# Environmental Product Declaration

## Statement of Verification

| | |
|---|---|
| CARES EPD No.: 0061 | Issue 01 |

This is to verify that the

**Environmental Product Declaration**

Provided by:
Qatar Steel Company (Q.P.S.C.)

Is in accordance with the requirements of:
EN ISO 14025:2010 and EN 15804:2012 + A2:2019/AC2021
and CARES PCR for Type III EPD of Semi-Finished and Finished Steel Products, February 2025

This declaration is for:
Carbon Steel Reinforcing Bar (Direct Reduced Iron production route)

## Company address:

Post Box 50090
Mesaieed Industrial City
Doha
State of Qatar

QATAR STEEL

LadinCamci

| | | |
|---|---|---|
| | Ladin Camci | 25 April 2026 |
| Signed for CARES | Operator | Date of this Issue |
| 25 April 2026 | | 24 April 2029 |
| First Issue Date | | Expiry Date |

The validity of this Environmental Product Declaration can be verified by contacting CARES on +44 (0)1732 450 000 or visiting CARES website https://www.carescertification.com/certification-schemes/environmental-product-declarations.

CARES, Pembroke House, 21 Pembroke Road, Sevenoaks, Kent TN13 1XR

# Environmental Product Declaration

## EPD Number: CARES EPD 0061

# General Information

| | |
|---|---|
| **EPD Programme Operator** | CARES<br>Pembroke House, 21 Pembroke Road, Sevenoaks, Kent, TN13 1XR UK<br>www.carescertification.com |
| **Applicable Product Category Rules** | CARES Product Category Rules (PCR) for Type III Environmental Product Declaration (EPD) of Semi-Finished and Finished Steel Products, February 2025 |
| **Commissioner of LCA study** | CARES<br>Pembroke House, 21 Pembroke Road, Sevenoaks, Kent, TN13 1XR UK<br>www.carescertification.com |
| **LCA consultant/Tool** | CARES EPD Tool version 3.0<br>SPHERA SOLUTIONS UK LIMITED<br>The Innovation Centre Warwick Technology Park, Gallows Hill, Warwick, Warwickshire<br>CV34 6UW UK<br>www.sphera.com |
| **Declared/Functional Unit** | 1 tonne of carbon steel reinforcing bar manufactured by the Direct Reduced Iron production route. |
| **Applicability/Coverage** | Manufacturer-specific product produced at a single plant of one manufacturer |
| **EPD Type** | Cradle to Gate with options, Modules C1-C4, and Module D |
| **Background database** | MLC (GaBi) Databases 2025.1 (Sphera, 2025) |

| **Demonstration of Verification** |
|---|
| CEN standard EN 15804 serves as the core PCR [a] |
| Independent verification of the declaration and data according to EN ISO 14025:2010<br>☐Internal ☒ External |
| (Where appropriate [b]) Third party verifier:<br>Dr Jane Anderson |
| a: Product category rules<br>b: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4) |

## Comparability

Environmental product declarations from different programmes may not be comparable if not compliant with EN 15804:2012+A2:2019/AC2021. Comparability is further dependent on the specific product category rules, system boundaries and allocations, and background data sources. See Clause 5.3 of EN 15804:2012+A2:2019/AC2021 for further guidance

## Information modules covered

| Product Stage | | | Construction Stage | | Use Stage | | | | | | | End-of-life Stage | | | | Benefits and loads beyond the system boundary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | B6 | B7 | C1 | C2 | C3 | C4 | D |
| Raw materials supply | Transport | Manufacturing | Transport to site | Construction – Installation | Use | Maintenance | Repair | Replacement | Refurbishment | Operational energy use | Operational water use | Deconstruction demolition | Transport | Waste processing | Disposal | Reuse, Recovery and/or Recycling potential |
| ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

Note: Checks indicate the Information Modules declared.

## Manufacturing site

Qatar Steel Company (Q.P.S.C.)
Post Box 50090
Mesaieed Industrial City
Doha
State of Qatar

# Construction Product:

## Product Description

The product consists of steel reinforcing bars (rebar) with a ribbed surface profile, manufactured in accordance with the standards listed in the References section. Reinforcing bars provide the tensile capacity that concrete lacks, enabling reinforced concrete to resist tension, bending, and cyclic loads while maintaining ductility and structural integrity. Their deformed surface ensures reliable bond and load transfer to the surrounding concrete in elements such as beams, slabs, columns, and foundations for buildings and civil engineering works.

In accordance with the requirements of EN 15804+A2, it is declared that the reinforcing steel bars and their associated packaging materials (steel wires or straps) are composed entirely of inorganic metallic substances and do not contain any biogenic carbon.

## Technical Information

| Property | Value, Unit |
|---|---|
| Production route | DRI - EAF |
| Density | 7850 kg/m$^3$ |
| Modulus of elasticity | 200000 N/mm$^2$ |
| Weldability ($C_{eq}$) | max 0.50 % |
| Yield strength (as per BS 4449:2005+A3:2016) | min 500 N/mm$^2$ – max 650 N/mm$^2$ |
| Tensile strength (as per BS 4449:2005+A3:2016) | min 540 N/mm$^2$<br>(Tensile strength/Yield Strength ≥ 1.08) |
| Agt (% total elongation at maximum force as per BS 4449:2005+A3:2016) | min 5 % |
| Surface geometry (Relative rib area, $f_R$ as per BS 4449:2005+A3:2016) | min 0.040 for Bar Size >6mm & ≤12mm & min 0.056 for Bar size>12 |
| Re-bend test (as per BS 4449:2005+A3:2016) | Pass |
| Fatigue test (as per BS 4449:2005+A3:2016) | Pass |
| Recycled content (as per ISO 14021:2016/Amd:2021) | 14.6 (Including internal and external scrap)<br>11.4 (Including external scrap only) |

* Technical Information details are as per relevant product standards listed in References section

## Main Product Contents

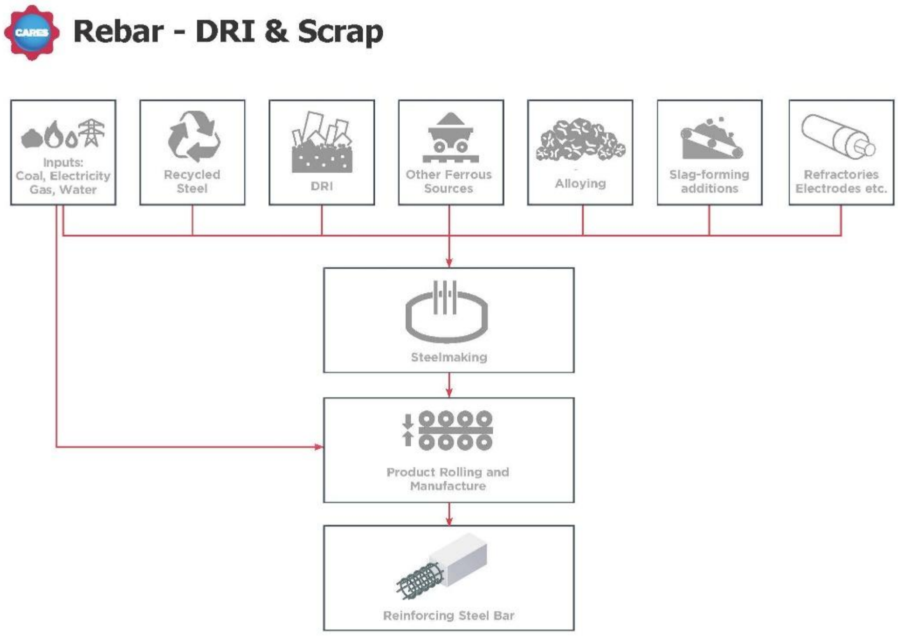
| Material/Chemical Input | % |
|---|---|
| Fe | 97 |
| C, Mn, Si, V, Ni, Cu, Cr, Mo and others | 3 |

## Manufacturing Process

The production of reinforcing steel follows an integrated gas-based Direct Reduced Iron (DRI) – Electric Arc Furnace (EAF) route. The process is categorized into the following stages:

- Direct Reduction (DRI & HBI): High-grade iron ore pellets are reduced in a shaft furnace. This solid-state process uses a reducing gas derived from natural gas (carbon monoxide and hydrogen) to remove oxygen from the ore without melting it. This results in high-purity Direct Reduced Iron (DRI). Depending on operational requirements, Hot Briquetted Iron (HBI) is also produced by compressing the DRI while still at high temperatures to increase its density and stability for storage or charging.
- Melting (EAF): The DRI/HBI is charged into an Electric Arc Furnace (EAF) along with a controlled proportion of high-quality steel scrap. High-power electrical energy is used to melt the metallic charge into liquid steel, while fluxing agents are added to form slag and remove impurities.
- Refining (LF): The molten steel undergoes secondary metallurgy in a Ladle Furnace (LF). During this stage, the chemical composition is precisely adjusted through the addition of ferro-alloys, and the steel is homogenised to meet specific grade requirements and mechanical properties.
- Continuous Casting (CCM): The refined liquid steel is cast into semi-finished billets through a multi-strand Continuous Casting Machine (CCM), where it is cooled and solidified into a uniform cross-section.
- Hot Rolling and Finishing: The billets are reheated in a natural gas-fired furnace and processed through a series of rolling stands to achieve the final diameter and embossed rib pattern. The bars undergo controlled cooling to ensure the required mechanical characteristics (strength and ductility), followed by cutting to length, bundling, and labelling for dispatch.

# Process flow diagram




# Construction Installation

Processing and proper use of reinforcing steel products depends on the application and should be made in accordance with generally accepted practices, standards and manufacturing recommendations.

During transport and storage of reinforcing steel products the usual requirement for securing loads is to be observed.

# Use Information

The composition of the reinforcing steel products does not change during use.

Reinforcing steel products do not cause adverse health effects under normal conditions of use.

No risks to the environment and living organisms are known to result from the mechanical destruction of the reinforcing steel product itself.

# End of Life

Reinforcing steel products are not reused at end of life but can be recycled to the same (or higher/lower) quality of steel depending upon the metallurgy and processing of the recycling route.

It is a high value resource, so efforts are made to recycle steel scrap rather than disposing of it at EoL. A recycling rate of 92% is typical for reinforcing steel products

# Life Cycle Assessment Calculation Rules

This EPD uses the "Cut-off by Classification" method, also known as the recycled content method. It assigns the environmental impacts of primary material production to the initial user. Recyclable materials enter the recycling process without burdens, and secondary materials only bear the impacts of recycling.

This method promotes recycling by making producers responsible for waste management. It supports a circular economy by reducing the environmental impacts of primary material production.

This approach follows ISO 14040 and ISO 14044 standards for Life Cycle Assessments.

The Life Cycle Impact Assessment (LCIA) has been carried out using the characterisation method described in EN 15804+A2. For all indicators the characterisation factors from the Environmental Footprint v3.1 (EF 3.1) was applied.

## Declared unit description

1 tonne of carbon steel reinforcing bars manufactured by the Direct Reduced Iron production route.

## System boundary

The system boundary of the EPD follows the modular design defined by EN 15804+A2. Type of this EPD is Cradle to Gate with options, Modules C1-C4, and Module D.

Impacts and aspects related to losses/wastage (i.e. production, transport and waste processing and end-of-life stage of lost waste products and materials) are considered in the modules in which the losses/wastage occur.

Once steel scrap has been collected for recycling it is considered to have reached the end of waste state.

## Data sources, quality and allocation

Data Sources and Quality:

The selection of data and the data quality requirements have been provided according to the requirements of BS EN 15941:2024.

Data Sources: Manufacturing data of the period 01/01/2025 - 31/12/2025 has been provided by Qatar Steel Company (Q.P.S.C.) operating on the geographical area noted in Manufacturing Site. A brief description of technology and inputs for the product is given in Manufacturing Process and in simplified Process Flow Diagram

The primary data collection was thorough, considering all relevant flows and these data were verified by CARES, including also the verification of mass balance, to ensure that data for all the inputs and outputs for the process over the period of data collection have been collected, and that the unit process data will comply with the cut-off rules of EN 15804:2012+A2:2019/AC2021. The EPD covers transport to, and end-of-life in Qatar.

The selection of the background data for electricity generation is in line with the CARES PCR 2025. Country or region-specific power grid mixes are selected from MLC (GaBi) Databases 2025.1 (Sphera, 2025); thus, consumption grid mix of Qatar has been selected to suit specific manufacturing location, and also for fabrication, installation and demolishing location. The emission factor of carbon footprint of the applied consumption grid mix of Qatar is 0.616 kg$CO_2$ eq/kWh.

Data Quality: Background data is consistently sourced from the MLC (GaBi) Databases 2025.1 (Sphera, 2025). The primary data collection was thorough, considering all relevant flows and these data have been verified during the audit conducted by CARES in March 2026.

There isn't any data from different LCI/LCA databases are used considering that the overall consistency of the study is not adversely affected.

Schemes applied for data quality assessment was as per EN 15804:2012+A2:2019, Annex E, Table E.1 — Data quality level and criteria of the UN Environment Global Guidance on LCA database development. No poor or very poor data was found during the assessment of relevant data.

Data quality level and criteria of the UN Environment Global Guidance on LCA database development:
Geographical Representativeness : Good
Technical Representativeness : Very good
Time Representativeness : Good

Allocation:

EAF slag and mill scale are produced as co-products from the steel manufacturing processes. Impacts are allocated between the steel, the slag and the mill scale based on economic value. The revenue generated from both mill scale, and EAF slag are 0.03% and 0.24% respectively, and their total is less than 1% in relation to the product based on current market prices, these co-products are of definite value and are freely/readily traded in reality. For this reason, economic allocation has been applied to the processes where this co-product arises.
Production losses of steel during the production process are recycled in a closed loop offsetting the requirement for external scrap. Specific information on allocation within the background data is given in the MLC (GaBi) Databases 2025.1 (Sphera, 2025).

## Cut-off criteria

On the input side all flows entering the system and comprising more than 1% in total mass or contributing more than 1% to primary energy consumption are considered. All inputs used as well as all process-specific waste and process emissions were assessed. For this reason, material streams which were below 1% (by mass) were captured as well. In this manner the cut-off criteria according to the PCR requirements are fulfilled).

The mass of steel wire or strap used for binding the product bundle is less than 1 % of the total mass of the product.

# LCA Results

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

**Core environmental impact indicators**

| Life Cycle Stage | Impact Category | | GWP-total | GWP-fossil | GWP-biogenic | GWP-luluc | ODP | AP | EP-freshwater |
|---|---|---|---|---|---|---|---|---|---|
| | | | kg $CO_2$ eq | kg $CO_2$ eq | kg $CO_2$ eq | kg $CO_2$ eq | kg CFC11 eq | mol $H^+$ eq | Kg P eq |
| Product stage | Raw material supply | A1 | 1.19E+03 | 1.19E+03 | 3.65 | 0.995 | 6.88E-09 | 3.01 | 1.01E-03 |
| | Transport | A2 | 206 | 205 | 0.220 | 0.152 | 1.98E-11 | 6.36 | 8.74E-05 |
| | Manufacturing | A3 | 884 | 884 | 0.074 | 0.019 | 1.11E-11 | 1.36 | 2.18E-05 |
| | Total (of product stage) | A1-3 | 2.28E+03 | 2.28E+03 | 3.94 | 1.17 | 6.91E-09 | 10.7 | 1.12E-03 |
| Construction process stage | Transport | A4 | 25.4 | 25.1 | 0.048 | 0.266 | 3.04E-12 | 0.038 | 6.96E-05 |
| | Construction | A5 | 2.44E+02 | 2.43E+02 | 0.405 | 0.193 | 6.89E-10 | 1.10 | 1.32E-04 |
| Use stage | Use | B1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maintenance | B2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair | B3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Replacement | B4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Refurbishment | B5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational energy use | B6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational water use | B7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **%92 Recycling / %8 Landfill Scenario** | | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 2.09 | 2.09 | 8.33E-04 | 6.83E-05 | 1.62E-13 | 0.012 | 2.52E-07 |
| | Transport | C2 | 48.4 | 47.8 | 0.090 | 0.477 | 5.75E-12 | 0.120 | 1.26E-04 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 1.23 | 1.22 | 3.96E-05 | 0.005 | 3.40E-12 | 0.009 | 1.82E-06 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -1.70E+03 | -1.70E+03 | 0.397 | -0.829 | -8.67E-10 | -3.91 | -5.94E-04 |
| **100% Landfill Scenario** | | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 2.09 | 2.09 | 8.33E-04 | 6.83E-05 | 1.62E-13 | 0.012 | 2.52E-07 |
| | Transport | C2 | 2.23 | 2.20 | 0.004 | 0.023 | 2.67E-13 | 0.003 | 6.11E-06 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 15.3 | 15.3 | 4.95E-04 | 0.063 | 4.25E-11 | 0.108 | 2.27E-05 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 309 | 309 | -0.072 | 0.151 | 1.57E-10 | 0.710 | 1.08E-04 |
| **100% Recycling Scenario** | | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 2.09 | 2.09 | 8.33E-04 | 6.83E-05 | 1.62E-13 | 0.012 | 2.52E-07 |
| | Transport | C2 | 52.4 | 51.8 | 0.097 | 0.516 | 6.22E-12 | 0.131 | 1.36E-04 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -1.87E+03 | -1.87E+03 | 0.437 | -0.914 | -9.56E-10 | -4.31 | -6.55E-04 |

GWP-total = Global warming potential, total;
GWP-fossil = Global warming potential, fossil;
GWP-biogenic = Global warming potential, biogenic;
GWP-luluc = Global warming potential, land use and land use change;
ODP = Depletion potential of the stratospheric ozone layer;
AP = Acidification potential, accumulated exceedance; and
EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment

# LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Core environmental impact indicators | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Life Cycle Stage | Impact Category | | EP-marine | EP-terrestrial | POCP | ADP-mineral & metals | ADP-fossil | WDP |
| | | | kg N eq | mol N eq | kg NMVOC eq | kg Sb eq | MJ, net calorific value | m³ world eq deprived |
| Product stage | Raw material supply | A1 | 1.10 | 12.0 | 3.09 | 1.57E-04 | 1.74E+04 | 60.2 |
| | Transport | A2 | 1.50 | 16.4 | 4.28 | 5.74E-06 | 2.42E+03 | 0.414 |
| | Manufacturing | A3 | 0.629 | 6.89 | 1.72 | 6.34E-06 | 1.12E+04 | -5.15 |
| | Total (of product stage) | A1-3 | 3.23 | 35.3 | 9.09 | 1.69E-04 | 3.10E+04 | 55.5 |
| Construction process stage | Transport | A4 | 0.016 | 0.164 | 0.033 | 1.71E-06 | 329 | 0.103 |
| | Construction | A5 | 0.338 | 3.70 | 0.947 | 1.73E-05 | 3.34E+03 | 5.57 |
| Use stage | Use | B1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maintenance | B2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair | B3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Replacement | B4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Refurbishment | B5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational energy use | B6 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational water use | B7 | 0 | 0 | 0 | 0 | 0 | 0 |
| **%92 Recycling / %8 Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 4.08E-03 | 0.045 | 0.011 | 2.94E-08 | 27.7 | 0.016 |
| | Transport | C2 | 0.054 | 0.580 | 0.129 | 3.15E-06 | 626 | 0.191 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0.002 | 0.025 | 0.007 | 7.57E-08 | 16.0 | 0.132 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -0.939 | -10.10 | -3.15 | -1.68E-05 | -1.29E+04 | -11.9 |
| **100% Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 4.08E-03 | 0.045 | 0.011 | 2.94E-08 | 27.7 | 0.016 |
| | Transport | C2 | 1.40E-03 | 0.015 | 0.003 | 1.50E-07 | 28.8 | 0.009 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0.028 | 0.308 | 0.085 | 9.46E-07 | 200 | 1.65 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0.171 | 1.84 | 0.573 | 3.05E-06 | 2.34E+03 | 2.17 |
| **100% Recycling Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 4.08E-03 | 0.045 | 0.011 | 2.94E-08 | 27.7 | 0.016 |
| | Transport | C2 | 0.058 | 0.630 | 0.140 | 3.41E-06 | 678 | 0.207 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -1.04 | -11.2 | -3.48 | -1.85E-05 | -1.42E+04 | -13.2 |

ADP-mineral&metals = Abiotic depletion potential for non-fossil resources;
ADP-fossil = Depletion potential of the stratospheric ozone layer;
WDP = Water (user) deprivation potential, deprivation-weighted water consumption.
The results of the three environmental impact indicators above shall be used with care as the uncertainties on these results are high or as there is limited experienced with these indicators.

EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment;
EP-terrestrial = Eutrophication potential, accumulated exceedance;
POCP = Formation potential of tropospheric ozone;
PM = Particulate matter.

# LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

## Parameters describing environmental impacts

| Life Cycle Stage | Impact Category | | PM | IRP | ETP-fw | HTP-c | HTP-nc | SQP |
|---|---|---|---|---|---|---|---|---|
| | | | disease incidence | kBq $U^{235}$ eq | CTUe | CTUh | CTUh | dimensionless |
| Product stage | Raw material supply | A1 | 4.20E-05 | 24.4 | 2.11E+03 | 1.91E-07 | 2.55E-06 | 1.25E+03 |
| | Transport | A2 | 1.11E-04 | 0.398 | 1.87E+03 | 2.82E-08 | 5.93E-07 | 86.5 |
| | Manufacturing | A3 | 8.80E-06 | 0.283 | 3.48E+02 | 7.10E-07 | 6.63E-05 | 23.7 |
| | Total (of product stage) | A1-3 | 1.62E-04 | 25.1 | 4.33E+03 | 9.29E-07 | 6.94E-05 | 1.36E+03 |
| Construction process stage | Transport | A4 | 3.76E-07 | 0.060 | 426 | 5.73E-09 | 3.23E-07 | 146 |
| | Construction | A5 | 1.64E-05 | 2.51 | 558 | 9.64E-08 | 7.01E-06 | 1.77E+02 |
| Use stage | Use | B1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maintenance | B2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair | B3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Replacement | B4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Refurbishment | B5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational energy use | B6 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational water use | B7 | 0 | 0 | 0 | 0 | 0 | 0 |
| **%92 Recycling / %8 Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 7.82E-08 | 5.77E-04 | 32.9 | 5.92E-10 | 7.53E-09 | 0.036 |
| | Transport | C2 | 1.45E-06 | 0.113 | 792 | 1.07E-08 | 5.87E-07 | 262 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 1.08E-07 | 0.019 | 13.8 | 2.13E-10 | 7.98E-09 | 3.96 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -5.75E-05 | 22.3 | -2.01E+03 | -2.70E-06 | 2.05E-06 | 1.04E+03 |
| **100% Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 7.82E-08 | 5.77E-04 | 32.9 | 5.92E-10 | 7.53E-09 | 0.036 |
| | Transport | C2 | 3.23E-08 | 0.005 | 37.4 | 5.03E-10 | 2.84E-08 | 12.8 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 1.35E-06 | 0.235 | 173 | 2.67E-09 | 9.98E-08 | 49.5 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 1.05E-05 | -4.06 | 365 | 4.91E-07 | -3.73E-07 | -189 |
| **100% Recycling Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 7.82E-08 | 5.77E-04 | 32.9 | 5.92E-10 | 7.53E-09 | 0.036 |
| | Transport | C2 | 1.57E-06 | 0.123 | 858 | 1.16E-08 | 6.36E-07 | 284 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -6.35E-05 | 24.6 | -2.21E+03 | -2.98E-06 | 2.26E-06 | 1.15E+03 |

IRP = 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 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.

HTP-nc = Potential comparative toxic unit for humans; and
ETP-fw = Potential comparative toxic unit for ecosystems;
HTP-c = Potential comparative toxic unit for humans;
SQP = Potential soil quality index.
The results of the four environmental impact indicators above shall be used with care as the uncertainties on these results are high or as there is limited experienced with these indicators.

# LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

## Parameters describing resource use

| Life Cycle Stage | Impact Category | | PERE | PERM | PERT | PENRE | PENRM | PENRT |
|---|---|---|---|---|---|---|---|---|
| | | | MJ | MJ | MJ | MJ | MJ | MJ |
| Product stage | Raw material supply | A1 | 1.03E+03 | 0 | 1.03E+03 | 1.74E+04 | 0 | 1.74E+04 |
| | Transport | A2 | 24.50 | 0 | 24.5 | 2.42E+03 | 0 | 2.42E+03 |
| | Manufacturing | A3 | 23.0 | 0 | 23.0 | 1.12E+04 | 0 | 1.12E+04 |
| | Total (of product stage) | A1-3 | 1.08E+03 | 0 | 1.08E+03 | 3.10E+04 | 0 | 3.10E+04 |
| Construction process stage | Transport | A4 | 24.2 | 0 | 24.2 | 329 | 0 | 329 |
| | Construction | A5 | 1.14E+02 | 0 | 1.14E+02 | 3.34E+03 | 0 | 3.34E+03 |
| Use stage | Use | B1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maintenance | B2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair | B3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Replacement | B4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Refurbishment | B5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational energy use | B6 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational water use | B7 | 0 | 0 | 0 | 0 | 0 | 0 |
| **%92 Recycling / %8 Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0.056 | 0 | 0.056 | 27.7 | 0 | 27.7 |
| | Transport | C2 | 43.6 | 0 | 43.6 | 626 | 0 | 626 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 3.09 | 0 | 3.09 | 16.0 | 0 | 16.0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 2.03E+03 | 0 | 2.03E+03 | -1.29E+04 | 0 | -1.29E+04 |
| **100% Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0.056 | 0 | 0.056 | 27.7 | 0 | 27.7 |
| | Transport | C2 | 2.12 | 0 | 2.12 | 28.8 | 0 | 28.8 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 38.7 | 0 | 38.7 | 200 | 0 | 200 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -369 | 0 | -369.0 | 2.34E+03 | 0 | 2.34E+03 |
| **100% Recycling Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0.056 | 0 | 0.056 | 27.7 | 0 | 27.7 |
| | Transport | C2 | 47.2 | 0 | 47.2 | 678 | 0 | 678 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 2.24E+03 | 0 | 2.24E+03 | -1.42E+04 | 0 | -1.42E+04 |

PERE = Use of renewable primary energy excluding renewable primary energy 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 resource

# LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Parameters describing resource use | | | | | | |
|---|---|---|---|---|---|---|
| Life Cycle Stage | Impact Category | | SM | RSF | NRSF | FW |
| | | | kg | MJ net calorific value | MJ net calorific value | m³ |
| Product stage | Raw material supply | A1 | 0 | 0 | 0 | 2.57 |
| | Transport | A2 | 0 | 0 | 0 | 0.020 |
| | Manufacturing | A3 | 176 | 0 | 0 | 0.198 |
| | Total (of product stage) | A1-3 | 176 | 0 | 0 | 2.79 |
| Construction process stage | Transport | A4 | 0 | 0 | 0 | 0.012 |
| | Construction | A5 | 17.5 | 0 | 0 | 0.281 |
| Use stage | Use | B1 | 0 | 0 | 0 | 0 |
| | Maintenance | B2 | 0 | 0 | 0 | 0 |
| | Repair | B3 | 0 | 0 | 0 | 0 |
| | Replacement | B4 | 0 | 0 | 0 | 0 |
| | Refurbishment | B5 | 0 | 0 | 0 | 0 |
| | Operational energy use | B6 | 0 | 0 | 0 | 0 |
| | Operational water use | B7 | 0 | 0 | 0 | 0 |
| **%92 Recycling / %8 Landfill Scenario** | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0 | 0 | 0 | 4.04E-04 |
| | Transport | C2 | 0 | 0 | 0 | 0.021 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0.004 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 1.03E+03 | 0 | 0 | -0.987 |
| **100% Landfill Scenario** | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0 | 0 | 0 | 4.04E-04 |
| | Transport | C2 | 0 | 0 | 0 | 1.02E-03 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0.048 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0 | 0 | 0 | 0.179 |
| **100% Recycling Scenario** | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0 | 0 | 0 | 4.04E-04 |
| | Transport | C2 | 0 | 0 | 0 | 0.023 |
| | Waste processing | C3 | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 1.12E+03 | 0 | 0 | -1.09 |

SM = Use of secondary material;
RSF = Use of renewable secondary fuels;
NRSF = Use of non-renewable secondary fuels;
FW = Net use of fresh water

# LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

| Other environmental information describing waste categories | | | | | |
|---|---|---|---|---|---|
| Life Cycle Stage | Impact Category | | HWD | NHWD | RWD |
| | | | kg | kg | kg |
| Product stage | Raw material supply | A1 | 2.02E-06 | 7.79 | 0.166 |
| | Transport | A2 | 8.43E-08 | 0.205 | 2.90E-03 |
| | Manufacturing | A3 | 9.72E-08 | 46.3 | 0.003 |
| | Total (of product stage) | A1-3 | 2.20E-06 | 54.3 | 0.171 |
| Construction process stage | Transport | A4 | 1.19E-08 | 0.043 | 4.32E-04 |
| | Construction | A5 | 2.24E-07 | 15.0 | 0.017 |
| Use stage | Use | B1 | 0 | 0 | 0 |
| | Maintenance | B2 | 0 | 0 | 0 |
| | Repair | B3 | 0 | 0 | 0 |
| | Replacement | B4 | 0 | 0 | 0 |
| | Refurbishment | B5 | 0 | 0 | 0 |
| | Operational energy use | B6 | 0 | 0 | 0 |
| | Operational water use | B7 | 0 | 0 | 0 |
| **%92 Recycling / %8 Landfill Scenario** | | | | | |
| End of life | Deconstruction, demolition | C1 | 4.71E-10 | 0.004 | 7.85E-06 |
| | Transport | C2 | 2.26E-08 | 0.081 | 8.18E-04 |
| | Waste processing | C3 | 0 | 0 | 0 |
| | Disposal | C4 | 3.51E-09 | 80.1 | 1.70E-04 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 4.82E-06 | -26.1 | 0.214 |
| **100% Landfill Scenario** | | | | | |
| End of life | Deconstruction, demolition | C1 | 4.71E-10 | 0.004 | 7.85E-06 |
| | Transport | C2 | 1.04E-09 | 0.004 | 3.80E-05 |
| | Waste processing | C3 | 0 | 0 | 0 |
| | Disposal | C4 | 4.38E-08 | 1.00E+03 | 0.002 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | -8.76E-07 | 4.75 | -0.039 |
| **100% Recycling Scenario** | | | | | |
| End of life | Deconstruction, demolition | C1 | 4.71E-10 | 0.004 | 7.85E-06 |
| | Transport | C2 | 2.45E-08 | 0.087 | 8.86E-04 |
| | Waste processing | C3 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 5.32E-06 | -28.8 | 0.236 |

HWD = Hazardous waste disposed;
NHWD = Non-hazardous waste disposed;
RWD = Radioactive waste disposed

# LCA Results (continued)

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

## Other environmental information describing output flows – at end of life

| Life Cycle Stage | Impact Category | | CRU | MFR | MER | EE | Biogenic carbon (product) | Biogenic carbon (packaging) |
|---|---|---|---|---|---|---|---|---|
| | | | kg | kg | kg | MJ per energy carrier | kg C | kg C |
| Product stage | Raw material supply | A1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Transport | A2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Manufacturing | A3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Total (of product stage) | A1-3 | 0 | 0 | 0 | 0 | 0 | 0 |
| Construction process stage | Transport | A4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Construction | A5 | 0 | 110 | 0 | 0 | 0 | 0 |
| Use stage | Use | B1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Maintenance | B2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Repair | B3 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Replacement | B4 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Refurbishment | B5 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational energy use | B6 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Operational water use | B7 | 0 | 0 | 0 | 0 | 0 | 0 |
| **%92 Recycling / %8 Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0 | 920 | 0 | 0 | 0 | 0 |
| | Transport | C2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Waste processing | C3 | 0 | | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0 | 0 | 0 | 0 | 0 | 0 |
| **100% Landfill Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Transport | C2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Waste processing | C3 | 0 | | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0 | 0 | 0 | 0 | 0 | 0 |
| **100% Recycling Scenario** | | | | | | | | |
| End of life | Deconstruction, demolition | C1 | 0 | 1.00E+03 | 0 | 0 | 0 | 0 |
| | Transport | C2 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Waste processing | C3 | 0 | | 0 | 0 | 0 | 0 |
| | Disposal | C4 | 0 | 0 | 0 | 0 | 0 | 0 |
| Potential benefits and loads beyond the system boundaries | Reuse, recovery, recycling potential | D | 0 | 0 | 0 | 0 | 0 | 0 |

CRU = Components for reuse;
MFR = Materials for recycling
MER = Materials for energy recovery;
EE = Exported Energy

# Scenarios and additional technical information

| Scenarios and additional technical information | | | |
|---|---|---|---|
| **Scenario** | **Parameter** | **Units** | **Results** |
| Module A4 Transport to the Building Site | On leaving the steelworks the reinforcing steel products are transported to a fabricator where they are converted into constructional steel forms suitable for the installation site, then transported on to the construction site, including provision of all materials and products. Road transport distance for rolled steel to fabricators and road transport distance for steel construction forms to site are assumed to be 100 km and 250 km, respectively.<br>Only the one-way distance is considered as it is assumed that the logistics companies will optimise their distribution and not return empty in modules beyond A3. | | |
| | Truck trailer - Fuel | litre/km | 1.56 |
| | Distance | km | 350 |
| | Capacity utilisation (including empty returns) | % | 85 |
| | Bulk density of transported products | kg/m³ | 7850 |
| Module A5 Installation in the Building | The fabrication process is a relatively simple unit process and accounts for the transformation of the rolled steel product into construction steel forms. The operations in this unit process are primarily cutting and welding. As such, other inputs to the process include electricity, thermal energy, and cutting gases. Other outputs of this process are steel scrap and wastewater (where applicable). Consumption grid mix of Qatar has been selected to suit specific fabrication and installation location.<br>Fabrication into structural steel products and installation in the building; including provision of all materials, products, and energy, as well as waste processing up to the end-of-waste state or disposal of final residues during the construction stage. Installation of the fabricated product into the building is assumed to result in 10% wastage (determined based on typical installation losses reported by the WRAP Net Waste Tool [WRAP 2017]). It is assumed that fabrication requires 15.34 kWh/tonne finished product, and that there is a 2% wastage associated with this process. | | |
| | Ancillary materials for installation - Waste material from fabrication, losses per tonne of construction steel forms | % | 2 |
| | Energy Use - Energy per tonne required to fabricate construction steel forms | kWh | 15.34 |
| | Waste materials from installation wastage | % | 10 |
| Module B2 Maintenance | No maintenance required. | | |
| Module B3 Repair | No repair process required s. | | |
| Module B4 Replacement | No replacement considerations required. | | |
| Module B5 Refurbishment | No refurbishment process required. | | |
| Reference Service Life | Reinforcing steel products are used in the main building structure so the reference service life will equal the lifetime of the building. BS EN 1990 specifies "building structures and other common structures" as having a lifetime of 50 years. On this basis, the RSL for this EPD is assumed to be 50 years. | | |
| Module B6 Use of Energy | No energy required during use stage related to the operation of the building. | | |
| Module B7 Use of Water | No water required during use stage related to the operation of the building. | | |
| Modules C1 to C4 End of life | The end-of-life stage starts when the construction product is replaced, dismantled or deconstructed from the building or construction works and does not provide any further function. The recovered steel is transported for recycling while a small portion is assumed to be unrecoverable and remains in the rubble which is sent to landfill. 92% of the reinforcing steel is assumed to be recycled and 8% is sent to landfill [STEELCONSTRUCTION.INFO 2012]. The EPD covers transport to, and end-of-life in Qatar.<br>Once steel scrap is generated through the deconstruction activities on the demolition site it is considered to have reached the "end of waste" state. No further processing is required so there are no impacts associated with this module. Hence no impacts are reported in module C3. | | |
| | Waste for recycling - Recovered steel from crushed concrete | % | 92 |
| | Waste for energy recovery - Energy recovery is not considered for this study as most end-of-life steel scrap is recycled, while the remainder is landfilled | - | - |
| | Waste for final disposal - Unrecoverable steel lost in crushed concrete and sent to landfill | % | 2 |
| | Portion of energy assigned to rebar from energy required to demolish building, per tonne | MJ | 24 |
| | Transport to waste processing by Truck - Fuel consumption | litre/km | 1.56 |
| | Transport to waste processing by Truck – Distance | km | 463 |
| | Transport to waste processing by Truck – Capacity utilisation | % | 85 |
| | Transport to waste processing by Truck – Density of Product | kg/m³ | 7850 |

| Scenarios and additional technical information | | | |
|---|---|---|---|
| Scenario | Parameter | Units | Results |
| | Transport to waste processing by Container ship - Fuel consumption | litre/km | 0.0041 |
| | Transport to waste processing by Container ship - Distance | km | 158 |
| | Transport to waste processing by Container ship – Capacity utilisation | % | 50 |
| | Transport to waste processing by Container ship – Density of Product | kg/m³ | 7850 |
| Module D | It is assumed that 92% of the steel used in the structure is recovered for recycling, while the remainder is landfilled. “Benefits and loads beyond the system boundary” (module D) accounts for the environmental benefits and loads resulting from net steel scrap that is used as raw material in the EAF and that is collected for recycling at end of life. The balance between total scrap arisings recycled from fabrication, installation and end of life and scrap consumed by the manufacturing process (internally sourced scrap is not included in this calculation). These benefits and loads are calculated by including the burdens of recycling and the benefit of avoided primary production.<br><br>This study is concerned with carbon steel reinforcing bar manufacturers from the DRI production route. In DRI production route, a large amount of net scrap is generated over the life cycle as the iron ore used to obtain DRI is a virgin source and there is a high end of life recycling rate for reinforcing steel products. As a result, module D mainly models the credits associated with the scrap output.<br><br>The resulting scrap credit/burden is calculated based on the global “value of scrap” approach (/worldsteel 2011). | | |
| | Recycled Content | kg | 114 |
| | Re-used Content | kg | 0 |
| | Recovered for recycling | kg | 920 |
| | Recovered for re-use | kg | 0 |
| | Recovered for energy | kg | 0 |

# Summary, comments and additional information

## Interpretation

DRI based reinforcing steel product of Qatar Steel Company (Q.P.S.C.) is made via the Electric Arc Furnace production route. The bulk of the environmental impacts and primary energy demand is attributed to the manufacturing phase, covered by information modules A1-A3 of EN 15804+A2.

The interpretation of the results has been carried out considering the methodology- and data-related assumptions and limitations declared in the EPD. This interpretation section focuses on the environmental impact categories as well as the primary energy demand indicators only.

### Global Warming Potential (GWP)

The majority of the life cycle GWP impact occurs in the production phase (A1-A3). A1-A3 impacts account for 87.99% overall life cycle impacts for this category. The most significant contributions to production phase impacts are the upstream production of raw materials used in the steelmaking process, generation/supply of electricity and the production/use of fuels on site. Fabrication, installation and the end-of-life processes covered in C1-C4 make a minimal contribution to GWP. For overall climate change impacts, carbon dioxide emissions account for the majority of impacts with methane being the second most significant contributor.

### Ozone Depletion Potential (ODP)

The majority of impacts are associated with the production phase (A1-3). Significant contributions to production phase impact come from the emission of ozone depleting substances during the upstream production of raw materials/pre-products as well as those arising from electricity production. Module D shows a very small credit even though scrap burdens are being assessed in this phase. This is explained because ODP emissions are linked to grid electricity production used.

### Acidification Potential (AP)

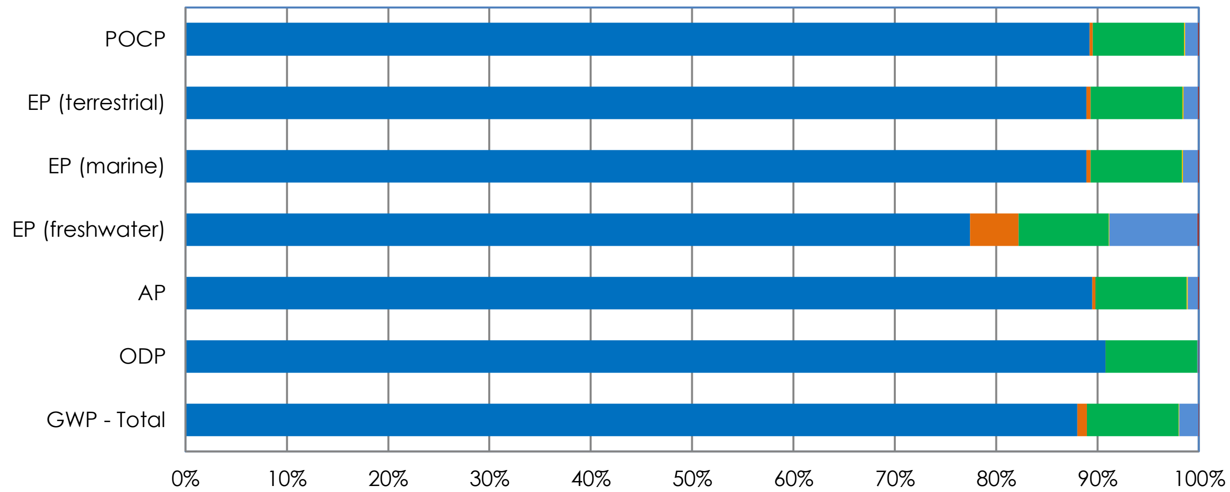
Acidification potential is generally driven by the production of sulphur dioxide and nitrogen oxides through the combustion of fossil fuels, particularly coal and crude oil products. The majority of the lifecycle AP impact occurs in the production phase (A1-A3), similar to GWP. The major contributors to production phase AP impacts comes from energy resources used in the production of the raw materials and pre-products for the steelmaking process and from transportation. Fabrication, installation and the end-of-life processes classed under C1-C4 make minimal contributions.

### Eutrophication Potential (EP)

Eutrophication is driven by nitrogen and phosphorus containing emissions and as with GWP and AP is often strongly linked with the use of fossil fuels. The major eutrophication impacts occur in the production phase (A1-A3). Significant contributions to production phase impact comes from the production of raw materials and transport. Fabrication, installation and the end-of-life processes classed under C1-C4 again make minimal contributions.

### Photochemical Ozone Creation Potential (POCP)

POCP tends to be driven by emissions of carbon monoxide, nitrogen oxides (NOx), sulphur dioxide and NMVOCs. The production phase is the dominant phase of the lifecycle with regards to POCP impacts. Again, these are all emissions commonly associated with the combustion of fuels. Significant contributors to POCP are the upstream production of raw materials/pre-products and transport, directly linked to fossil fuel combustion. It should be noted that the impacts for steel recycling in module D is almost of the same magnitude as the production phase impacts




| | GWP - Total | ODP | AP | EP (freshwater) | EP (marine) | EP (terrestrial) | POCP |
|---|---|---|---|---|---|---|---|
| A1-3 | 87.99% | 90.79% | 89.50% | 77.41% | 88.89% | 88.91% | 89.20% |
| A4 | 0.98% | 0.04% | 0.32% | 4.81% | 0.43% | 0.41% | 0.32% |
| A5 | 9.03% | 9.05% | 9.01% | 8.92% | 9.03% | 9.04% | 9.03% |
| C1 | 0.08% | 0.00% | 0.10% | 0.02% | 0.11% | 0.11% | 0.11% |
| C2 | 1.87% | 0.08% | 1.00% | 8.71% | 1.48% | 1.46% | 1.27% |
| C3 | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| C4 | 0.05% | 0.04% | 0.07% | 0.13% | 0.06% | 0.06% | 0.07% |

Figure 1 - shows the relative contribution of each life cycle stage to different environmental indicators for the carbon steel reinforcing bars manufactured by the primary (DRI) production route

## Production Stage Contribution Analysis

Scope & indicator:

This analysis explains the production stage A1–A3 using Climate change – total (GWP-total) for the declared unit. It is an interpretive view of hotspots; the module-level tables in LCA Results remain the authoritative values.

Method: EN 15804+A2; CFs: EN 15804 reference package EF 3.1.

Results and reconciliation:

Values represent A1–A3 only. The sum of step contributions equals the A1–A3 Climate change – total reported in the LCA Results tables. Process steps are analytical groupings within A1–A3 and are provided for interpretation; the module-level values remain the authoritative results in the EPD.

| Manufacturing Process Step | GWP-total<br>kg CO2 eq | Share of A1–A3<br>% |
|---|---|---|
| DRI Making | 1.39E+03 | 61.0 |
| Steelmaking | 711 | 31.1 |
| Rolling | 179 | 7.9 |
| **Total (A1-A3)** | **2.28+E03** | **100.0** |

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CARES SSRC Singapore Steel for the Reinforcement of Concrete Scheme - Appendix 1 Quality and operations assessment schedule for Singapore Standard (SS 560:2016) weldable reinforcing steel bars, coils and decoiled products for the reinforcement of concrete including inspection and testing requirements - https://www.carescertification.com/certified-companies/search - Certificate number of conformance to SS 560:2016 at the time of LCA study – 180602

CARES SRC Steel for the Reinforcement of Concrete Scheme. Appendix CP&AS 20 - Quality and operations assessment schedule for ASTM carbon and low alloy steel bars and coils for the reinforcement of concrete including inspection and testing requirements - http://www.ukcares.com/approved-companies - Certificate number of conformance to ASTM A615/A615M at the time of LCA study – 180101

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