# Environmental Product Declaration

In accordance with ISO 14025:2006 and 2026 and EN 15804:2012+A2:2019/AC:2021 for:

## Steel pipes (Hollow Steel Sections)

from

## Sahaviriya Steel Industries Public Company Limited

| | |
|---|---|
| Programme: | The International EPD System, www.environdec.com |
| Programme operator: | EPD International AB |
| Type of EPD: | EPD of multiple products, based on the average results of the product group<br>The list of all products covered by this EPD refers to Page 5-6 |
| EPD registration number: | EPD-IES-0035917:001 |
| Version date: | 2026-11-23 |
| Validity date: | 2031-11-22 |
| | *An EPD may be updated or depublished if conditions change. To find the latest version of the EPD and to confirm its validity, see www.environdec.com* |



# GENERAL INFORMATION

| Programme Information | |
|---|---|
| **Programme:** | The International EPD® System |
| **Address:** | EPD International AB<br>Box 210 60<br>SE-100 31 Stockholm<br>Sweden |
| **Website:** | www.environdec.com |
| **E-mail:** | support@environdec.com |

| Product Category Rules (PCR) |
|---|
| **CEN standard EN 15804 serves as the Core Product Category Rules (PCR)** |
| **Product Category Rules (PCR):** PCR 2019: Construction Products, version 2.0.1 (valid until: 2030-04-07). Based on CEN standard EN 15804. UN CPC – 412 |
| **PCR review was conducted by:** Technical Committee of the International EPD ® System. A full list of members is available on environdec.com. The review panel may be contacted via support@environdec.com. Review chair: Rob Rouwette (chair): start2see, Noa Meron (co-chair): thinkstep. |

| Third-party Verification |
|---|
| Independent third-party verification of the declaration and data, according to ISO 14025:2026, via:<br><br>☒ **Individual EPD verification without a pre-verified LCA/EPD tool**<br>Third-party verifier: Claudia A. Peña, Director of PINDA LCT SpA.,<br>Email: claudia@epd-chile.com<br>Approved by: International EPD System |
| Procedure for follow-up of data during EPD validity involves third party verifier:<br><br>☐ Yes ☒ No |

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

EPDs within the same product category but published in different EPD programmes, may not be comparable. For two EPDs to be comparable, they shall be based on the same PCR (including the same first-digit 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 identical scope in terms of included life-cycle stages (unless the excluded life-cycle stage is demonstrated to be insignificant); apply identical impact assessment methods (including the same version of characterisation factors); and be valid at the time of comparison.
For further information about comparability, see EN 15804 and ISO 14025.

# INFORMATION ABOUT EPD OWNER

Owner of the EPD: Sahaviriya Steel Industries Public Company Limited

Address: Praphawit Building, 28/1 Surasak Road, Silom, Bang Rak, Bangkok 10500

Contact: Maythawadee Ritlerd, E-mail: MaythawadeeR@ssi-steel.com

Address and contact information of the LCA practitioner commissioned by the EPD owner, if applicable: ECEE company limited
INC-204, Innovation Cluster 1, 131 Thailand Science Park, Phahonyothin Road, Khlong Nueng, Khlong Luang, Pathum Thani 12120

Description of the organisation: Sahaviriya Steel Industries Public Company Limited (SSI) is a distributor of steel pipe products manufactured from Hot Rolled Steel Sheet in Coils (HRC) produced by SSI at its Bangsaphan steel plant in Prachuap Khiri Khan Province, Thailand. The pipe forming, welding, and finishing processes are carried out by certified external manufacturing partners under subcontracting arrangements. SSI is responsible for product specifications, quality requirements, and the distribution of the steel pipe products.

# PRODUCT INFORMATION

Product name: Steel pipes (Hollow Steel Sections)

Product identification: Steel pipes (Hollow Steel Sections) are manufactured from roll-formed, welded structural steel in accordance with ASTM A1085, ASTM A500, TIS 107, JIS G3444 and BS EN 10219. Available in square, rectangular, and round shapes. Designed for high structural efficiency, improved weldability, and consistent material performance.



UN CPC code: 4128: Tubes, pipes and hollow profiles, of steel

Product description: This EPD covers a product group consisting of three types of steel pipes (Hollow Steel Sections) products, namely HSS, HR1, and SS400, which are manufactured using the same production process. These products differ in steel grade, dimensions, cross-sectional shape, thickness, and product specifications in accordance with relevant standards. The environmental impacts reported in this EPD are calculated using a production-mass-weighted average of all products within the group to represent the average environmental performance of the product group.

The three types of steel pipes (Hollow Steel Sections), namely HSS, HR1, and SS400, are manufactured in accordance with national and international standards, with dimensional tolerances meeting specific customer requirements. The product types are described as follows:

- HSS: High-strength welded structural steel pipes designed for applications requiring high load-bearing capacity.
- HR1: Steel pipes manufactured from general structural-grade hot-rolled steel for standard structural applications.
- SS400: Steel pipes manufactured in accordance with applicable industrial standards for general structural and industrial applications.

These products are used as structural steel pipes in building construction and infrastructure applications. Common applications include building structures, warehouses, factories, trusses, columns, beams, bridges, structural sign supports, elevated walkways, prefabricated and modular buildings, lightweight steel structural systems, and load-bearing components for canopies, fences, and guardrails.

The products are manufactured from Hot Rolled Steel Sheet in Coil supplied by SSI. The pipe forming and welding processes are carried out by selected external manufacturers in accordance with SSI's product specifications and technical requirements.

The products provide mechanical strength, dimensional accuracy, and surface quality suitable for structural, construction, and industrial applications. Product performance varies depending on the steel grade, dimensions, and specific customer requirements, with mechanical properties conforming to the relevant product standards.

There are no specific restrictions on the types of buildings or construction applications for which these products may be used. Their use shall comply with applicable design standards, engineering requirements, and customer specifications, taking into account the influence of product characteristics on structural performance. The influence on the operational performance and environmental impacts of the building or other construction works is dependent on the end-use application and is not separately assessed within this Environmental Product Declaration (EPD). Accordingly, no Reference Service Life (RSL) is declared, as the technical service life is determined by the specific characteristics, intended use, in-use environment, and maintenance requirements of the final construction works.

List of Products Covered by the EPD

**Product Dimensions**

| Round sections | | | Rectangular sections | | | Square sections | | |
|---|---|---|---|---|---|---|---|---|
| Nominal Size (inch) | Outside Diameter (mm.) | Thick ness (mm.) | Nominal Size (inch) | Size (W x H) (mm.) | Thick ness (mm.) | Nominal Size (inch) | Size (W x H) (mm.) | Thick ness (mm.) |
| 1-1/2" | 48,6 | 2,3 | 2" x 1" | 50 x 25 | 0,9 | 1" x 1" | 25 x 25 | 0,9 |
| 1-1/2" | 47,5 | 2,5 | 2" x 1" | 50 x 25 | 1,0 | 1" x 1" | 25 x 25 | 1,0 |
| 1-1/2" | 47,5 | 3,0 | 2" x 1" | 50 x 25 | 1,1 | 1" x 1" | 25 x 25 | 1,1 |
| 2" | 60,5 | 2,3 | 2" x 1" | 50 x 25 | 1,3 | 1" x 1" | 25 x 25 | 1,3 |
| 2" | 60,5 | 3,2 | 2" x 1" | 50 x 25 | 1,5 | 1" x 1" | 25 x 25 | 1,5 |
| 2-1/2" | 76,3 | 2,8 | 2" x 1" | 50 x 25 | 1,55 | 1" x 1" | 25 x 25 | 1,55 |
| 2-1/2" | 76,3 | 3,2 | 2" x 1" | 50 x 25 | 1,9 | 1" x 1" | 25 x 25 | 1,9 |
| 3" | 88,7 | 2,8 | 2" x 1" | 50 x 25 | 2,05 | 1-1/4" x 1-1/4" | 32 x 32 | 0,9 |
| 3" | 88,7 | 3,2 | 3" x 1-1/2" | 75 x 38 | 1,0 | 1-1/4" x 1-1/4" | 32 x 32 | 1,1 |
| 3-1/2" | 101,6 | 3,2 | 3" x 1-1/2" | 75 x 38 | 1,1 | 1-1/4" x 1-1/4" | 32 x 32 | 1,3 |
| 3-1/2" | 101,6 | 4,0 | 3" x 1-1/2" | 75 x 38 | 1,3 | 1-1/4" x 1-1/4" | 32 x 32 | 1,5 |
| 3-1/2" | 101,6 | 5,0 | 3" x 1-1/2" | 75 x 38 | 1,5 | 1-1/4" x 1-1/4" | 32 x 32 | 1,55 |
| 4" | 113,5 | 3,2 | 3" x 1-1/2" | 75 x 38 | 1,55 | 1-1/2" x 1-1/2" | 38 x 38 | 0,9 |
| 4" | 113,5 | 3,5 | 3" x 1-1/2" | 75 x 38 | 1,9 | 1-1/2" x 1-1/2" | 38 x 38 | 1,0 |
| 5" | 139,8 | 3,6 | 3" x 1-1/2" | 75 x 38 | 2,05 | 1-1/2" x 1-1/2" | 38 x 38 | 1,1 |
| 5" | 139,8 | 4,0 | 4" x 2" | 100 x 50 | 1,1 | 1-1/2" x 1-1/2" | 38 x 38 | 1,3 |
| 6" | 165,2 | 4,5 | 4" x 2" | 100 x 50 | 1,3 | 1-1/2" x 1-1/2" | 38 x 38 | 1,55 |
| 6" | 165,2 | 5,0 | 4" x 2" | 100 x 50 | 1,55 | 1-1/2" x 1-1/2" | 38 x 38 | 1,8 |
| 6" | 165,2 | 7,1 | 4" x 2" | 100 x 50 | 1,8 | 1-1/2" x 1-1/2" | 38 x 38 | 1,9 |
| 7" | 190,7 | 4,5 | 4" x 2" | 100 x 50 | 1,9 | 2" x 2" | 49 x 49 | 1,1 |
| 7" | 190,7 | 6,0 | 4" x 2" | 100 x 50 | 2,05 | 2" x 2" | 49 x 49 | 1,3 |
| 7" | 190,7 | 8,2 | 6" x 2" | 150 x 50 | 1,5 | 2" x 2" | 49 x 49 | 1,5 |
| 8" | 216,3 | 4,5 | 6" x 2" | 150 x 50 | 1,55 | 2" x 2" | 49 x 49 | 1,55 |
| 8" | 216,3 | 6,0 | 6" x 2" | 150 x 50 | 1,9 | 2" x 2" | 49 x 49 | 1,8 |
| 8" | 216,3 | 8,0 | 6" x 2" | 150 x 50 | 2,05 | 2" x 2" | 49 x 49 | 1,9 |
| 10" | 267,4 | 6,0 | | | | 4" x 4" | 100 x 100 | 1,5 |
| 10" | 267,4 | 8,0 | | | | 4" x 4" | 100 x 100 | 1,55 |
| 12" | 318,5 | 6,0 | | | | 4" x 4" | 100 x 100 | 1,9 |

| Product Dimensions | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Round sections | | | Rectangular sections | | | Square sections | | |
| Nominal Size (inch) | Outside Diameter (mm.) | Thick ness (mm.) | Nominal Size (inch) | Size (W x H) (mm.) | Thick ness (mm.) | Nominal Size (inch) | Size (W x H) (mm.) | Thick ness (mm.) |
| 12'' | 318,5 | 8,0 | | | | 4" x 4" | 100 x 100 | 2,05 |
| 12'' | 318,5 | 9,0 | | | | | | |

Name and location of production site(s): Steel Pipes (Hollow Steel Sections) presented in this study are products under the name of Sahaviriya Steel Industries Public Company Limited (SSI). The production process is carried out at an external manufacturing plant located at 157-157/1 Moo 14, Old Sukhumvit Road, Bang Pakong Subdistrict, Bang Pakong District, Chachoengsao Province, 24130, Thailand, under a Subcontracting Arrangement with SSI. SSI remains responsible for product specifications, quality requirements, and the supply of finished products.
References to any relevant websites for more information or explanatory materials, if applicable:
https://www.ssi-steel.com/en/about/product-process/steel-pipes-hollow-en/

Technical data:

| Name | Value | Unit |
|---|---|---|
| **HSS** | | |
| Yield Strength | 370-420 | MPa |
| Tensile Strength | 500-550 | MPa |
| Elongation | 21 | % |
| Thickness (round sections) | 2,3 – 9,0 | mm |
| Thickness (square sections) | 0,9 – 2,05 | mm |
| Thickness (rectangular sections) | 0,9 – 2,05 | mm |
| Standard Length | custom lengths available on request | |
| **HR1** | | |
| Yield Strength | Not specified (refer to applicable product standard) | MPa |
| Tensile Strength | 290 | MPa |
| Elongation | Not specified (refer to applicable product standard) | % |
| Thickness (round sections) | 2,3 – 9,0 | mm |
| Thickness (square sections) | 0,9 – 2,05 | mm |
| Thickness (rectangular sections) | 0,9 – 2,05 | mm |
| Standard Length | custom lengths available on request | |
| **SS400** | | |
| Yield Strength | 245 | MPa |
| Tensile Strength | 400 | MPa |
| Elongation | 21 | % |
| Thickness )round sections( | 2,3 – 9,0 | mm |
| Thickness )square sections( | 0,9 – 2,05 | mm |
| Thickness )rectangular sections( | 0,9 – 2,05 | mm |

| Name | Value | Unit |
|---|---|---|
| Standard Length | custom lengths available on request | |

# CONTENT DECLARATION

- The content declaration represents the average results of the product group covered by this EPD.

- The mass (weight) of one unit of a product: The declared unit is 1 000 kg of the Steel pipes (Hollow Steel Sections).

- Content of the product in the form of a list of materials and substances, and their mass: A list of the components and materials, along with their mass, of the Steel pipes (Hollow Steel Sections) is shown in the product content below.

| Product content | Mass, kg | Post-consumer recycled material, mass-% of product | Biogenic material, mass-% of product | Biogenic material, kg C/product or declared unit |
|---|---|---|---|---|
| Low-alloyed Steel | 99,8 | 1,1 | 0,0 | 0,0 |
| Unalloyed Steel | 900,2 | 9,7 | 0,0 | 0,0 |
| TOTAL | 1 000 | 10,8 | 0,0 | 0,0 |

- Information on the environmental and hazardous/toxic properties of a substances contained in the product: The products do not contain any of the substances of very high concern (SVHC).

- Other information on substances with hazardous and toxic properties: -
- The declared share of biogenic/recycled materials: The recycled content of a steel slab is approximately 10,8%.

The mass and the content of distribution and/or consumer packaging:
Not applicable

| Packaging materials | Mass, kg | Mass-% (versus the product) | Biogenic material, kg C/product or declared unit |
|---|---|---|---|
| No packaging | | | |

# LCA INFORMATION

Declared unit: 1000 kg of the steel pipes (Hollow Steel Sections).

Reference service life: A reference service life for steel pipes is not declared. Steel pipes (Hollow Steel Sections) are used in construction with many different application purposes. The lifetime therefore will be limited by the application and corresponding service. At the end of life, they will be recovered and recycled into a new steel product.

Time representativeness: 2024-01-01 to 2024-12-31.

Geographical scope:

- Modules A1-A2: Thailand
- Modules A3: Thailand
- Modules C1-C4, D: Thailand

Database(s) and LCA software used: The LCI includes data collection from a variety of publicly available sources, taking into consideration the representativeness in technology, temporal and geographical scales. In case of missing data, proxy data from Ecoinvent 3.10 were referred to, and sensitivity analysis was conducted. For the modelling and calculation, the LCA software SimaPro version 9.6.01 was used.

EPD/LCA software used: SimaPro 9.6.0.1

Description of system boundaries: Cradle to gate with modules C1–C4 and module D (A1–A3 + C + D)

A1: RAW MATERIAL SUPPLY
The production process for Steel pipes (Hollow Steel Sections) begins with material supply. This module encompasses the various acquisition processes for the raw materials used to produce steel pipes. The main raw material used in the production process is primary hot rolled steel sheet in coil (HRC), which is sourced entirely from Sahaviriya Steel Industries Public Company Limited (SSI), Thailand.

A2: TRANSPORTATION OF RAW MATERIALS TO THE MANUFACTURER
Transportation involves the delivery of raw materials from the supplier to the manufacturing plant's gate. For this study, all HRC are sourced exclusively from SSI within Thailand, with no international imports involved. Inland roadway transport (via transport truck) is the primary mode of delivery.

A3: MANUFACTURING
Hot Rolled Steel Sheet in Coils (HRC) strips of specified width and thickness are used as the primary raw material for producing Steel pipes (Hollow Steel Sections). These steel coils are uncoiled, leveled, and formed into square, rectangular, or circular cross-sections through forming processes. This stage forms the steel strip into a tubular shape through a series of forming and sizing operations. The tube is then joined along the seam and finished to achieve the required dimensions, straightness, and surface condition in accordance with product specifications.

C1-C4: DE-CONSTRUCTION DEMOLITION/TRANSPORT/WASTE PROCESSING/DISPOSAL
The modules C1-C4 are included. These modules consider the dismantling of the considered product (C1), the transportation of the dismantled components to their End of Life (EoL) destination (C2), the waste processing for recovery or recycling (C3) as well as the disposal (C4), if given. At EoL, the steel material leaves the product system in C3 for recycling in Module D. The considered EoL scenario for the steel material is 95% recycling and 5% landfill reference from Iron and Steel Institute of Thailand. (2024).

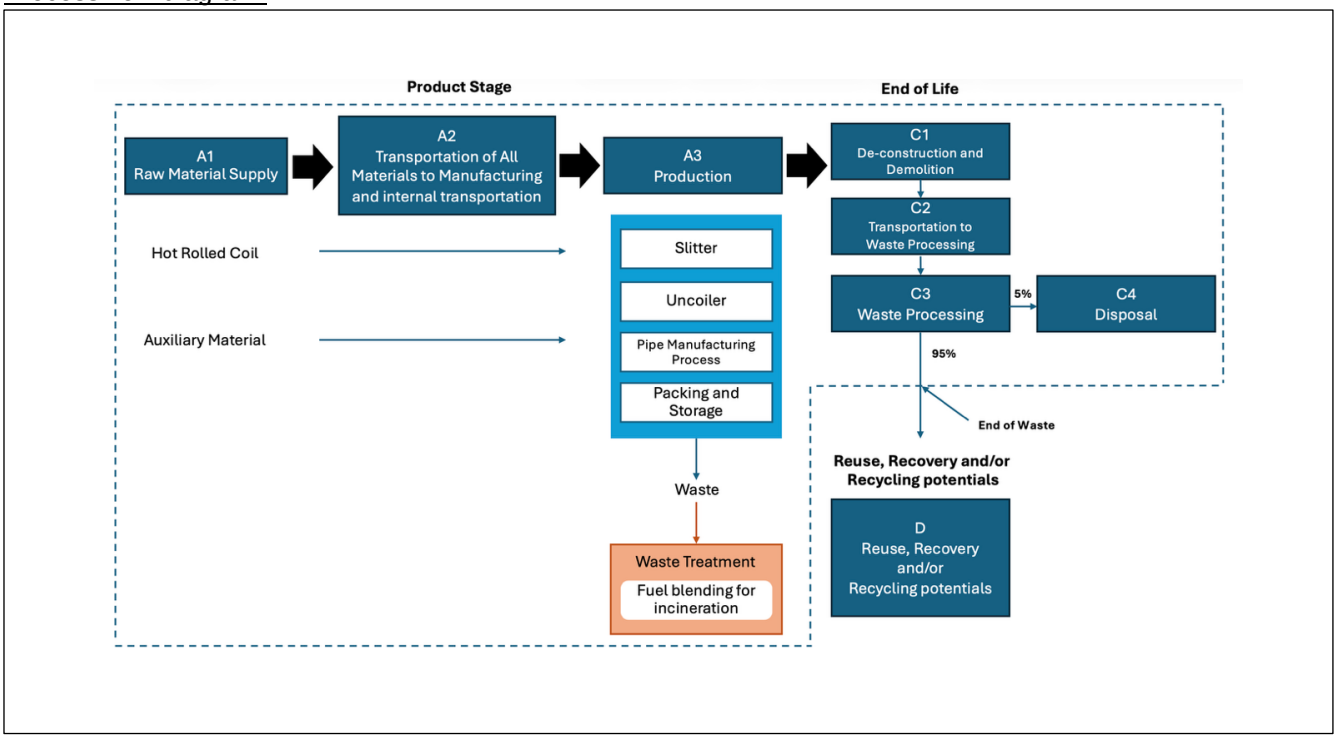
Default data for modelling C1, C2, C3 and C4 provided in PCR 2019:14 Construction products, version 2.0.1 as given below:

| **Process in C1** | **Energy carrier** | **Quantity [kWh/tonne]** |
|---|---|---|
| Demolition/deconstruction of steel, wood, and other materials | Diesel | 1,1 |
| **Process in C2** | **Distance (km)** | **Means of transport** |
| Transport (for products/materials not to be incinerated) | 80 | 16-32 tonne lorry (EURO 5), 50% load factor |
| **Process in C3** | **Energy carrier** | **Quantity [kWh/tonne]** |
| Loading and unloading at sorting facility | Diesel | 1,8 |
| Mechanical sorting | Electricity | 2,2 |
| Fragging of steel | Diesel | 7,4 |
| **Process in C4** | **Energy carrier** | **Quantity [kWh/tonne]** |
| Compacting of inert construction waste for landfills (including backfilling) | Diesel | 1,6 |

D: REUSE-RECOVERY-RECYCLING-POTENTIAL
Module D assesses the impact of the net flows of recovered materials (recycled or reused) from the life cycle stages A to C. As mentioned above, 95% of waste steel scrap will be recycled, which is considered as a net flow for impact assessment.

The system scope excludes construction process stage (Modules A4–A5), and use stage (Modules B1–B7), which are therefore declared as Module Not Declared (ND). These modules are excluded because the product is an intermediate construction product, and the specific scenarios for transportation to the construction site, installation, and use phase depend on the final application, which cannot be determined at the manufacturing stage.

Process flow diagram:




More information:

Allocation procedures: steel scrap, mill scale and iron tear generated during manufacturing have economic value and are treated as co-products (PCR Section 4.5.1). As the revenue difference between the main product and co-products exceeds 25%, economic allocation was applied using three-year average market prices (2022-2024) of steel pipes, steel scrap, mill scale and iron tear obtained from The Iron and Steel Institute of Thailand. Waste streams without economic value are not allocated; their treatment burdens are fully accounted for in the module where they are generated (Polluter Pays Principle).

Cut-off criteria: The cut-off criteria adopted is as stated in “EN15804:2012+A2:2019”. Where there is insufficient data or data gaps for a unit process, the cut-off criteria are 1% of the total mass of input of that process. The total of neglected input flows per module is a maximum of 5% of energy usage and mass.

Data quality: foreground (primary) data are measured/calculated data collected directly from production records for the 2024 reference year; background (secondary) data are sourced from the Ecoinvent v3.10 database. Precision, completeness, consistency and representativeness are all assessed as high.

The climate impact of electricity purchased and used in the manufacturing process (module A3) is 0,729 kg $CO_2$ eq./kWh (Thailand residual electricity mix, 2024 reference year, PEA grid), modelled as a market-based residual electricity mix in accordance with PCR 2019:14 v2.0.1 Section 4.7.2.3, as no manufacturer-specific evidence of RECs, PPAs, GOs or other qualifying contractual instruments was available.

Modules C1–C4: The end-of-life stage of Steel pipes (Hollow Steel Sections) is modelled in accordance with the default end-of-life scenarios specified in PCR 2019:14. The default scenario

assumes that 95% of the product is recycled, while the remaining 5% is disposed of in landfill at the end of its service life.

In accordance with PCR 2019:14, Clause 4.8.4, the following additional scenarios are also reported:

- Scenario A – 100% Recycling: All steel components are assumed to be recovered and recycled at the end of life. Module D accounts for the benefits and loads associated with the substitution of primary steel production.
- Scenario B – 100% Landfill: All steel components are assumed to be disposed of in landfill at the end of life. Under this scenario,no benefits from material recovery are assigned to Module D.

Module D scenario: Module D accounts for the net flow of recovered scrap steel reaching End-of-Waste (EoW) status in Module C3, based on a 95% end-of-life recycling rate (R2), after deducting the 10,830% recycled content (R1) in Module A1 to avoid double counting. The recovered scrap is assumed to substitute secondary steel production via Electric Arc Furnace (EAF) / Induction Furnace (IF) in Thailand, consistent with the geographical scope of the EPD. The end-of-life scenario assumes 95% recycling and 5% landfill disposal, based on Thailand-specific data from ISIT (2024).

Characterisation methods: Environmental Footprint (EF) 3.1 characterisation factors, in accordance with EN 15804+A2 and the applicable PCR.

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

| | Product stage | | | Distribution/ installation stage | | Use stage | | | | | | | End-of-life stage | | | | Beyond product life cycle |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | ND | ND | ND | ND | ND | ND | ND | ND | ND | X | X | X | X | X |
| Geography | TH | TH | TH | ND | ND | ND | ND | ND | ND | ND | ND | ND | TH | TH | TH | TH | TH |
| Share of primary data | 16,969% GWP-GHG | | | - | - | - | - | - | - | - | - | - | - | - | - | - | |
| Variation – products | <10% | | | | | | | | | | | | | | | | |
| Disclaimer | The share of specific/primary data and both variations (products and sites) refer to GWP-GHG results only. | | | | | | | | | | | | | | | | |

X = declared module; ND = module not declared; TH = Thailand

| Process | Source type | Source | Reference year | Data category | Share of primary data, of GWP-GHG results for A1-A3 |
|---|---|---|---|---|---|
| Manufacturing of product | Collected data | EPD Owner | 2024 | Primary data | 0,153% |
| Generation of electricity used in manufacturing of product | Database | Ecoinvent v. 3.10 | 2023 | Primary data | 1,731% |
| Transport of Inputs | Database | Ecoinvent v. 3.10 | 2023 | Primary data | 3,625% |
| Production of raw materials | Database | Ecoinvent v. 3.10 | 2022-2023 | Secondary data | 0,000% |
| Production of HRC | Collected data | EPD Owner | 2024 | Primary data | 11,460% |
| Total share of primary data, of GWP-GHG results for A1-A3 | | | | | 16,969% |

*Note: The share of primary data is calculated based on GWP-GHG results. It is a simplified indicator for data quality that supports the use of more primary data, to increase the representativeness of and comparability between EPDs. Note that the indicator does not capture all relevant aspects of data quality and is not comparable across product categories.*

# ENVIRONMENTAL PERFORMANCE

## LCA results of the product(s) - main environmental performance results

### Mandatory impact category indicators according to EN 15804

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **C1** | **C2** | **C3** | **C4** | **D** |
| GWP-total | kg $CO_2$ eq. | 2,3E+03 | 3,6E-01 | 1,6E+01 | 4,5E+00 | 2,7E-02 | -6,6E+02 |
| GWP-fossil | kg $CO_2$ eq. | 2,3E+03 | 3,6E-01 | 1,6E+01 | 4,5E+00 | 2,7E-02 | -6,6E+02 |
| GWP-biogenic | kg $CO_2$ eq. | 9,6E-01 | 2,2E-05 | 2,7E-03 | 5,7E-04 | 1,6E-06 | -1,4E+00 |
| GWP-luluc | kg $CO_2$ eq. | 7,9E-01 | 1,9E-05 | 6,2E-03 | 2,3E-04 | 1,4E-06 | -3,1E-01 |
| ODP | kg CFC 11 eq. | 1,7E-05 | 4,8E-09 | 2,2E-07 | 8,6E-08 | 3,5E-10 | -2,3E-06 |
| AP | mol H+ eq. | 9,8E+00 | 2,1E-03 | 5,2E-02 | 2,1E-02 | 1,5E-04 | -2,5E+00 |
| EP-freshwater | kg P eq. | 8,0E-01 | 4,3E-06 | 1,2E-03 | 1,1E-03 | 3,1E-07 | -3,2E-01 |
| EP-marine | kg N eq. | 2,5E+00 | 8,3E-04 | 1,7E-02 | 7,8E-03 | 6,0E-05 | -8,3E-01 |
| EP-terrestrial | mol N eq. | 2,6E+01 | 9,0E-03 | 1,8E-01 | 8,3E-02 | 6,6E-04 | -6,2E+00 |
| POCP | kg NMVOC eq. | 8,5E+00 | 2,8E-03 | 7,3E-02 | 2,6E-02 | 2,0E-04 | -1,9E+00 |
| ADP-minerals&metals* | kg Sb eq. | 4,5E-03 | 6,0E-08 | 5,0E-05 | 1,1E-06 | 4,4E-09 | -2,0E-03 |
| ADP-fossil* | MJ | 2,4E+04 | 4,7E+00 | 2,2E+02 | 6,0E+01 | 3,4E-01 | -6,3E+03 |
| WDP* | $m^3$ depriv. | 4,8E+02 | 4,4E-03 | 9,9E-01 | 2,2E-01 | 3,2E-04 | -3,4E+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 | | | | | | |

**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.*
**The results of the end-of-life stage (modules C1-C4) should be considered when using the results of the product stage (modules A1-A3).*

## Additional mandatory and voluntary impact category indicators

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **C1** | **C2** | **C3** | **C4** | **D** |
| GWP-GHG* | kg $CO_2$ eq. | 2,3E+03 | 3,6E-01 | 1,6E+01 | 4,5E+00 | 2,7E-02 | -6,6E+02 |
| Particulate matter | disease inc. | 1,9E-04 | 3,0E-08 | 1,2E-06 | 2,5E-07 | 2,2E-09 | -8,4E-05 |
| Ionising radiation** | kBq U-235 eq. | 4,0E+01 | 1,0E-03 | 1,8E-01 | 1,1E-02 | 7,5E-05 | -1,1E+01 |
| Ecotoxicity (freshwater)*** | CTUe | 6,1E+04 | 3,2E-01 | 5,8E+01 | 5,9E+00 | 2,3E-02 | -2,0E+04 |
| Human toxicity, cancer effect*** | CTUh | 1,7E-04 | 3,3E-10 | 8,1E-08 | 3,9E-09 | 2,4E-11 | -3,6E-05 |
| Human toxicity, non-cancer effects*** | CTUh | 3,1E-05 | 3,9E-10 | 1,4E-07 | 9,6E-09 | 2,8E-11 | -4,5E-06 |
| Land use related impacts/Soil quality*** | Pt | 5,9E+03 | 3,1E-01 | 1,3E+02 | 3,2E+00 | 2,3E-02 | -2,1E+03 |

**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.*

***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.*

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

## Resource use indicators

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **C1** | **C2** | **C3** | **C4** | **D** |
| PERE | MJ | 8,8E+02 | 1,3E-02 | 2,8E+00 | 1,6E-01 | 9,3E-04 | -2,6E+02 |
| PERM | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| PERT | MJ | 8,8E+02 | 1,3E-02 | 2,8E+00 | 1,6E-01 | 9,3E-04 | -2,6E+02 |
| PENRE | MJ | 2,4E+04 | 4,7E+00 | 2,2E+02 | 6,0E+01 | 3,4E-01 | -6,3E+03 |
| PENRM | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| PENRT | MJ | 2,4E+04 | 4,7E+00 | 2,2E+02 | 6,0E+01 | 3,4E-01 | -6,3E+03 |
| SM | kg | 1,1E+02 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| RSF | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| NRSF | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| FW | $m^3$ | 1,4E+01 | 1,3E-04 | 2,9E-02 | 4,0E-03 | 9,8E-06 | -1,2E+01 |
| 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 | | | | | | |

*Note: The primary energy use indicators were calculated in accordance with Annex 3, Option A of PCR 2019:14 – Construction Products (version 2.0.1), consistent with the methodology applied in the LCA report.*

## Waste indicators

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **C1** | **C2** | **C3** | **C4** | **D** |
| Hazardous waste disposed | kg | 5,7E-01 | 3,9E-05 | 5,5E-03 | 1,1E-03 | 2,9E-06 | -2,8E-01 |
| Non-hazardous waste disposed | kg | 2,1E+02 | 1,7E-03 | 1,0E+01 | 9,7E-02 | 5,0E+01 | -1,6E+02 |
| Radioactive waste disposed | kg | 9,7E-03 | 2,5E-07 | 4,4E-05 | 2,6E-06 | 1,8E-08 | -2,7E-03 |

## Output flow indicators

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **A1-A3** | **C1** | **C2** | **C3** | **C4** | **D** |
| Components for re-use | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Material for recycling | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 9,5E+02 | 0,0E+00 | 0,0E+00 |
| Materials for energy recovery | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Exported energy, electricity | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Exported energy, thermal | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |

# Additional LCA results of the product

This section provides results for alternate end-of-life scenarios.

## Mandatory impact category indicators according to EN 15804 for 100% Recycling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| GWP-total | kg $CO_2$ eq. | 3,6E-01 | 1,6E+01 | 4,7E+00 | 0,0E+00 | -7,0E+02 |
| GWP-fossil | kg $CO_2$ eq. | 3,6E-01 | 1,6E+01 | 4,7E+00 | 0,0E+00 | -6,9E+02 |
| GWP-biogenic | kg $CO_2$ eq. | 2,2E-05 | 2,7E-03 | 5,7E-04 | 0,0E+00 | -1,5E+00 |
| GWP-luluc | kg $CO_2$ eq. | 1,9E-05 | 6,2E-03 | 2,3E-04 | 0,0E+00 | -3,3E-01 |
| ODP | kg CFC 11 eq. | 4,8E-09 | 2,2E-07 | 8,8E-08 | 0,0E+00 | -2,4E-06 |
| AP | mol H+ eq. | 2,1E-03 | 5,2E-02 | 2,2E-02 | 0,0E+00 | -2,6E+00 |
| EP-freshwater | kg P eq. | 4,3E-06 | 1,2E-03 | 1,1E-03 | 0,0E+00 | -3,4E-01 |
| EP-marine | kg N eq. | 8,3E-04 | 1,7E-02 | 8,1E-03 | 0,0E+00 | -8,8E-01 |
| EP-terrestrial | mol N eq. | 9,0E-03 | 1,8E-01 | 8,5E-02 | 0,0E+00 | -6,6E+00 |
| POCP | kg NMVOC eq. | 2,8E-03 | 7,3E-02 | 2,7E-02 | 0,0E+00 | -2,0E+00 |
| ADP-minerals&metals* | kg Sb eq. | 6,0E-08 | 5,0E-05 | 1,1E-06 | 0,0E+00 | -2,1E-03 |
| ADP-fossil* | MJ | 4,7E+00 | 2,2E+02 | 6,2E+01 | 0,0E+00 | -6,7E+03 |

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| WDP* | $m^3$ depriv. | 4,4E-03 | 9,9E-01 | 2,2E-01 | 0,0E+00 | -3,6E+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 | | | | | |

## Additional mandatory and voluntary impact category indicators for 100% Recycling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| GWP-GHG* | kg $CO_2$ eq. | 3,6E-01 | 1,6E+01 | 4,7E+00 | 0,0E+00 | -7,0E+02 |
| Particulate matter | disease inc. | 3,0E-08 | 1,2E-06 | 2,6E-07 | 0,0E+00 | -8,9E-05 |
| Ionising radiation** | kBq U-235 eq. | 1,0E-03 | 1,8E-01 | 1,2E-02 | 0,0E+00 | -1,2E+01 |
| Ecotoxicity (freshwater)*** | CTUe | 3,2E-01 | 5,8E+01 | 6,0E+00 | 0,0E+00 | -2,2E+04 |
| Human toxicity, cancer effect*** | CTUh | 3,3E-10 | 8,1E-08 | 4,0E-09 | 0,0E+00 | -3,8E-05 |
| Human toxicity, non-cancer effects*** | CTUh | 3,9E-10 | 1,4E-07 | 9,7E-09 | 0,0E+00 | -4,7E-06 |
| Land use related impacts/Soil quality*** | Pt | 3,1E-01 | 1,3E+02 | 3,3E+00 | 0,0E+00 | -2,2E+03 |

## Resource use indicators for 100% Recycling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| PERE | MJ | 1,3E-02 | 2,8E+00 | 1,7E-01 | 0,0E+00 | -2,8E+02 |
| PERM | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| PERT | MJ | 1,3E-02 | 2,8E+00 | 1,7E-01 | 0,0E+00 | -2,8E+02 |
| PENRE | MJ | 4,7E+00 | 2,2E+02 | 6,2E+01 | 0,0E+00 | -6,7E+03 |
| PENRM | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| PENRT | MJ | 4,7E+00 | 2,2E+02 | 6,2E+01 | 0,0E+00 | -6,7E+03 |
| SM | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| RSF | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| NRSF | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| FW | $m^3$ | 1,3E-04 | 2,9E-02 | 4,0E-03 | 0,0E+00 | -1,3E+01 |
| 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 | | | | | |

*Note: The primary energy use indicators were calculated in accordance with Annex 3, Option A of PCR 2019:14 – Construction Products (version 2.0.1), consistent with the methodology applied in the LCA report.*

## Waste indicators for 100% Recycling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| Hazardous waste disposed | kg | 3,9E-05 | 5,5E-03 | 1,1E-03 | 0,0E+00 | -3,0E-01 |
| Non-hazardous waste disposed | kg | 1,7E-03 | 1,0E+01 | 9,8E-02 | 0,0E+00 | -1,7E+02 |
| Radioactive waste disposed | kg | 2,5E-07 | 4,4E-05 | 2,6E-06 | 0,0E+00 | -2,9E-03 |

## Output flow indicators for 100% Recycling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| Components for re-use | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Material for recycling | kg | 0,0E+00 | 0,0E+00 | 1,0E+03 | 0,0E+00 | 0,0E+00 |
| Materials for energy recovery | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Exported energy, electricity | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Exported energy, thermal | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |

## Mandatory impact category indicators according to EN 15804 for 100% Landfilling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| GWP-total | kg $CO_2$ eq. | 3,6E-01 | 1,6E+01 | 0,0E+00 | 5,3E-01 | 8,5E+01 |
| GWP-fossil | kg $CO_2$ eq. | 3,6E-01 | 1,6E+01 | 0,0E+00 | 5,3E-01 | 8,5E+01 |
| GWP-biogenic | kg $CO_2$ eq. | 2,2E-05 | 2,7E-03 | 0,0E+00 | 3,2E-05 | 1,8E-01 |
| GWP-luluc | kg $CO_2$ eq. | 1,9E-05 | 6,2E-03 | 0,0E+00 | 2,8E-05 | 2,3E-01 |
| ODP | kg CFC 11 eq. | 4,8E-09 | 2,2E-07 | 0,0E+00 | 7,0E-09 | 2,9E-07 |
| AP | mol H+ eq. | 2,1E-03 | 5,2E-02 | 0,0E+00 | 3,0E-03 | 3,2E-01 |
| EP-freshwater | kg P eq. | 4,3E-06 | 1,2E-03 | 0,0E+00 | 6,3E-06 | 4,2E-02 |
| EP-marine | kg N eq. | 8,3E-04 | 1,7E-02 | 0,0E+00 | 1,2E-03 | 1,1E-01 |
| EP-terrestrial | mol N eq. | 9,0E-03 | 1,8E-01 | 0,0E+00 | 1,3E-02 | 8,1E-01 |
| POCP | kg NMVOC eq. | 2,8E-03 | 7,3E-02 | 0,0E+00 | 4,0E-03 | 2,5E-01 |
| ADP-minerals&metals* | kg Sb eq. | 6,0E-08 | 5,0E-05 | 0,0E+00 | 8,7E-08 | 2,5E-04 |
| ADP-fossil* | MJ | 4,7E+00 | 2,2E+02 | 0,0E+00 | 6,9E+00 | 8,2E+02 |
| WDP* | $m^3$ depriv. | 4,4E-03 | 9,9E-01 | 0,0E+00 | 6,5E-03 | 4,4E+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 | | | | | |

## Additional mandatory and voluntary impact category indicators for 100% Landfilling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| GWP-GHG* | kg $CO_2$ eq. | 3,6E-01 | 1,6E+01 | 0,0E+00 | 5,3E-01 | 8,5E+01 |
| Particulate matter | disease inc. | 3,0E-08 | 1,2E-06 | 0,0E+00 | 4,4E-08 | 1,1E-05 |
| Ionising radiation** | kBq U-235 eq. | 1,0E-03 | 1,8E-01 | 0,0E+00 | 1,5E-03 | 1,4E+00 |
| Ecotoxicity (freshwater)*** | CTUe | 3,2E-01 | 5,8E+01 | 0,0E+00 | 4,6E-01 | 2,6E+03 |
| Human toxicity, cancer effect*** | CTUh | 3,3E-10 | 8,1E-08 | 0,0E+00 | 4,8E-10 | 4,6E-06 |
| Human toxicity, non-cancer effects*** | CTUh | 3,9E-10 | 1,4E-07 | 0,0E+00 | 5,7E-10 | 5,8E-07 |
| Land use related impacts/Soil quality*** | Pt | 3,1E-01 | 1,3E+02 | 0,0E+00 | 4,5E-01 | 2,7E+02 |

## Resource use indicators for 100% Landfilling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| PERE | MJ | 1,3E-02 | 2,8E+00 | 0,0E+00 | 1,9E-02 | 3,4E+01 |
| PERM | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| PERT | MJ | 1,3E-02 | 2,8E+00 | 0,0E+00 | 1,9E-02 | 3,4E+01 |
| PENRE | MJ | 4,7E+00 | 2,2E+02 | 0,0E+00 | 6,9E+00 | 8,2E+02 |
| PENRM | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| PENRT | MJ | 4,7E+00 | 2,2E+02 | 0,0E+00 | 6,9E+00 | 8,2E+02 |
| SM | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| RSF | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| NRSF | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| FW | $m^3$ | 1,3E-04 | 2,9E-02 | 0,0E+00 | 2,0E-04 | 1,6E+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 | | | | | |

*Note: The primary energy use indicators were calculated in accordance with Annex 3, Option A of PCR 2019:14 – Construction Products (version 2.0.1), consistent with the methodology applied in the LCA report.*

## Waste indicators for 100% Landfilling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| Hazardous waste disposed | kg | 3,9E-05 | 5,5E-03 | 0,0E+00 | 5,8E-05 | 3,7E-02 |
| Non-hazardous waste disposed | kg | 1,7E-03 | 1,0E+01 | 0,0E+00 | 1,0E+03 | 2,1E+01 |
| Radioactive waste disposed | kg | 2,5E-07 | 4,4E-05 | 0,0E+00 | 3,6E-07 | 3,5E-04 |

## Output flow indicators for 100% Landfilling

| Results per 1 Tonne of Steel pipes (Hollow Steel Sections) | | | | | | |
|---|---|---|---|---|---|---|
| **Indicator** | **Unit** | **C1** | **C2** | **C3** | **C4** | **D** |
| Components for re-use | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Material for recycling | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Materials for energy recovery | kg | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Exported energy, electricity | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |
| Exported energy, thermal | MJ | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 | 0,0E+00 |

# ABBREVIATIONS

| Abbreviation | Definition |
|---|---|
| **General Abbreviations** | |
| EN | European Norm (Standard) |
| EF | Environmental Footprint |
| GPI | General Programme Instructions |
| ISO | International Organization for Standardization |
| CEN | European Committee for Standardization |
| CLC | Co-location centre |
| CPC | Central product classification |
| GHS | Globally harmonized system of classification and labelling of chemicals |
| GRI | Global Reporting Initiative |
| SVHC | Substances of Very High Concern |
| ND | Not Declared |
| GWP-total | Global Warming Potential total |
| GWP-fossil | Global Warming Potential fossil |
| GWP-biogenic | Global Warming Potential biogenic |
| GWP-luluc | Global Warming Potential land use and land use change |
| ODP | Ozone Depletion Potential |
| AP | Acidification Potential |
| 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 photochemical oxidants |
| ADP | Abiotic depletion potential |
| AWARE | Water use by Available WAter REmaining |
| PERE | Use of renewable primary energy excluding 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 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 |
| HWD | Hazardous waste disposed |
| NHWD | Non-hazardous waste disposed |
| RWD | Radioactive waste disposed |
| CRU | Components for re-use |
| MFR | Materials for recycling |
| MER | Materials for energy recovery |
| EEE | Exported electrical energy |
| EET | Exported thermal energy |

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# VERSION HISTORY

**Version 1, 2026-11-23**

- Original Version of the EPD

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