VEER PLASTICS:

CONSTRUCTION PRODUCTS

(ROOFING UNDERLAYMENT, BUILDING WRAP & FLASHING TAPE)

Environmental Product Declaration

Of multiple products, based on a representative product
In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021

EPD Number	**S-P-09819**
Publication Date	**2024-1-2**
Valid Until	**2029-1-1**
Geographical Scope	**India**

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Content

1 Introduction

Veer Plastics Pvt Ltd manufactures a wide range of products in India, including synthetic technical textiles, coated and uncoated woven and non-woven fabrics and flexible packaging. Founded in 1985, they serve industries such as plastics packaging, agriculture, building construction, and specialty technical fabrics, such as geo-textiles and geo membranes globally. Veer Plastics runs four manufacturing facilities in India, primarily based in Gujarat, with additional warehouse locations in the USA and Canada. They deliver their products worldwide, including the USA and major European countries.

Veer Plastics manufactures Roofing Underlayment, Building Wrap, Flashing Tape, Geo-textiles, Geo-membranes and Flexible Intermediate Bulk Container (FIBC) bags and flexible packaging at their manufacturing unit in Gandhinagar, Gujarat. These products are predominantly made using polypropylene (PP), with minor quantities of other materials like Lamination PP, polymers, polymer-modified adhesives and PE release liners. The products share similar raw materials, transportation and manufacturing processes but vary in thickness (grams per square meter (GSM)) and width of the material supplied.

This EPD is based on a life cycle assessment for the construction products manufactured at Veer Plastics's manufacturing unit in Gandhinagar, Gujarat. The assessment was done as per requirements of PCR 2019:14 - 'Construction products' Version 1.3.1, 2019, EN 15804 and ISO 14044 (CEN, 2019; Erlandsson, 2022; ISO, 2006a, 2006b). The assessment and this EPD declare the average results of the following three products:

1. Roofing Underlayment
2. Building Wrap
3. Flashing Tape

2 General information

2.1 Programme information

Program	The International EPD® System, Indian Regional Hub http://www.environdec.com http://www.environdecindia.com
Programme operator	**EPD International AB** Box 210 60, SE-100 31, Stockholm, Sweden
Declaration holder	**Veer Plastics Pvt Ltd** Block #327, Santej Vadsar Road Santej, Ta Kalol District, Gandhinagar Gujarat – 382721
Product	**Construction Products** This EPD represents the average result of construction products manufactured by Veer Plastics at Gandhinagar. These construction products include roofing underlayment, building wraps, and flashing tapes.
CPC Code	36910
EPD registration number	S-P-09819
Publication date	2024-1-2
Validity date	2029-1-1
Geographical scope	India
Reference standards	The study fulfils criteria established by PCR 2019:14 - 'Construction products' Version 1.3.1, 2019. This study has also been conducted per the requirements of ISO 14040, ISO 14044, and EN 15804:2012+A2:2019. (CEN, 2019; Erlandsson, 2022; ISO, 2006a, 2006b)

2.2 PCR information

Reference PCR	PCR 2019:14 - 'Construction products' Version 1.3.1, 2019
Date of Issue	2021-02-05
PCR Reviewer	Claudia A. Peña The Technical Committee of the International EPD® System

2.3 Verification information

Type of Verification	External independent verification
Third-Party verifier	**Sunil Kumar C S** Chakra4 Sustainability Consulting Services Ivory 501, HM World City 9th Phase, J P Nagar Bengaluru, Karnataka - 560108 Email: sunilkumar@chakra4.in

2.4 LCA information

Title	Environmental Product Declaration of Construction Products Version 1.2
Dated	2023-12-13
Author	**Mili Jain** Founder, Monk Spaces HR-123/6, Pul Pehlad Pur New Delhi – 110044 Email: mili@monkspaces.com
Reference standards	This study has been conducted per PCR 2019:14 - 'Construction products' Version 1.3.1, 2019, EN 15804:2012+A2:2019/AC:2021 (Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products) and ISO 14040/44 requirements (CEN, 2019; Erlandsson, 2022; ISO, 2006a, 2006b).

3 Product Description and System Boundaries

3.1 Product identification and usage

Description and Usage	This EPD represents the average result of: 1. **Roofing Underlayment** - A4, B4, C4, D4 and Ultra synthetic underlayment are made of multiple layers of polypropylene laminated to form a strong barrier. VBreathe has a monolithic, non-porous functional membrane enhancing its performance as a true breathable roofing underlayment. PSU / PSU 2.0 and PSU Plus are self-adhesive underlayments made of multiple polypropylene laminated layers with a polymer-modified adhesive layer at the bottom. 2. **Building Wrap** - VHouse Building Wraps are a synthetic multilayer polypropylene laminated water-resistive barrier (WRB), either monolithic or micro-perforated. These have an excellent water holdout, drain ability and proper permanence or breathability for water vapour. VHouse Building wraps have functional variants like VHouse Pro, VHouse Max, VHouse Premium, and VHouse HPW. 3. **Flashing Tape** - Flashing Tapes are self-adhesive types used to seal the edges and corners of the products at ends and around the door and window openings. These are made of polypropylene, polyethene, polymer-modified adhesive and have easy-to-release liners. VFlash Max and VFlash Pro are the two variants.
Manufacturing location	Veer Plastics Pvt Ltd Block #327, Santej Vadsar Road, Santej, Ta Kalol Dist., Gandhinagar, Gujarat – 382721
About Manufacturer	Veer Plastics is an ISO 9001:2015 certified manufacturing company producing an extensive range of woven and non-woven packaging and technical textile products. Established in 1985, Veer is vertically integrated to cater for industries including cement, fertiliser, agriculture, food grains, building construction, chemical, lumber, metal, mining, oil and gas. The construction products assessed here meet the requirements of ASTM D226 Types I & II and D4869 Types II & IV.

3.2 Additional information about EPD

The EPD owner is the sole owner, liable, and responsible for the EPD.

EPDs within the same product category but registered in different EPD programmes or not compliant with EN 15804 may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/declared units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Declared Unit	1 kilogram (1 kg)
Geographical Scope	Global
Reference Period	The reference period for the primary data (foreground data) used within this EPD is from April 2020 to March 2023. The background data used in the study have been applied through the Ecoinvent v3.8 datasets published in 2021.

3.3 System boundary

The system boundary for this analysis has been defined as per requirements of PCR 2019:14 - 'Construction products' Version 1.3.1, 2019.

Stage	**Product stage**			**Construction stage**		**Use stage**							**End-of-life stage**				**Beyond system boundary**
	Raw material extraction	Transportation	Manufacturing	Transport to customer/site	Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/demolition	Transport to waste processing	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	ND									X	X	X	X	X
Geography	GLO			-	-	-	-	-	-	-	-	-	GLO				GLO
Specific data used	<70%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation-Roofing Underlayment	1%			-	-	-	-	-	-		-	-	-	-	-	-	-
Variation – Building Wrap	9%																
Building Wrap – Flashing Tape	37%																
Variation-sites	0%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Key: X = included in EPD
ND = module not declared (such a declaration shall not be regarded as an indicator result of zero.

3.3.1 Product Stage (A1-A3)

Module A1 (raw material extraction) indicates the extraction, collection and production of raw materials required to manufacture the construction products. These emissions are estimated based on quantities of raw material used and emission factors sourced from secondary data. Module A2 (transportation) includes shipment of raw materials to the manufacturing plant at Gandhinagar, Gujarat. These impacts are estimated based on primary data collected for quantity of materials, mode of transportation and distance covered during transportation. Module A3 (manufacturing) quantifies environmental impacts due to electricity consumption, water use and waste generated at the manufacturing unit in Gandhinagar, Gujarat. These are predominantly based on electricity bills, water bills, material consumption quantities and waste generation numbers recorded in the factory's Manufacturing Information System (MIS).

3.3.2 End of Life (C1-C4)

The use of only cradle-to-gate results without considering the results of end-of-life processes (module C) is strongly discouraged. The end-of-life processes expected are as follows:

- Multiple methods, either manual or mechanical, can accomplish the demolition (C1) of the Construction Products. Therefore, in accordance with industry practice, this has been assumed to be 0.
- For the estimation of module C2, the demolished products are expected to be taken to a recycling facility within 50km to landfill and incineration and 100 km to recycling disposal. This assumption is based on typical industry practices prevalent in India.
- The environmental impacts of sorting plastic wastes are quantified in module C3 based on emission factors available as secondary data.
- For final disposal (C4) of the collected products, 15% are expected to undergo recycling. In comparison, 40% will be sent to an incineration facility where some energy can be recovered. The rest of the material is expected to end up in conventional landfills. This assumption is per practice established by existing EPDs S-P-06873 and S-P-06663 (GreenJams, 2022; Saint Gobain, 2023).

3.3.3 Beyond system boundary (D)

Energy recovery due to incineration and benefits from recycling the product after use are accounted for in disposal mechanisms quantified as C4. In addition to this, Veer Plastics has implemented two projects to offset environmental impacts. These are:

1. Investment into wind power at Gundala, Gujarat.
2. Setting up a recycling plant that recycles used Polypropylene (PP) products. The recycled PP is then used to manufacture other products manufactured by Veer Plastics at a different manufacturing location. It should be noted that the recycling plant is only a benefit as long as the emissions caused by its electricity consumption are lower than the emissions avoided by recycling PP.

3.3.4 Exclusions

The assessment excludes the following:

1. No data is available for emissions due to the plant's carrying, handling, and storage of raw materials. These processes are manually carried out, and fugitive emissions were not estimated for this study.
2. The embodied impacts of the infrastructure and capital goods (the factory building, machinery installed in the factory, trucks used for transportation, equipment used for demolition, machines used for recycling and others) have been excluded from the assessment.

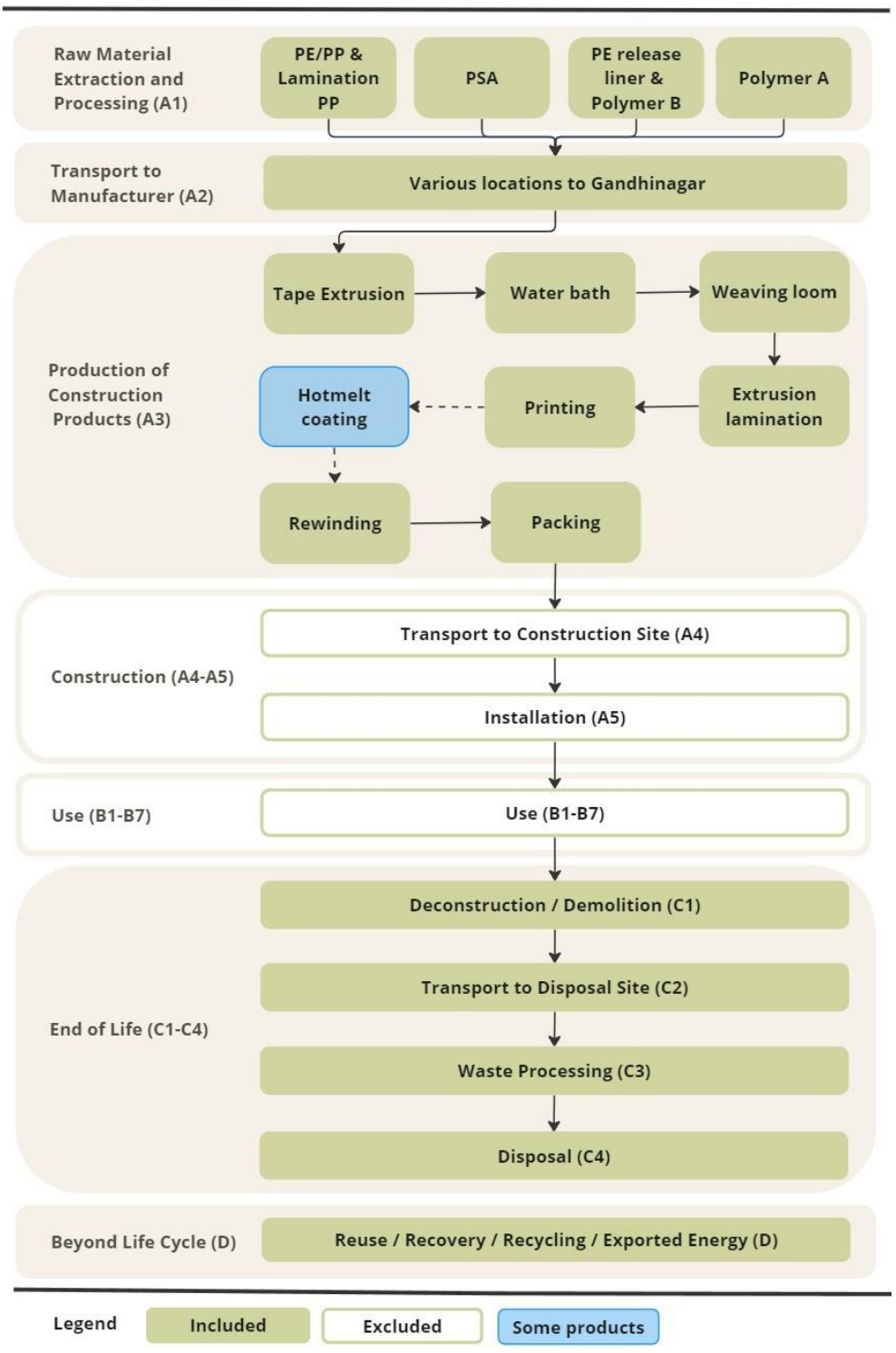

Figure 1: System boundary of LCA

3.1 Information sources and data quality

The quality of the LCI data for modelling the life cycle stages has been assessed according to ISO 14040:2006. The data quality requirements (Henriksen et al., 2021) for this study address the following aspects:

- Data age: The reference period for the primary data is from April 2020 to March 2023. The publication year of the secondary data varies based on availability.
- Geographical coverage: The primary data has been collected from the manufacturing unit. For the secondary data, a preference has been given to regional data over national data over global data. For instance, the data source for electricity is meant for the state of Gujarat. However, estimating emissions from manufacturing raw material (A1) for polypropylene was based on the global average.
- Technology coverage: The secondary data is based on generic technological processes for each raw material. No efficient processes have been considered for manufacturing the raw material.
- Representativeness: The results of the LCA are representative of the entire manufacturing process. It involves procuring raw materials and processing the roofing underlayment, building wrap, and flashing tape products at Gandhinagar, Gujarat. Modules C and D data have been quantified based on global averages. Therefore, the numbers hold for the use of the product anywhere in the world.
- Consistency: The methodology has been uniformly applied to all analysis components. There is no change in the system boundary or quality requirements for any assessment phase.
- Reproducibility: The study is reproducible with access to secondary data sources.

For upstream processes, the Ecoinvent 3.8 database was used with India-specific datasets. The calculation was conducted on the One Click LCA software.

3.2 Cut off rules

As per PCR 2019:14, the assessment requires an inclusion of 99% of inputs. To ensure compliance, the inputs are considered in terms of:

- Mass – This assessment accounts for all mass inputs.
- Energy – This assessment has accounted for all fuel and electrical consumptions. The energy generation from the offsite wind farm has been considered a benefit beyond the system boundary.
- Environmental Significance – Environmental significance has been accounted for in the mass and energy outputs.

3.3 Allocation

The Veer Plastics manufacturing unit manufactures multiple products. Since this assessment only looks at three of them, allocation cannot be avoided. This LCA follows a physical allocation approach by co-production. For the Gandhinagar plant, the total quantities of inputs like electricity consumption and water use were normalised over the total production. The FIBC bags are not under assessment for this product. However, the following table shows that these quantities were used to calculate the inputs per kg of bag processed. For example, 66% of the total electricity consumption for fiscal year 20-21 was used for roofing overlays.

Products manufactured	Manufacturing (kg)			Allocation (%)		
	20-21	21-22	22-23	20-21	21-22	22-23
Roofing Underlayment	79,91,062	1,72,95,728	1,30,04,059	66%	79%	79%
Building Wrap	13,80,011	12,69,527	6,62,371	11%	6%	4%
Flashing Tape	0	0	1,700	0%	0%	0%
FIBC Bags	27,58,374	34,29,760	28,53,364	23%	16%	17%
Total	**1,21,29,447**	**2,19,95,015**	**1,65,19,793**	**100%**	**100%**	**100%**

3.4 Averaging

The three product types have multiple variants. Some of these variants are only manufactured occasionally. For instance, the Ultra, VBreath, and PSU Plus were only manufactured as customised variants in 2022-2023. Once the average composition of each product is estimated, the assessment is conducted for the three products – Roofing Underlayment, Building Wrap and Flashing Tape. The results for these three products are further averaged by weight for the environmental product declaration. The results for this average construction product (representative product) are reported in this declaration. The declared GWP-GHG for modules A1-A3 of the roofing underlayment and building wrap differs from the representative product by 1% and 9%, respectively. Since the flashing tape accounts for less than 0.00% of the total manufacturing, the variation in its results is not a concern.

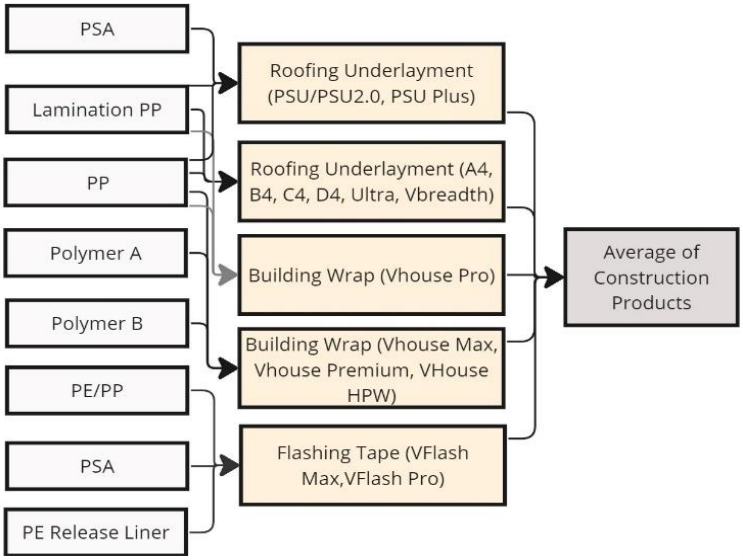

Figure 2: Averaging of Construction Products

Product	Manufacturing across reference period (kg)	Weight
Roofing Underlayment	3,82,90,849	92%
Building Wrap	33,11,908	8%
Flashing Tape	1,700	0%
Total	**4,16,04,457**	

4 Content Declaration

The data collected for the reference period was normalised for each kg of manufacturing through allocation. This normalisation leads to the material composition mentioned in the table below. The product contains no substances that can be included in the "Candidate List of Substances of Very High Concern for Authorisation".

Product Components		Weight (kg)	Post-consumer material, weight (%)	Biogenic material, weight- (%)	Weight biogenic carbon, (kg C/kg)
Raw Material	Polypropylene	0.639	0%	0%	0
	Lamination PP	0.345	0%	0%	0
	Polymer A	0.007	0%	0%	0
	Polymer B	0.003	0%	0%	0
	Polyethylene	0.000	0%	0%	0
	PSA	0.006	0%	0%	0
	PE release liner	0.000	0%	0%	0
	Total	**1.000**	**0%**	**0%**	**0**
Ancillary Material	Water	2.342	-	0%	0
		Weight (kg)	**Weight-% (versus the product) (%)**	**Weight biogenic carbon, (kg C/kg)**	
Packaging Material	Wood pallet	0.076	8%	-0.506	
	Paper Core	0.010	1%	-0.051	
	Cardboard box	0.000	0%	0.000	
	Plastic wrap	0.010	1%	0.000	

4.1 Unit Processes

The manufacturing process is as follows:

1. The raw polypropylene (PP) granules are collected from the depot through a truck and transported to the manufacturing site.
2. The incoming raw material, Polypropylene granules, is subjected to quality control testing and inspection. The rejected materials are returned to vendors.
3. Qualified PP granules are conveyed to the mono axially Tape Extrusion unit followed by the water bath and Tape winding process and subjected to quality checks.

4. After weaving PP Tapes into PP fabrics on circular looms, the fabrics undergo meticulous quality checks to ensure their excellence.
5. The lamination unit coats both sides of qualified woven fabrics with LDPC, colour masterbatch, and UV additives. Then, the PP fabrics are printed according to the desired colour and designed on the printing machine.
6. The printed PP fabrics are conveyed to the Rewinding unit to be cut to the required length.
7. The above steps (4, 5, 6) are subjected to Quality testing, and the rejections are sent to the scrap area.
8. After the final quality control inspection, qualified construction products are packed, labelled, stripped, and wrapped into rolls on wooden pallets before shipment.

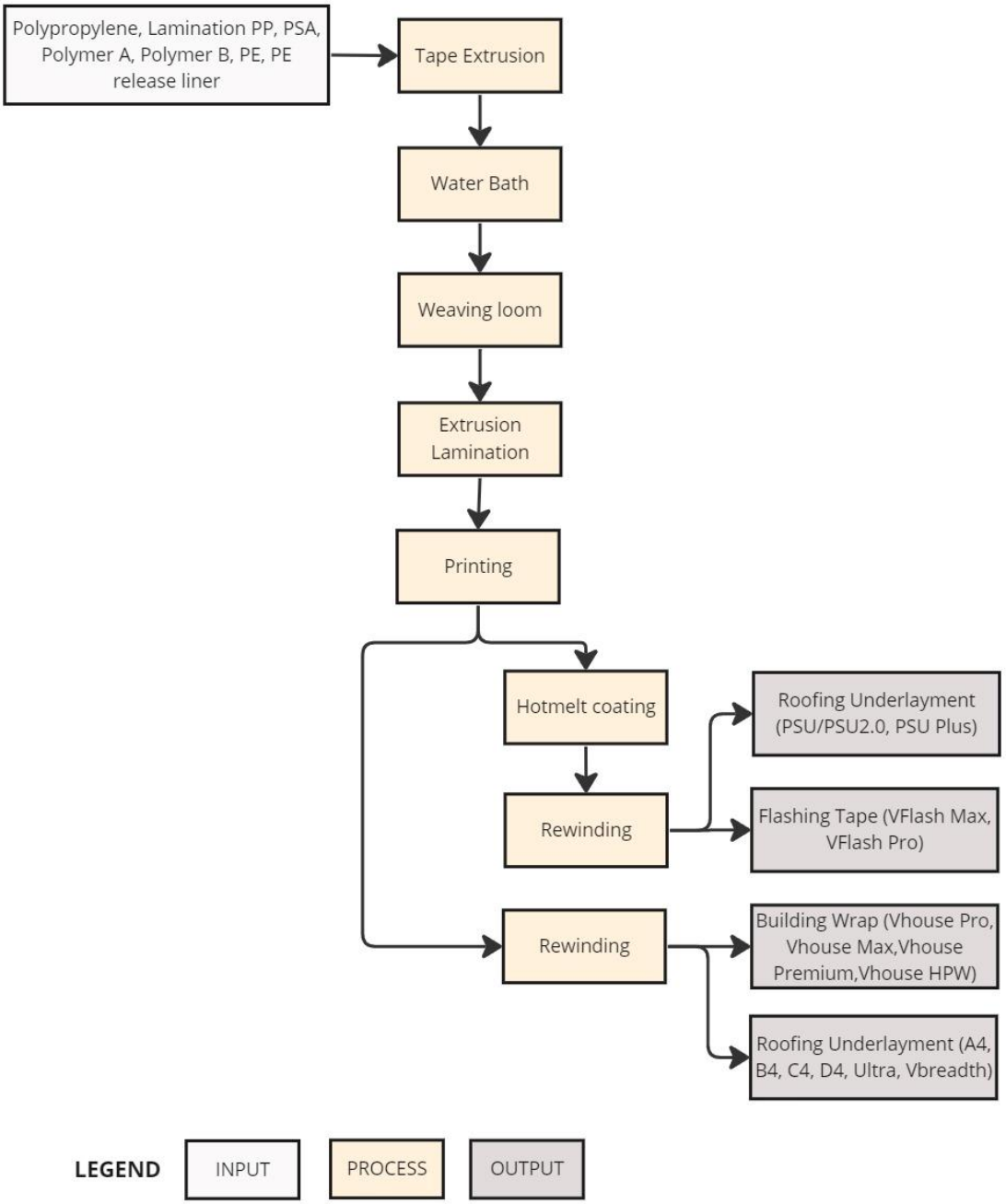

Figure 3: Manufacturing of construction products

5 Environmental Performance Results

5.1 LCIA categories

The environmental impact per declared unit (kg) for the following environmental impact categories is reported as per EN15804+A2:2019. The estimated impact results are only relative statements that do not indicate impact categories' endpoints, exceeding threshold values, safety margins or risks.

Environmental Impact Indicators for EN15804+A2:2019		
Impact category	**Indicator**	**Unit**
Climate change - total	Global warming potential - total (GWP-total)	$kgCO_2e$
Climate change - fossil	Global warming potential - fossil fuels (GWP-fossil)	$kgCO_2e$
Climate change - biogenic	Global warming potential - biogenic (GWP-biogenic)	$kgCO_2e$
Climate change - luluc	Global warming potential - land use and land use change (GWP-luluc)	$kgCO_2e$
Ozone Depletion	Depletion potential of the stratospheric ozone layer (ODP)	$kgCFC_{11}e$
Acidification	Acidification potential, Accumulated Exceedance (AP)	$molH^+e$
Eutrophication aquatic freshwater	Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kgPe
Eutrophication aquatic marine	Eutrophication potential, the fraction of nutrients reaching the marine end compartment (EP-marine)	kgNe
Eutrophication terrestrial	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	molNe
Photochemical ozone formation	Formation potential of tropospheric ozone (POCP)	kgNMVOCe
Depletion of abiotic resources- minerals and metals	Abiotic depletion potential for non-fossil resources (ADP- minerals & metals)	kgSbe
Depletion of abiotic resources - fossil fuels	Abiotic depletion for fossil resources potential (ADP-fossil)	MJ
Water use	Water (user) deprivation potential, deprivation-weighted water consumption (WOP)	m^3

Natural Resource Use Parameters		
Parameter	**Acronym**	**Unit**
Renewable primary energy as an energy carrier	PERE	MJ
Renewable primary energy resources as material utilisation	PERM	MJ
Total use of renewable primary energy resources	PERT	MJ
Non-renewable primary energy as an energy carrier	PENRE	MJ

Natural Resource Use Parameters		
Parameter	**Acronym**	**Unit**
Non-renewable primary energy as material utilisation	PENRM	MJ
Total use of non-renewable primary energy resources	PENRT	MJ
Use of secondary materials	SM	kg
Use of renewable secondary fuels	RSF	MJ
Use of non-renewable secondary fuels	NRSF	MJ
Net freshwater use	FW	m^3

Waste Categories Parameters		
Parameter	**Acronym**	**Unit**
Hazardous waste disposed	HWD	kg
Non-hazardous waste disposed	NHWD	kg
Radioactive Waste	RW	kg

Output Flows		
Parameter	**Acronym**	**Unit**
Components for reuse	CRU	kg
Materials for recycling	MR	kg
Materials for energy recovery	MER	kg
Exported energy, electricity	EEE	MJ

Biogenic Carbon	
Parameter	**Unit**
Biogenic carbon content in the product	kg C
Biogenic carbon content in the packaging	kg C

5.2 Core environmental impact – mandatory indicators (EN 15804)

Results per declared unit - 1 kg of Construction Products

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
GWP-total	$kgCO_2e$	2.47E+00	2.37E-02	1.02E+00	3.51E+00	0.00E+00	5.40E-03	4.95E-02	1.14E+00	-1.21E-01
GWP-fossil	$kgCO_2$	2.46E+00	2.37E-02	1.17E+00	3.65E+00	0.00E+00	5.40E-03	4.94E-02	1.13E+00	-1.20E-01
GWP-biogenic	$kgCO_2e$	4.68E-03	0.00E+00	-1.52E-01	-1.47E-01	0.00E+00	2.09E-06	8.23E-05	1.47E-01	-4.31E-04
GWP-luluc	$kgCO_2e$	7.26E-04	8.89E-06	3.17E-04	1.06E-03	0.00E+00	1.99E-06	4.47E-05	1.18E-05	-7.00E-05
ODP	$kgCFC_{11}e$	3.17E-08	5.42E-09	8.40E-09	4.55E-08	0.00E+00	1.24E-09	5.76E-09	2.78E-09	-2.69E-09
AP	$molH^+e$	9.65E-03	1.13E-04	5.85E-03	1.56E-02	0.00E+00	2.28E-05	2.18E-04	2.61E-04	-3.70E-04
EP-f	kgPe	4.84E-05	1.92E-07	7.00E-05	1.19E-04	0.00E+00	4.42E-08	4.36E-06	9.37E-07	2.00E-06
EP-m	kgNe	1.65E-03	3.29E-05	1.06E-03	2.74E-03	0.00E+00	6.79E-06	1.04E-04	9.46E-05	-5.96E-05
EP-t	molNe	1.82E-02	3.63E-04	1.24E-02	3.09E-02	0.00E+00	7.49E-05	4.91E-04	9.91E-04	-5.90E-04
POCP	kgNMVOCe	7.58E-03	1.13E-04	3.22E-03	1.09E-02	0.00E+00	2.40E-05	1.34E-04	2.93E-04	-4.31E-04
ADP-m	kgSbe	1.43E-05	5.50E-08	9.10E-07	1.52E-05	0.00E+00	1.27E-08	2.36E-06	1.66E-07	-1.58E-06
ADP-f	MJ	7.60E+01	3.54E-01	1.40E+01	9.03E+01	0.00E+00	8.10E-02	4.76E-01	6.59E-01	-5.90E+00
WDP	m^3	8.60E-01	1.58E-03	1.95E-01	1.05E+00	0.00E+00	3.63E-04	1.68E-02	4.68E-02	-7.33E-02

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-f = Eutrophication potential, the fraction of nutrients reaching freshwater end compartment; EP-m = Eutrophication potential, the fraction of nutrients reaching marine end compartment; EP-t = Eutrophication potential, Accumulated Exceedance; POCP = Photochemical Oxidants Creation Potential; ADP-m = Abiotic depletion potential for non-fossil resources; ADP-f = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption.

5.3 Potential environmental impact – additional mandatory indicators (EN 15804)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
GWP-GHG	$kgCO_2e$	1.99E-01	2.84E-03	1.05E-01	3.07E-01	0.00E+00	4.25E-04	3.89E-03	8.84E-02	-1.23E-02

The indicator includes all greenhouse gases (kgCO2e) in the GWP total. However, it excludes biogenic carbon dioxide uptake, emissions, and biogenic carbon stored in the product. This indicator is thus almost equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

5.4 Use of resources

Results per declared unit - 1 kg of Construction Products

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PERE	MJ	8.45E-01	3.96E-03	1.04E+00	1.89E+00	0.00E+00	9.13E-04	3.58E-02	1.34E-02	-1.07E+00
PERM	MJ	0.00E+00	0.00E+00	1.14E+00	1.14E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	8.45E-01	3.96E-03	2.17E+00	3.02E+00	0.00E+00	9.13E-04	3.58E-02	1.34E-02	-1.07E+00
PENRE	MJ	4.23E+01	3.54E-01	1.37E+01	5.63E+01	0.00E+00	8.10E-02	4.76E-01	6.59E-01	-2.72E+00
PENRM	MJ	3.36E+01	0.00E+00	6.64E-01	3.43E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	-3.18E+00
PENRT	MJ	7.60E+01	3.54E-01	1.43E+01	9.06E+01	0.00E+00	8.10E-02	4.76E-01	6.59E-01	-5.90E+00
SM	kg	3.12E-03	9.94E-05	8.23E-03	1.14E-02	0.00E+00	2.25E-05	2.31E-04	1.42E-01	-6.63E-04
RSF	MJ	3.39E-05	9.83E-07	3.50E-04	3.85E-04	0.00E+00	2.27E-07	4.44E-06	1.22E-06	-3.65E-06
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
FW	m^3	2.16E-02	4.55E-05	7.19E-03	2.89E-02	0.00E+00	1.05E-05	4.24E-04	3.56E-04	-1.86E-03

Acronyms: PERE = use of primary renewable 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 resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = use of net fresh water

5.5 Waste production

Results per declared unit - 1 kg of Construction Products

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	kg	1.14E-01	4.70E-04	9.95E-02	2.14E-01	0.00E+00	1.07E-04	5.12E-03	1.29E-03	-1.82E-03
NHWD	kg	1.91E+00	7.65E-03	2.63E+00	4.55E+00	0.00E+00	1.77E-03	5.71E-02	8.81E-01	7.13E-02
RWD	kg	1.65E-05	2.37E-06	4.05E-06	2.29E-05	0.00E+00	5.42E-07	3.09E-06	3.50E-07	-1.49E-06

Acronyms: HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed

5.6 Output flows

Results per declared unit - 1 kg of Construction Products

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
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
MR	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
MER	kg	0.00E+00	0.00E+00	7.85E-03	7.85E-03	0.00E+00	0.00E+00	0.00E+00	4.00E-01	0.00E+00
EEE	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
Acronyms: CRU = Components for reuse; MR = Materials for recycling; MER = Materials for energy recovery; EEE = Exported energy, electricity										

5.7 Biogenic carbon

Results per declared unit - 1 kg of Construction Products

Biogenic Carbon Content	Unit	Quantity
Biogenic carbon content in the product	kg C	0.00E+00
Biogenic carbon content in the packaging	kg C	5.58E-01

6 Interpretation

Global Warming Potential (GWP)	The cradle-to-gate GWP total of the average construction product is 3.51 $kgCO_2e$. The product's GWP-total of A1-A3, C1-C4 and D is 4.53 $kgCO_2e$.
Ozone Depletion Potential (ODP)	The Ozone Depletion Potential (ODP) category measures the potential impact of chloro-fluoro-carbons (CFCs) and chlorinated hydrocarbons (HCs) on depleting the ozone layer. Notably, during stages A1-A3 and C1-C4, the ODP is insignificant, indicating that emissions in these stages do not contribute to ozone layer depletion.
Acidification Potential (AP)	The Acidification Potential indicator accounts for soil, ground and surface water acidification. The acidification potential during the cradle-to-gate stage is 1.21 molH+e.
Eutrophication Potential (EP)	Eutrophication Potential (EP) is the ability to stimulate excessive plant and organism growth by introducing abundant nutrients into water and soil. It is assessed distinctly across freshwater, marine, and terrestrial ecosystems. In stages A1-A3 and C1-C4, terrestrial ecosystems demonstrate the highest level of nutrient excess at 0.03 molNe. In contrast, marine and freshwater ecosystems exhibit no risk of excessive nutrients.
Photochemical Oxidants Creation Potential (POCP)	The POCP scale quantifies the ability of volatile organic compounds (VOCs) to produce ground-level ozone. The cradle-to-gate POCP is 0.01 kgNMVOC
Abiotic Depletion Potential (ADP)	The ADP for fossils for A1-A3 is 90.10 MJ, C1-C4 is 1.22 MJ, and D is -5.90 MJ. The ADP for minerals and metals is zero. A negative value for this indicator indicates that the product stores or absorbs more emissions than it generates.
Water Depletion Potential (WDP)	The water footprint of a product is the amount of water consumed or polluted in all processing stages of its production. The WDP of the construction products for A1-A3, C1-C4 and D is 1.04 m^3.

7 References

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