

Environmental Product Declaration

X-LAM (Cross laminated timber) | with retour system

Derix

Publisher:	Derix
Program operator:	Stichting NMD
Calculation number:	EPD-NIBE-20221220-33075
Generation on:	14-06-2023
Issue date:	14-06-2023
Valid until:	14-06-2028
Status:	verified

R<THiNK



1 General information

1.1 PRODUCT

X-LAM (Cross laminated timber) | with retour system

1.2 VALIDITY

Issue date 14-06-2023

Valid until: 14-06-2028

1.3 OWNER OF THE DECLARATION

DERIX

Manufacturer: Derix

Address: Dam 63, D-41372 Niederkrüchten

E-mail: j.borreman@derix.nl

Website: www.derix.de

Production location: Derix GmbH & Co.

Address production location: Dam 63, D-41372 Niederkrüchten

1.4 VERIFICATION OF THE DECLARATION

CEN standard EN 15804:2012+A2:2019 serves as the core PCR. In compliance with ISO 14040:2006 and 14044:2006.

Independent verification of the declaration according to EN ISO 14025:2011-10.

☐ Internal ☒ External



Anne Kees Jeeninga, Advieslab

1.5 THIS DECLARATION IS BASED ON THE PRODUCT CATEGORY RULES

- NMD Determination method Environmental performance Construction works v1.1 March 2022
- EN16485:2014 Round and sawn timber – Environmental Product Declarations – Product category rules for wood and wood-based products for use in construction

1.6 PURPOSE AND TARGET GROUPS

The purpose of this LCA is to compile environmental data of materials and products used in the built environment. So that the environmental data can be used in calculations of buildings and / or civil works. The purpose of this report is to draw up a review dossier with the results of 'set 1' and 'set 2' for the product as mentioned in the NMD Determination method Environmental performance Construction works v1.1 March 2022. This document defines a standardized method for a LCA in the Netherlands, of a product used in the built environment, in addition to EN 15804+A2. The review dossier is in accordance with EN15804+A2, ISO14040 and ISO14044.

The target groups of this LCA study are: Users of the NMD or programs that use this database, such as BREEAM-NL, GPR gebouw and GPR bouwbesluit, MRPI freetool, DuboCalc, etc..

1.7 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 General information

1.8 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: EcoInvent version 3.6

Version database: v3.13 (2023-01-12)

** Used for calculating the characterized results of the Environmental profiles within R<THiNK.*

1.9 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'X-LAM (Cross laminated timber) | with retour system' with the calculation identifier EPD-NIBE-20221220-33075.

2 Product

2.1 PRODUCT DESCRIPTION

X-LAM is cross-laminated timber or CLT (cross laminated

timber) which, as a structural panel or disc element combines the best properties of different materials. X-LAM is a solid, highly building material, the prefabricated components of which can be easily and quickly assembled on site. no matter whether it is for floor, wall or roof elements. X-LAM consists of at least three cross-linked layers of timber glued together.

Retour System:

This EPD only applies for X-lam element for which a take back obligation is part of the contract with Derix.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

X-LAM icross-laminated timber elements can be used as a structural panel or disc element for floors, walls and/or roofs.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

All construction products in the NMD have a reference service life of 100+ years. In deviation from the the SBR levensdurengids 2011, wich defines a RSL of 75 years for wooden constructions products. In this LCA a RSL of 75 years is used.

USED RSL (YR) IN THIS LCA CALCULATION:

75

RSL PARTS

Same as RSL product

2.4 TECHNICAL DATA

Board dimensions:

Length: 6.00 – 17.80 m

Width: up to 3.50 m

Thickness: up to 400 mm

Timber species / Strength classes

Spruce: C24

Moisture content: 10 % ± 2 %

Moulded density: approx. 470 kg/m³
(other timber species and strength classes on request)

Gluing – Adhesive based on melamine resin:

Adhesive type 1 to EN 301, approved for gluing load-bearing timber components for interiors and exteriors, weather-resistant with transparent glue line (emission class E1)

Cutting and Processing:

with 5-axis CNC portal machine, to customer specifications

Computed burn rate:

0.65 mm / minute

2.5 SUBSTANCES OF VERY HIGH CONCERN

The product does not contain any substances listed in the “Candidate List of Substances” of Very High Concern (SVHC) for authorisation” exceeding 0.1% of the weight of the product.

2.6 DESCRIPTION PRODUCTION PROCESS

Manufacturing process:

The manufacture of X-LAM involves drying coniferous boards and timbers to less than 15% wood moisture, followed by pre-planing and sorting visually and/or mechanically by strength. Board sections identified as having strength-reduced areas are removed depending on the requisite strength class and the ensuing board sections joined by finger-jointing connections to form lamellas of infinite length. During the subsequent pre-planing process, the lamellas are planed on four sides to strengths ranging from 17 mm to 45 mm. In the last step the manufacturer directly arrange the glued lamellas crosswise in the press bed. After pressing and hardening, the blank is planed, bevelled, bound and packed.

Production waste:

based on annual production figures

Emissions during production:

Waste air incurred is cleaned in accordance with statutory specifications. There are no risks for water or soil. Noise-intensive machinery is encapsulated appropriately.

2.7 CONSTRUCTION DESCRIPTION

Method of application on the construction site:

assembly with a construction crane

2 Product

Equipment required:

X-LAM can be processed using the standard tools suitable for processing solid wood.

Energy consumption:

cranes energy consumption

3 Calculation rules

3.1 FUNCTIONAL UNIT

1 m³ cross-laminated timber

Declared unit: cubic meter (m³)

one cubic meter wooden construction for which a take back obligation is part of the contract.

Suitable for walls and roof elements.

Excluding the following:

- Anchoring
- ancillary materials
- Preservation treatments and other top layers
- Varnish
- Ballast

X-lam requires no maintenance or repair during the use phase. Maintenance in the form of lacquer, paint, etc. is not included. The demolition phase is also not part of this LCA.

3.2 CONVERSION FACTORS

Description	Value	Unit
Declared unit	1	m ³
Weight per declared unit	474.800	kg
Conversion factor to 1 kg	0.002106	m ³

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

The input data are representative for X-LAM (Cross laminated timber) for which a take back obligation is included in the contract. The data are representative for Netherlands.

3.5 CUT-OFF CRITERIA

Product Stage (A1-A3)

The production stage consists of the extraction of raw materials, transportation of the raw materials, processing the raw materials into materials and the production of the product. The required energy for production, and packaging material are included.

Construction process stage (A4-A5)

This stage consists the transport of the product from production plant to Utrecht.

It also includes the loss of material during construction. The additional needed production, transport and end-of-life of the lost material during construction is included.

The end-of-life of packaging material up to the end-of-waste state or disposal of final residues is also included.

The installation of the product including manufacture, transportation and end-of-life of ancillary materials and any energy or water use required for installation or operation of the construction site are taken into account.

Use stage (B1-B3)

This stage consists of the impacts arising from components of the building and construction works during their use.

3 Calculation rules

The stage also covers the combination of all planned technical and associated administrative maintenance actions during the service life to maintain the product installed in a building, in a construction works or its parts in a state in which it can perform its required functional and technical performance, as well as preserve the aesthetic qualities of the product. This will include preventative and regular maintenance activities.

Product replacement (B4) and renovation (B5) only apply when the product is considered in a lifespan (of a building, work, etc.).

Operational water and energy use are not considered.

End of life stage (C1-C4)

When the end of the life stage of the building is reached, the de-construction/demolition begins. This EPD includes de-construction/demolition (C1), the necessary transport (C2) from the demolition site to the sorting location and distance to final disposal. The end of life stage includes the final disposal to landfill (C4), incineration (C3) and needed recycling processes up to the end-of-waste point (C3). Loads and benefits of recycling, re-use and exported energy are part of module D.

The default end-of-life scenarios of the annex (March 2022) to the NMD Determination method v1.1 have been used for the various materials in the product.

Benefits and Loads beyond the system boundary (Module D)

This stage contains the potential loads and benefits of recycling and re-use of raw materials/products. The loads contain the needed recycling processes from end-of-waste-point up to the point-of-equivalence of the substituted primary raw material and a load for secondary material that will be lost at the end-of-life stage.

The loads and benefits of recycling and reuse are included in this module. The benefits are calculated based on the primary content and the primary equivalent.

In addition, the benefits of energy recovery are granted at this stage. The amount of avoided energy is based on the Lower Heating Values of the materials and the efficiencies

of the incinerators as mentioned in the NMD Determination method v1.1 or EcoInvent 3.6 (2019).

3.6 ALLOCATION

The energy consumption is allocated by volume, as the specific weight of wood depends on its moisture content and varies per m³.

3.7 DATA COLLECTION & REFERENCE TIME PERIOD

Data collection has been done for the reference year 2021

3.8 ESTIMATES AND ASSUMPTIONS

The results of the sensitivity analysis carried out proves that the assumed percentage of the X-lam elements that can be reuse has a great influence on the results of this LCA. Because a conservative percentage of 60% has been used in this LCA, the results are considered to be valid.

3.9 DATA QUALITY

Background data is based on the Life cycle inventory data of an association EPD for raw sawn spruce and EcoInvent 3.6. Foreground data is <2 years and background data <10 years. The data quality is considered to be good.

3.10 GUARANTIES OF ORIGIN

W.u.J. Derix GmbH & Co. purchased 100% renewable energy from hydro power for the reference year 2021

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	170 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>		
Electricity; total renewable mix; average (NL) - low voltage (max 1kV)	4.51	kWh

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	1.216	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)

No maintenance is needed to fulfil the requirements as stated in the applicable functional unit (chapter 3.1) and to achieve the stated reference service life (2.3).

4.5 REPAIR (B3)

No repairs are needed to fulfil the requirements as stated in the applicable functional unit (chapter 3.1) and to achieve the stated reference service life (chapter 2.3).

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]
Derix retour system (80% to Derix, 60% re-use recycling, incineration and landfill ratio based on wood 'clean', beams, planks (NMD ID 34))	Lorry (Truck), unspecified (default) market group for (GLO)	0	160	210	110	170

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 Scenarios and additional technical information

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 [%]
Derix retour system (80% to Derix, 60% re-use recycling, incineration and landfill ratio based on wood 'clean', beams, planks (NMD ID 34))	NL	0	2	34	4	60

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Derix retour system (80% to Derix, 60% re-use recycling, incineration and landfill ratio based on wood 'clean', beams, planks (NMD ID 34))	0.000	9.496	161.432	18.992	284.880
Total	0.000	9.496	161.432	18.992	284.880

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]
Derix retour system (80% to Derix, 60% re-use recycling, incineration and landfill ratio based on wood 'clean', beams, planks (NMD ID 34))	303.872	2285.851
Total	303.872	2285.851

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 CUBIC 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.	5.79E-1	1.13E-1	8.47E-2	2.27E-2	3.38E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.73E-2	5.44E-2	7.01E-4	-8.11E-1
GWP-total	kg CO2 eqv.	-6.99E+2	2.70E+1	2.59E+1	7.06E+0	7.84E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.16E+1	7.65E+2	1.56E+1	-8.89E+1
GWP-b	kg CO2 eqv.	-7.68E+2	1.96E-2	1.60E+0	5.34E-3	3.93E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.35E-3	7.63E+2	1.56E+1	-1.02E+0
GWP-f	kg CO2 eqv.	6.97E+1	2.70E+1	2.35E+1	7.05E+0	7.41E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.16E+1	2.38E+0	7.85E-2	-8.73E+1
GWP-luluc	kg CO2 eqv.	5.13E-2	7.88E-3	8.02E-1	2.15E-3	2.87E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.25E-3	3.38E-2	1.98E-5	-6.52E-1
EP-m	kg N eqv.	1.64E-1	3.41E-2	1.39E-2	4.97E-3	9.49E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.37E-2	2.41E-2	5.33E-4	-2.28E-1
EP-fw	kg P eqv.	1.54E-3	2.06E-4	2.52E-3	5.61E-5	1.69E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.17E-4	1.43E-4	1.22E-6	-3.73E-3
EP-T	mol N eqv.	2.17E+0	3.77E-1	1.63E-1	5.54E-2	1.22E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.61E-1	2.77E-1	2.86E-3	-3.25E+0
ODP	kg CFC 11 eqv.	1.09E-5	6.34E-6	1.26E-6	1.73E-6	8.27E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.56E-6	2.26E-7	2.95E-8	-1.47E-5
POCP		4.59E-1	1.21E-1	4.98E-2	2.18E-2	2.85E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.46E-2	7.23E-2	1.04E-3	-6.69E-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)

5 Results

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
	kg NMVOC eqv.													
ADP-f	MJ	1.20E+3	4.20E+2	3.70E+2	1.14E+2	7.50E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.75E+2	2.74E+1	2.16E+0	-1.40E+3
ADP-mm	kg Sb- eqv.	1.72E-3	4.60E-4	5.72E-4	1.25E-4	1.29E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.94E-4	2.89E-5	7.07E-7	-1.87E-3
WDP	m3 world eqv.	2.55E+2	1.36E+0	1.33E+1	3.72E-1	8.42E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.26E-1	6.78E-1	9.88E-3	-1.68E+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)

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15084+A2

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ETP-fw	CTUe	2.96E+3	3.34E+2	2.72E+2	9.11E+1	1.92E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.56E+2	5.48E+1	1.76E+0	-5.35E+3
PM	disease incidence	3.72E-5	2.44E-6	1.36E-6	6.18E-7	1.36E-6	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.04E-6	4.30E-7	1.48E-8	-2.99E-5
HTP-c	CTUh	1.75E-7	8.24E-9	1.79E-8	2.21E-9	9.06E-9	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.06E-9	4.81E-8	5.16E-11	-1.61E-7
HTP-nc	CTUh	2.18E-6	3.80E-7	3.76E-7	9.99E-8	1.39E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-7	1.67E-7	2.12E-9	-3.14E-6
IR	kBq U235 eqv.	8.36E+0	1.83E+0	1.12E+0	5.00E-1	4.01E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.33E-1	8.43E-2	1.00E-2	-7.61E+0
SQP	Pt	-9.86E+3	4.81E+2	-1.19E+3	1.31E+2	-1.62E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.52E+2	1.02E+1	5.54E+0	-6.79E+3

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

5 Results

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	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.

5 Results

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A1

Abbreviation	Unit	A1	A2	A3	A4	A5	B1	B2	B3	C1	C2	C3	C4	D
ADPE	Kg Sb	1.72E-3	4.60E-4	5.72E-4	1.25E-4	1.29E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.94E-4	2.89E-5	7.07E-7	-1.87E-3
GWP	Kg CO2 Equiv.	6.91E+1	2.68E+1	2.43E+1	6.99E+0	7.42E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.15E+1	2.39E+0	6.92E-1	-8.70E+1
ODP	Kg CFC-11 Equiv.	9.72E-6	5.06E-6	1.32E-6	1.38E-6	7.28E-7	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.04E-6	2.16E-7	2.38E-8	-1.31E-5
POCP	Kg Ethene Equiv.	4.58E-2	1.68E-2	8.45E-3	4.47E-3	3.25E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	6.94E-3	6.80E-3	2.09E-4	-7.72E-2
AP	Kg SO2 Equiv.	4.21E-1	8.78E-2	7.00E-2	1.84E-2	2.50E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.06E-2	3.73E-2	5.21E-4	-5.69E-1
EP	Kg PO43- Equiv.	8.56E-2	1.62E-2	1.28E-2	2.97E-3	5.12E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	9.93E-3	9.50E-3	2.58E-4	-1.40E-1

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	5.32E-1	1.99E-1	1.88E-1	5.44E-2	3.52E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	8.46E-2	1.46E-2	9.94E-4	-6.52E-1
HTP	kg 1.4 DB	3.60E+1	1.27E+1	6.59E+0	3.45E+0	2.67E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.84E+0	4.36E+0	4.90E-2	-5.24E+1
FAETP	kg 1.4 DB	8.07E-1	3.46E-1	1.70E-1	9.39E-2	6.80E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.41E-1	3.85E-2	7.88E-4	-1.20E+0
MAETP	kg 1.4 DB	2.87E+3	1.35E+3	7.14E+2	3.69E+2	2.30E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	5.08E+2	1.10E+2	3.19E+0	-3.59E+3
TETP	kg 1.4 DB	2.06E-1	4.09E-2	2.66E-1	1.11E-2	2.89E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.71E-2	1.53E-2	1.60E-4	-4.34E-1

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	1.91E+4	5.28E+0	6.60E+2	1.44E+0	6.33E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.19E+0	1.29E+1	8.48E-2	-1.49E+4
PERM	MJ	6.58E+3	0.00E+0	1.97E+2	0.00E+0	2.03E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-4.19E+3
PERT	MJ	2.56E+4	5.28E+0	8.57E+2	1.44E+0	8.36E+2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.19E+0	1.29E+1	8.48E-2	-1.91E+4
PENRE	MJ	1.13E+3	4.46E+2	3.40E+2	1.22E+2	7.38E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.86E+2	2.94E+1	2.29E+0	-1.37E+3
PENRM	MJ	1.48E+2	0.00E+0	5.61E+1	0.00E+0	6.12E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.28E+2
PENRT	MJ	1.28E+3	4.46E+2	3.96E+2	1.22E+2	7.99E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.86E+2	2.94E+1	2.29E+0	-1.49E+3
SM	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
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	6.32E+0	4.78E-2	6.33E-1	1.30E-2	2.23E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.13E-2	9.57E-2	2.66E-3	-4.37E+0

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	1.70E-3	1.02E-3	1.56E-3	2.78E-4	2.51E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.43E-4	1.04E-4	2.63E-6	-3.16E-3
NHWD	Kg	2.24E+1	3.65E+1	5.01E+0	9.95E+0	3.19E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.11E+1	1.17E+0	9.51E+0	-4.45E+1
RWD	Kg	6.80E-3	2.87E-3	1.24E-3	7.82E-4	4.12E-4	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.15E-3	9.39E-5	1.41E-5	-7.63E-3

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	7.05E-1	0.00E+0	8.57E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.85E+2	0.00E+0	-4.36E-1
MFR	Kg	0.00E+0	0.00E+0	1.41E+0	0.00E+0	6.75E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.90E+1	0.00E+0	-8.71E-1
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	7.95E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	1.13E+3
EET	MJ	0.00E+0	0.00E+0	5.03E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	7.14E+2
EEE	MJ	0.00E+0	0.00E+0	2.92E+1	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.15E+2

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 CUBIC METER

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per cubic 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 CUBIC 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	€ 9.65	168,7 %
A2 Transport	€ 3.19	55,8 %
A3 Manufacturing	€ 2.34	40,9 %
A4 Transport from the gate to the site	€ 0.82	14,3 %
A5 Construction - Installation process	€ 0.80	13,9 %
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	€ 1.39	24,2 %
C3 Waste processing	€ 0.78	13,6 %
C4 Disposal	€ 0.04	0,8 %
D Benefits and loads beyond the product system boundary	€ -13.28	-232,1 %
ECI NL per functional unit	€ 5.72	

6 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

EN16485

EN16485:2014 Round and sawn timber – Environmental Product Declarations – Product category rules for wood and wood-based products for use in construction

NMD-verification protocol

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

NMD Determination method

NMD Determination method Environmental performance Construction works v1.0 July 2020, foundation NMD



LCA 'Europees naaldhout, gedroogd, gezaagd'

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