Kvisten

ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804:2012+A2:2019 for:
Fagerhults Belysning AB, Åvägen 1, 566 80 Habo, Sweden

Programme:	*The International EPD® System, www.environdec.com*
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General information

Programme information

Programme:	The International EPD® System
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CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product category rules (PCR): PCR*2019-14 Construction products v1.2.5 and UN CPC code 4653* Together with EN 15804:2012+A2:2019
PCR review was conducted by: *The Technical Committee of the International EPD® System. Chair: Massimo Marino. Contact via info@environdec.com*
LCA practitioner: Karin Lagercrantz & Daniel Böckin, Miljögiraff AB
Independent third-party verification of the declaration and data, according to ISO 14025:2006: ☐ EPD process certification ☒ EPD verification
Third-party verifier: Martyna Mikusinska, Sweco Environment AB, Martyna.Mikusinska@sweco.se Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves a third-party verifier: ☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

The LCA approach harmonizes with the Product Category Rules for building products, cradle to grave (EPD International 2022). The Life Cycle Assessment report (Lagercrantz and Böckin 2023) is available to EPD-auditor on request and includes all the detailed information required according to ISO 14044 (ISO 2006b).

The EPD is for one specific product produced at a particular site.

Company information

Owner of the EPD:
Fagerhults Belysning AB

Contact:
Niclas Thulin, Sustainability Manager
(niclas.thulin@fagerhult.se)

Description:
Fagerhult develops, produces and markets professional lighting solutions for public environments such as offices, schools, retail areas, industries and hospitals, indoor and outdoor. Our lighting knowledge, combined with a wide range of innovative, energy-efficient, less environmental impact lighting solutions, makes us a natural partner for the entire project. Fagerhult is a part of the Fagerhult Group, one of Europe's leading lighting companies with 4,200 employees in 28 countries worldwide.

Product-related or management system-related certifications:
Fagerhults Belysning AB are ISO 9001 and ISO 14001 certified.

Name and location of production site:
Fagerhults Belysning AB, Habo, Åvägen 1, 566 80 Habo.

Product information

Product family:
Kvisten

Product description:
A suspended workplace luminaire with a strong focus on sustainability. With a wooden frame, reused reflectors, and reduced plastic components, the luminaire is made of both renewable and reused material. Beyond its construction, Kvisten offers exceptional operation efficiency and optimal lit experience. The product measures 72x75x1236 mm.

Product identification:
The Kvisten family includes article number 14100, including suffixes. The following variances are able to choose between, in the product family Kvisten:

- Light distribution: direct or direct/indirect
- Controls: Dali or Organic Response
- Colour temperature: 3000 or 4000 K
- External cable: included or not included
- Luminous flux between 1820-4050lm

This EPD is created with a worst-case scenario in A1-A3 (direct/indirect, Organic Response sensor and external cable included), representing all variances The difference in environmental impact between the worst and the best case is less than 10% for all impact categories. The results for B6 (energy use in the use phase) is calculated for the average luminous flux (2985 lm). The environmental impact of energy use in the use phase for different luminous fluxes can be scaled using the scale factors described in table 3 under “Additional information”.

No substances on the Candidate List of SVHC1 are present in the product or packaging.

[1] Candidate List of substances of very high concern for Authorisation - ECHA (europa.eu)

LCA information

Declared Unit	One Kvisten. The environmental impact of energy use in the use phase (module B6) is based on 50 000 hours of office lighting, which is the function delivered during the assumed lifetime of Kvisten (2500 hours per year for 20 years). The luminous flux is 2985lm.
The function	Office lighting.
Technical lifetime	Minimum of 100 000 operation hours. This implies that no parts need to be replaced during the assumed lifetime.
Product group classification	UN CPC 4653 – Lighting equipment.
Goal	Understanding the environmental impact throughout the product life cycle. Internal benefits during product development to reduce the environmental impact. External benefits for stakeholders when they select lighting for their offices.
Audience	Purchasers of lighting, lighting installers, lighting designers, architects, property owners and constructors.
Scope	Cradle-to-gate with with modules C1-C4, module D and optional modules (A4-A5 + B).
Time	Data regarding manufacturing is based on the environmental report for 2021, and the allocation to Kvisten is based on number of produced products in 2021.
Manufacturing Site	Fagerhults Belysning AB, Habo, Sweden.
Geographical Area	Majority of raw materials and components sourced from Europe, and a smaller share is sourced globally. Use phase is represented by Swedish use. Disposal scenario is modelled for Europe.
Compliant with	ISO 14040-44, attributional LCA ISO 14025 EN 15804:2012+A2:2019 Product category rules (PCR): PCR2019-14 Construction products v1.2.5
Cut-Off Rules	**Mass relevance** - If the flow was less than 1% of the cumulative mass of all the inputs and outputs of the LCI model. **Energy relevance** - If the flow was less than 1% of the cumulative energy of all the inputs and outputs of the LCI model. **Environmental relevance** - If the flow met the above criteria for exclusion yet was thought to have a potentially significant environmental impact. The environmental relevance was evaluated with experience and relevant external research on similar products. If an excluded material significantly contributed to the overall LCIA, more information was collected and assessed in the system. The sum of the neglected material flows did not exceed 5% of mass or 1% of energy.
Background Data	Ecoinvent 3.8 - allocation, Cut off.
Foreground Data -primary	Weight of articles and composition of raw material and packaging. Suppliers' location for transport. Energy use, water use, spillage and waste in Fagerhult´s operations. Customers distance for distribution to the client. EPD data on LED driver.
Electricity data	Electricity consumption in the A3 module is GoO-certified hydropower and B6 electricity is represented by data for the national production mix in Ecoinvent 3.8 regionalized for Sweden.
LCA software and database	SimaPro 9.4 on Ember/Miljogiraff/SimaPro@192.168.15.21/ MiljogiraffUpdate930/1162

Description of the manufacturing process (A3)

The production site at Habo is a modern industrial facility including research and development, production, and assembly of the products. The production process for Kvisten at the Habo facility consist of research and development, assembly and packaging.

The environmental aspect of general manufacturing is modelled for 2021 based on data from the production monitoring. The exception is manufacturing waste, which is calculated based on data for 2019. As the production in 2019 is similar to the production of today, and as treatment of manufacturing waste has proven to be negligible in previous life cycle assessments of Fagerhult's products, this is considered acceptable.

Assumptions: Transportation, usage and end-of-life treatment (A-C)

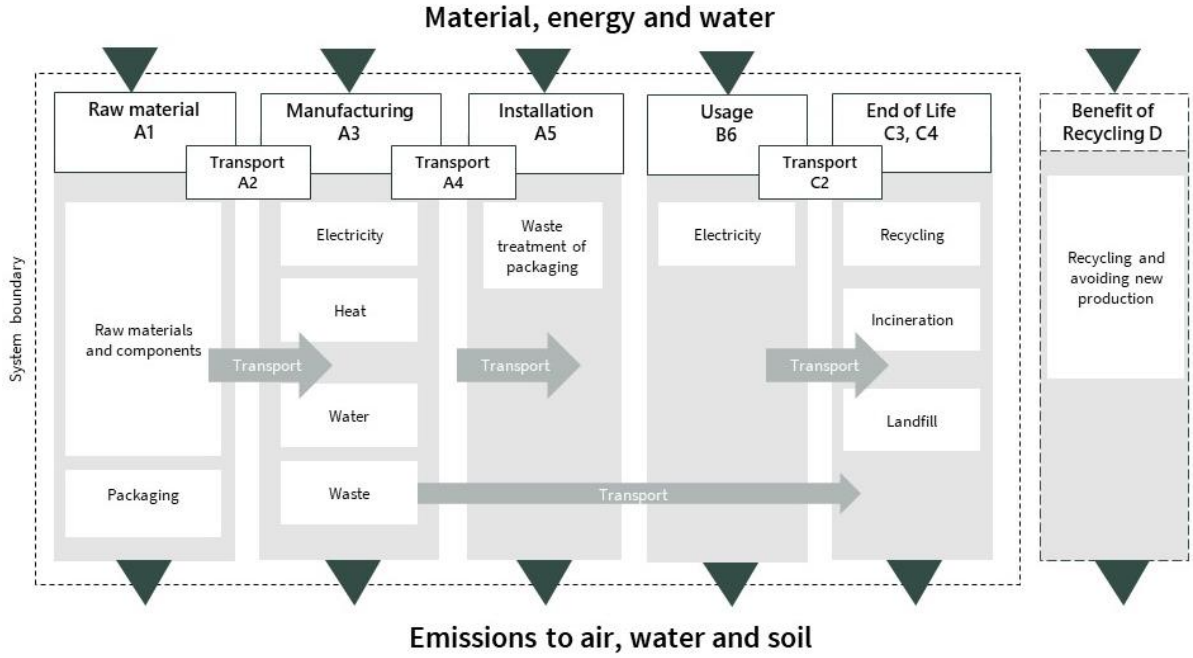
Allocation was done for impacts related to Fagerhult´s manufacturing facility, based on the number of produced products during 2021.

The distribution to clients is represented by an estimated average sized truck (32 ton payload) with average level of filling (45%), and an estimated average distance to client of 400 km.

The product is most often used in offices. The number of annual operating hours in an office environment (2500h) is chosen in line with the recommendations stated in EN 15193 (2500h) (CEN 2007). It is assumed to be used for 20 years. Electricity is represented by data for the national production mix in Sweden.

At the end-of-life, Kvisten is assumed to be transported to a waste treatment facility for electronic equipment, where the materials are separated, and the electronic components are further processed in a shredder. The distance to a waste treatment facility is assumed to be 40km. The treatment of the e-waste is modelled with a dataset for e-waste which represent generic global data. The remaining fractions are handled as average household waste in Sweden, which include average rates for sorting and recycling.

System diagram:



This study includes a cradle-to-grave perspective. That means that all processes needed for raw material extraction, manufacturing, transport, usage and end-of-life are included in the study. According to the PCR for Construction Products (EPD International 2022), environmental impacts from infrastructure, construction, production equipment, and tools that are not directly consumed in the production process can be excluded. In this study, only the construction of Fagerhult's manufacturing facility is included, the rest of the above-mentioned activities are excluded. Environmental impacts from personnel-related processes are excluded, in accordance with the PCR for Construction Products (EPD International 2022). An overview of processes that are excluded in this study is presented in Table 1.

Table 1: Excluded processes

Module	Excluded	Reason
A1	Production of supplier packaging	Negligible, (cut-off 1% rule)
A3	Infrastructure, production equipment, tools that are not directly consumed in the production process, personnel-related processes	According to PCR for Construction products (EPD International 2022)

Table 2: Modules included in the study

	Production stage			Construction stage		Use stage							End of life stage				Resource recovery stage
	Raw material	Transport	Manufacturing	Transport	Installation	Use	Maintenance	Repair	Replacement	Renovation	Energy during use	Water use	Demolition	Transport	Waste process	Final disposal	Potential benefits of recycling
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	X	X	X	X	X[2]	X[2]	X[2]	X[2]	X[2]	X[2]	X	X[2]	X[2]	X	X	X[2]	X
Geography	GLO	SE	SE	SE	SE	-	-	-	-	-	SE	-	-	EU	EU	EU	EU
Type of data	G/S	G	S	G	G	-	-	-	-	-	G	-	-	G	G	G	G
Share of impact from specific data (GWP-GHG)	50%			-	-	-	-	-	-	-	-	-	-	-	-	-	-

Modules declared: (X = included ND = not declared), geographical scope, share of specific data (in GWP-GHG indicator) and data variation: EPD modules included (G = generic data, S = Specific data).

[2] Considered to have no relevant environmental aspects.

Material content

The product weight is 2,3 kg per product, excluding packaging material.

Product components	Main material	Weight (kg)	Post-consumer (weight-%)	Biogenic material (weight-%)
Wooden components	Plywood	1,57	0%	85%
Electronics	Electronics	0,255	0%	0%
Cables	Copper, Plastic	0,225	0%	0%
PMMA components	PMMA	0,130	0%	0%
PET components	PET	0,0720	50%	0%
Polycarbonate components	Polycarbonates	0,0165	0%	0%
Steel components	Steel	0,0140	0%	0%
Wire lock	Brass	0,00600	0%	0%
Screws	Steel	0,00570	0%	0%
Total		2,29	2%	58%
Packaging				
Cardboard	Cardboard	0,292	0%	100%
Pallet	Wood	0,308	0%	100%
Total		0,600	0%	100%

Environmental Information

Results per reference service lifetime of one Kvisten (20 years, 50 000 operating hours).

Potential environmental impact – mandatory indicators according to EN 15804:2012+A2:2109

Impact category	Unit	A1-A3	A4	A5	B6	C1	C2	C3	C4	D
Climate change - Fossil	kg CO2 eq	1.72E+01	1.01E-01	5.86E-03	4.82E+01	0.00E+00	4.94E-02	4.88E-01	4.58E-01	-6.98E-01
Climate change - Biogenic	kg CO2 eq	-3.33E+00	1.02E-04	1.04E+00	8.23E-01	0.00E+00	1.93E-05	2.45E+00	3.01E-05	-1.28E-03
Climate change - Land use and LU change	kg CO2 eq	5.67E-01	3.77E-05	1.52E-06	3.40E+00	0.00E+00	4.36E-06	8.98E-06	6.07E-05	-7.69E-03
Climate change	kg CO2 eq	1.45E+01	1.01E-01	1.05E+00	5.25E+01	0.00E+00	4.95E-02	2.94E+00	4.58E-01	-7.08E-01
Ozone depletion	kg CFC11 eq	1.23E-06	2.51E-08	4.80E-10	2.34E-06	0.00E+00	1.07E-08	2.92E-09	2.06E-09	-4.16E-08
Acidification	mol H+ eq	1.64E-01	3.20E-04	6.90E-05	3.36E-01	0.00E+00	3.00E-04	3.79E-04	2.59E-04	-4.50E-03
Eutrophication, freshwater	kg P eq	1.17E-02	6.53E-06	1.74E-06	2.83E-02	0.00E+00	7.37E-07	9.14E-06	1.62E-05	-2.85E-04
Eutrophication, marine	kg N eq	2.70E-02	7.17E-05	3.63E-05	7.54E-02	0.00E+00	1.28E-04	2.05E-04	1.01E-04	-6.98E-04
Eutrophication, terrestrial	mol N eq	2.82E-01	7.83E-04	3.46E-04	7.18E-01	0.00E+00	1.41E-03	1.94E-03	8.78E-04	-6.82E-03
Photochemical ozone formation	kg NMVOC eq	8.19E-02	3.09E-04	8.58E-05	1.69E-01	0.00E+00	4.94E-04	4.79E-04	2.18E-04	-2.63E-03
Resource use, minerals and metals*	kg Sb eq	3.25E-03	2.41E-07	1.46E-08	3.32E-03	0.00E+00	4.20E-08	7.96E-08	4.01E-07	-3.37E-06
Resource use, fossils*	MJ	1.41E+02	1.64E+00	4.54E-02	6.58E+03	0.00E+00	6.52E-01	2.42E-01	4.25E-01	-8.57E+00
Water use	m3 depriv.	1.17E+01	5.63E-03	2.92E-03	8.33E+01	0.00E+00	3.36E-04	6.95E-03	1.21E-02	-1.66E-01
Particulate matter	disease inc.	1.23E-06	1.17E-08	6.64E-10	4.01E-06	0.00E+00	7.00E-09	3.31E-09	1.87E-09	-5.50E-08
Ionising radiation**	kBq U-235 eq	1.57E+00	8.28E-03	1.43E-04	4.70E+02	0.00E+00	2.95E-03	1.09E-03	3.72E-03	-6.20E-02
Ecotoxicity, freshwater*	CTUe	1.41E+03	1.28E+00	1.77E-01	3.10E+03	0.00E+00	3.55E-01	1.24E+00	2.91E+00	-1.62E+01
Human toxicity, cancer*	CTUh	4.00E-08	3.49E-11	2.47E-11	1.07E-07	0.00E+00	6.20E-12	1.44E-10	7.49E-11	-2.84E-09
Human toxicity, non-cancer*	CTUh	1.62E-06	1.34E-09	7.31E-10	2.45E-06	0.00E+00	2.52E-10	3.83E-09	1.13E-08	-2.00E-08
Land use	Pt	3.80E+02	1.87E+00	1.41E-02	1.54E+03	0.00E+00	1.17E-01	7.55E-02	1.60E-01	-1.22E+00

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

*** Disclaimer: The impact category for IR deals mainly with the eventual impact of low dose ionizing radiation on the human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and some construction materials is also not measured by this indicator.*

Raw material (A1), Transport (A2), Manufacturing (A3), Distribution (A4), Waste treatment of packaging (A5), Usage (B6), Transport (C2), Waste treatment (C3), Final disposal (C4), secondary effects of reuse and recycling (D).

Climate impact (IPCC 2021 GWP 100)

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B6	C1	C2	C3	C4	D
Climate change	kg CO2 eq	15,65	0,09	1,92	17,66	0,10	0,01	51,34	0,00	0,05	0,49	0,46	-0,685

Due to differences in the method EF and IPCC, both results may be necessary to display. The IPCC indicator includes all greenhouse gases in the GWP total but excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thus equal to the GWP indicator originally defined in EN 15804:2012+A1:2013.

Use of resources

The consumption of resources in terms of energy is measured as primary energy demand with the method CED 1.11.

Category	Unit	A1-A3	A4	A5	B6	C1	C2	C3	C4	D
PERE	MJ	148	0,0208	0,00165	2,73E+03	0,000	0,00349	0,0111	0,0418	-2,05
PERM	MJ	38,0	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
PERT	MJ	186	0,0208	0,00165	2,73E+03	0,000	0,00349	0,0111	0,0418	-2,05
PENRE	MJ	250	1,74	0,0492	6,60E+03	0,000	0,693	0,262	0,454	-9,14
PENRM	MJ	18,3	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
PENRT	MJ	269	1,74	0,0492	6,60E+03	0,000	0,693	0,262	0,454	-9,14
SM	Kg	0,0485	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
RSF	MJ	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
NRSF	MJ	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
FW	M3	0,178	0,000338	0,000199	1,73	0,000	0,0000542	0,00116	0,000446	-0,00449

PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials.
PERM	Use of renewable primary energy resources used as raw materials.
PERT	Total use of renewable primary energy resources.
PENRE	Use of non-renewable primary energy excl. non-renewable primary energy resources used as raw materials.
PENRM	Use of non-renewable primary energy resources used as raw materials.
PENRT	Total use of non-renewable primary energy resources.
SM	Use of secondary material.
RSF	Use of renewable secondary fuels.
NRSF	Use of non-renewable secondary fuels.
FW	Use of net fresh water

Information on biogenic carbon content

Share of biogenic carbon	Unit	Amount
Biogenic carbon in the product	kg C	0,666
Biogenic carbon in the packaging	kg C	0,262

Note: 1 kg biogenic carbon is equivalent to 44/12 kg CO_2.

Waste production and output flows

Waste and other output flows that are leaving the system (for which the environmental impact of further processingis not included in the results) shall be declared. As all waste flows are included in the model, no values for waste flows leaving the system are presented here.

Indicator	Unit	A1	A2	A3	A1-A3	A4	A5	B6	C1	C2	C3	C4	D
Components for reuse	kg	0	0	0	0	0	0	0	0	0	0	0	0
Material for recycling	kg	0	0	0	0	0	0,234	0	0	0	1,74	0,316	0
Materials for energy recovery*	kg	0	0	0	0	0	0,366	0	0	0	0	0	0
Exported energy, electricity	MJ	0	0	0	0	0	0	0	0	0	0	0	0
Exported energy, thermal	MJ	0	0	0	0	0	0	0	0	0	0	0	0

* The indicator “Materials for energy recovery” does not include materials for waste incineration.

Additional information

The environmental impact of Kvisten, from a lifecycle perspective, comes mainly from the electricity consumption in the use phase and the production of raw materials.

The environmental impact of the electricity is dominated by the environmental effect category "Resource use, fossils". The source is electricity from the grid in Sweden, which has a relatively low impact compared to electricity in other countries. The environmental impact of the raw materials is dominated by the environmental effect category "Resource use, minerals and metals". The model of the product system and value chain is sensitive to the energy source in electricity production. If the product is instead used with European electricity, the cradle-to-grave Climate impact (GWP) is about 80% higher.

The components that contribute the most to the environmental impact are the electronic components. Thus, any changes in these components or data should be considered in an update.

The luminous flux of the lamps in the Kvisten family ranges from 1820-4050 lm. 2985 lm has been used to calculate the impact of module B6 in this EPD. The environmental impact of B6 can be scaled for different luminous fluxes by multiplying with the scale factors in table 3. According to Fagerhult, the number of operating hours for offices can be reduced with about 35% if controls for presence and daylight are used. Thus, if buying a Kvisten with light control, the environmental impact for B6 can be multiplied by scale factor 3 in table 3.

Table 3: Scale factors for module B6.

Description of scale factor for module B6	Scale factor
1. Luminous flux: 1820	0.62
2. Luminous flux: 4050	1.52
3. Kvisten with daylight and presence control	0.65

References

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