Environmental Product Declaration (EPD)
According to ISO 14025 and EN 15804+A2:2019

Concrete paving stones

Registration number:	EPD-Kiwa-EE-224141-EN
Issue date:	27-11-2025
Valid until:	27-11-2030
Declaration owner:	Rünz & Hoffend GmbH & Co. KG
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Concrete paving stones

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-224141-EN

1.3 VALIDITY

Issue date: 27-11-2025

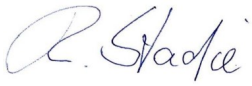
Valid until: 27-11-2030

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

Declaration owner: Rünz & Hoffend GmbH & Co. KG

Address: Gewerbegebiet Brückenstraße , D-56220 Urmitz/Rhein, Germany

E-mail: info@rh-steine.de

Website: rh-steine.de

Production location: Rünz und Hoffend GmbH Co. KG

Address production location: Brückenstraße, 56220 Urmitz, Germany

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+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Boris Agarski , University of Novi Sad

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-EE GPI R.3.0 (2025)

Kiwa-EE GPI R.3.0 Annex B1 (2025)

Specific PCR: Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements, EN 16757:2022

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+A2:2019.

1 General information

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.

1.10 CALCULATION BASIS

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

LCA software*: Simapro 9.6

Characterization method: RETHINK characterization method (see references for more details)

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.*

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Concrete paving stones' with the calculation identifier ReTHiNK-124141.

2 Product

2.1 PRODUCT DESCRIPTION

The EPD covers paving stones and is based on the worst-case LCA data for 1 m² of paving stone with a thickness of 8 cm.
Specifically, the product is a two-layer concrete paving stone, which comes in various formats and dimensions. The concrete used consists of aggregates, water, hydraulic binders such as cement, additives and auxiliary materials.

The paving stones considered have an average weight per unit area of approximately 175 kg/m² with a thickness of 8 cm. Different surface variants were included in the assessment, including colored ones, with or without surface protection. This ensures that all types of paving stones in the range are taken into account.

Material	Weight (%)
sand	~39
gravel	~26
grit	~18
cement	~16
water	~1
pigment	<1
plasticiser	<1

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The paving stones are used as flooring in outdoor areas, indoors, and on roof surfaces.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

As the use phase is not declared in this EPD, the declared reference service life does not have an effect on the calculation.
It has been declared as 50 years according to data from the table for the reference service life of building products provided by the BBSR (Federal Office for Building and Regional Planning).

USED RSL (YR) IN THIS LCA CALCULATION:

50

2.4 TECHNICAL DATA

Technical property	Value	Unit
Weight per Declared Area	175.6	kg/m2
Product Unit Weight	2195	kg/m3
permissible deviation in nominal length	+/- 2	mm
permissible deviation in nominal heigth	+/-3	mm
conicity	none as planned; max. 0.55 per side	mm
top surface area	smooth as planned, max. 1.55 convex, max. 1.0 concave	mm

2.5 SUBSTANCES OF VERY HIGH CONCERN

The product does not contain any substances from the “Candidate List of Substances of Very High Concern” (SVHC) in amounts greater than 0.1% (1.000 ppm).

2.6 DESCRIPTION PRODUCTION PROCESS

The product is manufactured at one production location (Gewerbegebiet Brückenstraße, D-56220, Urmitz/Rhein, Germany).

The paving stones have a two-layer structure consisting of a core concrete and a facing concrete. Both concrete layers are produced separately in two mixing plants according to defined recipes. Materials such as sand, grit, gravel, cement, aggregates, additives, and, if necessary, concrete colors are used. These are mixed with fresh water to form earth-moist concrete.

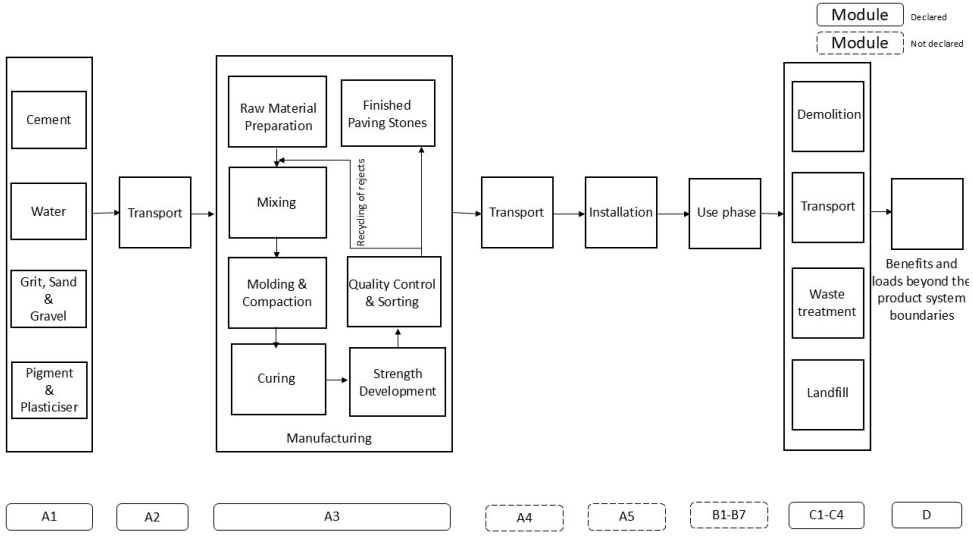
The freshly mixed concrete is then transferred to a paving stone production machine, where it is compacted into steel molds using a combined pressing and vibrating process. The core and facing layers are firmly bonded together in this process. The approximately 10 mm thick facing layer consists of color-coordinated aggregates, cement, and color pigments and forms the future visible surface of the stone.

2 Product

Immediately after molding, the paving stones are placed in a curing chamber. They remain there for at least 120 hours before being further processed. At this point, they have already reached at least 75% of their final standard strength.

During production, the stones are continuously checked for appearance, dimensional accuracy, and dimensional stability. Products that do not meet the quality requirements are offered as B-grade goods at a reduced price or identified as rejects.

Unusable paving stones are recycled: they are crushed and returned to the production process as a secondary raw material in the form of recycled aggregate.



3 Calculation rules

3.1 DECLARED UNIT

m2

In LCA calculations, 1 m2 Concrete paving stones was defined as the declared unit.

Reference unit: square meter (m2)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	m2
Weight per reference unit	175.588	kg
Conversion factor to 1 kg	0.005695	m2

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with 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	ND	ND	ND	ND	ND	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 concrete paving stones, a product of Rünz & Hoffend GmbH & Co. KG . The geographical reference area is Germany.

3.5 CUT-OFF CRITERIA

Product stage (A1-A3)
All input flows (e.g. raw materials, transportation, energy use, etc.) and output flows (e.g. production waste) are considered in this LCA. The total neglected input flows do therefore

3 Calculation rules

not exceed the limit of 5% of energy use and mass.
Excluded processes are:

- Long-term emissions
- The manufacture of equipment used in production, buildings or any other capital goods;
- The transport of personnel to the plant;
- The transportation of personnel within the plant;
- Water and energy usage of the plant unrelated to the production;
- Research and development activities;
- Packaging due to negligible impact and insufficient data

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.

3.6 ALLOCATION

Allocations were avoided as far as possible. No by-products or co-products are produced during the manufacture of the analysed product. The energy requirements of production were allocated to the individual products on the basis of energy consumption measurements. Specific information on the allocations within the background data can be found in the documentation of the ecoinvent datasets. Double counting was avoided.

3.7 DATA COLLECTION & REFERENCE PERIOD

Primary data was collected and provided by Rünz & Hoffend internally. The data has been collected for the year 2024, starting on the 1st of January and ending on the 31st of December.
Transportation distances are based on the distances of the production plant and the suppliers that were being used in the year 2024.

3.8 ESTIMATES AND ASSUMPTIONS

A payload factor of 50 percent was used for all truck transports, which in fact corresponds to a full delivery and empty return trip. A data set for a non-specific truck was used.

The demolition process for end-of-life products is assumed to be based on data from the National Milieudatabase (NMD) in the Netherlands. According to the NMD, a hydraulic excavator is capable of breaking 9.8 tons of concrete per hour and moving 8.3 tons of concrete per hour.

The waste scenario for this LCA was determined based on NMD ID 9, which relates to concrete (i.a. elements, brickwork, reinforced concrete). According to the data supplied by the NMD, the waste treatment process comprises 99% recycling and 1 % landfill.

3.9 DATA QUALITY

The quality level of geographical representativeness can be considered “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.

If possible, primary data from the customer was used, which has very good data quality because it comes directly from the source. In addition, secondary data from the ecoinvent database (2022, version 3.9.1) was used when no primary data could be supplied. The database is checked regularly and, therefore, meets the requirements of EN 15804+A2 (background data not older than 10 years). 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. Thus, the scenarios included are currently in use and are representative for one of the most likely scenario alternatives.

3 Calculation rules

3.10 POWER MIX

The electricity profile was modeled using the market-based method, with 85% of the electricity coming from the German residual grid mix (DE) and 15% from on-site solar production.

The residual grid mix has a GWP-total impact of 0.7252 kg CO_2-eq per kWh.

Since Rünz & Hoffend also generates and uses electricity via a photovoltaic system, this electricity was also used proportionally for the LCA. The total GWP value of the electricity mix used for self-generated electricity is 0.03118 kg CO2 equivalent per kWh.

Considering the respective shares and GWP values of each source, the total GWP of the electricity mix is 0.621 kg CO_2-eq per kWh.

4 Scenarios and additional technical information

4.1 DE-CONSTRUCTION, DEMOLITION (C1)

The following information describes the scenario for demolition at end of life.

Description	Amount	Unit
(ei3.9.1) Hydraulic excavator (average) [NMD generic]	0.017	hr
(ei3.9.1) Hydraulic excavator (average) [NMD generic]	0.019	hr

4.2 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) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	(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
Volume capacity utilisation factor	1

	Value and unit
Vehicle type used for transport	(ei3.6) 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 Scenarios and additional technical information

4.3 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) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	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) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	0.000	1.756	0.000	173.832	0.000
Total	**0.000**	**1.756**	**0.000**	**173.832**	**0.000**

4.4 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) concrete (i.a. elements, brickwork, reinforced concrete) (NMD ID 9)	170.761	0.000
Total	**170.761**	**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	C1	C2	C3	C4	D
GWP-total	kg CO_2 eq.	1.77E+1	1.10E-1	2.62E-2	1.78E+1	2.04E+0	1.32E+0	2.59E-1	1.07E-2	-7.42E-1
GWP-f	kg CO_2 eq.	1.75E+1	1.09E-1	2.62E-2	1.76E+1	2.04E+0	1.32E+0	2.59E-1	1.07E-2	-7.40E-1
GWP-b	kg CO_2 eq.	1.87E-1	3.56E-5	6.35E-6	1.87E-1	2.84E-4	4.29E-4	2.35E-4	4.66E-6	-1.42E-3
GWP-luluc	kg CO_2 eq.	6.07E-3	3.90E-4	3.59E-6	6.47E-3	2.30E-4	4.69E-3	5.83E-5	6.44E-6	-8.80E-4
ODP	kg CFC 11 eq.	8.51E-8	1.95E-9	3.06E-10	8.73E-8	3.25E-8	2.34E-8	5.81E-9	3.09E-10	-7.82E-9
AP	mol H+ eq.	4.11E-2	5.24E-4	7.13E-5	4.17E-2	1.89E-2	6.30E-3	1.63E-3	8.04E-5	-5.09E-3
EP-fw	kg P eq.	4.52E-3	1.09E-6	1.31E-6	4.52E-3	7.38E-6	1.31E-5	5.12E-6	1.04E-7	-2.50E-5
EP-m	kg N eq.	1.18E-2	1.99E-4	1.38E-5	1.20E-2	8.77E-3	2.39E-3	6.91E-4	3.07E-5	-1.52E-3
EP-T	mol N eq.	1.34E-1	2.12E-3	1.60E-4	1.36E-1	9.54E-2	2.55E-2	7.57E-3	3.31E-4	-1.75E-2
POCP	kg NMVOC eq.	3.71E-2	7.25E-4	4.88E-5	3.79E-2	2.83E-2	8.72E-3	2.25E-3	1.15E-4	-5.24E-3
ADP-mm	kg Sb-eq.	1.21E-5	3.43E-7	1.50E-7	1.26E-5	7.13E-7	4.12E-6	1.05E-6	1.48E-8	-3.61E-6
ADP-f	MJ	5.03E+1	1.57E+0	4.00E-1	5.23E+1	2.68E+1	1.89E+1	3.54E+0	2.66E-1	-9.15E+0
WDP	m3 world eq.	6.80E+0	8.56E-3	8.41E-4	6.81E+0	5.77E-2	1.03E-1	1.94E-2	1.17E-2	-1.05E+1

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

5 Results

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN 15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
PM	disease incidence	5.41E-7	1.08E-8	2.54E-10	5.52E-7	5.28E-7	1.30E-7	3.96E-8	1.76E-9	-9.48E-8
IR	kBq U235 eq.	4.34E-1	6.11E-4	1.15E-3	4.36E-1	5.47E-3	7.36E-3	4.04E-3	7.03E-5	-2.02E-2
ETP-fw	CTUe	3.28E+1	1.16E+0	6.69E-2	3.41E+1	1.28E+1	1.39E+1	1.19E+0	1.25E-1	-3.41E+0
HTP-c	CTUh	1.05E-8	5.79E-11	6.59E-12	1.06E-8	6.26E-10	6.97E-10	8.20E-11	4.54E-12	-5.83E-10
HTP-nc	CTUh	1.08E-7	1.26E-9	3.33E-10	1.10E-7	4.35E-9	1.51E-8	1.65E-9	5.69E-11	-7.46E-9
SQP	Pt	1.09E+2	1.24E+0	3.47E-2	1.11E+2	1.80E+0	1.49E+1	4.76E-1	5.28E-1	-1.15E+1

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
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
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2

5 Results

ILCD classification	Indicator	Disclaimer
	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	C1	C2	C3	C4	D
PERE	MJ	1.89E+1	2.21E-2	1.05E-2	1.89E+1	1.52E-1	2.67E-1	2.96E-1	2.25E-3	-6.78E-1
PERM	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
PERT	MJ	1.89E+1	2.21E-2	1.05E-2	1.89E+1	1.52E-1	2.67E-1	2.96E-1	2.25E-3	-6.78E-1
PENRE	MJ	1.51E+2	1.57E+0	4.00E-1	1.53E+2	2.68E+1	1.89E+1	3.54E+0	2.66E-1	-9.15E+0
PENRM	MJ	3.07E-1	0.00E+0	0.00E+0	3.07E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PENRT	MJ	1.51E+2	1.57E+0	4.00E-1	1.53E+2	2.68E+1	1.89E+1	3.54E+0	2.66E-1	-9.15E+0
SM	Kg	3.07E+0	0.00E+0	0.00E+0	3.07E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
RSF	MJ	1.10E+1	0.00E+0	0.00E+0	1.10E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	MJ	3.20E+1	0.00E+0	0.00E+0	3.20E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	m^3	1.77E-1	3.79E-4	2.47E-4	1.78E-1	2.10E-3	4.56E-3	9.77E-4	2.82E-4	-2.45E-1

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

OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
HWD	Kg	7.72E-2	9.99E-6	5.91E-7	7.72E-2	1.80E-4	1.20E-4	1.82E-5	1.41E-6	-3.93E-5
NHWD	Kg	2.26E+1	1.04E-1	1.17E-3	2.27E+1	3.83E-2	1.25E+0	5.30E-1	1.76E+0	-1.03E-1
RWD	Kg	2.51E-4	3.59E-7	1.53E-6	2.53E-4	2.93E-6	4.31E-6	3.40E-6	3.93E-8	-1.29E-5

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	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
MFR	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.74E+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
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
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

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

5 Results

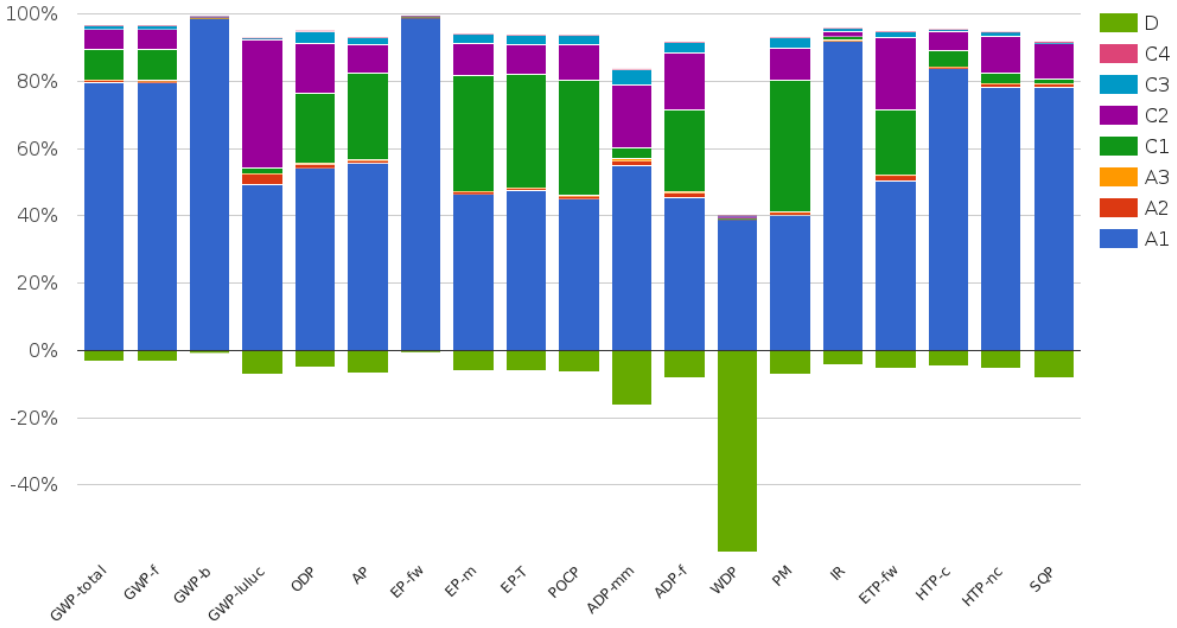
5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER SQUARE METER

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	kg C

6 Interpretation of results



The figure illustrates the impact categories for 1 m² of concrete paving stones.

As depicted, the contribution of raw materials (A1) is notably higher, whereas transportation (A2) and manufacturing (A3) exhibit a minor impact. This mainly stems from the cement, which is a material with high environmental impact due to the underlying production processes, which release a high amount of carbon dioxide through energy usage and chemical processes.

For most indicators, Module D indicates environmental benefits beyond the system boundaries.

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 15804:2012+A2:2019/AC:2021, Sustainability of Buildings - Environmental Product Declarations - Framework Development Rules by Product Category

Kiwa-EE GPI R.3.0
Kiwa-Ecobility Experts, General Programme Instructions “Product Level”, SOP EE 1203_R. 3.0 (27.02.2025)

Kiwa-EE GPI R.3.0 Annex B1
Kiwa-Ecobility Experts, General Programme Instructions “Product Level” – Annex B1 Environmental Information Programme according to EN 15804 / ISO 21930, SOP EE 1203_R. 3.0 (27.02.2025)

Specific PCR
Sustainability of construction works - Environmental product declarations - Product Category Rules for concrete and concrete elements, EN 16757:2022

ecoinvent
ecoinvent Version 3.9.1 (December 2022), system model: cut-off by classification

R<THINK characterization method
ecoinvent 3.9.1: EN 15804+A1 indicators (CML-IA Baseline v3.09), EN 15804+A2 indicators (EF 3.1)

Scenario for C1
LCA Rapportage categorie 3 data Nationale Milieudatabase Hoofdstuk 42 Betonconstructies, p. 10

NMD
NATIONAL ENVIRONMENTAL DATABASE, Calculation method to determine the environmental performance of construction works throughout their service life, based on EN 15804+A2., v 1.2 (January 2025)

DIN EN 1338:2003-08

7 References

Concrete paving blocks - Requirements and test methods

DIN EN 1339:2003-08
Concrete paving flags - Requirements and test methods

IENM/BSK-2015/18222
Regeling van de Staatssecretaris van Infrastructuur en Milieu, van 5 februari 2015, houdende vaststelling van regels ter bepaling van de status einde-afval van recyclinggranulaat (Regeling vaststelling van de status einde-afval van recyclinggranulaat)

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