Statement of Verification

BREG EN EPD No.: 000645 Issue 01

This is to verify that the

Environmental Product Declaration

provided by:

Poly-Pure (Epwin Materials Limited)

is in accordance with the requirements of:

EN 15804:2012+A2:2019

and

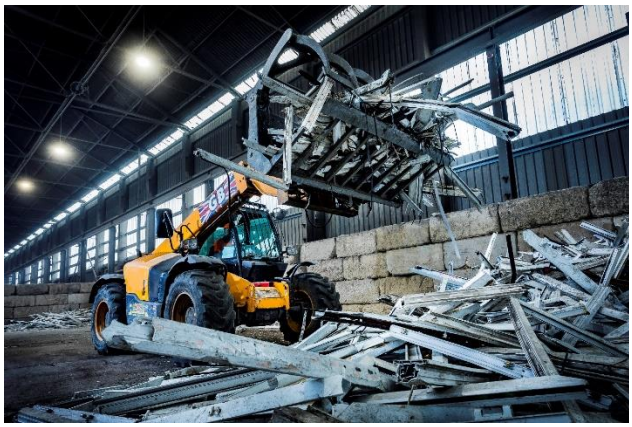
BRE Global Scheme Document SD207

This declaration is for:

1 kg of Recycled PVC Pulver and/or Pellet

Company Address

Poly-Pure (Epwin Materials Limited),
Units 6-7A, Atlas Works,
Norwich Rd, Lenwade,
Morton on the Hill,
Norwich
NR9 5SN



Signed for BRE Global Ltd	Emma Baker Operator	28 November 2024 Date of this Issue
28 November 2024 Date of First Issue		27 November 2029 Expiry Date

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Environmental Product Declaration

EPD Number: 000645

General Information

EPD Programme Operator	Applicable Product Category Rules
BRE Global Watford, Herts WD25 9XX United Kingdom	BRE 2023 Product Category Rules (PN 514 Rev 3.1) for Type III environmental product declaration of construction products to EN 15804:2012+A2:2019.
Commissioner of LCA study	**LCA consultant/Tool**
Poly-Pure (Epwin Materials Limited), Units 6-7A, Atlas Works, Norwich Rd, Lenwade, Morton on the Hill, Norwich NR9 5SN	Bala Subramanian/BRE LINA A2
Declared/Functional Unit	**Applicability/Coverage**
1 kg of Recycled PVC Pulver and/or Pellet	Other (please specify). Product specific
EPD Type	**Background database**
Cradle to Gate	Ecoinvent 3.8

Demonstration of Verification
CEN standard EN 15804 serves as the core PCR [a]
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐Internal ☒ External
(Where appropriate [b])Third party verifier: Pat Hermon
a: Product category rules b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

Comparability
Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019 for further guidance

Information modules covered

Product			Construction		Use stage							End-of-life					Benefits and loads beyond the system boundary
					Related to the building fabric					Related to the building							
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4		D
Raw materials supply	Transport	Manufacturing	Transport to site	Construction – Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal		Reuse, Recovery and/or Recycling potential
☑	☑	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		☐

Note: Ticks indicate the Information Modules declared.

Manufacturing site(s)

Poly-Pure (Epwin Materials Limited),
Units 6-7A, Atlas Works,
Norwich Rd, Lenwade,
Morton on the Hill,
Norwich
NR9 5SN

Construction Product:

Product Description

This EPD is related to the production of Pulverised and Pelletised recycled PVC from post-consumer and post-industrial waste PVC products. These rPVC types have a number of applications as recyclate in many PVC products such as, PVC pipes and PVC window frames. This EPD does not cover any other materials produced from the recycling process at Poly-Pure.

The Poly-Pure is a UK materials re-processor, recycling post-consumer and post-industrial PVC building materials, notably UPVC window frames and it was obtained by the Epwin Group in 2022.

In this EPD, the Recycled PVC Pellet and Pulver manufactured and sold by Poly-Pure has been modelled and included in this EPD. The scope of this EPD is to analyse the impacts of the waste post-consumer recycling process. The analysis includes the impacts of processing PVC post-consumer waste at the Poly-Pure factory. The impacts of the materials after they leave the factory gate are not included in this analysis due to the diverse applications of the pulver and pellet. For details, please refer to the construction (use stage) scenario and end-of-life scenario descriptions in this EPD. Therefore, it is a cradle-to-gate EPD.

Technical Information

The Poly-Pure site is accredited to ISO9001 and ISO14001.

Post consumer pulver and pellet are defined as a general-purpose extrusion grade material containing 100% recycled post-consumer uPVC, sourced from window profiles. The material has been developed to meet specific manufacturing criteria and this specification is validated against the following standards:

Standard	Description
Density – Once Extruded	EN ISO1183-1
Apparent Bulk Density	EN ISO60
Filler Content (Ash 1000 °C)	Method A of EN ISO 3451-5
K-Value – Measurement	ISO1628/2
Vicat Softening Point (°C)	EN ISO 2507-1
Particle Size	Sieve Analysis ISO 13322-2

Note: Please contact the Poly-Pure team for more information on 01603 863 338

Pulver is widely used in the core of layered underground pipes, co-extruded rainwater systems and windows. Pellet can also be used in windows and rainwater and this compounded version of the recyclate is growing in demand.

The use of recycled material has strong sustainability benefits as its overall production requires no additional raw materials (crude oil) and is less energy intensive than creating virgin PVC. Our process also benefits from being a dry process therefore there are no chemical and water usage.

Main Product Contents

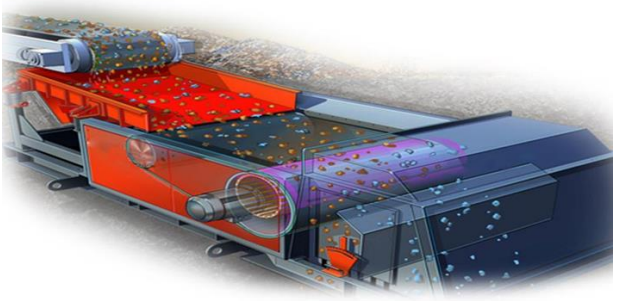
Material/Chemical Input	%
Post consumer PVC waste	100

Manufacturing Process

Poly-Pure is a leading UK materials re-processor, recycling post-consumer and post-industrial PVC building materials, notably UPVC window frames. Poly-Pure supplies re-processed PVC to a diverse customer base. Taking delivery of end-of-life construction materials, the process begins at the Hammer Mill.

The PVC Post Consumer Waste, typically in stick form is loaded into the Hammer Mill by a telehandler. A drum on which hammers are mounted and are free to swing, the rotor spins at a high speed inside the drum while material is force fed. The material is impacted by the hammers and is finely shredded and passes through a 60-80mm screen.

The shred is first hand sorted to remove: Rubble, Stainless Steel, Rubber, Oversized PVC and any other non-PVC product and secondly passed under an over band magnet to remove any remaining ferrous metal before passing over the ECS.
The Goudsmit Eddy Current Separator (ECS) works by magnetizing nonferrous metals which repels them away from the drum and thus separating them.



Once all the bulk metals are removed the shred is fed into a granulator, turning it into chip with screens installed and metal detection on the infeed belt with an automatic discharge shoot to remove any detected fine metal.

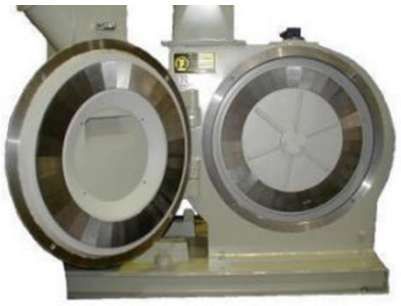
The next phase, the delta cleaner, sieves material from; top sieve removing anything over 25mm, the middle sieve removing anything over 15 mm, and the bottom sieve removing all items smaller than 3mm – this leaves chip between 3 and 15 mm.

The accepted material is then bucket conveyed into our optical colour sorter to separate white from ‘Jazz’ (mixed colours).
The SEA optical sorter has RGB (Red Green Blue) full-colour cameras both at the front and back of the machine seeing particles as small as 0.06mm at a frequency of 15000HZ.

Taking advantage of the differing tribo-electric properties of different plastics, separating these materials into 99.5% pure sorted fractions allows recycled mixed plastics waste to be used as quality raw material in new high-grade products.

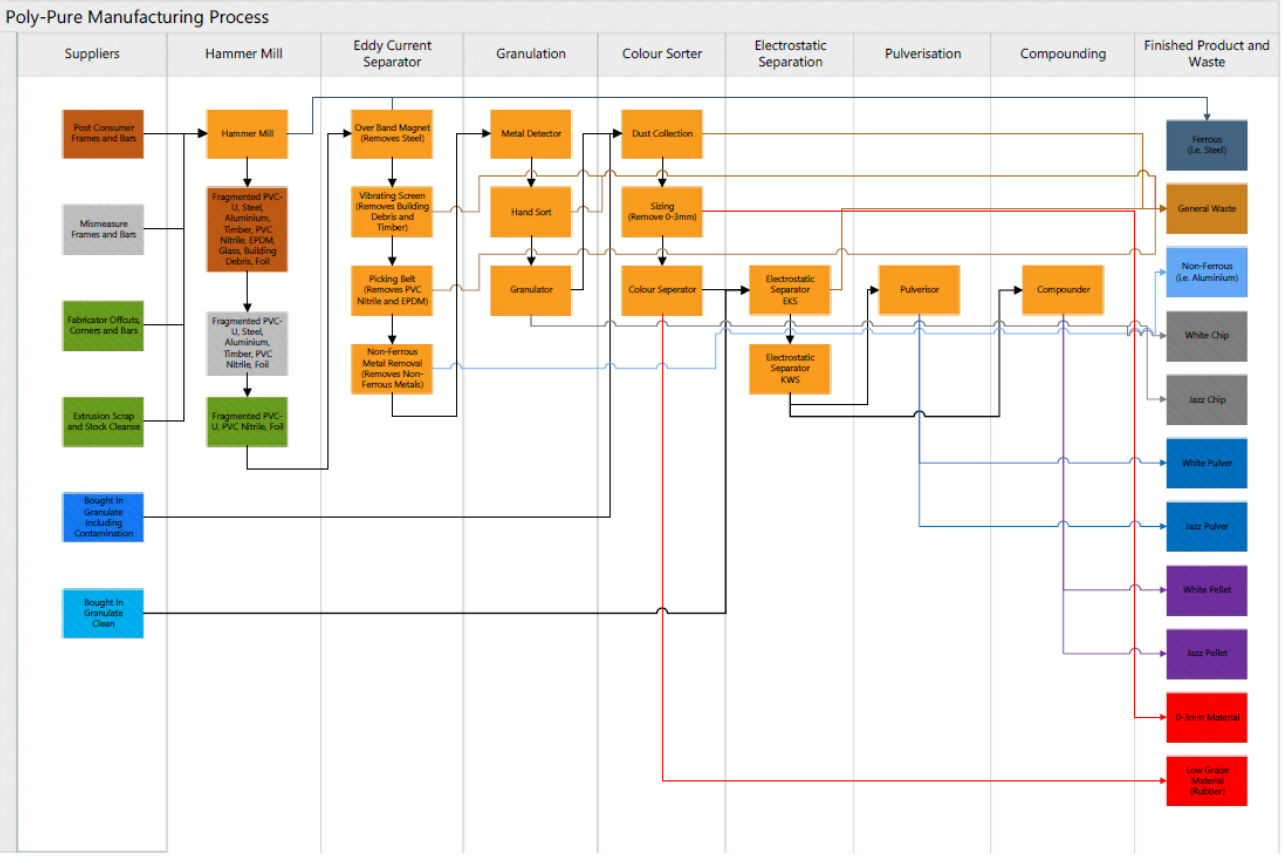
The final process which this intermediary rPVC material can undergo to make the finished product of Pulver or 3mm pellets are Pulverisation or Compounding.

The material in granular form is fed with a vibratory feeder and pulverised between the two rings of segments mounted on carrier discs, then air conveyed to a screening machine to 800-microns. The coarse material is repassed for further size reduction. The desired PULVER (powder) is diverted to bulk bags, in which they are sent on to customers.



Material that undergoes the process of compounding is further filtered through a 315-micron filter to remove any contamination which doesn't have the same melting point as PVC, before heating and passing through a die plate forming the finished 3mm PELLET product.

Process flow diagram.



Construction Installation and Use:

Once the recycled materials leave the factory gate, they undergo several processes to be transformed from raw material into a wide range of construction products that are essential for modern building practices. The transportation to the third-party distributor and the use phase (how the pulvers are transformed into products and their usage) are not included in the LCA/EPD for the Pellet /Pulver.

End of Life

rPVC Pulver and Pellets are used in a wide variety of products, each with different use phases and end-of-life scenarios, making it impractical to cover these aspects in the LCA/EPD of the rPVC Pulver and Pellets

Life Cycle Assessment Calculation Rules

Declared unit description.

1 kg of Recycled PVC Pulver and/or Pellet.

System boundary

This is a Cradle-to-Gate EPD, this includes the extraction of raw materials (A1), transportation (A2), and manufacturing processes up to the point where the PVC Pellet and Pulvers are packaged and leave the factory gate, in accordance with EN 15804:2012+A2:2019 and BRE 2023 Product Category Rules (PN 514 Rev 3.1).

Data sources, quality and allocation

The datasets are derived from Ecoinvent v3.8, and the LCA tool used was BRE LINA A2. The LCA analysis is conducted for the 1 kg of Recycled PVC Pulver and/or Pellet , and it includes the total amount of Post Consumer PVC waste used to manufacture the PVC Pellet and Pulver over the period of one year (from 01/01/2023 to 31/12/2023).

In addition to the PVC Pulver and/or PVC Pellet, other products are manufactured at the Poly-Pure manufacturing site. Therefore, the allocation of electricity, fuel, waste, water consumption, and discharge is required. The pellet is produced in the factory at a percentage of 12.27%, and the pulver is produced at a percentage of 59.98% by mass. Consequently, the allocation of electricity, waste, water consumption, and discharge has been done according to the provisions of BRE PCR PN514 and EN 15804, using the mass production quantity as the basis for allocation. Site wide values for energy, water and wastewater have been taken from bills. Figures for the raw materials, ancillary materials and packaging were from actual usages.

The manufacturer has confirmed that they are using 100% post-consumer PVC window profiles, mixed-color post-consumer PVC, and recycled granulated PVC (post-consumer) as raw material inputs. Additionally, the manufacturer has stated that they purchase waste PVC from other recycling businesses and PVC manufacturers. One of their supplier manufacturers has confirmed that the revenue contribution from selling waste PVC is less than 1%. The recycling business is selling the waste PVC to Poly-Pure Products, where the demolition impacts of C1–C4 have already been included in the previous product lifecycle therefore the doublecounting of impacts has been avoided in this analysis. According to EN15804, materials recovered from previous use or waste in one product system and used as input in another product system are classified as secondary materials. The transportation of the PVC from the waste provider and the processing of waste PVC in the factory have been included in the analysis. Upon the data review, it was noted that the mass balance is within the acceptable tolerance range and no proxy dataset used for the LCA modelling.

Secondary data has been obtained for all other upstream and downstream processes that are beyond the control of the manufacturer (i.e. raw material production) from the ecoinvent 3.8 database. All ecoinvent datasets are complete within the context used and conform to the system boundary and the criteria for the exclusion of inputs and outputs, according to the requirements specified in EN 15804:2012+A2:2019.

ISO14044 guidance. Quality Level	Geographical representativeness	Technical representativeness	Time representativeness
Very Good	Data from area under study.	Data from processes and products under study. Same state of technology applied as defined in goal and scope (i.e., identical technology).	n/a
Very Good	n/a	n/a	There is approximately 1-2 years between the Ecoinvent LCI reference year, and the time period for which the LCA was undertaken.

Specific European datasets have been selected from the ecoinvent LCI for this LCA. Manufacturer uses the national grid electricity and natural gas for production, so therefore the national grid electricity dataset has been used for the LCA modelling (Ecoinvent 3.8). The GWP carbon footprint for using 1 kWh of electricity is 0.239 kgCO2e/kWh. The quality level of time representativeness is also Very Good as the background LCI datasets are based on ecoinvent v3.8 which was compiled in 2021. Therefore, there is less than 5 years between the ecoinvent LCI reference year and the time period for which the LCA was undertaken.

Cut-off criteria

All raw materials and energy input to the manufacturing process have been included, except for direct emissions to air, water, and soil, which are not measured. The inventory process in this LCA includes all data related to raw material, packaging material and consumable items.

LCA Results – 1 kg of Recycled PVC Pellet and Pulver

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts									
			GWP-total	GWP-fossil	GWP-biogenic	GWP-luluc	ODP	AP	EP-freshwater
			kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CO_2 eq	kg CFC11 eq	mol H^+ eq	kg $(PO_4)^{3-}$ eq
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	5.56E-02	5.55E-02	4.73E-05	2.18E-05	1.28E-08	2.25E-04	3.58E-06
	Manufacturing	A3	7.58E-02	1.01E-01	-2.56E-02	6.15E-05	1.27E-08	5.85E-04	7.98E-06
	Total (Consumption grid)	A1-3	1.31E-01	1.57E-01	-2.56E-02	8.33E-05	2.56E-08	8.10E-04	1.16E-05

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
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; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

Parameters describing environmental impacts									
			EP-marine	EP-terrestrial	POCP	ADP-mineral &metals	ADP-fossil	WDP	PM
			kg N eq	mol N eq	kg NMVOC eq	kg Sb eq	MJ, net calorific value	m^3 world eq deprived	disease incidence
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	6.79E-05	7.42E-04	2.27E-04	1.93E-07	8.39E-01	3.78E-03	4.79E-09
	Manufacturing	A3	6.50E-04	2.62E-03	7.35E-04	2.51E-07	1.54E+00	1.92E-02	1.40E-08
	Total (Consumption grid)	A1-3	7.18E-04	3.37E-03	9.62E-04	4.44E-07	2.38E+00	2.30E-02	1.88E-08

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;

ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption; and
PM = Particulate matter.

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing environmental impacts

			IRP	ETP-fw	HTP-c	HTP-nc	SQP
			kBq U^{235} eq	CTUe	CTUh	CTUh	dimensionless
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	4.31E-03	6.55E-01	2.12E-11	6.87E-10	5.77E-01
	Manufacturing	A3	2.57E-02	9.24E-01	5.97E-11	6.46E-10	2.75E+00
	Total (Consumption grid)	A1-3	3.00E-02	1.58E+00	8.09E-11	1.33E-09	3.33E+00

IRP = Potential human exposure efficiency relative to U235;
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
HTP-nc = Potential comparative toxic unit for humans; and
SQP = Potential soil quality index.

Parameters describing resource use, primary energy

			PERE	PERM	PERT	PENRE	PENRM	PENRT
			MJ	MJ	MJ	MJ	MJ	MJ
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	1.18E-02	0.00E+00	1.18E-02	8.24E-01	0.00E+00	8.24E-01
	Manufacturing	A3	3.46E-01	2.49E-01	5.95E-01	-4.33E+00	6.07E+00	1.74E+00
	Total (Consumption grid)	A1-3	3.58E-01	2.49E-01	6.07E-01	-3.50E+00	6.07E+00	2.56E+00

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

Parameters describing resource use, secondary materials and fuels, use of water						
			SM	RSF	NRSF	FW
			kg	MJ net calorific value	MJ net calorific value	m^3
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	9.36E-05
	Manufacturing	A3	1.26E-03	5.74E-07	0.00E+00	5.63E-04
	Total (Consumption grid)	A1-3	1.26E-03	5.74E-07	0.00E+00	6.57E-04

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

Other environmental information describing waste categories					
			HWD	NHWD	RWD
			kg	kg	kg
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	9.25E-04	1.64E-02	5.68E-06
	Manufacturing	A3	2.37E-03	2.30E-01	1.05E-05
	Total (Consumption grid)	A1-3	3.30E-03	2.47E-01	1.62E-05

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

LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

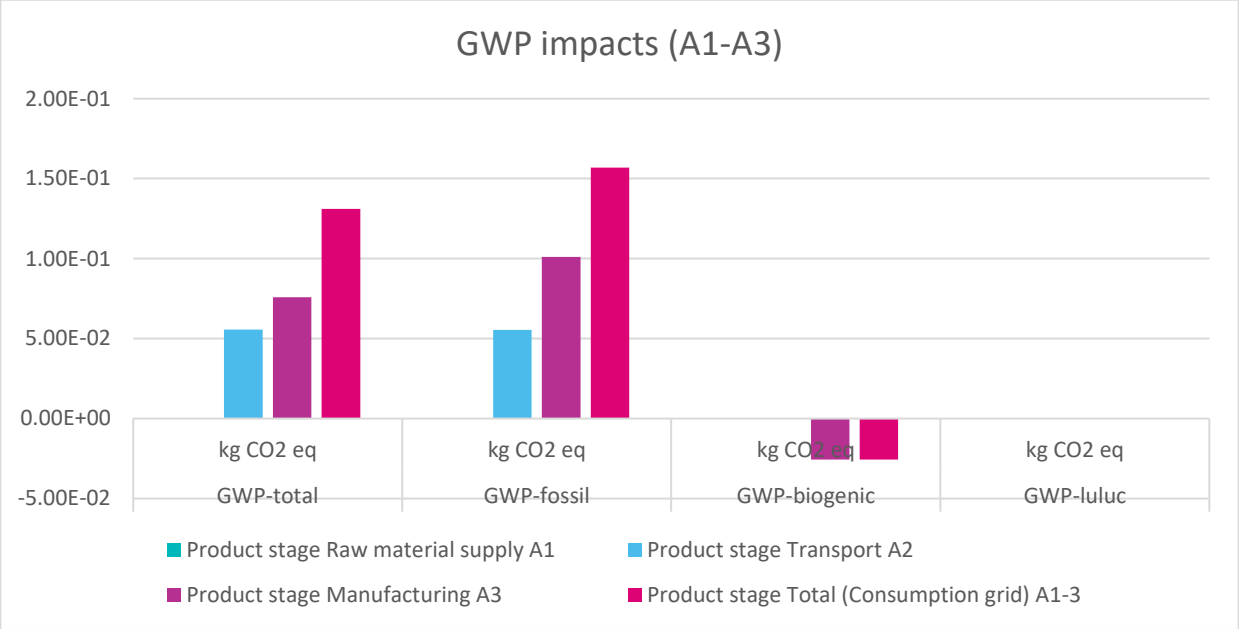
Other environmental information describing output flows – at end of life								
			CRU	MFR	MER	EE	Biogenic carbon (product)	Biogenic carbon (packaging)
			kg	kg	kg	MJ per energy carrier	kg C	kg C
Product stage	Raw material supply	A1	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Transport	A2	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
	Manufacturing	A3	0.00E+00	9.96E-06	4.25E-09	4.59E-04	0.00E+00	-7.84E-03
	Total (Consumption grid)	A1-3	0.00E+00	9.96E-06	4.25E-09	4.59E-04	0.00E+00	-7.84E-03

CRU = Components for reuse;
MFR = Materials for recycling

MER = Materials for energy recovery;
EE = Exported Energy

Interpretation of results:

The bulk of the environmental impacts and primary energy demand are attributed to the manufacturing phase, covered by information modules A1-A3 of EN15804:2012+A2:2019. The most of the impacts are attributable to the transportation and processing of waste in the Polypure factory.



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ISO 9001 – Data quality management

ISO 14001: Environmental Management systems

ISO 50001 – Energy Management systems

ISO 45001 - Occupational health and safety management systems — Requirements with guidance for use