08	1,51E-07	0,00E+00	1,37E-08	0,00E+00	8,99E-09	-1,32E-08
Human toxicity, non-cancer	CTUh	1,95E-06	5,81E-09	7,16E-09	2,76E-08	0,00E+00	2,59E-09	0,00E+00	5,09E-09	-9,14E-09
Human toxicity, cancer	CTUh	1,77E-07	1,46E-10	2,07E-10	7,11E-10	0,00E+00	6,67E-11	0,00E+00	3,90E-10	-1,82E-10
Acidification	mol H+ eq	2,68E-01	1,85E-03	3,31E-03	1,06E-02	0,00E+00	8,04E-04	0,00E+00	8,40E-04	-1,15E-03
Eutrophication, freshwater	kg P eq	1,46E-02	3,18E-05	1,41E-04	1,54E-04	0,00E+00	1,44E-05	0,00E+00	3,34E-05	-1,27E-04
Eutrophication, freshwater*	Kg PO4(3-)	4,47E-02	9,75E-05	4,32E-04	4,71E-04	0,00E+00	4,42E-05	0,00E+00	1,02E-04	-3,90E-04
Eutrophication, marine	kg N eq	3,40E-02	5,71E-04	6,63E-04	3,63E-03	0,00E+00	2,41E-04	0,00E+00	3,41E-03	-1,63E-04
Eutrophication, terrestrial	mol N eq	6,13E-01	6,24E-03	7,49E-03	3,97E-02	0,00E+00	2,64E-03	0,00E+00	3,25E-03	-1,94E-03
Ecotoxicity, freshwater	CTUe	1,24E+03	5,29E+00	9,18E+00	2,53E+01	0,00E+00	2,37E+00	0,00E+00	1,38E+01	-7,77E+00
Land use	Pt	3,63E+02	5,06E+00	1,58E+00	2,18E+01	0,00E+00	2,04E+00	0,00E+00	1,80E+00	-2,85E+00
Water use	m3 depriv.	1,48E+01	1,89E-02	2,15E-01	8,80E-02	0,00E+00	8,26E-03	0,00E+00	5,62E-02	-1,59E-02
Resource use, fossils	MJ	5,28E+02	6,61E+00	2,31E+01	3,16E+01	0,00E+00	2,97E+00	0,00E+00	1,36E+00	2,31E-01
Resource use, minerals and metals	kg Sb eq	1,42E-02	1,11E-05	9,36E-06	5,68E-05	0,00E+00	5,32E-06	0,00E+00	1,37E-06	-4,60E-06
Energy Resource, Renewable	MJ	8,01E+01	9,16E-02	4,03E+00	4,46E-01	0,00E+00	4,19E-02	0,00E+00	9,86E-02	-3,21E-01
Raw Materials Resource, Renewable	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
Total Resource, Renewable	MJ	8,01E+01	9,16E-02	4,03E+00	4,46E-01	0,00E+00	4,19E-02	0,00E+00	9,86E-02	-3,21E-01
Energy Resource, Non renewable	MJ	1,19E+02	1,32E-04	7,21E-05	6,70E-04	0,00E+00	6,29E-05	0,00E+00	2,04E-05	1,57E-05

Raw Materials Resource, Non renewable	MJ	4,42E+02	7,02E+00	2,55E+01	3,36E+01	0,00E+00	3,15E+00	0,00E+00	1,45E+00	2,50E-01
Total Resource, Non renewable	MJ	5,61E+02	7,02E+00	2,55E+01	3,36E+01	0,00E+00	3,15E+00	0,00E+00	1,45E+00	2,50E-01
Use of secondary materials	kg	6,70E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total amount of water	m3	-2,23E+03	-9,15E+00	-1,05E+02	-4,33E+01	0,00E+00	-4,06E+00	0,00E+00	-1,32E+01	1,76E+01
Non Hazardous waste	kg	3,02E+00	3,59E-01	3,19E-02	1,51E+00	0,00E+00	1,42E-01	0,00E+00	2,93E+00	5,33E-02
Hazardous waste	kg	4,74E-02	1,71E-05	7,65E-05	8,28E-05	0,00E+00	7,77E-06	0,00E+00	2,41E-06	-2,93E-07
Radioactive waste	kg	2,48E-03	4,51E-05	1,31E-05	2,16E-04	0,00E+00	2,02E-05	0,00E+00	6,72E-06	3,61E-06

Table 5 - Results of the characterization of 1 m2 of panel, 60mm.

*: the EN 15804 + A2 method available in the software used expresses the Eutrophication, freshwater category as Kg P eq., since PCRs also require Kg PO4 (3-) as the unit of measurement, the multiplication factor of 3.07 was used

Panel 80 mm

Categoria d'impatto	Unità	A1	A2	A3	A4	C1	C2	C3	C4	D
Climate change (GWP – GHG)	kg CO2 eq	4,53E+01	5,60E-01	1,53E+00	9,08E-01	0,00E+00	2,24E-01	0,00E+00	2,42E+00	1,65E-03
Climate change	kg CO2 eq	4,17E+01	5,66E-01	1,59E+00	9,17E-01	0,00E+00	2,27E-01	0,00E+00	3,06E+00	1,01E-02
Climate change - Fossil	kg CO2 eq	4,64E+01	5,66E-01	1,57E+00	9,16E-01	0,00E+00	2,27E-01	0,00E+00	2,41E+00	7,80E-04
Climate change - Biogenic	kg CO2 eq	-4,89E+00	3,16E-04	1,75E-02	4,93E-04	0,00E+00	1,21E-04	0,00E+00	6,55E-01	9,49E-03
Climate change - Land use and LU change	kg CO2 eq	2,11E-01	1,94E-04	1,84E-04	3,23E-04	0,00E+00	7,92E-05	0,00E+00	1,83E-04	-1,25E-04
Ozone depletion	kg CFC11 eq	5,31E-06	1,29E-07	2,82E-07	2,10E-07	0,00E+00	5,15E-08	0,00E+00	7,87E-08	1,42E-08
Ionising radiation	kBq U-235 eq	3,28E+00	4,41E-02	3,86E-02	7,17E-02	0,00E+00	1,76E-02	0,00E+00	1,99E-02	-1,05E-02
Photochemical ozone formation	kg NMVOC eq	1,24E-01	2,43E-03	2,33E-03	4,99E-03	0,00E+00	9,31E-04	0,00E+00	1,63E-03	-4,92E-04
Particulate matter	disease inc.	2,53E-06	4,11E-08	1,11E-08	6,63E-08	0,00E+00	1,58E-08	0,00E+00	1,45E-08	-1,32E-08
Human toxicity, non-cancer	CTUh	2,47E-06	7,52E-09	7,16E-09	1,21E-08	0,00E+00	2,98E-09	0,00E+00	1,06E-08	-9,14E-09
Human toxicity, cancer	CTUh	2,30E-07	1,90E-10	2,07E-10	3,13E-10	0,00E+00	7,69E-11	0,00E+00	8,13E-10	-1,82E-10
Acidification	mol H+ eq	3,03E-01	2,38E-03	3,31E-03	4,66E-03	0,00E+00	9,27E-04	0,00E+00	1,59E-03	-1,15E-03
Eutrophication, freshwater	kg P eq	1,67E-02	4,13E-05	1,41E-04	6,76E-05	0,00E+00	1,66E-05	0,00E+00	7,45E-05	-1,27E-04
Eutrophication, freshwater*	Kg PO4(3-)	5,12E-02	1,27E-04	4,32E-04	2,08E-04	0,00E+00	5,10E-05	0,00E+00	2,29E-04	-3,90E-04
Eutrophication, marine	kg N eq	4,31E-02	7,30E-04	6,63E-04	1,60E-03	0,00E+00	2,78E-04	0,00E+00	3,21E-03	-1,63E-04
Eutrophication, terrestrial	mol N eq	6,80E-01	7,99E-03	7,49E-03	1,75E-02	0,00E+00	3,04E-03	0,00E+00	5,99E-03	-1,94E-03
Ecotoxicity, freshwater	CTUe	1,58E+03	6,86E+00	9,18E+00	1,11E+01	0,00E+00	2,74E+00	0,00E+00	3,05E+01	-7,77E+00
Land use	Pt	4,97E+02	6,41E+00	1,58E+00	9,60E+00	0,00E+00	2,36E+00	0,00E+00	1,99E+00	-2,85E+00
Water use	m3 depriv.	1,93E+01	2,44E-02	2,15E-01	3,88E-02	0,00E+00	9,52E-03	0,00E+00	1,25E-01	-1,59E-02
Resource use, fossils	MJ	6,38E+02	8,57E+00	2,31E+01	1,39E+01	0,00E+00	3,42E+00	0,00E+00	2,31E+00	2,31E-01
Resource use, minerals and metals	kg Sb eq	1,43E-02	1,46E-05	9,36E-06	2,50E-05	0,00E+00	6,14E-06	0,00E+00	2,95E-06	-4,60E-06
Energy Resource, Renewable	MJ	1,04E+02	1,19E-01	4,03E+00	1,97E-01	0,00E+00	4,82E-02	0,00E+00	1,97E-01	-3,21E-01
Raw Materials Resource, Renewable	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
Total Resource, Renewable	MJ	1,04E+02	1,19E-01	4,03E+00	1,97E-01	0,00E+00	4,82E-02	0,00E+00	1,97E-01	-3,21E-01
Energy Resource, Non renewable	MJ	1,19E+02	1,74E-04	7,21E-05	2,95E-04	0,00E+00	7,24E-05	0,00E+00	4,44E-05	1,57E-05

Raw Materials Resource, Non renewable	MJ	5,60E+02	9,10E+00	2,55E+01	1,48E+01	0,00E+00	3,63E+00	0,00E+00	2,45E+00	2,50E-01
Total Resource, Non renewable	MJ	6,79E+02	9,10E+00	2,55E+01	1,48E+01	0,00E+00	3,63E+00	0,00E+00	2,45E+00	2,50E-01
Use of secondary materials	kg	6,70E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Total amount of water	m3	-2,74E+03	-1,18E+01	-1,05E+02	-1,91E+01	0,00E+00	-4,68E+00	0,00E+00	-2,94E+01	1,76E+01
Non Hazardous waste	kg	3,57E+00	4,53E-01	3,19E-02	6,66E-01	0,00E+00	1,63E-01	0,00E+00	2,75E+00	5,33E-02
Hazardous waste	kg	4,75E-02	2,22E-05	7,65E-05	3,65E-05	0,00E+00	8,96E-06	0,00E+00	4,40E-06	-2,93E-07
Radioactive waste	kg	2,72E-03	5,84E-05	1,31E-05	9,49E-05	0,00E+00	2,33E-05	0,00E+00	9,92E-06	3,61E-06

Table 6 - Results of the characterization of 1 m2 of panel, 80mm.

*: the EN 15804 + A2 method available in the software used expresses the Eutrophication, freshwater category as Kg P eq., since PCRs also require Kg PO4 (3-) as the unit of measurement, the multiplication factor of 3.07 was used

Bibliography

- EC-JRC, 2010. International reference Life Cycle data System Handbook. General Guidance for life cycle assessment. Detailed Guidance
- EN 15804:2019+A2 “Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products”
- General programme instructions for the international epd® system. Version 3.01.
- Construction products pcr 2019:14 version 1.1 valid until: 2024-12-202
- International Organisation for Standardization (ISO), Environmental management – Life Cycle assessment – Principles and framework. ISO 14040:2006, Geneva
- International Organisation for Standardization (ISO), 2006b Environmental management – Life Cyle assessment –Requirements and guidelines. ISO 14044:2006, Geneva
- International Organisation for Standardization (ISO), 2006c Environmental labels and declarations -- Type III environmental declarations -- Principles and procedures. ISO 14025:2006, Geneva
- Marcegaglia Spa - Life cycle assessment report - pickled – rolled – galvanized – painted coils 2017
- ArcelorMittal – EPD - Hot dip galvanized steel with pure Zinc coating
- Eurostat: https://ec.europa.eu/eurostat/web/waste/overview
- Rapporto Rifiuti Speciali - Edizione 2019 — Italiano – Ispra
- Ecoinvent, 2019. Swiss Centre for Life Cycle Assessment, v3.6 (www.ecoinvent.ch).

EPD®

www.environdec.com

RINA