

Environmental Product Declaration



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

[*Steel sheet-pile*]

from

[*Hebei Jinxi Sheet Pile & Section Steel Science & Technology Co., Ltd.*]

河北津西钢板桩型钢科技有限公司

Programme:

The International EPD[®] System, www.environdec.com

Programme operator:

EPD International AB

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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
Website:	www.environdec.com
E-mail:	info@environdec.com

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): <i>PCR 2019:14 PCR Construction products v1.3.4 issue data 2024-04-30 valid until 2025-6-20, UNCPC code 412</i>
PCR review was conducted by: The Technical Committee of the International EPD System. A full list of members available on www.environdec.com . The review panel may be contacted via info@environdec.com . No chair is appointed
Life Cycle Assessment (LCA)
LCA accountability: <Yongfeng Li, 13803308513@163.com >
Third-party verification
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: <Michael ZHU Jiang, TÜV Rheinland (China) Ltd.  >
Approved by: The International EPD [®] System
OR
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: <input type="checkbox"/> EPD verification by accredited certification body
Third-party verification: <name, organisation> is an approved certification body accountable for the third-party verification
The certification body is accredited by: <name of accreditation body & accreditation number, where applicable>
OR

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

EPD verification by EPD Process Certification*

Internal auditor: <name, organisation>

Third-party verification: <name, organisation> is an approved certification body accountable for third-party verification

Third-party verifier is accredited by: <name of accreditation body & accreditation number, where applicable>

*For EPD Process Certification, an accredited certification body certifies and reviews the management process and verifies EPDs published on a regular basis. For details about third-party verification procedure of the EPDs, see GPI.

Procedure for follow-up of data during EPD validity involves third party verifier:

Yes No

[Procedure for follow-up the validity of the EPD is at minimum required once a year with the aim of confirming whether the information in the EPD remains valid or if the EPD needs to be updated during its validity period. The follow-up can be organized entirely by the EPD owner or together with the original verifier via an agreement between the two parties. In both approaches, the EPD owner is responsible for the procedure being carried out. If a change that requires an update is identified, the EPD shall be re-verified by a verifier]

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:

Hebei Jinxi Sheet Pile & Section Steel Science & Technology Co., Ltd.

Contact:

Name: *Yongfeng Li*

Tel: +86 13803308513

Email: 13803308513@163.com

Description of the organisation:

Hebei Jinxi Sheet Pile & Section Steel Science & Technology Co., (short as Jinxi hereafter) was established in January 2017 and completed and put into operation in March 2018, which is a key project in Hebei Province in 2017 and the only steel project in the province included in the "strategic emerging industry" in 2017. With a total investment of 1.5 billion yuan, the company covers an area of 260 acres, has an annual design capacity of 1.2 million tons, and has produced a total of 3.3539 million tons of hot-rolled steel sheet piles by the end of 2023. At present, the company has obtained 63 patents authorized by the State Intellectual Property Office (including 2 invention patents), 10 software copyrights, passed ISO 9001 quality management system certification, ISO 14001 environmental management system certification, ISO45001 occupational health and safety management system certification, and obtained product certification from Malaysia and other countries; It has been successively rated as "high-tech enterprise", "specialized, special and new small and medium-sized enterprise", "science and technology small and medium-sized enterprise" and other honorary titles.

Product-related or management system-related certifications:

ISO 9001

ISO 14001

ISO 45001

Name and location of production site(s):

Name: Hebei Jinxi Sheet Pile & Section Steel Science & Technology Co., Ltd.

Location: Factory of Jinxi is located in West District, Qianxi County Economic Development Zone, Tangshan City, Hebei Province (East of Santunying Town).

Product information

Product name:

Steel sheet pile

Product identification:

U shaped or Z shaped sheet pile

Product description:

The steel sheet pile products are formed by hot rolling, a kind of steel structure with a linkage device on the edge, and this linkage device can be freely combined to form a continuous and tight retaining or retaining wall. Hot-rolled steel sheet piles are driven (pressed) into the foundation with a pile driver, so

that they are connected to each other to form a steel sheet pile wall, which is used to retain soil and water, and the commonly used hot-rolled steel sheet piles include U-shaped and Z-shaped. It is widely used in temporary projects such as foundation pit support, temporary revetment, bridge pier waterproof cofferdam, temporary island building, etc., and can also be used in permanent projects such as revetment, loading and unloading dock, retaining wall, breakwater, diversion embankment, embankment, and retaining wall. Jinxi hot-rolled steel sheet pile has the advantages of high strength, strong durability, good water-stopping effect, high construction efficiency, many reuse times and low cost.

UN CPC code:

412 Products of iron or steel

Geographical scope:

China for A1-A3

Global for A4 and A5

Global for C1-C4

LCA information

Declared unit:

1 kg of Jinxi Steel Sheet Piles.

Reference service life:

Not applicable

Time representativeness:

2023-01-01~2023-12-31

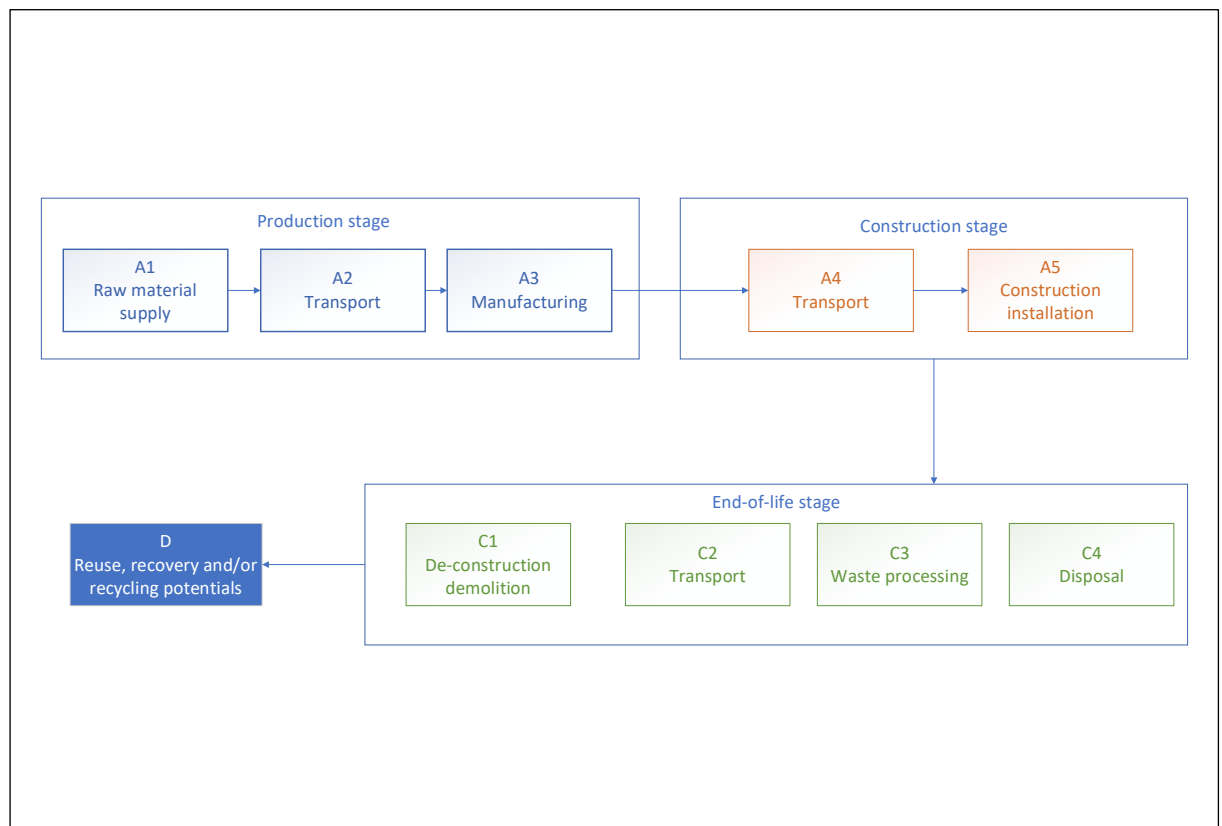
Database(s) and LCA software used:

Simapro 9.5 and Ecoinvent database 3.9.1

Description of system boundaries:

Cradle to gate with options, modules C1–C4, module D and with optional module A4 and A5

System diagram:



More information:

A1-A3

Due to the complexity of the steel sheet pile, the A1-A3 modules, or the cradle-to-gate module for the product is presented in an aggregated form. The steel sheet pile is produced from hot-rolling process from the refined steel. The refined steel contains two steps: iron smelting and steel production. The steel production can be further divided into refining and continuous casting. The refined steel is then hot-rolled into sheet and cutted into the desired dimension before they are packaged to delivery. For the steel refinery process, the economic allocation is applied based on the information from the supplier over the period of 2021-2023.

A4 product distribution

According to Jinxi, products are transported to other regions in China and Europe. The detailed transportation distance and mode given in table below. Additional 500 km is added to account for the port to the final consumer.

Table 1 Transportation of products

Destination	Land distance/km	Sea distance/km	Allocation ratio
China-Beijing-Tianjin-Hebei region	150	NA	21.68%
China-Eastern region	250	1500	36.14%
China-Southern region	250	2800	24.58%
Export-ASEAN	280	3266	11.96%
Export-EU	280	22657	3.90%

A5 Installation

According to PCR, the biogenic carbon of packaging material is normally emitted as biogenic CO2 emissions in module A5. the biogenic carbon stored in the packaging material normally can be balanced out within module A (summed over A1-A5, why A5 needs to be reported in such cases). In this case, paper board has embodied carbon, then

the installation stage (A5) was modelled. In this stage all the packaging material was assumed to be recycled and the only cost is transportation and the distance is also assumed 50km. In additional, the biogenic carbon is balanced out in this stage.

C1-C4 End-of-life

Due to the deconstruction and/or dismantling process of steel sheet-pile, the dataset in the Ecoinvent “treatment of waste reinforcement steel, collection for disposal CH” and “treatment of waste reinforcement steel, collection for disposal ROW” are applied for steel dismantling (C1) in EU and China respectively. According to the Ecoinvent dataset, dismantling of the steel by average consumes 0.626MJ diesel from the dismantling equipment.

For the end-of-life stage, 50km transportation distance from the project site to waste treatment site (C2) was assumed. For the end-of-life disposal treatment process (C3), The study considered End-of-Life scenario for the steel material is 85% recycling, and 15 % landfill.

Benefits and loads

According to the PCR, Module D assesses the impact of the net flows of recovered materials (recycled or reused) from the life cycle stages A to C, the net flow can be described by the difference between M MR in and M MR out, taking the material yield (here designated with Y) into account.

$$\text{Netflow} = \sum (\text{MMRout} - Y \cdot \text{MMRin})$$

In this LCA study, no secondary material was used in the production stage, so the M MR in is zero. As it is referred above, 85 % of waste steel is recycled. Thus, per 1kg steel sheet-pile produced, 0.85 kg steel was considered as net flow to assess the impacts.

Excluded Processes

The following steps/stages are not included in the system boundary due to the reason that the elements below are considered irrelevant or not within the boundary to the LCA study

- Production and disposal of the infrastructure and capital equipment (buildings, machines, transport media, roads, etc.)
- Due to the cut-off approach, the load and benefit of recycling pre-consumer steel scrap (or internally recycled scraps) are excluded from the analysis.
- Storage phases and sales of steel sheet piles due to no observable impact.
- Product losses due to abnormal damage such as natural disasters or fire accidents. These losses would mostly be accidental.
- The recycling process of defective products is reused internally for the manufacturing process.
- Handling operations at the distribution center and retail outlet due to small contribution and negligible impact.

Key assumptions

The key assumptions of this LCA study are as follows:

- The iron ore inputs are categorized into high quality and low quality. The Ecoinvent datasets: “Iron ore, crude ore, 63% Fe {GLO}| market for iron ore, crude ore, 63% Fe | Cut-off, U” and “Iron ore, crude ore, 46% Fe {GLO}| market for iron ore, crude ore, 46% Fe | Cut-off, U” are applied to reflect the high quality and low quality iron ores.
- The input items, consisting of fire resistive materials, oxidized millscale from steel refinery process, bags are closed-loop recycled. Thus, they are not accounted as the inputs in the respective processes.
- The fuels including white coal, lignite, brown coal and coke applied in the production process are converted to CO₂ in terms of its carbon content. The 100% conversion and resultant process CO₂ emissions are implemented according to a conservative perspective.
- During the end-of-life stage, the transportation of the waste steel sheet pile to treatment facilities including recycling, landfill, or incineration center was assumed to be 50 km for simplification purposes.
- The EoL of the steel is assumed to be recycling and landfill. The ratio is applied is 85%/15%.

Allocation

Allocation refers to the partitioning of input or output flows of a process or a product system between the product systems under study and one or more other product systems.

Multi-output allocation: multi-output allocation occurs for the iron smelting and steel production processes. Coal gas (carbon monoxide) is and steam are co-produced and sold to other enterprises for. In this case, the economic allocation is applied to partition between the main products (iron or steel) and

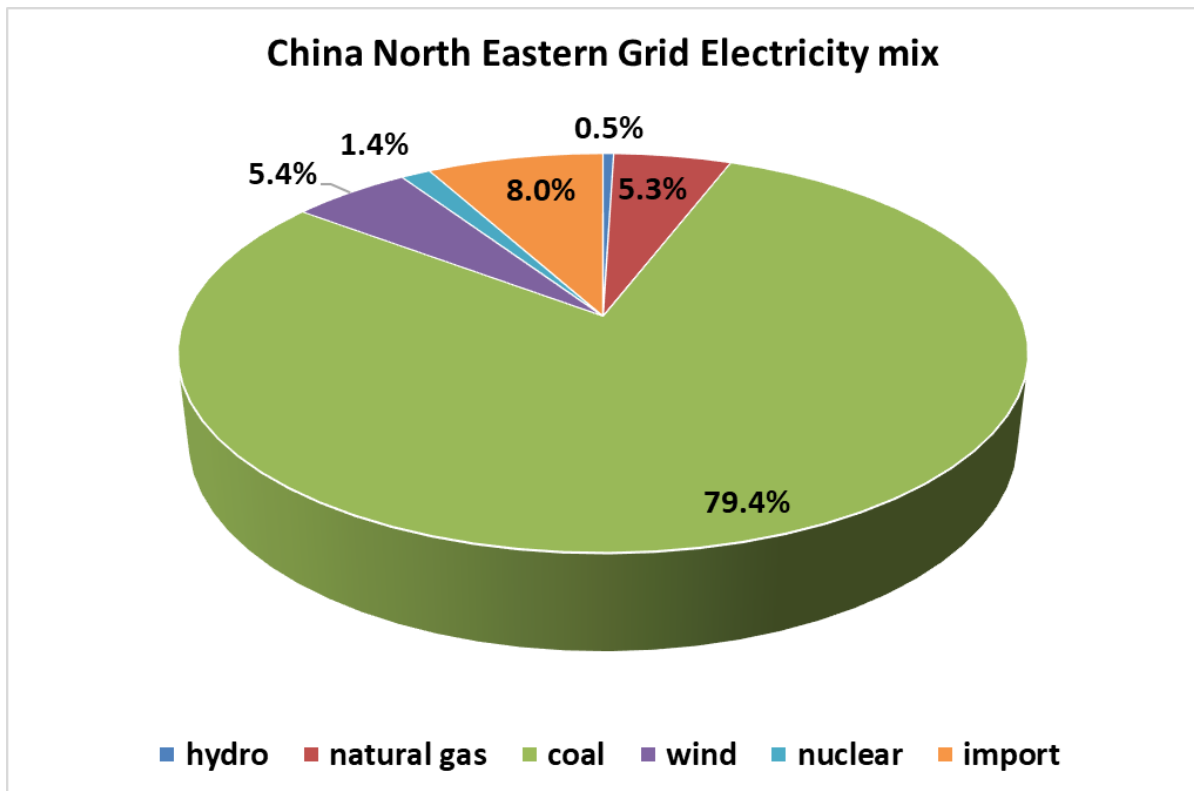
the co-products.

Outputs	Value	Unit	Economic price (2021-2023)	Allocation ratio
Refined steel block	1	kg	3.10 Yuan/kg	86%
Steam	0.105	kg	0.3 Yuan/kg	1%
Coal gas	904	lire	0.5 Yuan/m3	13%

Allocation for waste recycling: For the allocation of waste, the model “allocation cut-off by classification (ISO standard) is used. The underlying philosophy of this approach is that primary (first) production of materials is always allocated to the primary user of a material. If material is recycled, the primary producer does not receive any credit for the provision of any recyclable materials. Consequently, recyclable materials are available burden-free for recycling processes, and secondary (recycled) materials bear only the impacts of the recycling processes.

As for the end-of-life stage of the steel sheet pile product, following the PCR’s recommendation on end-of-life scenario of reuse, recycling, and recovery (Chapter 4.5.2 in PCR). Along with the benefit, the load from waste treatment for recycling purposes such as crushing and smelting, etc., is also allocated to the next life cycle of substituted products, but not the primary producers, hence no burden or benefit will be allocated to the primary producer of the sheet pile product (cut-off approach).

Electricity mix



In this LCA, the grid mix data on electricity of for the site in Tangshan is based on grid mixes of the

State Grid Cooperation of Northern China Branch (NCGC). Electricity mix has been modelled from ecoinvent database 3.9.1 (Electricity, medium voltage {CN-NCGC}) market for electricity, medium voltage | Cut-off, U). The electricity inventory is based on the year of 2020 for Chinese electricity generation (China Energy Statistics). Based on the PCR, it belongs to the level 3: residual electricity mixes on the market. The purchased electricity for the Jinxi factory is from the State Grid, a nationalized gigantic electricity supplier with power transmission and distribution across almost entire the country. Thus, the level 1 and level 2, namely the specific electricity mix with the Guarantee of Origin and residual mix of the specific electricity supplier is not applicable to the Jinxi factory.

According to the dataset in Ecoinvent, the main part of electricity is produced by hard coal, followed by natural gas and oil. Moreover, the electricity consumption of Jinxi's offices has not been considered in this LCA report. The GHG-GWP indicator for the applied electricity mix is 1.2 kg CO₂eq per kWh

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	CN	CN	CN	GLO	GLO								GLO	GLO	GLO	GLO	GLO
Specific data used	18.1%					-	-	-	-	-	-	-	-	-	-	-	-

Content information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Steel	1	0	0
TOTAL	1	0	0
Packaging materials	Weight, kg	Weight-% (versus the product)	Weight biogenic carbon, kg C/kg
Steel strap	1.52E-03	0.15%	0
Graphic paper	2.64E-05	0.01%	1.12E-05
TOTAL	1.55E-03	0.16%	1.12E-05

The products do not contain any of the substances of very high concern (SVHC) regulated by the Regulation (EC) No 1907/2006 (REACH) or the Regulation (EC) No 1272/2008 of European parliament.

Results of the environmental performance indicators

Mandatory impact category indicators according to EN 15804

Results per declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-fossil	kg CO ₂ eq.	2.73E+00	7.09E-02	5.38E-05	6.21E-02	9.61E-02	6.48E-02	9.11E-04	-1.41E+00
GWP-biogenic	kg CO ₂ eq.	-4.09E-05	9.82E-06	4.09E-05	1.43E-05	3.45E-05	3.03E-05	5.22E-07	5.68E-03
GWP-luluc	kg CO ₂ eq.	6.90E-04	4.31E-05	2.76E-08	6.99E-06	4.94E-05	1.25E-05	5.50E-07	-3.66E-04
GWP-total	kg CO ₂ eq.	2.73E+00	7.10E-02	9.47E-05	6.21E-02	9.62E-02	6.49E-02	9.13E-04	-1.41E+00
ODP	kg CFC 11 eq.	2.20E-08	1.06E-09	8.19E-13	9.88E-10	1.46E-09	1.01E-09	2.64E-11	-3.30E-08
AP	mol H ⁺ eq.	8.22E-03	9.30E-04	1.90E-07	5.76E-04	3.39E-04	5.90E-04	6.87E-06	-5.27E-03
EP-freshwater	kg P eq.	4.02E-04	4.52E-06	4.34E-09	1.91E-06	7.76E-06	3.16E-06	7.59E-08	-5.19E-04
EP-marine	kg N eq.	1.75E-03	2.45E-04	6.25E-08	2.67E-04	1.12E-04	2.70E-04	2.64E-06	-1.23E-03
EP-terrestrial	mol N eq.	2.03E-02	2.68E-03	6.62E-07	2.90E-03	1.18E-03	2.93E-03	2.83E-05	-1.30E-02
POCP	kg NMVOC eq.	6.66E-03	7.89E-04	2.56E-07	8.59E-04	4.58E-04	8.68E-04	9.84E-06	-7.38E-03
ADP-minerals & metals*	kg Sb eq.	4.19E-06	1.69E-07	1.72E-10	2.17E-08	3.07E-07	3.74E-08	1.27E-09	-7.27E-07
ADP-fossil*	MJ	2.83E+01	9.50E-01	7.57E-04	8.14E-01	1.35E+00	8.49E-01	2.27E-02	-1.43E+01
WDP*	m ³	4.37E-01	3.52E-03	3.34E-06	1.75E-03	5.97E-03	2.22E-03	1.00E-03	-8.41E-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								

* 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 declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
GWP-GHG ¹	kg CO ₂ eq.	2.73E+00	7.09E-02	5.38E-05	6.21E-02	9.62E-02	6.48E-02	9.12E-04	-1.41E+00

Resource use indicators

Results per declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
PERE	MJ	6.65E-01	1.03E-02	9.73E-06	4.64E-03	1.74E-02	9.79E-03	1.94E-04	-2.84E-01
PERM	MJ	3.20E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT	MJ	6.65E-01	1.03E-02	9.73E-06	4.64E-03	1.74E-02	9.79E-03	1.94E-04	-2.84E-01
PENRE	MJ	1.09E+01	9.50E-01	7.57E-04	8.14E-01	1.35E+00	8.49E-01	2.27E-02	-1.43E+01
PENRM	MJ	1.73E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.83E+01	9.50E-01	7.57E-04	8.14E-01	1.35E+00	8.49E-01	2.27E-02	-1.43E+01
SM	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
RSF	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
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 ³	1.10E-02	1.14E-04	1.06E-07	6.39E-05	1.89E-04	8.42E-05	2.41E-05	-2.45E-03
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								

Waste indicators

Results per functional or declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Hazardous waste disposed	kg	4.06E-04	1.99E-05	1.90E-08	7.10E-06	3.39E-05	8.68E-06	2.79E-07	-2.49E-04

¹ 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.

Non-hazardous waste disposed	kg	3.38E-01	3.15E-02	3.67E-05	1.16E-03	6.56E-02	1.37E-03	1.50E-01	-5.35E-02
Radioactive waste disposed	kg	7.62E-06	1.63E-07	1.57E-10	8.91E-08	2.80E-07	1.86E-07	3.36E-09	-2.92E-06

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	0.00E+00	0.00E+00	5.60E-03	0.00E+00	0.00E+00	8.50E-01	0.00E+00	0.00E+00
Materials for energy recovery	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
Exported energy, electricity	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
Exported energy, thermal	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

Other environmental indicators

Results per declared unit									
Indicator	Unit	A1-A3	A4	A5	C1	C2	C3	C4	D
Particulate matter	disease inc.	1.13E-07	4.33E-09	4.27E-12	1.61E-08	7.64E-09	1.62E-08	1.50E-10	-1.10E-07
Ionising radiation	kBq U-235 eq	3.19E-02	6.92E-04	6.60E-07	3.86E-04	1.18E-03	7.86E-04	1.44E-05	-1.20E-02
ETP-fw	CTUe	1.83E+01	5.10E-01	4.20E-04	3.89E-01	7.51E-01	3.97E-01	1.07E-02	- 4.13E+00
HTP-c	CTUh	6.97E-10	3.15E-11	2.43E-14	1.90E-11	4.35E-11	2.03E-11	3.88E-13	-7.67E-09
Land use	Pt	1.23E-08	5.46E-10	5.43E-13	1.32E-10	9.70E-10	1.67E-10	4.86E-12	-4.54E-09

Additional environmental information

ISO 9001: Quality Management System

ISO14001: Environmental Management System

ISO45001: Occupational Health and Safety Management System

Additional social and economic information

None

Information related to Sector EPD

It is not sector EPD

Differences versus previous versions

This is a new submission

References

SimaPro 9.5, LCA software

Ecoinvent, 2023. Swiss Centre for Life Cycle Assessment, v3.9 1

General Programme Instructions for the International EPD® System. Version 4.0.

EN 15804:2012+A2:2019/AC:2021 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

ISO 14040 (2020): Environmental Management - Life Cycle Assessment - Principles and Framework

ISO 14044 (2020): Environmental Management - Life Cycle Assessment - Requirements and Guidelines

PCR 2019:14 Construction Products. Version 1.3.4, issued on 2024-04-30 valid until 2024-06-20

ISO 9001:2015 Quality Management System

ISO 14001:2015 Environmental Management System

ISO 45001:2018 Occupational health and safety management systems

