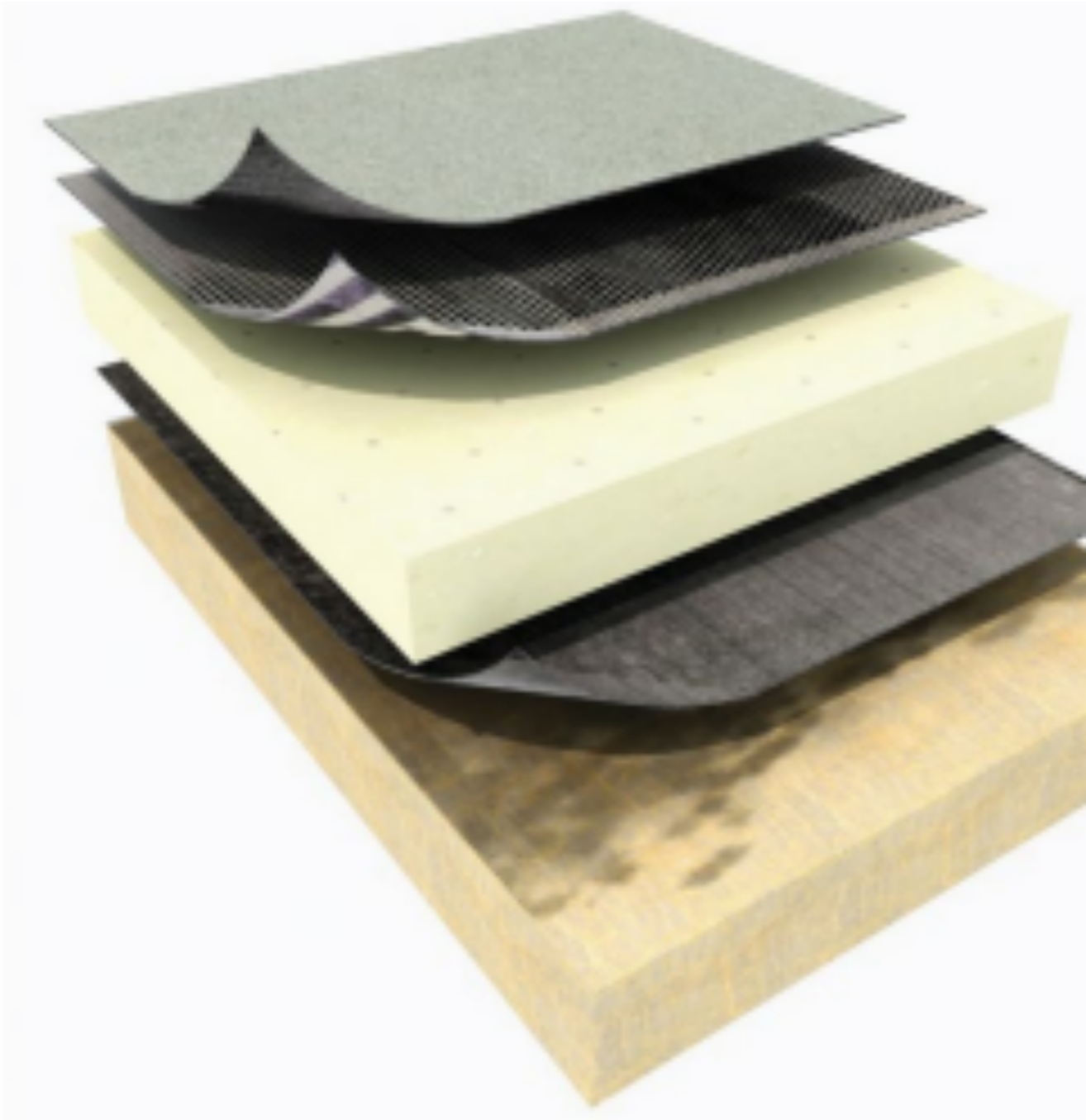
Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804

Langley TA-25 Flat Roofing System



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Issue date:	19-11-2024
Valid until:	19-11-2029
Declaration owner:	BMI Group Holdings UK Limited
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Langley TA-25 Flat Roofing System

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-187928-en

1.3 VALIDITY

Issue date: 19-11-2024

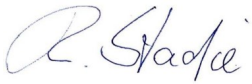
Valid until: 19-11-2029

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin
DE

Raoul Mancke

(Head of programme operations, Kiwa-Ecobility Experts)



Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: BMI Group Holdings UK Limited

Address: Thames Tower, Station Road, UK, RG1 1LX Reading

E-mail: info.group@bmigroup.com

Website: https://bmigroupinternational.com/

Production location: BMI Icopal Mondoubleau

Address production location: 30 rue Poterie, 41170 Cormenon

1.6 VERIFICATION OF THE DECLARATION

The independent verification is in accordance with the ISO 14025:2011. The LCA is in compliance with ISO 14040:2006 and ISO 14044:2006. The EN 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Lucas Pedro Berman, Senda

1.7 STATEMENTS

The owner of this EPD shall be liable for the underlying information and evidence. The programme operator Kiwa-Ecobility Experts shall not be liable with respect to manufacturer data, life cycle assessment data and evidence.

1.8 PRODUCT CATEGORY RULES

EN 15804+A2 - Kiwa-Ecobility Experts (Kiwa-EE)

General Product Category Rules (PCR A)

PCR B: EN 17388-1:2024: Flexible sheets for waterproofing - Environmental product declarations - Product category rules for reinforced bitumen, plastic and rubber flexible sheets for roof waterproofing

1 General information

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

LCA method R<THINK: Ecobility Experts | EN15804+A2

LCA software*: Simapro 9.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: EcoInvent version 3.6

Version database: v3.17 (2024-05-22)

** Simapro is used for calculating the characterized results of the Environmental profiles within R<THINK.*

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Langley TA-25 Flat Roofing System ' with the calculation identifier ReTHiNK-87928.

2 Product

2.1 PRODUCT DESCRIPTION

The Langley TA-25 Flat Roofing Systems, comprise polymer modified bitumen waterproofing membranes and vapour control layers (vcls) for use on flat and pitched roofs with limited access. The TA-25 system, part of the Langley Elastoflex range, is a premium quality, torch-applied, high performance SBS elastomeric membrane warm roof system for flat or sloping roofs. The cap sheet is available in several colours for architectural purposes and delineating walkways etc.

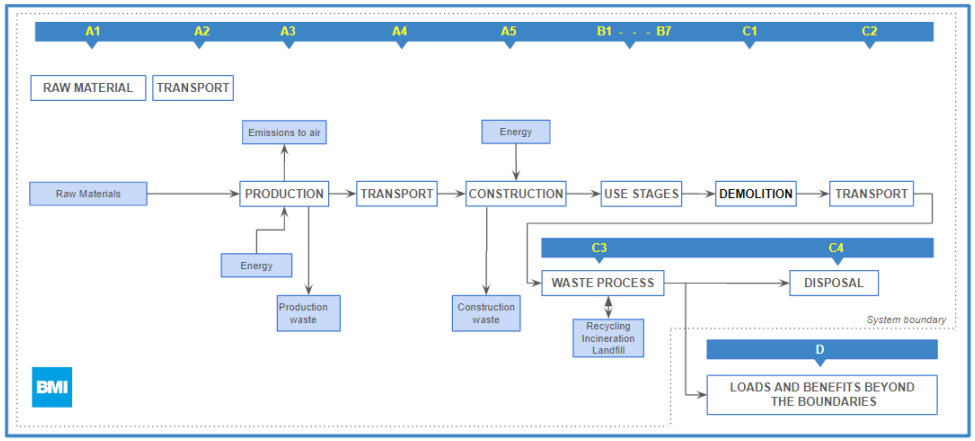
This system is for new build or refurbishment projects (where conditions allow, existing systems can be overlaid). Suitable for all roof decks (timber boarding requires a nailed attachment layer).

The LCA calculation for the TA-25 system is based on the following SBS modified bitumen layer choices:

- Parevapo SBS (vapour barrier)

- Adepar JS VV (base layer)

- Elastoflex GS (cap sheet)



2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Langley TA-25 Flat Roofing System is a system used for vapor control and waterproofing of flat and pitched roofs.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT
Reference service life of the system and its constituents is 50 years.

USED RSL (YR) IN THIS LCA CALCULATION:
50

RSL PARTS
Reference service life of the system and its constituents is 50 years.

2.4 TECHNICAL DATA

			Parevapo SBS (vapour barrier)	Adepar JS VV (base layer)	Elastoflex GS (cap sheet)
Test	**Reference Norm**	**Unit**	**Average values**	**Average values**	**Average values**
Tensile strength at max	EN 12 311-1: 1999	N/ 50mm	450 x 450	300 x 170	700 x 550
Elongation at max	EN 12 311-1: 1999	%	4 x 30	2,5 x 2,0	40 x 45
Nail tearing resistance	EN 12 310-1	N/ 50mm	160 x 160	-	-
Cold temperature flexibility	EN 1109	°C	≤ -20	≤ -20	-20
Heat flow test	EN 1110	°C	≥ 100	≥ 100	-
Static puncture resistance	EN 12730	kg	-	-	> 20

2 Product

2.5 SUBSTANCES OF VERY HIGH CONCERN

For construction product EPDs complaint with EN15804, the content declaration shall list substances contained in the products that are listed in the “Candidate List of Substances of Very High Concern for Authorization” when their content exceeds the limits for registration with the European Chemicals Agency: i.e. >0.1 % of the weight of the product. No such substances are used in the production of the products covered in this EPD.

2.6 DESCRIPTION PRODUCTION PROCESS

The products used in the system are manufactured by saturating and coating of the reinforcement with SBS modified bitumen, then calendering to correct thickness. The surfaces are finished by the application of sand or thermofusible film to the lower surface, and sand, mineral granules or slate flakes to the upper surface. The finished membranes are cooled, trimmed and rolled for packaging.

2.7 CONSTRUCTION DESCRIPTION

The bitumen membranes in this system are rolled out on the roof and fixated by torching or self-adhesion.

3 Calculation rules

3.1 FUNCTIONAL UNIT

m2 (square meter)

1 m2 of installed, SBS modified, bitumen waterproofing system (vapor barrier, base layer, cap sheet).
The material needed for the fulfillment of the functional unit encompasses the amount of subsidiary material required for the overlaps.

Reference unit: square meter (m2)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	m2
Weight per reference unit	13.355	kg
Conversion factor to 1 kg	0.074876	m2

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with options, modules C1-C4 and module D EPD. The life cycle stages included are as shown below:

(X = module included, ND = module not declared)

A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	X	X	X	X	X	ND	ND	X	X	X	X	X	X	X

The modules of the EN15804 contain the following:

Module A1 = Raw material supply	Module B5 = Refurbishment
Module A2 = Transport	Module B6 = Operational energy use
Module A3 = Manufacturing	Module B7 = Operational water use
Module A4 = Transport	Module C1 = De-construction / Demolition
Module A5 = Construction - Installation process	Module C2 = Transport
Module B1 = Use	Module C3 = Waste Processing
Module B2 = Maintenance	Module C4 = Disposal
Module B3 = Repair	Module D = Benefits and loads beyond the product system boundaries
Module B4 = Replacement	

3.4 REPRESENTATIVENESS

The data used is representing the TA-25 system (part of Langley Elastoflex range)which is a torch applied, high performance SBS elastomeric membrane warm roof system, produced by the BMI Group at its two production facilities in France. The data in this EPD is representative for the European Union and the United Kingdom.

3.5 CUT-OFF CRITERIA

Product stage (A1-A3)

3 Calculation rules

All input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. production waste) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Construction process stage (A4-A5)

All input flows (e.g. transportation to the construction site, additional raw material use for construction, installation energy (use)of energy use for assembly , etc.) and output flows (e.g. construction waste, packaging waste, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Use stage (B1-B5)

All (known) input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. emissions to soil, air and water, construction waste, packaging waste, end-of-life waste, etc.) related to the building fabric are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass. This is a Cradle to cradle EPD which covers all the EPD life cycle stages and modules (A-D), except for modules B4 (replacement) and B5 (refurbishment) just because they are not applicable for this product. This LCA covers nevertheless a full Cradle to cradle study.

End of life stage (C1-C4)

All input flows (e.g. energy use for demolition or disassembly, transport to waste processing, etc.) and output flows (e.g. end-of-life waste processing of the product, etc.) are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

Benefits and loads beyond the system boundary (Module D)

All benefits and loads beyond the system boundary resulting from reusable products, recyclable materials and/or useful energy carriers leaving the product system are considered in this LCA.

Other excluded processes

Other excluded processes from this LCA are as follows: the manufacture of equipment used in production, buildings or any other capital goods, transport of personnel to the plant, transportation of personnel within the plant, research and development activities, long-term emissions.

3.6 ALLOCATION

Mass allocation has been applied for the energy and water consumption in the case of Adepar JS VV, a semi-finished product produced in Loriol, France.

3.7 DATA COLLECTION & REFERENCE PERIOD

Primary data on energy consumption has been collected in 2021 and the primary data on manufacturing, packaging and suppliers is based on production year 2023.

3.8 ESTIMATES AND ASSUMPTIONS

Product overlap when installing has been estimated at 10% of the products length and 6% of its width.

3.9 DATA QUALITY

The LCA of the associated product system has been based on the primary data from the BMI production facility in Mondoubleau and Loriol, France. Background data has been based on primary environmental data and Ecoinvent 3.6 database.

3.10 POWER MIX

No guaranties of origin have been included and the used electricity during the manufacturing (module A3) has been modeled using the national grid dataset (0.092 kg/ Co2 eq). It is based on 16% renewable and 84% nonrenewable energy with nuclear power making up 72% of all the energy sources.

4 Scenarios and additional technical information

4.1 TRANSPORT TO CONSTRUCTION SITE (A4)

For the transport from production place to assembly/user, the following scenario is assumed for module A4 of this EPD.

	Value and unit
Vehicle type used for transport	Lorry (Truck) >32t, EURO6 | market for (EU)
Fuel type and consumption of vehicle	not available
Distance	930 km
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.2 ASSEMBLY (A5)

The following information describes the scenarios for flows entering the system and flows leaving the system at module A5.

FLOWS ENTERING THE SYSTEM

For flows entering the system at A5 the following scenario is assumed for module A5.

	Value	Unit
Energy consumption for installation/assembly		
Propane burned in building machine (GLO)	0.4	l

FLOWS LEAVING THE SYSTEM

The following output flows leaving the system at module A5 are assumed.

Description	Value	Unit
Output materials as result of loss during construction	1	%
Output materials as result of waste processing of materials used for installation/assembly at the building site	0.000	kg
Output materials as result of waste processing of used packaging	0.443	kg

4.3 USE STAGE (B1)

No significant environment impact in the use stage modules, because there is no (significant) emission to air, soil or water.

4 Scenarios and additional technical information

4.4 MAINTENANCE (B2)

For maintenance no input or output flows are moddeled.

4.5 REPAIR (B3)

Repairs are not applicable within the functional unit and to achieve the reference service life.

4.6 OPERATIONAL ENERGY USE (B6)

Description	Service cycle (yr)	Number of cycles (n)	Amount per cycle	Total Amount	Unit

4.7 OPERATIONAL WATER USE (B7)

Description	Service cycle (yr)	Number of cycles (n)	Amount per cycle	Total Amount	Unit

4.8 DE-CONSTRUCTION, DEMOLITION (C1)

No inputs are needed for the product at the de-construction / demolition phase

4.9 TRANSPORT END-OF-LIFE (C2)

The following distances and transport conveyance are assumed for transportation during end of life for the different types of waste processing.

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
Waste scenario EWA bitumen roofing material | Benefits Eurobitume (SE)	Lorry (Truck) 7.5-16t, EURO5 | market for (EU)	0	50	100	300	0

The transport conveyance(s) used in the scenario(s) for transport during end of life has the following characteristics.

Value and unit

4 Scenarios and additional technical information

Vehicle type used for transport	Lorry (Truck) 7.5-16t, EURO5 | market for (EU)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

	Value and unit
Vehicle type used for transport	Lorry (Truck), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Capacity utilisation (including empty returns)	50 % (loaded up and return empty)
Bulk density of transported products	inapplicable
Volume capacity utilisation factor	1

4.10 END OF LIFE (C3, C4)

The scenario(s) assumed for end of life of the product are given in the following tables.
First the assumed percentages per type of waste processing are displayed, followed by the assumed amounts.

Waste Scenario	Region	Not removed (stays in work) [%]	Landfill [%]	Incineration [%]	Recycling [%]	Re-use [%]
Waste scenario EWA bitumen roofing material | Benefits Eurobitume (SE)	EU	0	40	45	15	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Waste scenario EWA bitumen roofing material | Benefits Eurobitume (SE)	0.000	5.043	5.674	1.891	0.000
Total	**0.000**	**5.043**	**5.674**	**1.891**	**0.000**

4.11 BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY (D)

The presented Benefits and loads beyond the system boundary in this EPD are based on the following calculated Net output flows in kilograms and Energy recovery displayed in MJ Lower Heating Value.

4 Scenarios and additional technical information

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
Waste scenario EWA bitumen roofing material | Benefits Eurobitume (SE)	1.891	93.866
Total	**1.891**	**93.866**

5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER SQUARE METER

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
AP	mol H+ eqv.	5.11E-2	1.69E-3	4.15E-3	5.70E-2	3.60E-3	3.47E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.27E-3	5.86E-3	8.65E-4	-6.71E-3
GWP-total	kg CO2 eqv.	6.14E+0	4.36E-1	7.23E-1	7.30E+0	1.12E+0	1.88E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.17E-1	1.49E+1	8.05E-1	-2.80E+0
GWP-b	kg CO2 eqv.	-1.69E-1	3.20E-4	-7.10E-1	-8.79E-1	8.47E-4	6.97E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.56E-4	-4.07E-4	5.10E-4	-9.32E-4
GWP-f	kg CO2 eqv.	6.30E+0	4.36E-1	1.43E+0	8.17E+0	1.12E+0	1.19E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.16E-1	1.49E+1	8.05E-1	-2.78E+0
GWP-luluc	kg CO2 eqv.	5.84E-3	1.37E-4	1.24E-3	7.21E-3	3.41E-4	1.74E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.36E-4	5.57E-4	2.93E-5	-1.55E-2
EP-m	kg N eqv.	8.14E-3	3.80E-4	8.46E-4	9.37E-3	7.88E-4	8.46E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.62E-4	1.83E-3	6.88E-4	-1.77E-3
EP-fw	kg P eq	2.22E-4	3.43E-6	2.34E-5	2.49E-4	8.90E-6	7.15E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.88E-6	1.81E-5	1.14E-6	-2.22E-5
EP-T	mol N eqv.	9.04E-2	4.23E-3	9.35E-3	1.04E-1	8.79E-3	9.26E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.01E-3	2.02E-2	1.85E-3	-2.02E-2
ODP		1.27E-6	1.06E-7	3.01E-7	1.68E-6	2.74E-7	2.01E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.98E-8	1.11E-7	1.77E-8	-4.58E-7

AP=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
	kg CFC 11 eqv.																
POCP	kg NMVOC eqv.	3.34E-2	1.54E-3	3.61E-3	3.86E-2	3.45E-3	3.20E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.23E-3	5.71E-3	7.25E-4	-6.31E-3
ADP-f	MJ	4.19E+2	7.04E+0	4.03E+1	4.67E+2	1.82E+1	1.68E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.70E+0	9.34E+0	1.37E+0	-1.55E+2
ADP-mm	kg Sb-eqv.	8.62E-4	7.65E-6	2.09E-5	8.90E-4	1.99E-5	1.15E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E-5	1.14E-5	6.18E-7	-5.22E-6
WDP	m3 world eqv.	3.92E+0	2.26E-2	2.44E-1	4.19E+0	5.89E-2	7.09E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.44E-2	2.39E-1	5.80E-2	-4.25E-1

AP=Acidification (AP) | **GWP-total**=Global warming potential (GWP-total) | **GWP-b**=Global warming potential - Biogenic (GWP-b) | **GWP-f**=Global warming potential - Fossil (GWP-f) | **GWP-luluc**=Global warming potential - Land use and land use change (GWP-luluc) | **EP-m**=Eutrophication marine (EP-m) | **EP-fw**=Eutrophication, freshwater (EP-fw) | **EP-T**=Eutrophication, terrestrial (EP-T) | **ODP**=Ozone depletion (ODP) | **POCP**=Photochemical ozone formation - human health (POCP) | **ADP-f**=Resource use, fossils (ADP-f) | **ADP-mm**=Resource use, minerals and metals (ADP-mm) | **WDP**=Water use (WDP)

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
ETP-fw	CTUe	1.96E+2	5.58E+0	1.91E+1	2.21E+2	1.45E+1	1.09E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.97E+0	1.28E+1	1.83E+0	-4.09E+1
PM	disease incidence	3.53E-7	3.76E-8	4.22E-8	4.33E-7	9.81E-8	3.81E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.93E-8	6.40E-8	9.62E-9	-3.23E-8
	CTUh	5.21E-9	1.39E-10	7.54E-10	6.11E-9	3.51E-10	4.34E-10	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.23E-10	2.74E-9	3.83E-11	-6.64E-10

ETP-fw=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation, human health (IR) | **SQP**=Land use (SQP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
HTP-c																	
HTP-nc	CTUh	1.12E-7	6.10E-9	1.04E-8	1.29E-7	1.58E-8	1.11E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.19E-9	2.17E-8	7.85E-10	-1.07E-8
IR	kBq U235 eqv.	2.33E+0	3.08E-2	1.83E-1	2.54E+0	7.93E-2	7.55E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.06E-2	2.98E-2	5.52E-3	-1.58E+0
SQP	Pt	8.98E+1	7.93E+0	8.93E+1	1.87E+2	2.08E+1	3.90E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.80E+0	7.22E+0	3.19E+0	-5.23E+1

ETP-fw=Ecotoxicity, freshwater (ETP-fw) | **PM**=Particulate Matter (PM) | **HTP-c**=Human toxicity, cancer (HTP-c) | **HTP-nc**=Human toxicity, non-cancer (HTP-nc) | **IR**=Ionising radiation, human health (IR) | **SQP**=Land use (SQP)

CLASSIFICATION OF DISCLAIMERS TO THE DECLARATION OF CORE AND ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None
	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
ILCD type / level 2	Acidification potential, Accumulated Exceedance (AP)	None
	Eutrophication potential, Fraction of nutrients reaching freshwater end compartment (EP-freshwater)	None
	Eutrophication potential, Fraction of nutrients reaching marine end compartment (EP-marine)	None
	Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	None
	Formation potential of tropospheric ozone (POCP)	None
	Potential Human exposure efficiency relative to U235 (IRP)	1
ILCD type / level 3	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
	Abiotic depletion potential for fossil resources (ADP-fossil)	2
	Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	2
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2

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ILCD classification	Indicator	Disclaimer
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

5.2 INDICATORS DESCRIBING RESOURCE USE AND ENVIRONMENTAL INFORMATION BASED ON LIFE CYCLE INVENTORY (LCI)

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
PERE	MJ	7.73E+0	8.78E-2	8.25E+0	1.61E+1	2.28E-1	2.56E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.00E-2	5.17E-1	2.88E-2	-1.78E+1
PERM	MJ	1.32E+0	0.00E+0	5.66E+0	6.99E+0	0.00E+0	6.99E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	9.06E+0	8.78E-2	1.39E+1	2.31E+1	2.28E-1	3.26E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.00E-2	5.17E-1	2.88E-2	-1.78E+1
PENRE	MJ	2.38E+2	7.47E+0	3.91E+1	2.85E+2	1.93E+1	1.57E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.99E+0	9.95E+0	1.45E+0	-1.04E+2
PENRM	MJ	2.07E+2	0.00E+0	3.70E+0	2.11E+2	0.00E+0	2.11E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-6.12E+1
PENRT	MJ	4.46E+2	7.47E+0	4.28E+1	4.96E+2	1.93E+1	1.78E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.99E+0	9.95E+0	1.45E+0	-1.65E+2
SM	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	M3	1.04E-1	7.93E-4	9.08E-3	1.14E-1	2.07E-3	2.23E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.60E-4	9.39E-3	1.43E-3	-3.28E-2

PERE=renewable primary energy ex. raw materials | **PERM**=renewable primary energy used as raw materials | **PERT**=renewable primary energy total | **PENRE**=non-renewable primary energy ex. raw materials | **PENRM**=non-renewable primary energy used as raw materials | **PENRT**=non-renewable primary energy total | **SM**=use of secondary material | **RSF**=use of renewable secondary fuels | **NRSF**=use of non-renewable secondary fuels | **FW**=use of net fresh water

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OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
HWD	Kg	1.12E-3	1.69E-5	6.10E-5	1.20E-3	4.40E-5	3.64E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.26E-5	1.56E-5	2.06E-6	-6.96E-5
NHWD	Kg	9.00E-1	6.01E-1	1.71E-1	1.67E+0	1.58E+0	1.37E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.85E-1	7.04E-1	5.39E+0	-1.24E-1
RWD	Kg	3.67E-3	4.81E-5	2.65E-4	3.98E-3	1.24E-4	1.20E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.17E-5	3.58E-5	8.22E-6	-1.47E-3

HWD=hazardous waste disposed | **NHWD**=non hazardous waste disposed | **RWD**=radioactive waste disposed

ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
CRU	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	9.85E-2	9.85E-2	0.00E+0	3.09E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.02E+0	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	-5.58E-1	-5.58E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-3.02E+1
EEE	MJ	0.00E+0	0.00E+0	-3.24E-1	-3.24E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.75E+1

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EET**=Exported Energy Thermic | **EEE**=Exported Energy Electric

5 Results

5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER SQUARE METER

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per square meter:

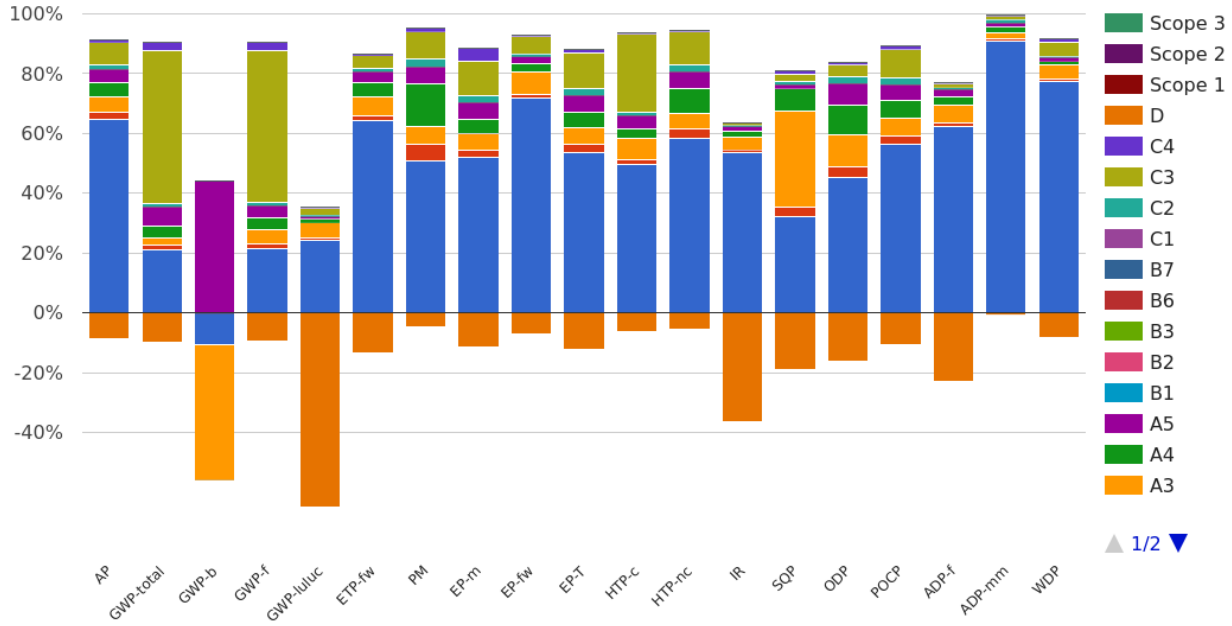
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0.03781	kg C
Biogenic carbon content in accompanying packaging	0.1808	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
product	0.1386	kg CO2 (biogenic)
Packaging	0.6628	kg CO2 (biogenic)

6 Interpretation of results



In the case of most of the impact categories, A1 is the module that is dominating the impact. GWP total results are to highest extent influenced by module C3 followed by modules A1 and A5.

7 References

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PCR B: EN 17388-1:2024
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