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

Monarflex RMB 400 Pro

Registration number:	EPD-Kiwa-EE-192451-EN
Issue date:	26-02-2025
Valid until:	26-02-2030
Declaration owner:	BMI Group Holdings UK Limited
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Monarflex RMB 400 Pro

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-192451-EN

1.3 VALIDITY

Issue date: 26-02-2025

Valid until: 26-02-2030

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, UK

E-mail: info.group@bmigroup.com

Website: https://bmigroupinternational.com/

Production location: Monarflex s.r.o.

Address production location: Továrenská 1, 943 03 Štúrovo, SK

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

Anne Kees Jeeninga, Advieslab

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

Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

PCR of EPD Norge: 'Product category rules EN 15804 +A2 NPCR 022 Part B for roof waterproofing version 2.0 Issue date: 31.03.2022 Valid to: 06.06.2023 validity extended to 31.12.2024'

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

1 General information

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.*

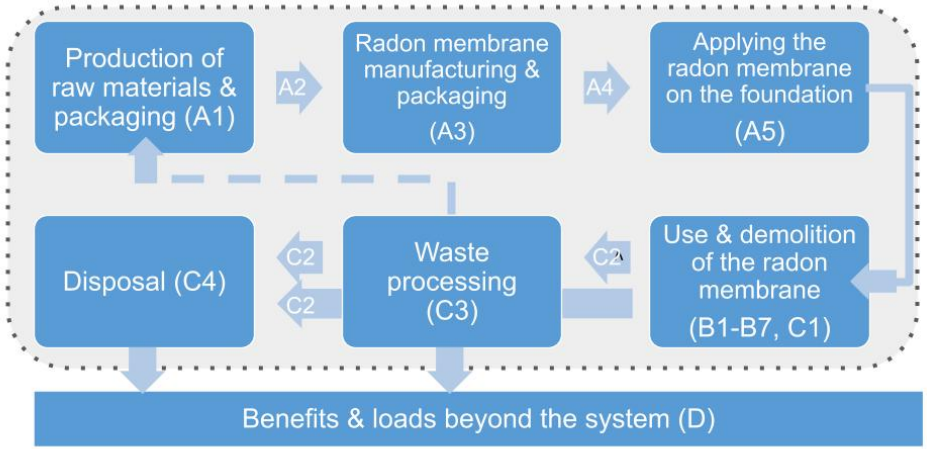
1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Monarflex RMB 400 Pro' with the calculation identifier ReTHiNK-92451.

2 Product

2.1 PRODUCT DESCRIPTION

Radon Barrier Protection Systems have been developed to provide a flexible solution for radon protection (and protection against moisture) in dwellings, schools and other buildings.



2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

They are used to protect buildings from the ingress of radon gas. It is a loose-laid membrane and may be installed below or above a ground-bearing slab, or on top of a suspended concrete floor.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

Product category rules EN 15804 +A2 NPCR 022 Part B for roof waterproofing

PCR of EPD Norge: 'Product category rules EN 15804 +A2 NPCR 022 Part B for roof waterproofing version 2.0 Issue date: 31.03.2022 Valid to: 06.06.2023 validity extended to 31.12.2024'

In this second document expected life times are mentioned of

- 30 years for plastic and rubber sheets (like PE based radon membranes)
- 60 years for concrete and clay tiles

So it seems that, based on the PCR from EPD Norge, it is 30 years because the radon membranes are PE based. Implying it is replaced after 30 years. However BMI has no information that (the foundation of) a building, which last much longer than 30 years, is dismantled to replace the radon membrane (after 30 years). It stays there till the end of life of the building. So it is assumed it is 60 years. Otherwise, if clients of BMI make calculations for a building (with a minimum lifetime of 60 years), they have to calculate (in the tools that calculate the environmental load of the building) with a replacement of the radon membrane after 30 years. However, as said, BMI has not received any information from the market that this does happen in reality. It doesn't seem to happen. This is confirmed by EPD's from other companies that also use a RSL of 60 years for the radon membranes.

USED RSL (YR) IN THIS LCA CALCULATION:

60

RSL PARTS

Product category rules EN 15804 +A2 NPCR 022 Part B for roof waterproofing

PCR of EPD Norge: 'Product category rules EN 15804 +A2 NPCR 022 Part B for roof waterproofing version 2.0 Issue date: 31.03.2022 Valid to: 06.06.2023 validity extended to 31.12.2024'

2.4 TECHNICAL DATA

The product is used for protection against radon and moisture in the ground. Quality requirements: Generally all permeables must comply with the EN 13967 2012 (EN 13967 2012 Type A and Type T). More information and technical data at https://www.bmigroup.com/uk/construction-products/structural-waterproofing/monarflex-radon-air-moisture-protection-systems/

2 Product

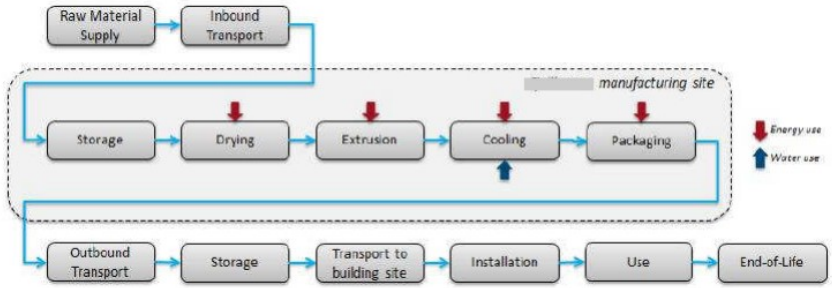
2.5 SUBSTANCES OF VERY HIGH CONCERN

None of the substances contained in the product are listed in the "Candidate List of Substances of Very High Concern for authorisation", or they do not exceed the threshold with the European Chemicals Agency

2.6 DESCRIPTION PRODUCTION PROCESS

Radon membranes are manufactured by a polythene extrusion process. 3 to 4 machines are involved for each product being

1. blown film: a process that involves melting plastic pellets and extruding them through a circular die. As the plastic is extruded, the air is blown into the center of the die, causing the molten plastic to expand into a bubble or tube
2. coater: The coater process involving melting plastic pellets is typically part of a hot melt coating or extrusion coating system. This process is widely used in industries such as packaging.
3. grid (optional, when there is a reinforcement): In this process, polyester yarns are knitted into a net using warp knitting machines. The machines glue the threads together with wax
4. rewinder: A film rewinder is a device used to rewind film from one large roll (so-called jumbo roll) into smaller rolls or to adjust the tension, width and quality of the film.



2.7 CONSTRUCTION DESCRIPTION

Radon membranes are loose-laid membranes and may be installed below or above a ground-bearing slab, or on top of a suspended concrete floor.

3 Calculation rules

3.1 FUNCTIONAL UNIT

m2

1 m2 installed radon membrane with 60 years lifespan, overlap (10% material) included

Reference unit: square meter (m2)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	m2
Weight per reference unit	0.444	kg
Conversion factor to 1 kg	2.254354	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

This EPD is representative for Monarflex RMB 400 Pro, a product of BMI Group Holdings UK Limited. The results of this EPD are representative for European Union.

3.5 CUT-OFF CRITERIA

In the Life cycle assessment the following cut-off criteria are applied:

3 Calculation rules

PRODUCT STAGE (A1-A3)

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-B7)

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.

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 (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.

3.6 ALLOCATION

Allocation has not been applied in this LCA.

3.7 DATA COLLECTION & REFERENCE PERIOD

Data gathering: From 7th of September 2023 till 19th of December 2024. Reference period: 2023

3.8 ESTIMATES AND ASSUMPTIONS

For areas where accurate data was not available, such as transport or end-of-life scenarios, we used default values like for transport Lorry (Truck), unspecified (default) | market group for (GLO), EcoInvent 3.6 (2019) and for eol polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57) for the main product and different eols for the packaging.

3.9 DATA QUALITY

The data quality is based on the principle that the data quality of the data of the processes that take place at the producer of the product must be higher than that of the other processes. For the processes at the producer, so at the factory in Sturovo, average product data have been used, retrieved from/ based on the ERP system. In addition to that as much as possible specific data from suppliers has been used. If no data was retrieved from the suppliers, background data has been used instead.

3.10 POWER MIX

The power mix that was used is the power residual mix for Slovakia since the radon membranes are produced in Sturovo, Slovakia and the mix wasn't checked (Electricity (SK) - low voltage (max 1kV), residual mix, EcoInvent 3.9.1 (2023). GWP: 0,318 kg CO2/ kWh

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), unspecified (default) | market group for (GLO)
Fuel type and consumption of vehicle	not available
Distance	2170 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

There are no significant environment impacts as a result of materials or energy used in the construction stage (A5).

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	5	%
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	0.059	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.

4.4 MAINTENANCE (B2)

For maintenance no input or output flows are moddeled.

4 Scenarios and additional technical information

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]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

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

	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)

4 Scenarios and additional technical information

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 [%]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	NL	0	10	85	5	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.000	0.044	0.377	0.022	0.000
Total	**0.000**	**0.044**	**0.377**	**0.022**	**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.

Waste Scenario	Net output flow [kg]	Energy recovery [MJ]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.022	15.306
Total	**0.022**	**15.306**

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
GWP-total	kg CO_2 eq.	9.24E-1	2.45E-2	-3.05E-2	9.18E-1	1.47E-1	2.10E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.39E-3	1.01E+0	6.60E-3	-7.04E-1
GWP-f	kg CO_2 eq.	9.22E-1	2.45E-2	6.43E-2	1.01E+0	1.47E-1	1.12E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.38E-3	1.01E+0	6.59E-3	-7.04E-1
GWP-b	kg CO_2 eq.	1.57E-3	1.13E-5	-9.54E-2	-9.38E-2	6.80E-5	9.82E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.87E-6	1.54E-4	5.07E-6	-1.63E-4
GWP-luluc	kg CO_2 eq.	4.84E-4	8.99E-6	6.97E-4	1.19E-3	5.40E-5	6.74E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.07E-6	8.14E-5	2.33E-7	-6.53E-5
ODP	kg CFC 11 eq.	2.77E-8	5.41E-9	4.75E-9	3.78E-8	3.25E-8	5.65E-9	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.85E-9	3.09E-8	1.46E-10	-8.87E-8
AP	mol H+ eq.	3.57E-3	1.42E-4	4.83E-4	4.19E-3	8.54E-4	3.02E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.86E-5	4.52E-4	4.11E-6	-7.32E-4
EP-fw	kg P eq.	2.52E-5	2.47E-7	7.65E-6	3.31E-5	1.49E-6	1.93E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.45E-8	3.03E-6	8.45E-9	-1.55E-6
EP-m	kg N eq.	6.01E-4	5.01E-5	1.04E-4	7.56E-4	3.01E-4	6.99E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-5	1.24E-4	2.49E-6	-2.05E-4
EP-T		6.77E-3	5.53E-4	1.03E-3	8.35E-3	3.32E-3	7.72E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.89E-4	1.38E-3	1.51E-5	-2.36E-3

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP minerals&metals) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (WDP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
	mol N eq.																
POCP	kg NMVOC eq.	3.77E-3	1.58E-4	2.73E-4	4.20E-3	9.47E-4	3.10E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.39E-5	3.69E-4	5.78E-6	-7.65E-4
ADP-mm	kg Sb-eq.	8.26E-6	6.21E-7	9.41E-7	9.82E-6	3.73E-6	8.22E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.12E-7	1.28E-6	5.02E-9	-4.99E-7
ADP-f	MJ	3.18E+1	3.70E-1	1.54E+0	3.37E+1	2.22E+0	1.87E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.26E-1	7.73E-1	1.12E-2	-1.23E+1
WDP	m3 world eq.	1.02E+0	1.32E-3	4.71E-2	1.07E+0	7.94E-3	5.69E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.52E-4	5.14E-2	4.78E-4	-7.42E-2

GWP-total=Global Warming Potential total (GWP-total) | **GWP-f**=Global Warming Potential fossil fuels (GWP-fossil) | **GWP-b**=Global Warming Potential biogenic (GWP-biogenic) | **GWP-luluc**=Global Warming Potential land use and land use change (GWP-luluc) | **ODP**=Depletion potential of the stratosperic ozon layer (ODP) | **AP**=Acidification potential, Accumulated Exceedance (AP) | **EP-fw**=Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater) | **EP-m**=Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine) | **EP-T**=Eutrophication potential, Accumulated Exceedance (EP-terrestrial) | **POCP**=Formation potential of tropospheric ozone (POCP) | **ADP-mm**=Abiotic depletion potential for non fossil resources (ADP minerals&metals) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) deprication potential, deprivation-weighted water consumption (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
PM	disease incidence	2.69E-8	2.21E-9	4.63E-9	3.38E-8	1.32E-8	2.89E-9	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.54E-10	3.62E-9	7.74E-11	-3.47E-9
IR		3.49E-2	1.55E-3	1.32E-2	4.96E-2	9.30E-3	3.28E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.30E-4	3.18E-3	4.37E-5	-4.49E-3

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (SQP)

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
	kBq U235 eq.																
ETP-fw	CTUe	5.95E+0	3.30E-1	1.27E+0	7.55E+0	1.98E+0	1.18E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E-1	1.27E+1	1.19E-2	-1.50E+0
HTP-c	CTUh	2.57E-10	1.07E-11	6.23E-11	3.30E-10	6.42E-11	4.17E-11	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.66E-12	1.92E-10	3.11E-13	-5.86E-11
HTP-nc	CTUh	6.34E-9	3.61E-10	1.30E-9	8.00E-9	2.17E-9	7.91E-10	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.23E-10	4.01E-9	7.74E-12	-1.08E-9
SQP	Pt	1.87E+0	3.21E-1	8.28E+0	1.05E+1	1.93E+0	6.60E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.10E-1	2.77E-1	2.64E-2	-4.38E+0

PM=Potential incidence of disease due to PM emissions (PM) | **IR**=Potential Human exposure efficiency relative to U235 (IRP) | **ETP-fw**=Potential Comparative Toxic Unit for ecosystems (ETP-fw) | **HTP-c**=Potential Comparative Toxic Unit for humans (HTP-c) | **HTP-nc**=Potential Comparative Toxic Unit for humans (HTP-nc) | **SQP**=Potential soil quality idex (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

5 Results

ILCD classification	Indicator	Disclaimer
	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
	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	8.90E-1	4.63E-3	5.32E-1	1.43E+0	2.78E-2	7.78E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.58E-3	7.91E-2	1.97E-4	-8.57E-1
PERM	MJ	0.00E+0	0.00E+0	8.72E-1	8.72E-1	0.00E+0	4.36E-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	8.90E-1	4.63E-3	1.40E+0	2.30E+0	2.78E-2	1.21E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.58E-3	7.91E-2	1.97E-4	-8.57E-1
PENRE	MJ	1.86E+1	3.93E-1	1.59E+0	2.05E+1	2.36E+0	1.23E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.34E-1	8.21E-1	1.19E-2	-1.30E+1
PENRM	MJ	1.55E+1	0.00E+0	9.00E-3	1.55E+1	0.00E+0	7.73E-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	-6.64E-1
PENRT	MJ	3.40E+1	3.93E-1	1.60E+0	3.60E+1	2.36E+0	2.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.34E-1	8.21E-1	1.19E-2	-1.36E+1
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

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

5 Results

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
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	m^3	1.54E-2	4.51E-5	1.89E-3	1.74E-2	2.70E-4	9.85E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.54E-5	1.51E-3	1.16E-5	-1.03E-3

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 resources | **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

Abbr.	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B6	B7	C1	C2	C3	C4	D
HWD	Kg	4.23E-6	9.37E-7	2.53E-6	7.70E-6	5.63E-6	8.46E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.20E-7	1.48E-6	1.69E-8	-1.44E-5
NHWD	Kg	3.70E-2	2.35E-2	9.94E-3	7.04E-2	1.41E-1	1.88E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.02E-3	1.86E-2	4.46E-2	-6.74E-3
RWD	Kg	2.96E-5	2.43E-6	1.13E-5	4.33E-5	1.46E-5	3.28E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.30E-7	2.78E-6	6.62E-8	-6.23E-6

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	0.00E+0	0.00E+0	0.00E+0	2.51E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.22E-2	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	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	-5.14E+0
EEE	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	-2.98E+0

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:

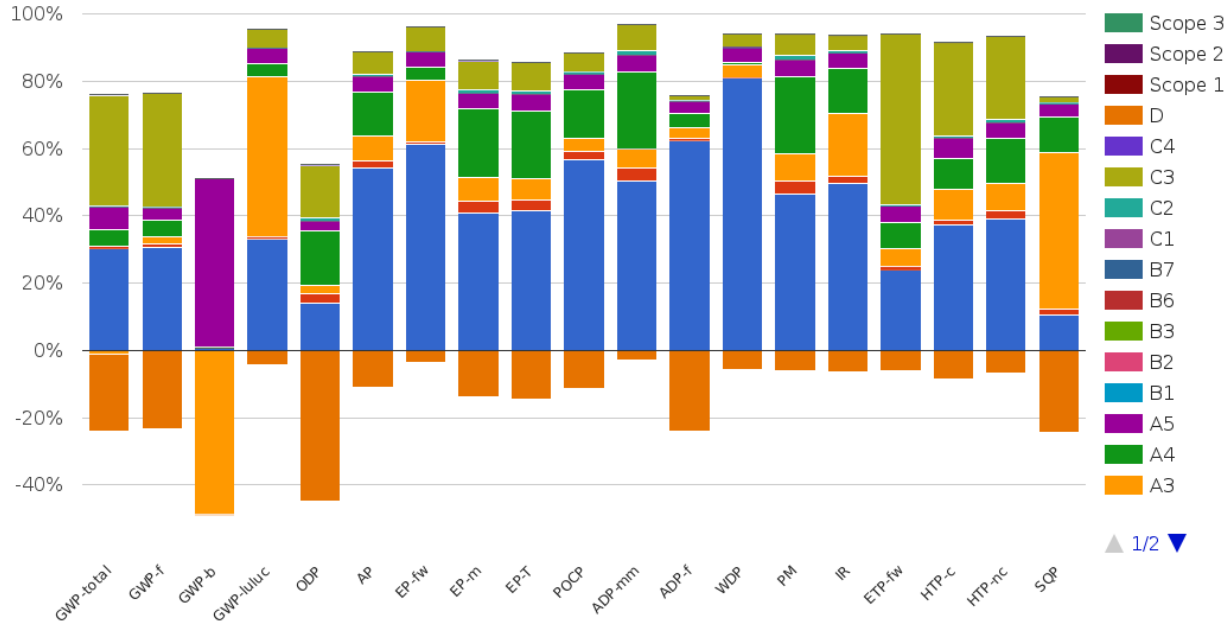
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.02664	kg C

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
Packaging	0.09769	kg CO2 (biogenic)

6 Interpretation of results



It has been analysed what the contribution is of the modules to the total GWP per functional unit. In the next table it is shown which phase(s) contribute(s) most and how much (the (high) contribution of module A1-A3 is mainly due to module A1 (raw materials)):

Phase/ module	GWP/ m2	share
A1-A3 Production	0.918	57%
A4-5 Construction	0.358	22%
C1-C4 + D End-of-life	0.323	20%
Total	**1.599**	**100%**

7 References

ISO 14040
ISO 14040:2006-10, Environmental management - Life cycle assessment - Principles and framework; EN ISO 14040:2006

ISO 14044
ISO 14044:2006-10, Environmental management - Life cycle assessment - Requirements and guidelines; EN ISO 14044:2006

ISO 14025
ISO 14025:2011-10: Environmental labels and declarations — Type III environmental declarations — Principles and procedures

EN 15804+A2
EN 15804+A2: 2019: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

General PCR Ecobility Experts
Kiwa-Ecobility Experts (Kiwa-EE) – General Product Category Rules (2022-02-14)

PCR of EPD Norge: 'Product category rules EN 15804 +A2 NPCR 022 Part B for roof waterproofing version 2.0 Issue date: 31.03.2022 Valid to: 06.06.2023 validity extended to 31.12.2024'

Backgrounddatabase
EcoInvent 3.6

8 Contact information

Publisher	Operator	Owner of declaration

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin, DE

E-mail:
DE.Ecobility.Experts@kiwa.com
Website:
https://www.kiwa.com/de/en/themes/ecobility-experts/ecobility-experts-epd-program/

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin, DE

E-mail:
DE.Ecobility.Experts@kiwa.com
Website:
https://www.kiwa.com/de/en/themes/ecobility-experts/ecobility-experts-epd-program/

BMI Group Holdings UK Limited
Thames Tower, Station Road, UK
RG1 1LX Reading, UK, GB

E-mail:
info.group@bmigroup.com
Website:
https://bmigroupinternational.com/

Kiwa-Ecobility Experts is established member of the ECO PLATFORM