

Environmental Product Declaration

VH - Variabel Plus (3.9.1)

BMI Group Holdings UK Limited

Publisher:	BMI Group Holdings UK Limited
Programme operator:	stichting MRPI
Calculation number:	ReTHiNK-130290
Generation on:	17-12-2025
Issue date:	17-12-2025
Valid until:	17-12-2030
Status:	verified

R<THiNK



1 General information

1.1 PRODUCT

VH - Variabel Plus (3.9.1)

1.2 VALIDITY

Issue date: 17-12-2025

Valid until: 17-12-2030

1.3 OWNER OF THE DECLARATION



Declaration owner: BMI Group Holdings UK Limited

Address: Thames Tower, 4th Floor, Station Rd, RG1 1LX Reading

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Website: www.bmigroup.com/uk/

Production location: BMI Petershagen

Address production location: Heisterholzstraße 1, 32469 Petershagen

1.4 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+A2:2019 serves as the core PCR.

☐ Internal ☒ External

A handwritten signature in black ink, appearing to read 'Anne Kees Jeeninga', is written over a circular stamp or seal.

Anne Kees Jeeninga, Advieslab

1.5 PRODUCT CATEGORY RULES

NMD Determination method Environmental performance Construction works v1.2 January 2025

1.6 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+A2:2019. 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+A2:2019 and ISO 14025.

1 General information

1.7 CALCULATION BASIS

LCA method R<THiNK: NMD Determination method v 1.2 | set1+2

LCA software*: Simapro 9.6

Characterization method: Bepalingsmethode 'set 1', 'set2' & param (NMD 3.4) v1.00

LCA database profiles: ecoinvent (for version see references)

Version database: v3.20b (2025-11-18)

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

1.8 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'VH - Variabel Plus (3.9.1) ' with the calculation identifier ReTHiNK-130290.

2 Product

2.1 PRODUCT DESCRIPTION

The **VH - Variabel** clay tiles are almost completely made out of clay. In case of surfaces they are natural, engobe based on iron oxides and glazed based on iron oxides combined with glass. Compositional differences between the mentioned tiles are insignificant and this EPD is therefore based on an average product and is valid for the DNH-V tiles with the above described surface finishes.

Category	Value	Unit
Tile Dimension (l x b)	377 x 255	mm
Tile Weight	2.83	kg
Average Number of Tiles per m2	15	-
Average Weight per m2	42.25	kg

This EPD applies to multiple VH-Variabel Plus products with the following SKU's (stock keeping unit):

11001527 / 11001529 / 11001530 / 11001528 / 11001525 / 11001524 / 11001526

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

Roof tiles are used for roofing on pitched roofs or as exterior wall cladding.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The chosen reference service life (RSL) of 100 years is based on the value used in the Category 3 Environmental Declaration (EPD) for glazed ceramic roofing tiles from the Nationale Milieudatabase (NMD).

NMD default RSL

USED RSL (YR) IN THIS LCA CALCULATION:

100

RSL PARTS

NMD default RSL

2.4 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.

2.5 DESCRIPTION PRODUCTION PROCESS

The production steps are as following:

Raw Material Processing

The basic materials, clay and loam, are mined from regional pits, usually in open-cast mines near the factory. The subsequent preparation for production involves separating out interfering components, limiting the maximum size, and ensuring proper dosing and mixing. The prepared mass is then temporarily stored in a blending pit for homogenization.

Forming

For production, the mixture is adjusted for moisture content, further homogenized, and pressed into a continuous column. For pressed roof tiles (e.g., Rubin), this clay column is cut into "slugs." These slugs are then placed in a turret press, which contains plaster molds for the top and bottom, to get their final shape. For extruded roof tiles (e.g., Beaver Tail tiles), the die of the extruder already forms the cross-section of the tile. The tile blank is then cut to length according to its shape (e.g., round or segmented cut). Excess material is reintroduced into the production mass.

Drying

2 Product

The blanks are removed, placed on drying racks, and stacked on drying wagons. These wagons pass through a tunnel dryer with a defined temperature and relative humidity profile. The drying process is partially powered by waste heat from the firing kiln.

Surface Finishing and Firing

The surfaces of the dried roof tiles can be coated with engobes, refined engobes, or glazes. The blanks are positioned on fireproof firing cassettes and placed on tunnel kiln wagons, which travel through a tunnel kiln with a defined temperature and airflow profile.

Quality Control and Packaging

All fired roof tiles are inspected for appearance and structure. Defective tiles are sorted out as "firing breakage." The tiles are bundled into small packages, strapped, and placed on reusable pallets. These are either wrapped in foil or strapped again.

2.6 CONSTRUCTION DESCRIPTION

Roof tiles are transported to the roof with an inclined lift or a crane and are then individually laid by hand on the corresponding substructure (battens). If roof tiles need to be cut, this is done with wet cutting devices or devices with dust extraction, while wearing a respiratory mask. The devices used for this must comply with the applicable regulations and be used correctly.

In order to attach the tiles to the roof nails, hooks, battens and counterbattens are used

3 Calculation rules

3.1 FUNCTIONAL UNIT

Pitched Roof Covering

1 m2 of roofing applied to a pitched roof that meets or exceeds the requirements of the Building Decree of the Netherlands (Bouwbesluit). Roof battens, battens, and fasteners must be included. Insulation material and the roofing structure are not included.

Reference unit: square meter (m2)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	m2
Weight per reference unit	44.868	kg
Conversion factor to 1 kg	0.022288	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	ND	ND	X	X	X	X	X

The modules of the EN 15804 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 VH - Variabel Plus (3.9.1) , a product of BMI Group Holdings UK Limited. The results of this EPD are representative for Netherlands.

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 or 5% on impact per environmental effect.

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 or 5% on impact per environmental effect.

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 or 5% on impact per environmental effect.

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 or 5% on impact per environmental effect.

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

Only mass allocation has been applied regarding the energy and water consumption.

3.7 DATA COLLECTION & REFERENCE PERIOD

The data gathering is based on the production year 2024.

3.8 ESTIMATES AND ASSUMPTIONS

All data from the operational data collection, i.e. all raw materials used according to the recipe, their transport to the factory, the thermal and electrical energy used, packaging materials, all direct production waste and all available emission measurements were taken into account in the balance. This also included material and energy flows with a share of less than one percent. The limit of 5% of neglected processes in terms of mass and energy consumption required in PCR Part A is thus met.

Machines, systems and infrastructure required in production were neglected and therefore not taken into account. Transport of the packaging material has also been included. The model is based on primary data from the BMI Group. Where primary data in means of specific datasets was missing, accurate Ecoinvent datasets have been used. No further assumptions have been made as primary data has been used.

3.9 DATA QUALITY

The quality level of geographical representativeness can be considered “very good”. The quality level of technical representativeness can be considered “good”. The time representativeness can also be regarded as “good”. The overall data quality for this EPD can, therefore, be described as “good”. All relevant process-specific data were collected during data collection. The database is checked regularly and, therefore, meets the requirements of DIN EN ISO 14040/44 (background data not older than 10 years). The background data meets the requirements of EN 15804+A2. The quantities of raw materials, consumables and supplies used and the energy consumption were recorded and averaged over the entire operating year. The general rule that specific data from certain production processes or average data derived from certain processes must take precedence when calculating an EPD or LCA was adhered to. Data for processes over which the manufacturer has no influence were assigned to generic data/scenarios. When selecting these, care was taken to always choose the data set/scenario that most realistically represents the processes.

3.10 POWER MIX

The power mix that was used is the power mix for Germany since the clay tiles are produced in Petershagen, Germany; Electricity (DE) - low voltage (max 1kV), residual mix, Ecoinvent 3.9.1; GWP of 0.72 kg CO₂ per 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	(ei3.9.1) Lorry (Truck) >32t, EURO6 market for (EU)
Fuel type and consumption of vehicle	not available
Distance	290 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
<i>Materials used for installation/assembly</i>		
(ei3.9.1) Softwood, planed, dried (460kg/m ³ , u=10%) production (EU) corr. acc. EN16449	2	kg
(ei3.9.1) Organic coated steel coils (Granite & Estetic)	0.1012	kg
<i>Energy consumption for installation/assembly</i>		
(ei3.9.1) Wire drawing, steel processing (EU) (only process)	0.98	kg

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	3	%
Output materials as result of waste processing of materials used for installation/assembly at the building site	2.101	kg
Output materials as result of waste processing of used packaging	0.749	kg

4 Scenarios and additional technical information

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 modelled.

4.5 REPAIR (B3)

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

4.6 DE-CONSTRUCTION, DEMOLITION (C1)

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

4.7 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]
(ei3.9.1) coarse ceramic (i.a. brickwork, tiles) (NMD ID 32)	(ei3.9.1) Lorry (Truck), unspecified (default) market group for (GLO)	0	100	150	50	50

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	(ei3.9.1) 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

4 Scenarios and additional technical information

Volume capacity utilisation factor

1

4.8 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 [%]
(ei3.9.1) coarse ceramic (i.a. brickwork, tiles) (NMD ID 32)	NL	0	1	0	99	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
(ei3.9.1) coarse ceramic (i.a. brickwork, tiles) (NMD ID 32)	0.000	0.449	0.000	44.419	0.000
Total	0.000	0.449	0.000	44.419	0.000

4.9 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]
(ei3.9.1) coarse ceramic (i.a. brickwork, tiles) (NMD ID 32)	44.419	0.000
Total	44.419	0.000

5 Results

For the impact assessment long-term emissions (>100 years) are not considered. 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 EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1- A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	2.27E+0	2.28E-1	9.65E+0	1.22E+1	1.33E+0	2.87E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.38E-1	6.61E-2	2.73E-3	-6.29E-1
GWP-f	kg CO ₂ eq.	2.27E+0	2.28E-1	1.07E+1	1.32E+1	1.32E+0	1.87E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.36E-1	6.61E-2	2.73E-3	-6.26E-1
GWP-b	kg CO ₂ eq.	3.36E-3	7.64E-5	-1.10E+0	-1.09E+0	4.44E-4	9.93E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.10E-4	6.00E-5	1.19E-6	-1.46E-3
GWP-luluc	kg CO ₂ eq.	1.73E-3	1.11E-4	1.28E-2	1.47E-2	6.46E-4	1.40E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.20E-3	1.49E-5	1.65E-6	-1.48E-3
ODP	kg CFC 11 eq.	2.14E-8	5.18E-9	6.68E-7	6.95E-7	3.01E-8	6.02E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.98E-9	1.49E-9	7.89E-11	-3.29E-8
AP	mol H ⁺ eq.	1.69E-2	5.65E-4	1.96E-2	3.71E-2	3.28E-3	1.42E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.61E-3	4.17E-4	2.05E-5	-5.34E-3
EP-fw	kg P eq.	9.25E-5	1.91E-6	3.26E-4	4.20E-4	1.11E-5	1.93E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.35E-6	1.31E-6	2.66E-8	-2.04E-5
EP-m	kg N eq.	3.73E-3	1.51E-4	5.34E-3	9.23E-3	8.75E-4	2.35E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.12E-4	1.77E-4	7.84E-6	-1.56E-3
EP-T	mol N eq.	4.19E-2	1.58E-3	5.80E-2	1.02E-1	9.17E-3	5.47E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.53E-3	1.94E-3	8.45E-5	-2.35E-2
POCP	kg NMVOC eq.	1.28E-2	9.22E-4	2.32E-2	3.69E-2	5.35E-3	8.67E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.23E-3	5.74E-4	2.94E-5	-5.45E-3
ADP-mm	kg Sb-eq.	5.87E-6	6.38E-7	3.58E-5	4.23E-5	3.71E-6	2.89E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.05E-6	2.67E-7	3.79E-9	-1.11E-6
ADP-f	MJ	2.69E+1	3.46E+0	1.62E+2	1.92E+2	2.01E+1	2.01E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.82E+0	9.03E-1	6.79E-2	-8.40E+0
WDP	m ³ world eq.	2.22E+0	1.65E-2	1.10E+0	3.34E+0	9.60E-2	8.78E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.63E-2	4.96E-3	3.00E-3	-2.93E+0

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 stratospheric ozone 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 mm) | **ADP-f**=Abiotic depletion for fossil resources potential (ADP fossil) | **WDP**=Water (user) depletion potential, deprivation-weighted water consumption (WDP)

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1- A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
PM	disease incidence	2.04E-7	2.25E-8	1.33E-7	3.60E-7	1.31E-7	2.62E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.32E-8	1.01E-8	4.49E-10	-8.46E-8
IR	kBq U235 eq.	6.85E-2	1.67E-3	1.76E-1	2.46E-1	9.67E-3	5.20E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.88E-3	1.03E-3	1.80E-5	-7.19E-3
ETP-fw	CTUe	2.19E+1	1.66E+0	1.96E+1	4.32E+1	9.67E+0	2.09E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.55E+0	3.04E-1	3.19E-2	-1.48E+0
HTP-c	CTUh	6.95E-8	1.01E-10	3.09E-9	7.27E-8	5.89E-10	6.36E-9	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.78E-10	2.10E-11	1.16E-12	4.24E-10
HTP-nc	CTUh	2.47E-8	2.47E-9	6.38E-8	9.09E-8	1.44E-8	2.59E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.87E-9	4.21E-10	1.45E-11	-4.25E-9
SQP	Pt	4.96E+1	3.51E+0	4.33E+1	9.64E+1	2.04E+1	3.81E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.80E+0	1.22E-1	1.35E-1	-1.06E+2

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 index (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
	Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	2
ILCD type / level 3	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

5 Results

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.		

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A1

Abbr.	Unit	A1	A2	A3	A1- A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ADPE	kg Sb eq.	5.88E-6	6.38E-7	3.62E-5	4.28E-5	3.71E-6	2.89E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.06E-6	2.68E-7	3.79E-9	-1.11E-6
GWP	kg CO ₂ eq.	2.26E+0	2.27E-1	1.07E+1	1.32E+1	1.32E+0	1.89E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.36E-1	6.58E-2	2.70E-3	-6.24E-1
ODP	kg CFC 11 eq.	1.83E-8	4.23E-9	5.06E-7	5.28E-7	2.46E-8	5.49E-8	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.96E-9	1.21E-9	6.38E-11	-3.49E-8
POCP	kg ethene eq.	5.93E-4	3.46E-5	1.23E-3	1.86E-3	2.01E-4	5.69E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.63E-5	9.66E-6	8.46E-7	-3.30E-4
AP	kg SO ₂ eq.	1.37E-2	4.49E-4	1.52E-2	2.93E-2	2.61E-3	9.23E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.20E-3	3.00E-4	1.53E-5	-3.61E-3
EP	Kg PO43- eq.	1.62E-3	6.38E-5	3.35E-3	5.03E-3	3.71E-4	2.45E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.27E-4	6.51E-5	2.83E-6	-9.56E-4

ADPE=Depletion of abiotic resources-elements | **GWP**=Global warming | **ODP**=Ozone layer depletion | **POCP**=Photochemical oxidants creation | **AP**=Acidification of soil and water | **EP**=Eutrophication

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Abbr.	Unit	A1	A2	A3	A1- A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ADPF	kg Sb eq.	1.40E-2	1.66E-3	8.44E-2	1.00E-1	9.63E-3	9.83E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.35E-3	4.47E-4	3.26E-5	-4.59E-3
HTP	kg 1,4 DB eq.	1.23E+0	8.93E-2	1.58E+0	2.90E+0	5.19E-1	6.19E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.19E-1	1.44E-2	5.90E-4	-2.47E-1
FAETP	kg 1,4 DB eq.	9.27E-2	3.91E-3	1.18E-1	2.14E-1	2.27E-2	5.90E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.32E-3	5.54E-4	5.03E-5	-6.03E-3
MAETP	kg 1,4 DB eq.	3.45E+2	2.03E+1	1.34E+2	5.00E+2	1.18E+2	8.36E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.67E+1	2.55E+0	2.60E-1	-1.38E+1

ADPF=Depletion of abiotic resources-fossil fuels | **HTP**=Human toxicity | **FAETP**=Ecotoxicity, fresh water | **MAETP**=Ecotoxicity, marine water | **TETP**=Ecotoxicity, terrestrial

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Abbr.	Unit	A1	A2	A3	A1- A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
TETP	kg 1,4 DB eq.	9.93E-3	8.00E-4	4.15E-2	5.23E-2	4.64E-3	2.13E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.26E-3	1.58E-4	9.02E-6	-8.74E-3

ADPF=Depletion of abiotic resources-fossil fuels | **HTP**=Human toxicity | **FAETP**=Ecotoxicity, fresh water | **MAETP**=Ecotoxicity, marine water | **TETP**=Ecotoxicity, terrestrial

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	C1	C2	C3	C4	D
PERE	MJ	4.30E+0	5.06E-2	-7.15E-1	3.64E+0	2.94E-1	4.26E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.81E-2	7.56E-2	5.75E-4	-2.26E+1
PERM	MJ	0.00E+0	0.00E+0	9.15E+0	9.15E+0	0.00E+0	2.83E+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
PERT	MJ	4.30E+0	5.06E-2	8.43E+0	1.28E+1	2.94E-1	7.08E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.81E-2	7.56E-2	5.75E-4	-2.26E+1
PENRE	MJ	2.69E+1	3.46E+0	1.56E+2	1.86E+2	2.01E+1	1.99E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.82E+0	9.03E-1	6.79E-2	-8.17E+0
PENRM	MJ	0.00E+0	0.00E+0	6.29E+0	6.29E+0	0.00E+0	1.89E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-2.26E-1
PENRT	MJ	2.69E+1	3.46E+0	1.62E+2	1.92E+2	2.01E+1	2.01E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.82E+0	9.03E-1	6.79E-2	-8.40E+0
SM	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.65E-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
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
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
FW	m ³	6.04E-2	5.43E-4	5.29E-2	1.14E-1	3.15E-3	2.61E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.16E-3	2.50E-4	7.21E-5	-6.82E-2

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

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OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1- A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
HWD	Kg	1.00E-4	2.15E-5	5.41E-4	6.63E-4	1.25E-4	2.22E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.07E-5	4.66E-6	3.60E-7	-4.81E-5
NHWD	Kg	1.50E+0	3.03E-1	6.13E-1	2.42E+0	1.76E+0	2.91E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	3.18E-1	1.35E-1	4.49E-1	-6.14E-2
RWD	Kg	5.16E-5	1.05E-6	2.02E-4	2.55E-4	6.13E-6	4.18E-5	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.10E-6	8.70E-7	1.00E-8	-4.85E-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	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
MFR	Kg	0.00E+0	0.00E+0	1.24E+1	1.24E+1	0.00E+0	2.31E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.44E+1	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
EE	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	1.58E+1
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	1.00E+1
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	5.81E+0

CRU=Components for re-use | **MFR**=Materials for recycling | **MER**=Materials for energy recovery | **EE**=Exported energy | **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	0.2658	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	0.9746	kg CO2 (biogenic)

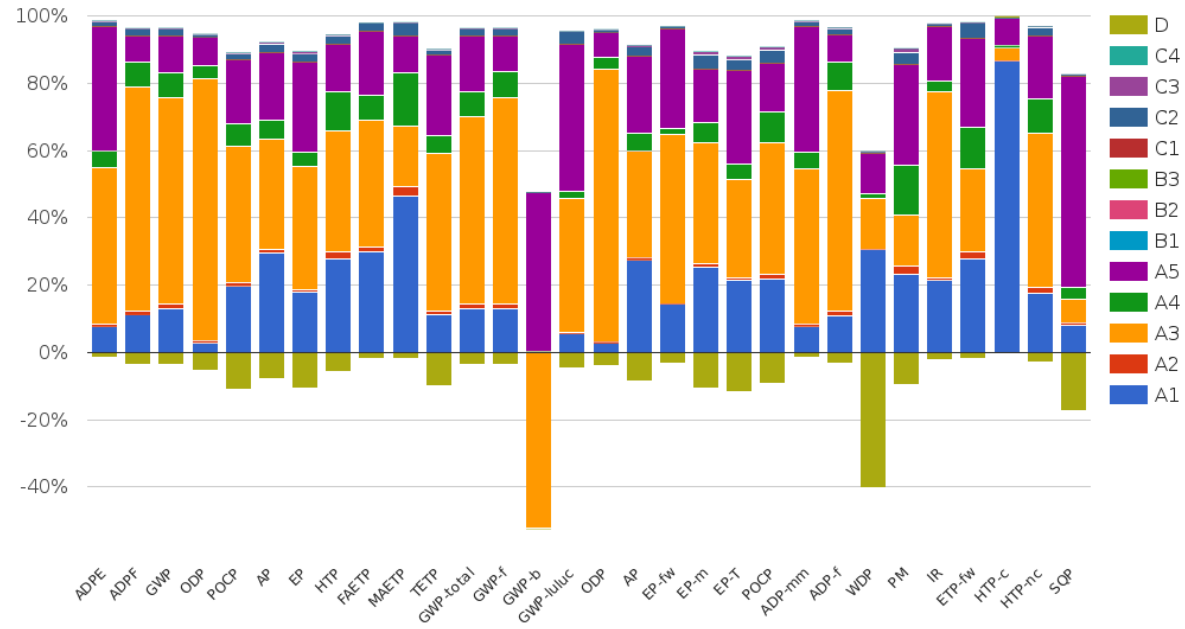
5 Results

5.4 ENVIRONMENTAL COST INDICATOR NL PER SQUARE METER

Using the environmental cost indicator (ECI) method, which is presented in the NMD Determination Method (2020), the results are aggregated to the single-point score. The ECI is a relevant valuation method, especially in the Dutch construction sector. In the Netherlands, it is a prerequisite for public tenders. The aim of the indicator is to show the shadow price for environmental impacts of a product or project. The application of single-point scores is an additional assessment tool for eco-balance results. However, it must be pointed out that weightings are always based on a value maintenance and not on a scientific basis (EN 14040). The ECI results are shown in the following table.

Module EN15804	ECI NL 2010	Share in total (%)
A1 Raw Materials Supply	€ 0.33	22,4 %
A2 Transport	€ 0.02	1,6 %
A3 Manufacturing	€ 0.80	53,9 %
A4 Transport from the gate to the site	€ 0.14	9,5 %
A5 Construction - Installation process	€ 0.22	15,0 %
B1 Use	€ 0.00	0,0 %
B2 Maintenance	€ 0.00	0,0 %
B3 Repair	€ 0.00	0,0 %
C1 De-construction / demolition	€ 0.00	0,0 %
C2 Transport	€ 0.04	2,5 %
C3 Waste processing	€ 0.01	0,5 %
C4 Disposal	€ 0.00	0,0 %
D Benefits and loads beyond the product system boundary	€ -0.08	-5,4 %
ECI NL 2010 per functional unit	€ 1.49	

6 Interpretation of results



When analyzing the GWP total emissions it can be seen that modules A1-A3 are by far the biggest contributors across the whole product cycle. These modules together cause 78% of the total GWP total emissions with the module A3 being the biggest contributor of them all with 61%.

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+A1

EN 15804+A1: 2013: Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products

EN 15804+A2

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

NMD Verification Protocol

NMD-Toetsingsprotocol Opname data in de Nationale Milieudatabase, Versie 1.2, August 2024

NMD Determination Method

Wijzigingsblad Wijziging 6 bij de Bepalingsmethode Milieuprestatie Bouwwerken - vergezeld van het onderliggende document Bepalingsmethode Milieuprestatie Bouwwerken versie 1.2, July 2025

NMD Reference Service Life

Stichting Nationale Milieudatabase (NMD). (2020). Deelproduct: Bekledingen, Keramische dakpan - geglazuurd (Category 3 Milieuverklaring) 31-05-2020

Ecoinvent

ecoinvent Version 3.6, September 2019

R<THiNK Characterization Method

ecoinvent 3.6: EN 15804+A1 indicators (CML-IA Baseline v3.06), EN 15804+A2 indicators (EF 3.0)

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