

Environmental Product Declaration



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

FLAT SHEET MADE OF FIBER CEMENT

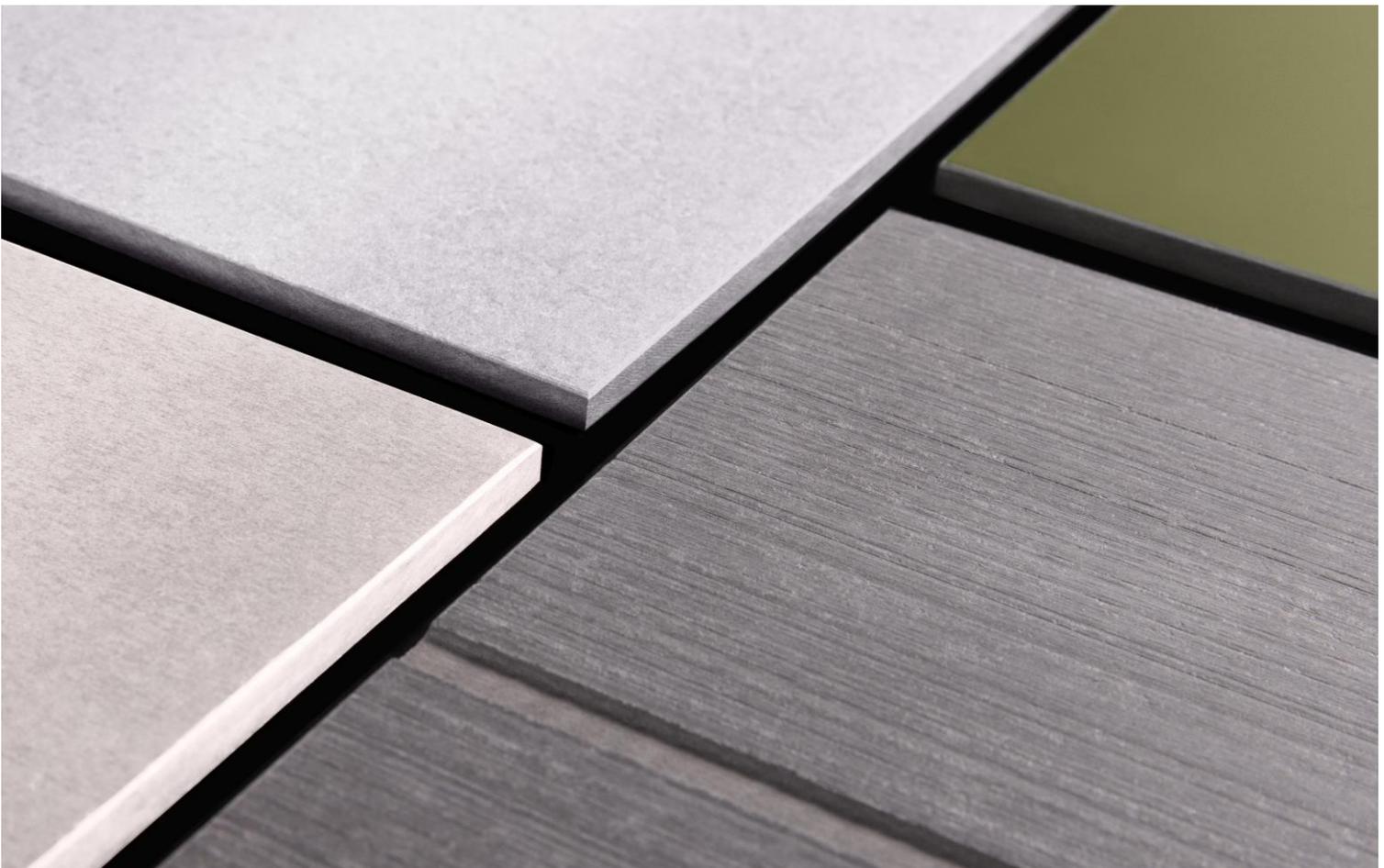
from

Sto SE & Co. KGaA



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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 www.environdec.com



General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
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Accountabilities for PCR, LCA and independent, third-party verification

Product Category Rules (PCR)

CEN standard EN 15804 serves as the Core Product Category Rules (PCR)

Product Category Rules (PCR): *PCR 2019:14. Construction products. Version 1.2.5; C-PCR-003 (TO PCR 2019:14); EN 16757:2022*

PCR review was conducted by: *technical committee of the International EPD® System*

Life Cycle Assessment (LCA)

LCA accountability: Studio Fieschi & soci Srl

Third-party verification

Independent third-party verification of the declaration and data, according to ISO 14025:2006, via:

EPD verification by individual verifier

Third-party verifier: *Chris Foster, EuGeos Srl*

Approved by: The International EPD® System

Procedure for follow-up of data during EPD validity involves 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.

Company information

Owner of the EPD:

Sto SE & Co. KGaA
Ehrenbachstraße 1, 79780 Stühlingen, Deutschland/Germany

Contact:

Lucian Götz
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Description of the organisation:

Sto is a major international manufacturer of products and systems for both external and interior walls and ceiling as well as industrial floor surfaces. In accordance with the Sustainable Industry Classification System® (SICS®), the company should be assigned to the construction materials sector. Sto SE & Co. KGaA is the parent company of the Sto Group, with its head office based in Stühlingen (Germany).

Product-related or management system-related certifications:

- EN ISO 9001 ([Managementsysteme \(sto.de\)](http://www.sto.de/Managementsysteme))
- EN ISO 14001 ([Managementsysteme \(sto.de\)](http://www.sto.de/Managementsysteme))
- EN ISO 50001 ([Managementsysteme \(sto.de\)](http://www.sto.de/Managementsysteme))

Name and location of production site:

Sto is acting as trader for the fibre cement flat sheets. The products are produced in Europe.

Product information

Product name: StoFibreCement Pure / Pure UV / Pure GX / Coat GX

Product identification: The products are used as cladding in the ventilated façade system StoVentec FibreCement

Product description: The boards made of fibre cement are composed by cement, inert materials and reinforced with cellulose. They are either mass-coloured and treated with a transparent hydrophobic treatment or painted to achieve an opaque look. The reaction to fire, the structural stability and the durability of the boards are assessed acc. to European technical standards.

UN CPC code: 375, Articles of concrete, cement, and plaster

Geographical scope: Europe

LCA information

Declared unit (DC): 1 m² of painted flat sheet, 8mm thickness and linear density of 14.4 kg/m², for outdoor (front of the house) applications.

The EPD represent 8mm, 10mm, and 12mm thickness of flat sheets, mass-coloured, painted and not painted. The painted flat sheet has been chosen as worst case scenario, the 8mm thick one has been chosen as representative product for Sto's portfolio of fibre-cement flat sheets. The 8mm flat sheet is one of the most sold by the company. The results for 10mm and 12mm thickness could be linearly scaled with conversion factors showed below.

Thickness [mm]	Conversion factor
8 mm	1
10 mm	1.25
12 mm	1.5

Time representativeness: manufacturing data for the flat panels is referred to 2021. Distribution is based on 2023 forecast.

Database(s) and LCA software used: Ecoinvent 3.5 and SimaPro 9.4

Description of system boundaries:

Cradle to gate with options: modules C1-C4, module D and with optional modules, A4 and A5.

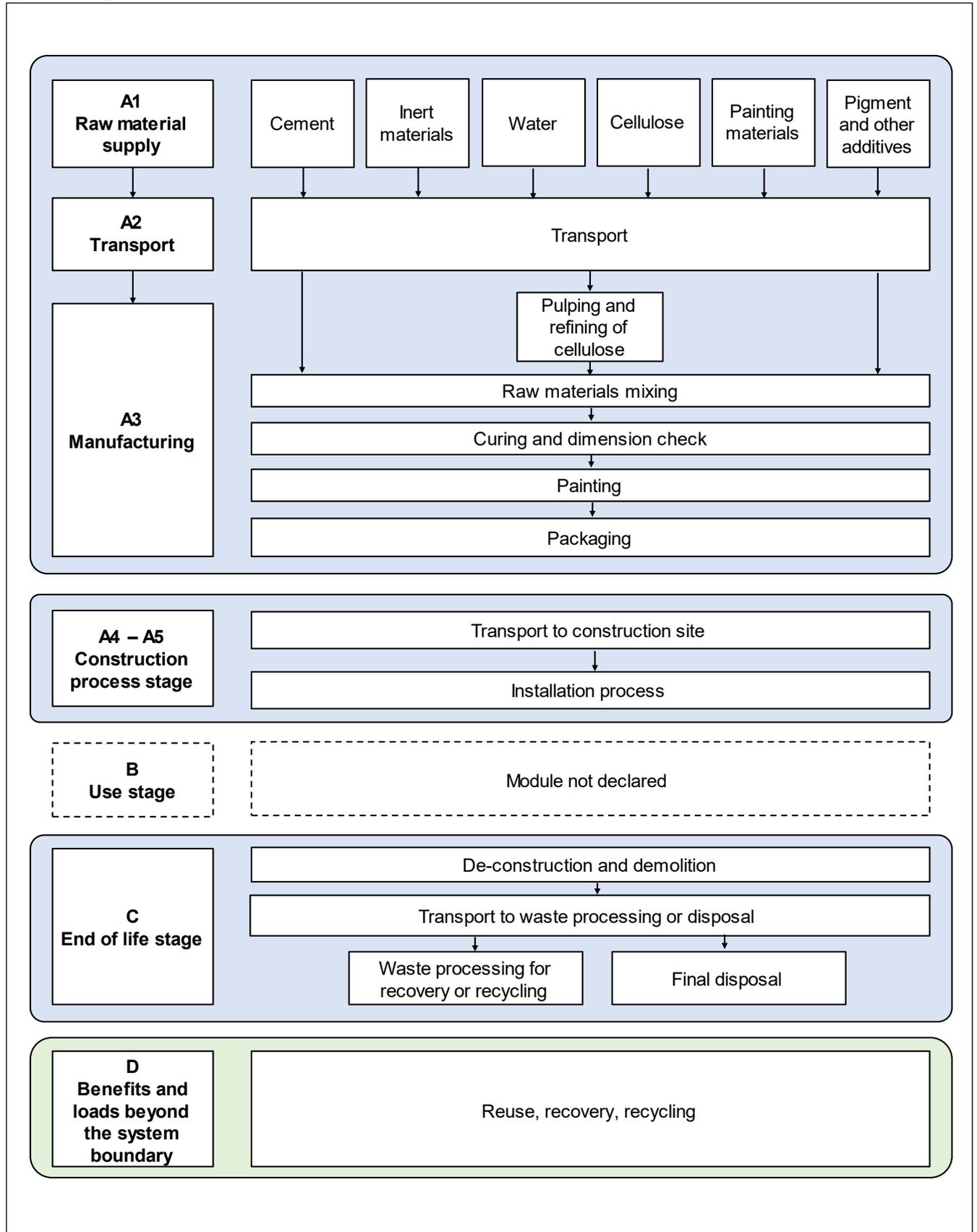
System boundaries include:

- A1: includes the raw material supply (extraction and processing of raw material used for the flat sheets: concrete, cellulose, etc) and the generation of electricity and fuels such as natural gas and diesel;
- A2: External transport of raw materials and secondary material inputs to the manufacturing plant;
- A3: includes the environmental aspects related to the product manufacturing such as auxiliaries and packaging production, combustion emission and waste disposal;
- A4: Transportation from production plant the installation site, packaging weight is considered. The resulting bulk density of the product transported in the scenario is 14.8 kg per 1 m² of packed flat sheet;
- A5: Construction installation and packaging disposal. No significant product losses during installation are considered. The ancillary materials such as frames were excluded;
- C1: includes disassembling of the product during the demolition of the building;
- C2: includes the transport of the dismantled sheets to disposal facility;
- C3: Waste processing for recycling of the product;
- C4: Final disposal of the product is not sent to recycling;
- D: Estimate of the potential benefits and/or impacts in case the products under study were reused, recycled, or recovered.

The system boundaries do not include:

- Energy feedstocks in painting materials.

System diagram:



Cut-off:

Raw materials production for painting which mass contribution on the total mass of raw materials used is less than 0.06%.

Fibreglass mesh, its mass accounts for less than 1% on the total mass of raw materials.

Packaging:

The shipping unit is made by a pallet, plastic materials, and steel wires. For pallets end-of-life, a rate of 25 reuses has been considered for material flows, according to the default scenarios proposed by the EF method in Annex 1-2. Considering a rate of 25 reuses for the pallet, the biogenic carbon material per declared unit is 6.99E-03 kg.

Production process:

The flat sheet under study is composed mainly by cement, inert materials (such as silica sand, fiber glass, etc), water and cellulose. Sheets are produced in different thicknesses ranging from 4 mm to 32 mm, they could be colored in mass. As showed in system boundary diagram flow, after the cellulose is pulped and refined, all raw materials are mixed. After that there's the curing, the dimension check and the painting. Finally, the product is packed.

This EPD applies to the following configurations of the flat sheet:

- 8mm thickness with a weight of 14.4 kg/m²
- 10mm thickness with a weight of 18 kg/m²
- 12mm thickness with a weight of 21.6 kg/m²

Distribution scenario:

Actual data on 2022 distribution are not available because the product distribution has started in 2023. A realistic scenario according to Sto's forecasts has been set. An average distance of 800 km to construction site supplier plant has been set. A Euro5 truck capacity of 16-32 tons is set. The weight of packaging is considered.

The resulting bulk density of the product transported in the scenario is 14.8 kg per 1 m² of packed flat sheet.

Assumptions for the End-of-Life scenario:

The end of waste (EoW) state has reached when the materials are ready to be recycled or recovered (sorting operation are included). The scenario is modelled according to the following assumptions:

- Module C1: the assumptions made by JRC 2018¹ has been adopted for concrete demolition scenario, i.e., diesel consumption for excavators 0.070 MJ/kg. The ancillary materials such as frames or tools were excluded.
- Module C2: an average distance for both recycling and disposal have been assumed as 100 km. For 1 m² of 8mm flat sheet, a bulk density of 14.4 kg was considered. The transport has been assumed by Euro 5 truck.
- Module C3: Eurostat data on construction waste has been used and is therefore set that 89% of the product is sent for recycling. Burdens for the first crushing of flat sheet waste have been considered. The dismantled product sent to recycling reach the end-of-waste state after the first crushing considered. Ecoinvent process related to limestone crushing has been used as proxy.
- Module C4: the amount of flat sheet isn't sent to recycling (C3), equal to 11% of the product, is assumed to be disposed as "waste cement-fibre slab" in a municipal incineration plant. For the

¹ Gervasio, H., Dimova, S., 2018, *Model for Life Cycle Assessment (LCA) of buildings*, EC JRC technical reports

incinerated material flow (set by the LCA dataset used), energy output flows of the LCA disposal dataset have been considered, as the end-of-waste is reached after incineration.

Impact Assessment:

Results show that the most relevant life cycle stage are modules A1, A2, and A3, as they contribute to the overall impacts in a range from 78% up to 95%. The second most relevant contribution comes from distribution (A4), ranging from 2% to 17%, depending on the impact category. The biogenic carbon of the packaging is accounted in GWP-biogenic results, the uptake of CO₂ occurs in A1 and emissions in A5 when the packaging is disposed. The biogenic carbon balance is zero considering the life cycle.

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	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	EUR	EUR	EUR	EUR	EUR	-	-	-	-	-	-	-	EUR	EUR	EUR	EUR	EUR
Specific data used	>90%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – products ²	<10%					-	-	-	-	-	-	-	-	-	-	-	-
Variation – sites	0%					-	-	-	-	-	-	-	-	-	-	-	-

² The stated variation is between painted and non-painted flat sheet in fibre cement. The variation is limited to GWP indicators. To scale the results between different thicknesses, use the conversion factor given in the LCA information.

Content information

Product components	Weight (%)	Biogenic material, weight-%
Cement	30%-50%	0%
Inert materials	30%-40%	0%
Water	<12%	0%
Cellulose	<12%	<5%
Pigment	<6%	0%
Painting materials	<5%	0%
other additives	<1%	0%
TOTAL	100%	<5%
Packaging materials	Weight, kg / DC	Weight biogenic carbon, kg C/DC
Wooden Pallet	3.71E-01	1.75E-01
PE	3.52E-02	0
Steel wire	2.15E-03	0
TOTAL	4.08E-01	1.75E-01

Notes:

- *The biogenic material percentage has been stated by product weight.*
- *Raw materials used for flat sheets do not include substances listed in the document "Candidate List of SVHC" released by European Chemicals Agency (<http://echa.europa.eu/candidate-list-table>).*

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-total	kg CO ₂ eq.	1.83E+01	1.97E+00	1.10E-01	9.35E-02	2.39E-01	5.70E-03	1.71E-02	-3.28E-01
GWP-fossil	kg CO ₂ eq.	1.82E+01	1.97E+00	1.08E-01	9.34E-02	2.39E-01	5.64E-03	1.68E-02	-3.27E-01
GWP-biogenic	kg CO ₂ eq.	2.71E-02	6.92E-04	1.53E-03	1.82E-05	8.41E-05	4.91E-05	2.63E-04	-9.32E-04
GWP-luluc	kg CO ₂ eq.	5.97E-03	5.75E-04	1.37E-05	7.94E-06	6.99E-05	7.67E-06	3.70E-06	-3.40E-04
ODP	kg CFC 11 eq.	2.57E-06	4.52E-07	2.26E-08	2.11E-08	5.49E-08	3.37E-10	3.08E-09	-4.04E-08
POCP	kg NMVOC eq.	4.07E-02	7.88E-03	1.33E-03	1.28E-03	9.58E-04	1.90E-05	1.12E-04	-9.28E-04
AP	mol H ⁺ eq.	5.81E-02	8.06E-03	1.03E-03	9.79E-04	9.80E-04	4.60E-05	9.98E-05	-1.76E-03
EP-freshwater	kg P eq.	3.78E-04	2.92E-05	1.07E-06	7.14E-07	3.55E-06	5.58E-07	5.62E-07	-2.16E-05
EP-marine	kg N eq.	1.21E-02	2.33E-03	4.39E-04	4.25E-04	2.83E-04	4.07E-06	3.50E-05	-2.77E-04
EP-terrestrial	mol N eq.	1.45E-01	2.60E-02	4.82E-03	4.67E-03	3.16E-03	1.05E-04	3.77E-04	-4.72E-03
ADP-minerals&metals ³	kg Sb eq.	3.28E-05	5.85E-06	6.49E-08	3.12E-08	7.11E-07	1.10E-08	3.51E-08	-1.26E-06
ADP-fossil ³	MJ	2.05E+02	3.00E+01	1.50E+00	1.35E+00	3.65E+00	8.35E-02	2.50E-01	-7.15E+00
WDP ³	m ³	6.16E+00	2.04E-01	9.50E-03	7.28E-03	2.48E-02	1.02E-01	7.66E-03	3.32E-02
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								

³ 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.

Additional mandatory and voluntary impact category indicators

Results per functional or declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG ⁴	kg CO ₂ eq.	1.83E+01	1.97E+00	1.10E-01	9.35E-02	2.39E-01	5.70E-03	1.71E-02	-3.28E-01
Particulate matter	disease inc.	5.23E-07	1.38E-07	2.65E-08	2.57E-08	1.68E-08	3.10E-10	3.71E-09	-1.26E-08
Ionising radiation ⁵	kBq U-235 eq	3.86E-01	1.28E-01	6.34E-03	5.82E-03	1.56E-02	5.60E-04	9.38E-04	-3.53E-02
Ecotoxicity, freshwater ³	CTUe	1.49E+02	2.11E+01	8.87E-01	7.64E-01	2.57E+00	1.18E-01	5.35E-01	-2.82E+00
Human toxicity, cancer ³	CTUh	5.41E-09	6.26E-10	3.77E-11	2.63E-11	7.61E-11	6.04E-12	4.09E-11	-1.36E-10
Human toxicity, non-cancer ³	CTUh	1.21E-07	2.45E-08	8.46E-10	6.66E-10	2.98E-09	2.35E-10	1.36E-09	-2.34E-09
Land use ³	Pt	4.25E+02	2.02E+01	2.90E-01	1.71E-01	2.46E+00	1.88E-02	3.14E-01	-1.95E+00

Resource use indicators

Results per functional or declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	3.03E+01	0.00E+00						
PERM	MJ	3.98E+01	3.17E-01	1.31E-02	7.83E-03	3.85E-02	1.03E-02	6.28E-03	-6.33E-01
PERT	MJ	7.01E+01	3.17E-01	1.31E-02	7.83E-03	3.85E-02	1.03E-02	6.28E-03	-6.33E-01
PENRE	MJ	1.48E+00	0.00E+00						
PENRM	MJ	2.03E+02	3.00E+01	1.50E+00	1.35E+00	3.65E+00	8.35E-02	2.50E-01	-7.15E+00
PENRT	MJ	2.05E+02	3.00E+01	1.50E+00	1.35E+00	3.65E+00	8.35E-02	2.50E-01	-7.15E+00
RSF	MJ	0.00E+00							
NRSF	MJ	0.00E+00							
FW	m ³	1.43E-01	5.46E-03	2.47E-04	1.85E-04	6.63E-04	7.57E-04	3.39E-04	-6.47E-03

⁴ 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 CO₂ is set to zero.

⁵ 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.

SM	kg	0.00E+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 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								

Waste indicators

Results per functional or declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	2.16E-01	1.86E-02	1.26E-03	7.85E-04	2.26E-03	2.42E-04	6.82E-01	-6.54E-03
Non-hazardous waste disposed	kg	1.11E+01	1.39E+00	1.62E-02	6.88E-04	1.69E-01	2.15E-04	6.18E-03	-1.44E-02
Radioactive waste disposed	kg	4.89E-04	2.03E-04	1.01E-05	9.39E-06	2.47E-05	4.89E-07	1.37E-06	-3.00E-05

Output flow indicators

Results per functional or declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Components for re-use	kg	0.00E+00							
Material for recycling	kg	0.00E+00	0.00E+00	1.97E-02	0.00E+00	0.00E+00	1.28E+01	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	1.79E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.03E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.28E+00	0.00E+00

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