ZAG EPD

Environmental Product Declaration

According to ISO 14025 and EN 15804:2012+A2:2019

Trimoterm façade panel

EPD number	EPD-20/0001
EPD number at ECO-Platform	00001348
EPD owner	**TRIMO, arhitekturne rešitve, d.o.o.** Prijateljeva cesta 12, 8210 Trebnje, Slovenia
EPD Program operator	ZAG EPD
Issue date	12.10.2020
Valid until	12.10.2025

ECO PLATFORM EPD EN 15804 VERIFIED

ZAVOD ZA GRADBENIŠTVO SLOVENIJE LJUBLJANA 17

www.zag.si

General information	Commercial name
	Trimoterm façade panel
Program holder: Slovenian National Building And Civil Engineering Institute - ZAG Dimičeva 12 1000 Ljubljana Slovenia http://www.zag.si	**Owner of the Environmental Product Declaration:** Trimo, architectural solutions, d.o.o. Prijateljeva cesta 12 8210 Trebnje Slovenia https://www.trimo-group.com/en
Number of the Environmental Product Declaration: EPD-20/0001	**Declared unit:** 1m^2 of Trimoterm façade panel
This Environmental Product Declaration is based on the Product Category Rules (PCR): Part B: Requirements on the EPD for Double skin metal faced sandwich panels, 2012, Institut Bauen und Umwelt e.V.	**Scope:** A1-A3, A4, A5, C1, C2, C3, C4 and D
Issue date: 12.10.2020 **Valid until:** 12.10.2025	**Verification:** The CEN standard SIST EN 15804 serves as the core Product Category Rule (PCR) Independent verification of the EPD according to EN ISO 14025 ☐ internal ☒ external
Production plant: Trimo Inženjering d.o.o. Novo Naselje 9 22310 Šimanovci Republic of Serbia	**Title and the handwritten signature of verifier:** *Hüdai Kara, PhD* Metsims Sustainability Consulting 4 Clear Water Place Oxford OX2 7NL, United Kingdom
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1 Product

1.1 Product description

The Trimoterm fireproof façade and roof system is a high-quality, versatile and environmentally friendly construction product, where the highest demands of fire resistance, sound reduction and thermal insulation are required. It offers the perfect combination of functionality and durability, while also enabling true architectural expression.

Available with a complete system of matching components and meeting country-specific requirements and regulations, Trimoterm is suitable for a wide range of external façade and roof cladding, internal partition walls, fire walls and ceilings. With good fire resistance, excellent thermal and sound insulation, as well as outstanding hygienic characteristics, Trimoterm panels can also be successfully used in the most demanding of environments, such as the energy producing and food-processing sectors as well as in the pharmaceutical industry.

A Trimoterm façade element consists of two galvanised and pre-finished steel sheets bonded to a non-combustible A1 mineral wool core. Together, the layers combine to make a solid element with a thickness ranging from 50 mm to 250 mm. Trimoterm is available in flat or curved options. Preinstalled gaskets prevent water from entering the system. The façade panels are available with astandard joint (i.e., Trimoterm FTV) or a hidden joint (i.e., Trimoterm FTV HL or Trimoterm Invisio).

1.2 Technical Data

Three different versions of the Trimoterm façade panels were considered in the study: Trimoterm Power S, Trimoterm Power T and Trimoterm Perform R.

The Trimoterm Power S façade system ensures higher structural spanning capabilities, while providing superior strength that is able to of withstand high wind loads. Trimoterm Power S can also be installed up to 100% faster and has durable performance.

The Trimoterm Power T façade and roof system guarantees extremely high thermal insulation, a stable indoor climate, air quality and energy savings through a reduced heat loss and lower running costs even in most demanding climate environments.

The Trimoterm Perform R is a high-quality façade and roof system that can be fitted to almost any building and is suitable for internal and external applications.

Three different panel thicknesses have been considered: 60 mm, 150 mm and 240mm.

Table 1: Characteristics of a Trimoterm Power S façade panel

Panel thickness (mm)	60	150	240
Mass – FTV (kg/m²)	15,80	26,10	36,30
Mass – FTV HL (kg/m²)	16,00	26,30	36,50
EI Fire resistance – FTV	N/A	EI180	EI240
EI Fire resistance – FTV HL	N/A	EI180	EI240
Thermal transmittance (W/m² K)	0,66	0,28	0,17
Airborne sound insulation (C;Ctr) (dB)	30 (-2;-3)	32 (-1;-2)	32 (-1;-2)
Combustibility of insulant core	Mineral wool non-combustible Class A1		
Water permeability	Class A (1200Pa)		

Table 2: Characteristics of a Trimoterm Power T façade panel

Panel thickness (mm)	60	150	240
Mass – FTV (kg/m²)	14,40	22,50	30,60
Mass – FTV HL (kg/m²)	14,60	22,70	30,80
EI Fire resistance – FTV	N/A	EI180	EI180
EI Fire resistance – FTV HL	N/A	EI180	EI240
Thermal transmittance (W/m² K)	0,58	0,25	0,16
Airborne sound insulation (C;Ctr) (dB)	N/A	30 (-1;-3)	30 (-1;-3)
Combustibility of insulant core	Mineral wool non-combustible Class A1		
Water permeability	Class A (1200Pa)		

Table 3: Characteristics of a Trimoterm Perform R façade panel

Panel thickness (mm)	60	150	240
Mass – FTV (kg/m²)	15,00	24,00	33,00
Mass – FTV HL (kg/m²)	15,20	24,20	33,20
EI Fire resistance – FTV	N/A	EI180	EI180
EI Fire resistance – FTV HL	N/A	EI180	EI240
Thermal transmittance (W/m² K)	0,63	0,26	0,17
Airborne sound insulation (C;Ctr) (dB)	30 (-2;-3)	32 (-1;-2)	32 (-1;-2)
Combustibility of insulant core	Mineral wool non-combustible Class A1		
Water permeability	Class A (1200Pa)		

Technical specifications for Trimoterm façade panels with a core made of mineral wool are:

- /EN 14509/

1.3 Base materials

The basic materials for the production of Trimoterm façade panels are:

- Galvanized steel sheet
- Adhesives (isocyanate and polyol)
- Rock mineral wool
- Polyurethane sealing tape

1.4 Manufacturing process

The Trimoterm production process starts with the an unwinding of two coils of steel sheet in unwinding device, with the steel sheets being shaped in the profiling unit of the assembly line. The sheet profile and the side joint of the panels are produced in the profiling process, which is carried out on a rotaring motion tool according to the principle of rolling endless sheet.

Next, mineral wool plates are cut and inserted into the so-called "carpet of mineral wool". This "carpet of mineral wool" is milled at the edges in a shape that adapts to the shape of the sheet joint. This forms the core of the panel, which provides the required mechanical properties of the final product.

After the profiling of the steel sheet and the preparation of the mineral wool, a polyurethane adhesive is applied. The adhesive has two-components and reacts above a certain temperature. Therefore, both the adhesive and the steel sheets are preheated before the application process. The adhesive represents the bond between the outer sheet and the mineral wool and between the inner sheet and the mineral wool.

The final stage in the assembly process is the closure of the top sheet, the bottom sheet and the mineral wool by compression in a double belt, where the adhesive finally reacts and creates the bond between all components of the finished composite. In addition, sealing is inserted into both the internal and external panel joints. The final product is an endless panel that, needs to be cut to the desired length. The cutting involves a flying band, the travel of which is synchronized with the panel.

Finally, the finished panels are stacked in a package, protected with foil and prepared for transport to the construction site.

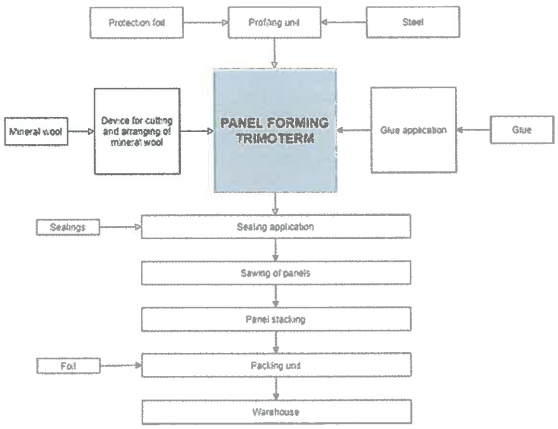

Figure 1: Schematic representation of the Trimoterm façade panel production process

1.5 Packaging

The following materials have been used for the packaging of the final product:

- Polyethylene (PE) foil
- Expanded polystyrene (EPS)
- Polypropylene (PP) tape

1.6 Further information

The owner of the declaration shall be liable for the underlying information and evidence. Further information about the Trimoterm façade panels is also available on the manufacturer web page:

https://www.trimo-group.com/en

2 LCA: Calculation rules

2.1 EPD classification

Type of EPD:

1a) Declaration of a specific product from a manufacturer's plant.

2.2 Declared unit

The declared unit was defined in accordance with the Product Category Rules (PCRs) Part B: Requirements on the EPD for Double skin metal faced sandwich panels, which are issued by the Institut Bauen und Umwelt e.V. (IBU). The following declared unit was applied:

1m^2 of Trimoterm façade panel

2.3 Geographical scope

EPD and LCA report is valid for FTV/FTV HL facade panels production plant in Serbia. Data used for calculations were gathered from that production site.

2.4 Reference service life (RSL)

Trimoterm FTV and FTV/HL façade panels used in lightweight metal constructions must withstand a term of protection of at least 15 years. The term of protection is the period until first slight renewals in the surface are required, only if there is no need of frequent inspections and service. The term of protection depends on the location, weather conditions and the quality of the coating. The Trimoterm façade panels exhibit an estimated service life of 40–45 years depending on the use conditions.

2.5 System boundary

The system boundaries were defined in accordance with the modular principle described in the European standard for Environmental Product Declarations (EPD) EN 15804:2012+A2:2019. This LCA analysis is based on the cradle to gate with options principle and includes modules A1-A3, A4, A5, C1, C2, C3, C4 and module D. The LCA of the Trimoterm façade panel covers the following life cycle stages:

A1: raw material extraction and processing, processing of secondary material input (e.g. recycling processes);

A2: transport to the manufacturer;

A3: manufacturing;

including the provision of all materials, products and related energy and water use.

A4: transport to the building site;

A5: installation into the buildings;

including the provision of all materials, products and related energy and water use.

C1: de-construction, demolition;

C2: transport to waste processing;

C3: waste processing for reuse, recovery and/or recycling;

C4: disposal;

including the provision of all materials, products and related energy and water use.

D: reuse, recovery and/or recycling potentials, expressed as net impacts and benefits.

The selection of the modules A1-A3, A4, A5, C1, C2, C3, C4 and D, and the exclusion of modules B1-B7 from this LCA analysis was based primarily on the availability, quality and reliability of the data. The data used for the modules A1-A3, A4, A5, C1, C3 and D are based on the measured quantities provided by the manufacturer, while the data used for the modules C2 and C4 are based on Information provided by the Joint Research Centre (JRC) and their European Platform on Life Cycle Assessment.

The processing of façade panels at the end-of-life stage (i.e. modules C) was described and conceptualised.

In addition, the selection of the modules A1-A3, A4, A5, C1, C2, C3, C4 and D is also in accordance with modules selected for the association EPD that was prepared for member companies of the European Association for Panels and Profiles (PPA–Europe) and revised EN 15804 standard.

The manufacturer is a PPA–Europe member and has provided data for the development of the association EPD. Even though this PPA–Europe EPD is an average EPD that cannot be directly compared to the EPDs that will be issued based on this LCA analysis, it nonetheless provides general guidance on what type of LCA analysis is expected by the industry.

It should be noted that the excluded modules (i.e. modules B1–B7) could be calculated as well. However, the calculation of these modules would be based more on assumed and simplified data than on measured data. Further, there were no metric data available that would back up those processes and enable the calculation of environmental impacts by means of a LCA.

As the requirement is to prepare a scientifically solid LCA analysis and thus issue high-quality and representative EPDs, the modules B1–B7 were left out of this LCA analysis primarily due to the lack of reliable data.

Nevertheless, there is no reliable data associated with the installation of the façade panels into the building (i.e. module A5) and the de-construction or demolition of the façade panels (i.e. module C1), since both (i.e. installation and demolition) are conducted manually.

The schematic representation of system boundaries can be seen in Figure 2.

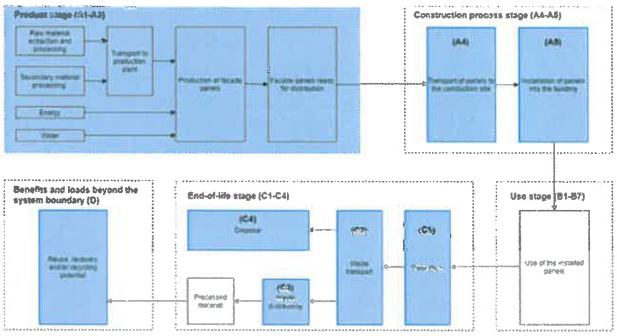

Figure 2: Schematic representation of the system boundaries, with the considered modules highlighted in blue.

2.6 Cut-off rules

The exclusion of inputs and outputs was conducted in accordance with the cut-off rules defined in the standard EN 15804:2012+A2:2019:

- All inputs and outputs to the studied system were included in the calculation, for which data are available;
- In the case of insufficient input data or data gaps for a unit process, the cut-off criteria was 1% of the renewable and non-renewable primary energy usage and 1% of the total mass input of that unit

process. The total of the neglected input flows per module was a maximum of 5% of the energy usage and the mass.

2.7 Background data

The LCA analysis was conducted with the GaBi ts (version 9.5.2.49) modelling software, which was developed by Thinkstep AG in collaboration with the University of Stuttgart. All processes were modelled based on the inventory data given in the GaBi Professional database.

2.8 Data quality

The quality of the data used for calculations in the LCA analysis correspond to the requirements of EN 15804:2012+A2:2019:

- Generic data were checked for plausibility;
- Data sets were complete according to the system boundary within the limits set by the criteria for the exclusion of inputs and outputs;
- Data were as current as possible. Data sets used for the calculations were valid for the current year and represent a reference year within 10 years for generic data and 5 years for producer specific data;
- The reference year refers to the year which the overall inventory best represents, considering the age/representativeness of the various specific and background data included, i.e. not automatically the year of modelling, calculation or publication year. Validity refers to the date to which the inventory is still judged sufficiently valid with the documented technological and geographical representativeness;
- All datasets were based on 1 year averaged data;
- The time period over which the inputs to and the outputs from the system has been accounted for is 100 years from the year for which the data set is deemed representative.

The data collection was based on a questionnaire prepared by the Slovenian National Building and Civil Engineering Institute (ZAG). Before of collection of the data, it was explained to the manufacturer that the LCA analysis will be as valid as the provided data.

The technological representativeness of any generic data was checked in the literature. The geographical representativeness and the reference period of all considered datasets were also checked. The final mass balance was also checked.

2.9 Period under review

The reference year for the data collected for this LCA analysis is 2020.

2.10 Allocation

For the product stage (i.e., modules A1-A3), the total consumption of energy and water for the production of 1m^2 of façade panel was provided by the manufacturer. The values of energy and water consumption in the production of 1m^2 of façade panel were obtained by proportionally distributing the total consumption of energy and water based on the overall quantity of panels.

2.11 Comparability

EPD of construction products may not be comparable, if they do not comply with EN 15804:2012+A2:2019.

2.12 List of substances

The product does not contain any SVHCs (Substances of Very High Concern) /REACH/.

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3 LCA: Results

Table 4: The selected phases of the LCA study

SYSTEM BOUNDARY																
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
Raw material supply	Transport	Manufacturing	Transport	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
☒	☒	☒	☒	☒	ND	ND	ND	ND	ND	ND	ND	☒	☒	☒	☒	☒
The modules of the product lifecycle, which are included in EPD are marked by "**X**", while modules not included are marked with a "**ND**" = module not declared																

3.1 Indicators of environmental impacts

The environmental impact assessment was calculated according to the standard 15804:2012+A2:2019 impact assessment method. The environmental impacts are presented with thirteen indicators (see Table 5). The tabular representation of all the environmental impact indicators for different versions of the Trimoterm façade panels are summarised in Table 6, Table 7, and Table 8

Table 5: Abbreviations and units of indicators of environmental impacts

Indicators of environmental impacts	Abbreviation	Unit
Global warming potential - total	GWP–total	kg CO_2 eq.
Global warming potential – fossil fuels	GWP–fossil	kg CO_2 eq.
Global warming potential – biogenic	GWP–biogenic	kg CO_2 eq.
Global warming potential - luluc	GWP–luluc	kg CO2 eq.
Deplention potential of the stratospheric ozone layer	ODP	kg CFC 11 eq.
Acidification potential (accumulated exceedance)	AP	mol H+ eq.
Eutrophical potential (fraction of nutrients reaching marine end compartment)	EP–freshwater	kg PO_4 eq.
Eutrophication potential (fraction of nutrients reaching marine end compartment)	EP–marine	kg N eq.
Eutrophication potential (accumulated exceedance)	EP–terrestrial	mol N eq.
Formation potential of tropospheric ozone	POCP	kg NMVOC eq.
Abiotic deplention potential for non-fossil resources	ADP–minerals & metals	kg Sb eq.
Abiotic deplention for fossil resources potential	ADP–fossil	MJ, net calorific value
Water (user) deprivation potential, deprivation - weighted water consumption	WDP	m^3 world eq. deprived

Table 6: Indicators of environmental impacts per 1m² for the Trimoterm Power S façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Abb.	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
GWP-total	[kg CO2 eq.]	3,64E+01	5,19E+01	6,74E+01	7,35E-01	1,22E+00	1,70E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,03E-02	7,58E-02	1,21E-01	2,46E-02	2,46E-02	2,46E-02	1,01E-01	2,52E-01	4,03E-01	-5,84E-01	-5,84E-01	-5,84E-01
GWP-fossil	[kg CO2 eq.]	3,63E+01	5,16E+01	6,69E+01	7,30E-01	1,21E+00	1,69E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,01E-02	7,53E-02	1,20E-01	2,44E-02	2,44E-02	2,44E-02	1,09E-01	2,73E-01	4,37E-01	-5,85E-01	-5,85E-01	-5,85E-01
GWP-biogenic	[kg CO2 eq.]	1,33E-01	2,95E-01	4,51E-01	-1,23E-03	-2,03E-03	-2,84E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,17E-05	2,93E-05	4,68E-05	4,66E-05	4,66E-05	4,66E-05	-8,66E-03	-2,16E-02	-3,46E-02	1,35E-03	1,35E-03	1,35E-03
GWP-luluc	[kg CO2 eq.]	1,57E-02	2,49E-02	3,50E-02	5,92E-03	9,80E-03	1,37E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,27E-04	3,18E-04	5,08E-04	9,00E-05	9,00E-05	9,00E-05	3,14E-04	7,86E-04	1,26E-03	-4,07E-04	-4,07E-04	-4,07E-04
ODP	[kg CFC-11 eq.]	1,45E-13	3,02E-13	4,59E-13	1,34E-16	2,22E-16	3,10E-16	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,03E-17	2,58E-17	4,12E-17	1,04E-16	1,04E-16	1,04E-16	4,05E-16	1,01E-15	1,62E-15	-9,53E-08	-9,53E-08	-9,53E-08
AP	[Mole of H+ eq.]	1,33E-01	2,34E-01	3,35E-01	8,93E-04	1,48E-03	2,06E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,25E-05	8,13E-05	1,30E-04	2,29E-04	2,29E-04	2,29E-04	7,84E-04	1,96E-03	3,13E-03	-1,26E-02	-1,26E-02	-1,26E-02
EP-freshwater	[kg P eq.]	3,86E-05	5,88E-05	7,95E-05	2,23E-06	3,69E-06	5,15E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,63E-08	1,66E-07	2,65E-07	5,85E-08	5,85E-08	5,85E-08	1,88E-07	4,69E-07	7,50E-07	-1,01E-04	-1,01E-04	-1,01E-04
EP-marine	[kg N eq.]	2,15E-02	3,27E-02	4,39E-02	2,84E-04	4,70E-04	6,56E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,06E-05	2,65E-05	4,24E-05	1,13E-04	1,13E-04	1,13E-04	2,02E-04	5,04E-04	8,07E-04	-4,25E-03	-4,25E-03	-4,25E-03
EP-terrestrial	[Mole of N eq.]	3,71E-01	7,05E-01	1,04E+00	3,36E-03	5,56E-03	7,75E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,27E-04	3,18E-04	5,08E-04	1,25E-03	1,25E-03	1,25E-03	2,22E-03	5,54E-03	8,86E-03	-6,06E-02	-6,06E-02	-6,06E-02
POCP	[kg NMVOC eq.]	7,16E-02	1,06E-01	1,41E-01	7,48E-04	1,24E-03	1,73E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,75E-05	6,88E-05	1,10E-04	3,28E-04	3,28E-04	3,28E-04	6,11E-04	1,53E-03	2,44E-03	-1,25E-02	-1,25E-02	-1,25E-02
ADP-m&m	[kg Sb eq.]	7,62E-04	7,65E-04	7,68E-04	5,92E-08	9,79E-08	1,37E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,61E-09	6,53E-09	1,04E-08	2,69E-08	2,69E-08	2,69E-08	9,81E-09	2,45E-08	3,92E-08	-2,61E-06	-2,61E-06	-2,61E-06
ADP-fossil	[MJ]	4,24E+02	6,02E+02	7,82E+02	9,76E+00	1,62E+01	2,25E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,01E-01	1,00E+00	1,60E+00	4,61E-01	4,61E-01	4,61E-01	1,43E+00	3,58E+00	5,73E+00	-7,95E+00	-7,95E+00	-7,95E+00
WDP	[m³ world equiv.]	2,24E+00	3,13E+00	4,02E+00	7,14E-03	1,18E-02	1,65E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,31E-04	3,28E-04	5,24E-04	4,12E-03	4,12E-03	4,12E-03	1,14E-02	2,86E-02	4,58E-02	-1,05E-01	-1,05E-01	-1,05E-01

Table 7: Indicators of environmental impacts per 1m² for the Trimoterm Power T façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Abb.	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
GWP-total	[kg CO2 eq.]	3,39E+01	4,85E+01	5,72E+01	6,55E-01	1,02E+00	1,38E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,27E-02	5,68E-02	9,09E-02	2,46E-02	2,46E-02	2,46E-02	7,57E-02	1,89E-01	3,03E-01	-5,84E-01	-5,84E-01	-5,84E-01
GWP-fossil	[kg CO2 eq.]	3,38E+01	4,81E+01	5,68E+01	6,50E-01	1,01E+00	1,37E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,26E-02	5,64E-02	9,03E-02	2,44E-02	2,44E-02	2,44E-02	8,19E-02	2,05E-01	3,28E-01	-5,85E-01	-5,85E-01	-5,85E-01
GWP-biogenic	[kg CO2 eq.]	1,18E-01	3,78E-01	3,40E-01	-1,09E-03	-1,70E-03	-2,30E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,78E-06	2,19E-05	3,51E-05	4,66E-05	4,66E-05	4,66E-05	-6,49E-03	-1,62E-02	-2,60E-02	1,35E-03	1,35E-03	1,35E-03
GWP-luluc	[kg CO2 eq.]	1,28E-02	2,08E-02	2,98E-02	5,28E-03	8,18E-03	1,11E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,53E-05	2,38E-04	3,81E-04	9,00E-05	9,00E-05	9,00E-05	2,36E-04	5,89E-04	9,43E-04	-4,07E-04	-4,07E-04	-4,07E-04
ODP	[kg CFC-11 eq.]	1,19E-13	2,37E-13	3,55E-13	1,20E-16	1,86E-16	2,51E-16	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,73E-18	1,93E-17	3,09E-17	1,04E-16	1,04E-16	1,04E-16	3,04E-16	7,59E-16	1,21E-15	-9,53E-08	-9,53E-08	-9,53E-08
AP	[Mole of H+ eq.]	1,16E-01	1,93E-01	2,68E-01	7,96E-04	1,23E-03	1,67E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,44E-05	6,09E-05	9,75E-05	2,29E-04	2,29E-04	2,29E-04	5,88E-04	1,47E-03	2,35E-03	-1,26E-02	-1,26E-02	-1,26E-02
EP-freshwater	[kg P eq.]	3,47E-05	5,04E-05	6,64E-05	1,99E-06	3,08E-06	4,17E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,97E-08	1,24E-07	1,99E-07	5,85E-08	5,85E-08	5,85E-08	1,41E-07	3,52E-07	5,63E-07	-1,01E-04	-1,01E-04	-1,01E-04
EP-marine	[kg N eq.]	1,96E-02	2,88E-02	3,65E-02	2,53E-04	3,93E-04	5,32E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,95E-06	1,99E-05	3,18E-05	1,13E-04	1,13E-04	1,13E-04	1,51E-04	3,78E-04	6,05E-04	-4,25E-03	-4,25E-03	-4,25E-03
EP-terrestrial	[Mole of N eq.]	3,15E-01	5,74E-01	8,17E-01	2,99E-03	4,64E-03	6,29E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,53E-05	2,38E-04	3,81E-04	1,25E-03	1,25E-03	1,25E-03	1,66E-03	4,15E-03	6,65E-03	-6,06E-02	-6,06E-02	-6,06E-02
POCP	[kg NMVOC eq.]	6,60E-02	9,38E-02	1,19E-01	6,66E-04	1,03E-03	1,40E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,06E-05	5,16E-05	8,25E-05	3,28E-04	3,28E-04	3,28E-04	4,58E-04	1,15E-03	1,83E-03	-1,25E-02	-1,25E-02	-1,25E-02
ADP-m&m	[kg Sb eq.]	7,61E-04	7,63E-04	7,66E-04	5,27E-08	8,18E-08	1,11E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,96E-09	4,89E-09	7,83E-09	2,69E-08	2,69E-08	2,69E-08	7,36E-09	1,84E-08	2,94E-08	-2,61E-06	-2,61E-06	-2,61E-06
ADP-fossil	[MJ]	3,92E+02	5,29E+02	6,68E+02	8,70E+00	1,35E+01	1,83E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,01E-01	7,52E-01	1,20E+00	4,61E-01	4,61E-01	4,61E-01	1,07E+00	2,69E+00	4,30E+00	-7,95E+00	-7,95E+00	-7,95E+00
WDP	[m³ world equiv.]	2,09E+00	2,76E+00	3,44E+00	6,36E-03	9,86E-03	1,34E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,83E-05	2,46E-04	3,93E-04	4,12E-03	4,12E-03	4,12E-03	8,59E-03	2,15E-02	3,43E-02	-1,05E-01	-1,05E-01	-1,05E-01

Table 8: Indicators of environmental impacts per 1m² for the Trimoterm Perform R façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Abb.	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
GWP-total	[kg CO2 eq.]	3,47E+01	4,77E+01	6,06E+01	6,81E-01	1,08E+00	1,48E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,53E-02	6,31E-02	1,01E-01	2,46E-02	2,46E-02	2,46E-02	8,41E-02	2,10E-01	3,36E-01	-5,84E-01	-5,84E-01	-5,84E-01
GWP-fossil	[kg CO2 eq.]	3,46E+01	4,74E+01	6,02E+01	6,77E-01	1,08E+00	1,47E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,51E-02	6,27E-02	1,57E-01	2,44E-02	2,44E-02	2,44E-02	9,10E-02	2,28E-01	3,64E-01	-5,85E-01	-5,85E-01	-5,85E-01
GWP-biogenic	[kg CO2 eq.]	1,22E-01	2,52E-01	3,83E-01	-1,14E-03	-1,81E-03	-2,48E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,75E-06	2,44E-05	6,09E-05	4,66E-05	4,66E-05	4,66E-05	-7,21E-03	-1,80E-02	-2,89E-02	1,35E-03	1,35E-03	1,35E-03
GWP-luluc	[kg CO2 eq.]	1,38E-02	2,21E-02	3,05E-02	5,49E-03	8,72E-03	1,20E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,06E-04	2,65E-04	6,61E-04	9,00E-05	9,00E-05	9,00E-05	2,62E-04	6,55E-04	1,05E-03	-4,07E-04	-4,07E-04	-4,07E-04
ODP	[kg CFC-11 eq.]	1,28E-13	2,58E-13	3,89E-13	1,25E-16	1,98E-16	2,71E-16	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,58E-18	2,15E-17	5,36E-17	1,04E-16	1,04E-16	1,04E-16	3,37E-16	8,44E-16	1,35E-15	-9,53E-08	-9,53E-08	-9,53E-08
AP	[Mole of H+ eq.]	1,21E-01	2,06E-01	2,90E-01	8,29E-04	1,32E-03	1,80E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,71E-05	6,77E-05	1,69E-04	2,29E-04	2,29E-04	2,29E-04	6,53E-04	1,63E-03	2,61E-03	-1,26E-02	-1,26E-02	-1,26E-02
EP-freshwater	[kg P eq.]	3,60E-05	5,32E-05	7,04E-05	2,07E-06	3,28E-06	4,50E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,53E-08	1,38E-07	3,45E-07	5,85E-08	5,85E-08	5,85E-08	1,56E-07	3,91E-07	6,25E-07	-1,01E-04	-1,01E-04	-1,01E-04
EP-marine	[kg N eq.]	2,02E-02	2,96E-02	3,90E-02	2,64E-04	4,19E-04	5,74E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,83E-06	2,21E-05	5,52E-05	1,13E-04	1,13E-04	1,13E-04	1,68E-04	4,20E-04	6,72E-04	-4,25E-03	-4,25E-03	-4,25E-03
EP-terrestrial	[Mole of N eq.]	3,33E-01	6,12E-01	8,91E-01	3,11E-03	4,95E-03	6,78E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,06E-04	2,65E-04	6,61E-04	1,25E-03	1,25E-03	1,25E-03	1,85E-03	4,62E-03	7,39E-03	-6,06E-02	-6,06E-02	-6,06E-02
POCP	[kg NMVOC eq.]	6,78E-02	9,69E-02	1,26E-01	6,94E-04	1,10E-03	1,51E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,29E-05	5,73E-05	1,43E-04	3,28E-04	3,28E-04	3,28E-04	5,09E-04	1,27E-03	2,04E-03	-1,25E-02	-1,25E-02	-1,25E-02
ADP-m&m	[kg Sb eq.]	7,61E-04	7,64E-04	7,66E-04	5,49E-08	8,71E-08	1,19E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,18E-09	5,44E-09	1,36E-08	2,69E-08	2,69E-08	2,69E-08	8,17E-09	2,04E-08	3,27E-08	-2,61E-06	-2,61E-06	-2,61E-06
ADP-fossil	[MJ]	4,02E+02	5,53E+02	7,04E+02	9,05E+00	1,44E+01	1,97E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,34E-01	8,35E-01	2,09E+00	4,61E-01	4,61E-01	4,61E-01	1,19E+00	2,99E+00	4,78E+00	-7,95E+00	-7,95E+00	-7,95E+00
WDP	[m³ world equiv.]	2,14E+00	2,89E+00	3,63E+00	6,62E-03	1,05E-02	1,44E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,09E-04	2,73E-04	6,82E-04	4,12E-03	4,12E-03	4,12E-03	9,54E-03	2,39E-02	3,82E-02	-1,05E-01	-1,05E-01	-1,05E-01

3.2 Indicators of raw material use

The results of raw materials use are presented with ten indicators in accordance with the standard EN 15804:2012+A2:2019 (see Table 9). Indicators include the use of renewable and non-renewable energy, the use of renewable and non-renewable material resources and the use of water.

Table 9: Abbreviations and units of indicators of raw material use

Indicators of raw material use	Abb.	Unit
Use of renewable primary energy, excluding raw material	PERE	MJ, net calorific value
Use of renewable primary energy, including raw material	PERM	MJ, net calorific value
Total use of renewable primary energy	PERT	MJ, net calorific value
Use of non-renewable primary energy, excluding raw materials	PENRE	MJ, net calorific value
Use of non-renewable primary energy sources, including raw materials	PENRM	MJ, net calorific value
Total use of primary non-renewable energy	PENRT	MJ, net calorific value
Use of secondary materials	SM	kg
Use of renewable secondary fuels	RSF	MJ, net calorific value
Use of non-renewable secondary fuels	NRSF	MJ, net calorific value
Net use of fresh water	FW	m^3

The tabular representation of all raw materials for different versions of the Trimoterm façade panels are summarised in Table 10, Table 11 and Table 12.

Table 10: Indicators of raw material use per 1m² for the Trimoterm Power S façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Abb.	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
PERE	[MJ]	3,43E+01	6,05E+01	8,68E+01	5,64E-01	9,34E-01	1,30E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-02	6,00E-02	9,60E-02	3,87E-02	3,87E-02	3,87E-02	1,88E-01	4,69E-01	7,51E-01	-2,52E-01	-2,52E-01	-2,52E-01
PERM	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	3,43E+01	6,05E+01	8,68E+01	5,64E-01	9,34E-01	1,30E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-02	6,00E-02	9,60E-02	3,87E-02	3,87E-02	3,87E-02	1,88E-01	4,69E-01	7,51E-01	-2,52E-01	-2,52E-01	-2,52E-01
PENRE	[MJ]	4,24E+02	6,02E+02	7,83E+02	9,80E+00	1,62E+01	2,26E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,01E-01	1,00E+00	1,60E+00	4,61E-01	4,61E-01	4,61E-01	1,43E+00	3,58E+00	5,73E+00	-7,95E+00	-7,95E+00	-7,95E+00
PENRM	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	4,24E+02	6,02E+02	7,83E+02	9,80E+00	1,62E+01	2,26E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,01E-01	1,00E+00	1,60E+00	4,61E-01	4,61E-01	4,61E-01	1,43E+00	3,58E+00	5,73E+00	-7,95E+00	-7,95E+00	-7,95E+00
SM	[kg]	7,51E+00	7,51E+00	7,51E+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	0,00E+00	2,12E-05	5,30E-05	8,48E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,45E-01	4,45E-01	4,45E-01
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	0,00E+00	0,00E+00	0,00E+00	2,40E-02	6,00E-02	9,60E-02	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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m3]	8,70E-02	1,25E-01	1,62E-01	6,58E-04	1,09E-03	1,52E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,40E-02	6,00E-02	9,60E-02	1,20E-04	1,20E-04	1,20E-04	3,61E-04	9,04E-04	1,45E-03	-2,43E-03	-2,43E-03	-2,43E-03

Table 11: Indicators of raw material use per 1m² for the Trimoterm Power T façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Abb.	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
PERE	[MJ]	2,98E+01	4,96E+01	6,95E+01	5,03E-01	7,80E-01	1,06E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,80E-02	4,50E-02	7,20E-02	3,87E-02	3,87E-02	3,87E-02	1,41E-01	3,52E-01	5,63E-01	-2,52E-01	-2,52E-01	-2,52E-01
PERM	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	2,98E+01	4,96E+01	6,95E+01	5,03E-01	7,80E-01	1,06E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,80E-02	4,50E-02	7,20E-02	3,87E-02	3,87E-02	3,87E-02	1,41E-01	3,52E-01	5,63E-01	-2,52E-01	-2,52E-01	-2,52E-01
PENRE	[MJ]	3,92E+02	5,29E+02	6,68E+02	8,73E+00	1,35E+01	1,84E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,01E-01	7,52E-01	1,20E+00	4,61E-01	4,61E-01	4,61E-01	1,08E+00	2,69E+00	4,30E+00	-7,95E+00	-7,95E+00	-7,95E+00
PENRM	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	3,92E+02	5,29E+02	6,68E+02	8,73E+00	1,35E+01	1,84E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,01E-01	7,52E-01	1,20E+00	4,61E-01	4,61E-01	4,61E-01	1,08E+00	2,69E+00	4,30E+00	-7,95E+00	-7,95E+00	-7,95E+00
SM	[kg]	7,51E+00	7,51E+00	7,51E+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	0,00E+00	1,59E-05	3,98E-05	6,36E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,45E-01	4,45E-01	4,45E-01
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	0,00E+00	0,00E+00	0,00E+00	1,80E-02	4,50E-02	7,20E-02	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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m3]	8,07E-02	1,09E-01	1,38E-01	5,86E-04	9,09E-04	1,23E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,80E-02	4,50E-02	7,20E-02	1,20E-04	1,20E-04	1,20E-04	2,71E-04	6,78E-04	1,08E-03	-2,43E-03	-2,43E-03	-2,43E-03

Table 12: Indicators of raw material use per 1m² for the Trimoterm Perform R façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Abb.	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
PERE	[MJ]	3,13E+01	5,32E+01	7,52E+01	5,23E-01	8,31E-01	1,14E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,00E-02	5,00E-02	1,25E-01	3,87E-02	3,87E-02	3,87E-02	1,56E-01	3,91E-01	6,26E-01	-2,52E-01	-2,52E-01	-2,52E-01
PERM	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PERT	[MJ]	3,13E+01	5,32E+01	7,52E+01	5,23E-01	8,31E-01	1,14E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,00E-02	5,00E-02	1,25E-01	3,87E-02	3,87E-02	3,87E-02	1,56E-01	3,91E-01	6,26E-01	-2,52E-01	-2,52E-01	-2,52E-01
PENRE	[MJ]	4,03E+02	5,54E+02	7,05E+02	9,09E+00	1,44E+01	1,98E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,34E-01	8,35E-01	2,09E+00	4,61E-01	4,61E-01	4,61E-01	1,19E+00	2,99E+00	4,78E+00	-7,95E+00	-7,95E+00	-7,95E+00
PENRM	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
PENRT	[MJ]	4,03E+02	5,54E+02	7,05E+02	9,09E+00	1,44E+01	1,98E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,34E-01	8,35E-01	2,09E+00	4,61E-01	4,61E-01	4,61E-01	1,19E+00	2,99E+00	4,78E+00	-7,95E+00	-7,95E+00	-7,95E+00
SM	[kg]	7,51E+00	7,51E+00	7,51E+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	0,00E+00	1,77E-05	4,42E-05	1,10E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,45E-01	4,45E-01	4,45E-01
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	0,00E+00	0,00E+00	0,00E+00	2,00E-02	5,00E-02	1,25E-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	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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	[m3]	8,28E-02	1,14E-01	1,46E-01	6,10E-04	9,69E-04	1,33E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,00E-02	5,00E-02	1,25E-01	1,20E-04	1,20E-04	1,20E-04	3,01E-04	7,53E-04	1,20E-03	-2,43E-03	-2,43E-03	-2,43E-03

3.3 Other indicators of environmental impacts

The results for other environmental information describing waste categories (i.e., waste disposal data) are presented with three indicators in accordance with the standard EN 15804:2012+A2:2019. (see Table 13).

Table 13: Abbreviations and units of other indicators of environmental impacts

Indicators for other environmental information –waste categories	**Abbreviation**	**Unit**
Disposal of hazardous waste	HWD	kg
Disposal of non-hazardous waste	NHWD	kg
Disposal of radioactive waste	RWD	kg
Indicators for other environmental information – output flows	**Abbreviation**	**Unit**
Constituents suitable for re-use	CRU	kg
Materials for recycling	MFR	kg
Materials for energy recovery	MER	kg
Exported energy	EE	MJ per energy carrier

The tabular representation of other environmental information of different versions of the Trimoterm façade panels are summarised in Table 14, Table 15 and Table 16.

Table 14: Other indicators of environmental impacts per 1m² for the Trimoterm Power S façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Indicator	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
HWD	[kg]	1,69E-05	1,71E-05	1,73E-05	4,53E-07	7,50E-07	1,05E-06	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,49E-08	3,73E-08	5,96E-08	9,70E-09	9,70E-09	9,70E-09	2,18E-08	5,46E-08	8,74E-08	0,00E+00	0,00E+00	0,00E+00
NHWD	[kg]	2,61E+00	5,52E+00	8,44E+00	1,55E-03	2,57E-03	3,59E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,18E-05	1,80E-04	2,87E-04	1,39E-04	1,39E-04	1,39E-04	7,21E+00	1,80E+01	2,88E+01	0,00E+00	0,00E+00	0,00E+00
RWD	[kg]	4,40E-03	7,77E-03	1,11E-02	1,81E-05	2,99E-05	4,17E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,32E-07	1,33E-06	2,13E-06	3,70E-06	3,70E-06	3,70E-06	1,63E-05	4,08E-05	6,53E-05	0,00E+00	0,00E+00	0,00E+00
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	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	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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,46E+00	8,46E+00	8,46E+00	0,00E+00	0,00E+00	0,00E+00	8,46E+00	8,46E+00	8,46E+00
MER	[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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,00E-01	4,00E-01	4,00E-01	0,00E+00	0,00E+00	0,00E+00	4,00E-01	4,00E-01	4,00E-01
EE	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Table 15: Other indicators of environmental impacts per 1m² for the Trimoterm Power T façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Indicator	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
HWD	[kg]	1,68E-05	1,70E-05	1,73E-05	4,04E-07	6,26E-07	8,49E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,12E-08	2,79E-08	4,47E-08	9,70E-09	9,70E-09	9,70E-09	1,64E-08	4,10E-08	6,55E-08	0,00E+00	0,00E+00	0,00E+00
NHWD	[kg]	2,13E+00	4,31E+00	6,50E+00	1,38E-03	2,15E-03	2,91E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,39E-05	1,35E-04	2,15E-04	1,39E-04	1,39E-04	1,39E-04	5,41E+00	1,35E+01	2,16E+01	0,00E+00	0,00E+00	0,00E+00
RWD	[kg]	3,84E-03	6,38E-03	8,91E-03	1,61E-05	2,50E-05	3,38E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,99E-07	9,98E-07	1,60E-06	3,70E-06	3,70E-06	3,70E-06	1,22E-05	3,06E-05	4,89E-05	0,00E+00	0,00E+00	0,00E+00
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	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	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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,46E+00	8,46E+00	8,46E+00	0,00E+00	0,00E+00	0,00E+00	8,46E+00	8,46E+00	8,46E+00
MER	[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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,00E-01	4,00E-01	4,00E-01	0,00E+00	0,00E+00	0,00E+00	4,00E-01	4,00E-01	4,00E-01
EE	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Table 16: Other indicators of environmental impacts per 1m² for the Trimoterm Perform R façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Indicator	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
HWD	[kg]	1,68E-05	1,71E-05	1,73E-05	4,20E-07	6,68E-07	9,15E-07	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,24E-08	3,10E-08	7,76E-08	9,70E-09	9,70E-09	9,70E-09	1,82E-08	4,55E-08	7,28E-08	0,00E+00	0,00E+00	0,00E+00
NHWD	[kg]	2,29E+00	4,72E+00	7,14E+00	1,44E-03	2,29E-03	3,14E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,98E-05	1,50E-04	3,74E-04	1,39E-04	1,39E-04	1,39E-04	6,01E+00	1,50E+01	2,40E+01	0,00E+00	0,00E+00	0,00E+00
RWD	[kg]	4,03E-03	6,84E-03	9,65E-03	1,68E-05	2,66E-05	3,65E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,43E-07	1,11E-06	2,77E-06	3,70E-06	3,70E-06	3,70E-06	1,36E-05	3,40E-05	5,44E-05	0,00E+00	0,00E+00	0,00E+00
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	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	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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	8,46E+00	8,46E+00	8,46E+00	0,00E+00	0,00E+00	0,00E+00	8,46E+00	8,46E+00	8,46E+00
MER	[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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,00E-01	4,00E-01	4,00E-01	0,00E+00	0,00E+00	0,00E+00	4,00E-01	4,00E-01	4,00E-01
EE	[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	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	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

3.4 Additional environmental impact indicators

The results of the additional environmental impact indicators are presented with six indicators in accordance with the standard EN 15804:2012+A2:2019. (see Table 17).

Table 17: Abbreviations and units of additional environmental impacts indicators

Indicator	Abbreviation	Unit
Particulate Matter emissions	PM	Disease incidence
Ionizing radiation, human health	IRP	kBq U 235 eq.
Eco-toxicity (freshwater)	ETP–fw	CTUe
Human toxicity, cancer effects	HTP–c	CTUh
Human toxicity, non-cancer effects	HTP–nc	CTUh
Land use related impacts/soil quality	SQP	Dimensionless

The tabular representation of the additional environmental information of different versions of the Trimoterm façade panels are summarised in Table 18, Table 19, and Table 20

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Table 18: Additional indicators of environmental impacts per 1m² for the Trimoterm Power S façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Indicator	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
PM	[Disease incidences]	1,25E-06	2,01E-06	2,77E-06	5,75E-09	9,51E-09	1,33E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,23E-10	8,08E-10	1,29E-09	5,29E-09	5,29E-09	5,29E-09	9,70E-09	2,42E-08	3,88E-08	-1,68E-07	-1,68E-07	-1,68E-07
IRP	[kBq U235 eq.]	9,84E-01	1,29E+00	1,59E+00	2,67E-03	4,41E-03	6,15E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,26E-05	1,32E-04	2,10E-04	3,35E-04	3,35E-04	3,35E-04	1,68E-03	4,20E-03	6,71E-03	-4,41E-02	-4,41E-02	-4,41E-02
ETP-fw	[CTUe]	1,67E+02	3,07E+02	4,48E+02	7,30E+00	1,21E+01	1,69E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,22E-01	8,05E-01	1,29E+00	3,62E-01	3,62E-01	3,62E-01	8,19E-01	2,05E+00	3,27E+00	-5,30E+02	-5,30E+02	-5,30E+02
HTP-c	[CTUh]	5,18E-08	9,64E-08	1,41E-07	1,51E-10	2,50E-10	3,49E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	7,77E-12	1,94E-11	3,11E-11	8,64E-12	8,64E-12	8,64E-12	1,21E-10	3,03E-10	4,85E-10	-2,44E-10	-2,44E-10	-2,44E-10
HTP-nc	[CTUh]	2,65E-06	6,14E-06	9,63E-06	7,69E-09	1,27E-08	1,78E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,51E-10	8,78E-10	1,40E-09	4,68E-10	4,68E-10	4,68E-10	1,34E-08	3,34E-08	5,35E-08	-7,54E-09	-7,54E-09	-7,54E-09
SQP	[Pt]	5,86E+01	1,15E+02	1,71E+02	3,43E+00	5,67E+00	7,91E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,26E-01	3,15E-01	5,04E-01	1,02E-01	1,02E-01	1,02E-01	2,99E-01	7,47E-01	1,19E+00	-3,84E+00	-3,84E+00	-3,84E+00

Table 19: Additional indicators of environmental impacts per 1m² for the Trimoterm Power T façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Indicator	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
PM	[Disease incidences]	1,12E-06	1,70E-06	2,26E-06	5,12E-09	7,94E-09	1,08E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,42E-10	6,06E-10	9,69E-10	5,29E-09	5,29E-09	5,29E-09	7,27E-09	1,82E-08	2,91E-08	-1,68E-07	-1,68E-07	-1,68E-07
IRP	[kBq U235 eq.]	9,33E-01	1,16E+00	1,39E+00	2,37E-03	3,68E-03	4,99E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	3,95E-05	9,86E-05	1,58E-04	3,35E-04	3,35E-04	3,35E-04	1,26E-03	3,15E-03	5,04E-03	-4,41E-02	-4,41E-02	-4,41E-02
ETP-fw	[CTUe]	1,42E+02	2,49E+02	3,58E+02	6,51E+00	1,01E+01	1,37E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,42E-01	6,04E-01	9,66E-01	3,62E-01	3,62E-01	3,62E-01	6,14E-01	1,54E+00	2,46E+00	-5,30E+02	-5,30E+02	-5,30E+02
HTP-c	[CTUh]	4,44E-08	7,78E-08	1,11E-07	1,35E-10	2,09E-10	2,83E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,83E-12	1,46E-11	2,33E-11	8,64E-12	8,64E-12	8,64E-12	9,10E-11	2,27E-10	3,64E-10	-2,44E-10	-2,44E-10	-2,44E-10
HTP-nc	[CTUh]	2,06E-06	4,68E-06	7,31E-06	6,85E-09	1,06E-08	1,44E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,63E-10	6,58E-10	1,05E-09	4,68E-10	4,68E-10	4,68E-10	1,00E-08	2,51E-08	4,01E-08	-7,54E-09	-7,54E-09	-7,54E-09
SQP	[Pt]	4,83E+01	9,11E+01	1,34E+02	3,05E+00	4,74E+00	6,42E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,45E-02	2,36E-01	3,78E-01	1,02E-01	1,02E-01	1,02E-01	2,24E-01	5,60E-01	8,96E-01	-3,84E+00	-3,84E+00	-3,84E+00

Table 20: Additional indicators of environmental impacts per 1m² for the Trimoterm Perform R façade panel

		A1-A3			A4			A5			C1			C2			C3			C4			D		
		Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)			Panel thickness (mm)		
Indicator	Unit	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240	60	150	240
PM	[Disease incidences]	1,16E-06	1,80E-06	2,43E-06	5,33E-09	8,46E-09	1,16E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,69E-10	6,73E-10	1,68E-09	5,29E-09	5,29E-09	5,29E-09	8,08E-09	2,02E-08	3,23E-08	-1,68E-07	-1,68E-07	-1,68E-07
IRP	[kBq U235 eq.]	9,50E-01	1,20E+00	1,46E+00	2,47E-03	3,93E-03	5,38E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,38E-05	1,10E-04	2,74E-04	3,35E-04	3,35E-04	3,35E-04	1,40E-03	3,50E-03	5,60E-03	-4,41E-02	-4,41E-02	-4,41E-02
ETP-fw	[CTUe]	1,50E+02	2,68E+02	3,87E+02	6,77E+00	1,08E+01	1,47E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,68E-01	6,71E-01	1,68E+00	3,62E-01	3,62E-01	3,62E-01	6,82E-01	1,71E+00	2,73E+00	-5,30E+02	-5,30E+02	-5,30E+02
HTP-c	[CTUh]	4,69E-08	8,40E-08	1,21E-07	1,40E-10	2,22E-10	3,05E-10	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	6,48E-12	1,62E-11	4,05E-11	8,64E-12	8,64E-12	8,64E-12	1,01E-10	2,53E-10	4,04E-10	-2,44E-10	-2,44E-10	-2,44E-10
HTP-nc	[CTUh]	2,26E-06	5,17E-06	8,08E-06	7,13E-09	1,13E-08	1,55E-08	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,93E-10	7,31E-10	1,83E-09	4,68E-10	4,68E-10	4,68E-10	1,11E-08	2,79E-08	4,46E-08	-7,54E-09	-7,54E-09	-7,54E-09
SQP	[Pt]	5,17E+01	9,89E+01	1,46E+02	3,18E+00	5,05E+00	6,92E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,05E-01	2,63E-01	6,56E-01	1,02E-01	1,02E-01	1,02E-01	2,49E-01	6,22E-01	9,96E-01	-3,84E+00	-3,84E+00	-3,84E+00

4 Interpretation of results

Trimoterm Power S façade panel

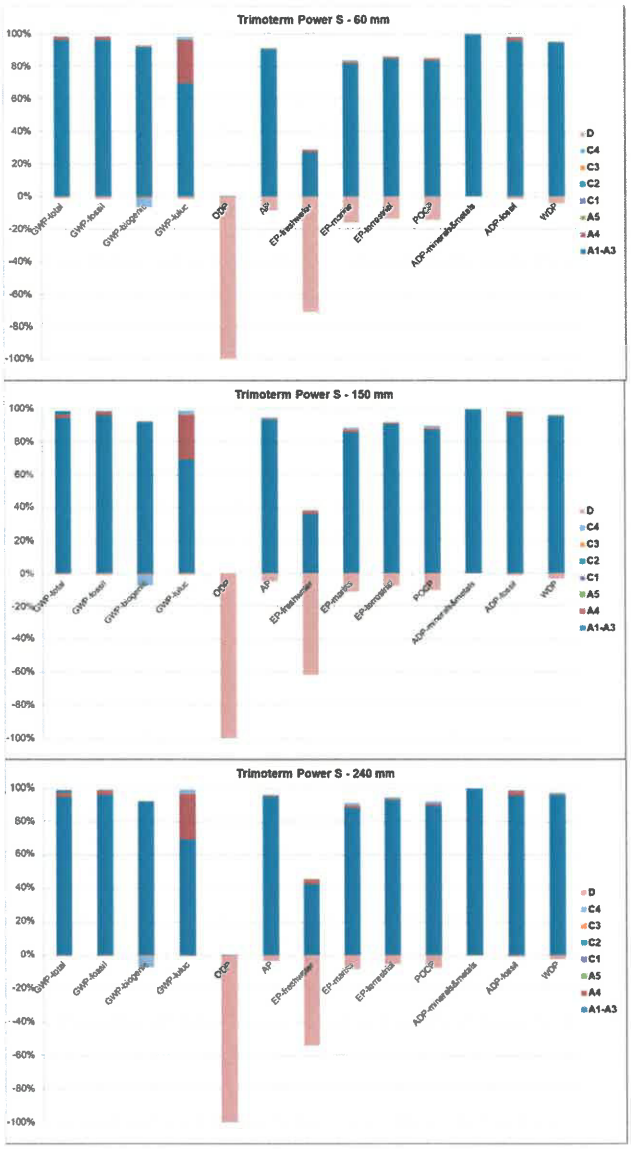

Figure 3: Relative contributions of the different life cycle stages (i.e. modules A1-A3, A4, A5, C1, C2, C3 C4 and D) to the environmental impact per 1m^2 of the Trimoterm Power S façade panels

It clear Figure 3 that the product stage (i.e. modules A1-A3) contributes the most to the environmental impact of the Trimoterm Power S façade panels. For example, the product stage represents on average 73,63% of the total environmental impact in terms of GWP–total (sum of GWP–fossil, GWP–biogenic and GWP–luluc), 75,07% of the total environmental impact in terms of ODP, 81,55% of the total environmental impact in terms of AP, 91,19% of the total environmental impact in terms of EP-freshwater, 75,75% of the total environmental impact in terms of EP–marine and 84,97% of the total environmental impact in terms of EP–terrestrial, on average 75,32% of the total environmental impact in terms of POCP, 99,11% of the total environmental impact in terms of ADP–minerals & metals, 81,21% of the total environmental impact in terms of ADP–fos and 81,67% of the total environmental impact in terms of WDP.

The other life cycle stage that has a more significant impact on the environmental burden associated with the life cycle of the Trimoterm Power S façade panels is the construction stage (i.e. module A4).

For example, module A4 represents on average 1,72% of the total environmental impact in terms of GWP–total (sum of GWP–fossil, GWP–biogenic and GWP–luluc), 0,06% of the total environmental impact in terms of ODP, 0,51% of the total environmental impact in terms of AP, 5,50% of the total environmental impact in terms of EP–freshwater, 1,03% of the total environmental impact in terms of EP–marine and 0,67% of the total environmental impact in terms of EP–terrestrial.

Figure 3 also shows that module A4 has a positive environmental impact in terms of POCP, where it presents 0,84% of the total impact in terms of the photochemical ozone creation potential (POCP).

The photochemical ozone (i.e, POCP) is generated by the sunlight-initiated oxidation of volatile organic compounds (VOCs) and carbon monoxide (CO) in the presence of nitrogen oxides (NOx). The VOCs react differently with different oxidants (e.g. ozone, NO_2) and therefore can either have negative or positive effects on the ozone formation. The negative value of the transport in terms of the POCP is related to the separation of

the NOx emissions into the NO_2 and NO emissions, with NO and O_3 (ozone) reacting to form NO_2 and O_2 during the night time and thus leading to a reduction of the POCP.

Furthermore, module A4 represents on average 0,16% of the total environmental impact in terms of ADP–minerals & metals, 2,09% of the total environmental impact in terms of ADP–fos and 0,54% of the total environmental impact in terms of WDP (see Figure 3).

On the other hand, it clear from Figure 3 that modules C2, C3 and C4 exert a minimal or no (i.e. modules A5 and C1) environmental burden in terms of the considered environmental impact categories. Moreover, the installation of the panels into the building (i.e. module A5) and the de–construction or demolition of the panels (i.e. module C1) are conducted manually.

A potential environmental benefit was calculated for benefits and loads beyond the system boundary stage (i.e. module D) for all the considered environmental impact categories. It clear from Figure 3 that there is a potential benefit from the reusing/recycling of the metal sheets, which can be obtained during the end-of-life stage of the Trimoterm Power S façade panels.

A potential environmental benefit can be seen in terms of the following impact categories: negligibly low 1,54% of the total impact in terms of GWP–total, 17,26% of the total impact in terms of AP, 71,07% of the total environmental impact in terms of EP–freshwater, 16,19% of the total environmental impact in terms of EP–marine and 13,86% of the total environmental impact in terms of EP–terrestrial, 14,62% of the total environmental impact in terms of POCP and 1,79% of the total environmental impact in terms of ADP-fos. The largest contributions to potential environmental benefit can be seen in terms of ODP (see Figure 3).

Trimoterm Power T façade panel

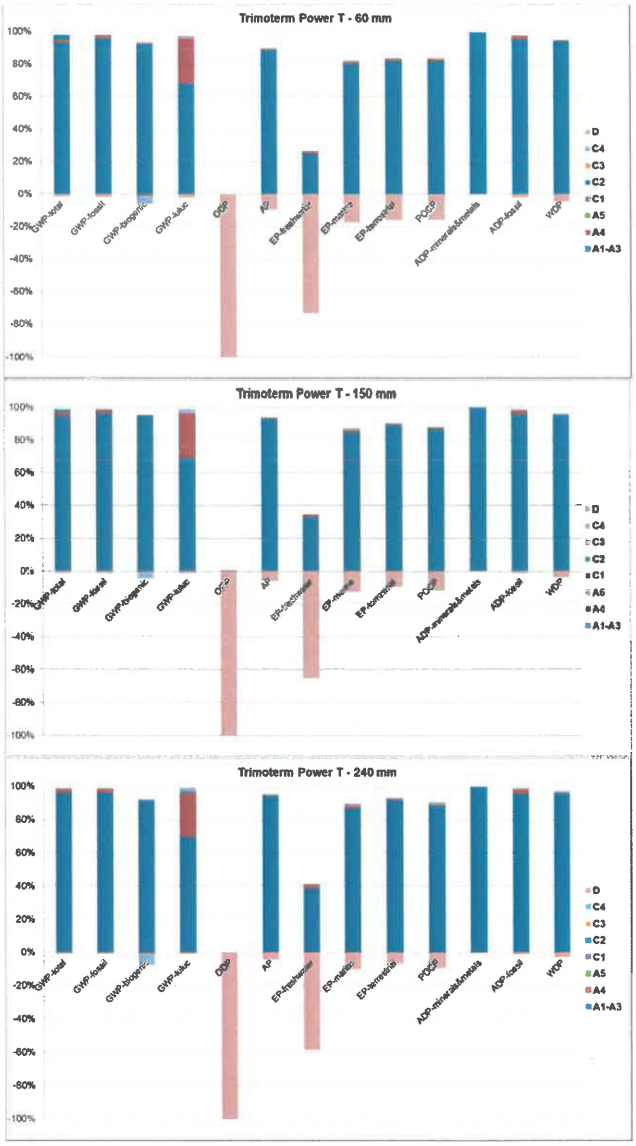

Figure 4: Relative contributions of the different life cycle stages (i.e. modules A1-A3, A4, A5, C1, C2, C3 C4 and D) to the environmental impact per 1m² of the Trimoterm Power T façade panels

It clear from Figure 4 that the product stage (i.e. modules A1-A3) contributes the most to the environmental impact of the Trimoterm Power T façade panels. For example, the product stage represents on average 71,95% of the total environmental impact in terms of GWP–total (sum of GWP–fossil, GWP–biogenic and GWP–luluc), 70,19% of the total environmental impact in terms of ODP, 79,07% of the total environmental impact in terms of AP, 91,13% of the total environmental

impact in terms of EP–freshwater, 73,78% of the total environmental impact in terms of EP–marine and 82,69% of the total environmental impact in terms of EP–terrestrial, on average 73,44% of the total environmental impact in terms of POCP, 99,13% of the total environmental impact in terms of ADP–minerals & metals, 79,81% of the total environmental impact in terms of ADP–fos and 78,91% of the total environmental impact in terms of WDP.

The other life cycle stage that has a more significant impact on the environmental burden associated with the life cycle of the Trimoterm Power T façade panels is the construction stage (i.e. module A4).

For example, module A4 represents on average 1,58% of the total environmental impact in terms of GWP–total (sum of GWP–fossil, GWP–biogenic and GWP–luluc), 0,07% of the total environmental impact in terms of ODP, 0,50% of the total environmental impact in terms of AP, 5,36% of the total environmental impact in terms of EP–freshwater, 0,97% of the total environmental impact in terms of EP–marine and 0,67% of the total environmental impact in terms of EP–terrestrial.

Figure 4 also shows that module A4 has a positive environmental impact in terms of POCP, where it presents 0,78% of the total impact in terms of the photochemical ozone creation potential (POCP).

The photochemical ozone (i.e. POCP) is generated by the sunlight-initiated oxidation of volatile organic compounds (VOCs) and carbon monoxide (CO) in the presence of nitrogen oxides (NOx). The VOCs react differently with different oxidants (e.g. ozone, NO_2) and therefore can either have negative or positive effects on the ozone formation. The negative value of the transport in terms of the POCP is related to the separation of the NOx emissions in the NO_2 and NO emissions, with NO and O_3 (ozone) reacting to form NO_2 and O_2 during the night time and thus leading to a reduction of the POCP.

Furthermore, module A4 represent on average 0,14% of the total environmental impact in terms of ADP–minerals & metals, 1,69% of the total environmental impact in terms of ADP–fos and 0,54% of the total environmental impact in terms of WDP (see Figure 4).

On the other hand, it clear from Figure 4 that modules C2, C3 and C4 exert a minimal or no (i.e. modules A5 and C1) environmental burden in terms of the considered environmental impact categories. Moreover, the installation of the panels into the building (i.e. module A5) and the de–construction or demolition of the panels (i.e. module C1) are conducted manually.

A potential environmental benefit was calculated for benefits and loads beyond the system boundary stage (i.e. module D) for all the considered environmental impact categories. It clear from Figure 4 that there is a potential benefit due to the reusing/recycling of the metal sheets, which can be obtained during the end-of-life stage of the Trimoterm Power T façade panels.

A potential environmental benefit can be seen in terms of the following impact categories: negligibly low 1,66% of the total impact in terms of GWP–total, 9,69% of the total impact in terms of AP, 73,24% of the total environmental impact in terms of EP–freshwater, 17,52% of the total environmental impact in terms of EP–marine and 15,93% of the total environmental impact in terms of EP–terrestrial, 15,69% of the total environmental impact in terms of POCP and 1,94% of the total environmental impact in terms of ADP–fos. The largest contributions to the potential environmental benefit can be seen in terms of ODP (see Figure 4).

Trimoterm Perform R façade panel

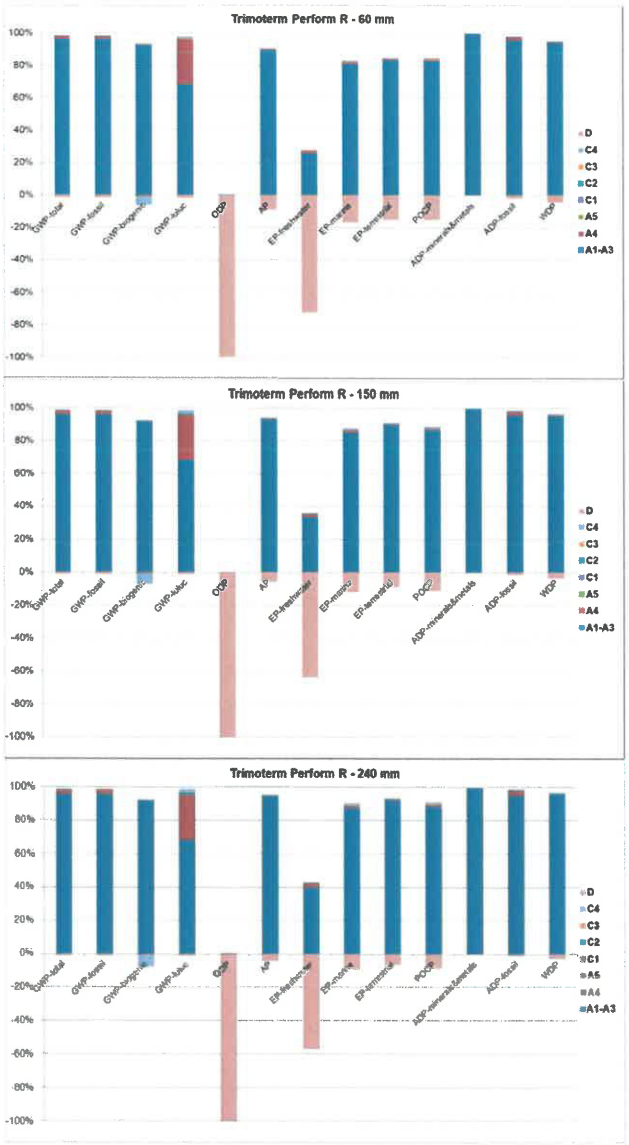

Figure 5: Relative contributions of the different life cycle stages (i.e. modules A1-A3, A4, A5, C1, C2, C3 C4 and D) to the environmental impact per 1m^2 of the Trimoterm Perform R façade panels

It clear from Figure 5 that the product stage (i.e., modules A1-A3) contributes the most to the environmental impact of the considered Trimoterm Perform R façade panels. For example, the product stage represents on average 72,27% of the total environmental impact in terms of GWP–total (sum of GWP–fossil, GWP–biogenic and GWP–luluc), 72% of the total environmental impact in terms of ODP, 79,98% of the total environmental impact in terms of AP, 91,14% of the total environmental impact in terms of EP-freshwater, 74,38% of the total environmental impact in terms of EP-marine and 83,50% of the total environmental impact in terms of EP-terrestrial, on average 74,02% of the total environmental impact in terms of POCP, 99,12% of the total environmental impact in terms of ADP–minerals & metals, 80,31% of the total environmental impact in terms of ADP–fos and 79,93% of the total environmental impact in terms of WDP.

The other life cycle stage that has a more significant impact on the environmental burden associated with the life cycle of the considered Trimoterm Perform R façade panels is the construction stage (i.e. module A4).

For example, module A4 represents on average 1,65% of the total environmental impact in terms of GWP–total (sum of GWP–fossil, GWP–biogenic and GWP–luluc), 0,07% of the total environmental impact in terms of ODP, 0,51% of the total environmental impact in terms of AP, 5,42% of the total environmental impact in terms of EP–freshwater, 0,99% of the total environmental impact in terms of EP–marine and 0,67% of the total environmental impact in terms of EP–terrestrial

Figure 5 also shows that module A4 has a positive environmental impact in terms of POCP, where it presents 0,80% of the total impact in terms of the photochemical ozone creation potential (POCP).

The photochemical ozone (i.e., POCP) is generated by the sunlight-initiated oxidation of volatile organic compounds (VOCs) and carbon monoxide (CO) in the presence of nitrogen oxides (NOx). The VOCs react differently with different oxidants (e.g. ozone, NO_2)and therefore can either have negative or positive effects on the ozone formation. The negative value of the transport in terms of the POCP is related to the separation of the NOx emissions in the NO_2 and NO emissions, with NO and O_3 (ozone) reacting to form NO_2 and O_2 during

the night time and thus leading to the a reduction of the POCP.

Further, module A4 represent on average 0,15% of the total environmental impact in terms of ADP–minerals & metals, 2,01% of the total environmental impact in terms of ADP–fos and 0,54% of the total environmental impact in terms of WDP. (see Figure 5).

On the other hand, it clear from Figure 5 that modules C2, C3 and C4 exert a minimal or no (i.e. modules A5 and C1) environmental burden in terms of the considered environmental impact categories. Moreover, the installation of the panels into the building (i.e. module A5) and the de-construction or demolition of the panels (i.e. module C1) are conducted manually.

A potential environmental benefit was calculated for benefits and loads beyond the system boundary stage (i.e. module D) for all the considered environmental impact categories. It can be seen from Figure 5 that there is a potential benefit due to the reusing/recycling of the metal sheets, which can be obtained during the end-of-life stage of Trimoterm Perform R façade panels.

A potential environmental benefit can be seen in terms of the following impact categories: negligibly low 1,62% of the total impact in terms of GWP–total, 9,33% of the total impact in terms of AP, 72,51% of the total environmental impact in terms of EP–freshwater, 17,07% of the total environmental impact in terms of EP–marine and 15,20% of the total environmental impact in terms of EP–terrestrial, 15,33% of the total environmental impact in terms of POCP and 1,89% of the total environmental impact in terms of ADP–fos. The largest contributions to the potential environmental benefit can be seen in terms of ODP (see Figure 5).

5 References

1. GaBi ts (version 9.5.2.49) modelling software
2. EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
3. EN ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework
4. EN ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines
5. EN ISO 14025:2010 Environmental labels and declarations - Type III environmental
6. Part B: Requirements on the EPD for Double skin metal faced sandwich panels. Institut Bauen und Umwelt e.V. (IBU). http://www.epd-online.com (Accessed: 18/06/2020)
7. Report No. 344/20-530-1, issue date: 12.10.2020

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The data specified in the EPD are calculated on the basis of the data provided by the manufacturer. In the event that the manufacturer's information is incorrect, calculations do not apply.