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FIRE SEALING SYSTEMS FOR PENETRATIONS WITH CABLES, PIPES AND VENTILATION DUCTS

Protega Novaflex, Protega Novatherm SP, Protega Ecomastic SP, Protega Novastripe, Protega Novapipe W, Protega Novapipe S and Protega Firestop

PROTEGA, AB

LIFE-CYCLE ASSESSMENT BACKGROUND REPORT

IN ACCORDANCE WITH EN 15804:2012+A2:2019 & ISO 14025

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1. INTRODUCTION/GENERAL ASPECTS

1.1 Terms used in the report

Manufacturer	Protega, AB
Products	Fire sealing systems for penetrations with cables, pipes and ventilation ducts: • Protega Novaflex, • Protega Novatherm SP, • Protega Ecomastic SP, • Protega Novastripe, • Protega Novapipe W • Protega Novapipe S • Protega Firestop
Production site	Verkstadsgatan 6B, SE-231 66, Trelleborg, Sweden
PCR	PCR – Construction products 2019:14, version 1.1
Standards	EN 15804:2012+A2:2019 & ISO 14025
Declared unit	1 kg of product
Data Period	2020

General information

The purpose of this study was to examine the environmental impacts of Products manufactured by Manufacturer and prepare environmental product declarations (EPD) according to PCR.

This report has been prepared in 28.02.2022.

1.2 Commissioner and practitioner of LCA study and date

Commissioner of the LCA study: The assessment was ordered by Manufacturer

External practitioner of the LCA study: The assessment has been conducted by Silvija Serapinaite, Vesta Consulting, UAB.

External verifier: The report was checked and verified by Vladimir Kočí, LCA Studio

1.3 Statement of assessment standards

The assessment and the resulting EPDs have been prepared according to the requirements of standards EN 15804:2012+A2:2019, ISO 14040:2006, ISO 14025:2010 and PCR.

1.4 Reasons for performing the LCA

The goal of the study has been to provide necessary data and documentation to produce an EPD according to the requirements of EN 15804:2012+A2:2019 and PCR, and to gain insight into the environmental impacts related to Products.

1.5 Intended application and target audience.

The results of this study will be published in an environmental product declaration for Products. The study does not support comparative assertions intended to be disclosed to the public.

Target audiences of the study are customers and other parties with an interest in the environmental impacts of the studied products. The EPD are used in both business-to-business (B2B) and business-to-consumer (B2C) communication.

2. SCOPE OF THE EPD PROJECT

2.1 Functional unit and declared unit

The declared unit of the study is 1 kg of fire sealing systems supplied to the client. Scope of the EPDs is cradle to gate with options, modules C1-C4 and module D.

Table 1. Dry content of products

NAME	DRY CONTENT	COEFFICIENT TO CALCULATE 1 KG OF DRY PRODUCT
Protega Novaflex	75%	0.75
Protega Novatherm SP	76%	0.76
Protega Ecomastic SP	77%	0.77
Protega Novastripe. Protega Novapipe W. Protega Novapipe S	72%	0.72
Protega Firestop	67%	0.67

2.2 Description of the product and technical parameters

The mastics are used indoor in systems for fire penetrations and linear seals. Products are white and water-based. These products are described as reactive mastics and they are optimized for different fire scenarios in different kind of structures and in both horizontal and vertical position. These products are used for linear seals in fire class up to EI240 and fire penetrations of cables, pipes and ducts in fire classes up to EI120.

In the event of a fire, the mastic maintains its resistance ability to prevent temperature increase and hot gases to penetrate the protected solution.

Figure 1. Mastics

Mastics and penetration systems has CE marking and represents that products comply with the EU‘s New Approach. Our products are manufactured in compliance with European Assessment Document (EAD) which specifies all requirements for factory made fire resistant mastics:

- European Assessment Document (EAD) EAD 350141-00-1106 "Linear joint and gap seals"
- European Assessment Document (EAD) EAD 350454-00-1104 "Penetration seals"
- EN 13501

Company is ISO certified with certification for both ISO 9001:2015 (Quality Standard) and ISO 14001:2015 (Environmental Standard).

Protega Novaflex, Protega Novatherm SP, Protega Ecomastic SP, Protega Novastripe, Protega Novapipe W, Protega Novapipe S and Protega firestop do not contain any hazardous substances exceeding the limit values in accordance with the /REACH Directive, Annex XVII/ and the /ECHA candidate list/ of substances of very high concern.

Components of the studied products are presented in the table below.

Table 2. Components of studied product

MATERIALS	VALUE	UNIT
Polymer dispersion -50%	35-50	% [m/m]
Pigment TiO2	0-8	% [m/m]
Ammonium polyphosphate	0-10	% [m/m]
Filler	35-45	% [m/m]
Dispersing agents	< 2,5	% [m/m]
Thixotropic agents	< 3	% [m/m]
Defoamers	< 2	% [m/m]
Coalescent	< 4,5	% [m/m]
Water	0.5-25	% [m/m]

Specifications of the studied products are presented in the table below.

Table 3. Product specifications

MATERIALS	VALUE	UNIT
Density	1300-1500	kg/m^3
Solids content	70-80	%
pH value	8-10	log10(aH+)
Fire resistance /EN1366-3, 4/,/EN13501-2/	EI30-240	min
Durability /EAD 350454-00-1104/, /EAD 350141-00-1106/	Type Z2	

Mastic products and systems are used in all kind of buildings. Today's need for all kind of installations means that building a network of pipes or cables in a building often means that you need to go through fire rated walls and floors. The linear seals are used to create tightness between i.e. connecting walls, door frames to walls.

2.3 System boundaries

2.3.1 System boundaries

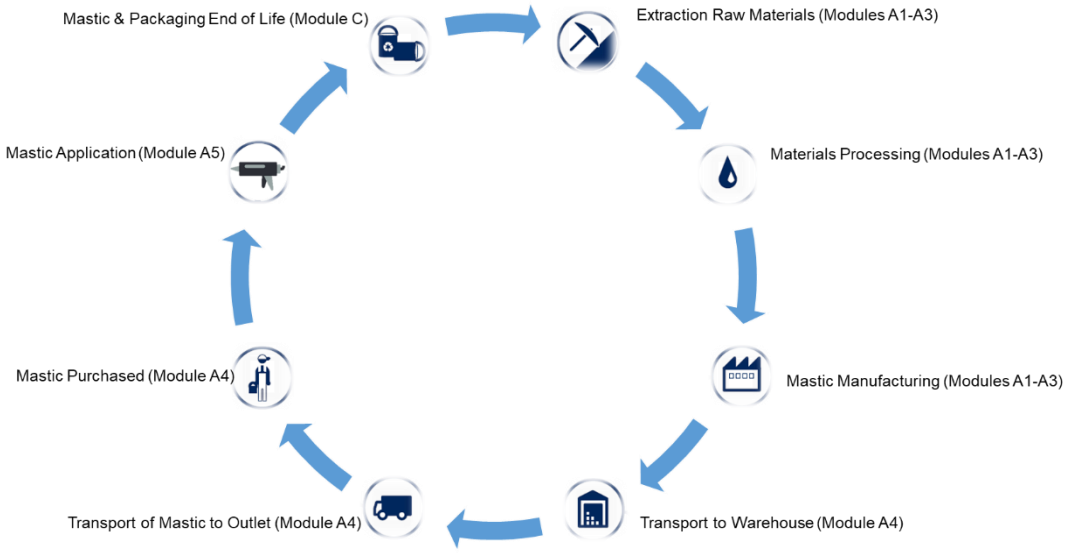
The type of scope of this study is cradle to gate with options, modules C1-C4 and module D. The study covers impacts of raw materials' production, their transportation to the production plant, manufacturing process, transportation of the products to the installation site, end-of-life stage, and resource recovery stage. Installation process and use stage are not covered by the study. Stages included in the study are marked in figure bellow.

Figure 2. Types of EPD with respect to life cycle stages covered and modules for the assessment

	PRODUCT STAGE			ASSEMBLY STAGE		USE STAGE							END OF LIFE STAGE				BEYOND THE SYSTEM BOUNDARIES
	Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction /demolition	Transport	Waste processing	Disposal	Reuse/Recovery/Recycling
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	x	x	x	x	x	MNR	MNR	MNR	MNR	MNR	MNR	MNR	x	x	x	x	x
Geography	EU	EU	EU	EU	EU	-	-	-	-	-	-	-	EU	EU	EU	EU	EU
Specific data used	>90%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Modules not declared = MND. Modules not relevant = MNR

System diagram:



A1 raw material supply

The environmental impacts of raw material supply include emissions generated when raw materials are taken from nature, transported to industrial units for processing and processed, along with waste handling from various production processes. All major upstream processes are taken into consideration, including infrastructure. Loss of raw material and energy transmission losses are also considered. This stage includes all raw materials which end up in the final products as well as materials used in production but not included in the final products such as packaging materials and other ancillary materials.

A2 transportation

The considered transportation impacts include exhaust emissions resulting from transportation of raw materials from suppliers to manufacturing facilities as well as the environmental impacts of production of the diesel used. The manufacturing, maintenance, and disposal of the vehicles as well as tyre and road wear during transportation have also been included. The transportation distances and methods were provided by Manufacturer.

A3 manufacturing

The environmental impacts considered for the production stage cover the materials and energy used in production but not included in the final products. The study considers also the losses occurring during the manufacturing processes. Also, the transmission losses of energy have been included.

2.3.2 Technical flowchart

The product is approximately 1/4 water; the remaining 3/4 comprises of binder, filler and additives that aid performance. Protega mastics are manufactured using dispersing units. All raw materials are checked and the quantity for a batch is weighed. Then all raw materials are mixed with water in the dispersing unit. After and during the batch preparation is an internal quality control carried out. The control includes technical quality characteristics relating to mastics and fire protection requirements. The internal control is supervised by external monitoring together with third party testing of some products. All these tests are made with well documented intervals.

2.3.3 Scenarios for analyses beyond cradle to gate

Scenarios included in the LCA base on realistic scenarios which are currently in use and are representative for one of the most likely scenario alternatives.

A4 Transportation to construction site

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions. According to producer transportation doesn't cause losses as product are packaged properly. Transport is calculated based on data form manufacturer and a scenario with the parameters described in the following table.

Table 4. **Transport parameters**

Parameter	Value/Description
Vehicle type used for transport	EURO 5 truck with a trailer with an average load of >32t and container ship
Distance	100 % of production: Truck – 573 km.
Capacity utilization	56 % of the capacity in volume (truck)

A5 Assembly into the building

The products can be applied using skeleton gun, sausage/sealant gun or spatula. Details concerning surface pre-treatment, application requirements and drying behaviour can be seen in the current technical information sheet (see www.protega.se).

B1-B7 Use stage

Repair/damage

Damages or repairs should be treated in the same way as new application with the mastics/systems using the quantities/dimensions described in TDS and/or certificate. Scrape or remove damaged surfaces to remove loose mastic.

End of life

End of life stage includes deconstruction (C1), transport to waste processing (C2), waste processing for reuse, recovery and/or recycling (C3) and disposal (C4).

The impact of building demolition has been considered negligible compared to other impacts of a building's life cycle. Mastics are currently not recycled. Therefore, recycling is not considered. The mastic is treated together with the substrate according as construction materials. The subcategory indoor wood and outdoor wood have an energy content and are assumed to be incinerated with energy recovery. The subcategory indoor wall and outdoor wall have a mineral substrate and thus no energy content and are assumed to be landfilled.

All of the end-of-life product is assumed to be sent to the closest facilities such as recycling and landfill. Transportation distance to the closest disposal area is estimated as 50 km and the transportation method is lorry which is the most common.

Landfill has been assumed as end-of-life scenario.

D benefits of recycling

Module D calculates the potential environmental benefits of the recycling or reuse of materials. This product has not considerable benefits due to recycling or/and reuse.

2.3.4 Assumptions about electricity consumption and other relevant background data

The impacts of electricity have been modelled based on Ecoinvent 3.6. PROTEGA, AB buys electricity which is combined from nuclear, hydro and wind/solar electricity. Electricity data was modelled according Sweden electricity production distributed by nuclear (boiling and pressure water reactor), hydro, wind/solar sources. Please find certificate of electricity guarantee of origin in ANNEX 4.

Table 5. **Electricity production distribution by nuclear, hydro and wind sources**

TYPE OF ENERGY RESOURCE	AMOUNT IN %
Hydro	54.5
Nuclear (boiling water reactor)	29.11
Nuclear (pressure water reactor)	13.69

Wind	2.7
Total	100.00

The impacts of heat production (from natural gas) and fuel usage have been modelled based on Ecoinvent 3.6. The resulting impact factor used in the calculation is presented in the table below.

Table 6. **Energy emission factors**

OBJECT	GWP VALUE	DATA QUALITY
Electricity production, nuclear (boiling water reactor) data quality and CO^2 emission kg CO^2 eq./kWh	0.0122 kg CO^2e/kWh	This dataset represents the production of high voltage electricity at a grid-connected nuclear boiling water reactor (BWR) in Sweden in 2012. Data of this CH dataset are scaled with a factor derived from the comparison of the efficiencies of Swiss BWR and those valid for this dataset in order to account for a higher or lower fuel input for the production of 1 kWh, respectively.
Electricity production, nuclear (pressure water reactor) data quality and CO^2 emission kg CO^2 eq./kWh	0.0113 kg CO^2e / kWh	This dataset represents the production of high voltage electricity at a grid-connected nuclear pressure water reactor (PWR) in Sweden in 2012.
Electricity production (hydro, run-of-river) data quality and CO^2 emission kg CO^2 eq./kWh	0.0039 kg CO^2e/kWh	This dataset represents the production of 1 kWh of electricity in a run-of-river power plant unit in Sweden in 2012. Run-of-river power plants are hydro power plants without reservoirs. Depending on the net head of the power plant, high-pressure, medium-pressure and low-pressure systems can be distinguished. Low-pressure power plants including river power stations and canal power plants are very common; therefore, these two types of run-of-river power stations are covered in the dataset. To some extent, high-pressure as well as medium-pressure run-of-river systems can be considered as reservoir power stations, e.g. as unit in plant groups that are dominated by storage power plants, but also include alpine run power stations.
Electricity production (wind) data quality and CO^2 emission kg CO^2 eq./kWh	0.025 kg CO^2e/kWh	This dataset represents the production of high voltage electricity at onshore grid-connected wind power plants with a capacity of more than 3MW (3MW excluded) in in Sweden in 2012. It includes operation and maintenance expenditures as well as infrastructure inputs. Wind load hours have

OBJECT	GWP VALUE	DATA QUALITY
		been adapted to local conditions (see parameters). At the moment, the class of onshore >3MW wind turbines is approximated with a 4.5 MW onshore wind turbine consisting of the infrastructure datasets for the wind turbine construction and the network connection construction.
Heat production, natural gas, at industrial furnace >100kw data quality and CO^2 emission kg CO^2 eq./kg	0.0687 kg CO^2e/MJ	The environmental impacts of the heat production are based on Ecoinvent 3.6 database. The module includes fuel input from high pressure (RER) network, infrastructure (boiler), emissions to air, and electricity needed for operation.

2.3.5 Cut-off criteria for initial inclusion of inputs and output

The study does not exclude any modules or processes which are stated mandatory in the EN 15804:2012+A2:2019 and PCR. The study does not exclude any hazardous materials or substances.

The study includes all major raw material and energy consumption. Processes excluded from the assessment and the related cut-off criteria are provided in table below.

Table 7. **List of excluded processes**

PROCESS EXCLUDED FROM STUDY	CUT-OFF CRITERIA	QUANTIFIED CONTRIBUTION FROM PROCESS
Used stage (B1-B7)	Not relevant. In normal use scenario, it is assumed that there is no maintenance (B2), repair (B3), replacement (B4) and refurbishment (B5) needed.	

2.3.6 Data quality requirements

Data quality meets requirements stated in PCR. Table below include information of data quality of this work.

Table 8. **Data quality information**

TYPE OF DATA	A1-A3	A4	C1-C4	D
Inventory data	Specific annual data from year 2020 collected from Manufacturer	Average from annual data from year 2020	Scenario base on Manufacturer information, generic data	Scenario base on Manufacturer information, generic data

		collected from Manufacturer		
Environmental data	Generic and specific data for Sweden, Europe or World (supplementary materials) not older than 5 years	Generic data for Sweden, Europe or World not older than 5 years	Generic data for Sweden, Europe or World not older than 5 years	Generic data for Sweden, Europe or World not older than 5 years

3. LIFE CYCLE INVENTORY ANALYSIS

3.1 Data collection procedures

Inventory data of product stage (A1-A3) was collected via questionnaire and personal contact with representative of Manufacturer. Questionnaire includes rows for data collection about annual quantities of used raw and supplementary including material losses as well as information about material suppliers, transportation distance and type. Also, annual energy and water consumption and waste generation data is collected via questionnaire. Information required for allocation of material flows asked personally.

For quantitative and qualitative descriptions of unit processes necessary to model life cycle stages of declared unit refer to ANNEX 1.

For all data sources please refer to ANNEX 2.

For all the print screens from One Click LCA toll please refer to ANNEX 3.

3.2 Validation of data

The quality requirements for the life cycle assessment were set according to the EN ISO 14044 standard (4.2.3.6) and the EN 15804 standard (6.3.7). The generic data used in modelling the input and output flows can be considered to be of good quality.

3.2.1 Procedures for collection process specific data

The quality of the specific data is consistent with the standards used. The data was examined prudently and clarification requested from Manufacturer when necessary. The data represents year 2020, which was the latest year with full year data. The study was commenced during the autumn/winter of 2021. All gathered data was used without excluding categories in advance following the system boundaries set in earlier chapters.

3.2.2 Criteria for choosing the generic data

One Click LCA tool and database was used to assess the upstream and downstream processes. One Click LCA -database represents the most recent data available in the form of EN 15804 compliant environmental product declarations (EPDs) as well as complementary data from Ecoinvent 3.6 database.

Ecoinvent is a widely used database which is commonly referenced in published life cycle studies. The data follows ISO14040/14044 standards. The data collected from Ecoinvent represents mainly Europe and is thus well suited to model the countries studied in this assessment. The most recent version of resources was chosen for calculations. It must me mentioned, that Ecoinvent does not provide all year specific data (i.e., the studied 2020), but the data represents a period of time, and thus the data can be considered to be temporally relevant.

3.2.3 Treatment of missing data

Whenever possible, the missing data gaps are covered by making conservative and relevant assumptions. Some estimations/assumptions to the specific data collected from Manufacturer were necessary due to the lack of data or detected anomalies. These are explained below.

- As it was impossible to collect energy consumption data separately for each product produced the in the plant, data was allocated. Allocation is based on annual production rate. Allocation is made with high accuracy and precision.
- Transportation distance of product to construction site is calculated according to all average data of transported products in 2020.
- Transportation distance of waste produced in manufacturing phase was assumed base on average location of nearest waste treatment station and waste incineration facility.

3.3 Allocation principles and procedures

3.3.1 Documentation and justification of allocation procedures

Avoiding allocation could not be avoided for following inputs as the information was only measured on factory process level:

- Electricity and gas consumptions reason for allocation: only measured on factory level;
- Municipal water use, reason for allocation: only measured on factory level;
- Waste from production, reason for allocation: only measured on factory level;
- Packaging for products: only measured on factory level.

Protega, AB also produces Intumescent paints for fire protection of wood and steel not only mastics.

Electricity and water consumption in production is counted according to the meter readings on monthly basis. According to this information the consumptions of electricity and water were allocated to the product groups Protega AB produce. Then, the flows allocated to the product group were divided among the annual production rate of specific group to declared unit.

Table 7. **Description of allocation procedure and justification**

DATA	COVERAGE	DESCRIPTION OF ALLOCATION PROCEDURE	JUSTIFICATION
Electricity	Data covers all production facilities, annual data 2020 supplied by the manufacturer	See description above	Allocation between the products is based on declared unit.
Gas	Data covers all production facilities, annual data 2020 supplied by the manufacturer	See description above	Allocation between the products is based on declared unit.
Water use	Data covers all production facilities, annual data 2020 supplied by the manufacturer	See description above	Allocation between the products is based on declared unit.
Waste	Data covers all production facilities, annual data 2020 supplied by the manufacturer	Data for the products were allocated according to annual production rate. Then, the flows allocated to the products were divided among the declared unit of product.	Allocation between the products is based on declared unit.
Packaging	Data covers all production facilities, annual data 2020 supplied by the manufacturer	Data for the products were allocated according to annual production rate. Then, the flows allocated to the products were divided among the declared unit of product.	Allocation between the products is based on declared unit.

4. LIFE CYCLE IMPACT ASSESSMENT

4.1 LCIA procedures, calculations and results of the study

The calculations were conducted using Bionova's own One Click LCA tool which is a cloud-based LCA software in compliancy with EN 15804 standard. The source of LCA data sets is Ecoinvent 3.6 or verified EN 15804 EPDs.

The manufacturing consumption data (i.e., data collected from Manufacturer) was entered into the following questionnaires.

The data is inserted into the following queries (LCA stages in parenthesis);

- General information; data regarding the manufacturer and the product as well as the assessment including units and coverage.
- Product materials (A1, A2 and A3); input flows of materials used in the product (Polymer dispersion, Pigment TiO, Ammonium polyphosphate, Filler, Dispersing agents, Thixotropic agents, Defoamers, Coalescent, Water) and their transportation distances to the manufacturer and transportation methods. Also, production volume (used as a divider in order to provide results per declared unit of product).
- Manufacturing (A3); input flows of electricity, gas and water used in the production. Also includes output flows of waste from the production.
- Delivery and installation (A4 and A5); mass of a declared unit of transported product, transportation distances and transportation methods; packaging elimination at stage A5.
- End of life (C1-C4, D); volume of product demolition, volume of material transported to treatment, volume of disposed product.

The software multiplies the added numeric inputs with the impact factors from the database and calculates the impacts for the studied stages as presented above.

LCA results of the studied product(s) are presented in the tables below.

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Environmental Information

Results for Protega Novaflex. Protega Novatherm SP. Protega Ecomastic SP. Protega Novastripe. Protega Novapipe W. Protega Novapipe S

Core environmental impact indicators according to 15804:2012+A2:2019

POTENTIAL ENVIRONMENTAL IMPACT PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	1.29E0	1.4E-2	1.81E-1	1.49E0	5.47E-2	1.69E-1	0	6.26E-3	0	8.96E-2	0
GWP-fossil	kg CO_2 eq.	1.28E0	1.4E-2	2.02E-1	1.5E0	5.52E-2	1.42E-1	0	6.25E-3	0	8.95E-2	0
GWP-biogenic	kg CO_2 eq.	8.75E-3	1.01E-5	-2.08E-2	-1.21E-2	4.01E-5	2.77E-2	0	3.33E-6	0	6.51E-5	0
GWP-luluc	kg CO_2 eq.	5.3E-4	4.25E-6	1.34E-4	6.69E-4	1.66E-5	7.55E-7	0	2.22E-6	0	3.89E-6	0
ODP	kg CFC_{-11} eq.	1.54E-7	3.29E-9	1.83E-8	1.76E-7	1.3E-8	2.11E-10	0	1.42E-9	0	2.46E-9	0
AP	mol H^+ eq.	1.18E-2	6.14E-5	7.48E-4	1.26E-2	2.32E-4	2.09E-5	0	2.55E-5	0	6.77E-5	0
EP-freshwater*	kg P eq	8.88E-4	1.14E-7	6.9E-6	8.95E-4	4.49E-7	2.86E-8	0	5.23E-8	0	1.43E-7	0
EP-marine	kg N eq.	9.99E-4	1.83E-5	1.54E-4	1.17E-3	6.99E-5	9.35E-6	0	7.59E-6	0	2.29E-5	0
EP-terrestrial	mol N eq.	1.01E-2	2.03E-4	1.52E-3	1.19E-2	7.72E-4	1.01E-4	0	8.38E-5	0	2.52E-4	0
POCP	kg NMVOC eq	3.74E-3	6.46E-5	5.78E-4	4.39E-3	2.48E-4	2.48E-5	0	2.57E-5	0	9.19E-5	0
ADP-minerals&metals **	kg Sb eq.	1.62E-5	2.38E-7	1.58E-6	1.8E-5	9.42E-7	2.93E-8	0	1.69E-7	0	8.52E-8	0
ADP-fossil	MJ	2.66E1	2.18E-1	5.9E0	3.27E1	8.59E-1	2.05E-2	0	9.43E-2	0	1.87E-1	0
WDP	m^3	6.61E-1	8.07E-4	9.46E-2	7.56E-1	3.19E-3	3.05E-4	0	3.03E-4	0	8.33E-3	0

Acronyms		GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential. Accumulated Exceedance; EP-freshwater = Eutrophication potential. fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential. fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential. Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential. deprivation-weighted water consumption * Required characterisation method and data are in kg P-eq. Multiply by 3.07 to get PO4e. **EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation. human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

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USE OF RESOURCES PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	9.28E-1	2.73E-3	5.87E-1	1.52E0	1.08E-2	3.38E-4	0	1.33E-3	0	3.24E-3	0
PERM	MJ	0	0	2.66E-1	2.66E-1	0	3.17E-4	0	0	0	0	0
PERT	MJ	9.28E-1	2.73E-3	8.54E-1	1.78E0	1.08E-2	6.55E-4	0	1.33E-3	0	3.24E-3	0
PENRE	MJ	1.96E1	2.18E-1	3.68E0	2.35E1	8.59E-1	2.05E-2	0	9.43E-2	0	1.87E-1	0
PENRM	MJ	1.37E0	0	2.23E0	3.59E0	0	0	0	0	0	0	0
PENRT	MJ	2.1E1	2.18E-1	5.9E0	2.71E1	8.59E-1	2.05E-2	0	9.43E-2	0	1.87E-1	0
SM	kg	1.14E-2	0	5.26E-4	1.19E-2	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	1.2E-2	4.52E-5	1.68E-3	1.37E-2	1.79E-4	3.55E-5	0	1.61E-5	0	2.1E-4	0
Acronyms		PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

PROTEGA

WASTE PRODUCTION PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2.96E-1	2.12E-4	8.08E-3	3.05E-1	8.34E-4	9.7E-4	0	9.57E-5	0	3.32E-4	0
Non-hazardous waste disposed	kg	1.41E0	2.33E-2	2.75E-1	1.71E0	9.23E-2	4.68E-2	0	6.57E-3	0	7.5E-1	0
Radioactive waste disposed	kg	2.97E-5	1.49E-6	2.01E-5	5.12E-5	5.89E-6	6.92E-8	0	6.46E-7	0	1.12E-6	0

OUTPUT FLOWS PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0	0	3.5E-2	3.5E-2	0	0	0	0	0	0	0
Material for recycling	kg	0	0	1E-3	1E-3	0	0	0	0	0	0	0
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0
Exported energy	MJ	0	0	0	0	0	0	0	0	0	0	0

ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930

POTENTIAL ENVIRONMENTAL IMPACT PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2 eq.	1.24E0	1.39E-2	1.92E-1	1.45E0	5.471E-2	1.417E-1	0	6.197E-3		6.358E-2	0
ODP	kg CFC_{-11} eq.	1.83E-7	2.61E-9	1.9E-8	2.05E-7	1.031E-8	1.83E-10	0	1.13E-9		1.959E-9	0
AP	kg SO_2 eq.	1.2E-2	3.07E-5	6.32E-4	1.27E-2	1.123E-4	1.438E-5	0	1.254E-5		2.979E-5	0
EP	kg PO_4^3 eq.	2.36E-3	5.98E-6	2.35E-4	2.6E-3	2.269E-5	1.157E-5	0	2.575E-6		2.996E-3	0
POCP	kg C_2H_4 eq.	5.47E-4	1.85E-6	4.82E-5	5.97E-4	7.117E-6	2.802E-7	0	8.251E-7		1.331E-5	0
ADP-minerals&metals	kg Sb eq.	1.62E-5	2.38E-7	1.58E-6	1.8E-5	9.419E-7	2.933E-8	0	1.69E-7		8.524E-8	0
ADP-fossil	MJ	2.66E1	2.18E-1	5.9E0	3.27E1	8.586E-1	2.051E-2	0	9.425E-2		1.867E-1	0
Acronyms		GWP = Global Warming Potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential; EP = Eutrophication potential; POCP = Formation of ozone of lower atmosphere; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption										

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM

POTENTIAL ENVIRONMENTAL IMPACT PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG	kg CO2e	1.28E0	1.4E-2	2.02E-1	1.5E0	5.52E-2	1.42E-1	0	6.25E-3	0	8.95E-2	0

Environmental Information

Results for Protega Firestop

Core environmental impact indicators according to 15804:2012+A2:2019

POTENTIAL ENVIRONMENTAL IMPACT PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	7.18E-1	1.06E-2	1.81E-1	9.1E-1	5.47E-2	1.69E-1	0	3.05E-3	0	8E-2	0
GWP-fossil	kg CO_2 eq.	7.15E-1	1.06E-2	2.02E-1	9.27E-1	5.52E-2	1.42E-1	0	3.04E-3	0	8E-2	0
GWP-biogenic	kg CO_2 eq.	2.64E-3	7.71E-6	-2.08E-2	-1.82E-2	4.01E-5	2.77E-2	0	2.21E-6	0	5.82E-5	0
GWP-luluc	kg CO_2 eq.	1.8E-4	3.19E-6	1.34E-4	3.18E-4	1.66E-5	7.55E-7	0	9.16E-7	0	3.48E-6	0
ODP	kg CFC_{-11} eq.	6.26E-8	2.49E-9	1.84E-8	8.34E-8	1.3E-8	2.11E-10	0	7.16E-10	0	2.19E-9	0
AP	mol H^+ eq.	2.22E-3	4.46E-5	7.49E-4	3.02E-3	2.32E-4	2.09E-5	0	1.28E-5	0	6.05E-5	0
EP-freshwater*	kg P eq	2.33E-4	8.63E-8	6.9E-6	2.4E-4	4.49E-7	2.86E-8	0	2.48E-8	0	1.28E-7	0
EP-marine	kg N eq.	4.11E-4	1.34E-5	1.54E-4	5.78E-4	6.99E-5	9.35E-6	0	3.85E-6	0	2.04E-5	0
EP-terrestrial	mol N eq.	4.56E-3	1.48E-4	1.52E-3	6.24E-3	7.72E-4	1.01E-4	0	4.26E-5	0	2.25E-4	0
POCP	kg NMVOC eq	1.6E-3	4.77E-5	5.79E-4	2.23E-3	2.48E-4	2.48E-5	0	1.37E-5	0	8.21E-5	0
ADP-minerals&metals	kg Sb eq.	6.64E-6	1.81E-7	1.58E-6	8.4E-6	9.42E-7	2.93E-8	0	5.2E-8	0	7.61E-8	0
ADP-fossil	MJ	1.62E1	1.65E-1	5.91E0	2.23E1	8.59E-1	2.05E-2	0	4.74E-2	0	1.67E-1	0
WDP	m^3	1.46E-1	6.14E-4	9.46E-2	2.41E-1	3.19E-3	3.05E-4	0	1.76E-4	0	7.44E-3	0
Acronyms		GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential. Accumulated Exceedance; EP-freshwater = Eutrophication potential. fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential. fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential. Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion											

		potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential. deprivation-weighted water consumption * Required characterisation method and data are in kg P-eq. Multiply by 3.07 to get PO4e. **EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation. human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

USE OF RESOURCES PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	2.74E-1	2.08E-3	5.88E-1	8.64E-1	1.08E-2	3.38E-4	0	5.96E-4	0	2.89E-3	0
PERM	MJ	0	0	2.66E-1	2.66E-1	0	3.17E-4	0	0	0	0	0
PERT	MJ	2.74E-1	2.08E-3	8.54E-1	1.13E0	1.08E-2	6.55E-4	0	5.96E-4	0	2.89E-3	0
PENRE	MJ	1.31E1	1.65E-1	3.68E0	1.69E1	8.59E-1	2.05E-2	0	4.74E-2	0	1.67E-1	0
PENRM	MJ	0	0	2.23E0	2.23E0	0	0	0	0	0	0	0
PENRT	MJ	1.31E1	1.65E-1	5.91E0	1.91E1	8.59E-1	2.05E-2	0	4.74E-2	0	1.67E-1	0
SM	kg	1.35E-3	0	5.26E-4	1.87E-3	0	0	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0	0	0	0	0	0
FW	m^3	3.13E-3	3.44E-5	1.68E-3	4.84E-3	1.79E-4	3.55E-5	0	9.86E-6	0	1.88E-4	0
Acronyms		PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water										

WASTE PRODUCTION PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2.31E-1	1.6E-4	8.08E-3	2.4E-1	8.34E-4	9.7E-4	0	4.6E-5	0	2.97E-4	0
Non-hazardous waste disposed	kg	3.78E-1	1.77E-2	2.75E-1	6.71E-1	9.23E-2	4.68E-2	0	5.09E-3	0	6.7E-1	0
Radioactive waste disposed	kg	1.16E-5	1.13E-6	2.01E-5	3.29E-5	5.89E-6	6.92E-8	0	3.25E-7	0	1E-6	0

OUTPUT FLOWS PER 1 KG OF PRODUCT

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0	0	3.5E-2	3.5E-2	0	0	0	0	0	0	0
Material for recycling	kg	0	0	1E-3	1E-3	0	0	0	0	0	0	0
Materials for energy recovery	kg	0	0	0	0	0	0	0	0	0	0	0
Exported energy	MJ	0	0	0	0	0	0	0	0	0	0	0

POTENTIAL ENVIRONMENTAL IMPACT PER 1 KG OF PRODUCT												
Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP	kg CO_2 eq.	6.87E-1	1.05E-2	1.92E-1	8.9E-1	5.471E-2	1.417E-1	0	3.018E-3	0	5.68E-2	0
ODP	kg CFC_{-11} eq.	6.12E-8	1.98E-9	1.9E-8	8.22E-8	1.031E-8	1.83E-10	0	5.689E-10	0	1.75E-9	0
AP	kg SO_2 eq.	1.83E-3	2.16E-5	6.32E-4	2.49E-3	1.123E-4	1.438E-5	0	6.195E-6	0	2.661E-5	0
EP	kg PO_4^3 eq.	8.76E-4	4.36E-6	2.35E-4	1.12E-3	2.269E-5	1.157E-5	0	1.251E-6	0	2.676E-3	0
POCP	kg C_2H_4 eq.	1.27E-4	1.37E-6	4.82E-5	1.77E-4	7.117E-6	2.80E-7	0	3.925E-7	0	1.189E-5	0
ADP-minerals&metals	kg Sb eq.	6.64E-6	1.81E-7	1.58E-6	8.4E-6	9.419E-7	2.933E-8	0	5.195E-8	0	7.615E-8	0
ADP-fossil	MJ	1.62E1	1.65E-1	5.91E0	2.23E1	8.586E-1	2.051E-2	0	4.735E-2	0	1.668E-1	0
Acronyms		GWP = Global Warming Potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential; EP = Eutrophication potential; POCP = Formation of ozone of lower atmosphere; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption										

ENVIRONMENTAL IMPACTS – GWP-GHG - THE INTERNATIONAL EPD SYSTEM

POTENTIAL ENVIRONMENTAL IMPACT PER 1 KG OF PRODUCT												
Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG	kg CO2e	7.15E-1	1.06E-2	2.02E-1	9.27E-1	5.52E-2	1.42E-1	0	3.04E-3	0	8E-2	0

5. LIFE CYCLE INTERPRETATION

Results for Protega Novaflex. Protega Novatherm SP. Protega Ecomastic SP. Protega Novastripe. Protega Novapipe W. Protega Novapipe S

As can be seen from the picture below total GWP emissions of studied products are dominated by the raw material extraction and processing (A1). These results are supported by the fact that product is made of chemical ingredients. 71.5% of total GWP emissions comes from A1 stage. Manufacturing is the next emission source of the product. 10.0% of total GWP emissions comes from A3 stage. Installation into the building is the third emission source for product (9.4% of total GWP emissions). The contribution of other life cycle stages is less comparing with others.

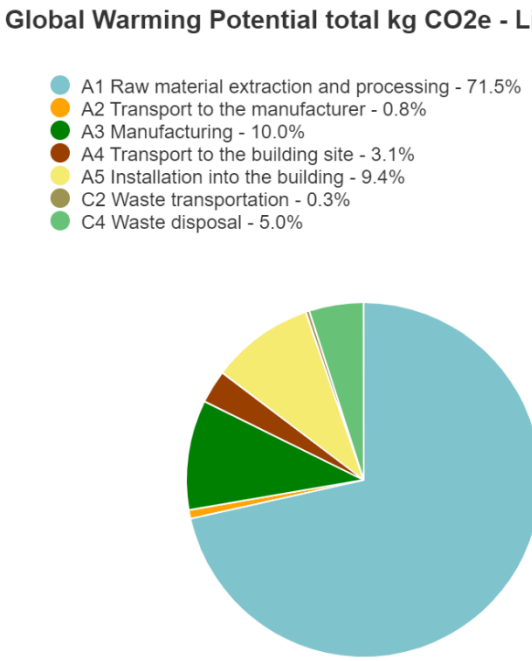

Figure 3. Total GWP emissions for studied products according to Life-cycle stages

Comparing CO_2 emission according to classifications we can see that biggest part of CO_2 comes from raw materials as well (72.1% of total GWP emissions). 9.4% of total GWP emissions comes from installation waste and 7.5% of total GWP – packaging materials for the product.

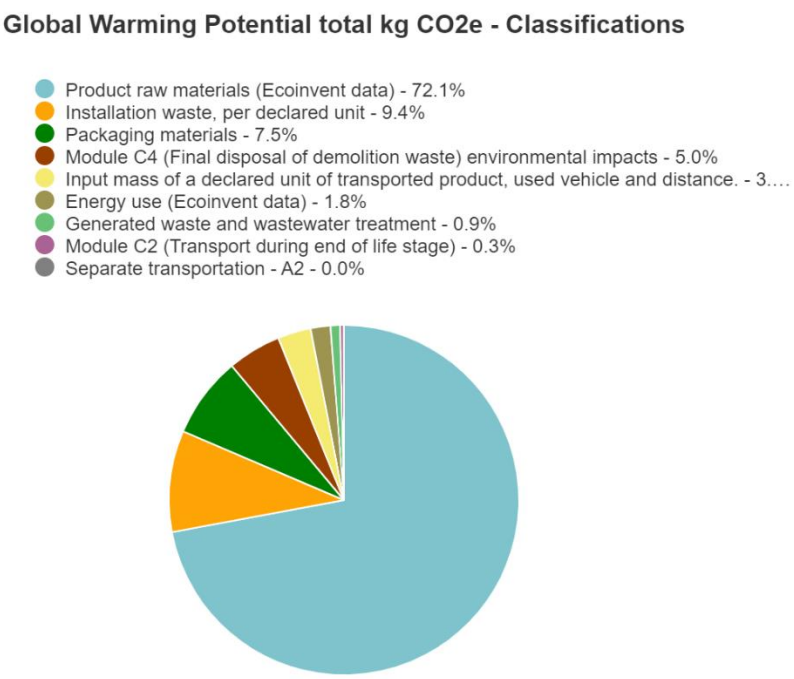

Figure 4. Total GWP emissions for studied products according to classifications

As it was mention before, below total GWP emissions of studied products are dominated by the raw material extraction and processing (A1). 39.7% of total GWP emissions comes from production of acrylic acid, 19.6% comes from Titanium dioxide production, 15.7% comes from aluminium hydroxide production and etc.

Table 8. **Most contributing materials**

RECOURSES	OF CRADLE TO GATE (A1-A3)
Acrylic acid production	39.7%
Titanium dioxide production, sulfate process	19.6%
Aluminium hydroxide production	15.7%
Propylene glycol production, liquid	12.1%
Thixotropic agent, e.g. Thixatrol ST	4.3%
Ammonium Polyphosphate (uncoated grade)	4.1%
Mineral oil based defoamers	3.0%
Disperbyk-190	1.5%
Market for tap water	0.0%

Results for Protega Firestop

As can be seen from the picture below total GWP emissions of studied products are dominated by the raw material extraction and processing (A1). These results are supported by the fact that product is made of chemical ingredients. 59% of total GWP emissions comes from A1 stage. Manufacturing is the next emission source of the product. 14.9% of total GWP emissions comes from A3 stage. Installation into the building is the third emission source for product (13.9% of total GWP emissions). The contribution of other life cycle stages is less comparing with others.

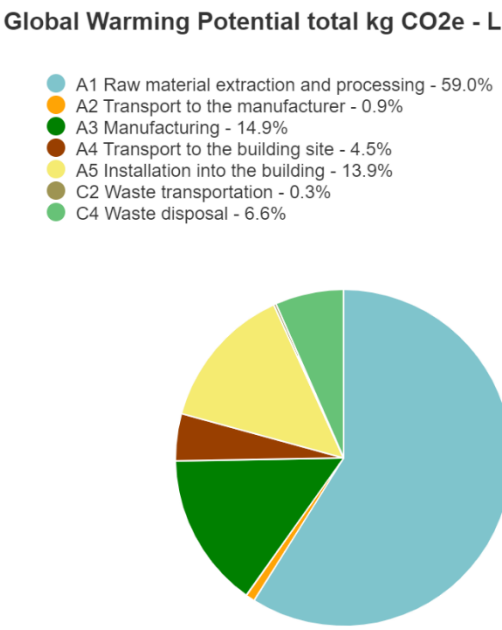

Figure 5. Total GWP emissions for studied products according to Life-cycle stages

Comparing CO_2 emission according to classifications we can see that biggest part of CO_2 comes from raw materials as well (59.5% of total GWP emissions). 13.9% of total GWP emissions comes from installation waste and 11.1% of total GWP – packaging materials for the product.

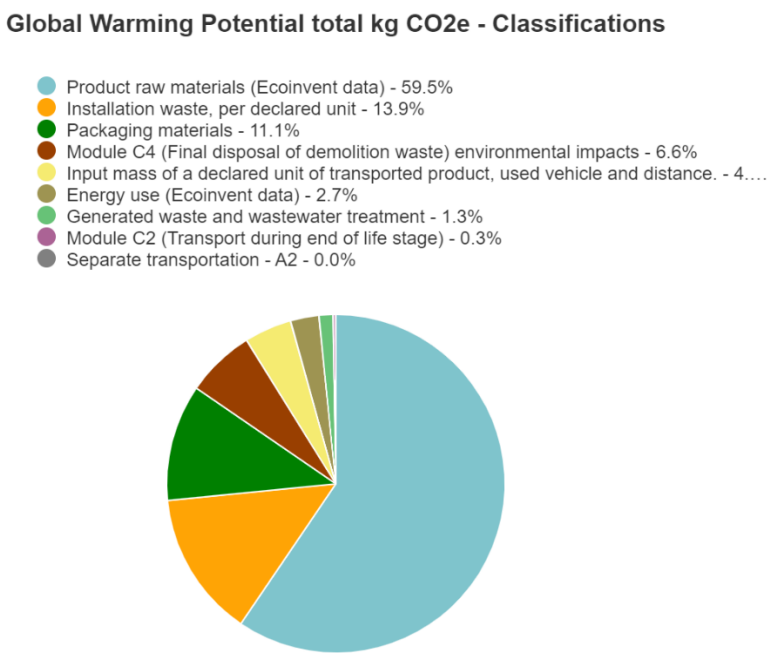

Figure 6. Total GWP emissions for studied products according to classifications

As it was mention before, below total GWP emissions of studied products are dominated by the raw material extraction and processing (A1). 61% of total GWP emissions comes from production of acrylic acid, 29.1% comes from aluminium hydroxide production and etc.

Table 9. Most contributing materials

RECOURSES	OF CRADLE TO GATE (A1-A3)
Acrylic acid production	61.0%
Aluminium hydroxide production	29.1%
Propylene glycol production, liquid	5.7%
Disperbyk-190	1.8%
Thixotropic agent, e.g. Thixatrol ST	1.7%
Mineral oil based defoamers	0.7%
Market for tap water	0.0%

6. REFERENCES

Standards and PCR'S

- ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations Principles and procedures.
- ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.
- ISO 14044:2006 Environmental management. Life cycle assessment. Requirements and guidelines.
- EN 15804:2012+A2:2019 Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products;
- PCR 2019:14 Construction products (version 1.1)

Data references:

- One Click LCA tool;
- Ecoinvent 3.6 database

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ANNEX 1: DATA TABLES FOR UNIT PROCESSES

Section1. Quantitative and Qualitative Descriptions of Unit Processes Necessary to Model Life Cycle Stages of Declared Unit

Mastics production has been modelled based on generic data concerning their production in Europe. The European level data can be considered to represent the studied country well, as the processes and technologies used. Electricity data point represents country specific data while gas data point – Europe. Waste treatment data has been modelled based on world generic data. World data was used for flows that have insignificant effect on final results. The world generic data was applied only when more specific data wasn't available. Thus, the data can be considered to be of good quality.

Section1.1. Production of raw material (A1)

The amount of raw materials was provided by Manufacturer according to 2020. Mastics are divided into three groups according the components.

Table 10. **Group of mastics**

MASTICS	NAME
Group 1	Protega Ecomastic SP
Group 2	Protega Novatherm SP
Group 3	Protega Novaflex, Protega Novastripe, Protega Novapipe W and Protega Novapipe S
Group 4	Protega Firestop

Mass flows of raw materials per declared unit taking in account material losses of the manufacturing process are presented in the table below. All the datapoints have been chosen according safety data sheets of chemicals. Mastic of group 4, differs more than 10% in total GWP, so it has separate calculations from the average.

Table 11. **Mass flows of raw materials**

RAW MATERIALS	MANUFACTURER	UNIT	GROUP 1	GROUP 2	GROUP 3	AVERAGE of GROUP 1-3	GROUP 4
Polymer dispersion - 50%	Celanese	kg	0.437	0.457	0.378	0.424	0.362
Pigment TiO2	Grupa Azoty	kg	0.041	0.071	0.041	0.051	0.000
Ammonium polyphosphate	Clariant	kg	0.000	0.000	0.082	0.027	0.000
Filler	Azelis	kg	0.426	0.376	0.398	0.400	0.412
Dispersing agents	BTC Nordic	kg	0.010	0.010	0.020	0.014	0.009
Thixotropic agents	Björn-Thorsen	kg	0.025	0.020	0.020	0.022	0.005
Defoamers	IMCD Nordic	kg	0.015	0.015	0.015	0.015	0.002
Coalescent	Brenntag Nordic	kg	0.041	0.041	0.041	0.041	0.009
Water	-	kg	0.005	0.010	0.005	0.007	0.201
TOTAL		kg	1.0	1.0	1.0	1.0	1.0

All the datapoints from ecoinvent database in One Click LCA tool have been chosen according safety data sheets of chemicals. The selection of chemicals in database is provided in the table below.

Table 12. **Datapoints selection**

RAW MATERIALS	MANUFACTURER	DATAPOINT
Polymer dispersion -50%	Celanese	60% - Acrylic acid production 40% - Water
Pigment TiO2	Grupa Azoty	Titanium dioxide production, sulfate process
Ammonium polyphosphate	Clariant	Ammonium Polyphosphate (uncoated grade) (CEPE)
Filler	Azelis	Aluminium hydroxide production
Dispersing agents	BTC Nordic	Disperbyk-190 (CEPE)
Thixotropic agents	Björn-Thorsen	Thixotropic agent, e.g. Thixatrol ST (CEPE)
Defoamers	IMCD Nordic	Mineral oil based defoamers (CEPE)
Coalescent	Brenntag Nordic	Propylene glycol production, liquid

CEPE is the European association of Paint, Printing Inks and Artists' colours manufacturers representing approximately 85% of the industry. There are various sub-sectors represented while one

of them, the decorating paints sector who is also involved in the Product Environmental Footprint pilot phase for Decorative paints.

Section1.2. Mass and energy flows of manufacturing process (A3)

Amount of packaging materials were provided by Manufacturer according to 2020.

Table 13. **Average packing material consumption, 2020**

MATERIAL CONSUMPTION	UNIT	
Plastic cartridges	kg	0.0467
Euro pallets	unit	0.00057

Wastes' amount ware calculated according declared unit.

Table 14. **Generated waste during manufacturing**

WASTE GENERATION	UNIT	VALUE	DESCRIPTION	TREATMENT
Combustible waste	kg	0.011	For incineration (Malmo)	Treatment of municipal solid waste
Cardboard packaging	kg	0.001	For recycling (Malmo)	Treatment of paper and carboard
IBC	kg	0.035	For re-use (Goteborg)	Materials for reuse
Wastewater	m3	0.00094		Treatment of wastewater in wastewater treatment plant

There is no waste from production, so there is no need for a mass balance.
Energy consumption was calculated according declared unit.

Table 12. **Energy consumption, 2020**

ENERGY	UNIT	VALUE
Electricity consumption (total)	kWh/kg	0.147
Hydro	kWh/kg	0.080
Nuclear (boiling water reactor)	kWh/kg	0.043
Nuclear (pressure water reactor)	kWh/kg	0.020
Wind	kWh/kg	0.004
Heat production, natural gas (for technology and heating)	kWh/kg	0.125

Section1.3. Transportation distance of input and output material flows of the whole life cycle (A2, A4, A5, C2)

The raw materials are transported (A2) to Production Site using road transportation. The distances and methods have been provided by Manufacturer and based on the location of their suppliers as well as known transportation methods.

According to producer transportation to construction site doesn't cause losses as products are transported properly. The distances and methods have been provided by Manufacturer and based on the location of their clients as well as known transportation methods according 2020.

Table 15. **Transportation to construction site (all 2020 data)**

DESTINATION	DISTRIBUTION (EXPORT) RATE, %	DISTANCE FOR LORRY, KM
Customer 1	31%	527
Customer 2	18%	1215
Customer 3	12%	310
Customer 4	12%	373
Customer 5	7%	37
Customer 6	6%	944
Customer 7	6%	285
Customer 8	6%	434

Table 16. **Transportation to construction site for declared unit**

DESTINATION	TRANSPORTED WEIGHT, KG	FIRST LEG DISTANCE, KM
Transported product by Lorry	1.06	573

Capacity of utilization for truck is 56% of the capacity in volume. Capacity of utilization for ferry is 50% of the capacity in volume.

Distance to waste treatment (C2) facility at the end-of-life. Scenarios related data is described in the section '2.3.3: Scenarios for analyses beyond cradle to gate'.

The raw materials are transported (A2) to Production Site using road and sea transportation. The distances and methods have been provided by Manufacturer and based on the location of their suppliers as well as known transportation methods.

Table 13. **Transportation distances and method**

	KM	TRANSPORTATION METHOD
Raw materials to manufacturer (A2)		
Polymer dispersion -50%	100	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Pigment TiO2	190	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
	120	Container ship, 50 % of the capacity in volume
Ammonium polyphosphate	820	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Filler	90	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Dispersing agents	62	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Thixotropic agents	69	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Defoamers	30	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Coalescent	30	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Plastic cartridges	985	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Transportation to waste treatment facility at construction-installation process (A5)	50	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume
Transportation to waste treatment facility at the end-of-life (C2)	50	EURO 5 truck with a trailer with an average load of 32t, 56 % of the capacity in volume

Section1.5. Construction-installation process

Module A5 Construction and installation process includes all materials and energy used for installation. At the same time, the transport and management of the waste produced is taken into account. The most common scenario for the analysed product is the application by using skeleton gun, sausage/sealant gun or spatula, so that, it does not require construction or installation prior to use. Details concerning surface pre-treatment, application requirements and drying behaviour can be seen in the current technical information sheet (see www.protega.se).

PARAMETER	VALUE/DESCRIPTION
Auxiliary materials for installation	Not evaluated
Other resources use	No other resource use

Quantitative description of energy type (regional mix) and consumption during the installation process	No energy consumption
Direct emissions to ambient air, soil and water	None
Output flow of materials (specified by type) resulting from the processing of waste at the site, i.e. during collection for recycling, recovery (recovery) or discharge (specifying the route)	The waste from the packaging (Euro pallets and Plastic cartridges) of the product is 100% collected and transported (50 km of distance) to waste treatment

Section1.5. Use stage

In normal use scenario, it is assumed that no maintenance (B2), repair (B3), replacement (B4) and refurbishment (B5) is needed during the 10 years of life of the product.

Damages or repairs should be treated in the same way as new application with the mastics. These changes are not taking into account.

Section1.6. End-of-life and end-of-waste material flows (C1-C4)

Assumption related to end-of-life (C1-C4) modules are described in the section '2.3.3: Scenarios for analyses beyond cradle to gate'. The impact of building demolition has been considered negligible compared to other impacts of a building's life cycle. As it was assumed that building waste, which cannot be recycled or reused is transported to the incineration plant. Products are transported by truck with a 16-32-ton trailer. A transport distance of 50 km has been considered. On account of their shares of organic products, Protega Novaflex, Protega Novatherm SP, Protega Ecomastic SP, Protega Novastripe, Protega Novapipe W and Protega Novapipe S have a substance-inherent energy content which can be recovered in incineration plants.

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ANNEX 2: SOURCES OF DATA FOR THE LCA

Environmental resources applied in calculation and related flows are presented in the table below.

RESOURCE NAME	ENVIRONMENT DATA SOURCE	DATE	EPD NUMBER	STANDARD	REFERENCE FLOW	GEOGRAPHICAL REPRESENTATION	RESULT CATEGORY
Acrylic acid production	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: diesel, burned in building machine	World	C1
Aluminium hydroxide production	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: aluminium hydroxide	Europe	A1 A2 A1-A3
Ammonium Polyphosphate (uncoated grade)	CEPE database v3.0 (2016)	2016		EN15804+A1, EN15804+A2	CEPE	Europe	A1 A2 A1-A3
Diesel, burned in building machine	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: diesel, burned in building machine	World	C1
Direct emission to air: Carbon dioxide, non-fossil	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2		World	A3 A1-A3
Disperbyk-190	CEPE database v3.0 (2016)	2016		EN15804+A1, EN15804+A2	CEPE	Europe	A1 A2 A1-A3
Electricity production, hydro, run-of-river	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: electricity, high voltage	Sweden	A3 A1-A3
Electricity production, nuclear, boiling water reactor	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: electricity, high voltage	Sweden	A3 A1-A3
Electricity production, nuclear, pressure water reactor	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: electricity, high voltage	Sweden	A3 A1-A3

RESOURCE NAME	ENVIRONMENT DATA SOURCE	DATE	EPD NUMBER	STANDARD	REFERENCE FLOW	GEOGRAPHICAL REPRESENTATION	RESULT CATEGORY
Electricity production, wind, >3mw turbine, onshore	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: electricity, high voltage	Sweden	A3 A1-A3
Eur-flat pallet production	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: eur-flat pallet	Europe	A3 A1-A3
Heat production, natural gas, at industrial furnace >100kw	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: heat, district or industrial, natural gas	Europe	A3 A1-A3
Injection moulding	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: injection moulding	Europe	A3 A1-A3
Market for polyethylene, high density, granulate	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: polyethylene, high density, granulate	World	A2 A3 A1-A3
Market for tap water	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: tap water	Europe	A1 A2 A1-A3
Materials for re-use	-	2021		EN15804+A1, EN15804+A2		World	A3 A1-A3
Mineral oil based defoamers	CEPE database v3.0 (2016)	2016		EN15804+A1, EN15804+A2	CEPE	Europe	A1 A2 A1-A3
Propylene glycol production, liquid	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: propylene glycol, liquid	Europe	A1 A2 A1-A3
Thixotropic agent, e.g. Thixatrol ST	CEPE database v3.0 (2016)	2016		EN15804+A1, EN15804+A2	CEPE	Europe	A1 A2 A1-A3

RESOURCE NAME	ENVIRONMENT DATA SOURCE	DATE	EPD NUMBER	STANDARD	REFERENCE FLOW	GEOGRAPHICAL REPRESENTATION	RESULT CATEGORY
Titanium dioxide production, sulfate process	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: titanium dioxide	Europe	A1 A2 A1-A3
Transported mass				EN15804+A1, EN15804+A2			A2 A1-A3
Treatment of municipal solid waste, incineration	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: municipal solid waste	World	A3 A1-A3
Treatment of waste paint, sanitary landfill	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: waste paint	Europe	C4
Treatment of waste paperboard, unsorted, sorting	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: waste paperboard, sorted	World	A3 A1-A3
Treatment of waste wood, post-consumer, sorting and shredding	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: wood chips, from post-consumer wood, measured as dry mass	World	A5
Treatment of wastewater, average, capacity 4.7e10l/year	ecoinvent 3.6	2019		EN15804+A1, EN15804+A2	Reference product: wastewater, average	Switzerland	A3 A1-A3

ANNEX 3: SCREENSHOTS OF DATA INPUT

Input for Protega Novaflex. Protega Novatherm SP. Protega Ecomastic SP. Protega Novastripe. Protega Novapipe W. Protega Novapipe S

1. Manufacturing materials - A1 1 kg CO_2e - 77 % 1 kg mass

If you are using recycled or reused materials as inputs for your product, the 'polluter pays' principle of EN15804 is applied, which in practical terms means that product impacts are counted towards your product only after 'End of Waste' status (see TR 16970 Guidance for the implementation of EN 15804, 6.2.2). If you use raw materials that are wastes, then their impacts are for your product. However, additional processing required for your products will still need to be accounted. To identify such materials in the database, you can set 'Characteristics' filter to 'Global Warming Potential is Zero'.

Product raw materials (Ecoinvent data) Compare answers Create a group Move materials

Input here materials that go into the product itself, including water if part of product recipe. Packaging and ancillary production materials (e.g. oils and gases) are not inputted here.

Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers		Production losses, %	Use for +A1/+A2/TRACI	Allocation, %	
Ammonium Polyphosphate (uncoated gr	0,0272	kg	1.0	kg	0,06kg - 3%	Ammonium polyphosphate		820	Market for transport		Market for transport	Included in quantity	All	100	Change
Aluminium hydroxide production (Ref	0,4000	kg	1.0	kg	0,21kg - 12%	Filler		90	Market for transport		Market for transport	Included in quantity	All	100	Change
Disperbyk-190 (CEPE)	0,0136	kg	1.0	kg	0,02kg - 1%	Dispersing agents		62	Market for transport		Market for transport	Included in quantity	All	100	Change
Thixotropic agent, e.g. Thixatrol S	0,0220	kg	1.0	kg	0,06kg - 3%	Thixotropic agents		69	Market for transport		Market for transport	Included in quantity	All	100	Change
Mineral oil based defoamers (CEPE)	0,0153	kg	1.0	kg	0,04kg - 2%	Defoamers		30	Market for transport		Market for transport	Included in quantity	All	100	Change
Market for tap water (Reference pro	0,0068	kg	1.0	kg	~0kg - ~0%	Water			Market for transport		Market for transport	Included in quantity	All	100	Change
Market for tap water (Reference pro	0,1695	kg	1.0	kg	~0kg - 0,1%	Polymer dispersion		100	Market for transport		Market for transport	Included in quantity	All	100	Change
Acrylic acid production (Reference	0,2542	kg	1.0	kg	0,51kg - 30%	Polymer dispersion		100	Market for transport		Market for transport	Included in quantity	All	100	Change
Propylene glycol production, liquid	0,0407	kg	1.0	kg	0,16kg - 9%	Coalescent		30	Market for transport		Market for transport	Included in quantity	All	100	Change
Titanium dioxide production, sulfat	0,0508	kg	1.0	kg	0,25kg - 15%	Pigment TiO2		120	Market for transport	190	Market for transport	Included in quantity	All	100	Change

Product raw materials (EPDs from One Click LCA) Compare answers Create a group Move materials

+ Click to input data

2. Ancillary and packaging materials - A3

0.17 kg CO_2e - 10 %

Packaging materials Compare answers Create a group Move materials

Input here packaging materials used to ship and protect the product, if any

Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers		Use for +A1/+A2/TRACI	Allocation, %	
Market for polyethylene, high densi	0,0467	kg	1.0	kg	0,12kg - 7%	Plastic cartridges		896	Market for transport		Market for transport	All	100	Change
Injection moulding (Reference produ	0,0467	kg	1.0	kg	0,05kg - 3%	Plastic cartridges			Market for transport		Market for transport	All	100	Change
Eur-flat pallet production (Referen	0,00056622	unit	0.01	kg	~0kg - 0,2%	Euro pallets			Market for transport		Market for transport	All	100	Change

Ancillary materials Compare answers Create a group Move materials

Add here the materials used in the manufacturing process that are not part of the final product, such as welding gases or oils used in the process.

Start typing or click the arrow

3. Additional transport - A1 & A2

0 kg CO_2e 0.01 kg mass

Separate transportation - A2 Compare answers Create a group Move materials

Input raw material masses, used vehicle and distances (only for transportation that is not reported earlier)

Start typing or click the arrow

Resource	Quantity		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers		Use for +A1/+A2/TRACI	Allocation, %	LCA Stage	
Transported mass	0,0136	kg	~0kg - ~0%	Euro pallets		30	Market for transport		Market for transport	All	100	A2	Change

Transportation fuels Compare answers Create a group Move materials

Start typing or click the arrow

1. Manufacturing energy use - A3

0.03 kg CO_2e - 2 %

According to EN 15804 and ISO 21930, the generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport are included in the A1-A3 life-cycle stages with variance between the stanc definition. Using renewable electricity in the product calculation is possible, if the manufacturer can demonstrate procurement of renewable electricity with sourcing certificates.
If this is applied, renewable electricity sourcing needs to be maintained for the whole validity of the EPD.
If manufacturing is exporting energy outside the system boundary, please insert those as separate negative flows here.

Energy use (Ecoinvent data) Compare answers Create a group Move materials

Input here manufacturing process energy use. Also include energy used for any internal transport.

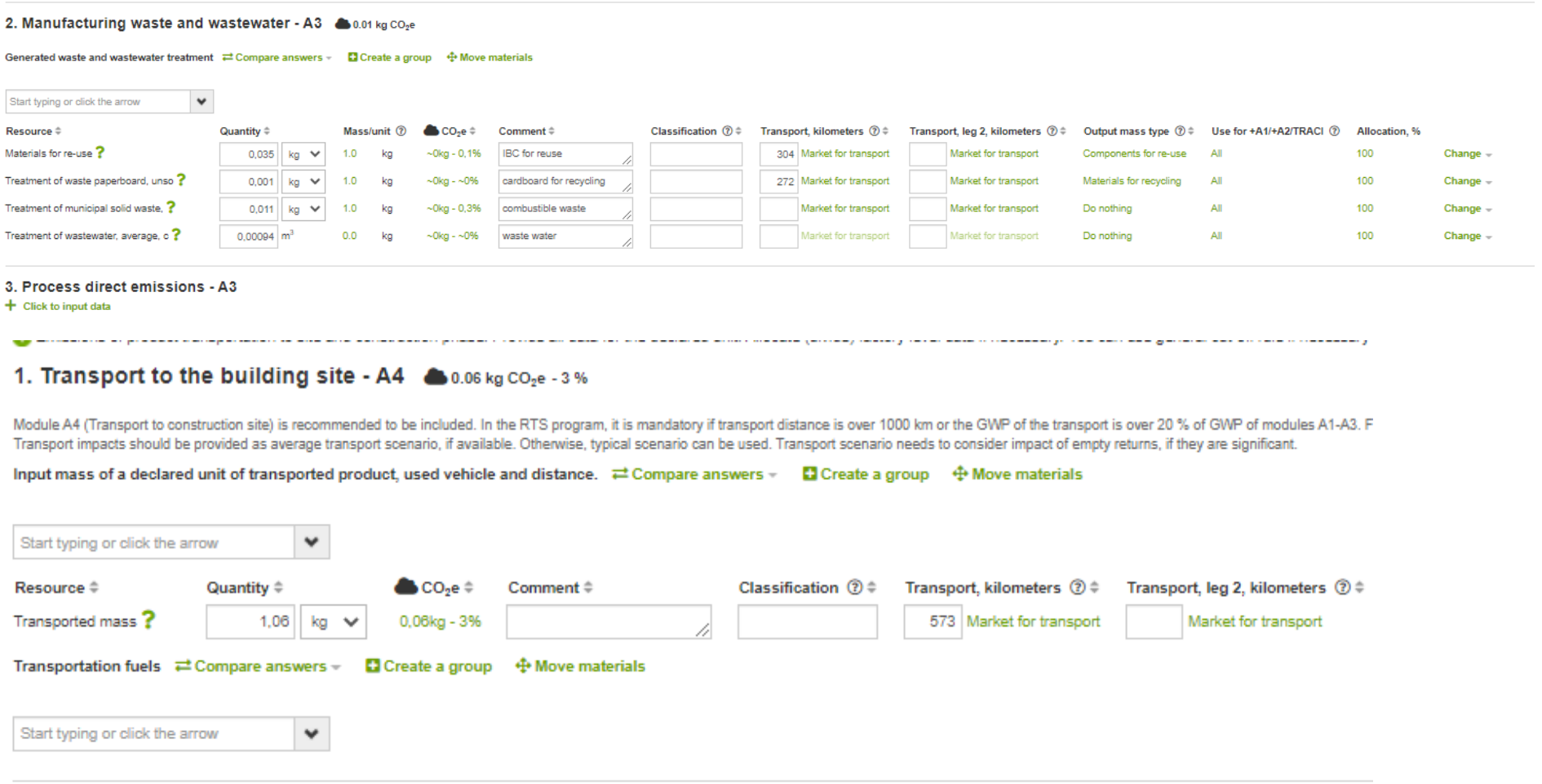
Start typing or click the arrow

Resource	Quantity		CO_2e	Comment	Classification	Use for +A1/+A2/TRACI	Allocation, %	
Electricity production, hydro, run-	0,08	kWh	~0kg - ~0%	Hydro		All	100	Change
Electricity production, nuclear, bo	0,043	kWh	~0kg - ~0%	nuclear, PWR		All	100	Change
Electricity production, nuclear, pr	0,02	kWh	~0kg - ~0%	nuclear, BWP		All	100	Change
Electricity production, wind, >3mw	0,004	kWh	~0kg - ~0%	Wind		All	100	Change
Heat production, natural gas, at in	0,125	kWh	0,03kg - 2%	Gas		All	100	Change
Market for tap water (Reference pro	0,76	kg	~0kg - ~0%	Water		All	100	Change

Energy use (LCA profiles from One Click LCA) Compare answers Create a group Move materials

Input here manufacturing process energy use. Also include energy used for any internal transport.

Start typing or click the arrow



2. Manufacturing waste and wastewater - A3 0.01 kg CO_2e

Generated waste and wastewater treatment | Compare answers | Create a group | Move materials

Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers		Output mass type	Use for +A1/+A2/TRACI	Allocation, %	
Materials for re-use	0,035	kg	1.0	kg	~0kg - 0,1%	IBC for reuse		304	Market for transport		Market for transport	Components for re-use	All	100	Change
Treatment of waste paperboard, unso	0,001	kg	1.0	kg	~0kg - ~0%	cardboard for recycling		272	Market for transport		Market for transport	Materials for recycling	All	100	Change
Treatment of municipal solid waste,	0,011	kg	1.0	kg	~0kg - 0,3%	combustible waste			Market for transport		Market for transport	Do nothing	All	100	Change
Treatment of wastewater, average, c	0,00094	m^3	0.0	kg	~0kg - ~0%	waste water			Market for transport		Market for transport	Do nothing	All	100	Change

3. Process direct emissions - A3

Click to input data

1. Transport to the building site - A4 0.06 kg CO_2e - 3 %

Module A4 (Transport to construction site) is recommended to be included. In the RTS program, it is mandatory if transport distance is over 1000 km or the GWP of the transport is over 20 % of GWP of modules A1-A3. F
Transport impacts should be provided as average transport scenario, if available. Otherwise, typical scenario can be used. Transport scenario needs to consider impact of empty returns, if they are significant.

Input mass of a declared unit of transported product, used vehicle and distance. Compare answers | Create a group | Move materials

Start typing or click the arrow

Resource	Quantity		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers	
Transported mass	1,06	kg	0,06kg - 3%			573	Market for transport		Market for transport

Transportation fuels Compare answers | Create a group | Move materials

Start typing or click the arrow

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2. Installation into the building - A5

0.14 kg CO_2e - 8 % 0.17 kg mass

Installation resources and outputs, per declared unit (Ecoinvent) Compare answers Create a group Move materials

Start typing or click the arrow

Installation resources and outputs, per declared unit (EPDs from One Click LCA) Compare answers Create a group Move materials

Start typing or click the arrow

Installation waste, per declared unit Compare answers Create a group Move materials

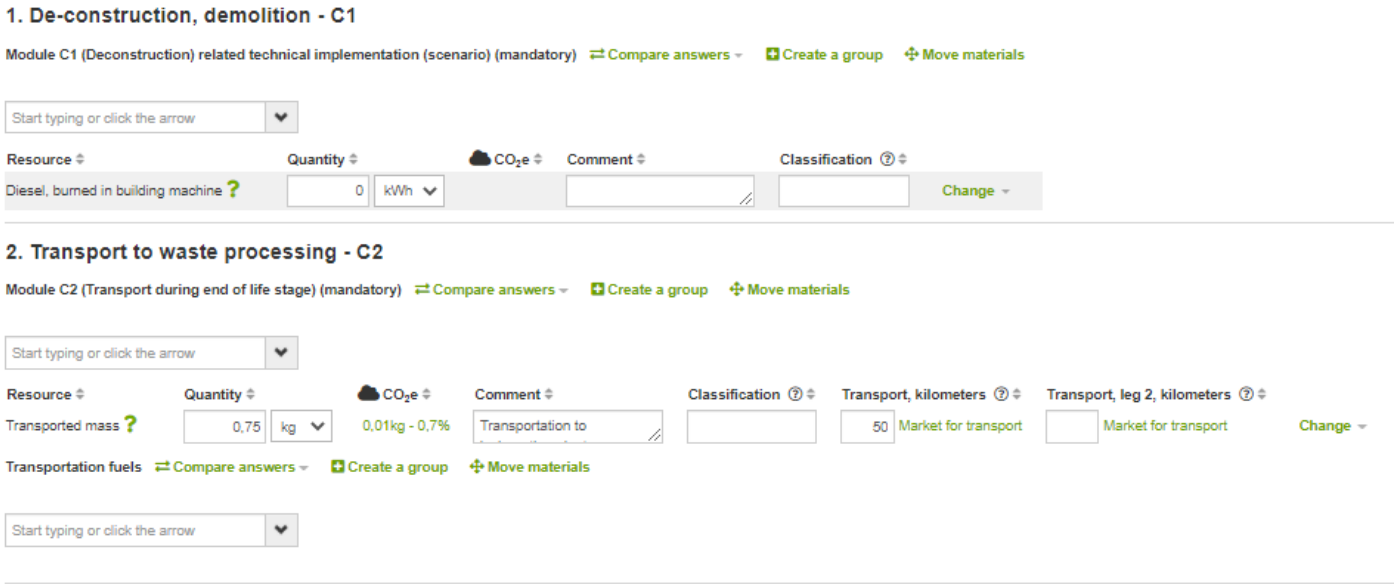
Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers		Use for +A1/+A2/TRACI	Output mass ty
Treatment of waste wood, post-consu	0,0136	kg	1.0	kg	~0kg - ~0%	Euro pallets		50	Market for transport		Market for transport	All	Do nothing
Direct emission to air: Carbon diox	0,0523045	kg	1.0	kg		To eliminate biogenic minus			Market for transport		Market for transport	All	Do nothing
Treatment of waste polyethylene, mu	0,0467	kg	1.0	kg	0,14kg - 8%	Treatment of packaking		50	Market for transport		Market for transport	All	Do nothing

Separate transportation Compare answers Create a group Move materials

Input raw material masses, used vehicle and distances (only for transportation that is not reported earlier)

Start typing or click the arrow


1. De-construction, demolition - C1
Module C1 (Deconstruction) related technical implementation (scenario) (mandatory)
Compare answers
Create a group
Move materials
Start typing or click the arrow
Resource
Quantity
CO2e
Comment
Classification
Diesel, burned in building machine
0
kWh
Change
2. Transport to waste processing - C2
Module C2 (Transport during end of life stage) (mandatory)
Compare answers
Create a group
Move materials
Start typing or click the arrow
Resource
Quantity
CO2e
Comment
Classification
Transport, kilometers
Transport, leg 2, kilometers
Transported mass
0,75
kg
0,01kg - 0,7%
Transportation to
50
Market for transport
Market for transport
Change
Transportation fuels
Compare answers
Create a group
Move materials
Start typing or click the arrow

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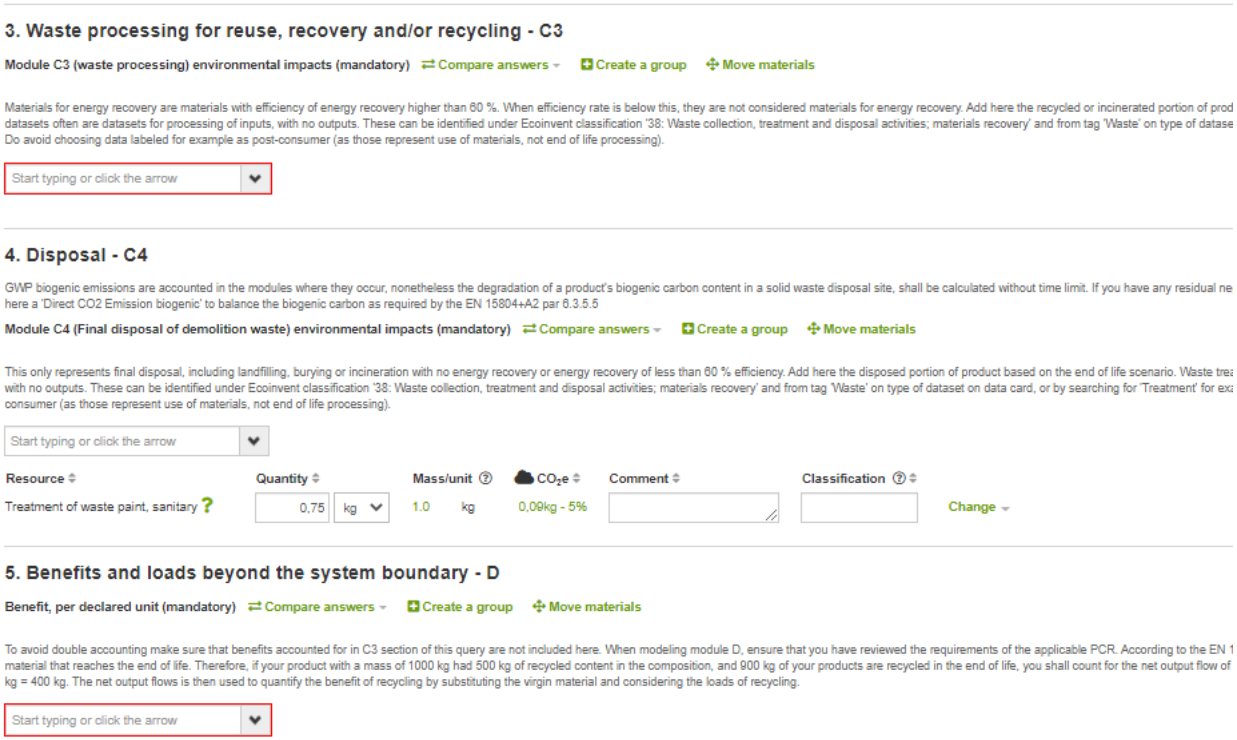

3. Waste processing for reuse, recovery and/or recycling - C3
Module C3 (waste processing) environmental impacts (mandatory)
Compare answers
Create a group
Move materials
Materials for energy recovery are materials with efficiency of energy recovery higher than 60 %. When efficiency rate is below this, they are not considered materials for energy recovery. Add here the recycled or incinerated portion of prod
datasets often are datasets for processing of inputs, with no outputs. These can be identified under Ecoinvent classification '38: Waste collection, treatment and disposal activities; materials recovery' and from tag 'Waste' on type of datase
Do avoid choosing data labeled for example as post-consumer (as those represent use of materials, not end of life processing).
Start typing or click the arrow
4. Disposal - C4
GWP biogenic emissions are accounted in the modules where they occur, nonetheless the degradation of a product's biogenic carbon content in a solid waste disposal site, shall be calculated without time limit. If you have any residual ne
here a 'Direct CO2 Emission biogenic' to balance the biogenic carbon as required by the EN 15804+A2 par 6.3.5.5
Module C4 (Final disposal of demolition waste) environmental impacts (mandatory)
Compare answers
Create a group
Move materials
This only represents final disposal, including landfilling, burying or incineration with no energy recovery or energy recovery of less than 60 % efficiency. Add here the disposed portion of product based on the end of life scenario. Waste trea
with no outputs. These can be identified under Ecoinvent classification '38: Waste collection, treatment and disposal activities; materials recovery' and from tag 'Waste' on type of dataset on data card, or by searching for 'Treatment' for exa
consumer (as those represent use of materials, not end of life processing).
Start typing or click the arrow
Resource
Quantity
Mass/unit
CO2e
Comment
Classification
Treatment of waste paint, sanitary
0,75
kg
1.0
kg
0,09kg - 5%
Change
5. Benefits and loads beyond the system boundary - D
Benefit, per declared unit (mandatory)
Compare answers
Create a group
Move materials
To avoid double accounting make sure that benefits accounted for in C3 section of this query are not included here. When modeling module D, ensure that you have reviewed the requirements of the applicable PCR. According to the EN 1
material that reaches the end of life. Therefore, if your product with a mass of 1000 kg had 500 kg of recycled content in the composition, and 900 kg of your products are recycled in the end of life, you shall count for the net output flow of
kg = 400 kg. The net output flows is then used to quantify the benefit of recycling by substituting the virgin material and considering the loads of recycling.
Start typing or click the arrow

Input for Protega Firestop

1. Manufacturing materials - A1 0.72 kg CO_2e - 65 % 1.0 kg mass

If you are using recycled or reused materials as inputs for your product, the 'polluter pays' principle of EN15804 is applied, which in practical terms means that product impacts are counted towards your product only after 'End of Waste' status (see TR 16970 Guidance for the implementation of EN 15804, 6.2.2). I for your product. However, additional processing required for your products will still need to be accounted. To identify such materials in the database, you can set 'Characteristics' filter to 'Global Warming Potential is Zero'.

Product raw materials (Ecoinvent data) Compare answers Create a group Move materials

Input here materials that go into the product itself, including water if part of product recipe. Packaging and ancillary production materials (e.g. oils and gases) are not inputted here.

Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers		Production losses, %	Use for +A1/+A2
Aluminium hydroxide production (Ref	0,412	kg	1.0	kg	0,21kg - 19%	Filler		90	Market for transport		Market for transport	Included in quantity	All
Disperbyk-190 (CEPE)	0,009	kg	1.0	kg	0,01kg - 1%	Dispersing agents		62	Market for transport		Market for transport	Included in quantity	All
Thixotropic agent, e.g. Thixatrol S	0,005	kg	1.0	kg	0,01kg - 1%	Thixotropic agents		69	Market for transport		Market for transport	Included in quantity	All
Mineral oil based defoamers (CEPE)	0,002	kg	1.0	kg	~0kg - 0,4%	Defoamers		30	Market for transport		Market for transport	Included in quantity	All
Propylene glycol (CEPE)	0,009	kg	1.0	kg	0,04kg - 4%	Coalescent		30	Market for transport		Market for transport	Included in quantity	All
Market for tap water (Reference pro	0,201	kg	1.0	kg	~0kg - ~0%	Water			Market for transport		Market for transport	Included in quantity	All
Market for tap water (Reference pro	0,1448	kg	1.0	kg	~0kg - 0,1%	Polymer dispersion		100	Market for transport		Market for transport	Included in quantity	All
Acrylic acid production (Reference	0,2172	kg	1.0	kg	0,44kg - 39%	Polymer dispersion		100	Market for transport		Market for transport	Included in quantity	All

Product raw materials (EPDs from One Click LCA) Compare answers Create a group Move materials

Click to input data

PROTEGA

2. Ancillary and packaging materials - A3

0.17 kg CO_2e - 15 %

Packaging materials Compare answers Create a group Move materials

Input here packaging materials used to ship and protect the product, if any

Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers	Transport, leg 2, kilometers	Use fo
Market for polyethylene, high densi	0,0467	kg	1.0	kg	0,12kg - 10%			896 Market for transport	Market for transport	All
Injection moulding (Reference produ	0,0467	kg	1.0	kg	0,05kg - 4%			Market for transport	Market for transport	All
Eur-flat pallet production (Referen	0,0005662	unit	0.01	kg	~0kg - 0,4%	Euro pallets		Market for transport	Market for transport	All

Ancillary materials Compare answers Create a group Move materials

Add here the materials used in the manufacturing process that are not part of the final product, such as welding gases or oils used in the process.

Start typing or click the arrow

3. Additional transport - A1 & A2

0 kg CO_2e 0.01 kg mass

Separate transportation - A2 Compare answers Create a group Move materials

Input raw material masses, used vehicle and distances (only for transportation that is not reported earlier)

Start typing or click the arrow

Resource	Quantity		CO_2e	Comment	Classification	Transport, kilometers	Transport, leg 2, kilometers	Use for +A1/+A2/TRACI	Allocation,
Transported mass	0,0136	kg	~0kg - ~0%	Euro pallets		30 Market for transport	Market for transport	All	100

Transportation fuels Compare answers Create a group Move materials

Start typing or click the arrow

1. Manufacturing energy use - A3

0.03 kg CO_2e - 3 %

According to EN 15804 and ISO 21930, the generation of electricity, steam and heat from primary energy resources, also including their extraction, refining and transport are included in the A1-A3 life-cycle stages with variance b definition. Using renewable electricity in the product calculation is possible, if the manufacturer can demonstrate procurement of renewable electricity with sourcing certificates.
If this is applied, renewable electricity sourcing needs to be maintained for the whole validity of the EPD.
If manufacturing is exporting energy outside the system boundary, please insert those as separate negative flows here.

Energy use (Ecoinvent data) Compare answers Create a group Move materials

Input here manufacturing process energy use. Also include energy used for any internal transport.

Start typing or click the arrow

Resource	Quantity		CO_2e	Comment	Classification	Use for +A1/+A2/TRACI	Allocation, %	
Electricity production, hydro, run-	0,08	kWh	~0kg - ~0%	Hydro		All	100	Chan
Electricity production, nuclear, bo	0,043	kWh	~0kg - ~0%	nuclear, PWR		All	100	Chan
Electricity production, nuclear, pr	0,02	kWh	~0kg - ~0%	nuclear, BWP		All	100	Chan
Electricity production, wind, >3mw	0,004	kWh	~0kg - ~0%	Wind		All	100	Chan
Heat production, natural gas, at in	0,125	kWh	0,03kg - 3%	Gas		All	100	Chan
Market for tap water (Reference pro	0,76	kg	~0kg - ~0%	Vanduo		All	100	Chan

Energy use (LCA profiles from One Click LCA) Compare answers Create a group Move materials

Input here manufacturing process energy use. Also include energy used for any internal transport.

Start typing or click the arrow

2. Manufacturing waste and wastewater - A3

0.01 kg CO_2e - 1 %

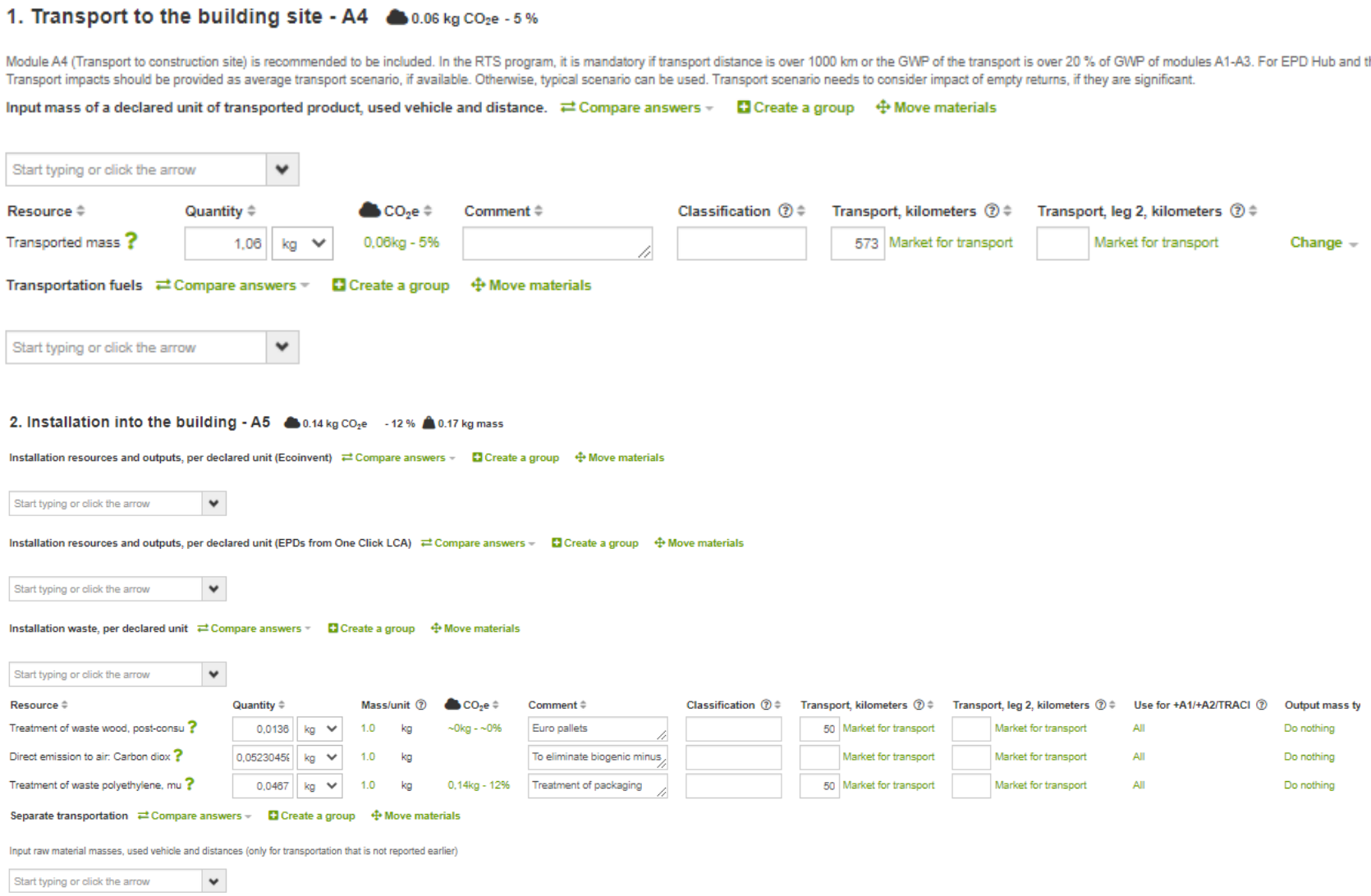
Generated waste and wastewater treatment | Compare answers | Create a group | Move materials

Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers		Transport, leg 2, kilometers		Output mass type
Materials for re-use	0,035	kg	1.0	kg	~0kg - 0,2%	IBC for reuse		304	Market for transport		Market for transport	Components for re-use
Treatment of waste paperboard, unso	0,001	kg	1.0	kg	~0kg - ~0%	cardboard for recycling		272	Market for transport		Market for transport	Materials for recycling
Treatment of municipal solid waste,	0,011	kg	1.0	kg	~0kg - 0,6%	combustible waste		272	Market for transport		Market for transport	Do nothing
Treatment of wastewater, average, c	0,00094	m^3	0.0	kg	~0kg - ~0%	waste water			Market for transport		Market for transport	Do nothing

3. Process direct emissions - A3

Click to input data



1. Transport to the building site - A4 0.06 kg CO_2e - 5 %

Module A4 (Transport to construction site) is recommended to be included. In the RTS program, it is mandatory if transport distance is over 1000 km or the GWP of the transport is over 20 % of GWP of modules A1-A3. For EPD Hub and the Interna
Transport impacts should be provided as average transport scenario, if available. Otherwise, typical scenario can be used. Transport scenario needs to consider impact of empty returns, if they are significant.

Input mass of a declared unit of transported product, used vehicle and distance. Compare answers Create a group Move materials

Start typing or click the arrow

Resource	Quantity		CO_2e	Comment	Classification	Transport, kilometers	Transport, leg 2, kilometers	
Transported mass	1,06	kg	0,06kg - 5%			573 Market for transport	Market for transport	Change

Transportation fuels Compare answers Create a group Move materials

Start typing or click the arrow

2. Installation into the building - A5 0.14 kg CO_2e - 12 % 0.17 kg mass

Installation resources and outputs, per declared unit (Ecoinvent) Compare answers Create a group Move materials

Start typing or click the arrow

Installation resources and outputs, per declared unit (EPDs from One Click LCA) Compare answers Create a group Move materials

Start typing or click the arrow

Installation waste, per declared unit Compare answers Create a group Move materials

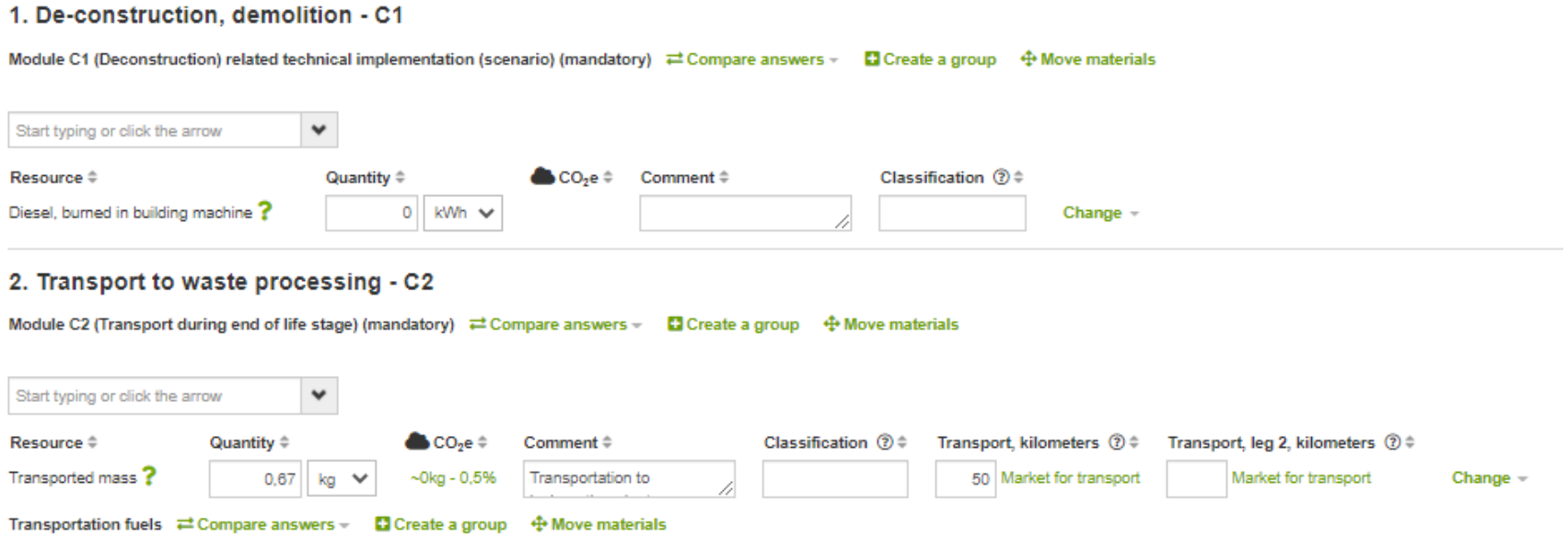
Start typing or click the arrow

Resource	Quantity		Mass/unit		CO_2e	Comment	Classification	Transport, kilometers	Transport, leg 2, kilometers	Use for +A1/+A2/TRACI	Output mass ty
Treatment of waste wood, post-consu	0,0136	kg	1.0	kg	~0kg - ~0%	Euro pallets		50 Market for transport	Market for transport	All	Do nothing
Direct emission to air: Carbon diox	0,0523045(	kg	1.0	kg		To eliminate biogenic minus		Market for transport	Market for transport	All	Do nothing
Treatment of waste polyethylene, mu	0,0467	kg	1.0	kg	0,14kg - 12%	Treatment of packaging		50 Market for transport	Market for transport	All	Do nothing

Separate transportation Compare answers Create a group Move materials

Input raw material masses, used vehicle and distances (only for transportation that is not reported earlier)

Start typing or click the arrow


1. De-construction, demolition - C1
Module C1 (Deconstruction) related technical implementation (scenario) (mandatory)
Compare answers
Create a group
Move materials
Start typing or click the arrow
Resource
Quantity
CO2e
Comment
Classification
Diesel, burned in building machine
0
kWh
Change
2. Transport to waste processing - C2
Module C2 (Transport during end of life stage) (mandatory)
Compare answers
Create a group
Move materials
Start typing or click the arrow
Resource
Quantity
CO2e
Comment
Classification
Transport, kilometers
Transport, leg 2, kilometers
Transported mass
0,67
kg
~0kg - 0,5%
Transportation to
50
Market for transport
Market for transport
Change
Transportation fuels
Compare answers
Create a group
Move materials

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3. Waste processing for reuse, recovery and/or recycling - C3

Module C3 (waste processing) environmental impacts (mandatory) Compare answers Create a group Move materials

Materials for energy recovery are materials with efficiency of energy recovery higher than 60 %. When efficiency rate is below this, they are not considered materials for energy recovery. Add here the recycled or in
datasets often are datasets for processing of inputs, with no outputs. These can be identified under Ecoinvent classification '38: Waste collection, treatment and disposal activities; materials recovery' and from tag '
Do avoid choosing data labeled for example as post-consumer (as those represent use of materials, not end of life processing).

Start typing or click the arrow

4. Disposal - C4

GWP biogenic emissions are accounted in the modules where they occur, nonetheless the degradation of a product's biogenic carbon content in a solid waste disposal site, shall be calculated without time limit. If y
here a 'Direct CO2 Emission biogenic' to balance the biogenic carbon as required by the EN 15804+A2 par 6.3.5.5

Module C4 (Final disposal of demolition waste) environmental impacts (mandatory) Compare answers Create a group Move materials

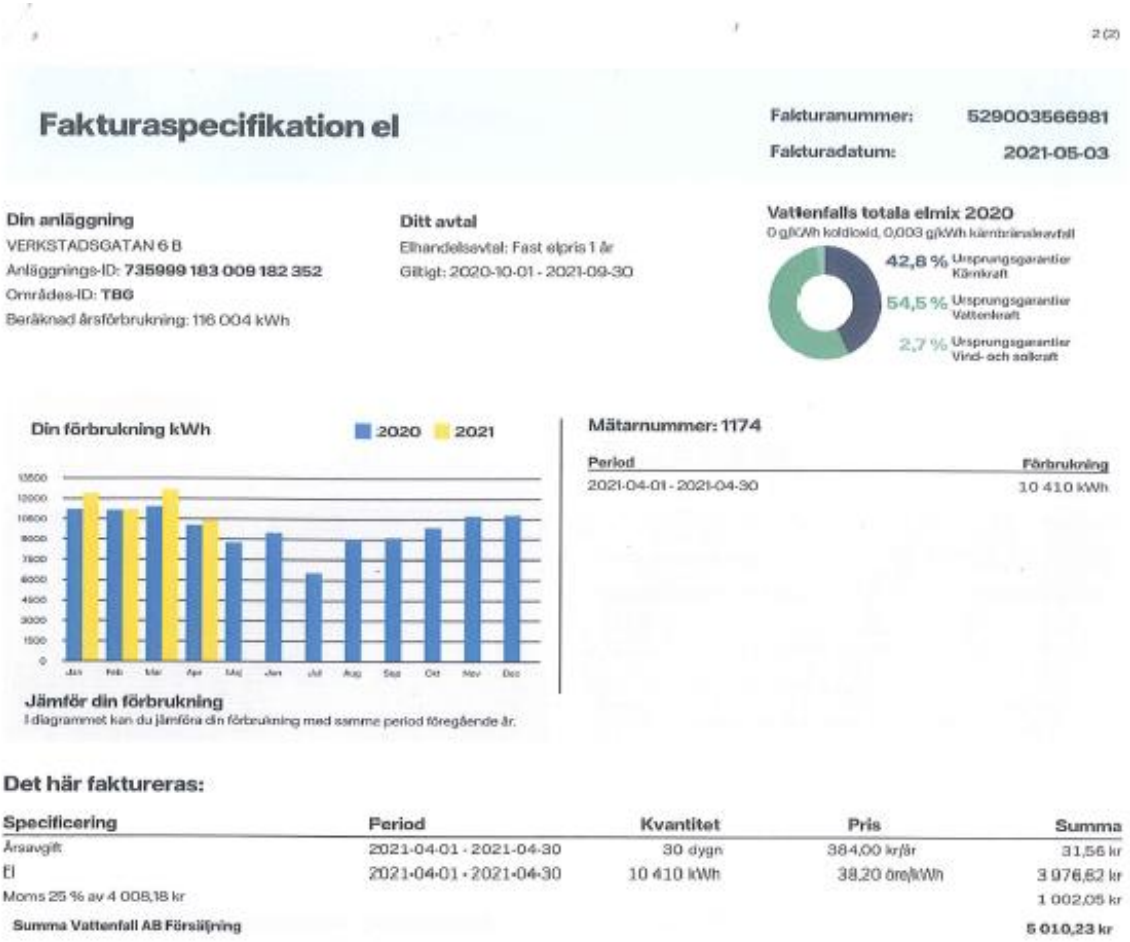
This only represents final disposal, including landfilling, burying or incineration with no energy recovery or energy recovery of less than 60 % efficiency. Add here the disposed portion of product based on the end of
with no outputs. These can be identified under Ecoinvent classification '38: Waste collection, treatment and disposal activities; materials recovery' and from tag 'Waste' on type of dataset on data card, or by searchi
consumer (as those represent use of materials, not end of life processing).

Start typing or click the arrow

Resource	Quantity		Mass/unit	CO_2e	Comment	Classification	
Treatment of waste paint, sanitary	0,67	kg	1.0 kg	0,08kg - 7%			Change

5. Benefits and loads beyond the system boundary - D

ANNEX 4: CERTIFICATE OF GREEN ELECTRICITY



2 (2)

Fakturaspecifikation el

Fakturanummer: 529003566981
Fakturadatum: 2021-05-03

Din anläggning
VERKSTADSGATAN 6 B
Anläggnings-ID: **735999 183 009 182 352**
Områdes-ID: **TBG**
Beräknad årsförbrukning: 116 004 kWh

Ditt avtal
Elhandelsavtal: Fast elpris 1 år
Giltigt: 2020-10-01 - 2021-09-30

Vattenfalls totala elmix 2020
0 g/kWh koldioxid, 0,003 g/kWh kärnbränsleavfall

42,8 % Ursprungsgarantier Kärnkraft
54,5 % Ursprungsgarantier Vattenkraft
2,7 % Ursprungsgarantier Vind- och solkraft

Din förbrukning kWh 2020 2021

Mätarnummer: 1174

Period	Förbrukning
2021-04-01 - 2021-04-30	10 410 kWh

Jämför din förbrukning
I diagrammet kan du jämföra din förbrukning med samma period föregående år.

Det här faktureras:

Specificering	Period	Kvantitet	Pris	Summa
Årsavgift	2021-04-01 - 2021-04-30	30 dygn	384,00 kr/år	31,56 kr
El	2021-04-01 - 2021-04-30	10 410 kWh	38,20 öre/kWh	3 976,62 kr
Moms 25 % av 4 008,18 kr				1 002,05 kr
Summa Vattenfall AB Försäljning				**5 010,23 kr**

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