

# ENVIRONMENTAL PRODUCT DECLARATION

as per ISO 14025 and EN 15804+A2

|                          |                                      |
|--------------------------|--------------------------------------|
| Owner of the Declaration | JSW Steel Italy Piombino             |
| Publisher                | Institut Bauen und Umwelt e.V. (IBU) |
| Programme holder         | Institut Bauen und Umwelt e.V. (IBU) |
| Declaration number       | EPD-JSW-20240097-IBA1-EN             |
| Issue date               | 18.04.2024                           |
| Valid to                 | 17.04.2029                           |

**JSW steel rail**

**JSW Steel Italy Piombino S.p.A.**

[www.ibu-epd.com](http://www.ibu-epd.com) | <https://epd-online.com>



## 1. General Information

### JSW Steel Italy Piombino S.p.A.

#### Programme holder

IBU – Institut Bauen und Umwelt e.V.  
Hegelplatz 1  
10117 Berlin  
Germany

#### Declaration number

EPD-JSW-20240097-IBA1-EN

#### This declaration is based on the product category rules:

Rails forming a track for vehicles, 01.08.2021  
(PCR checked and approved by the SVR)

#### Issue date

18.04.2024

#### Valid to

17.04.2029



Dipl.-Ing. Hans Peters  
(Chairman of Institut Bauen und Umwelt e.V.)



Florian Pronold  
(Managing Director Institut Bauen und Umwelt e.V.)

### JSW steel rail

#### Owner of the declaration

JSW Steel Italy Piombino  
Largo Caduti sul Lavoro 21  
57025 Piombino  
Italy

#### Declared product / declared unit

1 ton of steel rail

#### Scope:

The EPD declaration refers to 1 tonne of rail product manufactured at the JSW Steel Italy plant in Piombino (Italy).  
The data used is based on one year's manufacturing of product 60 E1. This product has been identified as representative of JSW Steel Italy's total production for the year 2022 which also includes the following products: 50E5, 60E2, 54E2, 54E1, 60E1A2 and 115RE2010  
For this EPD, LCA model created by the bloom supplier (JSW Steel Limited) in order to realise the EPD *Average of Finished Long Products (Steel)* was used for the bloom production phase.

The owner of the declaration shall be liable for the underlying information and evidence; the IBU shall not be liable with respect to manufacturer information, life cycle assessment data and evidences.

The EPD was created according to the specifications of EN 15804+A2. In the following, the standard will be simplified as *EN 15804*.

#### Verification

|                                                                                  |            |                                     |            |
|----------------------------------------------------------------------------------|------------|-------------------------------------|------------|
| The standard EN 15804 serves as the core PCR                                     |            |                                     |            |
| Independent verification of the declaration and data according to ISO 14025:2011 |            |                                     |            |
| <input type="checkbox"/>                                                         | internally | <input checked="" type="checkbox"/> | externally |



Vito D'Incognito,  
(Independent verifier)

## 2. Product

### 2.1 Product description/Product definition

In the railway sector, JSW Steel Italy Piombino manufactures rails, switch and crossing rails and check rails at its Piombino plant, in different grades and sections according to the main international and European standards or according to customer specifications, in lengths between 4 and 108 m. The manufacturing of joints is not included in this study. For the placing on the market in the European Union/European Free Trade Association (EU/EFTA) (with the exception of Switzerland) the following legal provisions apply:

- *Directive (EU) 2016/797* of the European Parliament and of the Council of 11 May 2016 on the interoperability of the rail system within the European Union
- *Commission regulation 1299/2014* of 18th November 2014 concerning a technical specification for interoperability relating to the infrastructure subsystem of the rail system in the European Union,
- *Commission Implementing Regulations (EU) 2019/776* and *(EU) 2020/387*

For the use and application of the product the respective national provisions at the place of use, apply.

### 2.2 Application

In the railway sector, JSW Steel Italy Piombino products are mainly for use in:

- High-speed lines
- Mixed railway lines (passenger and freight)
- Urban public transport (subways and trams)
- Railways switches

### 2.3 Technical Data

The technical specifications of the products within the scope of the EPD are reported in the following main standards:

- *EN 13674 – 1*
- *EN 13674 – 2*
- *EN 13674 – 3*
- *EN 13674 – 4*
- *UIC 860.O*
- *BS 11*
- *AREMA*
- *Customer specifications*

#### Constructional data for representative product

| Name                                                  | Value       | Unit                |
|-------------------------------------------------------|-------------|---------------------|
| Density                                               | 7850        | kg/m <sup>3</sup>   |
| Tensile strength                                      | > 880       | N/mm <sup>2</sup>   |
| Grade of material according to the delivery standards | R260        | -                   |
| Hardness                                              | > 260       | HBV                 |
| Elongation                                            | > 10        | %                   |
| Lineal Thermal Expansion Coefficient (LTEC)           | 11.5 - 12.0 | 10 <sup>-6</sup> °C |

Performance data of the product with respect to its characteristics are in accordance with the relevant technical provision (no CE-marking).

### 2.4 Delivery status

JSW Steel Italy Piombino rails are supplied in as-rolled conditions, in the following linear weight range:

- rails: 27 - 70 kg/m
- tongue bars: 50 - 70 kg/m

Rails can be cut according to customer requirements. Max supplied length: 108m

### 2.5 Base materials/Ancillary materials

The starting material for rail production in Piombino consists of 100 % casting blooms of square and rectangular cross-sections. Chemical composition is in accordance with the standards indicated in chapter 2.3.

- This product contains substances listed in the *candidate list* exceeding 0.1 percentage by mass: NO
- This product/article/at least one partial article contains other carcinogenic, utagenic, reprotoxic (CMR) substances in categories 1A or 1B which are not on the *candidate list*, exceeding 0.1 percentage by mass: NO'
- Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) *Ordinance on Biocide Products No. 528/2012*): NO

### 2.6 Manufacture

The source material for the production of rails at Piombino are long semi-finished products of square and rectangular cross-sections that the site supplies from JSW group steel mills. The blooms are produced with ore coming from proprietary mines. The production cycle uses only internally sourced scrap and involves degassing and continuous casting. For more information regarding bloom production, please refer to the *EPD Average of Finished Long Products (Steel) by JSW Steel Limited*.

Blooms arrive in Piombino by ship and are transported to the rolling plant for subsequent use as feed in the production of rails. The rolling mill is equipped with a walking beam furnace, a roughing stand, two reversible stands, a finishing stand and a still-air cooling plate. The standard length produced is 108m. Long rails, previously straightened and subjected to quality controls (NDT checks: eddy current, US and visual testing), are then transported by internal rail link to the Service Centre (CSE) for cutting to size and possible drilling according to customer specifications, before being placed in the warehouse and subsequent shipment.

### 2.7 Environment and health during manufacturing

Piombino plant is certified in accordance with the following standards:

- *ISO 9001*
- *ISO 14001*
- *ISO 45001*
- *ISO 50001*

and performs periodic internal and third-party audits to ensure compliance with its Management System procedures. A monitoring and control plan is applied to verify compliance with the level of emissions required by current regulations. The company promotes an approach based on minimizing consumption and environmental impacts by applying the PDCA method.

### 2.8 Product processing/Installation

Rails produced in Piombino are usually processed directly by customers at the installation site.

### 2.9 Packaging

The rails are usually supplied loose and secured for transport by means of cranes equipped with a dedicated gripping device called 'Rail Grip'. Contact damage is avoided by the use of spacing timber.

### 2.10 Condition of use

The composition of the rails does not change during the life cycle.

Inspection and maintenance operations of rails in use are carried out by customers in accordance with their experience and relevant international Standards.

### 2.11 Environment and health during use

No health or environmental impacts are recorded during the life cycle of the rails.

### 2.12 Reference service life

This EPD does not cover modules B1-B7. A reference service life for rails is not declared.

### 2.13 Extraordinary effects

#### Fire

Rails aren't flammable without the release of flammable gasses or fumes during use.

#### Water

No environmental impact is expected due to the unforeseeable influence of water, e.g. flooding.

### Mechanical destruction

No environmental impact is expected due to unforeseeable mechanical destruction.

### 2.14 Re-use phase

Rails are 100 % steel, which is totally recyclable as a raw material in the steelmaking process. In fact, steel undergoes no degradation during the production cycle and can therefore be recycled countless times.

### 2.15 Disposal

The declared product can be entirely recycled as an EoW or waste. The waste Code in accordance with the *European Waste Catalogue (EWC)* is 17 04 05.

### 2.16 Further information

Other information about the declared product are available on the JSW Steel Italy Piombino website at <https://www.jswitaly.com/>

## 3. LCA: Calculation rules

### 3.1 Declared Unit

This environmental product declaration refers to a declared unit of 1 ton of representative JSW Steel Italy rail in accordance with the PCR "Rails forming a track for vehicles", 01/08/2021. The declaration type is according to EN 15804+A2: Cradle to gate (A1-A3) with modules C1–C4 and module D.

#### Declared unit and mass reference

| Name          | Value | Unit              |
|---------------|-------|-------------------|
| Declared unit | 1     | t                 |
| Density       | 7850  | kg/m <sup>3</sup> |

Other declared units are allowed if the conversion is shown transparently.

This EPD covers all types of rails produced by JSW Steel Italy in 2022. The calculation were performed based on the manufacturing data of the 60E1 rails which were identified as representative for the whole production, since they account for 83 % of 2022 annual production. The products covered by this EPD are: 60E1 (grade R260), 50E5 (grade R260), 60E2 (grade R260), 54E2 (grade R260), 54E1 (grade R260/R260Mn), 60E1A2 and 115R2010 (grade Arema low Alloy). The representativeness of the data considered for all JSW Steel Italy products was analysed by means of a sensitivity analysis.

### 3.2 System boundary

This life cycle assessment refers to a cradle-to-gate analysis with options. The following life cycle phases are taken into consideration in the analysis:

#### Module A1-A3| Product stage

The product stage includes provision of all materials, products, auxiliaries and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the product stage.

These modules consider the manufacturing of raw materials in particular steel bloom, the transport to the production site and the production processes of the product under study.

#### Module C1 | Dismantling

The rail dismantling takes place in the C1 module which considers energy production and consumption in terms of diesel and all the emissions connected with the fuel-burning process.

#### Module C2| Transport to the processing/disposal site

After the dismantling, the rail is transported to the end-of-life processing where all the impacts related to the transport processes are considered.

#### Module C3| Waste processing

Product flows that reach Module D for recycling leave the product system in C3.

#### Module C4| Disposal

There is no disposal (C4) as the considered End-of-Life scenario is 100 % recycling.

#### Module D| Benefits and loads beyond the system boundaries

The potential for substituting primary steel with a recycling scenario (100 % of the product) is set forth in Module D. The 100 % recycling scenario is based on the fact that the product still retains an important economic value at its end of life, so that it can be sold externally.

### 3.3 Estimates and assumptions

The blooms under consideration come from 2 separate plants:

- JSW Steels, Salem, Tamil Nadu (plant on which the EPD *Average of Finished Long Products (Steel)* is based)
- JSW Steel Limited, Raigarh Works (Formerly known as Monnet Ispat&Energy Ltd), Naharpali, Dist Raigarh, Chhattishgarh

For the production of virgin material in A1, only the data provided by the supplier was used, assuming that the production impact of the JSW Steel Limited, Raigarh Works (corresponding to 1 % of the blooms supplied to JSW Italy) was the same as that of JSW Steels, Salem, Tamil Nadu (corresponding to 99 % of the blooms supplied to JSW Italy). All assumptions are explained through detailed documentation and correspond to the best possible representation of reality on the basis of the available data.

### 3.4 Cut-off criteria

No cut-offs were applied in the study.

### 3.5 Background data

Data from the Managed LCA Content (GaBi database 2023.2) was used as background data.

### 3.6 Data quality

The foreground data collected at JSW Steel Italy Piombino are based on the volumes consumed and produced annually. All primary data refers to rail manufacturing were collected by JSW Steel Italy Piombino and refer to the production year 2022. In selecting the background data, the technological, geographical and temporal representativeness of the database was analysed. In the absence of specific data, generic datasets or representative average data were used. The overall quality of the data is considered good. In order to assess the representativeness of this EPD for all rails produced by JSW Steel Italy Piombino, an analysis of variance was carried out, which showed a minimal variation in results between the different products.

### 3.7 Period under review

Foreground data were collected in the 2022 production year.

### 3.8 Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product's

lifespan: Global

### 3.9 Allocation

The data collected for 2022 rails production was allocated by mass on the production of 60E1 rails. To understand the allocations made by the bloom producer who provided the primary data (JSW steel limited), please refer to the EPD *Average of Finished Long Products (Steel)*. During the LCA modelling, no allocations were performed. Information about the allocation procedure of single datasets is documented in <https://sphera.com/product-sustainability-gabi-data-search/>.

### 3.10 Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to *EN 15804* and the building context, respectively the product-specific characteristics of performance, are taken into account. The *Managed LCA Content (GaBi database 2023.2)* has been used.

## 4. LCA: Scenarios and additional technical information

### Characteristic product properties of biogenic carbon

No biogenic carbon is contained in the product concerned.

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO<sub>2</sub>.

### Information on describing the biogenic carbon content at factory gate

| Name                                              | Value | Unit |
|---------------------------------------------------|-------|------|
| Biogenic carbon content in product                | -     | kg C |
| Biogenic carbon content in accompanying packaging | -     | kg C |

### End of life (C1 - C4)

According to EN 15804+A2 it is requested to declare 100 % End-of-Life scenarios (here considered: 100 % recycling).

| Name            | Value | Unit |
|-----------------|-------|------|
| Collected waste | 1000  | kg   |
| Recycling       | 1000  | kg   |

### Reuse, recovery and/or recycling potentials (D), relevant scenario information

| Name                    | Value | Unit |
|-------------------------|-------|------|
| Net flow of steel scrap | 1000  | kg   |

## 5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE OR INDICATOR NOT DECLARED; MNR = MODULE NOT RELEVANT)

| Product stage       |           |               | Construction process stage          |          | Use stage |             |        |             |               |                        |                       | End of life stage          |           |                  |          | Benefits and loads beyond the system boundaries |
|---------------------|-----------|---------------|-------------------------------------|----------|-----------|-------------|--------|-------------|---------------|------------------------|-----------------------|----------------------------|-----------|------------------|----------|-------------------------------------------------|
| Raw material supply | Transport | Manufacturing | Transport from the gate to the site | Assembly | Use       | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | De-construction demolition | Transport | Waste processing | Disposal | Reuse-Recovery-Recycling-potential              |
| A1                  | A2        | A3            | A4                                  | A5       | B1        | B2          | B3     | B4          | B5            | B6                     | B7                    | C1                         | C2        | C3               | C4       | D                                               |
| X                   | X         | X             | MND                                 | MND      | MND       | MND         | MNR    | MNR         | MNR           | MND                    | MND                   | X                          | X         | X                | X        | X                                               |

### RESULTS OF THE LCA - ENVIRONMENTAL IMPACT according to EN 15804+A2: 1 t of steel rail

| Parameter      | Unit                             | A1       | A2       | A3       | C1       | C2       | C3 | C4 | D         |
|----------------|----------------------------------|----------|----------|----------|----------|----------|----|----|-----------|
| GWP-total      | kg CO <sub>2</sub> eq            | 2.7E+03  | 1.52E+02 | 1.27E+02 | 6.38E-01 | 1.16E+01 | 0  | 0  | -2.1E+03  |
| GWP-fossil     | kg CO <sub>2</sub> eq            | 2.7E+03  | 1.5E+02  | 1.27E+02 | 6.1E-01  | 1.11E+01 | 0  | 0  | -2.1E+03  |
| GWP-biogenic   | kg CO <sub>2</sub> eq            | 3.38E-01 | 1.73E+00 | 2.29E-01 | 2.79E-02 | 5.04E-01 | 0  | 0  | 1.27E+00  |
| GWP-luluc      | kg CO <sub>2</sub> eq            | 5.15E-01 | 2.15E-03 | 1.79E-02 | 6.14E-05 | 1.13E-03 | 0  | 0  | -7.63E-01 |
| ODP            | kg CFC11 eq                      | 5.81E-06 | 3.25E-12 | 4.59E-11 | 6.83E-14 | 1.26E-12 | 0  | 0  | 2.62E-09  |
| AP             | mol H <sup>+</sup> eq            | 2.61E+01 | 2.51E+00 | 6.06E-02 | 3.06E-03 | 5.69E-02 | 0  | 0  | -3.55E+00 |
| EP-freshwater  | kg P eq                          | 3.41E-04 | 2.32E-05 | 9.32E-05 | 1.48E-07 | 2.73E-06 | 0  | 0  | -7.35E-04 |
| EP-marine      | kg N eq                          | 4.2E+00  | 1.06E+00 | 1.21E-01 | 1.45E-03 | 2.77E-02 | 0  | 0  | -8.64E-01 |
| EP-terrestrial | mol N eq                         | 4.6E+01  | 1.17E+01 | 3.07E-01 | 1.59E-02 | 3.05E-01 | 0  | 0  | -9.3E+00  |
| POCP           | kg NMVOC eq                      | 1.22E+01 | 2.8E+00  | 7.38E-02 | 4.1E-03  | 5.49E-02 | 0  | 0  | -2.92E+00 |
| ADPE           | kg Sb eq                         | 1.9E-05  | 7.81E-07 | 3.39E-05 | 8E-09    | 1.48E-07 | 0  | 0  | -3.57E-05 |
| ADPF           | MJ                               | 3.81E+04 | 2E+03    | 1.07E+02 | 8.74E+00 | 1.61E+02 | 0  | 0  | -1.36E+04 |
| WDP            | m <sup>3</sup> world eq deprived | 9.37E+01 | 1.92E-01 | 6.92E+01 | 1.5E-03  | 2.77E-02 | 0  | 0  | -7.75E+01 |

GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential of tropospheric ozone photochemical oxidants; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources; WDP = Water (user) deprivation potential)

### RESULTS OF THE LCA - INDICATORS TO DESCRIBE RESOURCE USE according to EN 15804+A2: 1 t of steel rail

| Parameter | Unit           | A1       | A2       | A3       | C1       | C2       | C3 | C4 | D         |
|-----------|----------------|----------|----------|----------|----------|----------|----|----|-----------|
| PERE      | MJ             | 1.14E+03 | 2.7E+00  | 2.77E+01 | 5.82E-02 | 1.07E+00 | 0  | 0  | 1.51E+03  |
| PERM      | MJ             | 0        | 0        | 0        | 0        | 0        | 0  | 0  | 0         |
| PERT      | MJ             | 1.14E+03 | 2.7E+00  | 2.77E+01 | 5.82E-02 | 1.07E+00 | 0  | 0  | 1.51E+03  |
| PENRE     | MJ             | 3.81E+04 | 2E+03    | 1.07E+02 | 8.79E+00 | 1.62E+02 | 0  | 0  | -1.37E+04 |
| PENRM     | MJ             | 0        | 0        | 0        | 0        | 0        | 0  | 0  | 0         |
| PENRT     | MJ             | 3.81E+04 | 2E+03    | 1.07E+02 | 8.79E+00 | 1.62E+02 | 0  | 0  | -1.37E+04 |
| SM        | kg             | 0        | 0        | 0        | 0        | 0        | 0  | 0  | 1E+03     |
| RSF       | MJ             | 2.97E-06 | 0        | 0        | 0        | 0        | 0  | 0  | 0         |
| NRSF      | MJ             | 4.51E-05 | 0        | 0        | 0        | 0        | 0  | 0  | 0         |
| FW        | m <sup>3</sup> | 2.5E+00  | 6.32E-03 | 1.56E+00 | 8.16E-05 | 1.51E-03 | 0  | 0  | -5.36E-01 |

PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

### RESULTS OF THE LCA - WASTE CATEGORIES AND OUTPUT FLOWS according to EN 15804+A2: 1 t of steel rail

| Parameter | Unit | A1       | A2       | A3       | C1       | C2       | C3 | C4 | D        |
|-----------|------|----------|----------|----------|----------|----------|----|----|----------|
| HWD       | kg   | 1.66E-05 | 7.62E-11 | 2.94E-07 | 1.5E-11  | 2.76E-10 | 0  | 0  | 1.31E-07 |
| NHWD      | kg   | 1.83E+01 | 2.93E-02 | 1.11E+00 | 8.14E-04 | 1.5E-02  | 0  | 0  | -3.4E+01 |
| RWD       | kg   | 1.54E-01 | 2.65E-04 | 2.21E-03 | 1.4E-05  | 2.58E-04 | 0  | 0  | 4.8E-01  |
| CRU       | kg   | 0        | 0        | 0        | 0        | 0        | 0  | 0  | 0        |
| MFR       | kg   | 0        | 0        | 3.26E+01 | 0        | 0        | 0  | 0  | 1E+03    |
| MER       | kg   | 0        | 0        | 0        | 0        | 0        | 0  | 0  | 0        |
| EEE       | MJ   | 0        | 0        | 0        | 0        | 0        | 0  | 0  | 0        |
| EET       | MJ   | 0        | 0        | 0        | 0        | 0        | 0  | 0  | 0        |

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

## RESULTS OF THE LCA – additional impact categories according to EN 15804+A2-optional:

1 t of steel rail

| Parameter | Unit              | A1 | A2 | A3 | C1 | C2 | C3 | C4 | D  |
|-----------|-------------------|----|----|----|----|----|----|----|----|
| PM        | Disease incidence | ND | ND | ND | ND | ND | ND | ND | ND |
| IR        | kBq U235 eq       | ND | ND | ND | ND | ND | ND | ND | ND |
| ETP-fw    | CTUe              | ND | ND | ND | ND | ND | ND | ND | ND |
| HTP-c     | CTUh              | ND | ND | ND | ND | ND | ND | ND | ND |
| HTP-nc    | CTUh              | ND | ND | ND | ND | ND | ND | ND | ND |
| SQP       | SQP               | ND | ND | ND | ND | ND | ND | ND | ND |

PM = Potential incidence of disease due to PM emissions; IR = Potential Human exposure efficiency relative to U235; ETP-fw = Potential comparative Toxic Unit for ecosystems; HTP-c = Potential comparative Toxic Unit for humans (cancerogenic); HTP-nc = Potential comparative Toxic Unit for humans (not cancerogenic); SQP = Potential soil quality index

Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. 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 or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

## 6. LCA: Interpretation

The major contributor to all impact categories is steel production (module A1), accounting for more than 55 % of the impacts in each category. Module A1 alone contributes to 90 % of Global Warming Potential (GWP) indicator, while the whole upstream phase (A1-A2) generates almost the entire impact (95 %). Energy is the second contributor to GWP, accounting for almost 8 % of the total, mainly due to the natural gas used during rail production. Module A2 has a relative impact on marine and terrestrial eutrophication indicators and for the POCP, while module A3 (manufacturing) impacts mainly freshwater eutrophication indicators and the WDP, due mainly to the water consumption and emissions into water that occur during the manufacturing process. The higher impact of the manufacturing process on these categories is mainly driven by the production of auxiliary materials (19 % of EP-freshwater

indicator and 38 % of WDP) and energy consumption, including both electricity and natural gas production (15 % of EP-freshwater indicator and 6 % of WDP).

End-of-life modules have negligible impacts in almost all categories; the main contribution is derived from waste transportation (Module C2). Conversely, Module D has a considerable value when compared to the other indicators. In fact, for total GWP and EP freshwater, the credits from the steel recycling process reach more than -30 % in terms of relative impacts. Not in all indicators, however, is a credit associated with module D. For the ODP, an impact, although minimal, is associated with module D since the steel recycling process has a greater impact than the production process from raw materials.

## 7. Requisite evidence

Not relevant for this EPD.

## 8. References

### Standards

#### AREMA 2022

Chapter 4 Rail. Manual for Railway Engineering

#### BS 11 : 1985

Specification for Railway Rails

#### EN 13674-1:2011+A1:2017

Railway applications – Track – Rail – Part 1: Vignole railway rails 46 kg/m and above

#### EN 13674-2:2020

Railway applications – Track – Rail – Part 2: Switch and crossing rails used in conjunction with Vignole railway rails 46 kg/m and above

#### EN 13674-3:2006+A1:2010

Railway applications – Track – Rail – Part 3: Check rails

#### EN 13674-4 (edizione Aprile 2019)

Railway applications - Track - Rail - Part 4: Vignole railway rails from 27 kg/m to, but excluding 46 kg/

#### EN 15804+A2

EN 15804:2012+A2:2019+AC:2021, Sustainability of construction works — Environmental Product Declarations — Core rules for the product category of construction products.

#### ISO 14001

ISO 14001:2015. Environmental management systems - Requirements with guidance for use

#### ISO 14025

EN ISO 14025:2011, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

#### ISO 45001

ISO 45001: 2018 Occupational health and safety management systems -- Requirements with guidance for use

**ISO 50001**

ISO 50001: 2018, Energy management systems - Requirements with guidance for use

**ISO 9001**

ISO 9001:2015 Quality management systems- Requirements

**UIC 860.O**

Technical specification for the supply of rail. 9th edition, January 2008

**Further References****Candidate list**

Candidate List of substances of very high concern for Authorisation published by the European Chemicals Agency in accordance with Article 59(10) of the REACH Regulation.

**CPR**

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**EU Biocidal Products Regulation (No. 528/2012)**

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**IBU 2021**

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