



Steel is essential for growth but is a high-emissions sector. While coal-based blast furnaces dominate, cleaner options like EAF need balanced support in technology, resources, and financing for a sustainable transition.

Steel is fundamental to infrastructure, construction, mobility, energy systems and industrial growth. However, it remains a hard-to-abate sector, accounting for 7–9% of global GHG emissions, largely due to the continued reliance on the coal-intensive blast furnace–basic oxygen furnace route for nearly 70% of production. While the scrap-based electric arc furnace pathway offers significantly lower emissions (~20–25% of traditional routes), it is constrained by scrap availability and end product limitations.

Although decarbonisation of steelmaking is essential for achieving global climate goals, efforts are constrained by high energy costs, limited access to clean power, scaling challenges in new process routes and lack of maturity in policymaking. Tata Steel integrates ESG principles into its core strategy and, aligned with the Tata Group's Project Aalingana, has committed to Net Zero emissions by 2045. Achieving this goal requires collaborative action across stakeholders, supportive policies, robust carbon pricing frameworks, stronger demand for green steel and affordable clean energy access.

Net Zero

Emissions by 2045 for Tata Steel Group

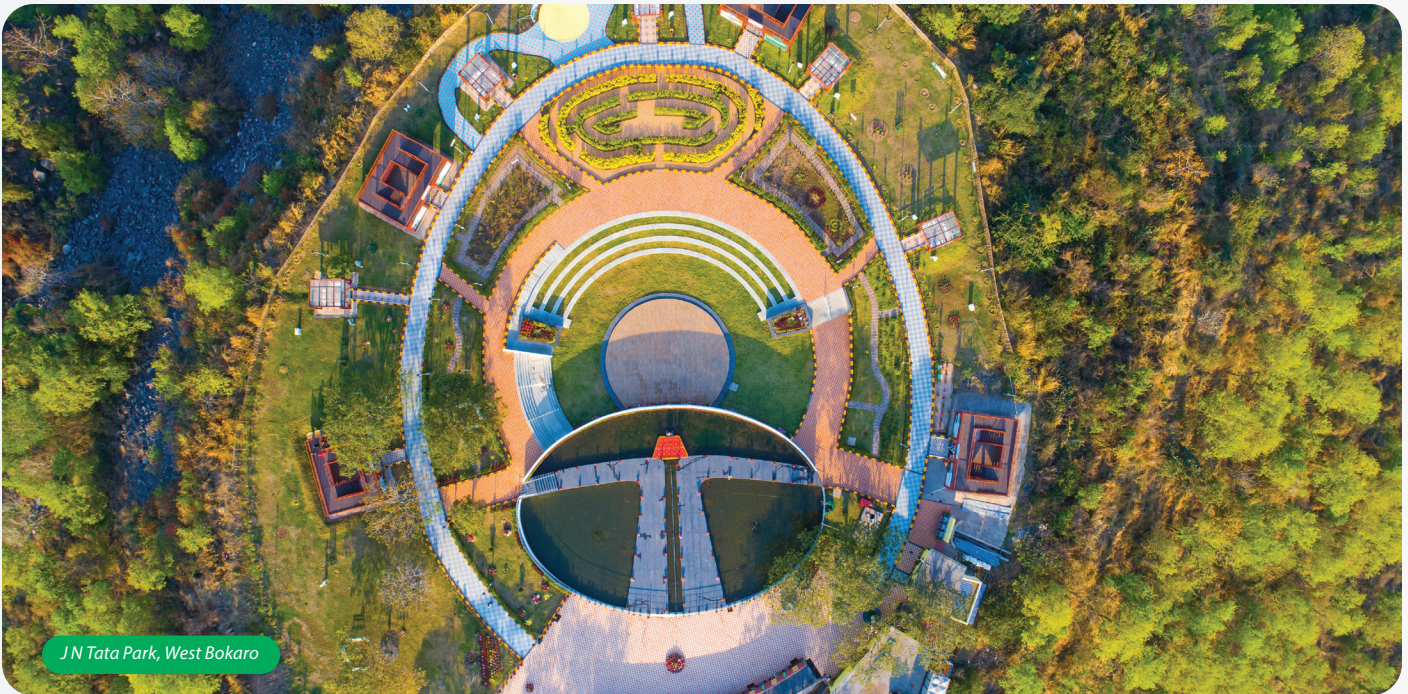
Integrating TNFD recommendations

As a member of the Taskforce on Nature-related Financial Disclosures (TNFD), Tata Steel has actively contributed to the development of the framework and is now among the early adopters of its recommendations, integrating them with the TCFD.

The Company has conducted comprehensive climate risk assessments across its key steelmaking sites, embedding the outcomes into its ERM framework. In parallel, Tata Steel has undertaken a detailed assessment of nature-related dependencies, risks, and opportunities for its India operations, leveraging advanced third-party analytical tools.

Notably, Tata Steel published its first standalone TNFD Report in 2025, marking a significant milestone in its journey towards nature-related transparency and disclosure.

This report presents a holistic view of both climate and nature-related risks and opportunities. It aligns with IFRS S2 (formerly TCFD) and TNFD recommendations. By structuring its disclosures around the four core pillars — Governance, Strategy, Risk Management, and Metrics & Targets — Tata Steel demonstrates strong alignment with global best practices and reinforces its commitment to transparent and sustainable value creation.



JN Tata Park, West Bokaro

Governance

Tata Steel has embedded robust governance to drive its climate change agenda, aligned with its strategic goal of Industry leadership in ESG. Oversight is provided by Board-level committees, including the CSR & Sustainability Committee and the Safety, Health & Environment Committee, alongside the Risk Management Committee, which reviews early warning indicators and mitigation strategies. Apex Management Committees chaired by the CEO & MD support strategic planning, risk oversight, and performance monitoring.

Cross-functional Centres of Excellence for GHG Emissions Reduction and Biodiversity Management guide implementation. Additionally, the TOP (Total Operational Performance) in Technology programme institutionalises project execution, ensuring prioritisation of critical sustainability initiatives aligned with the Net Zero ambition.

Strategy

While the Company is guided by a long-term ambition of achieving Net Zero emissions by 2045, the approach and the pace of decarbonisation in each geography is influenced by local contexts. Each geography operates under a unique environment shaped by local regulations, the extent of policy incentives, the availability and price of green energy, the maturity of supporting infrastructure, and customers' readiness to pay a premium for low-emission steel.

These factors influence technology choices, investment sequencing and the pace of transformation, resulting in differentiated strategies that still align with Tata Steel's overall direction. Together these considerations, combined with Tata Steel's technology-led decarbonisation roadmap, will shape the Company's transition to a low-carbon future across India, the UK, the Netherlands and Thailand.



India

India is experiencing a phase of rapid economic growth and is already the world's second-largest steel producer. The National Steel Policy envisions capacity reaching 400 MTPA by FY2035-36, with demand expected to grow four to five times by mid-century, driven by infrastructure expansion and industrialisation. While this growth is critical for national development, it also presents significant decarbonisation challenges, as the sector continues to be dominated by fossil fuel-intensive blast furnace–basic oxygen furnace routes.

The transition pathway in India is shaped by several structural constraints. Limited availability of cost-competitive transition fuels such as natural gas restricts the scalability of gas-based Direct Reduced Iron (DRI). Scrap availability remains structurally low due to underdeveloped end-of-life recovery systems, which will take time to mature, limiting the immediate expansion of scrap-based steelmaking route. At the same time, most near-zero emission technologies are still in early stages of readiness, making blast furnaces essential to meet near-term demand. Regulatory developments are driving change such as the Carbon Credit Trading Scheme (CCTS) and the emerging Green Steel Taxonomy are at inception stage. Tata Steel's India transition strategy therefore focuses on progressively reducing fossil fuel dependence while aligning with national resource realities and its Net Zero by 2045 ambition. A key milestone in this journey is the inauguration of a 0.75 MTPA scrap-based EAF in Ludhiana, marking a shift toward low-emission circular steelmaking.

On the energy front, Tata Steel's electricity mix in India currently includes by-product gases and waste heat recovery (45%), coal (35%), grid supply (18%) and renewables (~2%). These waste heat recovery systems and dual-fired boilers improve energy efficiency and reduce emissions. To enhance renewable integration, the Company has secured 379 MW of round-the-clock hybrid wind–solar capacity through Tata Power Renewable Energy Limited (TPREL), corresponding to 966 MW of installed capacity. This is complemented by a 70 MW solar project for its Maharashtra operations. There are rooftop and floating solar installations of 59 MWp across

Jamshedpur and Kalinganagar. These initiatives are expected to increase renewable energy share from 2.4% (in FY2025-26) to 6.4% by FY2026-27. Additional measures include piloting the use of plant-based biochar to partially substitute fossil fuels in blast furnaces at Jamshedpur and Meramandali.

To enable deep decarbonisation over the long term, Tata Steel is advancing first-of-its-kind technologies in India aimed at transforming the ironmaking process. In partnership with SMS group, the Company is introducing the EASyMelt pilot at Jamshedpur — a combined coal and gas-based, plasma-assisted melter capable of reducing CO₂ emissions by over 50% compared to conventional routes. The technology is planned for demonstration at the E Blast Furnace by 2030, supporting future large-scale deployment.

In parallel, Tata Steel is progressing the scale-up of Hlsarna through a proposed 1 MTPA demonstration plant at Jamshedpur. Hlsarna is an innovative smelting technology that enables the direct use of iron ore fines and powdered coal, eliminating the need for coke making and sinter plants. By combining a high-temperature melting cyclone with a smelting vessel, it allows ore to be melted and reduced in a single continuous step, while generating a concentrated off-gas stream suitable for carbon capture. The technology can also utilise lower-grade raw materials, including those typical to India, bolstering its relevance and scalability.

In FY2025-26, Tata Steel completed its first Nature-based Solutions (NbS) assessment for the Sukinda Ecorace Conservation Project, which was reviewed by IUCN India and aligned with the IUCN Global NbS Standard. In its continued efforts to reduce Scope 3 carbon emissions, the Company doubled the deployment of green vehicles (vs. FY2024-25) with over 600 green mobility vehicles now operational for raw material and finished goods movement across locations. Tata Steel also became the first Indian steel company to undertake a fully-laden B24 biofuel voyage for flux shipments from Mina Saqr port (UAE) to India using a Capesize vessel.



The United Kingdom

In the UK, Tata Steel is transitioning completely to scrap-based EAF steelmaking (3.2 MTPA), supported by £500 million government funding. The phased shutdown of coke ovens and blast furnaces, decommissioning of legacy assets (completed in 2024) followed by the commissioning of the new EAF are together expected to reduce direct emissions by ~50 million tonnes of CO₂ over 10 years.

Improvement projects have also progressed including the installation of new efficient compressed air drying equipment and optimisation of cooling towers at the Corby site and extensive optimisation of Port Talbot site's steam network.

Toward sustainability-linked product development, TSUK introduced Catnic SolarSeam®, an innovative bonded photovoltaic solution that delivers efficient renewable energy without visible frames and is guaranteed to operate for 25 years.

The Netherlands

TSN's decarbonisation strategy is centred on a phased plan to transition to a Direct Reduced Iron (DRI) and EAF-based steelmaking. In line with the publicly announced Joint Letter of Intent with the Dutch government, this transition is supported by conditional public funding of up to approximately €2 billion. The programme includes the phased closure of one blast furnace and one coke and gas plant, and complementary measures aimed at improving environmental performance.

Currently TSN is engaged with all stakeholders to resolve various regulatory challenges facing the business and to complete conditions precedent for the decarbonisation and environmental improvement project. Subject to resolution of these matters and a final investment decision and implementation, the planned transformation is expected to deliver a substantial reduction in direct CO₂ emissions, with indicative reductions of approximately 5.4 million tonnes CO₂ per year compared to a baseline of 12.6 million tonnes CO₂ at 7.23 MTPA of steel production.



Net Zero by 2045

Strategy lever #1

Energy efficiency and Process optimisation

Progress so far

- Completed 1 year of the Kraftblock thermal-energy-storage technology operations at the Sinter Plant at Jamshedpur. The solution turns waste heat into process heat, delivering fuel savings, productivity gains, and ~22,000 tCO₂ annual reduction
- TSK Phase 2 expansion ramp-up underway to achieve planned operating parameters
- Installation of Coke Dry Quenching (CDQ), top-pressure recovery turbines, dry-gas cleaning, and improved waste-heat and by-product-gas recovery
- Implemented a Regenerative Thermal Oxidiser at TSN Maubeuge, reducing CO₂ emissions by 7,500 tCO₂ per year
- Extensive optimisation of the Port Talbot steam network

Short to long term

- Adoption of best-available energy efficiency systems which enable increased recovery of waste heat and by-product gas

Strategy lever #2

Scrap-based steelmaking

Progress so far

- Inaugurated the 0.75 MTPA scrap-based EAF plant at Ludhiana, Punjab in India
- Commissioned the 0.5 MTPA scrap-recycling facility at Rohtak
- Increased scrap usage at the Basic Oxygen Steelmaking (BOS) plant at IJmuiden, contributing to a record low CO₂ intensity in 2025 (ref EU ETS)
- Build phase of 3.2 MTPA Port Talbot EAF project is underway

Short to medium term

- Scale up of scrap-recycling facilities to streamline scrap supply chain
- Designing future projects with higher scrap-charging capability
- Increasing scrap-charging in existing steelmaking facilities

Long term

- Capacity expansion through scrap-based EAF steelmaking

Strategy lever #3

Greening of power mix

Progress so far

- Renewable capacity expanded using Power Purchase Agreements
- Substituting coal with gas in power generation
- Taking over ownership of the Vattenfall power plants boosts energy self sufficiency at TSN, providing direct control over on-site power during the transition and enabling a cleaner, lower carbon power mix

Short to medium term

- Replacing ageing assets with high-efficiency by-product gas power plants
- Increasing the share of renewable energy in the power mix

Long term

- Full replacement of any fossil-based power with renewable power

Net Zero by 2045

Strategy lever #4

Use of alternative reductants

Progress so far

- Hydrogen injection in Blast Furnace trialled at Jamshedpur, first in the world at such scale
- Biochar usage continued in Blast Furnace operations at Jamshedpur and has been introduced across other iron and steelmaking sites
- Reinforced supply chain readiness to support scale-up and conducted tailored pilot trials to evaluate technologies for efficient biomass-to-biochar conversion
- Conducted a world-first Coal Bed Methane (CBM) injection trial at Blast Furnace in Jamshedpur
- Replacement of diesel with Hydrotreated Vegetable Oil (HVO) at IJmuiden

Short to medium term

- Introducing biochar as a fossil fuel substitute in blast furnaces at all units
- Piloting Coke Oven Gas (COG) injection as a partial coke replacement

Long term

- Strengthening the supply chain for reliable biochar sourcing
- Adoption of natural gas/hydrogen injection into blast furnaces
- Sustainable storage, and use of Green Hydrogen across the steel value chain

Strategy lever #5

Breakthrough technologies

Progress so far

- Commissioned first-of-its-kind a 5-TPD Carbon Capture plant
- Hydrogen generation using municipal solid waste
- Trial of Hlsarna with Indian raw materials

Short to medium term

- Setting up of 1 MTPA Hlsarna demonstration plant in Jamshedpur
- Piloting EASyMelt in the E Blast Furnace at Jamshedpur
- Upscaling pilots of Carbon Capture Utilisation and Storage (CCUS) and dovetailing with the existing processes

Long term

- Scale-up of EASyMelt technology
- Scale-up of Hlsarna smelting technology
- Development and adoption of CCU and CCS



● Carbon Direct Avoidance ● Process Improvement ● Carbon Capture



Risk management

Tata Steel manages climate-related risks through its integrated ERM framework, ensuring a consistent approach across the organisation. The ERM process applies bottom-up and top-down assessments to enable comprehensive risk identification and minimise blind spots. Early warning indicators and mitigation actions are defined and periodically reviewed by the business. The climate-related risks are reviewed periodically by the Risk Management Committee of the Board.

In line with TCFD recommendations, Tata Steel undertook an independent climate risk assessment covering key steelmaking sites in India, the Netherlands, and the UK. The assessment identified material physical risks like extreme heat, flooding, water stress, and wind and storm events—evaluated under IPCC RCP 4.5 and 8.5 scenarios for 2030 and 2050.



Description

Mitigation

Physical Risk

Operational disruption in steelmaking facilities due to extreme climate (physical) events leading to loss in profitability.

- › Climate-resilient capacity design combining strengthened structures and low water intensity processes to withstand extreme weather events such as high wind speeds, extreme temperatures, and intense rainfall and minimise operational disruptions
- › Enhancing water security through recycling, use of treated municipal wastewater, rainwater harvesting, and improved stormwater management to reduce freshwater dependence.

Transition Risk

Development in climate change regulations and disclosure standards, reducing access to capital and increasing the cost of funding.

- › Utilise sustainability-linked financing to enable capital investments in growth and decarbonisation
- › Develop and communicate a comprehensive decarbonisation action plan to external stakeholders to achieve targeted carbon emission reductions, in alignment with regulatory requirements such as BRSR

Cost of carbon compliance:

- (a) Impact on operational costs from direct carbon pricing
- (b) Impact of carbon border taxes
- (c) Use of more expensive but greener energy

- › Develop phased decarbonisation strategies across the short, medium, and long term, aligned with the evolving market and policy landscape like CCTS
- › Align long-term capital expenditure plans with the Company's carbon emission target
- › Adoption of best available technology for operational efficiency, maximising scrap recycling, maximising power-mix through RE and bioenergy, capacity expansion via scrap-based EAF route, etc.
- › Piloting breakthrough technology such as EASyMelt and HIsarna
- › Pursue deep decarbonisation through Carbon Capture, Storage & Usage and hydrogen-based steelmaking

Climate-related opportunities

Taxonomy of Green Steel and procurement of less CO₂ intensive products

In alignment with the Government of India's (GoI) Green Steel Taxonomy under the Public Procurement Policy, which classifies steel products based on carbon emissions and assigns 3 to 5 star ratings, Tata Steel is advancing multiple decarbonisation initiatives.

Trading of carbon credit certificates

GoI is establishing emission reduction targets for steel producers. Entities achieving reductions beyond the prescribed targets will earn Carbon Credit Certificates.

Low carbon market economy

India's low-emission steel market is still at an early stage and growing. Tata Steel has designed two product pathways verified through an accredited third party to cater customer demands: (a) low-emission steel enabled through an internal carbon bank mechanism, and (b) steel products with increased recycled content.

The underlying internal systems, controls, and processes required to deliver low emission steel are fully developed and deployment ready.

Metrics and targets

Tata Steel reports its ESG performance through its BRSR and ESG Factsheet, both integrated within its Integrated Report in alignment with leading global frameworks and standards including SEBI's BRSR, the Greenhouse Gas Protocol, IFRS S2 (erstwhile TCFD), the Global Biodiversity Framework (GBF) and the UN Sustainable Development Goals (SDGs).

The Company discloses a comprehensive set of environmental metrics, including GHG emissions, non-GHG air pollutants, waste generation and management, recycling and recovery, water discharge, and water withdrawal in stress areas. These disclosures ensure transparency and consistency in tracking environmental performance.

☉ Refer to the Business Responsibility and Sustainability Report and ESG Factsheet in Tata Steel's Integrated Report FY2025-26

☉ For targets, refer to the ESG Goals section in Tata Steel's Integrated Report FY2025-26



CRM Bara Pond, Jamshedpur