Responsible™ Steel | standards & certification

Summary: Fundamentals for GHG Emissions Accounting and Classification

An outline of the excerpts from the ResponsibleSteel International Production Standard v2.1.1, Principle 10: GHG Emissions and Climate Change

Driving transparency, comparability and decarbonisation progress

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www.responsiblesteel.org

Contents: ResponsibleSteel GHG Fundamentals

Section 1 is used to calculate crude steel GHG emissions intensity at *site level*

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Section 2 is used to calculate scrap share, and to determine the DPL at *site level*

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Section 3 requires a PCF or EPD to calculate the emissions at *product level*

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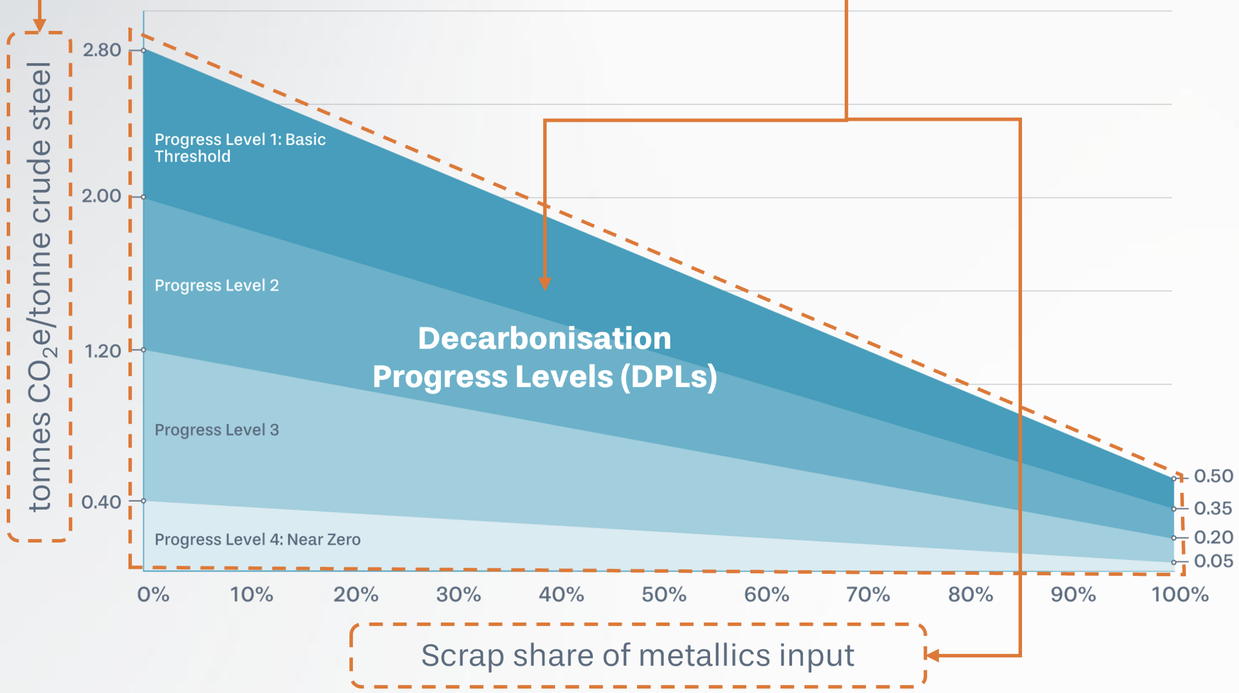
Certified Steel Requirements*



**Certified Steel requires achievement of at least DPL1, as well as Progress Level 1 for Responsible Sourcing (Principle 3) alongside compliance with all of Principle 10 and the Production Standard's other 12 Principles*

Note: Each section is separable and can be applied individually, but they are intended to be used together to make use of their interconnected value.

Purpose of separate publication of ResponsibleSteel's GHG Fundamentals

- To enhance clarity and usability of fundamental aspects of GHG emissions accounting and classification and thereby support decarbonisation of the global steel sector.

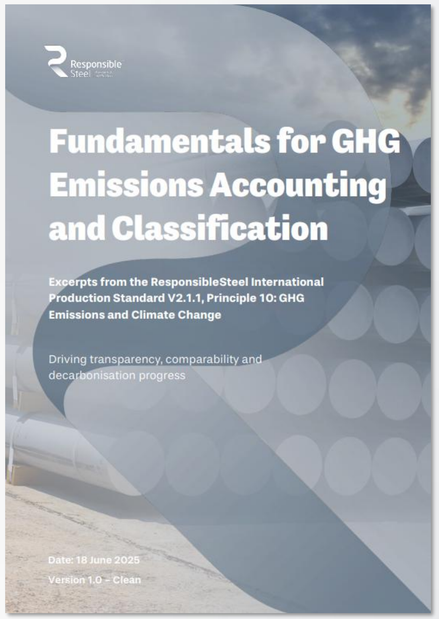
- To serve as a valuable reference point for wide range of stakeholders concerned about GHG emissions and climate change: steelmakers, steel buyers, policymakers, investors, and civil society organisations.

- To improve the understanding, accessibility and uptake of the:
  - ResponsibleSteel methodology on crude steel GHG emissions intensity at site-level;
  - ResponsibleSteel classification system for Decarbonisation Progress, and;
  - ResponsibleSteel requirements for GHG emissions intensity declarations at product-level.

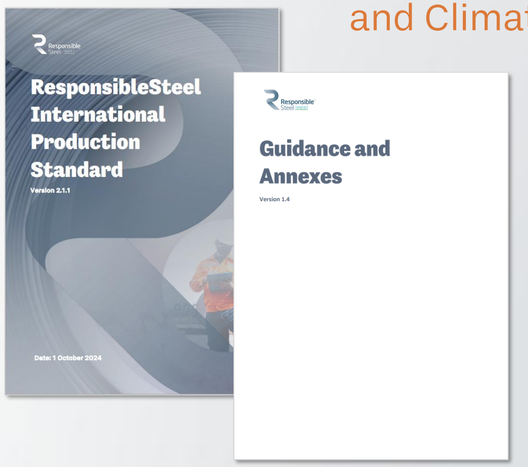
  ...which will consequently increase the transparency, comparability and completeness of the emissions from steel production, globally.

- To aid harmonisation, alignment and interoperability both of emissions accounting methodologies and definitions for low and near-zero emissions steel thresholds.

N.B. Use of this document does not entitle users to make claims about ResponsibleSteel certification, compliance with some, or all of, the ResponsibleSteel International Production Standard, or Decarbonisation Progress Level achievement.



Aspects of Principle 10: GHG Emissions and Climate Change



Section 1: ResponsibleSteel methodology on crude steel GHG emissions intensity at site-level

- This methodology has been specifically designed so that users can compare, on a consistent basis, the embodied GHG emissions for every tonne of steel produced anywhere in the world.
- The first version of this ResponsibleSteel methodology was published in 2022 in v2 of the International Production Standard.
- To achieve both emissions inclusivity and comparability across all steel products, the emissions boundary begins upstream of the steelmaker (inclusive of raw material/fuel extraction, intermediary material/fuel manufacture, and transportation to site) and has a downstream cut-off at crude steel.
- Thousands of different steel products and eight different hot rolling processes exist globally, leading to significant heterogeneity in the processing requirements post-crude steel. This underscores the importance of a crude steel emissions boundary endpoint, which is defined as the point immediately after casting.
- Over 60 signatories to the Steel Standards Principles achieved a consensus leading up to COP-29 on the importance of utilising emissions intensity units, the mining-to-crude emissions boundary, and incentivising primary data use, which are all fundamental aspects of ResponsibleSteel's methodology.

Building on existing methodologies

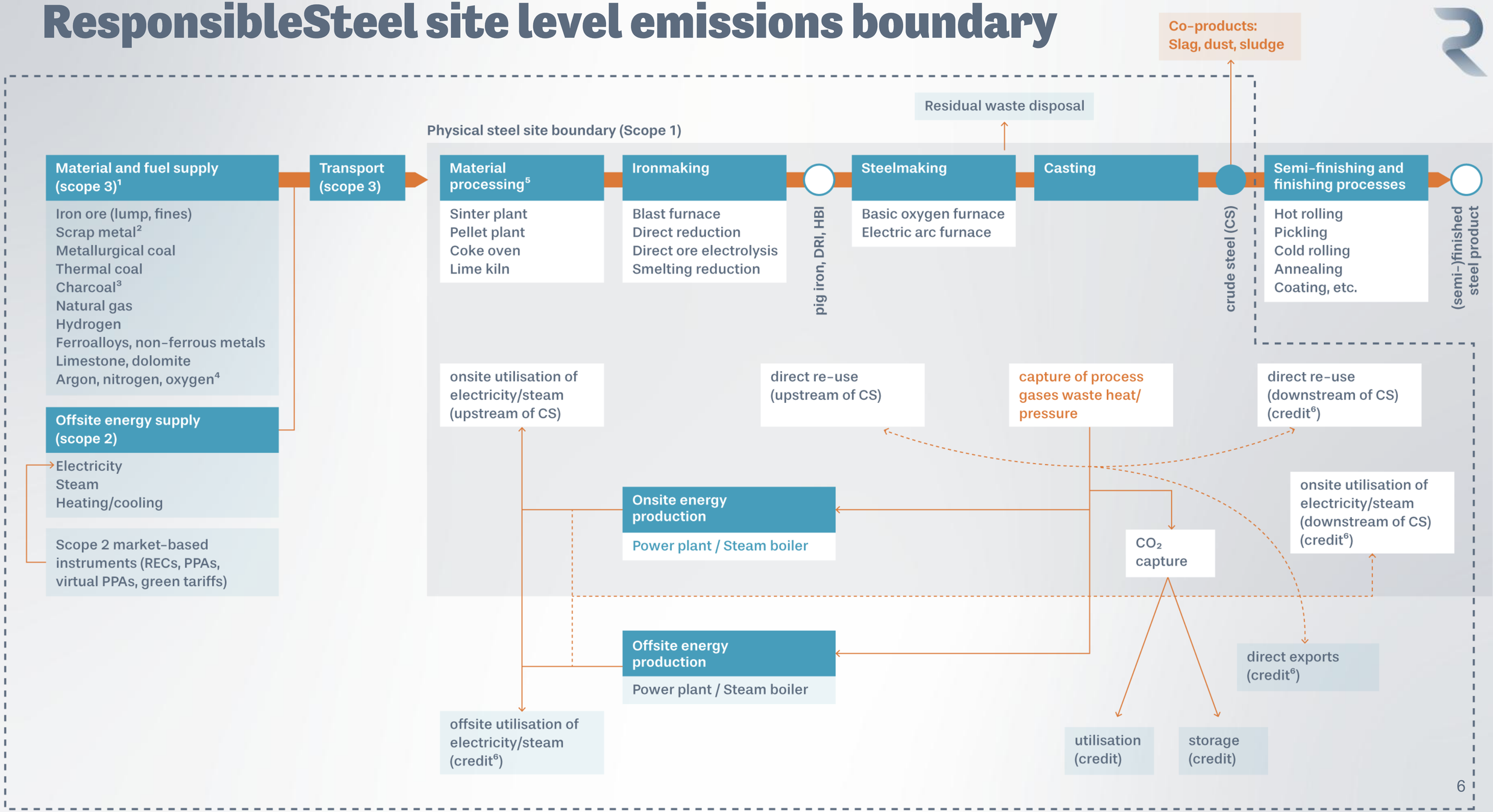
The ResponsibleSteel site-level methodology is based on the worldsteel CO2 Data Collection Methodology, and the corresponding ISO 14404 series (Parts 1 to 4). Critical adjustments made such as inclusion of all GHGs, full evaluation of all input materials in upstream scope 3, and incentives for primary data utilization, as summarized in the comparison table below.

	System Boundary	Scopes covered	GHGs	Unit	Scope 2 methods	Scrap credits	Solid co-product credits (slag, dusts, sludges)	Other credits	Data quality
ResponsibleSteel crude Steel GHG emissions intensity methodology	Site; "cradle-to-crude steel"	Scope 1, scope 2 & upstream scope 3	All GHGs	t CO_2e/t crude Steel	Location and market-based (inc. RECs, GOs PPAs, virtual PPAs)	No recycled content credit (embodied GHG value of zero)	No allocation	Exports of intermediary materials (e.g. sinter, DRI). Exports of electricity and steam, or that which is used post-crude steel (system expansion method). CCU, CCS, and biomass-related CO_2 sequestration, if net lifecycle emission reductions can be evidenced.	Use of primary data incentivised for the embodied GHG value of upstream materials and fuels by providing a conservative secondary dataset (most global values multiplied by 1.2, coal, coke and natural gas multiplied by 1.6).
ISO 14404 series	Site; "cradle-to-finished steel" (exc. mining & transport)	Scope 1, scope 2 & select upstream scope 3 (exc. mining & transport)	CO_2	t CO_2/t crude steel	Location-based only	No recycled content credit (embodied GHG value of zero)	No allocation	Exports of intermediary materials (e.g. sinter, DRI). Exports of electricity and steam (system expansion method).	No data quality requirements. Indicative emission factors for CO2 emission sources provided (partially aligned with worldsteel). Justification required for use of different emission factors.
Worldsteel CO2 Data Collection Methodology	Site; "cradle-to-finished steel*" (exc. mining & transport)	Scope 1, scope 2 & select upstream scope 3 (exc. mining and transport)	CO_2**	t CO_2/t crude steel	Location-based (market-based used in internal analysis only)	No recycled content credit (embodied GHG value of zero)	No allocation (used in internal analysis only)	Exports of intermediary materials (e.g. sinter, DRI). Exports of electricity and steam (system expansion method). Exports of ethanol, methanol & ammonia. Exports of CO_2.	Recommend use of primary site data. Provide industry average (secondary data) factors for the most relevant material and fuel inputs for scope 1,2,and 3.

**new version of worldsteel's methodology will also consider crude steel and hot rolled steel cut offs*

***worldsteel's methodology is working towards inclusion of all GHGs (especially methane) and extending the boundary upstream to include mining*

ResponsibleSteel site level emissions boundary



*1-6: please see the full document

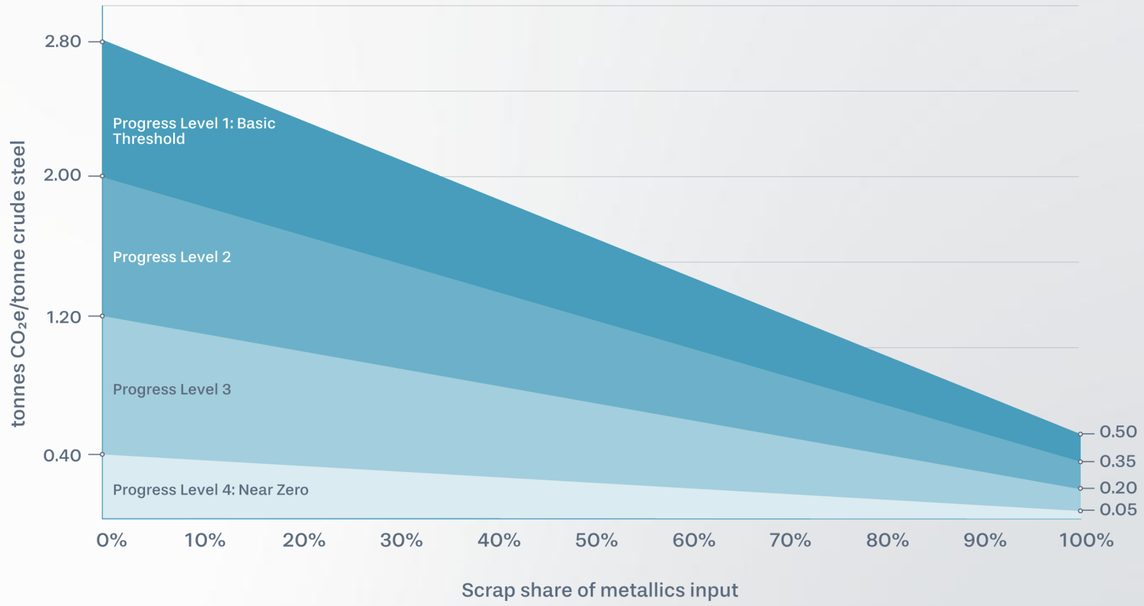
Section 2: ResponsibleSteel classification system for decarbonisation progress

- A universally applicable classification system to assess the decarbonisation progress of all steelmaking sites, globally, on a level playing field
- A steelmaking site's Decarbonisation Progress Level (DPL) can be determined using the site-level crude steel GHG emissions intensity (refer to Section 1) and scrap percentage (as outlined in this Section), according to the requirements set out in the published "GHG Fundamentals" document containing excerpts from the ResponsibleSteel International Production Standard.
- The classification ranges from DPL 1 (better than industry average) to DPL 4 (near-zero emissions), with DPL 2 and DPL 3 representing lower emissions step-changes.
- There is a building coalition of schemes backing the scrap-variable approach to define low/lower/near-zero emissions steel. Alongside ResponsibleSteel, the International Energy Agency (IEA), Industrial Deep Decarbonisation Initiative (IDDI), Chinese Iron and Steel Association (CISA), SteelZero, First Movers Coalition (FMC), and the Low Emissions Steel Standard (LESS) all define their steel emissions thresholds as a function of scrap. The emissions boundaries/scopes are distinct across the different schemes, which explains some of the differences in the thresholds themselves (IEA, 2024).
- For more information, refer to the:
  - 2-page guide on understanding ResponsibleSteel's Decarbonisation Progress Levels
  - Policy paper on the "Steel Decarbonisation Scale"
- Note that to achieve ResponsibleSteel Certified Steel (beyond Core Site certification), there is mandatory achievement of at least DPL 1. A steelmaking site's advancement towards more ambitious DPLs is required in line with its corporate-level decarbonisation pathway and transition action plan (required in Criterion 10.1) and site-level emissions reduction targets and planning (required in Criterion 10.5).

Decarbonisation Progress Level (DPL) Requirements

(a) Key methodological aspects of emissions accounting

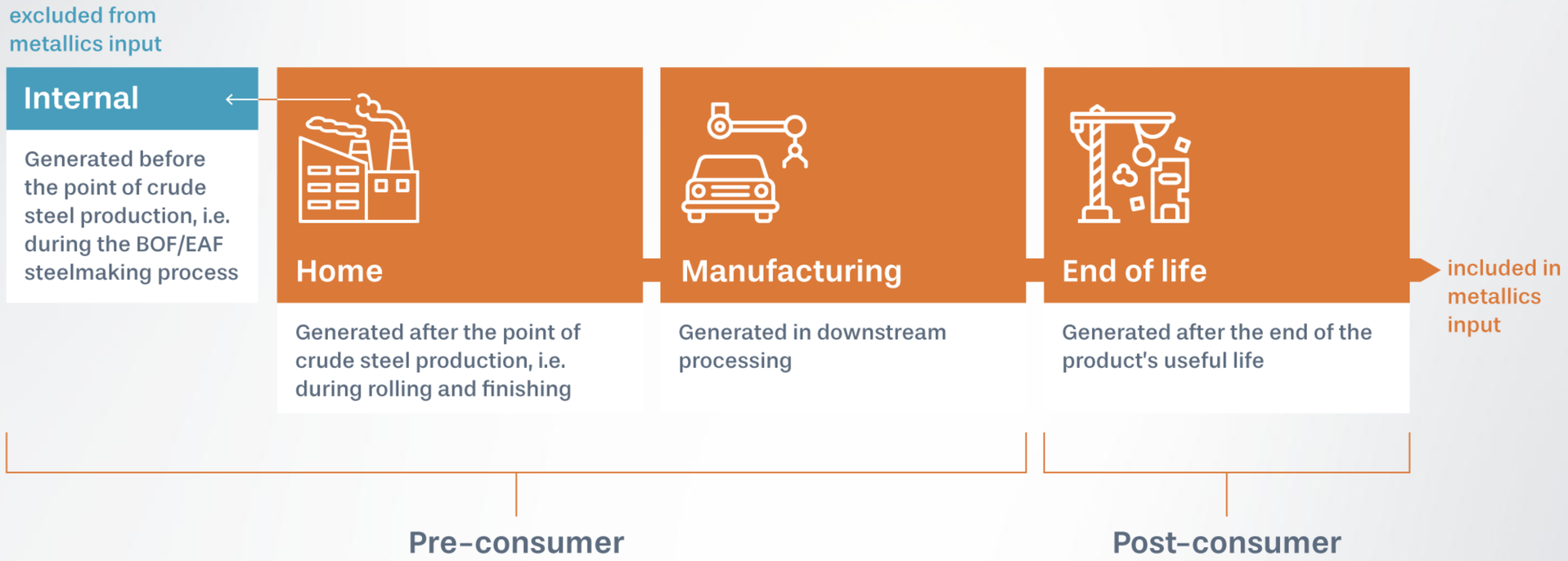
- tonnes CO2e/tonnes crude steel
- "cradle-to-crude" boundary, inc. scope 1, scope 2 and upstream scope 3
- Captures all emissions occurring at the site, regardless of the output product(s) or technology
- Scrap assumed to have embodied GHG value of zero
- Primary data use incentivised – "burden of doubt" approach for secondary data applied for input materials:
  - global average x1.2 for most input materials
  - global average x1.6 for coal, coke and natural gas due to additional unaccounted impacts from methane
- System expansion crediting approach used for process gases and waste energy which is captured to produce electricity or heat (replacing grid electricity, or natural gas, respectively)
- No co-product allocation applied for slags, sludges, dust, etc.



(b) Scrap Percentage Calculation

Scrap share of metallic inputs (%) = metallics within scrap inputs/metallics within all inputs

- Metallic-containing inputs to steelmaking: scrap, pig iron, DRI, HBI, ferroalloys, non-ferrous metals.
- Scrap includes home scrap, manufacturing scrap and end-of-life (EOL) scrap (i.e., excludes internal scrap), inclusive of both ferrous scrap and non-ferrous scrap.



Section 3: ResponsibleSteel requirements for GHG emissions intensity declarations at product-level

- Product-level emissions intensity requirements complement the site-level GHG emissions intensity calculated using the methodology set out in Section 1.
- Requires GHG emissions intensity calculation and disclosure of all steel products produced at the site.
- Must be disclosed in the form of a Product Carbon Footprint (PCF) or an Environmental Product Declaration (EPD). The value of interest is the Global Warming Potential (GWP) across modules A1-A3 of the lifecycle assessment (LCA), which includes raw material extraction, transportation of those raw materials to the site, and manufacturing of the product itself. This corresponds to an emissions boundary of 'cradle-to-gate', in units of tonnes of CO_2e per tonne steel product.
- The GWP value captures the product's emissions up to the finished product, beyond crude steel, filling a critical data gap which is essential for downstream steel buyers to determine their own upstream scope 3 emissions.
- Due to the vast heterogeneity of product emissions accounting methodologies, product-level data is insufficient to compare the emissions of steel production, globally, on a like-for-like basis.

Comparison of:

GHG measurement	Decarbonisation Progress Levels (function of t CO_2e/t crude steel and scrap %)	Product emissions intensity (t CO_2e/t steel product)
Comparability	✓ Consistent and comparable unit of measurement across entire global industry	✗ Not comparable across the industry due to different products and accounting methodologies
Emissions inclusivity	✗ 'Cradle-to-crude' steel (to ensure comparability across all steel products), missing emissions downstream of crude steel	✓ At least 'cradle-to-gate' emissions (Modules A1-A3) - end-of-life emissions may also be considered
Transparency around scrap usage	✓ Mandatory declaration of scrap %	✗ No mandatory declaration of scrap utilisation
Support for push to near zero	✓ Scrap variable scale prevents carbon leakage, driving global, sector-wide progress to near zero	✗ Useful to the customer to help reduce scope 3 emissions, but on its own will not deliver climate outcomes we all seek
Measurement rules	*ResponsibleSteel V2 Criterion 10.4, which builds on the worldsteel CO2 methodology and ISO 14404 series*	*Internationally/regionally-recognised standards, e.g. PAS 2050, EN 15804, ISO 14067/14025/20915*
Required for ResponsibleSteel Progress Level Certification	✓	

Applicable product standards

A number of standards, methodologies and tools may be used to support the determination and reporting of the product carbon footprint, either as a unique attribute, or as one part of a broader assessment that considers other environmental aspects in addition to GHG emissions.

These include:

Standards that focus specifically on the product carbon footprint:

- The GHG Protocol Product Life Cycle Accounting and Reporting Standard
- ISO 14067:2018, Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services

Standards that cover a broader range of environmental aspects:

- EN 15804:2012 + A2:2019, Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14025:2010 Environmental labels and declarations. Type III environmental declarations. Principles and procedures
- ISO 14040:2006, Environmental management – Life cycle assessment – Principles and framework
- ISO 14044:2006, Environmental management – Life cycle assessment – Requirements and guidelines
- ISO 20915:2018, Life cycle inventory calculation methodology for steel products
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of products and services.

The Global Warming Potential (GWP) value in Product Carbon Footprints (PCFs) and Environmental Product Declarations (EPDs) – a useful but incomparable metric

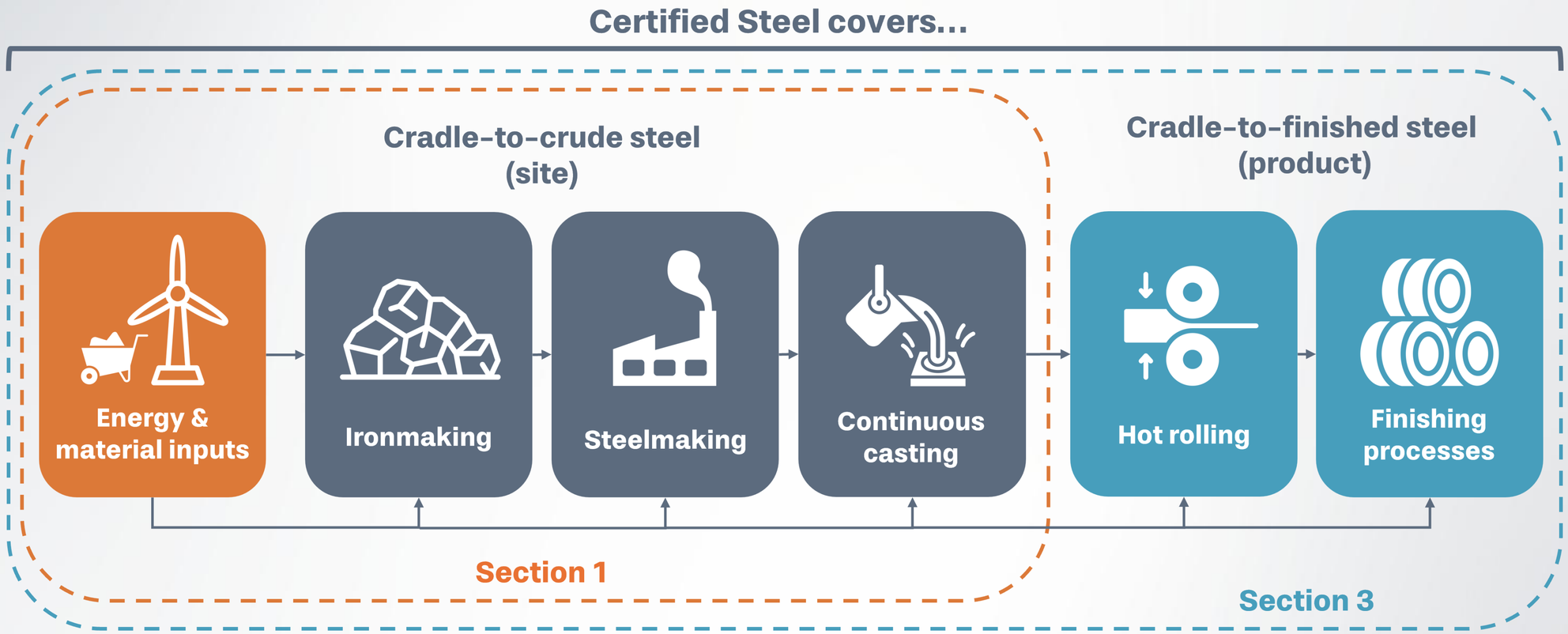
Pros

- Established third-party verification process
- Useful in Scope 3 value chain reporting
- Lifecycle assessment (LCA) approach with impacts considered across manufacturing, use and end-of-life stages
- Provides transparency in emissions (and beyond) at different stages
- Alignment with some regulation (EU Taxonomy and building codes)

Cons

- Inconsistent and incomparable:
  - Multiple different standards to choose from with unique accounting rules (a single EPD may reference multiple standards).
  - Product-level data presented in tonnes CO2e/t (semi)finished steel, making it impossible to compare at the common crude steel cut off.
- Frequently provide optionality in co-product accounting methods, reducing consistency even when the same standard is referenced
- Not reflective of site-level data; product data could be averaged across multiple sites
- Scrap percentage not disclosed
- Slow update cycles (5 years) which can use data up to 10 years old for generic data, and 5 years old for producer specific data
- Regional data default values used which causes variation
- Cost and resource-intensive

Two emissions boundaries ensure comparability and comprehensive emissions assessment



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