



# ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH EN 15804+A2 & ISO 21930

Vega S  
Greenled Oy



## GENERAL INFORMATION

### MANUFACTURER

Manufacturer	Greenled Oy
Address	Oritkarintie 4
Contact details	info@greenled.fi
Website	www.greenled.fi

### EPD STANDARDS, SCOPE AND VERIFICATION

Program operator	-
Reference standard	EN 15804+A2:2019
PCR	EPD Hub Core PCR Version 1.1, 5 Dec 2023
Sector	Electrical product
Category of EPD	ISO 14021 self-declared EPD
Parent EPD number	-
Scope of the EPD	Cradle to gate with options, A4-B7, and modules C1-C4, D
EPD author	Greenled Oy
EPD verification	Independent verification of this EPD and data, according to ISO 14025: <input type="checkbox"/> Internal verification <input type="checkbox"/> External verification
EPD verifier	-

The manufacturer has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programs may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804 and if they are not compared in a building context.

### PRODUCT

Product name	Vega S
Additional labels	-
Product reference	-
Place of production	Oulu, Finland
Period for data	Calendar year 2023
Averaging in EPD	Multiple products
Variation in GWP-fossil for A1-A3	-10%

### ENVIRONMENTAL DATA SUMMARY

<b>Declared unit</b>	1 unit of luminaire
<b>Declared unit mass</b>	5.976 kg
<b>GWP-fossil, A1-A3 (kgCO<sub>2</sub>e)</b>	4,33E+01
<b>GWP-total, A1-A3 (kgCO<sub>2</sub>e)</b>	4,20E+01
<b>Secondary material, inputs (%)</b>	65.7
<b>Secondary material, outputs (%)</b>	58.1
<b>Total energy use, A1-A3 (kWh)</b>	139
<b>Net freshwater use, A1-A3 (m<sup>3</sup>)</b>	0.34

## PRODUCT AND MANUFACTURER

### ABOUT THE MANUFACTURER

Greenled is a turnkey lighting solution provider to companies and the public sector. We assist our customers in adding value to their business activities by offering lighting solutions with respect to the principles of sustainable development. Our offer covers everything from single products to management and execution of large-scale lighting projects.

### PRODUCT DESCRIPTION

Vega S is a versatile street- and area luminaire that adapts to your future Smart City needs. The design and technical features of the luminaire are perfect for Scandinavian conditions. The luminaire has a smooth body that keeps any trash from clinging to it. Vega S is designed to endure Nordic snow and slush. The luminaire is manufactured in Finland. Further information can be found at [www.greenled.fi](http://www.greenled.fi).

### PRODUCT RAW MATERIAL MAIN COMPOSITION

Raw material category	Amount, mass %	Material origin
Metals	70.78	EU,GLOBAL
Minerals	13.53	GLOBAL
Fossil materials	15.69	EU,GLOBAL
Bio-based materials	0	

### BIOGENIC CARBON CONTENT

Product's biogenic carbon content at the factory gate

Biogenic carbon content in product, kg C	0
Biogenic carbon content in packaging, kg C	0.376

### FUNCTIONAL UNIT AND SERVICE LIFE

Declared unit	1 unit of luminaire
Mass per declared unit	5.976 kg
Functional unit	-
Reference service life	100 000h

### SUBSTANCES, REACH - VERY HIGH CONCERN

The product does not contain any REACH SVHC substances in amounts greater than 0,1 % (1000 ppm).

# PRODUCT LIFE-CYCLE

## SYSTEM BOUNDARY

This EPD covers the life-cycle modules listed in the following table.

Product stage			Assembly stage		Use stage							End of life stage				Beyond the system boundaries		
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D		
X	X	X	X	X	MND	MND	MND	MND	MND	X	MND	MNR	X	X	X	X		
Raw materials	Transport	Manufacturing	Transport	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction/ demolition	Transport	Waste processing	Disposal	Reuse	Recovery	Recycling

Modules not declared = MND. Modules not relevant = MNR

## MANUFACTURING AND PACKAGING (A1-A3)

The environmental impacts considered for the product stage cover the manufacturing of raw materials used in the production as well as packaging materials and other ancillary materials. Also, fuels used by machines, and handling of waste formed in the production processes at the manufacturing facilities are included in this stage. The study also considers the material losses occurring during the manufacturing processes as well as losses during electricity transmission.

The product is made of metals, plastics and electronic components. The components are transported to Greenled production facility, where the main manufacturing being assembled together. The finished product is packaged in polyethylene and cardboard before being sent to the installation site on a wooden pallet.

## TRANSPORT AND INSTALLATION (A4-A5)

Transportation impacts occurred from final products delivery to construction site (A4) cover fuel direct exhaust emissions, environmental impacts of fuel production, as well as related infrastructure emissions.

Average distance of transportation from production plant to building site is assumed as 500 km and the transportation method is assumed to be lorry. Transportation does not cause losses as products are packaged properly. Transportation impacts that occur from delivery of the product cover direct exhaust emissions of fuel, environmental impacts of fuel production, as well as related infrastructure emissions. Environmental impacts from installation into the building include waste packaging materials (A5). The impacts of energy consumption and the used ancillary materials during installation are considered negligible.

## PRODUCT USE AND MAINTENANCE (B1-B7)

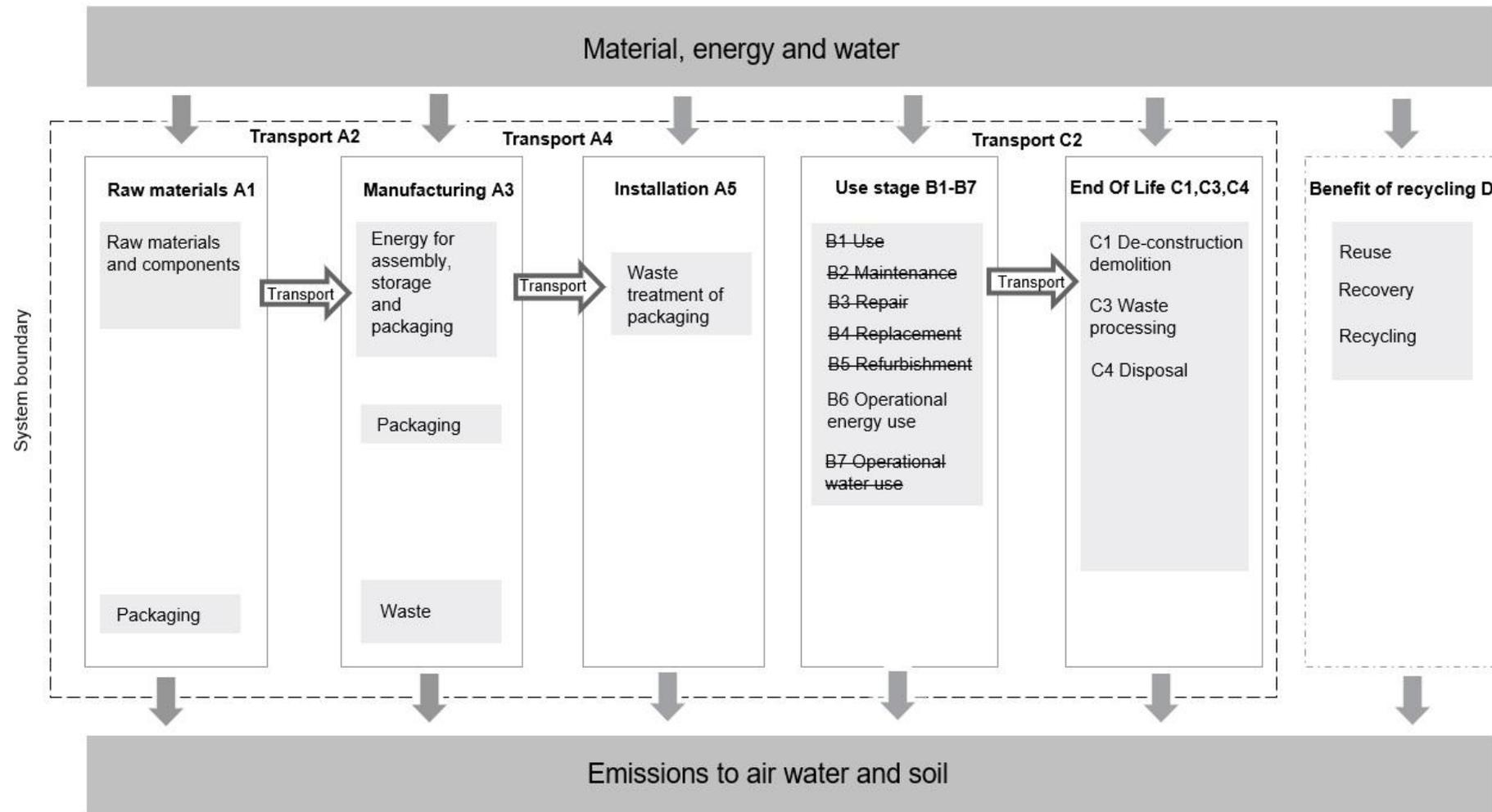
During the use phase, the product consumes electricity from Finland electricity grid mix (B6). Impacts due to electricity production include direct emissions to air, transformation and transmission losses.

## PRODUCT END OF LIFE (C1-C4, D)

Consumption of energy and natural resources in demolition process is assumed to be negligible. It is assumed that the waste is collected separately and transported to the waste treatment center. According to EN 50693:2019, the sequence of treatment operations occurring to the product shall include de-pollution, fractions separation and preparation (dismantling, crushing, shredding, sorting), recycling, other material recovery, energy recovery and disposal. In this study, the default values from table G.4 of EN 50693 is used for treating materials in different waste treatment methods. Due to the material and energy recovery potential of parts in the lighting system, the

end-of-life product is converted into recycled raw materials, while the energy recovered from incineration displaces electricity and heat production (D). The wooden pallet and other plastic packaging used during transportation is also incinerated for energy recovery and/or recycled. The benefits and loads of incineration and recycling are included in Module D.

# MANUFACTURING PROCESS



## LIFE-CYCLE ASSESSMENT

### CUT-OFF CRITERIA

The study does not exclude any modules or processes which are stated mandatory in the reference standard and the applied PCR. The study does not exclude any hazardous materials or substances. The study includes all major raw material and energy consumption. All inputs and outputs of the unit processes, for which data is available for, are included in the calculation. There is no neglected unit process more than 1% of total mass or energy flows. The module specific total neglected input and output flows also do not exceed 5% of energy usage or mass.

### ALLOCATION, ESTIMATES AND ASSUMPTIONS

Allocation is required if some material, energy, and waste data cannot be measured separately for the product under investigation. All allocations are done as per the reference standards and the applied PCR. In this study, allocation has been done in the following ways:

Data type	Allocation
Raw materials	No allocation
Packaging material	Allocated by mass or volume
Ancillary materials	Allocated by mass or volume
Manufacturing energy and waste	Allocated by mass or volume

### AVERAGES AND VARIABILITY

Type of average	Multiple product
Averaging method	Representative product
Variation in GWP-fossil for A1-A3	-10% %

This is an average EPD of multiple products from the manufacturer Greenled Oy. This EPD is created with a most conservative scenario in A1-A3 in terms of material composition (Vega S 127W with two zhaga connectors). The versions differ mainly in the electronic components. The difference between representative case and best case (Vega S 10W without zhaga connectors) is -10% in GWP-fossil A1-A3.

### LCA SOFTWARE AND BIBLIOGRAPHY

This EPD has been created using One Click LCA EPD Generator. The LCA and EPD have been prepared according to the reference standards and ISO 14040/14044. The EPD Generator uses Ecoinvent v3.8, Plastics Europe, Federal LCA Commons and One Click LCA databases as sources of environmental data.

# ENVIRONMENTAL IMPACT DATA

## CORE ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
GWP – total <sup>1)</sup>	kg CO <sub>2</sub> e	4,10E+01	7,58E-01	2,48E-01	4,20E+01	2,92E-01	1,43E+00	MND	MND	MND	MND	MND	3,48E+03	MND	MNR	8,42E-02	1,14E+00	7,78E-01	-4,06E+00
GWP – fossil	kg CO <sub>2</sub> e	4,09E+01	7,57E-01	1,62E+00	4,33E+01	2,92E-01	4,28E-02	MND	MND	MND	MND	MND	3,45E+03	MND	MNR	8,41E-02	1,14E+00	7,78E-01	-3,16E+00
GWP – biogenic	kg CO <sub>2</sub> e	0,00E+00	0,00E+00	-1,38E+00	-1,38E+00	0,00E+00	1,38E+00	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	-8,46E-01
GWP – LULUC	kg CO <sub>2</sub> e	1,11E-01	2,80E-04	9,88E-03	1,21E-01	1,05E-04	2,09E-05	MND	MND	MND	MND	MND	3,09E+01	MND	MNR	3,10E-05	1,95E-04	5,22E-05	-5,78E-02
Ozone depletion pot.	kg CFC-11e	4,17E-06	1,74E-07	1,79E-07	4,53E-06	6,97E-08	1,73E-09	MND	MND	MND	MND	MND	1,95E-04	MND	MNR	1,94E-08	1,25E-08	7,80E-09	-2,90E-07
Acidification potential	mol H <sup>+</sup> e	2,96E-01	3,27E-03	9,67E-03	3,09E-01	1,22E-03	9,44E-05	MND	MND	MND	MND	MND	1,51E+01	MND	MNR	3,56E-04	1,37E-03	3,96E-04	-1,72E-01
EP-freshwater <sup>2)</sup>	kg Pe	2,89E-02	6,19E-06	1,39E-04	2,90E-02	2,00E-06	1,75E-06	MND	MND	MND	MND	MND	1,35E-01	MND	MNR	6,89E-07	6,51E-06	1,15E-06	-2,90E-04
EP-marine	kg Ne	4,54E-02	9,68E-04	2,39E-03	4,88E-02	3,69E-04	2,30E-05	MND	MND	MND	MND	MND	2,40E+00	MND	MNR	1,06E-04	3,36E-04	1,40E-04	-3,80E-03
EP-terrestrial	mol Ne	4,80E-01	1,07E-02	2,55E-02	5,16E-01	4,07E-03	2,37E-04	MND	MND	MND	MND	MND	2,89E+01	MND	MNR	1,17E-03	3,76E-03	1,45E-03	-5,60E-02
POCP (“smog”) <sup>3)</sup>	kg NMVOCe	1,55E-01	3,40E-03	5,18E-03	1,64E-01	1,31E-03	7,33E-05	MND	MND	MND	MND	MND	7,71E+00	MND	MNR	3,74E-04	9,87E-04	4,06E-04	-2,28E-02
ADP-minerals & metals <sup>4)</sup>	kg Sbe	1,17E-03	1,77E-06	5,98E-06	1,18E-03	6,86E-07	1,86E-07	MND	MND	MND	MND	MND	4,32E-02	MND	MNR	1,97E-07	9,67E-06	1,63E-07	-1,72E-03
ADP-fossil resources	MJ	3,85E+02	1,14E+01	3,26E+01	4,29E+02	4,47E+00	2,35E-01	MND	MND	MND	MND	MND	1,04E+05	MND	MNR	1,26E+00	1,76E+00	7,46E-01	-4,61E+01
Water use <sup>5)</sup>	m <sup>3</sup> e depr.	1,41E+01	5,08E-02	1,13E+00	1,53E+01	2,06E-02	3,97E-03	MND	MND	MND	MND	MND	2,23E+03	MND	MNR	5,65E-03	7,12E-02	5,91E-02	-4,88E+00

1) GWP = Global Warming Potential; 2) EP = Eutrophication potential. Required characterisation method and data are in kg P-eq. Multiply by 3,07 to get PO4e; 3) POCP = Photochemical ozone formation; 4) ADP = Abiotic depletion potential; 5) EN 15804+A2 disclaimer for Abiotic depletion and Water use and optional indicators except Particulate matter and Ionizing radiation, human health. The results of these environmental impact indicators shall be used with care as the uncertainties on these results are high or as there is limited experience with the indicator.

**ADDITIONAL (OPTIONAL) ENVIRONMENTAL IMPACT INDICATORS – EN 15804+A2, PEF**

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Particulate matter	Incidence	2,61E-06	8,71E-08	9,74E-08	2,79E-06	3,43E-08	4,56E-09	MND	MND	MND	MND	MND	8,62E-05	MND	MNR	9,70E-09	1,46E-08	6,30E-09	-3,76E-07
Ionizing radiation <sup>6)</sup>	kBq 11235e	4,28E+00	5,41E-02	1,03E+00	5,36E+00	2,30E-02	1,58E-03	MND	MND	MND	MND	MND	4,97E+03	MND	MNR	6,02E-03	1,75E-02	3,65E-03	-8,20E-01
Ecotoxicity (freshwater)	CTUe	1,32E+03	1,02E+01	3,13E+01	1,36E+03	3,72E+00	2,22E+00	MND	MND	MND	MND	MND	6,80E+04	MND	MNR	1,14E+00	7,69E+00	3,70E+02	-4,50E+02
Human toxicity, cancer	CTUh	1,63E-07	2,52E-10	1,64E-09	1,65E-07	9,80E-11	4,64E-11	MND	MND	MND	MND	MND	2,06E-06	MND	MNR	2,79E-11	2,50E-10	8,22E-10	-8,77E-09
Human tox. non-cancer	CTUh	1,56E-06	1,01E-08	1,90E-08	1,59E-06	3,93E-09	4,79E-10	MND	MND	MND	MND	MND	5,02E-05	MND	MNR	1,13E-09	1,09E-08	3,53E-08	-9,89E-07
SQP <sup>7)</sup>	-	1,76E+02	1,31E+01	9,53E+01	2,85E+02	5,21E+00	1,37E-01	MND	MND	MND	MND	MND	3,32E+04	MND	MNR	1,46E+00	2,10E+00	1,02E+00	-2,77E+01

6) EN 15804+A2 disclaimer for Ionizing radiation, human health. 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; 7) SQP = Land use related impacts/soil quality.

**USE OF NATURAL RESOURCES**

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Renew. PER as energy <sup>8)</sup>	MJ	5,42E+01	1,28E-01	2,39E+01	7,83E+01	5,79E-02	2,36E-02	MND	MND	MND	MND	MND	2,54E+04	MND	MNR	1,42E-02	2,48E-01	3,08E-02	-1,75E+01
Renew. PER as material	MJ	0,00E+00	0,00E+00	1,20E+01	1,20E+01	0,00E+00	-1,20E+01	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	8,15E+00
Total use of renew. PER	MJ	5,42E+01	1,28E-01	3,60E+01	9,03E+01	5,79E-02	-1,20E+01	MND	MND	MND	MND	MND	2,54E+04	MND	MNR	1,42E-02	2,48E-01	3,08E-02	-9,33E+00
Non-re. PER as energy	MJ	3,80E+02	1,14E+01	3,18E+01	4,23E+02	4,47E+00	2,35E-01	MND	MND	MND	MND	MND	1,04E+05	MND	MNR	1,26E+00	1,76E+00	7,46E-01	-4,61E+01
Non-re. PER as material	MJ	5,59E+00	0,00E+00	7,43E-01	6,34E+00	0,00E+00	-1,11E+00	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	-2,80E+00	-2,80E+00	-9,32E-04
Total use of non-re. PER	MJ	3,85E+02	1,14E+01	3,25E+01	4,29E+02	4,47E+00	-8,78E-01	MND	MND	MND	MND	MND	1,04E+05	MND	MNR	1,26E+00	-1,03E+00	-2,05E+00	-4,61E+01
Secondary materials	kg	3,93E+00	3,16E-03	5,52E-01	4,48E+00	1,26E-03	2,55E-04	MND	MND	MND	MND	MND	8,67E+00	MND	MNR	3,51E-04	1,32E-03	7,25E-04	3,95E-01
Renew. secondary fuels	MJ	7,91E-03	3,18E-05	2,84E-01	2,92E-01	1,11E-05	1,16E-06	MND	MND	MND	MND	MND	3,94E-02	MND	MNR	3,54E-06	8,61E-05	1,57E-05	-1,30E-04
Non-ren. secondary fuels	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Use of net fresh water	m <sup>3</sup>	3,06E-01	1,47E-03	2,80E-02	3,35E-01	5,93E-04	8,55E-05	MND	MND	MND	MND	MND	9,19E+01	MND	MNR	1,64E-04	2,42E-03	9,60E-04	-1,32E-01

8) PER = Primary energy resources.

**END OF LIFE – WASTE**

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Hazardous waste	kg	6,45E+00	1,51E-02	9,59E-02	6,56E+00	4,79E-03	1,51E-03	MND	MND	MND	MND	MND	2,28E+02	MND	MNR	1,68E-03	1,07E-02	2,00E-02	-7,30E-01
Non-hazardous waste	kg	6,19E+01	2,47E-01	2,39E+00	6,46E+01	8,34E-02	4,44E-02	MND	MND	MND	MND	MND	5,83E+03	MND	MNR	2,75E-02	8,02E-01	2,07E+00	-2,72E+01
Radioactive waste	kg	1,25E-03	7,61E-05	2,46E-04	1,57E-03	3,08E-05	1,21E-06	MND	MND	MND	MND	MND	1,09E+00	MND	MNR	8,45E-06	7,31E-06	0,00E+00	-2,75E-04

**END OF LIFE – OUTPUT FLOWS**

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Components for re-use	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Materials for recycling	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,50E-01	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	3,47E+00	0,00E+00	0,00E+00
Materials for energy rec	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,00E-01	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,71E-01	MND	MND	MND	MND	MND	0,00E+00	MND	MNR	0,00E+00	9,20E+00	0,00E+00	0,00E+00

**ENVIRONMENTAL IMPACTS – EN 15804+A1, CML / ISO 21930**

Impact category	Unit	A1	A2	A3	A1-A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Global Warming Pot.	kg CO <sub>2</sub> e	3,15E+01	7,50E-01	1,65E+00	3,39E+01	2,89E-01	5,25E-02	MND	MND	MND	MND	MND	3,41E+03	MND	MNR	8,33E-02	1,14E+00	7,70E-01	-3,12E+00
Ozone depletion Pot.	kg CFC <sub>11</sub> e	1,80E-06	1,38E-07	1,43E-07	2,08E-06	5,52E-08	1,54E-09	MND	MND	MND	MND	MND	1,70E-04	MND	MNR	1,53E-08	1,04E-08	6,35E-09	-2,47E-07
Acidification	kg SO <sub>2</sub> e	1,89E-01	2,54E-03	7,26E-03	1,99E-01	9,44E-04	7,58E-05	MND	MND	MND	MND	MND	1,25E+01	MND	MNR	2,77E-04	1,09E-03	3,01E-04	-1,54E-01
Eutrophication	kg PO <sub>4</sub> <sup>3</sup> e	6,56E-02	5,72E-04	3,46E-03	6,96E-02	2,11E-04	1,32E-04	MND	MND	MND	MND	MND	5,31E+00	MND	MNR	6,30E-05	4,47E-04	1,30E-03	-1,55E-02
POCP (“smog”)	kg C <sub>2</sub> H <sub>4</sub> e	1,09E-02	9,84E-05	4,13E-04	1,14E-02	3,72E-05	9,40E-06	MND	MND	MND	MND	MND	5,62E-01	MND	MNR	1,08E-05	3,92E-05	2,04E-05	-6,91E-03
ADP-elements	kg Sbe	1,16E-03	1,72E-06	5,45E-06	1,17E-03	6,67E-07	1,85E-07	MND	MND	MND	MND	MND	4,33E-02	MND	MNR	1,91E-07	9,64E-06	1,46E-07	-1,72E-03
ADP-fossil	MJ	3,85E+02	1,14E+01	3,15E+01	4,28E+02	4,47E+00	2,35E-01	MND	MND	MND	MND	MND	9,81E+04	MND	MNR	1,26E+00	1,76E+00	7,46E-01	-4,59E+01