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

Sirux

Registration number:	EPD-Kiwa-EE-178194-EN
Issue date:	22-01-2025
Valid until:	22-01-2030
Declaration owner:	LTS Licht & Leuchten GmbH
Publisher:	Kiwa-Ecobility Experts
Programme operator:	Kiwa-Ecobility Experts
Status:	verified

1 General information

1.1 PRODUCT

Sirux

1.2 REGISTRATION NUMBER

EPD-Kiwa-EE-178194-EN

1.3 VALIDITY

Issue date: 22-01-2025

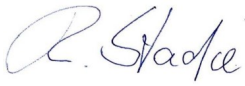
Valid until: 22-01-2030

1.4 PROGRAMME OPERATOR

Kiwa-Ecobility Experts
Wattstraße 11-13
13355 Berlin
DE

Raoul Mancke

(Head of programme operations, Kiwa-Ecobility Experts)



Dr. Ronny Stadie

(Verification body, Kiwa-Ecobility Experts)

1.5 OWNER OF THE DECLARATION

Manufacturer: LTS Licht & Leuchten GmbH

Address: Waldesch 24, 88069 Tettnang, Germany

E-mail: vertrieb@lts-light.com

Website: https://www.lts-light.com/

Production location: LTS Licht & Leuchten GmbH

Address production location: Waldesch 24, 88069 Tettnang, 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 15804:2012+A2:2019 serves as the core PCR.

☐ Internal ☒ External

Lucas Pedro Berman, Senda

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

EN 50693:2022 Product category rules for life cycle assessments of electronic and electrical products and systems

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

Institute Construction and Environment e.V. (IBU) - Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires (06-04-2023, v1)

1 General information

1.9 COMPARABILITY

In principle, a comparison or assessment of the environmental impacts of different products is only possible if they have been prepared in accordance with EN 15804+A2. For the evaluation of the comparability, the following aspects have to be considered in particular: PCR used, functional or declared unit, geographical reference, the definition of the system boundary, declared modules, data selection (primary or secondary data, background database, data quality), scenarios used for use and disposal phases, and the life cycle inventory (data collection, calculation methods, allocations, validity period). PCRs and general program instructions of different EPD program operators may differ. Comparability needs to be evaluated. For further guidance, see EN 15804+A2 (5.3 Comparability of EPD for construction products) and ISO 14025 (6.7.2 Requirements for comparability).

1.10 CALCULATION BASIS

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

LCA software*: Simapro 9.1

Characterization method: EN 15804 +A2 Method v1.0

LCA database profiles: EcoInvent version 3.6

Version database: v3.17 (2024-05-22)

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

1.11 LCA BACKGROUND REPORT

This EPD is generated on the basis of the LCA background report 'Sirux' with the calculation identifier ReTHiNK-78194.

2 Product

2.1 PRODUCT DESCRIPTION

The Sirux is a track-mounted spotlight with a LED spot, folded reflector, and housing made from aluminium. The luminaire rotates through 350° and pivots through 90° via an integrated articulated arm.

Its modular product structure is designed for durability and is easy to repair so that defective parts can be replaced. A click system enables reflectors to be replaced without tools. At the end of its life, Sirux can be disassembled into its individual parts and sent for recycling.

The composition of the Sirux luminaire is the following:

Material	Composition
Aluminium	70 %
Electronics	14 %
Plastic	12 %
Steel	3 %
Cables	1 %

The packaging of the product consists of cardboard and paper.

2.2 APPLICATION (INTENDED USE OF THE PRODUCT)

The Sirux luminaire can be used for all applications where precisely directed, focused light and high efficiency standards are required. The main sector where it is applied is the retail sector.

The Sirux luminaire can be individually equipped with different light qualities and control options and upgraded to the latest electronics. Sirux can be integrated into the Organic Response lighting control system via Plug & Play and is also open to the connection of other data-based applications.

2.3 REFERENCE SERVICE LIFE

RSL PRODUCT

The RSL of this product is 50.000 hours, based on the RSL of the main electronic component, which is the LED.

USED RSL (YR) IN THIS LCA CALCULATION:

15

2.4 TECHNICAL DATA

Lighting data / Norms:

Lamps	LED Spot / CRI90 BBBL / 3500 K
Lifetime	L90 B50 50.000h L80 B20 50.000h
System power	17.9 W
Luminaire luminous flux	2710 lm
System efficiency	151,00 lm/W
Module efficiency	178,00 lm/W
UGR class	≤22
Beam angle	45°
Supply voltage	220 - 240 V / 50 - 60 Hz
Protection class	I
Type of protection	IP20

Dimensions / Weights:

Length	185 mm
Width	84 mm
Height	92 mm
Diameter of light head	84 mm

2 Product

Net weight	0,84 kg
Gross weight	0,94 kg

Constructional data:

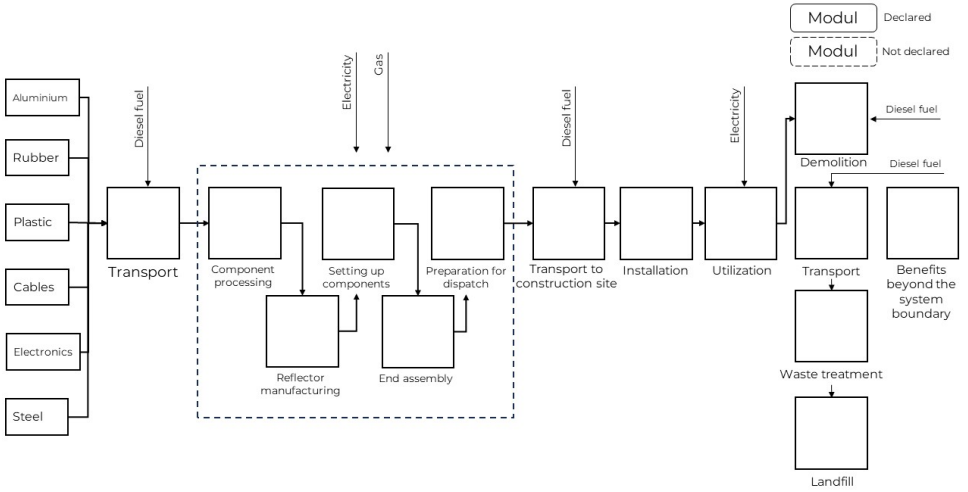
Name	*Value*	*Unit*
Width x length	84 x 185	mm
Luminous energy	2710	lm s
Luminous flux	2710	lm
Luminous intensity	1411	cd/1000lm
Luminance	-	cd/m²
Illuminance	686	lx/3 meter
Luminous emittance	-	lx
Luminous efficiency	151	lm/W
Nonglaring	<22	UGR
Light distribution	50	°

2.5 SUBSTANCES OF VERY HIGH CONCERN

The product does not contain any (or less than 1%) of the substances from the "*Candidate List of Substances of Very High Concern for Authorization*" (SVHC) in amounts greater than 0,1% (1.000 ppm).

2.6 DESCRIPTION PRODUCTION PROCESS

The raw materials and/or components are firstly delivered to the LTS production location in Tettnang. Any materials that require this are further processed and the reflector is produced. All components are then set up, and the product goes through the final assembly.



3 Calculation rules

3.1 DECLARED UNIT

1 piece luminaire

The declared unit is 1 piece luminaire Sirux.

Reference unit: piece (p)

3.2 CONVERSION FACTORS

Description	Value	Unit
Reference unit	1	p
Weight per reference unit	0.730	kg
Conversion factor to 1 kg	1.369390	p

3.3 SCOPE OF DECLARATION AND SYSTEM BOUNDARIES

This is a Cradle to gate with options 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	X	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 Sirux, a product of LTS Licht & Leuchten GmbH. The results of this EPD are representative for European Union.

The considered scenarios are currently in use and are representative of one of the most likely scenario alternatives.

3.5 CUT-OFF CRITERIA

Product stage (Modules A1-A3)

3 Calculation rules

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.

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;
- Research and development activities

Use stage (Module B6)

All (known) input flows (e.g. raw materials, transportation, energy use, packaging, etc.) and output flows (e.g. emissions to soil, air and water, construction waste, packaging waste, end-of-life waste, etc.) related to the building fabric are considered in this LCA. The total neglected input flows do therefore not exceed the limit of 5% of energy use and mass.

End of life stage (Modules 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.

3.7 DATA COLLECTION & REFERENCE PERIOD

The data is collected in the year 2024.

Since it is a relatively new product, there has not been one full year of production yet. To make sure that the data is representative, data from multiple production rounds has been used.

3.8 ESTIMATES AND ASSUMPTIONS

For data protection reasons, various assumptions made on the data used for this EPD are only explained in the background report accompanying this EPD.

Of the use phase, only module B6 (Operational Energy Use) is declared. The numbers for this are calculated based on the formula given in the PCR. According to the PCR, the operational energy use should be calculated based on the type of product (luminaire, lamp, or lamp component) and the use scenario (what the lamp is used for). This product is a luminaire and it is used mainly in the retail sector.

The energy consumption of a luminaire can be calculated with the following formula:

Energy consumption [kWh] = {Pa * FCP * FO * (FD * tD + FN * tN) + Pp * ty} * 1/1000 * a

- Pa [W] = active power
- FCP = product constant illuminance factor
- FO = occupancy dependency factor
- FD = daylight dependency factor
- tD [h] = daylight operating hours per year
- FN = non-daylight dimming factor
- tN [h] = non-daylight operating hours per year
- Pp [W] = passive power
- ty [h] = 8760
- a = reference service lifetime of installation in years

The exact calculation for this product is given in the corresponding background report. For some parameters an assumption had to be made, because no information on it is available. Therefore, the numbers for B6 are conservative numbers.

No inputs have been entered for module C1, because it is assumed that the product can be dismantled without heavy machinery or equipment.

3 Calculation rules

3.9 DATA QUALITY

The data used for this EPD is comprised of primary data directly collected by LTS Light & Leuchten. All relevant process-specific data could be recorded during the operational data collection.

Where available, primary data from suppliers was used for the LCA, otherwise secondary data from the regularly updated Ecoinvent database (version 3.6) was used. The environmental profiles used from the Ecoinvent database are all from 2019, which means that there is less than 6 years difference between the reference year according to the documentation and the period for which the data is representative, which is why the quality level for temporal representativeness can be described as good.

The majority of the data used, whether primary or secondary, is representative either for Europe or Globally. Since most of the data used originate from average data from a larger area that includes the area under study (Europe or Global), the quality level for geographical representativeness can be considered good.

Finally, for some of the inputs the specific material or technology was provided, however, for other inputs an assumption had to be made on the specific material or technology and a similar material or technology was chosen. Therefore the primary and secondary data used have either the same or a similar state of the art as the materials of the product under investigation, which is why the quality level for technical representativeness can be considered good.

In accordance with the criteria of the 'UN Environmental Global Guidance on LCA database development' mentioned in EN 15804+A2, the data quality for all three representativeness categories (geographical, technical and temporal) can therefore be described as good.

The scenarios included are current and representative of one of the most likely scenario variants.

3.10 POWER MIX

The “location-based” approach is used for this EPD. LTS Licht & Leuchten has provided the electricity mix they use from its energy provider. In this mix, both renewable energy financed by the EEG-levy and renewable energy with Guarantee of Origin (GO) have been included. However, since the GOs could not be provided, the percentage for this energy source has been replaced by the German residual mix. This electricity mix is therefore made up of 57,2% renewable energy financed by the EEG-levy, and for the other 42,8% the German residual mix has been used.

The electricity used has a Global Warming Potential (GWP-total) of 0,32735994 kg CO_2-eq per kilowatt-hour (kWh).

4 Scenarios and additional technical information

4.1 OPERATIONAL ENERGY USE (B6)

Description	Service cycle (yr)	Number of cycles (n)	Amount per cycle	Total Amount	Unit
Use	15	1.00	447.5	447.50	kWh

4.2 DE-CONSTRUCTION, DEMOLITION (C1)

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

4.3 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]
Galvanised steel (i.a. profiles, sheets) (NMD ID 75)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Steel, light (NMD ID 73)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
EoL electronics - passive components	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0
copper, mixed (electricity cables) (NMD ID 42)	Lorry (Truck), unspecified (default) | market group for (GLO)	0	100	150	50	0

4 Scenarios and additional technical information

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

4.4 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 [%]
Galvanised steel (i.a. profiles, sheets) (NMD ID 75)	NL	0	5	0	95	0
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	NL	0	3	3	94	0
Steel, light (NMD ID 73)	NL	0	1	0	87	12
EoL electronics - passive components	NL	0	5	35	60	0
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	NL	0	0	90	10	0
elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	NL	0	10	85	5	0
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	NL	0	5	5	90	0
copper, mixed (electricity cables) (NMD ID 42)	NL	0	10	5	85	0

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
Galvanised steel (i.a. profiles, sheets) (NMD ID 75)	0.000	0.002	0.000	0.034	0.000
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	0.000	0.015	0.015	0.478	0.000
Steel, light (NMD ID 73)	0.000	0.000	0.000	0.008	0.001
EoL electronics - passive components	0.000	0.005	0.035	0.061	0.000
Total	**0.000**	**0.024**	**0.094**	**0.611**	**0.001**

4 Scenarios and additional technical information

Waste Scenario	Not removed (stays in work) [kg]	Landfill [kg]	Incineration [kg]	Recycling [kg]	Re-use [kg]
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	0.000	0.000	0.042	0.005	0.000
elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	0.000	0.000	0.000	0.000	0.000
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	0.000	0.001	0.001	0.013	0.000
copper, mixed (electricity cables) (NMD ID 42)	0.000	0.001	0.001	0.012	0.000
Total	**0.000**	**0.024**	**0.094**	**0.611**	**0.001**

4.5 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]
Galvanised steel (i.a. profiles, sheets) (NMD ID 75)	0.034	0.000
aluminium, cast alloy for buildings (i.a. profiles, sheets, pipes) (NMD ID 4)	0.102	0.000
Steel, light (NMD ID 73)	0.005	0.000
EoL electronics - passive components	0.061	0.000
plastics, other (i.a. profiles, sheets, pipes) (NMD ID 45)	0.005	0.000
elastomeres (i.a. epdm) (i.a. roofing, foils) (NMD ID 20)	0.000	0.001
Metals, others (i.a. fasteners, fittings) (NMD ID 50)	0.011	0.000
copper, mixed (electricity cables) (NMD ID 42)	0.012	0.000
Total	**0.229**	**0.001**

5 Results

For the impact assessment, the characterization factors of the LCIA method EN 15804 +A2 Method v1.0 are used. Long-term emissions (>100 years) are not considered in the impact assessment. The results of the impact assessment are only relative statements that do not make any statements about end-points of the impact categories, exceedance of threshold values, safety margins or risks. The following tables show the results of the indicators of the impact assessment, of the use of resources as well as of waste and other output flows.

5.1 ENVIRONMENTAL IMPACT INDICATORS PER PIECE

CORE ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	B6	C1	C2	C3	C4	D
AP	mol H+ eqv.	4.15E-2	3.16E-3	1.63E-3	4.63E-2	1.12E+0	0.00E+0	3.69E-5	7.07E-4	4.87E-6	-1.12E-2
GWP-total	kg CO2 eqv.	6.31E+0	1.84E-1	6.49E-1	7.15E+0	1.98E+2	0.00E+0	6.36E-3	3.42E-1	1.34E-3	-1.54E+0
GWP-b	kg CO2 eqv.	1.49E-3	2.35E-5	-1.36E-1	-1.35E-1	5.77E+0	0.00E+0	2.93E-6	-1.24E-4	9.85E-6	1.46E-2
GWP-f	kg CO2 eqv.	6.30E+0	1.84E-1	7.84E-1	7.27E+0	1.92E+2	0.00E+0	6.35E-3	3.42E-1	1.33E-3	-1.55E+0
GWP-luluc	kg CO2 eqv.	1.27E-2	9.03E-5	1.34E-3	1.42E-2	4.47E-1	0.00E+0	2.33E-6	8.70E-5	6.04E-7	-6.60E-3
EP-m	kg N eqv.	5.70E-3	8.41E-4	3.66E-4	6.91E-3	1.42E-1	0.00E+0	1.30E-5	1.32E-4	2.51E-6	-1.58E-3
EP-fw	kg P eq	2.07E-4	1.32E-6	3.40E-5	2.42E-4	2.05E-2	0.00E+0	6.41E-8	4.61E-6	2.31E-8	-5.38E-5
EP-T	mol N eqv.	6.35E-2	9.33E-3	4.68E-3	7.75E-2	1.75E+0	0.00E+0	1.43E-4	1.52E-3	1.37E-5	-1.77E-2
ODP	kg CFC 11 eqv.	1.52E-7	3.90E-8	9.30E-8	2.84E-7	1.62E-5	0.00E+0	1.40E-9	1.36E-8	9.80E-11	-4.09E-8
POCP	kg NMVOC eqv.	1.86E-2	2.47E-3	1.21E-3	2.23E-2	4.45E-1	0.00E+0	4.09E-5	4.20E-4	4.17E-6	-5.46E-3
ADP-f	MJ	7.33E+1	2.58E+0	1.21E+1	8.80E+1	3.95E+3	0.00E+0	9.58E-2	1.21E+0	1.08E-2	-1.42E+1
ADP-mm	kg Sb-eqv.	1.79E-3	3.05E-6	3.53E-6	1.80E-3	1.40E-3	0.00E+0	1.61E-7	2.77E-6	5.56E-9	1.92E-3
WDP	m3 world eqv.	1.67E+0	6.78E-3	7.02E-2	1.75E+0	4.43E+1	0.00E+0	3.43E-4	1.74E-2	2.79E-4	1.88E-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

ADDITIONAL ENVIRONMENTAL IMPACT INDICATORS EN15804+A2

Abbr.	Unit	A1	A2	A3	A1-A3	B6	C1	C2	C3	C4	D
ETP-fw	CTUe	1.85E+2	2.01E+0	7.70E+0	1.95E+2	2.71E+3	0.00E+0	8.55E-2	5.47E+0	9.46E+0	-3.99E+1
PM	disease incidence	4.23E-7	1.12E-8	1.29E-8	4.47E-7	2.94E-6	0.00E+0	5.72E-10	8.27E-9	7.07E-11	-1.36E-7
HTP-c	CTUh	6.95E-9	8.75E-11	2.16E-10	7.25E-9	6.99E-8	0.00E+0	2.77E-12	1.16E-10	6.30E-13	-2.33E-9
HTP-nc	CTUh	1.91E-7	2.04E-9	4.52E-9	1.97E-7	2.38E-6	0.00E+0	9.35E-11	6.16E-9	2.07E-11	-3.61E-8
IR	kBq U235 eqv.	2.25E-1	1.09E-2	1.72E-2	2.53E-1	3.42E+1	0.00E+0	4.02E-4	5.11E-3	3.88E-5	-9.08E-3
SQP	Pt	1.73E+1	1.42E+0	2.14E+1	4.01E+1	9.65E+2	0.00E+0	8.31E-2	1.10E+0	1.60E-2	-5.52E-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
	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

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ILCD classification	Indicator	Disclaimer
	Potential Comparative Toxic Unit for ecosystems (ETP-fw)	2
	Potential Comparative Toxic Unit for humans (HTP-c)	2
	Potential Comparative Toxic Unit for humans (HTP-nc)	2
	Potential Soil quality index (SQP)	2

Disclaimer 1 – This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.

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

PARAMETERS DESCRIBING RESOURCE USE

Abbr.	Unit	A1	A2	A3	A1-A3	B6	C1	C2	C3	C4	D
PERE	MJ	1.48E+1	2.55E-2	4.11E+0	1.89E+1	7.49E+2	0.00E+0	1.20E-3	1.26E-1	5.60E-4	-1.86E+0
PERM	MJ	8.16E-2	0.00E+0	1.43E+0	1.51E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	MJ	1.49E+1	2.55E-2	5.54E+0	2.04E+1	7.49E+2	0.00E+0	1.20E-3	1.31E-1	5.83E-4	-1.85E+0
PENRE	MJ	7.48E+1	2.74E+0	1.32E+1	9.08E+1	4.15E+3	0.00E+0	1.02E-1	1.23E+0	1.01E-2	-1.48E+1
PENRM	MJ	1.33E+0	0.00E+0	6.39E-2	1.40E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-1.33E-1
PENRT	MJ	7.61E+1	2.74E+0	1.33E+1	9.22E+1	4.15E+3	0.00E+0	1.02E-1	1.29E+0	1.15E-2	-1.50E+1
SM	Kg	3.83E-1	0.00E+0	0.00E+0	3.83E-1	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
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
FW	M3	1.70E+1	2.34E-4	3.01E-3	1.70E+1	3.31E+0	0.00E+0	1.17E-5	7.97E-4	8.98E-6	-1.13E-3

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

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OTHER ENVIRONMENTAL INFORMATION DESCRIBING WASTE CATEGORIES

Abbr.	Unit	A1	A2	A3	A1-A3	B6	C1	C2	C3	C4	D
HWD	Kg	1.52E-3	4.93E-6	2.04E-5	1.54E-3	2.63E-3	0.00E+0	2.43E-7	3.16E-3	1.15E-8	3.88E-3
NHWD	Kg	8.17E-1	9.51E-2	3.53E-2	9.47E-1	1.34E+1	0.00E+0	6.08E-3	4.27E-2	2.46E-2	-3.04E-1
RWD	Kg	1.34E-3	1.74E-5	2.12E-5	1.38E-3	2.80E-2	0.00E+0	6.29E-7	5.52E-6	4.79E-8	-1.50E-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	B6	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	1.15E-3	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	0.00E+0	5.50E-1	0.00E+0	0.00E+0
MER	Kg	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EET	MJ	0.00E+0	0.00E+0	-1.08E-2	-1.08E-2	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-4.07E-4
EEE	MJ	0.00E+0	0.00E+0	-6.25E-3	-6.25E-3	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	-2.37E-4

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

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5.3 INFORMATION ON BIOGENIC CARBON CONTENT PER PIECE

BIOGENIC CARBON CONTENT

The following Information describes the biogenic carbon content in (the main parts of) the product at the factory gate per piece:

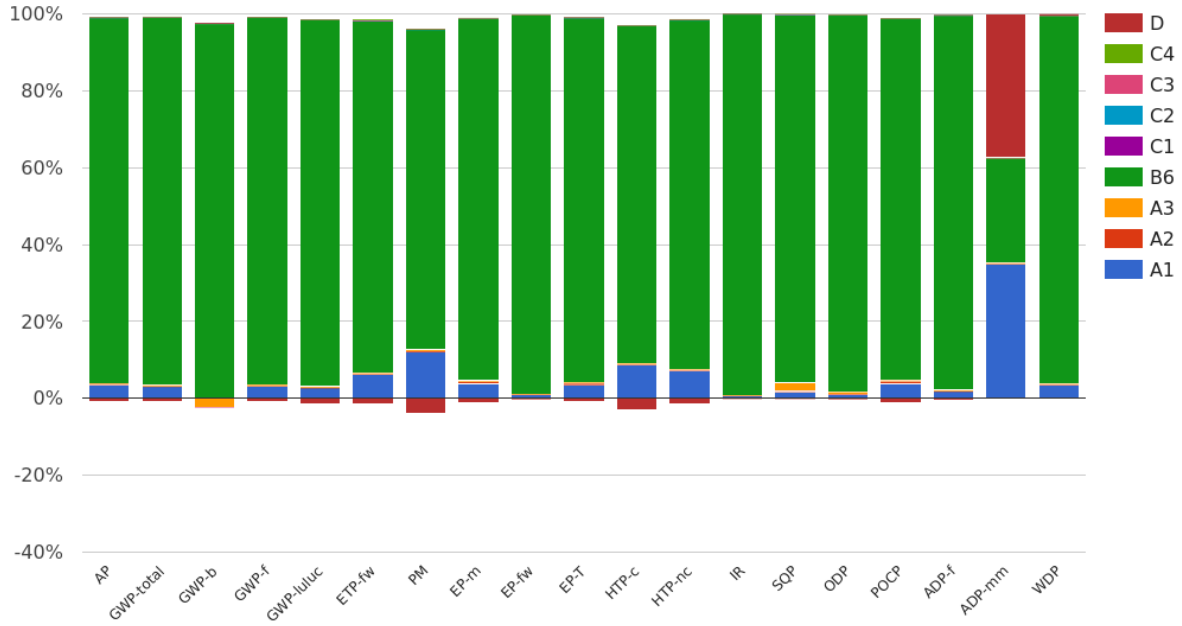
Biogenic carbon content	Amount	Unit
Biogenic carbon content in the product	0	kg C
Biogenic carbon content in accompanying packaging	0.04138	kg C

UPTAKE OF BIOGENIC CARBON DIOXIDE

The following amount of carbon dioxide uptake is taken into account. Related uptake and release of carbon dioxide in downstream processes are not taken into account in this number although they do appear in the presented results. One kilogram of biogenic Carbon content is equivalent to 44/12 kg of biogenic carbon dioxide uptake.

Uptake Biogenic Carbon dioxide	Amount	Unit
Packaging	0.1517	kg CO2 (biogenic)

6 Interpretation of results



As can be seen in the graph, for all environmental impact categories, module B6 (operational energy use) has the biggest influence. This is due to the fact that this module has been calculated for the whole reference service life of the product (50,000 hours).

After module B6, module A1 (raw material supply) has the largest influence on almost all environmental impact categories. This can mainly be attributed to the reflector and the aluminium elements used in this product.

7 References

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

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

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

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

EN50693
EN 50693:2022-08: Product category rules for life cycle assessments of electronic and electrical products and systems

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

PCR B
Institute Construction and Environment e.V. (IBU) - Part B: Requirements on the EPD for Luminaires, lamps and components for luminaires (06-04-2023, v1)

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Environmental Performance Assessment Method for Construction Works. Version 1.1 (March 2022). Nationale Milieudatabase.

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Ecoinvent Centre. Ecoinvent Database Version 3.6 (2019). https://www.ecoinvent.org.

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