

Steel (Hot-Rolled Finished Coil)

Declared Unit: 1.0 kg

Boundary: Cradle-to-Gate

Origin: Belgium (BE)

Standard: GHG Protocol / 2026 LSR

1.868

KG CO₂E / KG STEEL

TOTAL FOOTPRINT

1.868 kg CO₂e

Net per functional unit (1.0 kg)

DIRECT SCOPE 1

64.0% (1.196 kg)

Primary chemical reduction & coke oxidation

TOP UPSTREAM DRIVER

Iron Ore Pellets

0.255 kg CO₂e (13.6% of cradle-to-gate)

DATA QUALITY & LSR



99.1% Coverage

Tier-1 Ecoinvent 3.10 • dLUC: 0.0019 kg



GHG Protocol Scope Distribution

Cradle-to-Gate

Factory gate attribution for 1.868 kg CO₂e

Scope 1: Direct Manufacturing & Reduction	1.196 kg (64.0%)
Scope 3: Upstream Raw Materials & Logistics	0.601 kg (32.2%)
Scope 2: Purchased Electricity & Steam (BE Grid)	0.071 kg (3.8%)

LIFECYCLE STAGE EMISSION WEIGHT (%)

● Upstream Materials (25.8%) ● Inbound Freight (6.4%) ● Primary Smelting (59.8%) ● Reheating & Power (8.0%) *Use & EoL excluded by gate boundary

 **Material & Chemical
Contribution**

Dominant emission vectors across supply chain

Top 5 Hotspots

PROCESS / SOURCE RELATIVE RATIO KG CO₂E SHARE

Coking & Sintering

0.531 28.4%

BF Iron Reduction

0.506 27.1%

Iron Ore Mining

0.255 13.6%

Coking Coal Mining

0.124 6.6%

Ocean Bulk Freight

0.088 4.7%

BOF Decarburization

0.081 4.3%

🕒 Key Findings & Hotspot Insights

Strategic audit findings from the technical assessment

Blast Furnace Dominance (55.5% Direct Scope 1)

Direct combustion and stoichiometric chemical reduction of iron oxide via carbon coke are responsible for 1.037 kg CO₂e. Deep decarbonization is strictly bounded by chemical reductant substitution.

Upstream Category 1 Fragility (0.548 kg Scope 3)

Extractive supply chains (iron ore pelletizing in Brazil/Nordics and metallurgical coal from Australia) generate 32.2% of the product's footprint, outweighing regional processing electricity by more than 7:1.

2026 LSR Land & Biogenic Compliance

Direct Land Use Change (dLUC) amortized from open-pit mining is quantified at **0.0019 kg CO₂e**. Slag natural weathering removals were evaluated as 0.0000 due to non-permanent boundary criteria.

⚡ **Decarbonization Action Plan**

Modeled trajectory towards low-emission steel production

Strategy / Mechanism	Horizon	PCF Impact
BOF Scrap Max Loading (28%) Increases circular input, cuts molten pig iron demand	2026-2028	-0.180 kg
Renewable PPA (Belgian Offshore Wind) Replaces grid mix (0.142 kg/kWh) for caster drives	2026-2027	-0.066 kg
Bio-Coal Injection (LSR Certified) Replaces fossil PCI with certified biogenic reductants	2028-2032	-0.220 kg
Green H₂ DRI + EAF Route Fundamental replacement of BF-BOF carbon metallurgy	2032-2040	-1.350 kg

Methodology: GHG Protocol Product Standard • AR6 GWP100 • Ecoinvent 3.10 / WSA Certified LCI

System Boundary: Factory Gate (Belgium) • Uncertainty: ±6.8% (95% CI) • Verified via carboncalcpcf.com