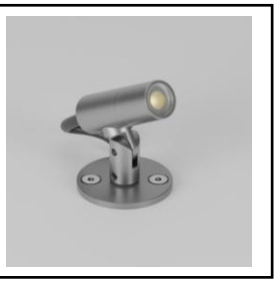
STOANE LIGHTING

EQUIPMENT DESIGN + MANUFACTURE

LIFE CYCLE ASSESSMENT REPORT

For Type II Environmental Communications



Reference Product:

Pipien
3000K_Flood

Life Cycle Assessment carried out in compliance with:

PEP Ecopassport PCR-ed4-EN-2021 09 06, supplemented by PSR-0014-ed2.0-EN2023 07 13

EN 50693:2019

EN 15804:2012+A2:2019

Date of issue: 17/12/2025

1. General Information

1.1. Company Information

Stoane Lighting

20 Dryden Road
Bilston Glen Industrial Estate
Loanhead
EH20 9LZ
United Kingdom

Website: https://stoanelighting.com
Telephone: +44 131 440 1313
Email: sales@mikestoanelighting.com

1.2. Product Information

Reference Product The reference product is one unit of Pipien_3000K_Flood luminaire produced by Stoane Lighting. The reference product is equipped with a 4mm LED at 3000K, with a (delivered) lumen output of 99.2 lm for a Flood, and a dimmable control gear typically used with this type of product, specified according to rules in PSR-0014-ed2.0[1]. The technical properties of the reference product are summarised in Table 1.

Technical Characteristics

Table 1: Technical characteristics of the reference product

	Unit	Values for Pipien_3000K_Flood
***Mass** (excl. packaging)*	**kg**	0.192
***Mass** (incl. packaging)*	**kg**	0.292
Assigned lifetime	**h**	100000
LED light source lifetime (L70B50)	**h**	66000
Control gear	**h**	50000
Protection index for water and dust	-	IP66
CRI	-	95
Colour Temperature	**K**	3000
Light source diameter	**mm**	4
Optic option	-	Flood
Declared operating voltage	**V**	2.8
***Lumen output** (initial)*	**lm**	148.0
***Lumen output** (delivered)*	**lm**	99.2
***Power** (light source)*	**W**	1.4
***Power** (luminaire)*	**W**	2.59
Luminous efficacy	**lm/W**	70.83
Light management function	-	External light management system
Energy saving coefficient	-	0.5

Reference Lifetime The reference lifetime in years for this product is 25 years, which corresponds to the assigned lifetime of 100000 hours in a scenario where the product is operated for 4000 h/year. This value was selected as it corresponds to the highest available annual operating hours, according to guidelines in PSR-0014-ed2.0 (Table *2*).

Table 2: Reference lifetime (years) based on use scenarios in different types of buildings.

Type of building	Annual operating hours (h)	Operational lifetime (years)
Urban	4000	25
Zone, open space	4000	25

1.3. General information

Scope The scope of this report is cradle-to-grave with the addition of Module D, according to definition included in EN15804+A2.

Product category According to PSR-0014-ed2.0 the reference product belongs to the LED luminaire category, and it is equipped with an integrated replaceable LED module, for use with external control gear/power supply.

Declared Unit The declared unit (DU) is

To provide lighting that delivers an outgoing artificial luminous flux of 99.2 lumens during a lifetime of 25 years.

Functional Unit The functional unit (FU) defined for comparative purposes applied in this PEP is

To provide lighting that delivers an outgoing artificial luminous flux of 1000 lumens during a reference lifetime of 35000 hours.

According to PSR-0014-ed2.0.

Reference Flow The following reference flow factor shall be used to convert the impacts from the declared unit level to the functional unit level:

$$\left(\frac{luminous\ output_{FU}}{luminous\ output_{DU}}\right) \times \left(\frac{lifetime_{FU}}{lifetime_{DU}}\right) = \left(\frac{1000\ lm}{99.2\ lm}\right) \times \left(\frac{35000\ h}{100000\ h}\right) = 3.5$$

1.4. Homogeneous family

The reference product represents the “Pipien” family, which includes products differing based on colour temperature and optic options.

The different optic and colour temperature options do not require different or additional materials or modifications to the reference product’s structure, manufacturing operations or End of Life (EoL) treatments, only the power and/or delivered lumen output are affected. Therefore, the impact variations are only observable for the energy consumed during the use of the product (stage B6 of the product’s life cycle).

The criteria and ranges of variation for the homogeneous family are shown in Table *3*.

Table 3: Criteria and minimum and maximum values of the ranges of variation for the homogeneous family, reported next to the values associated with the reference product.

Criteria	Unit	Value for the reference product	Minimum value in the family	Maximum value in the family
Luminous output (initial)	**lm**	148.0	139.0	169.0
Typical power	**W**	1.4	1.4	1.4
Optic option	**-**	Flood	Medium	Elliptical
Colour temperature	**K**	3000	2700	4000

This report is valid for all products included in the homogeneous family. The coefficients to be used to extrapolate the impacts for products in the family are reported in section 5.2.

2. Material Composition

2.1. Product

The materials contained in the product are shown in Table *4*. The aluminium parts in the product consist of 70% secondary (post-consumer) material. The product's packaging consists of a cardboard box filled with shredded cardboard, reused by the company from previous shipments of goods.

Table 4: Material composition of the reference product.

Materials	Mass (kg)	Proportion (%)
Metals		
Aluminium	0.035	12.0
Stainless steel	0.004	1.4
	0.039	***13.4***
Plastics		
Polycarbonate	0.001	0.3
Polymethyl methacrylate	0.0001	0.03
Rubber	0.001	0.3
	0.002	***0.6***
Others (electronics)		
LED light source	0.0002	0.07
Power supply	0.128	43.8
Cable	0.021	7.2
	0.149	***51.0***
Glass		
Glass	0.001	0.3
	0.001	***0.3***
Packaging		
Cardboard box	***0.100***	***34.3***
Total	***0.292***	***100***

3. Life Cycle stages

3.1. Manufacturing

Stoane Lighting sources components and materials from the closest geographical locations possible. Whilst local sourcing is possible for some raw materials, international sourcing is occasionally required especially for electrical/electronic components. Materials and components are processed and assembled at a single factory located in Edinburgh (Scotland). Except for some components (e.g. screws and bolts) which are purchased as finished products, all proprietary parts are manufactured by Stoane Lighting. The factory relies on an energy provider that ensures the provision of electricity from 100% renewable sources; however, for the purpose of this assessment, the electricity has been modelled using the standard Scottish electricity mix (renewable and non-renewable), as shown in Table *5*.

Table 5: Average Scottish electricity mix (data from year 2020).

Electricity source	Proportion (%)
electricity production, hydro	11.45
electricity production, wind, offshore	8.75
electricity production, wind, onshore	32.75
electricity production, oil	1.25
electricity production, natural gas	9.85
electricity production, nuclear	29.95
electricity production, photovoltaic	0.85
electricity, from municipal waste incineration	5.15

After manufacturing, the product's finished parts are transported by road using an electric van to local sites for finishing processes, and back to the manufacturing site, ready for final assembly and shipping.

All the manufacturing waste is collected and sent for recycling.

A scheme representing the main steps of the production processes is shown in Figure 1.

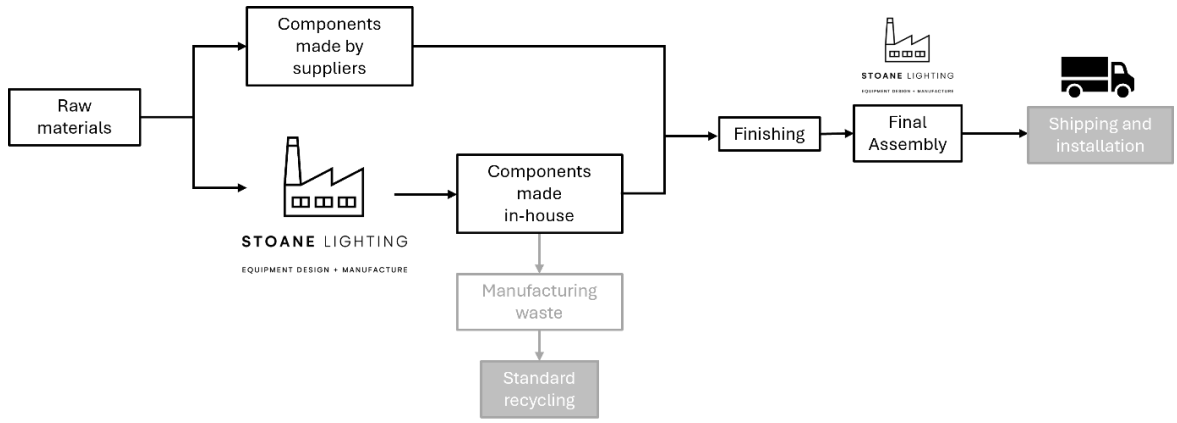


Figure 1: Scheme representing the main steps involved in the sourcing and manufacturing processes before the product is ready to be shipped to the customer.

Packaging associated with materials and components supplied to Stoane Lighting was considered as mostly made up of cardboard boxes, with a small amount of plastic wrapping in the packaging. The packaging mass was estimated as 5% of the total materials mass supplied to the manufacturer. The average composition of the packaging was 90% cardboard boxes and 10% polyethylene film.

3.2. Distribution

Stoane lighting manufactures for a global market but a distribution scenario has been created for markets in the United Kingdom (84%) and Europe (16%). This corresponds to an intracontinental distribution scenario according to PEP-PCR-ed4-EN2021 09 06, requiring a distance of 3,500 km travelled by road. Average datasets for transportation by lorry (with average loading, including empty runs) were used to model the distribution stage.

3.3. Installation

The installation of the product can be carried out without the use of additional material or energy flows. The output of the installation stage is the disposal of packaging materials; this has been modelled using default values for Europe from PSR-0014-ED2.0- EN-2023 07 13.

3.4. Use

The product does not generate direct emissions (B1).

One round of maintenance (B2) has been included to account for one replacement of LED module and control gear (power supply) during the lifetime of the product, as shown in Table *6*. This was modelled as taking place at the manufacturing site (Edinburgh), with a like-for-like replacement.

Table 6: Components for replacement during stage B2, with relative mass.

Components for replacement	Mass (kg)
Power supply	0.128
LED Light source	0.0002

Repairs (B3), replacements (B4) and refurbishments (B5) are not foreseen. The product does not need to consume water (B7).

Using luminaire consumes electricity (B6); the electricity mix has been calculated with contributions from the average mix in the United Kingdom (84%) and Europe (16%), as shown in Table 7.

Table 7: Data and parameters used to calculate the impact of stage B6.

Datasets	Proportion (%)	Total electricity (kWh)
Market for low voltage electricity – GB mix	84.3	109.278
Market for low voltage electricity – Europe mix	15.7	20.352

3.5. End of Life

The waste generated at the End of Life of the product is categorised as Waste from Electrical and Electronic Equipment (WEEE). As the market for this product has been identified as United Kingdom (84%) and Europe (16%), statistics from both regions applicable to WEEE treatment and disposal were used (Recolight, 2021) (Eurostat, 2021), shown in Table *8*.

Table 8: Waste treatment rates applicable to luminaire products for United Kingdom and Europe.

Location	Recycling (%)	Incineration (%)	Landfill (%)	Source
United Kingdom	55	20	25	(Recolight, 2021)
Europe	32	3	65	(Eurostat, 2021)

3.6. Benefits and Loads beyond the system boundaries

Recycling materials at the End of Life of the product generates benefits by avoiding the production of new raw materials. Benefits have been calculated considering the recycled materials listed in Table 9.

Table 9: Recycled materials used in the calculation of benefits and loads beyond the system boundaries (module D).

Material	Unit	Value
Metals	kg	0.036
Plastics	kg	0.002
Others	kg	0.061

4. Environmental Impacts

Software, databases and rules used for the calculation of the environmental impacts of the product are summarised in Table 10; Table 11 gives an overview of the life cycle stages considered in the study, in compliance with PEP-PSR-0014-Ed2.0-EN-2023 07 13.

Table 10: Key information regarding the LCA analysis.

Information	Value
LCA Software	OpenLCA 2.0.0
LCA Database	Ecoinvent 3.10 with EN 15804+A2 add-on
Indicators	Environmental, resource, waste and output according to EN 15804:2012+A2:2019
PCR	PEP-PCR–Ed4-EN-2021 09 06
PSR	PEP-PSR-0014-Ed2.0-EN-2023 07 13
Functional Unit	Provide lighting that delivers an outgoing artificial luminous flux of 1000 lumens during a reference lifetime of 35000 hours

Table 11: Life cycle stages considered in the LCA analysis.

Life cycle stage	*Meaning*
A1	Material extraction
A2	Transport to factory
A3	Manufacturing
A4	Transport to site
A5	Installation

Life cycle stage	*Meaning*
B2	Maintenance
B6	Energy in use
C2-C4	Waste transport, treatment and disposal
D	Benefits and loads beyond End of Life

4.1. Results per Functional Unit

The following results of the environmental declaration have been developed by considering an outgoing artificial luminous flux of 1000 lumens over a reference lifetime of 35000 hours.

Table 12: Results of environmental impact indicators per Functional Unit.

Indicator	Unit	Total (excl. D)	Prod. (A1-A3)	A1	A2	A3	A4	A5	Use (B1-B7)	B2	B6	C2-C4	D
Environment – mandatory													
ADP-Elements	kg Sb eq	4.884E-03	1.916E-03	1.954E-03	1.470E-06	-3.956E-05	1.674E-06	9.630E-07	2.987E-03	1.403E-03	1.584E-03	-2.197E-05	-2.447E-07
ADP-Fossil	MJ	4.627E+03	3.882E+02	3.151E+02	4.924E+01	2.390E+01	7.601E+00	3.513E+00	4.226E+03	3.488E+02	3.877E+03	2.334E+00	1.256E+01
AP	mol H^+ eq	1.035E+00	2.474E-01	2.313E-01	1.599E-02	1.271E-04	2.147E-03	1.129E-03	7.837E-01	1.959E-01	5.878E-01	4.708E-04	5.099E-03
EP-Freshwater	kg P eq	1.083E-01	3.015E-02	3.016E-02	8.216E-05	-8.705E-05	3.782E-05	9.030E-05	7.810E-02	2.622E-02	5.188E-02	-6.093E-05	4.867E-04
EP-Marine	kg N eq	2.042E-01	4.286E-02	3.603E-02	6.489E-03	3.423E-04	8.131E-04	7.171E-04	1.593E-01	3.983E-02	1.195E-01	4.429E-04	7.008E-04
EP-Terrestrial	mol N eq	2.184E+00	4.693E-01	3.978E-01	6.895E-02	2.629E-03	8.675E-03	4.066E-03	1.697E+00	4.323E-01	1.265E+00	4.521E-03	6.237E-03
GWP-Biogenic	kg CO_2 eq	1.021E+00	-5.923E-02	-4.640E-02	-1.480E-02	1.973E-03	4.240E-04	7.490E-02	1.006E+00	-4.471E-02	1.051E+00	-7.478E-04	4.335E-03
GWP-Fossil	kg CO_2 eq	2.065E+02	2.875E+01	2.465E+01	3.742E+00	3.623E-01	5.222E-01	2.558E-01	1.761E+02	2.727E+01	1.489E+02	8.291E-01	7.899E-01
GWP-Land use	kg CO_2 eq	3.279E-01	5.802E-02	3.950E-02	6.112E-04	1.791E-02	2.559E-04	1.826E-04	2.693E-01	3.403E-02	2.352E-01	1.876E-04	2.106E-02
GWP-Total	kg CO_2 eq	2.078E+02	2.875E+01	2.464E+01	3.728E+00	3.822E-01	5.229E-01	3.309E-01	1.774E+02	2.726E+01	1.501E+02	8.285E-01	8.153E-01
ODP	kg CFC-11 eq	1.329E-05	1.709E-06	1.629E-06	6.434E-08	1.567E-08	1.146E-08	2.527E-08	1.151E-05	1.699E-06	9.810E-06	3.751E-08	2.328E-08
POCP	kg NMVOC eq	5.843E-01	1.339E-01	1.112E-01	2.170E-02	9.687E-04	3.188E-03	1.099E-03	4.442E-01	1.239E-01	3.204E-01	1.874E-03	2.787E-03
WDP	m3 world eq	6.034E+01	9.101E+00	8.551E+00	1.093E-01	4.405E-01	3.863E-02	1.022E-01	5.108E+01	7.661E+00	4.342E+01	1.265E-02	1.734E+00
Environment – optional													
HT-Cancer	CTUh	1.635E-07	3.344E-08	3.307E-08	4.519E-10	-8.229E-11	2.365E-10	8.897E-11	9.025E-08	3.268E-08	5.758E-08	3.949E-08	2.398E-09
HT-Non Cancer	CTUh	5.349E-06	1.510E-06	1.491E-06	3.914E-08	-1.964E-08	5.394E-09	2.067E-09	3.273E-06	1.460E-06	1.812E-06	5.593E-07	2.493E-08
ETPF	CTUe	1.449E+03	6.110E+02	5.879E+02	2.376E+01	-6.448E-01	3.711E+00	1.816E+00	8.271E+02	5.654E+02	2.617E+02	5.523E+00	3.234E+00
PMF	disease inc.	7.979E-06	1.796E-06	1.738E-06	4.719E-08	1.085E-08	4.638E-08	1.648E-08	4.321E-06	1.610E-06	2.711E-06	1.800E-06	5.978E-08
LULUC	-	1.803E+03	1.395E+02	1.322E+02	6.020E+00	1.288E+00	5.772E+00	1.329E+00	1.656E+03	1.301E+02	1.526E+03	5.132E-01	4.836E-01
IRH	kBq U^{235} eq	1.330E+02	3.025E+00	1.970E+00	2.333E-02	1.033E+00	1.040E-02	1.646E-02	1.300E+02	1.893E+00	1.281E+02	1.273E-02	2.352E-01

Table 13: Results of resource use, waste, output and biogenic carbon per Functional Unit.

Indicator	Unit	Total (excl. D)	Prod. (A1-A3)	A1	A2	A3	A4	A5	Use (B1-B7)	B2	B6	C2-C4	D
Resources													
PENRE	MJ	4.614E+03	3.822E+02	3.139E+02	4.475E+01	2.352E+01	6.943E+00	3.453E+00	4.220E+03	3.428E+02	3.877E+03	2.334E+00	1.208E+01
PENRM	MJ	1.281E+01	6.055E+00	1.190E+00	4.490E+00	3.749E-01	6.581E-01	5.942E-02	6.033E+00	6.033E+00	0.000E+00	1.069E-03	4.732E-01
PENRT	MJ	4.627E+03	3.882E+02	3.151E+02	4.924E+01	2.390E+01	7.601E+00	3.513E+00	4.226E+03	3.489E+02	3.877E+03	2.335E+00	1.256E+01
PERE	MJ	8.841E+02	4.351E+01	3.538E+01	5.909E-01	7.540E+00	1.193E-01	4.171E-01	8.400E+02	3.167E+01	8.084E+02	2.179E-02	5.360E+00
PERM	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ	8.841E+02	4.351E+01	3.538E+01	5.909E-01	7.540E+00	1.193E-01	4.171E-01	8.400E+02	3.167E+01	8.084E+02	2.179E-02	5.360E+00
FW	m^3	1.780E+00	2.915E-01	2.807E-01	3.748E-03	7.037E-03	9.730E-04	4.520E-03	1.484E+00	2.567E-01	1.227E+00	-4.318E-04	3.770E-02
NRSF	MJ	1.001E+00	8.898E-01	1.256E-01	1.435E-03	7.627E-01	3.161E-03	-9.129E-06	1.071E-01	1.071E-01	0.000E+00	1.107E-03	3.806E-03
RSF	MJ	2.909E-02	1.964E-02	9.470E-03	2.082E-03	8.085E-03	2.244E-03	2.195E-05	7.114E-03	7.114E-03	0.000E+00	7.429E-05	4.052E-03
SM	kg	1.194E-01	8.285E-02	5.559E-02	9.156E-03	1.811E-02	8.433E-03	1.509E-04	2.919E-02	2.919E-02	0.000E+00	-1.179E-03	1.032E-02
Waste													
HWD	kg	1.143E+00	7.841E-01	7.443E-01	1.374E-02	2.608E-02	7.096E-03	2.296E-04	3.481E-01	3.448E-01	3.342E-03	3.705E-03	2.159E-01
NHWD	kg	1.994E+01	3.212E+00	3.067E+00	1.273E-01	1.710E-02	4.800E-01	7.764E-02	1.547E+01	4.445E+00	1.102E+01	7.050E-01	-2.437E-02
RWD	kg	3.399E-02	8.901E-04	6.415E-04	6.868E-06	2.417E-04	2.528E-06	7.027E-06	3.308E-02	6.309E-04	3.244E-02	1.796E-05	6.170E-05
Output													
CRU	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MFR	kg	2.334E-01	7.021E-02	4.587E-02	8.044E-03	1.630E-02	7.375E-03	1.292E-04	5.903E-02	5.903E-02	0.000E+00	9.668E-02	9.244E-03
MER	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
EE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Biogenic carbon content													
Biogenic carbon in packaging	kg	0.28											
Biogenic carbon in product	kg	0.00											

4.2. Results per unit of product

The following results have been developed considering one unit of Pipien_3000K_Flood, with an outgoing artificial luminous flux of 99.2 lumens over a reference lifetime of 100000 hours.

Table 14: Results of environmental impact indicators per unit of product (declared unit).

Indicator	Unit	Total (excl. D)	Prod. (A1-A3)	A1	A2	A3	A4	A5	Use (B1-B7)	B2	B6	C2-C4	D
Environment – mandatory													
ADP-Elements	kg Sb eq	1.384E-03	5.430E-04	5.538E-04	4.167E-07	-1.121E-05	4.744E-07	2.730E-07	8.466E-04	3.976E-04	4.490E-04	-6.227E-06	-6.935E-08
ADP-Fossil	MJ	1.311E+03	1.100E+02	8.930E+01	1.396E+01	6.773E+00	2.154E+00	9.956E-01	1.198E+03	9.887E+01	1.099E+03	6.614E-01	3.559E+00
AP	mol H^+ eq	2.933E-01	7.012E-02	6.555E-02	4.533E-03	3.602E-05	6.085E-04	3.199E-04	2.221E-01	5.552E-02	1.666E-01	1.334E-04	1.445E-03
EP-Freshwater	kg P eq	3.070E-02	8.546E-03	8.548E-03	2.329E-05	-2.467E-05	1.072E-05	2.559E-05	2.214E-02	7.431E-03	1.471E-02	-1.727E-05	1.379E-04
EP-Marine	kg N eq	5.786E-02	1.215E-02	1.021E-02	1.839E-03	9.702E-05	2.305E-04	2.033E-04	4.516E-02	1.129E-02	3.387E-02	1.255E-04	1.986E-04
EP-Terrestrial	mol N eq	6.189E-01	1.330E-01	1.127E-01	1.954E-02	7.453E-04	2.459E-03	1.152E-03	4.810E-01	1.225E-01	3.584E-01	1.281E-03	1.768E-03
GWP-Biogenic	kg CO_2 eq	2.894E-01	-1.679E-02	-1.315E-02	-4.195E-03	5.591E-04	1.202E-04	2.123E-02	2.851E-01	-1.267E-02	2.977E-01	-2.120E-04	1.229E-03
GWP-Fossil	kg CO_2 eq	5.853E+01	8.150E+00	6.986E+00	1.061E+00	1.027E-01	1.480E-01	7.250E-02	4.992E+01	7.728E+00	4.219E+01	2.350E-01	2.239E-01
GWP-Land use	kg CO_2 eq	9.294E-02	1.644E-02	1.119E-02	1.732E-04	5.077E-03	7.252E-05	5.175E-05	7.632E-02	9.646E-03	6.668E-02	5.316E-05	5.968E-03
GWP-Total	kg CO_2 eq	5.891E+01	8.149E+00	6.984E+00	1.057E+00	1.083E-01	1.482E-01	9.378E-02	5.028E+01	7.725E+00	4.256E+01	2.348E-01	2.311E-01
ODP	kg CFC-11 eq	3.768E-06	4.844E-07	4.617E-07	1.824E-08	4.442E-09	3.247E-09	7.162E-09	3.262E-06	4.816E-07	2.781E-06	1.063E-08	6.599E-09
POCP	kg NMVOC eq	1.656E-01	3.794E-02	3.152E-02	6.151E-03	2.746E-04	9.037E-04	3.115E-04	1.259E-01	3.511E-02	9.080E-02	5.312E-04	7.898E-04
WDP	m3 world eq	1.710E+01	2.580E+00	2.424E+00	3.098E-02	1.248E-01	1.095E-02	2.897E-02	1.448E+01	2.171E+00	1.231E+01	3.585E-03	4.915E-01
Environment – optional													
HT-Cancer	CTUh	4.635E-08	9.479E-09	9.374E-09	1.281E-10	-2.332E-11	6.704E-11	2.522E-11	2.558E-08	9.261E-09	1.632E-08	1.119E-08	6.797E-10
HT-Non Cancer	CTUh	1.516E-06	4.280E-07	4.225E-07	1.109E-08	-5.566E-09	1.529E-09	5.858E-10	9.275E-07	4.138E-07	5.137E-07	1.585E-07	7.067E-09
ETPF	CTUe	4.107E+02	1.732E+02	1.666E+02	6.734E+00	-1.827E-01	1.052E+00	5.146E-01	2.344E+02	1.603E+02	7.417E+01	1.565E+00	9.165E-01
PMF	disease inc.	2.261E-06	5.089E-07	4.925E-07	1.338E-08	3.077E-09	1.315E-08	4.672E-09	1.225E-06	4.563E-07	7.684E-07	5.101E-07	1.694E-08
LULUC	-	5.110E+02	3.953E+01	3.746E+01	1.706E+00	3.649E-01	1.636E+00	3.766E-01	4.693E+02	3.689E+01	4.324E+02	1.455E-01	1.371E-01
IRH	kBq U^{235} eq	3.770E+01	8.575E-01	5.582E-01	6.613E-03	2.927E-01	2.949E-03	4.666E-03	3.683E+01	5.366E-01	3.630E+01	3.607E-03	6.665E-02

Table 15: Results of resource use, waste, output and biogenic carbon per unit of product (declared unit).

Indicator	Unit	Total (excl. D)	Prod. (A1-A3)	A1	A2	A3	A4	A5	Use (B1-B7)	B2	B6	C2-C4	D
Resources													
PENRE	MJ	1.308E+03	1.083E+02	8.896E+01	1.268E+01	6.667E+00	1.968E+00	9.788E-01	1.196E+03	9.717E+01	1.099E+03	6.614E-01	3.425E+00
PENRM	MJ	3.630E+00	1.716E+00	3.372E-01	1.273E+00	1.063E-01	1.865E-01	1.684E-02	1.710E+00	1.710E+00	0.000E+00	3.031E-04	1.341E-01
PENRT	MJ	1.311E+03	1.100E+02	8.930E+01	1.396E+01	6.773E+00	2.154E+00	9.957E-01	1.198E+03	9.888E+01	1.099E+03	6.617E-01	3.559E+00
PERE	MJ	2.506E+02	1.233E+01	1.003E+01	1.675E-01	2.137E+00	3.380E-02	1.182E-01	2.381E+02	8.976E+00	2.291E+02	6.175E-03	1.519E+00
PERM	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
PERT	MJ	2.506E+02	1.233E+01	1.003E+01	1.675E-01	2.137E+00	3.380E-02	1.182E-01	2.381E+02	8.976E+00	2.291E+02	6.175E-03	1.519E+00
FW	m^3	5.045E-01	8.263E-02	7.957E-02	1.062E-03	1.994E-03	2.758E-04	1.281E-03	4.205E-01	7.276E-02	3.477E-01	-1.224E-04	1.068E-02
NRSF	MJ	2.837E-01	2.522E-01	3.561E-02	4.066E-04	2.162E-01	8.959E-04	-2.587E-06	3.035E-02	3.035E-02	0.000E+00	3.137E-04	1.079E-03
RSF	MJ	8.245E-03	5.566E-03	2.684E-03	5.901E-04	2.292E-03	6.361E-04	6.220E-06	2.016E-03	2.016E-03	0.000E+00	2.106E-05	1.149E-03
SM	kg	3.386E-02	2.348E-02	1.576E-02	2.595E-03	5.133E-03	2.390E-03	4.277E-05	8.273E-03	8.273E-03	0.000E+00	-3.341E-04	2.926E-03
Waste													
HWD	kg	3.240E-01	2.222E-01	2.110E-01	3.895E-03	7.392E-03	2.011E-03	6.508E-05	9.867E-02	9.772E-02	9.471E-04	1.050E-03	6.119E-02
NHWD	kg	5.653E+00	9.103E-01	8.694E-01	3.609E-02	4.845E-03	1.360E-01	2.200E-02	4.384E+00	1.260E+00	3.125E+00	1.998E-01	-6.908E-03
RWD	kg	9.635E-03	2.523E-04	1.818E-04	1.947E-06	6.851E-05	7.165E-07	1.992E-06	9.374E-03	1.788E-04	9.196E-03	5.092E-06	1.749E-05
Output													
CRU	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
MFR	kg	6.616E-02	1.990E-02	1.300E-02	2.280E-03	4.619E-03	2.090E-03	3.661E-05	1.673E-02	1.673E-02	0.000E+00	2.740E-02	2.620E-03
MER	kg	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
EE	MJ	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Biogenic carbon content													
Biogenic carbon in packaging	kg	0.08											
Biogenic carbon in product	kg	0.00											

5. Extrapolation

5.1. Extrapolation rules

Extrapolations rules can be used to establish impacts of other products in the Pipien homogenous family and have been calculated following PCR-ed4-EN-2021 09 14 and PSR-0014-ed2.0- EN-2023 07 18. The defined rules shall be applied using the information provided in the following tables. The energy saving coefficient is the same across the homogeneous family.

Table 16: Extrapolation parameters of the reference product.

Parameter	Unit	Value for reference product (Pipien_3000K_Flood)
Lumen output (initial)	lm	148.0
Lumen output (delivered)	lm	99.2
Power (light source)	W	1.4
Power (luminaire)	W	2.6
Energy saving coefficient	-	0.5

The coefficients at the product level (declared unit) were calculated using the following formula:

$$\frac{\text{Power of concerned product (W)}}{\text{Power of reference product (W)}} \; x \; \frac{\text{Energy saving coefficient of concerned product}}{\text{Energy saving coefficient of reference product}}$$

The coefficients at the functional unit level were calculated using the formula:

$$\text{Extrapolation coefficient at the product level } x \; \frac{\text{Lighting output of reference product (lumen)}}{\text{Lighting output of product concerned (lumen)}}$$

5.2. Extrapolation coefficients

The reported extrapolation coefficients are intended to be applied to stage B6 only, as the variations in the homogeneous family are only significant in this stage. Therefore, extrapolation coefficients to be applied to other life cycle stages are equal to 1.

Table 17: Calculated extrapolation coefficients for stage B6, per Functional Unit.

Product	*Coeff.*	*Product*	*Coeff.*	*Product*	*Coeff.*	*Product*	*Coeff.*
Pipien_2700K_Medium	1.32	Pipien_2700K_Flood	1.06	Pipien_2700K_Wide Flood	1.27	Pipien_2700K_Elliptical	1.23
Pipien_3000K_Medium	1.24	Pipien_3000K_Flood	1.00	Pipien_3000K_Wide Flood	1.20	Pipien_3000K_Elliptical	1.16
Pipien_3500K_Medium	1.16	Pipien_3500K_Flood	0.94	Pipien_3500K_Wide Flood	1.12	Pipien_3500K_Elliptical	1.08
Pipien_4000K_Medium	1.09	Pipien_4000K_Flood	0.88	Pipien_4000K_Wide Flood	1.05	Pipien_4000K_Elliptical	1.01

Table 18: Calculated extrapolation coefficients for stage B6, per unit of product (declared unit).

Product	*Coeff.*	*Product*	*Coeff.*	*Product*	*Coeff.*	*Product*	*Coeff.*
Pipien_2700K_Medium	1.00	Pipien_2700K_Flood	1.00	Pipien_2700K_Wide Flood	1.00	Pipien_2700K_Elliptical	1.00
Pipien_3000K_Medium	1.00	Pipien_3000K_Flood	1.00	Pipien_3000K_Wide Flood	1.00	Pipien_3000K_Elliptical	1.00
Pipien_3500K_Medium	1.00	Pipien_3500K_Flood	1.00	Pipien_3500K_Wide Flood	1.00	Pipien_3500K_Elliptical	1.00
Pipien_4000K_Medium	1.00	Pipien_4000K_Flood	1.00	Pipien_4000K_Wide Flood	1.00	Pipien_4000K_Elliptical	1.00

6. Additional Information

Stoane Lighting have carried out life cycle assessment of the reference product and produced this report such that the impacts associated with this product may be understood and information extracted from this report for other calculations by external stakeholders. Stoane lighting recognise both the power of information and the complexity, as such they would be happy to support anyone using this report with, for example: training on extracting relevant data, explanation of impact categories, use of extrapolation for homogenous family calculations, strategies for impact reduction and LCA terminology. Stoane Lighting support the use of life cycle assessment not only as a means for external third-party verified impact communication but also to measure impact and target reductions.

The study underlying this report has been carried out following rules outlined in PCR-ed4-EN-2021 09 14 and PSR-0014-ed2.0- EN-2023 07 18 by program operator PEP Ecopassport. The LCA has not been reviewed by an independent third party, therefore it does not meet the requirements of ISO 14025 for Type III environmental communications (or EPDs). Stoane Lighting would be happy to provide further information on the LCA study and the datasets used to any interested parties.