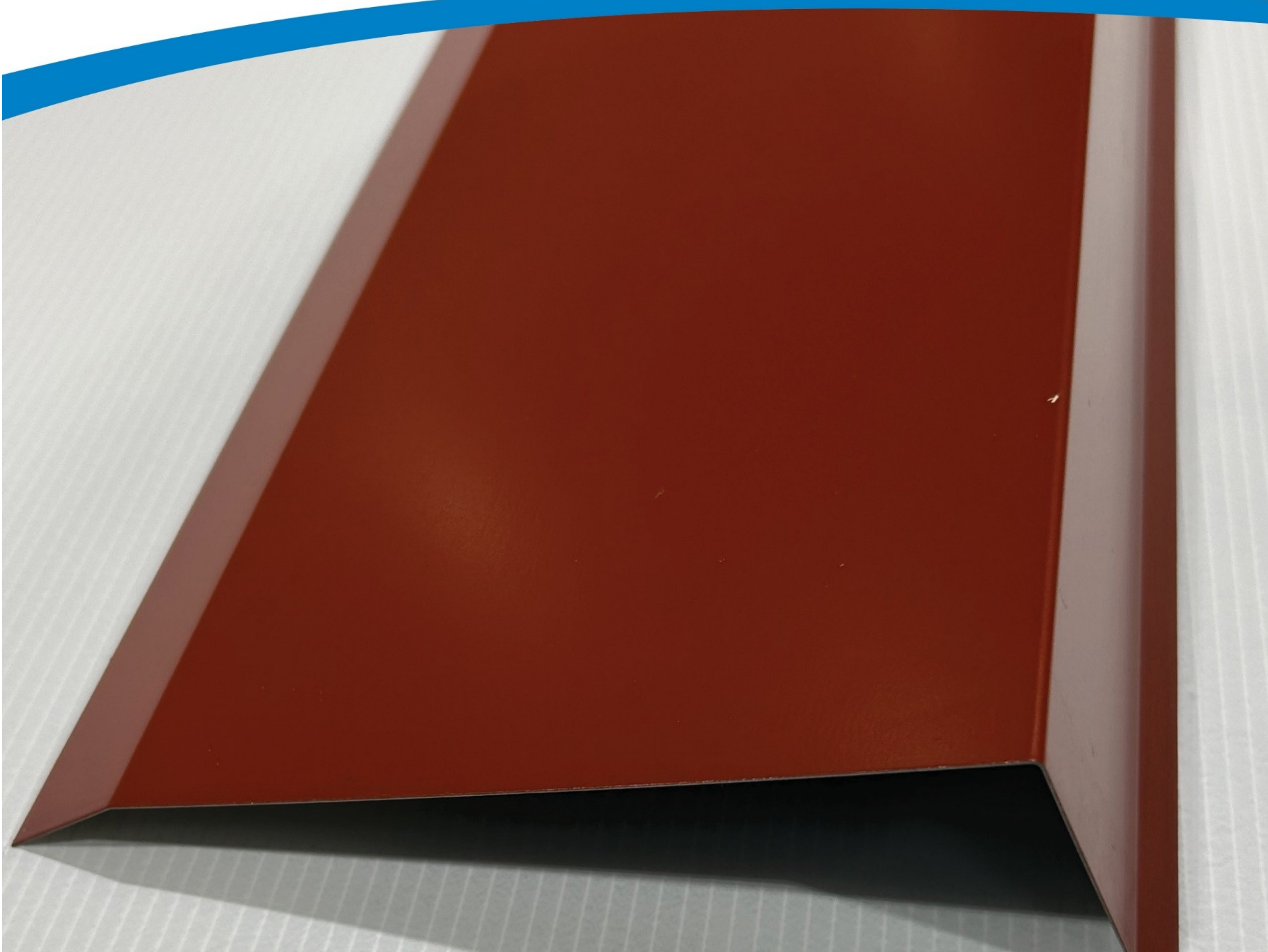
# Tata Steel Norway Byggsystemer AS flat steel sheets with Colorcoat®

## Environmental Product Declaration



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Tata Steel Norway Byggsystemer AS flat sheets with Colorcoat Prisma® or Colorcoat® PE25
Environmental Product Declaration
(in accordance with ISO 14025 and EN 15804)

This EPD is representative and valid for the specified (named) product


Declaration Number: EPD-TS-2026-025
Issue date: 28th May 2026
Valid until: 30th July 2030


Owner of the Declaration: Tata Steel Norway Byggsystemer AS
Programme Operator: Tata Steel UK Limited, 18 Grosvenor Place, London, SW1X 7HS

The CEN standard EN 15804:2012+A2:2019 serves as the core Product Category Rules (PCR) supported by Tata Steel's EN 15804 verified EPD PCR documents

Independent verification of the declaration and data, according to ISO 14025

Internal ☐ External ☒

Author of the Life Cycle Assessment: Tata Steel UK
Third party verifier: Chris Foster, Eugeos Ltd.

# 1 General information

| | |
|---|---|
| Owner of EPD | Tata Steel Norway Byggsystemer AS |
| Product & module | Flat steel sheets with Colorcoat Prisma® or Colorcoat® PE25 |
| Manufacturer | Tata Steel Norway Byggsystemer AS |
| Manufacturing sites | Skien, Shotton, Llanwern and Port Talbot |
| Product applications | Construction |
| Declared unit | 1kg of flat steel sheets |
| Date of issue | 28th May 2026 |
| Valid until | 30th July 2030 |

This Environmental Product Declaration (EPD) is for Tata Steel Norway Byggsystemer's flat steel sheets manufactured by Tata Steel in Norway, using Colorcoat Prisma®, Colorcoat® PE25, Colorcoat® SDP50 or Colorcoat HPS200 Ultra®, pre-finished steel. The environmental indicators are for products manufactured at Skien in Norway, with feedstock supplied from Shotton, UK.

The information in the Environmental Product Declaration is based on production data from 2021, 2022, and 2023.

EN 15804 serves as the core PCR, supported by Tata Steel's EN 15804 verified EPD programme Product Category Rules documents, and the LCA model supporting this declaration has been independently verified according to ISO 14025 [1,2,3,4,5,6,7].

Third party verifier

Chris Foster, Eugeos Ltd, Suite 11, The Old Fuel Depot,

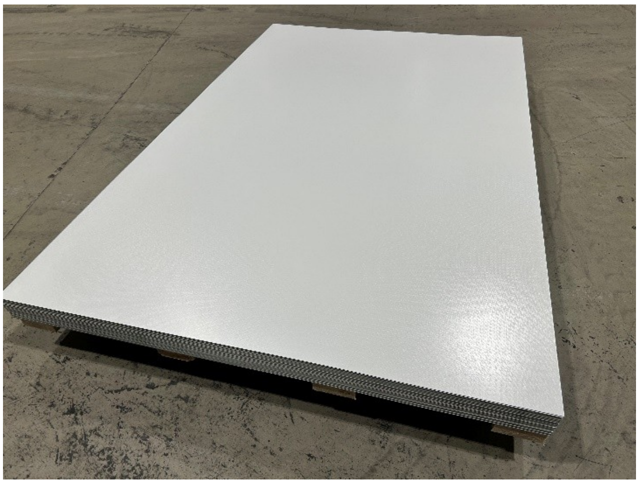
Twemlow Lane, Twemlow, CW4 8GJ, UK

# 2 Product information

## 2.1 Product description

Tata Steel Norway Byggsystemer AS produce flat sheets, cut and packed in 250m$^2$ packages. The primary application of these sheets is for the tinsmith market, where they are mainly cut and shaped for flashings. The sheets are available in gauges of either 0.5mm or 0.6mm, and at a width of 1250mm. They are produced in standard lengths of 2.0m, 2.5m and 3.0m, although bespoke lengths (and quantities) can be ordered. The steel grade is S280 and the coil coating is either Colorcoat Prisma® or Colorcoat® PE25, Colorcoat® SDP50 or Colorcoat HPS200 Ultra®.

**Figure 1 Colorcoat® flat steel sheets**



## 2.2 Manufacturing

The manufacturing sites included in the EPD are listed in Table 1 below.

**Table 1 Participating sites**

| Site name | Product | Manufacturer | Country |
|---|---|---|---|
| **Port Talbot** | Hot rolled coil | Tata Steel | UK |
| **Port Talbot** | Cold rolled coil | Tata Steel | UK |
| **Llanwern** | Cold rolled coil | Tata Steel | UK |
| **Shotton** | Metallic coated coil | Tata Steel | UK |
| **Shotton** | Organic coated coil | Tata Steel | UK |
| **Skien** | Flat steel sheets | Tata Steel | NO |

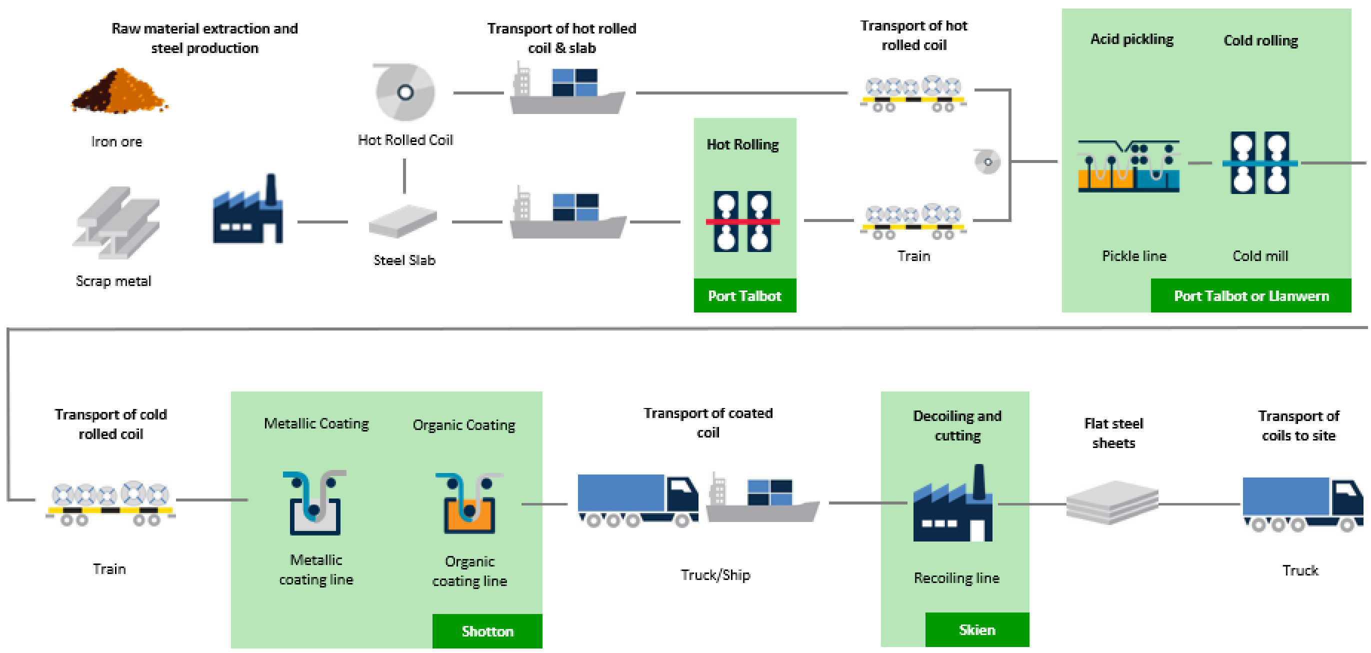
The process of steel coil manufacture begins with sinter being produced from iron ore and limestone, and together with coke from coal, reduced in a blast furnace to produce iron. Steel scrap is then added to the liquid iron and oxygen is blown through the mixture to convert it into liquid steel in the basic oxygen furnace. The liquid steel is continuously cast into discrete slabs, which can be reheated and rolled in a hot strip mill to produce steel coil.

Tata Steel UK purchases high quality steel slabs and hot rolled coils from our own sister plants as well as external partners, which are transported to Port Talbot by ship, rail, and road. The purchased slabs are reheated and rolled in the Port Talbot hot strip mill. The hot rolled coils are then cold rolled and pickled, either in Port Talbot, or transported by rail, from Port Talbot to Llanwern where they are pickled and cold rolled.

Pre-finished steel comprises a number of paint layers and treatments which are applied to the steel in an automated and carefully controlled process with each layer of the product having a particular function. It is the combined effect of all these layers that give the product its overall performance and ensures a material that is robust and offers the specifier a choice of colour and effect. During the organic coating process for Colorcoat®, a zinc based metallic coating is first applied to the steel coil. A pre-treatment is applied and then a primer before adding the final top coat layer(s) in the form of liquid paint. This topcoat is applied on the top surface only, while the reverse or back side of the strip is produced with a high performing backing coat. These are cured at elevated temperatures before being recoiled.

The coated coils are transported to the manufacturing facility at Skien in Norway by road and roll-on-roll-off ferry, to be decoiled and cut into suitable sizes on a dedicated process line. An overview of the process from raw materials to production of the flat steel sheets, is shown in Figure 2.

**Figure 2 Process overview from raw materials to flat steel sheets**




Process data for the manufacture of hot and cold rolled coil at Port Talbot and cold rolled coil at Llanwern were gathered as part of the latest worldsteel data collection. For Port Talbot and Llanwern, and the metallic and organic coating at Shotton, the data collection was not only organised by site, but also by each process line within the site. In this way it was possible to attribute resource use and emissions to each process line, and using processed tonnage data for that line, also attribute resources and emissions to specific products. Site wide data was also collected from the manufacturing site at Skien.

## 2.3 Technical data and specifications

The general properties of the flat sheet are shown in Table 2, the technical specifications and certifications for the coatings are presented in Table 3.

**Table 2 General characteristics and specification of flat steel sheets**

| | Norway Byggsystemer AS flat steel sheets |
|---|---|
| **Thickness of sheet (mm)** | 0.50, 0.60, or 0.65 |
| **Sheet width (mm)** | 1250 |
| **Sheet length (m)** | 2.0, 2.5 or 3.0* |
| **Steel grade** | S280 |

* Bespoke lengths available by request

**Table 3 Technical specification for Colorcoat® PE15 and PE25**

| | Norway Byggsystemer AS flat steel sheets |
|---|---|
| **Metallic coating** | Colorcoat® coils are supplied with a zinc based metallic coating which conforms to EN 10346:2015 [8] |
| **Organic coating** | Colorcoat HPS200 Ultra®, Colorcoat Prisma®, Colorcoat® SDP50 or Colorcoat® PE25 Fully REACH[9] compliant and chromate free |
| **Certifications** | Certifications applicable to Tata Steel's Shotton site are: ISO9001[10], ISO14001[11], ISO45001[12], ISO50001[13], BES6001 [14], BBA certification (Colorcoat®)[15], RC5, Ruv4, CPI5 certificates in accordance with EN 10169[16] |

## 2.4 Packaging

The flat steel sheets are packaged using wood base supports, polypropylene protective sheets and plastic strapping in order to protect them during delivery to site and prior to installation.

Plastic packaging: 3.39E-03 kg/m$^2$

Timber packaging: 4.03-02 kg/m$^2$

## 2.5 Reference service life

A reference service life for this product is not declared because the final application of the steel sheets is not certain. To determine the full service life of coated steel sheets, all factors would need to be included such as the end product and application, building type, and the location and environment.

The indicative design working life of a structure is classed in accordance with EN 1990 [17] clause 2.3. The design life ranges from category 1 at 10 years, to category 5 at 100 years. Common building structures are classed as category 4 at 50 years. In accordance with EN 1994-1-1 [18], clause 4.2, the exposed surface of the steel shall be adequately protected to resist the particular atmospheric conditions. The organic coating makes the product suitable for external environments, with specific project guarantees available for both inland and coastal applications. Under 'normal' conditions, coated steel product would not need to be replaced over the life of the building and structure.

## 2.6 Biogenic Carbon content

There are no materials containing biogenic carbon in flat sheet products. Timber is used to package the profile products and comprises a measurable mass of the total packaging as shown in Table 3 below.

### Table 4 Biogenic carbon content at the factory gate

| | Flat sheets |
|---|---|
| **Biogenic carbon content (product) (kg)** | 0 |
| **Biogenic carbon content (packaging) (kg)** | 0.020 |

Note: 1kg biogenic carbon is equivalent to 44/12 kg of $CO_2$

# 3 LCA methodology

### 3.1 Declared unit

The unit being declared is 1kg of coated flat steel sheet

### 3.2 Scope

This EPD can be regarded as Cradle-to-Grave and the modules considered in the LCA are;

A1-A3: Production stage (Raw material supply, transport to production site, manufacturing)
A4 & A5: Production stage (Transport to the construction site and installation)
B1-B7: Use stage (related to the building fabric including maintenance, repair, replacement)
C1-C4: End-of-life (Deconstruction, transport, processing for recycling and disposal)
D: Reuse, recycling and recovery

### 3.3 Cut-off criteria

All information from the data collection process has been considered, covering all used and registered materials, and all fuel and energy consumption. On-site emissions were measured, and those emissions have been considered. Data for all relevant sites were thoroughly checked and also cross-checked with one another to identify potential data gaps. No processes, materials or emissions that are known to make a significant contribution to the environmental impact of the flat steel sheets have been omitted. On this basis, there is no evidence to suggest that input or outputs contributing more than 1% to the overall mass or energy of the system, or that are environmentally significant, have been omitted. It is estimated that the sum of any excluded flows contribute less than 5% to the impact assessment categories. The manufacturing of required machinery and other infrastructure is not considered in the LCA.

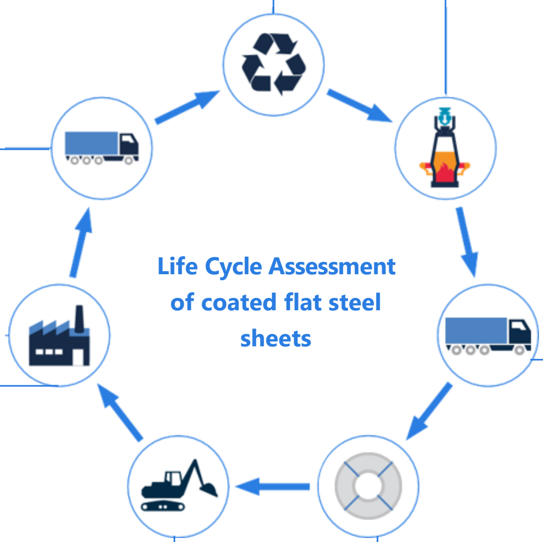
**Figure 3 Life Cycle Assessment of flat steel sheets**

**Module D: Benefits & loads beyond the system boundary**
Includes impacts from;
- Recycling of the steel component (85%)

**Module C: End-of-life stage**
Includes impacts from:
- Deconstruction of flat steel sheets
- Transport from site to end-of-life
- Processing of steel sheets for recycling
- Disposal to landfill of steel (15%)

**Module B: Use stage**
Includes impacts from;
- Use or application of the flat steel sheets on a building
- Maintenance, repair, replacement, refurbishment of the system

**Modules A4 & A5: Construction process stage**
Includes impacts from;
- Delivery of coated flat sheets to construction site
- Installation and assembly of sheet product at construction site




**Module A1: Product stage (primary processing)**
Includes impacts from;
- Raw material extraction and processing (iron ore, coal)
- Steelmaking, casting, and the production of cold rolled coil at Port Talbot and Llanwern
- Preparation of recycled scrap
- Metallic and organic coating at Shotton
- Production of zinc and paint for coatings
- Responsible sourcing of materials to BES 6001 standard

**Module A2: Product stage (transport)**
Includes impacts from;
- Transport of pre-finished steel coils from Shotton to the production site at Skien

**Module A3: Product stage (flat sheet manufacture)**
Includes impacts from;
- Decoiling and cutting of coated steel
- Packaging of sheets for delivery to site

### 3.4 Background data

For life cycle modelling of the flat steel sheets, the Sphera LCA for Experts Software System for Life Cycle Engineering (formerly GaBi) is used [17]. The LCAfE database contains consistent and documented datasets which can be viewed in the online Managed LCA Content (MLC) documentation [18].

Where possible, specific data derived from Tata Steel's own production processes were the first choice to use where available. Data were also obtained directly from the relevant suppliers. The steel substrate was modelled using the worldsteel global average dataset

To ensure comparability of results in the LCA, the basic data of the Sphera MLC were used for energy, transportation and auxiliary materials.

### 3.5 Data quality

The data from Tata Steel's own production processes are from 2021, 2022, and 2023, and the technologies on which these processes were based during that period, are those used at the date of publication of this EPD. All relevant background datasets are taken from the Sphera MLC, and the last revision of all but three of these data sets took place less than 10 years ago. However, the contribution to impacts of these three datasets is of low significance, and therefore, the study is considered to be based on good quality data.

### 3.6 Allocation

The primary steel supply is modelled using the worldsteel global average dataset for BF/BOS steel slab, available in LCAfE. As a consequence, it is not possible to apply a methodology to assign impacts to the production of slag and hot metal from the blast furnace, be that physical and chemical partitioning of the manufacturing process, or economic allocation. Therefore, no allocation was applied to the primary steel production processes in this study.

Where there is site wide material and energy usage, these have been allocated to the relevant products in this study by mass.

End-of-life assumptions for recovered steel and steel recycling are accounted for as per the current methodology from the World Steel Association 2017 Life Cycle Assessment methodology report [19]. A net scrap approach is used to avoid double accounting, and the net impacts are reported as benefits and loads beyond the system boundary (Module D).

### 3.7 Additional technical information

The main scenario assumptions used in the LCA are detailed below in Table 4. The end of life percentages are based on the results of a survey carried out by the Steel Construction Institute in 2000[20].

For all indicators the characterisation factors from the EC-JRC are applied, identified by the name EN_15804, and based upon the EF Reference Package 3.1[21]. In LCAfE, the corresponding impact assessment is used, denoted by EN 15804 +A2.

### 3.8 Comparability

Care must be taken when comparing EPDs from different sources. EPDs may not be comparable if they do not have the same functional unit or scope (for example, whether they include installation allowances in the building), or if they do not follow the same standard such as EN 15804. The use of different generic data sets for upstream or downstream processes that form part of the product system may also mean that EPDs are not comparable.

Comparisons should ideally be integrated into a whole building assessment, in order to capture any differences in other aspects of the building design that may result from specifying different products. For example, a more durable product would require less maintenance and reduce the number of replacements and associated impacts over the life of the building.

**Table 4 Main scenario assumptions**

| Module | Scenario assumptions |
|---|---|
| **A1 to A3 – Product stage** | Manufacturing data from Tata Steel's sites at Port Talbot, Llanwern, Shotton and Skien. |
| **A2 – Transport to the manufacturing site** | The manufacturing facility is located on the Skien site. Transport to Skien includes truck transport of 271km and ship transport of 1030km. Utilisation factors for the truck and ship of 45% and 48% respectively were assumed, accounting for empty returns. |
| **A4 – Transport to construction site** | A transport distance of 250km by road on a 25 tonne capacity truck was considered representative of a typical installation. Utilisation factor of 30% was assumed to account for empty returns |
| **A5 – Installation at construction site** | Energy consumption estimated based upon published data for the erection of steel constructions in Germany [22]. |
| **B1 to B7 – Use stage** | This stage includes any maintenance or repair, replacement or refurbishment of the product over the life cycle. This is not required over the life of the product under normal conditions. |
| **C1 – Deconstruction & demolition** | Energy consumption estimated based upon published data for the dismantling of steel constructions in Germany [22] |
| **C2 – Transport for recycling, reuse, and disposal** | A transport distance of 100km to landfill or to a recycling site is assumed.. Transport is on a 25 tonne load capacity lorry with 30% utilisation to account for empty returns |
| **C3 – Waste processing for reuse, recovery and/or recycling** | The recycled flat sheets are processed in a shredder. |
| **C4 - Disposal** | At end-of-life, 15% of the product is disposed on landfill |
| **D – Reuse, recycling, and energy recovery** | At end-of-life, 85% of the steel is recycled |

Please note that in the LCAfE software, an empty return journey is accounted for by halving the load capacity utilisation of the outbound journey.

# 4 Results of the LCA

### Description of the system boundary

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

X = Included in LCA; MND = module not declared

### Environmental impact:

1kg of flat steel sheets with Colorcoat®

| Parameter | Unit | A1 – A3 | A4 | A5 | B1 – B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| GWP-total | kg $CO_2$ eq | 2.98E+00 | 3.19E-02 | 1.15E-02 | 0.00E+00 | 6.79E-02 | 9.67E-03 | 1.01E-02 | 2.30E-03 | -1.35E+00 |
| GWP-fossil | kg $CO_2$ eq | 3.01E+00 | 3.03E-02 | 1.10E-02 | 0.00E+00 | 6.79E-02 | 9.77E-03 | 1.02E-02 | 2.30E-03 | -1.35E+00 |
| GWP-biogenic | kg $CO_2$ eq | -3.81E-02 | 1.57E-03 | 3.68E-02 | 0.00E+00 | 4.93E-05 | -2.16E-04 | -1.05E-04 | -7.43E-06 | 7.98E-03 |
| GWP-luluc | kg $CO_2$ eq | 2.25E-03 | 0.00E+00 | 2.12E-04 | 0.00E+00 | 1.42E-05 | 1.00E-04 | 4.88E-05 | 9.41E-06 | -1.80E-04 |
| ODP | kg CFC11 eq | 2.05E-08 | 0.00E+00 | 5.91E-15 | 0.00E+00 | 4.19E-15 | 1.62E-15 | 2.35E-13 | 6.41E-15 | 1.82E-12 |
| AP | mol $H^+$ eq | 1.00E-02 | 2.98E-05 | 1.38E-05 | 0.00E+00 | 7.31E-05 | 1.64E-05 | 3.31E-05 | 1.62E-05 | -3.31E-03 |
| EP-freshwater | kg P eq | 3.77E-05 | 0.00E+00 | 2.37E-09 | 0.00E+00 | 2.24E-08 | 2.62E-08 | 3.57E-08 | 3.41E-09 | -3.14E-07 |
| EP-marine | kg N eq | 2.10E-03 | 1.47E-05 | 5.62E-06 | 0.00E+00 | 2.60E-05 | 6.84E-06 | 6.17E-06 | 4.24E-06 | -5.31E-04 |
| EP-terrestrial | mol N eq | 2.17E-02 | 1.68E-04 | 6.24E-05 | 0.00E+00 | 2.88E-04 | 7.29E-05 | 6.60E-05 | 4.62E-05 | -4.76E-03 |
| POCP | kg NMVOC eq | 7.21E-03 | 2.86E-05 | 1.56E-05 | 0.00E+00 | 8.24E-05 | 1.49E-05 | 1.77E-05 | 1.27E-05 | -2.16E-03 |
| ADP-minerals&metals | kg Sb eq | 7.77E-05 | 0.00E+00 | 4.05E-10 | 0.00E+00 | 1.01E-09 | 6.48E-10 | 3.72E-09 | 1.42E-10 | -7.67E-06 |
| ADP-fossil | MJ net calorific value | 3.82E+01 | 0.00E+00 | 1.57E-01 | 0.00E+00 | 9.39E-01 | 1.25E-01 | 2.09E-01 | 3.03E-02 | -1.35E+01 |
| WDP | $m^3$ world eq deprived | 5.53E+00 | 0.00E+00 | 1.18E-04 | 0.00E+00 | 1.44E-04 | 4.45E-05 | 2.01E-03 | 2.48E-04 | -9.12E-02 |
| PM | Disease incidence | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| IRP | kBq U235 eq | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| ETP-fw | CTUe | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| HTP-c | CTUh | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| HTP-nc | CTUh | ND | ND | ND | ND | ND | ND | ND | ND | ND |
| SQP | | ND | ND | ND | ND | ND | ND | ND | ND | ND |

GWP-total = Global Warming Potential total
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 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
ADPE = Abiotic depletion potential for non-fossil resources
ADPF = Abiotic depletion potential for fossil resources
WDP = Water (user) deprivation potential, deprivation-weighted water consumption
PM = Potential incidence of disease due to PM emissions
IRP = Potential Human exposure efficiency relative to U235
ETP-fw = Potential Comparative Toxic Unit for ecosystems
HTP-c = Potential Comparative Toxic Unit for humans
HTP-nc = Potential Comparative Toxic Unit for humans
SQP = Potential soil quality index

The following indicators should be used with care as the uncertainties on these results are high or as there is limited experience with the indicator : ADP-minerals&metals, ADP-fossil, and WDP.

## Resource use:

1kg of flat steel sheets with Colorcoat®

| Parameter | Unit | A1 – A3 | A4 | A5 | B1 – B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| PERE | MJ | 1.84E+01 | 0.00E+00 | 2.97E-01 | 0.00E+00 | 2.74E-02 | 3.95E-02 | 2.50E-01 | 2.44E-02 | 2.23E+00 |
| PERM | MJ | 1.26E+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 |
| PERT | MJ | 1.96E+01 | 0.00E+00 | 2.97E-01 | 0.00E+00 | 2.74E-02 | 3.95E-02 | 2.50E-01 | 2.44E-02 | 2.23E+00 |
| PENRE | MJ | 1.60E+02 | 0.00E+00 | 6.59E-01 | 0.00E+00 | 3.94E+00 | 5.25E-01 | 8.77E-01 | 1.27E-01 | -5.65E+01 |
| PENRM | MJ | 9.23E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| PENRT | MJ | 1.60E+02 | 0.00E+00 | 6.59E-01 | 0.00E+00 | 3.94E+00 | 5.25E-01 | 8.77E-01 | 1.27E-01 | -5.65E+01 |
| SM | kg | 3.04E-01 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| RSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| NRSF | MJ | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| FW | $m^3$ | 1.22E+00 | 0.00E+00 | 3.91E-04 | 0.00E+00 | 4.15E-05 | 1.95E-05 | 3.60E-04 | 3.05E-05 | -5.75E-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

## Output flows and waste categories:

1kg of flat steel sheets with Colorcoat®

| Parameter | Unit | A1 – A3 | A4 | A5 | B1 – B7 | C1 | C2 | C3 | C4 | D |
|---|---|---|---|---|---|---|---|---|---|---|
| HWD | kg | 3.18E-04 | 0.00E+00 | 2.50E-10 | 0.00E+00 | 8.21E-11 | 2.10E-11 | 8.03E-09 | 2.77E-11 | -4.23E-07 |
| NHWD | kg | 9.00E-01 | 0.00E+00 | 1.87E-04 | 0.00E+00 | 6.15E-04 | 7.32E-05 | 4.80E-04 | 1.26E+00 | 6.84E-01 |
| RWD | kg | 1.79E-03 | 0.00E+00 | 2.80E-06 | 0.00E+00 | 2.31E-06 | 9.90E-07 | 1.11E-04 | 1.34E-06 | 6.19E-06 |
| CRU | 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 |
| MFR | kg | 9.77E-03 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 3.27E+00 |
| MER | kg | 1.60E-02 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 | 0.00E+00 |
| EEE | 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 |
| EET | 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 |

HWD = Hazardous waste disposed

NHWD = Non-hazardous waste disposed

RWD = Radioactive waste disposed

CRU = Components for reuse

MFR = Materials for recycling

MER = Materials for energy recovery

EEE = Exported electrical energy

EET = Exported thermal energy

# 5 Interpretation of results

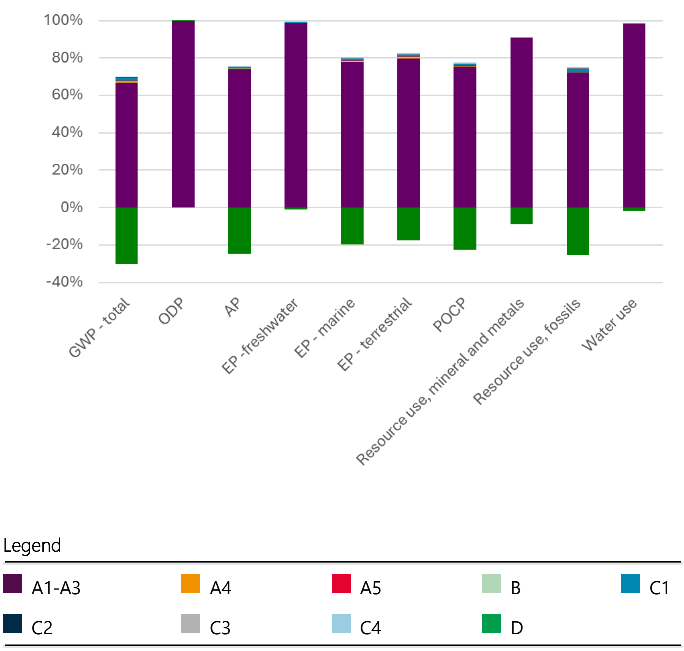
Figure 4 shows the relative contribution per life cycle stage for selected environmental impact categories for 1kg of Tata Steel's coated flat steel sheets. Each column represents 100% of the total impact score, which is why all the columns have been set with the same length. A burden is shown as positive (above the 0% axis) and a benefit is shown as negative (below the 0% axis). The main contributors across all impact categories are A1-A3 (burdens) and D (benefits beyond the system boundary).

The manufacture of the cold rolled coil during stage A1-A3 is responsible for around 60-75% of each impact in most of the categories, specifically, the conversion of iron ore into liquid steel which is the most energy intensive part of the manufacturing process.

The majority of emissions come from the process of making crude steel, in the use of coal and coke in the blast furnace, and from the injection of oxygen into the basic oxygen furnace, as well as combustion of the process gases. These processes, give rise to emissions of $CO_2$ which contribute around 94% of the Global Warming Potential (GWP), and sulphur oxides, which are responsible for 61% of the impact in the Acidification Potential (AP) category. In addition, oxides of nitrogen are emitted which contribute 35% of the A1-A3 Acidification Potential, and the vast majority of the Eutrophication Potential (EP-marine and EP-terrestrial). Freshwater Eutrophication potential is contributed mostly by Phosphate (78%). The combined emissions of nitrogen oxides, carbon monoxide, and sulphur oxides, together contribute 86% of the Photochemical Ozone indicator (POCP).

Figure 4 clearly indicates the relatively small contribution to each impact from the other life cycle stages considered. Of these stages, the most significant contribution is from stage C1(deconstruction) in GWP, eutrophication marine and terrestrial, Fossil Resource Use indicator, and AP, which comes mostly from the use of diesel fuel.

**Figure 4 LCA results for the coated flat steel sheets**




Module D values are largely derived using worldsteel's value of scrap methodology which is based upon many steel plants worldwide, including both BF/BOF and EAF steel production routes. At end-of-life, the recovered sheet is modelled with a credit given as if it were re-melted in an Electric Arc Furnace and substituted by the same amount of steel produced in a Blast Furnace [19]. The specific emissions that represent the burden in A1-A3, are essentially the same as those responsible for the impact benefits in Module D. It is important that the life cycle of the steel product is considered here, because in most cases, the Module D credit provides significant benefits in terms of reducing the whole life environmental impacts.

Referring to the LCA results, the impact in Module D for ODP and the Use of Renewable Primary Energy indicator (PERT) are different to other impact categories, being a burden or load rather than a benefit. For ODP, this is because there is greater use of electricity in recycling steel compared to manufacturing it through the BF/BOF route, leading to larger ODP impacts. This also applies to the use of renewable energy, hence why PERT is positive in module D as well.

# 6 References and product standards


1. Tata Steel's EN 15804 verified EPD programme, General programme instructions, V2 January 2022

2. Tata Steel's EN 15804 verified EPD programme, Product Category Rules Part 1, V2 January 2022

3. Tata Steel's EN 15804 verified EPD programme, Product Category Rules Part 2 – Steel Structural Deck, V2 June 2022

4. ISO 14044:2006+A2:2020, Environmental management - Life Cycle Assessment – Requirements and guidelines

5. ISO 14025:2006, Environmental labels and declarations - Type III environmental declarations - Principles and procedures

6. ISO 14040:2006+ A1:2020, Environmental management - Life Cycle Assessment - Principles and framework

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

8. EN 10346:2015, Continuously hot-dip coated steel flat products for cold forming

9. REACH, EU regulation for Registration, evaluation, authorisation and restriction of chemicals

10. ISO 9001:2015, Quality management systems

11. ISO 14001:2015, Environmental management systems

12. ISO 45001:2018, Occupational health and safety management systems. Requirements with guidance for use

13. ISO 50001:2018, Energy management systems

14. BES6001, Responsible sourcing of construction products

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16. EN 1994-1-1:2004, Eurocode 4. Design of composite steel and concrete structures. General rules and rules for buildings

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