



**Alliance Steel (M) Sdn. Bhd.**  
**联合钢铁 (大马) 集团公司**

**Alliance Steel (M) Sdn. Bhd.**



## ENVIRONMENTAL PRODUCT DECLARATION

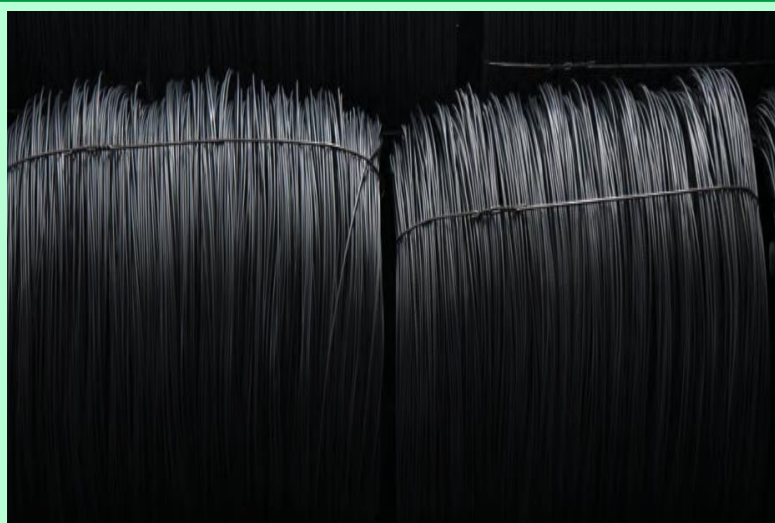
### Wire Rods

Jalan Gebeng By PASS, 26080  
Kawasan Industrial Malaysia-China Kuantan,  
Kuantan, Pahang, Malaysia

In accordance with ISO 14025 and EN 15804:2012+A2:2019

|                  |          |
|------------------|----------|
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|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EPD OWNER</b>                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Name of the company</b>                                                                                                                  | Alliance Steel (M) Sdn. Bhd. (ASSB)                                                                                                                                                                                                                                                                                                                                |
| <b>Registered office</b>                                                                                                                    | Jalan Gebeng By PASS, 26080<br>Kawasan Industrial Malaysia-China Kuantan,<br>Kuantan, Pahang, Malaysia                                                                                                                                                                                                                                                             |
| <b>Contacts for information on the EPD</b>                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                    |
| <b>PROGRAM OPERATOR</b>                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                    |
| <b>EPDItaly</b>                                                                                                                             | Via Gaetano De Castillia n° 10 - 20124 Milano, Italy                                                                                                                                                                                                                                                                                                               |
| <b>INFORMATION ON THE EPD</b>                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Product name (s)</b>                                                                                                                     | Wire Rods                                                                                                                                                                                                                                                                                                                                                          |
| <b>Site (s)</b>                                                                                                                             | Jalan Gebeng By PASS, 26080<br>Kawasan Industrial Malaysia-China Kuantan,<br>Kuantan, Pahang, Malaysia                                                                                                                                                                                                                                                             |
| <b>Short description and technical information of the product (s)</b>                                                                       | Wire rods are produced by rolling steel billets in a wire rod mill. The main production process includes coking, sintering, pelletizing, blast furnace, converter, refining, continuous casting, and hot rolling.                                                                                                                                                  |
| <b>Field of application of the product (s)</b>                                                                                              | Wire rods are used to manufacture nails, screws, bolts, and wire mesh for reinforcing concrete structures, as well as to produce wire ropes and cables for bridges, elevators, and cranes. They play a crucial role in the construction, power, mechanical manufacturing, and automotive industries.                                                               |
| <b>Product (s) reference standards (if any)</b>                                                                                             | MS ISO 16120-2:2020                                                                                                                                                                                                                                                                                                                                                |
| <b>CPC Code (number)</b><br><a href="https://unstats.un.org/unsd/classifications/Econ">https://unstats.un.org/unsd/classifications/Econ</a> | UN CPC 4124                                                                                                                                                                                                                                                                                                                                                        |
| <b>VERIFICATION INFORMATION</b>                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                    |
| <b>PCR (title, version, date of publication or update)</b>                                                                                  | CEN standard EN 15804 serves as the Core Product Category Rules (PCR)<br>PCR for Construction products: ICMQ-001/15 rev 3.2 (according to EN 15804+A2). Publication at 03/11/2025                                                                                                                                                                                  |
| <b>EPDItaly Regulation (version, date of publication or update)</b>                                                                         | EPDItaly Regulations Rev 6.0<br>Issue date: 30/10/2023                                                                                                                                                                                                                                                                                                             |
| <b>Project Report LCA</b>                                                                                                                   | Life cycle assessment of wire rod products for ASSB<br>Ver. 1.0<br>Submit date: 16/06/2025                                                                                                                                                                                                                                                                         |
| <b>Independent Verification Statement</b>                                                                                                   | The PCR review was performed by ICMQ S.p.A. - info@epditaly.it.<br>Independent verification of the declaration and data, carried out according to ISO 14025: 2010.<br>Internal <input checked="" type="checkbox"/> External<br>Third party verification carried out by: ICMQ S.p.A., via Gaetano De Castillia n ° 10 - 20124 Milan, Italy. Accredited by Accredia. |
| <b>Comparability Statement</b>                                                                                                              | Environmental statements published within the same product category, but from different programs, may not be comparable.                                                                                                                                                                                                                                           |

|                            |                                                                                                                                                                                                                                                                                                                                         |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                            | In particular, EPDs of construction products may not be comparable if they do not comply with EN 15804: 2012 + A2: 2019.                                                                                                                                                                                                                |
| <b>Liability Statement</b> | <p>The EPD Owner releases EPDIItaly from any non-compliance with environmental legislation. The holder of the declaration will be responsible for the information and supporting evidence.</p> <p>EPDIItaly disclaims any responsibility for the information, data and results provided by the EPD Owner for life cycle assessment.</p> |

## COMPANY INFORMATION

|                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Description of the organisation:</b>      | <p>Founded in April 2014, Alliance Steel (M) Sdn. Bhd. is located in Kuantan, the capital of Pahang State and the biggest city of East Coast Economic Region, near to Kuantan Port, facing the South China Sea.</p> <p>Alliance Steel (M) Sdn. Bhd. is a private joint-stock foreign enterprise jointly invested by Fujian Wugang Group Co., Ltd. And Guangxi Shenglong Metallurgical Co., Ltd., This project is a key project and the first entrant in the Malaysia-China Kuantan Industrial Park, which was personally promoted by the leaders of China and Malaysia and jointly developed by the two governments. The main leaders of China and Malaysia personally participated in witnessing the signing ceremony of the project.</p> <p>ASSB is a multinational enterprise integrating production, processing, distribution, and trade. It is also the most technologically advanced steel enterprise in Malaysia, offering a full range of products and specifications. The first phase of the project involved a total investment of about 1.6 billion US dollars, covering an area of 710 acres, and with more than 4,100 employees. ASSB mainly produces high-speed wire rods, bar rods and H-beams, with a production capacity of 4.0 million tons.</p> |
| <b>Name and location of production site:</b> | <p>Jalan Gebeng By PASS, 26080</p> <p>Kawasan Industrial Malaysia-China Kuantan, Kuantan, Pahang, Malaysia</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## PRODUCT INFORMATION

|                                |                                                                                                                                                                                                                              |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Product name:</b>           | Wire Rods                                                                                                                                                                                                                    |
| <b>Product identification:</b> | Wire rod is produced by rolling steel billets in a wire rod mill. The main production process includes coking, sintering, pelletizing, blast furnace, converter, refining, continuous casting, and hot rolling.              |
| <b>Product features:</b>       | Wire rods are produced in various grades, including C12D, SAE1006, SAE1008, SAE1010, SAE1012, and others. They come with diameters ranging from 5.5 mm to 14 mm and weights between 2000 kg and 2100 kg per continuous coil. |
| <b>Product description:</b>    | Wire rods are produced by rolling steel billets in a wire rod mill and are typically cold drawn into wire for                                                                                                                |

further processing, such as cold rolling, cold heading, cold upsetting, cold extrusion, cold forging, or hot forging. They are used in the manufacture of nails, screws, bolts, and wire mesh for reinforcing concrete structures, as well as in the production of wire ropes and cables for bridges, elevators, and cranes. Wire rods play a crucial role in the construction, power, mechanical manufacturing, and automotive industries.

| Product composition information: |                 |
|----------------------------------|-----------------|
| Composition                      | Wire rods       |
| C                                | ≤ 0.08% - 0.25% |
| Si                               | ≤ 0.2%          |
| Mn                               | 0.25% - 1%      |
| P                                | ≤ 0.035%        |
| S                                | ≤ 0.035%        |

# GENERAL INFORMATION

## LCA information

**LCA report:** Life cycle assessment of wire rods products for ASSB Ver. 1.0

**Software:** Steel LCA Tool Ver. 1.4, August 28, 2025 - Qualified LCA Tool

**LCA practitioner:** Ling Zhang, E-c digital, zhangling@ecdigit.com; Yifei Wang, E-c digital, yangix@ecdigital.com.

**Declared unit:** 1 metric ton of wire rods product produced in Malaysia

**Time representativeness:** Primary data covers a period of 01.01.2024 to 31.12.2024, with all secondary data used <3 years difference to year of study.

**Type of EPD:** EPD of wire rods products, based on the average results of the product group.

**Description of system boundaries:** The system boundary of this LCA study covers the cradle to gate stage (A1 to A3) plus end-of-life (C1-C4) and benefits and loads beyond the system boundary (D), because other life cycle stages are dependent on scenarios and are better developed for specific building or construction works.

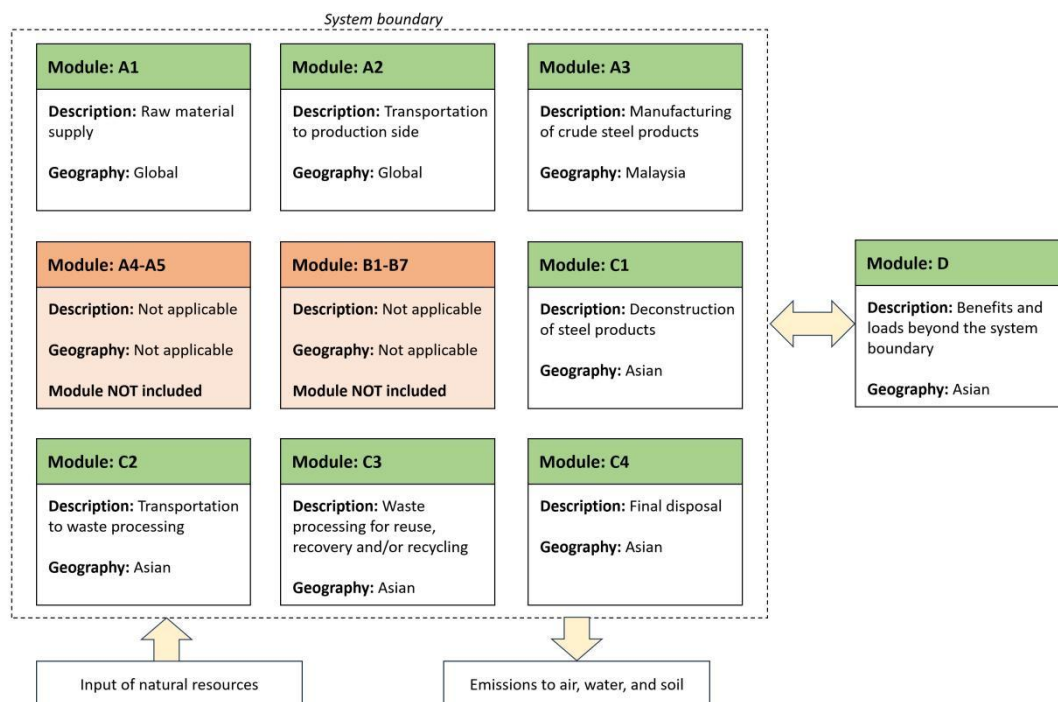


Figure 1: System boundary

## Product system description:

ASSB produce wire rods products for use in the construction industry. In this EPD, the system boundary was defined as cradle-to-gate (modules A1-A3) with options C1-C4 plus module D as described below and presented in the process flow in Figure 1 above:

- A1 raw materials supply: This stage includes the extraction or production of purchased raw materials (e.g., iron concentrate, pellet ore, iron ore), purchased energy (e.g., coal, coke), and auxiliary materials (e.g., limestone, alloys). The carbon footprint of purchased electricity (GWP100) is 0.843 kg CO<sub>2</sub>-eq/kWh.

- A2 transportation: All raw materials, including iron ore and limestone, are transported to the ASSB site via road and sea routes.
- A3 manufacturing: This stage encompasses the production processes within the ASSB production system, which is divided into the main production system and the energy production system. The main production system includes steel-making processes such as coking, sintering, pelletizing, blast furnace, converter, refining, continuous casting, and hot rolling. The energy production system covers processes like desalinated water production, self-generated power systems.
- C1-C4 end of life: At end of life, the building is deconstructed, with assumptions and scenario analysis outlined in Table 1. Scrap steel reinforcement mesh from demolition is sorted and waste processing in module C3 is modelled by background data “treatment of waste reinforcement steel, sorting plant” from Ecoinvent 3.10 database.

**Table 1: Scenario and additional technical information of end-of-life stage**

| Scenario | Parameter                                                              | Value | Unit |
|----------|------------------------------------------------------------------------|-------|------|
| C1       | Energy required for deconstruction, diesel                             | 24    | MJ   |
| C2       | Transport to waste processing by Truck                                 | 50    | km   |
| C3       | Background data: treatment of waste reinforcement steel, sorting plant | -     | -    |
| C4       | Waste for recycling - Recovered steel from crushed concrete            | 92    | %    |
|          | Waste for final disposal - sent to landfill                            | 8     | %    |

- D benefits and loads: Benefits and loads are assigned to the net scrap steel generated over the product lifecycle, calculated by the difference between end-of-life recycled scrap and scrap input in manufacturing. These are based on the recycling burdens and the benefits of avoided primary production.

#### Goal of study:

The goal of this study was to create an environmental profile for reporting in an EPD of the wire rods products, aimed at better understanding its life-cycle environmental impacts.

#### Intended use:

This LCA study enables ASSB to assess the relative environmental impact contributions of all processes within the product lifecycle. Consequently, it provides insights into the environmental impact distribution across the product system under investigation, helping to pinpoint critical areas where targeted mitigation measures can be implemented.

#### Allocation:

Allocation, as defined in EN 15804, involves dividing input or output flows between multiple product systems. In this study, allocation is minimized by subdividing processes and collecting specific data for each sub-process. Where process division is possible but data are unavailable, inputs and outputs are distributed to reflect the physical relationships between products, based on how inputs and outputs change with product quantity.

For joint co-production processes that cannot be subdivided, allocation reflects the primary purpose of the process. When co-products differ by  $\leq 25\%$  in revenue, allocation is based on physical properties (e.g., mass, volume); otherwise, economic value is used. Flows with inherent properties, such as energy content, are allocated according to physical flows regardless of economic considerations.

For ASSB's wire rods, co-products like blast furnace slag, liquid argon, and nitrogen, considered end-of-waste, are allocated using economic value from the Ecoinvent database and ASSB.

#### Cut-off criteria:

The exclusion of inputs and outputs followed these guidelines:

All available data for a unit process are included; any data gaps are conservatively estimated with average or generic data, with assumptions fully documented.

For incomplete data, per EN 15804, cut-off criteria allow for excluding up to 1% of renewable/non-renewable primary energy use and 1% of total mass per unit process. Neglected input flows per module (e.g., A1-A3, C1-C4, D) are limited to 5% of energy use and mass.

Particular care is taken to include materials or processes with potential significant emissions across declared LCIA categories.

#### Data Quality:

Data quality has been assessed and validated during data collection process.

Data quality requirements followed those of ISO 14040/44, EN 15804:2012+A2:2019 and PCR for Construction products: ICMQ-001/15 rev 3.2 (according to EN 15804+A2). To ensure the quality of data was sufficient data quality checks were completed on key data parameters by data quality indicators using a data quality matrix and assigning scores between 1 (best) and 5 (worst). The range of scores for primary and secondary data used in this study can be summarized as:

- Temporal representativeness: Excellent
- Technological representativeness: Very good
- Geographical representativeness: Very good
- Precision: Very good

#### Database(s) and LCA software used:

Secondary data are from the Ecoinvent v3.10, cut-off by classification. The LCA model was developed with "Steel LCA Tool" version 1.4 of 28.08.2025, developed by EC Digital and verified by ICMQ.

#### Life cycle impact assessment method (LCIA):

This study applies the EF 3.1 impact assessment methods. EF 3.1 characterization factors are considered to be the most robust and up-to-date available for the European context, are widely used and respected within the LCA community, and are required for Product Environmental Footprint studies and Environmental Product Declarations under EN 15804+A2.

**Table 2 Modules declared in the LCA research of wire rods products**

|                                                                    |                                                       |     |    |                                     |
|--------------------------------------------------------------------|-------------------------------------------------------|-----|----|-------------------------------------|
| Included modules in the life cycle assessment                      | Product Stage                                         | X   | A1 | Raw material supply                 |
|                                                                    |                                                       | X   | A2 | Transport                           |
|                                                                    |                                                       | X   | A3 | Manufacturing                       |
|                                                                    | Construction Stage                                    | MND | A4 | Transport from the gate to the site |
|                                                                    |                                                       | MND | A5 | Assembly                            |
|                                                                    | Use Stage                                             | MND | B1 | Use                                 |
|                                                                    |                                                       | MND | B2 | Maintenance                         |
|                                                                    |                                                       | MND | B3 | Repair                              |
|                                                                    |                                                       | MND | B4 | Replacement                         |
|                                                                    |                                                       | MND | B5 | Refurbishment                       |
|                                                                    |                                                       | MND | B6 | Operational energy use              |
|                                                                    |                                                       | MND | B7 | Operational water use               |
|                                                                    | End of Life Stage                                     | X   | C1 | De-construction demolition          |
|                                                                    |                                                       | X   | C2 | Transport                           |
|                                                                    |                                                       | X   | C3 | Waste processing                    |
|                                                                    |                                                       | X   | C4 | Disposal                            |
|                                                                    | Benefits and loads beyond the product system boundary | X   | D  | Reuse-Recovery-Recycling potential  |
| Note: X=Declared Module, MND=Module not Declared in this LCA study |                                                       |     |    |                                     |

# Environmental performance:

Table 3 Results of environmental impacts by stage (1 metric ton of wire rods products)

| Impact indicators | Unit                              | Product stage |           |           |           | De-constructi on demolition | Transport | Waste process | Disposal | Reuse-Recovery-Recycling potential |
|-------------------|-----------------------------------|---------------|-----------|-----------|-----------|-----------------------------|-----------|---------------|----------|------------------------------------|
|                   |                                   | A1            | A2        | A3        | A1:A3     | C1                          | C2        | C3            | C4       | D                                  |
| <i>GWP</i>        | kg CO <sub>2</sub> eq             | 2.94E+02      | 1.46E+02  | 1.40E+03  | 1.84E+03  | 2.41E+00                    | 9.59E+00  | 6.56E+01      | 5.01E-01 | -9.09E+02                          |
| <i>GWP, b</i>     | kg CO <sub>2</sub> eq             | -6.12E+00     | -2.95E-02 | -8.09E-02 | -6.23E+00 | 2.40E-04                    | 2.90E-05  | 9.38E-03      | 5.18E-05 | 4.62E+00                           |
| <i>GWP, f</i>     | kg CO <sub>2</sub> eq             | 2.99E+02      | 1.46E+02  | 1.40E+03  | 1.84E+03  | 2.40E+00                    | 9.58E+00  | 6.56E+01      | 5.00E-01 | -9.14E+02                          |
| <i>GWP, ghg</i>   | kg CO <sub>2</sub> eq             | 3.01E+02      | 1.46E+02  | 1.40E+03  | 1.84E+03  | 2.40E+00                    | 9.59E+00  | 6.56E+01      | 5.01E-01 | -9.11E+02                          |
| <i>GWP, luluc</i> | kg CO <sub>2</sub> eq             | 7.56E-01      | 7.46E-02  | 9.45E-02  | 9.25E-01  | 2.09E-04                    | 3.90E-03  | 9.19E-03      | 2.60E-04 | 1.00E+00                           |
| <i>ODP</i>        | kg CFC-11 eq                      | 3.58E-06      | 2.16E-06  | 3.72E-07  | 6.12E-06  | 3.66E-08                    | 1.40E-07  | 9.70E-07      | 1.43E-08 | 1.59E-06                           |
| <i>AE, a</i>      | mol H <sup>+</sup> eq             | 1.65E+00      | 3.55E+00  | 9.40E-02  | 5.29E+00  | 2.17E-02                    | 2.20E-02  | 5.81E-01      | 3.54E-03 | -3.12E+00                          |
| <i>P</i>          | kg P eq                           | 6.36E-01      | 6.40E-03  | 3.07E-03  | 6.45E-01  | 7.00E-05                    | 7.57E-04  | 3.09E-03      | 4.15E-05 | -2.73E-01                          |
| <i>N</i>          | kg N eq                           | 5.05E-01      | 8.91E-01  | 2.26E-02  | 1.42E+00  | 1.01E-02                    | 5.10E-03  | 2.66E-01      | 1.35E-03 | -7.01E-01                          |
| <i>AE, t</i>      | mol N eq                          | 4.45E+00      | 9.89E+00  | 2.25E-01  | 1.46E+01  | 1.10E-01                    | 5.50E-02  | 2.91E+00      | 1.47E-02 | -9.15E+00                          |
| <i>POCP</i>       | kg NMVO C eq                      | 1.29E+00      | 2.73E+00  | 1.47E-01  | 4.16E+00  | 3.29E-02                    | 3.07E-02  | 8.66E-01      | 5.28E-03 | -2.72E+00                          |
| <i>ADP, e</i>     | kg Sb eq                          | 4.39E-04      | 1.94E-04  | 1.04E-04  | 7.37E-04  | 8.62E-07                    | 3.20E-05  | 3.84E-05      | 7.94E-07 | -8.86E-03                          |
| <i>ADP, f</i>     | MJ, net calorific value           | 1.36E+04      | 1.85E+03  | 1.46E+02  | 1.56E+04  | 3.15E+01                    | 1.35E+02  | 8.57E+02      | 1.23E+01 | -7.85E+03                          |
| <i>WDP</i>        | m <sup>3</sup> world eq. deprived | 6.79E+01      | 6.31E+00  | 4.00E+02  | 4.75E+02  | 7.70E-02                    | 6.12E-01  | 2.63E+00      | 3.43E-02 | -2.08E+02                          |
| <i>PM</i>         | Disease incidence                 | 5.99E-05      | 6.42E-06  | 1.32E-05  | 7.95E-05  | 6.16E-07                    | 7.13E-07  | 1.62E-05      | 8.06E-08 | -8.18E-05                          |
| <i>IRP</i>        | kBq U235 eq                       | 7.69E+00      | 1.23E+00  | 4.77E-01  | 9.39E+00  | 1.41E-02                    | 1.12E-01  | 7.42E-01      | 7.82E-03 | -1.91E+01                          |
| <i>CTUe</i>       | CTUe                              | 8.20E+03      | 3.60E+02  | 2.44E+02  | 8.81E+03  | 4.46E+00                    | 3.62E+01  | 1.25E+02      | 1.68E+00 | -3.30E+04                          |
| <i>CTUh, c</i>    | CTUh                              | 1.68E-05      | 6.90E-07  | 8.95E-08  | 1.75E-05  | 9.39E-09                    | 5.04E-08  | 2.51E-07      | 2.25E-09 | -1.08E-04                          |
| <i>CTUh, nc</i>   | CTUh                              | 2.08E-06      | 6.32E-07  | 1.18E-06  | 3.89E-06  | 4.27E-09                    | 8.69E-08  | 1.38E-07      | 2.20E-09 | -1.38E-05                          |
| <i>SQP</i>        | dimensionless                     | 2.87E+03      | 5.02E+02  | 5.04E+01  | 3.42E+03  | 2.20E+00                    | 8.15E+01  | 7.88E+01      | 2.41E+01 | -3.28E+03                          |

Acronyms

|               |                                                             |               |                                                                         |
|---------------|-------------------------------------------------------------|---------------|-------------------------------------------------------------------------|
| <i>GWP</i>    | Climate change: global warming potential, total (GWP100)    | <i>POCP</i>   | Formation potential of tropospheric ozone                               |
| <i>GWP, f</i> | Climate change: global warming potential, fossil (GWP100)   | <i>ADP, e</i> | Abiotic depletion potential for non-fossil resources: minerals & metals |
| <i>GWP, b</i> | Climate change: global warming potential, biogenic (GWP100) | <i>ADP, f</i> | Abiotic depletion potential for fossil resources                        |

|                   |                                                                                                    |                 |                                                                            |
|-------------------|----------------------------------------------------------------------------------------------------|-----------------|----------------------------------------------------------------------------|
| <i>GWP, luluc</i> | Climate change: land use and land use change-global warming potential (GWP100)                     | <i>WDP</i>      | Water (user) deprivation potential, deprivation-weighted water consumption |
| <i>GWP, gbg</i>   | Climate change: global warming potential, excluding biogenic uptake, emission and storage (GWP100) | <i>PM</i>       | Potential incidence of disease due to PM emissions                         |
| <i>ODP</i>        | Ozone depletion potential                                                                          | <i>IRP</i>      | Ionizing radiation, potential human exposure efficiency relative to U235   |
| <i>AE, a</i>      | Acidification potential, Accumulate Exceedance                                                     | <i>CTUb</i>     | Potential comparative toxic unit for ecosystems: fresh water               |
| <i>P</i>          | Eutrophication potential, fraction of nutrients reaching freshwater end compartment                | <i>CTUb, c</i>  | Potential comparative toxic unit for humans: cancer effects                |
| <i>N</i>          | Eutrophication potential, fraction of nutrients reaching marine end compartment                    | <i>CTUb, nc</i> | Potential comparative toxic unit for humans: non-cancer effects            |
| <i>AE, t</i>      | Eutrophication potential, Accumulate Exceedance                                                    | <i>SQP</i>      | Land use related impacts: potential soil quality index                     |

\*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.

\*\*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 unclear 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.

**Table 4 Results of resource use by stage (1 metric ton wire rods products)**

| Impact indicator s | Unit           | Product stage |          |          |          | De-constructi on demolitio n | Transport | Waste process | Disposal | Reuse-Recovery-Recycling potential |
|--------------------|----------------|---------------|----------|----------|----------|------------------------------|-----------|---------------|----------|------------------------------------|
|                    |                | A1            | A2       | A3       | A1:A3    | C1                           | C2        | C3            | C4       | D                                  |
| <i>PERE</i>        | MJ             | 3.25E+02      | 1.88E+01 | 1.43E+01 | 3.58E+02 | 1.92E-01                     | 1.79E+00  | 1.00E+01      | 1.14E-01 | -8.61E+02                          |
| <i>PERM</i>        | 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 | 0.00E+00                           |
| <i>PERT</i>        | MJ             | 3.25E+02      | 1.88E+01 | 1.43E+01 | 3.58E+02 | 1.92E-01                     | 1.79E+00  | 1.00E+01      | 1.14E-01 | -8.61E+02                          |
| <i>PENRE</i>       | MJ             | 1.36E+04      | 1.85E+03 | 1.46E+02 | 1.56E+04 | 3.15E+01                     | 1.35E+02  | 8.57E+02      | 1.23E+01 | -7.85E+03                          |
| <i>PENRM</i>       | 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 | 0.00E+00                           |
| <i>PENRT</i>       | MJ             | 1.36E+04      | 1.85E+03 | 1.46E+02 | 1.56E+04 | 3.15E+01                     | 1.35E+02  | 8.57E+02      | 1.23E+01 | -7.85E+03                          |
| <i>SM</i>          | kg             | 0.00E+00      | 0.00E+00 | 3.85E+02 | 3.85E+02 | 0.00E+00                     | 0.00E+00  | 0.00E+00      | 0.00E+00 | 0.00E+00                           |
| <i>RSF</i>         | 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 | 0.00E+00                           |
| <i>NRSF</i>        | 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 | 0.00E+00                           |
| <i>FW</i>          | m <sup>3</sup> | 0.00E+00      | 0.00E+00 | 2.90E+00 | 2.90E+00 | 0.00E+00                     | 0.00E+00  | 0.00E+00      | 0.00E+00 | 0.00E+00                           |

#### Acronyms

|              |                                                                                                            |              |                                                     |
|--------------|------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------|
| <i>PERE</i>  | Use of renewable primary energy excluding renewable primary energy resources used as raw materials         | <i>PENRT</i> | Total use of non-renewable primary energy resources |
| <i>PERM</i>  | Use of renewable primary energy resources used as raw materials                                            | <i>SM</i>    | Use of secondary raw materials                      |
| <i>PERT</i>  | Total use of renewable primary energy resources                                                            | <i>RSF</i>   | Use of renewable secondary fuels                    |
| <i>PENR</i>  | Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials | <i>NRSF</i>  | Use of non-renewable secondary fuels                |
| <i>PENRM</i> | Use of non-renewable primary energy resources used as raw materials                                        | <i>FW</i>    | Use of net fresh water                              |

Table 5 Results of output flows and waste categories by stage (1 metric ton wire rods products)

| Impact indicators | Unit | Product stage |          |          |          | De-constructi on demolition | Transport | Waste processin g | Disposal | Reuse-Recovery-Recycling potential |
|-------------------|------|---------------|----------|----------|----------|-----------------------------|-----------|-------------------|----------|------------------------------------|
|                   |      | A1            | A2       | A3       | A1:A3    | C1                          | C2        | C3                | C4       | D                                  |
| <i>HWD</i>        | kg   | 1.00E+02      | 2.77E+00 | 8.20E-01 | 1.04E+02 | 3.51E-02                    | 2.38E-01  | 1.16E+00          | 1.36E-02 | -3.62E+02                          |
| <i>NHWD</i>       | kg   | 3.19E+03      | 4.18E+01 | 1.76E+01 | 3.25E+03 | 4.80E-01                    | 4.46E+00  | 9.86E+01          | 8.03E+01 | 4.93E+03                           |
| <i>RWD</i>        | kg   | 1.87E-03      | 3.00E-04 | 1.21E-04 | 2.29E-03 | 3.45E-06                    | 2.74E-05  | 1.82E-04          | 1.91E-06 | -4.73E-03                          |
| <i>CRU</i>        | 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 | 0.00E+00                           |
| <i>MFR</i>        | kg   | 0.00E+00      | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00                    | 0.00E+00  | 9.20E+02          | 0.00E+00 | 0.00E+00                           |
| <i>MER</i>        | 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 | 0.00E+00                           |
| <i>EEE</i>        | 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 | 0.00E+00                           |
| <i>EEH</i>        | 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 | 0.00E+00                           |

Acronyms

|             |                              |            |                               |
|-------------|------------------------------|------------|-------------------------------|
| <i>HWD</i>  | Hazardous waste disposed     | <i>MFR</i> | Materials for recycling       |
| <i>NHWD</i> | Non-hazardous waste disposed | <i>MER</i> | Materials for energy recovery |
| <i>RWD</i>  | Radioactive waste disposed   | <i>EEE</i> | Exported energy, electricity  |
| <i>CRU</i>  | Components for re-use        | <i>EEH</i> | Exported energy, heat         |

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