

Environmental Product Declaration

# DREEN® Nxt Comfort

Zoontjens International B.V.

Publisher:	Zoontjens International B.V.
Program operator:	Stichting NMD
Calculation number:	ReTHiNK-54243
Generation on:	14-12-2023
Issue date:	14-12-2023
Valid until:	14-12-2028
Status:	verified

R<THiNK



# 1 General information

## 1.1 PRODUCT

DREEN® Nxt Comfort

## 1.2 VALIDITY

**Issue date:** 14-12-2023

**Valid until:** 14-12-2028

## 1.3 OWNER OF THE DECLARATION



**Manufacturer:** Zoontjens International B.V.

**Address:** Jules Verneweg 94A, 5015 BM Tilburg

**E-mail:** info@zoontjens.nl

**Website:** <https://www.zoontjens.nl/>

**Production location:** Struyk Verwo Infra Dordrecht

**Address production location:** Merwedestraat 40, 3313 CS Dordrecht

## 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 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Agnes Schuurmans, SGS Search / Intron

## 1.5 PRODUCT CATEGORY RULES

NMD Determination method Environmental performance Construction works v1.1 March 2022

## 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. 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 EPDs programs 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).

## 1.7 CALCULATION BASIS

**LCA method R<THiNK:** NMD Determination method v 1.1 | set1+2

**LCA software\*:** Simapro 9.1.1

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

**LCA database profiles:** EcolInvent version 3.6

**Version database:** v3.15 (2023-07-12)

*\* 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 'DREEN® Nxt Comfort' with the calculation identifier ReTHiNK-54243.

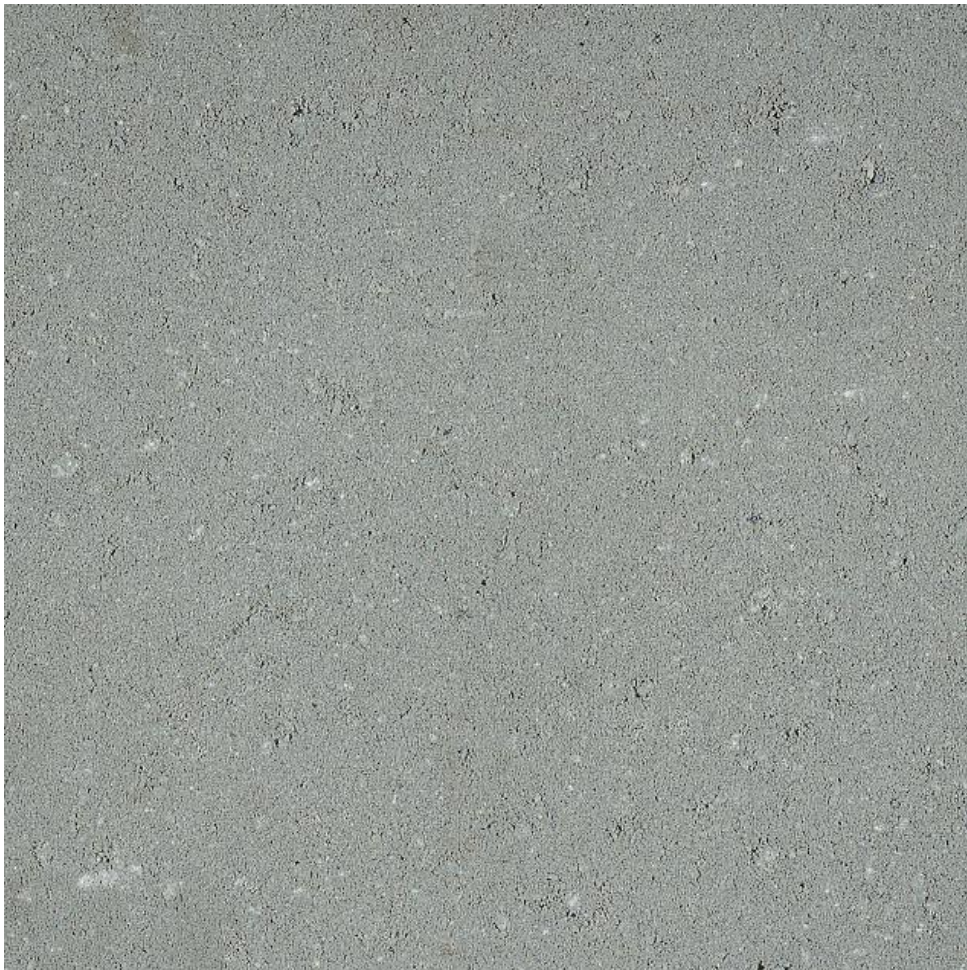


## 2 Product

### 2.1 PRODUCT DESCRIPTION

The Dreen® Nxt Comfort tile is a roof paving that is used in combination with a lockplate system that fixes the tiles to each other. Any height differences can be accommodated by additionally choosing an (adjustable) tile support or the DNS® system and are supplied separately.

In addition to the Texture product series, the tiles have a smooth appearance.



### 2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The Dreen® Nxt tile is suitable for all roofs and is largely used as a roof terrace, roof path, and roof garden for roof squares, roof fields and roof parks, among others. Dreen® Nxt is suitable for intensive use under heavier loads.

### 2.3 REFERENCE SERVICE LIFE

#### RSL PRODUCT

The Dutch Technical Commission of LCA xxperts (TIC) has decided, based on the category 3 background report of the Dutch NMD (operator of Dutch environmental database for national building regulations), that the period for inner-city repaving has been assumed to be 25 years. This same assumption is applied to tiles for roof pavings. This is not dictated by the technical lifespan of the products, but by the frequency of reuse of stones and tiles (end of life scenario NMD ID 14). The actual Reference Service Life remains 50 years (2x 25 years).

#### USED RSL (YR) IN THIS LCA CALCULATION:

25

#### RSL PARTS

All individual raw materials have an equal or longer reference life than the end product.

### 2.4 TECHNICAL DATA

The Dreen® Nxt Comfort tile is available in the following sizes and in four standard colors (urban grey, light grey, pepper and ginger).

- 30x30x3.5 cm
- 50x50x4.5 or 50x50x6 cm
- 60x40x4.5 or 60x40x6 cm

**The results of this LCA/EPD is only applicable for the following dimensions: 50x50x4.5 cm.**

### 2.5 SUBSTANCES OF VERY HIGH CONCERN

No raw materials listed on the SVHC list (substances of very high concern) are used.

## 2 Product

### 2.6 DESCRIPTION PRODUCTION PROCESS

The following activities take place at the production location:

#### Supply and storage

Raw materials and consumables are delivered to the location by road by truck. Bulk raw materials are often delivered by water by inland vessels and, if possible, by seagoing vessels. Storage takes place in bulk compartments and silos (bulk goods) or in a storage area (packed goods from suppliers). Transfer takes place by means of crane, conveyor belts and on-site transport (all energy carriers, such as diesel, electricity, propane/LPG and natural gas for possible heating) are registered for goods receipt (including transfer to storage)).

#### On-site transport and production

On-site transport of raw materials and auxiliary materials from storage to the mixer is carried out with electric and diesel powered equipment. All energy consumption, such as diesel, electricity and LPG, is centrally registered. The manufacturing process of concrete mortar and end product is done with an electrically powered mixing plant and electrically powered stone/tile forming machines (pressed).

#### Storage and distribution

On-site transport and storage of the finished product is carried out with electric and/or diesel forklifts. All energy consumption, such as diesel, electricity and LPG, is centrally registered. The final product is temporarily stored in a storage area where the finished products await transport to customers/contractors.

### 2.7 CONSTRUCTION DESCRIPTION

The processing of Dreen® Nxt Comfort roof paving on location includes a number of activities:

#### Installing the lockplate

The lockplates are placed directly on the roof covering (or structure), working in the direction of the slope.

#### Placing the tiles

The tiles are placed so that each corner rests on a lockplate. This ensures that the tile remains in a stable and fixed position. If it is necessary to place the tile elevated (and/or level), an (adjustable) tile support or a DNS® system is available (see the supplier's website [www.zoontjens.nl](http://www.zoontjens.nl)).

## 3 Calculation rules

### 3.1 FUNCTIONAL UNIT

#### m2 roof paving

1 m2 roof paving (50 cm x 50 cm, standard thickness of 45 mm, 4 tiles per m2), including the lockplates to fixate the tiles (standard, 4,8 pieces per m2 based on a minimum of 30m2 roof paving) with a reference service life of 25 years (resulting in 2x 25 years with re-use end of life scenario).

(the presented mass per m2 includes also the mass of the lockplates, available colors: urban grey, light grey, pepper and ginger).

reference\_unit: square meter (m2)

### 3.2 CONVERSION FACTORS

Description	Value	Unit
reference_unit	1	m2
weight_per_reference_unit	100.690	kg
Conversion factor to 1 kg	0.009932	m2

### 3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with options, modules C1-C4 and module D LCA. 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 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 DREEN® Nxt Comfort, a product of Zoontjens International B.V.. 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:

#### 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-B3)

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.

### 3 Calculation rules

#### 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

The allocation of energy consumption is allocated to the production volume of the concrete mortar (no further difference in allocation between the individual colors of the top coat was made). The required concrete volume for 1 m<sup>2</sup> of roof paving is equal to 4x 10.9 liters (0.0436 m<sup>3</sup>) with a thickness of 45 mm (base layer 33 mm, top layer 12 mm).

Each color for the DREEN® Nxt Comfort product series (urban grey, light grey, ginger and pepper) is equally included in this LCA study for the top layer (4x 25%).

#### 3.7 DATA COLLECTION & REFERENCE TIME PERIOD

The data collection is based on the production year 2022. This includes the used raw materials, waste, suppliers, transport distances and the necessary energy consumption of the production facility.

#### 3.8 ESTIMATES AND ASSUMPTIONS

The amount of production waste is determined for the final product based on the annual production data of the production facility and the construction waste is estimated to be not more than 3% (according to the default Dutch on-site construction waste percentage for prefab products).

#### 3.9 DATA QUALITY

##### Completeness

To the best of our knowledge, all environmental effects have been considered (score 1). All raw materials, energy consumption, possible emissions and waste percentages are included in this report (score 1), but a complete mass balance is not available for the entire production location and the product (score 5). An energy balance is available (annual data), in which all energy sources for the location are mapped (and related to the net production quantity) (score 1).

##### Representativeness

All data relates to the annual data of the production facility, which is located in the Netherlands (score 1) and the recipe specifically relates to the finished product (score 1).

##### Consistency and reproducibility

Based on the principles in this report, it is possible to reproduce the LCA and verify the results (score 1).

#### 3.10 GUARANTEES OF ORIGIN

Not applicable for this production facility.

## 4 Scenarios and additional technical information

### 4.1 TRANSPORT TO CONSTRUCTION SITE (A4)

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

	Value and unit
Vehicle type used for transport	Lorry (Truck) >32t, EURO6   market for (EU)
Fuel type and consumption of vehicle	not available
Distance	150 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>Energy consumption for installation/assembly</i>		
Diesel, burned in machine (incl. emissions)	0.070175	l

#### FLOWS LEAVING THE SYSTEM

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

Description	Value	Unit
Output materials as result of loss during construction	3	%
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	0.051	kg

### 4.3 USE STAGE (B1)

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

## 4 Scenarios and additional technical information

### 4.4 MAINTENANCE (B2)

For maintenance no input or output flows are modeled.

### 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)

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

Description	Amount	Unit
Diesel, burned in machine (incl. emissions)	0.070	l

### 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]
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
NMD ID 14 Module A1-A3 of product 537423	Lorry (Truck), unspecified (default)   market group for (GLO)	0	100	150	50	0
NMD ID 14 Module A1-A3 of product 537425	Lorry (Truck), unspecified (default)   market group for (GLO)	0	100	150	50	0
NMD ID 14 Module A1-A3 of product 537430	Lorry (Truck), unspecified (default)   market group for (GLO)	0	100	150	50	0
NMD ID 14 Module A1-A3 of product 111262	Lorry (Truck), unspecified (default)   market group for (GLO)	0	100	150	50	0
NMD ID 14 Module A1-A3 of product 111175		0	100	150	50	0



## 4 Scenarios and additional technical information

Waste Scenario	Transport conveyance	Not removed (stays in work) [km]	Landfill [km]	Incineration [km]	Recycling [km]	Re-use [km]
	Lorry (Truck), unspecified (default)   market group for (GLO)					

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)
Bulk density of transported products	inapplicable
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 [%]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	NL	0	10	85	5	0
NMD ID 14 Module A1-A3 of product 537423	NL	0	1	0	4	95
NMD ID 14 Module A1-A3 of product 537425	NL	0	1	0	4	95
NMD ID 14 Module A1-A3 of product 537430	NL	0	1	0	4	95
NMD ID 14 Module A1-A3 of product 111262	NL	0	1	0	4	95
NMD ID 14 Module A1-A3 of product 111175	NL	0	1	0	4	95

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	0.079	0.673	0.040	0.000
<b>Total</b>	<b>0.000</b>	<b>1.078</b>	<b>0.673</b>	<b>4.036</b>	<b>94.903</b>

## 4 Scenarios and additional technical information

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
NMD ID 14 Module A1-A3 of product 537423	0.000	0.061	0.000	0.243	5.771
NMD ID 14 Module A1-A3 of product 537425	0.000	0.062	0.000	0.249	5.906
NMD ID 14 Module A1-A3 of product 537430	0.000	0.061	0.000	0.243	5.766
NMD ID 14 Module A1-A3 of product 111262	0.000	0.754	0.000	3.016	71.629
NMD ID 14 Module A1-A3 of product 111175	0.000	0.061	0.000	0.246	5.832
<b>Total</b>	<b>0.000</b>	<b>1.078</b>	<b>0.673</b>	<b>4.036</b>	<b>94.903</b>

### 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]
polyolefines (i.a. pe,pp) (i.a. pipes, foils) (NMD ID 57)	0.040	22.067
NMD ID 14 Module A1-A3 of product 537423	6.014	0.000
NMD ID 14 Module A1-A3 of product 537425	6.155	0.000
NMD ID 14 Module A1-A3 of product 537430	6.008	0.000
NMD ID 14 Module A1-A3 of product 111262	67.064	0.000
NMD ID 14 Module A1-A3 of product 111175	6.078	0.000
<b>Total</b>	<b>91.358</b>	<b>22.067</b>

## 5 Results

For the impact assessment, the characterization factors of the LCIA method Bepalingsmethode 'set 1', 'set2' & param (NMD 3.4) v1.00 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

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
AP	mol H+ eqv.	3.93E-2	2.33E-2	1.05E-2	4.24E-3	4.83E-3	0.00E+0	0.00E+0	0.00E+0	2.41E-3	3.21E-4	8.46E-4	5.73E-5	-2.81E-2
GWP-total	kg CO2 eqv.	1.24E+1	2.31E+0	2.94E+0	1.32E+0	9.78E-1	0.00E+0	0.00E+0	0.00E+0	2.30E-1	5.55E-2	1.81E+0	1.70E-2	-7.68E+0
GWP-b	kg CO2 eqv.	1.24E-1	8.33E-4	2.86E-2	9.98E-4	4.74E-3	0.00E+0	0.00E+0	0.00E+0	6.40E-5	2.56E-5	3.12E-4	1.95E-5	-8.60E-2
GWP-f	kg CO2 eqv.	1.23E+1	2.31E+0	2.91E+0	1.32E+0	9.73E-1	0.00E+0	0.00E+0	0.00E+0	2.30E-1	5.54E-2	1.81E+0	1.70E-2	-7.59E+0
GWP-luluc	kg CO2 eqv.	5.37E-3	9.61E-4	8.64E-4	4.01E-4	2.62E-4	0.00E+0	0.00E+0	0.00E+0	1.81E-5	2.03E-5	1.46E-4	1.88E-6	-2.40E-3
EP-m	kg N eqv.	8.27E-3	6.78E-3	3.04E-3	9.28E-4	1.66E-3	0.00E+0	0.00E+0	0.00E+0	1.06E-3	1.13E-4	2.36E-4	2.16E-5	-7.27E-3
EP-fw	kg P eqv.	2.39E-4	1.88E-5	1.05E-4	1.05E-5	1.26E-5	0.00E+0	0.00E+0	0.00E+0	8.37E-7	5.59E-7	5.59E-6	7.40E-8	-1.25E-4
EP-T	mol N eqv.	9.76E-2	7.51E-2	3.48E-2	1.04E-2	1.85E-2	0.00E+0	0.00E+0	0.00E+0	1.17E-2	1.25E-3	2.63E-3	2.16E-4	-8.36E-2
ODP	kg CFC 11 eqv.	5.84E-7	5.09E-7	2.32E-7	3.23E-7	1.05E-7	0.00E+0	0.00E+0	0.00E+0	4.97E-8	1.22E-8	5.58E-8	2.43E-9	-6.13E-7
POCP		2.75E-2	2.05E-2	9.22E-3	4.06E-3	5.13E-3	0.00E+0	0.00E+0	0.00E+0	3.20E-3	3.56E-4	7.06E-4	6.53E-5	-2.21E-2

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

## 5 Results

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
	kg NMVOC eqv.													
ADP-f	MJ	1.28E+2	3.40E+1	3.38E+1	2.14E+1	9.87E+0	0.00E+0	0.00E+0	0.00E+0	3.17E+0	8.36E-1	1.46E+0	1.67E-1	-6.71E+1
ADP-mm	kg Sb-eqv.	9.57E-5	5.32E-5	1.57E-5	2.34E-5	6.32E-6	0.00E+0	0.00E+0	0.00E+0	3.53E-7	1.40E-6	2.30E-6	5.71E-8	-5.83E-5
WDP	m3 world eqv.	2.62E+0	9.95E-2	-1.31E-1	6.94E-2	1.05E-1	0.00E+0	0.00E+0	0.00E+0	4.24E-3	2.99E-3	9.19E-2	7.44E-3	-7.98E-1

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

### ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15084+A2

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ETP-fw	CTUe	1.25E+2	2.77E+1	3.35E+1	1.70E+1	1.02E+1	0.00E+0	0.00E+0	0.00E+0	1.91E+0	7.45E-1	2.27E+1	1.17E-1	-7.35E+1
PM	disease incidence	2.50E-7	1.67E-7	1.10E-7	1.15E-7	8.41E-8	0.00E+0	0.00E+0	0.00E+0	6.38E-8	4.98E-9	7.34E-9	1.11E-9	-1.92E-7
HTP-c	CTUh	2.60E-9	9.69E-10	6.63E-10	4.13E-10	2.41E-10	0.00E+0	0.00E+0	0.00E+0	6.67E-11	2.42E-11	3.44E-10	2.76E-12	-1.55E-9
HTP-nc	CTUh	9.82E-8	2.93E-8	2.20E-8	1.87E-8	7.43E-9	0.00E+0	0.00E+0	0.00E+0	1.64E-9	8.15E-10	7.18E-9	8.16E-11	-5.75E-8
IR	kBq U235 eqv.	3.96E-1	1.45E-1	9.14E-2	9.34E-2	3.61E-2	0.00E+0	0.00E+0	0.00E+0	1.36E-2	3.50E-3	5.95E-3	6.81E-4	-2.18E-1
SQP	Pt	4.08E+1	2.32E+1	8.82E+0	2.45E+1	3.43E+0	0.00E+0	0.00E+0	0.00E+0	4.04E-1	7.25E-1	5.08E-1	3.55E-1	-2.63E+1

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

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

ILCD classification	Indicator	Disclaimer
ILCD type / level 1	Global warming potential (GWP)	None

## 5 Results

ILCD classification	Indicator	Disclaimer
ILCD type / level 2	Depletion potential of the stratospheric ozone layer (ODP)	None
	Potential incidence of disease due to PM emissions (PM)	None
	AAcidification 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
	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

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ADPE	Kg Sb	9.57E-5	5.32E-5	1.57E-5	2.34E-5	6.32E-6	0.00E+0	0.00E+0	0.00E+0	3.53E-7	1.40E-6	2.30E-6	5.71E-8	-5.83E-5
GWP		1.21E+1	2.29E+0	2.88E+0	1.31E+0	9.65E-1	0.00E+0	0.00E+0	0.00E+0	2.28E-1	5.49E-2	1.81E+0	1.52E-2	-7.54E+0

**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



## 5 Results

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
	Kg CO2 Equiv.													
ODP	Kg CFC-11 Equiv.	5.45E-7	4.05E-7	2.06E-7	2.58E-7	8.78E-8	0.00E+0	0.00E+0	0.00E+0	3.94E-8	9.75E-9	5.59E-8	1.93E-9	-5.28E-7
POCP	Kg Ethene Equiv.	3.42E-3	1.58E-3	7.68E-4	8.35E-4	4.39E-4	0.00E+0	0.00E+0	0.00E+0	2.32E-4	3.32E-5	6.67E-5	7.78E-6	-1.85E-3
AP	Kg SO2 Equiv.	3.16E-2	1.82E-2	8.09E-3	3.43E-3	3.63E-3	0.00E+0	0.00E+0	0.00E+0	1.72E-3	2.42E-4	6.57E-4	4.33E-5	-2.20E-2
EP	Kg PO43- Equiv.	4.00E-3	2.67E-3	1.49E-3	5.54E-4	6.65E-4	0.00E+0	0.00E+0	0.00E+0	3.90E-4	4.75E-5	1.09E-4	9.53E-6	-3.20E-3

**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

### NATIONAL ANNEX NMD

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ADPF	Kg Sb	6.02E-2	1.62E-2	1.82E-2	1.01E-2	4.75E-3	0.00E+0	0.00E+0	0.00E+0	1.50E-3	4.04E-4	7.80E-4	8.00E-5	-3.41E-2
HTP	kg 1.4 DB	1.46E+0	1.00E+0	4.37E-1	6.44E-1	2.05E-1	0.00E+0	0.00E+0	0.00E+0	8.43E-2	2.31E-2	1.30E-1	3.16E-3	-1.04E+0
FAETP	kg 1.4 DB	3.32E-2	2.58E-2	1.02E-2	1.75E-2	4.55E-3	0.00E+0	0.00E+0	0.00E+0	1.17E-3	6.75E-4	6.75E-3	9.11E-4	-2.32E-2
MAETP	kg 1.4 DB	1.31E+2	9.90E+1	4.14E+1	6.89E+1	1.64E+1	0.00E+0	0.00E+0	0.00E+0	4.08E+0	2.43E+0	1.97E+1	1.05E+0	-9.71E+1
TETP	kg 1.4 DB	1.64E-2	3.40E-3	9.33E-3	2.08E-3	1.11E-3	0.00E+0	0.00E+0	0.00E+0	1.39E-4	8.18E-5	3.46E-4	7.28E-6	-1.18E-2

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

## 5 Results

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

#### PARAMETERS DESCRIBING RESOURCE USE

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
PERE	MJ	8.34E+0	4.19E-1	2.65E+0	2.69E-1	3.83E-1	0.00E+0	0.00E+0	0.00E+0	1.71E-2	1.05E-2	1.46E-1	1.54E-3	-3.59E+0
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	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	8.34E+0	4.19E-1	2.65E+0	2.69E-1	3.83E-1	0.00E+0	0.00E+0	0.00E+0	1.71E-2	1.05E-2	1.46E-1	1.54E-3	-3.59E+0
PENRE	MJ	1.10E+2	3.61E+1	3.50E+1	2.27E+1	9.69E+0	0.00E+0	0.00E+0	0.00E+0	3.36E+0	8.87E-1	1.56E+0	1.77E-1	-7.21E+1
PENRM	MJ	2.60E+1	0.00E+0	1.17E+0	0.00E+0	8.14E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.40E-2
PENRT	MJ	1.36E+2	3.61E+1	3.62E+1	2.27E+1	1.05E+1	0.00E+0	0.00E+0	0.00E+0	3.36E+0	8.87E-1	1.56E+0	1.77E-1	-7.21E+1
SM	Kg	7.58E+0	0.00E+0	5.97E-1	0.00E+0	2.45E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-3.58E+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
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
FW	M3	1.27E-1	3.55E-3	1.11E-2	2.43E-3	5.05E-3	0.00E+0	0.00E+0	0.00E+0	1.63E-4	1.02E-4	2.72E-3	1.78E-4	-5.57E-2

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

#### OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
HWD	Kg	9.73E-5	7.91E-5	3.98E-5	5.18E-5	1.71E-5	0.00E+0	0.00E+0	0.00E+0	8.62E-6	2.12E-6	2.79E-6	2.50E-7	-8.47E-5
NHWD	Kg	5.34E-1	1.62E+0	3.44E-1	1.86E+0	1.78E-1	0.00E+0	0.00E+0	0.00E+0	3.75E-3	5.30E-2	4.54E-2	1.08E+0	-8.63E-1
RWD	Kg	3.99E-4	2.29E-4	1.09E-4	1.46E-4	4.93E-5	0.00E+0	0.00E+0	0.00E+0	2.20E-5	5.49E-6	5.34E-6	1.08E-6	-2.66E-4

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

## 5 Results

### ENVIRONMENTAL INFORMATION DESCRIBING OUTPUT FLOWS

Abbreviation	Unit	A1	A2	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	2.85E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.49E+1	0.00E+0	0.00E+0
MFR	Kg	0.00E+0	0.00E+0	7.12E+0	0.00E+0	3.37E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.04E+0	0.00E+0	-3.22E+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
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	1.16E+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	7.36E+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	4.28E+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	kg C

## 5 Results

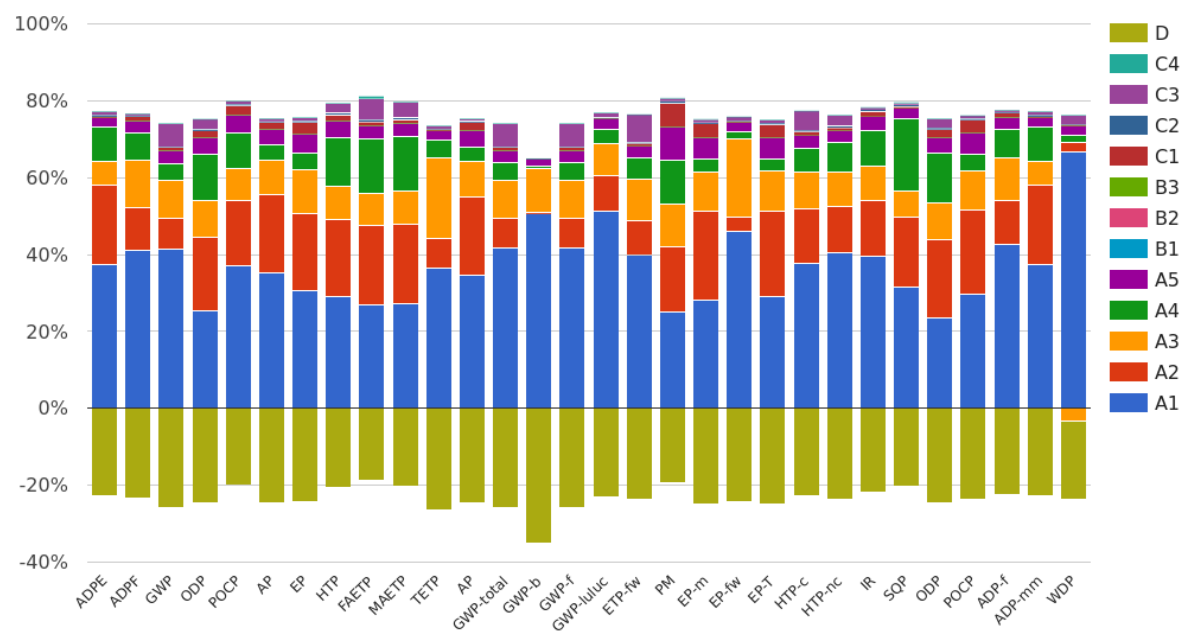
### 5.4 ENVIRONMENTAL COST INDICATOR NL PER SQUARE METER

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	Share in total (%)
A1 Raw Materials Supply	€ 0.93	73,3 %
A2 Transport	€ 0.32	25,0 %
A3 Manufacturing	€ 0.24	18,8 %
A4 Transport from the gate to the site	€ 0.15	12,0 %
A5 Construction - Installation process	€ 0.09	7,1 %
B1 Use	€ 0.00	0,0 %
B2 Maintenance	€ 0.00	0,0 %
B3 Repair	€ 0.00	0,0 %
C1 De-construction / demolition	€ 0.03	2,4 %
C2 Transport	€ 0.01	0,5 %
C3 Waste processing	€ 0.11	8,5 %
C4 Disposal	€ 0.00	0,1 %
D Benefits and loads beyond the product system boundary	€ -0.61	-47,7 %
<b>ECI NL per functional unit</b>	<b>€ 1.27</b>	



## 6 Interpretation of results



An analysis of the results (environmental impact) has been carried out for the 'generic' product of this LCA and the four variants (colored top layer, each have a share of 25% in the recipe). The result (-9%/+14%) of all individual environmental effects of the individual products are within the margin stated by the NMD (max. +/-20%) for set 1 (EN15808:A1 + 4 additional indicators) when compared to the results of the 'generic' product.

Related to the end result (module A-D), the contribution of the modules is as follows: module A: 132%, module B: 0%, module C: 11% and module D: -43%. Within module A, the raw materials (A1) have the greatest contribution (70%).

## 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 14040:2006

**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-verification protocol version 1.0, July 2020, foundation NMD

**NMD Determination method**

NMD Determination method Environmental performance Construction works v1.1 March 2022, foundation NMD

## 8 Contact information

Publisher		Operator	Owner of declaration
			
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