

# Environmental Product Declaration



In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

## Painted Structural Steel

from

## Grædstrup Stål A/S



Programme:	The International EPD® System, <a href="http://www.environdec.com">www.environdec.com</a>
Programme operator:	EPD International AB
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Type of EPD	<i>EPD of multiple products, based on the average results of the product group An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at <a href="http://www.environdec.com">www.environdec.com</a></i>



## General information

### Programme information

<b>Programme:</b>	The International EPD <sup>®</sup> System
<b>Address:</b>	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
<b>Website:</b>	<a href="http://www.environdec.com">www.environdec.com</a>
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<b>Accountabilities for PCR, LCA and independent, third-party verification</b>
<b>Product Category Rules (PCR)</b>
CEN standard EN 15804+A2 serves as the Core Product Category Rules (PCR) reference packaging based on EF 3.1
Product Category Rules (PCR): <i>Construction products 2019:14 Version 1.3.4, 2024-04-30;</i>
PCR review was conducted by: <i>Martin Erlandsson, IVL Swedish Environmental Research Institute, martin.erlandsson@ivl.se</i>
<b>Life Cycle Assessment (LCA)</b>
LCA accountability: <i>Augustas Sudaras, Green Survey ApS</i> <a href="http://www.greensurvey.dk">www.greensurvey.dk</a>
<b>Third-party verification</b>
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:  <input checked="" type="checkbox"/> EPD verification by individual verifier  Third-party verifier: <i>Sigita Židonienė, PhD., Vesta Consulting, Sigita@vestaconsulting.lt</i>  Approved by: The International EPD <sup>®</sup> System
<b>OR</b>
Procedure for follow-up of data during EPD validity involves third party verifier:  <input type="checkbox"/> Yes <input checked="" type="checkbox"/> 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+A2, 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+A2 and ISO 14025.

## Company information

Owner of the EPD: Grædstrup Stål A/S

Email: info@gsas.dk

Phone: +45 75 76 01 00

Description of the organisation:

Grædstrup Stål has existed since the mid-70s, when it was just a small local company.

From 1985, when new owners (Anna and Kjeld Knudsen) arrived, the business took off, and large steel structures became the primary business area for Grædstrup Stål. Today, both lattice rafters, welded rafters and rafters with wedges are produced.

Grædstrup Stål has approx. 16,000 m<sup>2</sup> of production halls available. And production is carried out with fully automatic systems as well as with manual welding lines.

Grædstrup Stål powder coats their products, which the competitors do not. The powder coating gives a harder surface, and the gloss is more glossy compared to traditional surface treatment. In addition, there are no binders and other harmful substances in the powder that is used.

Most projects are installed by Grædstrup Stål. We have 3 trucks with cranes for this purpose. In some cases, foreign assembly may be hired.

We take great pride in keeping our agreements to our customers. An agreement is an agreement. Many of our customers are hall builders, contractors and timber merchants. And many have been customers of the house for a long time.

Name and location of production site(s): GRÆDSTRUP STÅL A/S Hamborgvej 6 DK-8740 Brædstrup

## Product information

Product name: PaintedStructural Steel

Product description: The product can function either as individual components or as a standalone structural system, with each part made entirely from steel.

UN CPC code: 421 – Structural metal products and parts thereof

Geographical scope: A1-A3 - Denmark, EU, China, A4-A5 – Global, Denmark, C1-C4 – Global Denmark D- Denmark

**Table 1 Technical specifications Beams**

Characteristic Beams	Value, units	
Size	Thickness options	80-1000 mm
	Length options	12 – 18 m. Special lengths to 22m are also available by prior order
Length tolerance	0/+100mm	
Yield strength min	355 MPa	
Tensile strength min	355 MPa	
Elongation	17%	
Impact Test	≥27J	
Welding requirements	Ceq ≤ 0,45%	

**Table 2 Technical specifications Merchants**

Characteristic Merchants	Value, units	
Size	Thickness options	3-30 mm
	Length options	6-12 m. Special lengths to 16m are also available by prior order
Length tolerance	0/+100mm	
Yield strength min	355 MPa	
Tensile strength min	355 MPa	
Elongation	17%	
Impact Test	≥27J	
Welding requirements	Ceq ≤ 0,45%	

## LCA information

Declared unit: 1000 kg painted structural steel

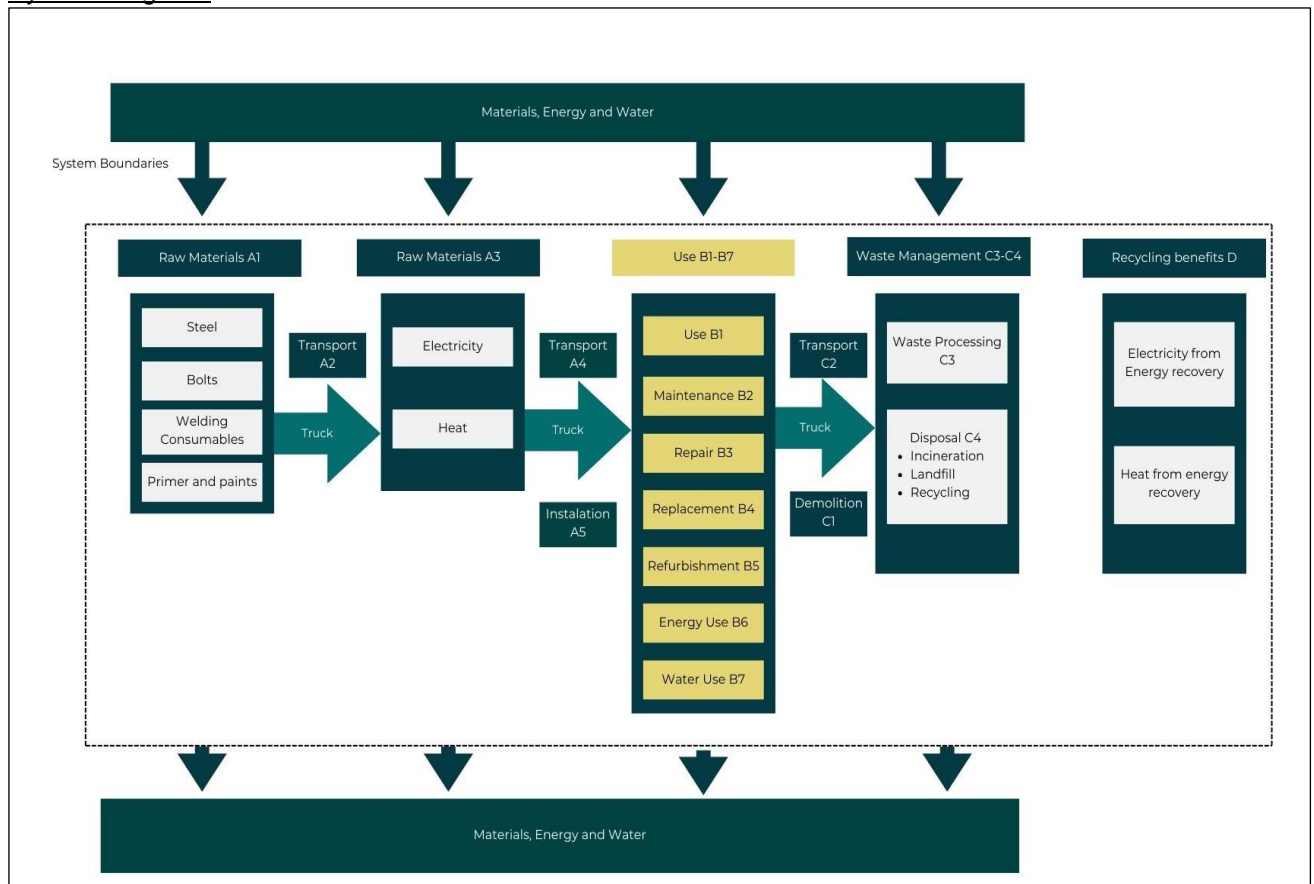
Time representativeness: Product specific data are based on average production collected in the period 2023

Database(s) and LCA software used: SimaPro 9.6.0.1 and Ecoinvent 3.10, ÖKOBAUDAT

Description of system boundaries:

Cradle to gate with options (A1–A3 and A4 and A5). A1 (Raw material supply), A2 (Transport) and A3 (Manufacturing) A4 (Transportation), A5 (Construction Installation) as well as C1 (Deconstruction), C2 (transport at end-of-life), C3 (Waste processing) and C4 (Disposal) in addition, module D – benefits and loads beyond the system boundary is included.

System diagram:



Data quality: The foreground data collected internally is based on yearly production amounts and extrapolations of measurements on specific machines and plants. Overall, the data quality can be described as good. The primary data collection has been done thoroughly.

Cut-off criteria: Life cycle inventory data for a minimum of 99% of total material and energy inputs flows have been included in the life cycle analysis.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules declared	X	X	X	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	X
Geography	EU, CN	EU	DK	EU	DK	-	-	-	-	-	-	-	DK	GLO	DK	DK	DK
Specific data used	37,30%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – products	<10%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0			-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>System boundary (X = included in LCA; MND = module not declared)</b>																	

**Note: The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that do not capture all relevant aspects of data quality. The indicator is not comparable across product categories.**

### Product stage:

**A1:** This module considers the extraction and processing of raw materials and energy consumption.

**A2:** The raw materials are transported to the manufacturing plant. In this case the model includes road and sea transportation for the raw materials.

**A3:** This module encompasses the manufacturing process of Grødstrup Stål A/S, including product fabrication. It accounts for energy use and waste generation at the production facility. Key steps include:

#### 1. Material Preparation:

- The required steel profiles are retrieved and prepared for the subsequent production steps. This ensures the necessary raw materials are ready for processing.

#### 2. Cutting:

- The steel profiles are cut to the specified lengths and dimensions using specialized cutting tools or machinery. This step ensures that the raw materials are prepared according to the product design requirements.

#### 3. Welding:

- After cutting, the steel profiles are welded together to form the primary structure. This welding process is essential for joining the different parts of the steel structure.

#### **4. Welding Accessories:**

- Any additional components or accessories, such as brackets or reinforcement elements, are welded onto the main structure. These accessories are necessary to complete the product according to its design and function.

#### **5. Hanging for Surface Treatment (Ophæng):**

- After the welding processes, the steel components are hung or prepared for surface treatment.

#### **6. Painting and Drying:**

- Action: Instead of galvanization, the items are painted. This may involve applying protective coatings such as primer and topcoat to provide corrosion resistance and the desired aesthetic finish.
- Quality Control: The order status is updated, and KS documentation is prepared and stored as per the quality control requirements.

#### **7. Final Assembly (Løsning):**

- Action: The painted components are assembled for final delivery.

**A4:** Transportation to the construction site was estimate that on average is 150km.

**A5:** Installation using the machinery

#### **End of Life stage:**

**C1:** Demolition - takes into account the deconstruction and demolition of the structural steel. Based on the (Ö. Bozdağ, 2007) and (Broniewicz & Dec, 2022), the energy per ton of steel required to demolish is 10kWh/ton.

**C2:** Transport of the discarded product to the processing site. It is estimated that there is no mass loss during the use of the product, therefore, the end-of-life product is assumed that it has the same weight as the declared product. All the end-of-life products are being sent for recycling and final disposal according to the Danish waste management infrastructure on average is assumed to be 20 km distance and the transportation method is lorry which is the most common.

**C3:** Recycling of the steel **Recyclability:** The product and its components are highly recyclable, ensuring that the materials can be effectively reclaimed and reused. Due to there might be an uncertainty or damaged product after the deconstruction it was taken a conservative approach that 90% is being recycled.

**C4:** Landfilling of the remaining waste

**D: Reuse, recovery and/or recycling potential.** Module D captures the environmental impacts and benefits associated with the recycling of the Græstrup Stål A/S structural steel. This module reflects the emissions from the recycling process and the benefits gained from substituting the need for manufacturing steel components with recycled materials.

## Content information

Product components	Weight, kg	Percentage of the product composition - %	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Steel:	950,25	95.02%	73.14%*	0
Bolts	34.45	3.45%	0	0
Welding Consumables	8.28	0.83%	0	0
Primers and paints	7.02	0.7%	0	0
<b>TOTAL</b>	<b>1000</b>	<b>100%</b>	<b>65.9%*</b>	<b>0</b>

No dangerous substances from the candidate list of SVHC for Authorisation are present in concentrations greater than 0.1% by weight in the product

*\*The weight of post-consumer material has been estimated using a conservative approach, as some suppliers are unable to provide precise data on the proportions of post-consumer and pre-consumer materials in the product.*

# Results of the environmental performance indicators

## Mandatory impact category indicators according to EN 15804+A2

Results per Declared Unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO <sub>2</sub> eq.	1,04E+03	1,55E+01	3,61E+00	3,61E+00	3,91E+00	2,04E+01	6,25E-01	-2,63E+02
GWP-biogenic	kg CO <sub>2</sub> eq.	4,53E-01	8,06E-03	3,90E-04	3,90E-04	4,90E-05	-3,10E-01	8,05E-05	5,38E-01
GWP-luluc	kg CO <sub>2</sub> eq.	3,60E-01	5,52E-03	3,13E-04	3,13E-04	1,55E-03	2,41E-02	3,25E-04	-7,28E-02
GWP-total	kg CO <sub>2</sub> eq.	1,04E+03	1,55E+01	3,61E+00	3,61E+00	3,91E+00	2,01E+01	6,26E-01	-2,62E+02
ODP	kg CFC <sub>11</sub> eq.	2,34E-05	3,24E-07	5,52E-08	5,52E-08	5,46E-08	2,74E-07	1,81E-08	-1,23E-06
AP	mol H <sup>+</sup> eq.	3,18E+00	3,67E-02	3,25E-02	3,25E-02	1,30E-02	2,42E-01	4,43E-03	-8,86E-01
EP-freshwater	kg P eq.	4,76E-02	1,09E-03	1,05E-04	1,05E-04	3,07E-04	1,31E-02	5,19E-05	-1,21E-01
EP-marine	kg N eq.	7,31E-01	9,62E-03	1,51E-02	1,51E-02	4,23E-03	5,36E-02	1,69E-03	-2,14E-01
EP-terrestrial	mol N eq.	7,89E+00	1,04E-01	1,65E-01	1,65E-01	4,60E-02	6,06E-01	1,84E-02	-2,30E+00
POCP	kg NMVOC eq.	2,54E+00	6,37E-02	4,93E-02	4,93E-02	1,81E-02	1,80E-01	6,60E-03	-8,01E-01
ADP-minerals&metals*	kg Sb eq.	8,46E-02	4,33E-05	1,26E-06	1,26E-06	1,25E-05	1,44E-03	9,72E-07	-1,75E-04
ADP-fossil*	MJ	1,61E+04	2,33E+02	4,72E+01	4,72E+01	5,49E+01	2,73E+02	1,53E+01	-2,66E+03
WDP*	m <sup>3</sup>	8,33E+02	1,43E+00	1,38E-01	1,38E-01	3,00E-01	5,90E+00	6,83E-01	-6,32E+01
Acronyms	GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption								

\* 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.

Note: it is discouraged to use the results of modules A1-A3 without considering the results of module C when module C is declared.

Disclaimer: The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

## Additional mandatory and voluntary impact category indicators

Results per Declared Unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG <sup>1</sup>	kg CO <sub>2</sub> eq.	1,04E+03	1,55E+01	3,61E+00	3,61E+00	3,91E+00	2,04E+01	6,26E-01	-2,62E+02

\*This method is based on the final government distribution version of the IPCC report 'AR6 Climate Change 2021. This version of the method excludes CO<sub>2</sub> uptake and biogenic CO<sub>2</sub> emissions.

## Resource use indicators

Results per Declared Unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	7,66E+02	3,70E+00	2,89E-01	2,89E-01	7,20E-01	4,52E+01	1,42E-01	-9,85E+01
PERM	MJ	6,17E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	5,55E+00	0,00E+00	0,00E+00
PERT	MJ	7,72E+02	3,70E+00	2,89E-01	2,89E-01	7,20E-01	5,07E+01	1,42E-01	-9,85E+01
PENRE	MJ	1,61E+04	2,33E+02	4,72E+01	4,72E+01	5,49E+01	2,73E+02	1,53E+01	-2,66E+03
PENRM	MJ	2,98E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-2,68E+00	-2,98E-01	0,00E+00
PENRT	MJ	1,61E+04	2,33E+02	4,72E+01	4,72E+01	5,49E+01	2,71E+02	1,50E+01	-2,66E+03
SM	kg	4,07E+00	1,01E-01	0,00E+00	0,00E+00	0,00E+00	3,33E-01	0,00E+00	1,38E+02
RSF	MJ	2,43E-02	1,27E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	-8,86E-03
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
FW	m <sup>3</sup>	7,48E+02	3,50E-02	3,38E-03	3,38E-03	7,34E-03	1,48E-01	1,60E-02	-1,51E+00
Acronyms	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 excluding 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 re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water								

<sup>1</sup> This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO<sub>2</sub> is set to zero.

## Waste indicators

Results per Declared Unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	1,02E+01	3,39E-01	5,27E-02	5,27E-02	9,62E-02	1,79E+00	1,70E-02	-5,02E+01
Non-hazardous waste disposed	kg	2,14E+02	6,79E+00	7,20E-01	7,20E-01	1,81E+00	6,45E+01	3,90E-01	-6,71E+02
Radioactive waste disposed	kg	2,55E-03	7,01E-05	5,18E-06	5,18E-06	1,10E-05	5,94E-04	2,38E-06	-1,87E-03

## Output flow indicators

Results per Declared Unit									
Indicator	Unit	A1-A3	A4	A5	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	0,00E+00	0,00E+00
Material for recycling	kg	4,82E-01	1,77E-03	0,00E+00	0,00E+00	0,00E+00	9,00E+02	0,00E+00	0,00E+00
Materials for energy recovery	kg	1,48E-04	1,02E-05	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, electricity	MJ	1,90E+00	3,50E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	7,70E-01	4,29E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

## Information on biogenic carbon content

BIOGENIC CARBON CONTENT PER DECLARED UNIT		
Parameter	Unit	At the factory gate
Biogenic carbon content in product	[kg C]	0
Biogenic carbon content in accompanying packaging	[kg C]	0
Note	1 kg biogenic carbon is equivalent to 44/12 kg of CO <sub>2</sub>	

## Additional environmental information

### Manufacturing energy scenario documentation

Energy Source	Method	Kg CO2eq/kWh
Solar Power	IPCC 2021	0.081
Danish Energy Mix	IPCC2021	0.165

## Additional environmental impact indicators

Results per Declared Unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PM	[Disease incidence]	3,56E-05	1,51E-06	9,25E-07	9,25E-07	3,10E-07	3,29E-06	1,01E-07	-1,80E-05
IRP2	[kBq U235 eq.]	1,01E+01	2,83E-01	2,11E-02	2,11E-02	4,51E-02	2,32E+00	9,77E-03	-7,40E+00
ETP-fw1	[CTUe]	1,32E+03	3,04E+01	3,26E+00	3,26E+00	9,60E+00	1,65E+02	1,22E+00	-2,76E+03
HTP-c1	[CTUh]	7,84E-06	9,94E-08	1,41E-08	1,41E-08	2,03E-08	1,84E-07	2,83E-09	-7,34E-05
HTP-nc1	[CTUh]	2,67E-06	1,54E-07	6,40E-09	6,40E-09	3,51E-08	1,24E-06	2,75E-09	-2,40E-06
SQP1	-	2,49E+03	2,35E+02	3,30E+00	3,30E+00	3,27E+01	5,31E+02	3,02E+01	-5,70E+02
Caption	PM = Particulate Matter emissions; IRP = Ionizing radiation – human health; ETP-fw = Eco toxicity – freshwater; HTP-c = Human toxicity – cancer effects; HTP-nc = Human toxicity – non cancer effects; SQP = Soil Quality								
Disclaimers	<p>1 The results of this environmental indicator shall be used with care as the uncertainties on these results are high or as there is limited experienced with the indicator.</p> <p>2 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.</p>								

## End-of-life scenario

Scenario information	Value	Unit
Collected separately	900	kg
Collected with mixed waste:	100	kg
For reuse	-	kg
For recycling	900	kg
For energy recovery	-	kg
For final disposal:	100	kg
Assumptions for scenario development	-	As appropriate

## References

- General Programme Instructions of the International EPD® System. Version 4.0.
- ISO 14025:2010 Environmental labels and declarations – Type III environmental declarations Principles and procedures.
- ISO 14040:2006 Environmental management. Life cycle assessment. Principles and frameworks.
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