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THE CBAM AND BEYOND

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LIST OF ABBREVIATIONS

ACVA	Accredited Carbon Verification Agencies
ADB	Asian Development Bank
ADEETI	Assistance in Deploying Energy Efficient Technologies in Industries and Establishments
AEM	anion exchange membrane
AM/NS	ArcelorMittal/Nippon Steel
ASPA	Alloy Steel Producers Association of India
BCA	Border Carbon Adjustment
BEE	Bureau of Energy Efficiency
BF–BOF	blast furnace–basic oxygen furnace
BHP	Broken Hill Proprietary Company Limited
CAGR	compound annual growth rate
Capex	capital expenditure
CBAM	Carbon Border Adjustment Mechanism
CCC	Carbon Credit Certificate
CCTS	Carbon Credit Trading Scheme
CCUS	carbon capture, utilisation, and storage
CECP	Clean Energy and Climate Partnership
CERC	Central Regulatory Electricity Commission
CII	Confederation of Indian Industry
CO_2	carbon dioxide
COP	Conference of the Parties
CPAE	carbon price adjustment on exports
CRC	cold rolled coil
CSDDD	Corporate Sustainability Due Diligence Directive
CSEP	Centre for Social and Economic Progress
CTIP	Clean Trade and Investment Partnership
DGTR	Directorate General of Trade Remedies
DPP	Digital Product Passport
DRI	direct reduced iron
EAF	electric arc furnace
EEA	European Environmental Agency
EIB	European Investment Bank
EMC 2.0	Electronics Manufacturing Clusters 2.0
EPC	engineering, procurement, and construction
ESG	environmental, social, and governance
ESPR	Ecodesign for Sustainable Products Regulation
EST	environmentally sound technologies
ETS	Emissions Trading System
EU	European Union
FDI	foreign direct investment

FDMS	fines dry magnetic separation
FICCI	Federation of Indian Chambers of Commerce and Industry
FISME	Federation of Indian Micro and Small & Medium Enterprises
FTA	free trade agreement
FY	financial year
GDP	gross domestic product
GHCI	Green Hydrogen Certification Scheme of India
GT	gigatonne
GW	gigawatt
HBI	hot briquetted iron
HRC	hot rolled coil
HS	Harmonized System
IAA	Industrial Accelerator Act
ICM	Indian Carbon Market
ICRA	(previously) Investment Information and Credit Rating Agency
IDDI	Industrial Deep Decarbonisation Initiative
IEA	International Energy Agency
IF	induction furnace
IFCCT	Integrated Forum on Climate Change and Trade
IFCMA	Inclusive Forum on Carbon Mitigation Approaches
IFD	Investment Facilitation for Development (Agreement)
IPA	Investment Protection Agreement
IPFA	investment protection and facilitation agreement
ISA	Indian Steel Association
ISO	International Organization for Standardization
ISP	integrated steel plant
ITC	International Trade Centre
ITP	Industry Transition Partnership
JPC	Joint Plant Committee
JSL	Jindal Steel Limited
JV	joint venture
Kg	kilogram
KwH	kilowatt-hour
LeadIT	Leadership Group for Industry Transition
LNG	liquified natural gas
MDB	multilateral development bank
MENA	Middle East and North Africa
MMBtu	metric million British thermal unit
MMT	million metric tonnes
MNRE	Ministry of New and Renewable Energy
MOE	molten oxide electrolysis
MoEFCC	Ministry of Environment, Forest and Climate Change
MoU	memorandum of understanding

MRA	mutual recognition agreement
MRV	monitoring, reporting, and verification
MSMEs	micro, small, and medium enterprises
MTPA	million tonnes per annum
MW	megawatt
NDCs	Nationally Determined Contributions
NGHM	National Green Hydrogen Mission
NGSM	National Green Steel Mission
OECD	Organisation for Economic Co-operation and Development
OPEX	operational expenditure
PAT	Perform, Achieve and Trade (Scheme)
PEM	proton exchange membrane
PSCC	Parliamentary Standing Committee on Commerce
R&D	research and development
RED	Renewable Energy Directive
RFNBO	Renewable Fuels of Non-Biological Origin
SAIL	Steel Authority of India Limited
SECI	Solar Energy Corporation of India Limited
SHR	slag heat recovery
SIFA	Sustainable Investment Facilitation Agreement
SIMS	Steel Import Monitoring System
SMAP	Steel and Metals Action Plan
SOEC	solid oxide electrolyser cells
STRMI	Steel Research and Technology Mission of India
tCO_2/tcs	tonnes of carbon dioxide per tonne of crude steel
tCO_2/tfs	tonnes of carbon dioxide per tonne of finished steel
tCO_2e/ts	tonnes of carbon dioxide equivalent per tonne of steel
TDF	Temporary Decarbonisation Fund
TERI	The Energy and Resources Institute
TMT	thermo-mechanically treated (steel bars)
TRIPS	Trade-Related Aspects of Intellectual Property Rights (Agreement)
TRL	Technology Readiness Level
TRQ	tariff-rate quota
TTC	Trade and Technology Council
UK	United Kingdom
UNFCCC	United Nations Framework Convention on Climate Change
US	United States (of America)
WSA	World Steel Association
WTO	World Trade Organization

Executive Summary

Perspectives on the European Union's Carbon Border Adjustment Mechanism (EU CBAM) have been highly polarised. While the EU strongly advocates for the CBAM as a necessary tool to achieve its climate ambitions, most developing countries oppose it due to the anticipated economic burden, perceived protectionist nature, and concerns over climate justice. The EU–India free trade agreement negotiations also reflect this divide, with the CBAM having emerged as a major point of contention.

India's critique of the CBAM is important, warranting careful consideration and appropriate action. Indeed, the European Commission must ensure transparency, engage in regular bilateral dialogue, and provide sufficient financial and technical assistance to prevent it from being a trade barrier for Indian firms. At the same time, India's opposition obscures diverse and complex ground realities, as the implications of the CBAM for Indian firms are likely to be highly heterogeneous. Moreover, it downplays the fact that India, too, seeks to transition to a low-carbon economy – albeit at a different pace and with different levels of ambition than the EU, reflecting distinct development realities.

With a focus on the Indian steel sector, this report unpacks the complex and asymmetric impact of CBAM. It also takes a broader, beyond-CBAM approach that considers the impact of emerging EU regulatory measures on EU market access and competitiveness. These include forthcoming trade defense instruments, low-carbon and circular steel standards, and additional product information requirements. By situating the CBAM within this wider regulatory landscape, this report provides a more nuanced understanding of the cumulative challenges and opportunities facing the Indian steel sector.

Leveraging the existing (and growing) EU–India momentum, generated by the conclusion of the EU-India free trade agreement and the Joint EU–India Comprehensive Strategic Agenda, this report also identifies concrete opportunities to advance cooperation on steel decarbonisation. It does so by taking India's steel decarbonisation challenges and opportunities, rather than market access barriers, as the starting point. This reframing enables a more comprehensive assessment of a wider set of policy instruments that can be used to advance EU-India cooperation on steel decarbonisation, including financial de-risking instruments, technology transfer and co-development, investment frameworks, and regulatory cooperation. Indeed, the EU and India have a unique opportunity to pioneer a new, more holistic approach to trade, climate cooperation, and industrial transformation in steel manufacturing, which would be critical to decarbonising one of the world's most polluting industries.

To translate the existing EU-India momentum into concrete policy action requires, in addition to political will, bridging the gap between high-level EU–India policy discourse and on-the-ground realities within India's steel industry. This report, grounded in extensive empirical research, seeks to better connect these different dimensions. Drawing on over 80 interviews with stakeholders across government, industry, and international organisations, mostly in India, it offers a detailed understanding of the Indian steel sector's structural diversity, technological pathways, and evolving decarbonisation efforts. This level of detail is necessary to identify concrete, actionable areas where EU–India cooperation can yield real outcomes, yet are often missed in high-level policy discussions.

Key takeaways

Decarbonising India's steel industry is important to meet global climate goals.

This sector's success is crucial to achieving global climate goals, given that India's steel industry is rapidly expanding while being one of the most carbon and energy-intensive in the world. India is the world's second-largest steel-producing country (trailing only China). It accounts for over two-fifths of global steelmaking capacity in development – 352 million tonnes per annum compared to China's 40 million tonnes per annum. Indeed, India's steel production is projected to double by 2030 and quadruple by 2050 (based on 2019 production levels) to meet rising demand, particularly in the construction, infrastructure, and automotive sectors. By 2050, India will produce almost 20% of the world's steel, up from 7.4% today. However, India's steel production has an emissions intensity of 2.54 tonnes of carbon dioxide per tonne of crude steel, the highest among the top 10 global steel-producing countries and about 30% above the global average of 1.91. The Indian steel sector is also the third-most energy-intensive, using about a quarter more energy per tonne of steel than the global average. The projected growth of India's steel production, coupled with its emissions and energy-intensive profile, makes decarbonising Indian steel not only an Indian but also a global climate priority.

The dominant Indian narrative around the CBAM obscures its highly heterogeneous firm-level impacts.

CBAM exposure and impact can vary significantly across Indian firms, depending on their emissions intensity, steel production route(s), dependence on the EU market, and capacity for measuring, reporting, and verification. While carbon-intensive producers face clear competitiveness risks, firms with lower emissions intensities – particularly those using scrap-based electric arc furnaces or gas-based direct reduced iron and electric arc furnace routes – may gain a competitive advantage under the CBAM. Similarly, integrated steel plants, which possess stronger compliance capabilities and greater financial flexibility, are generally better positioned to absorb CBAM costs compared to smaller producers. As a result, some firms have shifted from opposing the CBAM to viewing it as a commercial opportunity, particularly where it aligns with existing decarbonisation strategies. This diversity of firm-level responses challenges the dominant Indian narrative on CBAM – which criticises the scheme for being discriminatory, protectionist, and misaligned with the principles of the UNFCCC – and should be more accurately reflected in India's policy discourse.

The CBAM risks deepening a 'green divide' in India between integrated steel plants and micro, small, and medium enterprises (MSMEs).

MSMEs, which account for about 40% of India's steel production, face significant constraints in decarbonising their operations. This reflects obstacles to accessing financing, deploying suitable low-carbon technologies, and the absence of adequate monitoring, reporting and verification capacity. As a result, MSMEs risk falling behind in India's green transition. CBAM has the potential to deepen this emerging green divide, given that the integrated steel plants are mostly able to comply with its monitoring, reporting, and verification requirements while keeping costs down by shipping their green steel to the EU, whereas MSMEs, which are not able to calculate direct carbon emissions, would be required to use punitive default values, which are typically substantially higher than their actual emissions – thereby increasing their CBAM costs. This creates market-displacement risk for smaller firms, as they could lose EU market share to larger competitors.

The CBAM is an uneven and limited driver of decarbonisation in India.

Given that only a small share of Indian steel is exported to the EU (1.7% in 2024), the CBAM's influence as a decarbonisation lever is inherently constrained. While it may accelerate steel decarbonisation efforts among export-oriented integrated steel plants in India, it will likely fail to incentivise MSMEs' decarbonisation, in part because reliance on default values weakens the link between emissions reduction and cost savings. Moreover, interactions with other EU measures, such as the EU's trade defense instruments, may further reduce the CBAM's decarbonisation effect. Decarbonising Indian steel beyond export markets will require addressing the sector's more fundamental challenges, including the lack of demand for green steel in India, the sector's reliance on coal, barriers to deploying innovative technologies, and financing and investment constraints.

India's Carbon Credit Trading Scheme will be critical to develop India's carbon accounting ecosystem, but is unlikely to significantly reduce a firm's CBAM costs.

India's Carbon Credit Trading Scheme, which is currently under development, is a baseline and credit scheme that will include decarbonisation targets for the steel industry. It will be critical for developing India's carbon accounting ecosystem, as it will require firms to measure, report, and verify their emissions. Moreover, it will generate high-quality emissions data, which will help build a valuable evidence base to develop more accurate, India-specific default values across different production routes under the CBAM. However, once in effect, the scheme will only have a limited impact on reducing firms' CBAM costs, reflecting significant carbon price gaps between the EU and India carbon regimes, fundamental design differences, and differences in system boundaries. This may change as India's Carbon Credit Trading system matures and becomes more ambitious.

A growing 'spaghetti bowl' of EU steel-related measures will have important implications for Indian exporters.

In the coming years, steel exporters to the EU will increasingly face a broader set of regulatory constraints. Indeed, a growing spaghetti bowl of upcoming EU steel-related measures may create market access challenges that go well beyond those posed by the CBAM. Key upcoming measures include the tariff-rate quota for steel (1 July 2026), which will reduce existing steel quotas by 47% and increase the out-of-quota tariff to 50%, a low-carbon steel definition, and ecodesign, performance, and information requirements through Digital Product Passports under the Ecodesign for Sustainable Products Regulation (for steel, likely to enter into force early 2028). This cumulative regulatory burden risks undermining the competitiveness of Indian steel exports in the EU market, well beyond CBAM. The implications will vary by product categories, as the product scope of these measures will be limited to a subset of products. In particular, it could render EU market access more challenging for Integrated Steel Producers, as they will be highly exposed to these regulations.

Monitoring, reporting and verification capacity and product origin tracing are emerging as core requirements for competitiveness.

The ability to measure, verify, and trace emissions is becoming a prerequisite to remain competitive. Not only is it key to bypass default values under CBAM; it is also required to demonstrate compliance with India's Carbon Credit Trading Scheme, or to certify the carbon intensity of a product under India's Green Steel Taxonomy. Moreover, the forthcoming EU regulatory frameworks mentioned above will increasingly require product information, such as life-cycle analysis, origin tracing, and digital product passports, which go well beyond what is required by CBAM. MSMEs are ill-equipped to meet even existing monitoring, reporting and verification requirements, let alone the more expansive tracing requirements. Even integrated steel plants are likely unequipped at present to conduct life-cycle analysis and develop digital product passports. Strengthening these systems will therefore be a prerequisite for decarbonising the Indian steel sector and retaining its competitiveness.

Effective EU–India cooperation requires shifting the focus from demand-side measures, such as CBAM, to supply-side and structural decarbonisation challenges in India.

Effective EU–India cooperation on steel decarbonisation requires addressing India's specific challenges. Indeed, the Indian stakeholders interviewed for this report widely agreed that the steel sector must be decarbonised, but lacked clarity on the way forward, given India's unique challenges, including its reliance on coal-based production, limited scrap availability, low-grade iron ore, fragmented MSME structures, financing constraints, and weak domestic demand for green steel. Bilateral EU–India cooperation frameworks – including the EU-India Trade and Technology Council, the EU-India Comprehensive Partnership on Climate and Energy, or the intended establishment of an EU-India platform for cooperation on climate action, and the other initiatives highlighted in the 2026 EU–India Joint Strategic Agenda – should focus on Indian steel decarbonisation challenges when identifying opportunities for cooperation.

Access to scrap is a critical and under-addressed lever for decarbonisation.

Increasing scrap use is one of the most immediate and cost-effective pathways to reduce emissions, particularly for MSMEs. However, India faces a scrap deficit and relies on imports to meet 25% of its scrap demand. Indeed, India is the world's second-largest scrap importer. Existing and potential EU restrictions on scrap exports constrain India's access to this key input, and therefore, to decarbonise its steel industry, as around 8% of India's scrap imports come from the EU. It is critical that EU-India cooperation addresses these scrap export restrictions. At the same time, India must address domestic bottlenecks by formalising and modernising its fragmented scrap collection and processing systems to augment collection rates, reduce contamination, and improve traceability.

Access to (and the suitability of) low-carbon steel technologies remains a major constraint, especially for MSMEs.

India's steel decarbonisation is hindered by a geographic asymmetry in technological innovation. India's dependence on imported, patented technologies raises costs and shapes access, favouring integrated steel producers while excluding MSMEs. Moreover, many technologies developed in advanced economies are not suited to India's production conditions, due to differences in scale, feedstock quality, and infrastructure. Combined with low technology-readiness levels and high investment risks, their deployability is limited. Addressing these challenges and ensuring that sufficient resources are being spent on decarbonising the world's fastest-growing steel sector requires a stronger focus on EU–India technology co-development, alongside de-risking mechanisms to mobilise private investment.

Investment remains an underutilised lever of EU-India cooperation around steel decarbonisation.

Foreign direct investment from the EU can play a critical role in advancing India's steel decarbonisation by enabling capital deployment, technology transfer, and industrial capacity building. However, discussions on investment and industry decarbonisation remain largely siloed. Finalising the EU–India investment agreement would be critical to creating a more predictable investment ecosystem in India. Moreover, an EU-India investment agreement should incorporate investment facilitation and promotion elements to align investment flows with decarbonisation priorities, particularly in the clean-energy and steel value chains.

Cooperation on green hydrogen is promising and could lead to win–win outcomes.

EU–India cooperation would be most effective in areas that yield clear mutual benefits. One such area is green hydrogen. India will be able to produce green hydrogen at around half the projected cost in Europe, while sourcing from India will help meet the EU's supply chain derisking objectives. For India, EU investment is critical to mobilising capital, scaling infrastructure, and accessing advanced electrolyser technologies. EU–India cooperation on green hydrogen should focus on scaling up electrolysis production in India, including through European technologies and investment; creating de-risking mechanisms; and aligning standards and certifications. Moreover, it is critical that India's green hydrogen is not developed exclusively for export but can also be deployed domestically to decarbonise Indian steel. Opportunities for India to export green iron to the EU must also be further explored.

Policy recommendations

This report provides several policy recommendations to enhance EU–India cooperation on steel decarbonisation, which are summarised in Table ES 1 below. They are organised around five key pillars:

Pillar 1: Reframing EU–India cooperation on steel decarbonisation around India's challenges

Pillar 2: Reducing CBAM exposure for MSMEs

Pillar 3: Mitigating the (cumulative) impact of other EU steel measures

Pillar 4: Strengthening domestic policy instruments to accelerate steel decarbonisation in India

Pillar 5: Enhancing India's strategic engagement on steel decarbonisation on multilateral platforms

Table ES 1: Policy recommendations for EU–India cooperation on steel decarbonisation

Policy recommendations	Rationale
PILLAR 1: Reframing EU–India cooperation on steel decarbonisation around India's challenges	
Leverage the momentum created by the EU–India FTA, Joint EU-India Comprehensive Strategic Agenda, the memorandum of understanding on climate cooperation, and discussions around associating with Horizon Europe, to deepen collaboration around green technologies and industrial transformation, including steel	The signing of the EU-India FTA, after two decades of negotiations, and Strategic Framework suggests unprecedented momentum to strengthen EU–India cooperation. Not only is the EU-India agreement reshaping the blocs' economic relations; it also offers an opportunity to build a forward-looking climate cooperation framework. Various references to decarbonising hard-to-abate industries in the Strategic Framework signal the parties' intent to go into this direction.
Make Indian steel decarbonisation challenges – not market access issues – the starting point of EU–India cooperation discussions on industrial transformation	CBAM's impact on steel decarbonisation in India will be limited. Therefore, EU-India cooperation on steel decarbonisation should be framed beyond CBAM; instead, India-specific steel decarbonisation challenges must be the strategic starting point.
Establish a joint de-risking mechanism that combines public, concessional, and private financing to enable India to participate in early-stage technology development	Investing in steel decarbonisation technologies is capital-intensive and risky, given that many of the technologies are not yet commercialised. Public-private financial derisking instruments will be essential to attract investment.
Incentivise technology transfer in areas where EU technologies require only minor adaptations to be deployed in the Indian context. This can be done by patent pooling and public-interest licensing	Given the geographic patent asymmetry in steel decarbonisation technologies, access to relevant technologies can be costly for Indian firms. Patent pooling and public interest licensing could reduce these costs.
Where existing steel decarbonisation technologies are not suitable for India's steelmaking conditions, the EU and India must cooperate on technology co-development tailored to the Indian context, particularly for use by MSMEs	Steel decarbonisation technologies patented in developed economies are often not suitable for direct use in India, due to mismatches in scale, resources, raw material and production routes. Technology co-development would ensure that resources are going into developing technologies developed specifically for the Indian context.
Conclude negotiations for an EU-India investment protection agreement and turn it into a hybrid investment protection and facilitation agreement	Concluding the investment protection agreement would create greater investment certainty, which is critical to enhance EU investment in clean supply chains and green steel in India. Adding investment facilitation provisions would also be critical, as it would streamline the bureaucracy around investment, address investment barriers, and improve transparency. The investment agreement should include a business-to-government platform to raise awareness about investment barriers
Advance regulatory cooperation on clean technologies, carbon pricing methodologies, and decarbonisation-related standards, including by sharing best practices on carbon accounting systems, enhancing interoperability between accounting methodologies, and aligning low-carbon and green-hydrogen standards	The differences between the EU and Indian low carbon steel standards and carbon accounting methodologies create increased trade costs and complexity for Indian exporting firms.

Policy recommendations	Rationale
Anchor cooperation in areas of mutual strength, including trade and investment opportunities around electrolysers, green hydrogen and green iron	Cooperation should be firmly anchored in areas of clear strategic alignment between the EU and India. Green hydrogen already stands out as a priority domain where cooperation can effectively leverage complementary strengths. In particular, the EU and India should further explore cooperation around three different segments of the hydrogen value chain: (i) electrolyser production; (ii) trade in green hydrogen; and (iii) trade in green iron (HBI). The first option will likely be the easiest develop. The third one could be explored as an alternative to option2, exporting green hydrogen directly, given its transport costs and technical challenges.
Establish an institutional coordinating body for EU–India steel decarbonisation activities. This can be the Trade and Technology Council, a structured partnership under the memorandum of understanding on climate cooperation, or another body. This coordinating body should adopt a strong bottom-up strategy, ensuring participation from a variety of stakeholders	The proliferation of EU–India cooperation platforms around climate, clean energy, and industrial transformation risks diluting the efforts and rendering them uncoordinated. A coordinating body should ensure alignment across different cooperation initiatives. Multi-stakeholder involvement is essential to identify commercially viable, context-specific solutions and to ensure that cooperation is grounded in operational realities rather than high-level policy commitments alone.
PILLAR 2: Reducing CBAM exposure for MSMEs	
Conduct a comprehensive mapping of MSME participation in Indian steel exports, focusing on their technologies, emissions profiles, and export profiles	While MSMEs comprise a significant share of Indian steel exporters, accurate official statistics are difficult to find. The absence of detailed and official data on MSME steel exporters, their product mix (e.g., under Harmonized System code 72 and 73), and production routes constrains the design of effective, tailored support measures.
Build monitoring, reporting and verification capacity among MSMEs. Such support must move beyond technical dialogue and lead to concrete investments in infrastructure, training, and institutional capacity	Indian MSMEs' current reliance on default values under the CBAM, which are often significantly higher than their actual emissions, substantially inflates their effective CBAM burden and weakens incentives to decarbonise. Strengthening monitoring, reporting and verification systems would enable firms to report verified emissions and reduce compliance costs.
Crucially, MRV support must move beyond technical dialogue and translate into technical and financial support to build infrastructure, training, and institutional capacity. Priority areas should focus on addressing digital infrastructure gaps and access to verifiers. A push could also be made to simplify CBAM reporting.	While EU rules permit non-EU entities to become accredited, the process is complex and resource-intensive, making it unfeasible for most MSMEs. Meanwhile, India has a shortage of CBAM-recognised verifiers.
Facilitate access to accredited verifiers in India, including through establishing a mutual recognition agreement between EU and Indian accreditation bodies	While EU rules permit non-EU entities to become accredited, the process is complex and resource intensive. A mutual recognition between EU and Indian accreditation bodies could expand the pool of eligible verifiers in India and reduce compliance costs.
Establish more accurate default values for India, specific to different production routes that are being used in India, including blast furnace-basic oxygen furnace; direct reduced iron/electric arc furnace; and direct reduced iron/induction furnace	Improving the accuracy of the default values is essential to reducing CBAM exposure for MSMEs that rely on them. The existing default values and their gradually increasing punitive markup significantly exceed actual emissions, effectively penalising firms not for higher emissions but for limited monitoring, reporting and verification capacity. Production-route default data are particularly important for India, given the heterogeneity of steel production routes, with varying emissions intensity.

Policy recommendations	Rationale
The data generated by the Carbon Credit Trading Scheme could form a basis for revising India's default values for steel. It could also serve as a basis for developing production-route-specific default values.	CBAM updates, amendments, and implementing acts are released at a rapid pace, making it challenging for firms, especially MSMEs, to stay up to date. In addition, many implementing documents are highly technical and require interpretation by experts. CBAM focal points in the EU and India would help MSMEs and other firms to follow and keep up with new CBAM developments.
PILLAR 3: Mitigating the (cumulative) impact of other EU steel measures	
Raise awareness around the growing complexity of EU steel regulations and their cumulative implications for exporting firms, including through establishing a steel-specific focal point in India. Key upcoming EU measures include the Ecodesign for Sustainable Products Regulation, an upcoming tariff-rate quota for steel, and developments under the Industry Accelerator Act.	A growing "spaghetti bowl" of EU steel-related measures – most notably the forthcoming delegated act for steel under the ESPR and the new tariff-rate quota (TRQ) regime for steel (to enter into effect in July 2026) – is set to fundamentally reshape market access conditions for steel exporters. Taken together, these measures are poised to introduce a layered, increasingly complex compliance environment that extends well beyond the CBAM and will significantly increase the regulatory burden on a subset of Indian steel producers covered by these measures. Little existing awareness of these measures calls for action.
Ensure greater policy coherence across steel-related EU measures and avoid contradictory signals	There is an emerging disconnect between the EU's stated objective of supporting global decarbonisation and the design of some of its trade-related instruments. For example, the upcoming tariff-rate quota for steel does not differentiate by carbon intensity risk, thereby undermining low-carbon production incentives and weakening the credibility of the EU's external climate agenda. Moreover, the EU's restrictions on scrap steel – which is key to decarbonise steel production – directly constrain India's steel decarbonisation efforts.
Strengthen the coverage of India in EU impact assessments, especially the upcoming impact assessment for the Delegated Act for steel under the Ecodesign for Sustainable Products Regulation. While the Commission must ensure to adequately reflect on the anticipated implications for India, the Indian government should make sure to voice its specific concerns and contribute to the public consultations.	Existing impact assessments often give limited attention to the implications for major exporters. This risks enabling poorly calibrated regulatory design and unintended trade consequences for partners such as India. The upcoming delegated acts provide an opportunity for enhanced engagement with trading partners like India, which should be used to reflect on, and mitigate, the anticipated market access impact on Indian firms.
Adopt a gradual and sequenced implementation approach of the Delegated Act on steel under the Ecodesign for Sustainable Products Regulation	A phased approach would allow firms time to build the technical, digital, and administrative capabilities needed to comply. Without gradual implementation, compliance costs may disproportionately burden firms with limited adaptive capacity, particularly MSMEs, and increase market exit risk rather than decarbonisation.
Promote greater alignment and interoperability among emissions-accounting methodologies across the CBAM and Ecodesign for Sustainable Products Regulation-related tools	Regulatory fragmentation increases compliance costs and administrative complexity. Allowing firms to rely on aligned methodologies or interoperable emissions data across multiple frameworks would reduce duplication of effort and facilitate compliance.
Strengthen convergence between EU and Indian low-carbon steel standards, where feasible	While full alignment between the EU's low-carbon steel standards and India's Green Steel Taxonomy is unlikely – due to differences in scope, ambition, and industrial context, there is scope to progressively strengthen convergence. Efforts should focus on enhancing methodological interoperability, sharing best practices, and, where feasible, exploring limited forms of mutual recognition. Over time, such cooperation could help reduce fragmentation and support the development of more integrated low-carbon steel markets.

Policy recommendations	Rationale
Prepare Indian firms for digital product passports, including through pilot schemes and stronger traceability systems	Digital product passports will require robust access to emissions data, traceability, and digital infrastructure that many Indian firms, especially MSMEs, do not yet have in place. Pilot schemes and early preparation would provide a practical pathway to ensuring compliance and reduce future adjustment costs.
Encourage voluntary adoption of traceability and sustainability frameworks, such as chain-of-custody guidelines and ResponsibleSteel certification	Early adoption of voluntary frameworks can help firms build the systems needed for future regulatory compliance, while strengthening their position in increasingly carbon-sensitive export markets.
PILLAR 4: Strengthening domestic policy instruments to accelerate steel decarbonisation in India	
Better integrate decarbonisation objectives into India's steel expansion strategy through decoupling	At a macro level, the Indian government must more effectively integrate its steel decarbonisation objectives into its steel production expansion strategy. This requires decoupling steel production from carbon emissions. The draft National Steel Policy 2025 – although not yet publicly available at the time of writing this report – appears to be heading in this direction.
Scale funding and facilitate access to finance to support MSMEs' steel decarbonisation	The Indian government should increase the budget allocation for R&D in the steel sector to achieve its climate objectives. To address the emerging green divide, it should also adopt a strategic reorientation of public funding toward technologies tailored to MSMEs' needs, including hydrogen-based rotary kilns. In addition, the Indian government should focus on enhancing access to financing for MSMEs.
Adopt cluster-based approaches to steel decarbonisation for MSMEs	The concentration of MSMEs in industrial clusters creates strong opportunities for collective action. Shared infrastructure, joint procurement, awareness-building, and pooling engagement with regulators can reduce costs, mitigate risks, and make decarbonisation more feasible for smaller firms.
Strengthen institutional coordination across ministries involved in steel decarbonisation	Indian line ministries often work in siloes. Effective steel decarbonisation, which spans multiple cross-cutting policy areas, requires stronger coordination among (for example) the Ministry of Steel, the Ministry of Commerce, the Ministry of New and Renewable Energy, the Ministry of Environment, Forests, and Climate Change and the Ministry of Finance. Such coordination is necessary to identify strategic priorities for steel decarbonisation, including in the context of international trade and investment cooperation.
Operationalise and progressively scale the Carbon Credit Trading Scheme	The timely rollout of the Carbon Credit Trading Scheme is critical to creating a domestic carbon-pricing framework. Over time, increasing its ambition through tighter targets, broader coverage, and stronger price signals would strengthen decarbonisation incentives and could enable greater deductions under CBAM.
Integrate MSMEs into India's carbon market architecture, including through the voluntary offset mechanism and eventual broader participation in the Carbon Credit Trading Scheme	MSMEs are currently largely excluded from the Carbon Credit Trading Scheme, leading to increased risk of a widening green divide between large producers and smaller firms. Supporting their participation through the voluntary offset mechanism, and eventually, through including them in the CCTS, would enable a more inclusive transition while creating opportunities to monetise decarbonisation efforts.
Formalise and modernise India's scrap ecosystem	Expanding scrap use is one of the most immediate and cost-effective ways to reduce emissions, especially for MSMEs. However, the current scrap ecosystem is fragmented and informal, limiting availability, quality, and traceability. Formalisation and modernisation, including through introducing automation and enhancing implementation of existing policies, will be necessary for both decarbonisation and compliance with future EU and domestic requirements.

Policy recommendations	Rationale
Create domestic demand signals for green steel, including through public procurement targets	A major barrier to steel decarbonisation in India is weak domestic demand for green steel. Public procurement can help create a market for green steel, improve its commercial viability, and accelerate investment in cleaner production routes.
Leverage the role of state governments	State governments shape the enabling environment for industrial decarbonisation through their control over land, electricity, infrastructure, and local industrial policy. Their involvement is essential to ensuring effectiveness of implementation and alignment with regional industrial realities. Large steel producing firms can also play a role in creating demand, by leveraging their market influence to support sustainable procurement.
PILLAR 5: Enhancing India's strategic engagement on steel decarbonisation on multilateral and plurilateral platforms	
Adopt a more proactive and strategic leadership role on multilateral and plurilateral platforms, using them to highlight India's structural challenges and shape global frameworks	India's engagement in multilateral discussions has often been reactive, in response to instruments such as the CBAM and other border carbon adjustments. A more proactive approach would allow India to shape emerging global frameworks in ways that better reflect its domestic realities. This is particularly important given India's rapidly growing steel demand and relatively high emissions intensity, making its transition central to global decarbonisation outcomes.
Leverage and strengthen engagement in key multilateral and plurilateral initiatives (e.g., the United Nations Framework Convention on Climate Change, the Industrial Deep Decarbonisation Initiative, the First Movers Coalition) to mobilise finance, technology transfer, and demand for low-carbon steel	Existing global platforms provide important, yet underutilised, opportunities to advance industrial decarbonisation. India's targeted engagement in the United Nations Framework Convention on Climate Change processes could help mobilise financial and technological support for hard-to-abate sectors such as steel. At the same time, initiatives such as the Industrial Deep Decarbonisation Initiative and the First Movers Coalition can help shape demand-side signals, industrial standards, and procurement frameworks. Strengthening India's leadership in these initiatives would allow it to influence global norms, while ensuring they remain compatible with the production realities of firms in developing countries, such as those of MSMEs.
Actively promote global alignment and interoperability of standards, carbon accounting methodologies, and trade-related climate measures through platforms such as the Organisation for Economic Co-operation and Development's Inclusive Forum on Carbon Mitigation Approaches and World Trade Organization processes	The proliferation of carbon accounting frameworks, definitions of 'low-carbon steel', and border carbon adjustment mechanisms is increasing compliance costs and creating new trade barriers. Active Indian engagement is essential to reducing fragmentation, improving transparency, and promoting interoperability across standards to reflect diverse production contexts. India's active presence on platforms such as the Organisation for Economic Co-operation and Development's Inclusive Forum and World Trade Organization-led initiatives on steel standards can help ensure that emerging global rules support, rather than constrain, India's decarbonisation pathway and broader trade interests.

Foreword

The need to reconcile trade, climate ambition, and development has become a defining challenge of our time. These three imperatives form a triangle, each side depends on the other two, and only when all three are present can sustainable outcomes be achieved. Yet too often, these objectives are pursued in isolation. Cooperation between the European Union and India can serve as an important force in shaping a more sustainable form of re-globalisation, while strengthening shared objectives between partners that, despite differences, increasingly converge on the need for climate action. The recently concluded EU-India Free Trade Agreement creates unprecedented momentum to better align trade with climate objectives and development imperatives-the three necessary sides of the "triangle" approach.

This report offers a compelling illustration of how this trade–climate–development triangle can be operationalised. By reframing EU–India cooperation through the lens of steel decarbonisation, it demonstrates how a broader set of trade and investment instruments can be mobilised to advance the transition. These include technology co-development, financing and de-risking mechanisms, investment frameworks, and strengthened regulatory dialogue. Such an approach is essential to ensure greater coherence across policies and institutions, and to translate the current momentum in EU–India trade relations into tangible outcomes for both climate and development.

The report also provides a balanced contribution to a debate that has too often been framed too narrowly. The European Union's Carbon Border Adjustment Mechanism has understandably generated concern among its trading partners, particularly in developing economies such as India. Yet focusing exclusively on CBAM risks obscuring the deeper challenge and opportunity: to address the structural drivers and constraints to steel decarbonisation, and identify practical avenues for cooperation that reflect differing development realities while advancing shared climate objectives.

Delivering concrete outcomes for EU–India cooperation on green steel will require bridging perspectives and grounding policy discussions in a more detailed understanding of on-the-ground industrial realities. By bringing together trade policy analysis with the practical challenges of decarbonising steel production in India, this report is an invaluable contribution to a more informed dialogue. It is my hope that it will foster a deeper appreciation of India's transition challenges and support the emergence of pragmatic, cooperative solutions capable of turning the current EU–India momentum into a meaningful partnership with trade, climate, and development outcomes.

Pascal Lamy
Former Director General of the World Trade Organization and former Commission for Trade, European Commission

April 2026

Foreword

This paper titled "*The CBAM and Beyond: Leveraging EU-India trade cooperation to decarbonise Indian Steel*" by Colette van der Ven and Sanvid Tuljapurkar of TULIP Sàrl is a very timely contribution that examines the somewhat contested issues related to the implications of the EU's Carbon Border Adjustment Mechanism (CBAM) for India's steel sector, in terms of the challenges it poses and the opportunities it affords in the broader context of the accentuated climate change imperatives the world faces today and prioritization of deeper EU–India cooperation on decarbonisation.

The paper recognizes upfront that the CBAM involves an area of divergence between the EU and India, and has been contested at the WTO with a possibility of retaliatory action, and in the EU–India FTA negotiations for its possible offsetting impact on concessions. India, along with a significant chunk of the developing world, has long held that non-trade issues must not be allowed to distort the trade liberalization discussion and potentially acquire a trade-restrictive and discriminatory character by turning on its head the logic of gains from trade emanating from comparative advantage, which has shaped global trade for centuries. To the extent some of these non-trade issues, like decarbonization, involve critical global public goods with existential implications for mankind, separate, well defined and already pursued channels outside the trade platform could be further strengthened and better implemented to achieve these ends, rather than add to the disproportionate climate change burden (essentially not of their making) that developing countries already face, by applying non-trade levers that reduce their trade competitiveness. For instance, given this historical context, an emphasis on the developed world abiding by their stated obligation to providing technical and financial support to developing countries for de-carbonization could perhaps have been a fairer and more productive pursuit for the EU.

While acknowledging this backdrop, the authors were necessarily required to take CBAM as a given in carrying out the study and charting out a possible optimal path for all stakeholders hereon, which has been done admirably well in the paper. In generating these possibilities, the paper recognizes that CBAM could harm India's steel and other exports and disproportionately hurt micro, small, and medium enterprises (MSMEs). The paper also highlights the often-overlooked aspect that CBAM is only one part of a wider set of EU measures affecting market access. These include aspects like low-carbon steel standards, TRQs, eco-design and performance regulations and digital product passports, which heighten the challenges faced by Indian exporters.

A possible way forward lies in recognizing that notwithstanding its opposition to CBAM, India emphasizes a rapid transition to low-carbon economy, including a low-carbon steel sector. This offers the opportunity for India and the EU to cooperate in supporting and facilitating India's transition to contribute towards achieving the broad outcomes envisaged from CBAM without imposing undue burdens on India's exporters. In arriving at these possibilities, the report draws on extensive stakeholder consultations including high-level policy debates and on-the-ground consultations in both regions. The paper argues that the ongoing EU–India engagement, especially through the FTA platform, creates unique opportunities to, inter-alia, align trade and climate objectives; support industrial transformation in steel; and develop collaborative approaches to decarbonisation. In advocating the way forward on these opportunities, the paper emphasizes the importance of greater transparency and dialogue from the EU; financial and technical support for affected Indian firms and coordinated action across trade, domestic policy, and international forums

The paper realistically recognizes that only about 6% of India's steel exports go to the EU, which weakens the incentive for CBAM to drive sector-wide decarbonisation. However, to the extent steel sector decarbonisation remains a key part of the broader de-carbonization goal for India, the effort faces constraints like the heavy reliance on coal-based production, limited scrap availability, a fragmented MSME sector, a weak green steel basis for domestic demand and limited access to finance and suitable technologies. Capacity gaps in aspects like weak monitoring, reporting and verification mechanisms for lifecycle emissions tracking, product traceability systems and digital compliance, which are critical for sustainably and effectively coping with the imperatives imposed by CBAM and other measures for EU market access, are also identified.

The report rightly argues that the focus must shift from CBAM per-se and trade penalties to jointly and cooperatively undertaking structural transformation to address all these concerns and challenges through initiatives like collaboratively co-developing technologies suited to Indian conditions; enabling technology transfer and patent sharing; supporting MSME-relevant solutions; finalising an investment protection agreement; and aligning EU investment with decarbonisation goals, amongst others. Practical measure at an operational level like improving access to scrap (which is critical for low-carbon steel) by modernising India's scrap ecosystem and collaborating on green hydrogen value chains have also been suggested.

To sum up, the paper commendably chalks out a very tangible, achievable and potentially credible collaborative pathway for India and the EU to take joint initiatives in the area of decarbonization of the steel and other sectors in a manner that contributes towards achieving the CBAM outcomes targeted by the EU while fully addressing India's trade related concerns. Towards this end, the paper must lead to the preparation of a concrete mutually agreed action plan that must thereafter be expeditiously implemented.

Anup Wadhawan
Former Commerce Secretary, Government of India

April 2026

1 Introduction

The European Union's (EU) Carbon Border Adjustment Mechanism (CBAM), a levy on the embedded emissions of certain imported goods, came into force in 2023 with financial obligations taking effect from 1 January 2026. It has sparked considerable debate. The European Commission argues that the CBAM is a climate measure necessary to circumvent carbon leakage – where businesses relocate production to regions with weaker emission rules – which would undercut EU climate goals and competitiveness (European Commission 2025a). By levying a carbon price on imported goods equivalent to what EU producers would pay under the EU's Emissions Trading Scheme (ETS), the Commission argues that the CBAM creates a level playing field and a strong incentive for decarbonisation.

Many EU trading partners – particularly developing countries – have expressed concerns about the CBAM, with India being among the most vocal critics. The Indian government has characterised the scheme as "extra-territorial", (WTO Council on Trade in Goods 2024, 14) "discriminatory" (BASIC 2021, 19), in violation of the principles of international trade and environmental law, and demonstrating a disregard for India's Nationally Determined Contributions (NDCs) (WTO Trade Concerns Database n.d.). India has further stressed the existential threat that the CBAM poses to micro-, small- and medium-sized enterprises (MSMEs) and has threatened retaliatory action at the World Trade Organization (WTO) (WTO Trade Concerns Database n.d.). The CBAM also proved a key sticking point in the EU–India Free Trade Agreement (FTA) negotiations concluded in January 2026 (European Union and India 2026a), with Indian negotiators seeking exemptions for Indian firms, expressing concern that the scheme could offset the preferential tariffs granted by the FTA, especially for Indian steel exporters (van der Ven 2026a; Kumar 2026).

India's critique of the CBAM is important and warrants careful consideration and appropriate action. Indeed, the Commission must ensure transparency, engage in regular bilateral dialogue, and provide sufficient financial and technical assistance to obviate the CBAM's potential to serve as a trade barrier for the Indian firms most affected. At the same time, India's opposition to the CBAM obscures a diverse and complex ground reality, as the instrument's implications are highly heterogeneous. On the basis of over 80 interviews conducted for this report, including with a large number of representatives from the private sector in India, this report finds that micro, small, and medium-sized enterprises (MSMEs) will largely struggle to remain competitive under the CBAM, while integrated steel producers (ISPs) and firms with greener production processes will largely be able to absorb the CBAM costs and might even gain a competitive advantage. This nuance should be more accurately reflected in official policy discussions.

Excessive focus on CBAM also risks overlooking forthcoming EU regulatory measures, which might have more significant market access and competitiveness implications for select Indian exporters. This includes the upcoming steel tariff-rate quota (TRQ), a low-carbon steel standard, as well as ecodesign and performance requirements and digital product passports (DPPs) under the Ecodesign for Sustainable Products Regulation. By situating the CBAM within this wider regulatory landscape, this report provides a more nuanced understanding of the cumulative challenges and opportunities facing the Indian steel sector.

From a decarbonisation lens, India's strong opposition to the CBAM also downplays the fact that it, too, acknowledges the importance of transitioning to a low-carbon steel economy – albeit at a different pace and with different levels of ambition than the EU, reflecting distinct developmental realities. The draft National Steel Policy 2025 proposes, alongside a steel production target of 400 million metric tonnes (MMT) of crude steel by 2035–36, a 25% reduction in emissions intensity.[1] Indeed, decarbonising Indian steel is critical to achieving India's goal of reducing emissions to net zero by 2070 (Verma et al. 2024).

More fundamentally, the CBAM is an export-oriented demand-side measure, which makes it a limited lever for decarbonising India's steel sector, given that the vast majority of Indian steel is produced for the domestic market (94% in 2024). Thus, it is critical to adopt a broader approach to EU-India cooperation that focuses not only on market access issues and measures such as CBAM, but also on India's steel decarbonisation challenges and opportunities. This reframing creates the opportunity to bring in a wider set of trade and investment instruments – including financial de-risking instruments, technology transfer and co-development, investment frameworks, and regulatory cooperation – and identify how they can be collectively deployed in a targeted and orchestrated manner to decarbonise Indian steel.

The momentum created by the signing of the EU-India FTA, the Joint EU-India Comprehensive Strategic Agenda and associated frameworks and initiatives creates an unprecedented opportunity not only to deepen trade relations between the two blocs but also to transform cooperation on industrial decarbonisation, including the steel sector. Indeed, cooperation on hard-to-abate industries and clean energy features prominently in the Comprehensive Strategic Agenda, while the EU-India FTA also highlights the importance of technical dialogue and cooperation around CBAM.

1 Specifically, the draft National Steel Policy 2025 aims to reduce carbon emissions to 2 metric tonnes of carbon dioxide per tonne of finished steel by 2035-2036 (Arora 2026). This is based on news agencies reporting on the draft National Steel Policy, but the actual policy has yet to be released.

A key challenge to translating the existing momentum into concrete outcomes for steel decarbonisation requires bridging the gap between high-level EU–India policy discourse and ground realities within India's steel industry. Drawing on extensive interviews conducted primarily with Indian stakeholders across government, industry, and international organisations, this report offers a detailed understanding of the sector's structural diversity, technological pathways, and evolving decarbonisation efforts. This level of detail is necessary to identify concrete, actionable areas where EU–India cooperation can yield real outcomes, yet which are often missed in high-level EU-India policy discussions.

This report is organised into the following sections:

Section 2 sets out the methodology used in this report.

Section 3 provides background and context, offering an overview of the Indian steel sector with a focus on opportunities and challenges for steel decarbonisation. This section provides the foundation for a more detailed analysis of the CBAM's implications for the Indian steel sector in Section 4.

Section 4 focuses on the CBAM and its implications for the Indian steel industry. It unpacks the scheme's key elements and analyses India's trade exposure to CBAM, taking a country, firm, and product approach.

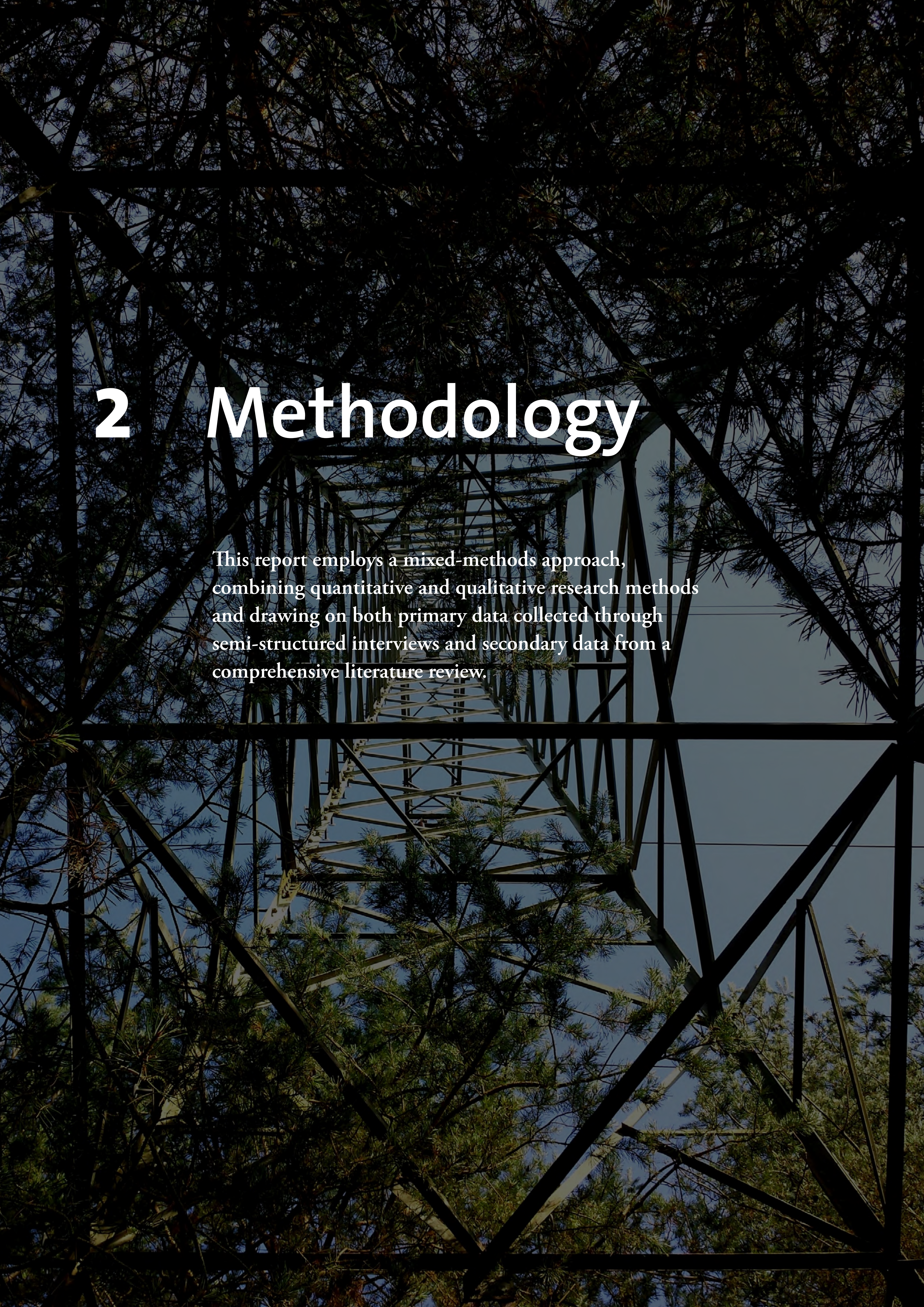
Section 5 unpacks India's Carbon Credit Trading Scheme (CCTS) and explores its role in creating an Indian carbon accounting ecosystem and its CBAM implications.

Section 6 focuses on forthcoming EU steel measures beyond the CBAM and their impact on Indian steel exports to the EU. It focuses on the low-carbon steel standard and the ecodesign, performance, and transparency standards that are being developed under the Ecodesign for Sustainable Products Regulation (ESPR), the upcoming TRQ for steel, as well as EU restrictions on scrap steel.

Section 7 explores how India can strategically use trade and investment instruments to address its domestic steel decarbonisation challenges. It focuses on technology transfer and co-development; financial de-risking instruments; and investment protection, facilitation, and promotion. This section also includes a case study on the opportunities and challenges to deepen EU-India cooperation on green hydrogen and green iron.

Section 8 outlines and, where appropriate, recaps policy recommendations to be considered, with a focus on EU–India cooperation under the FTA, the CBAM, other EU steel-relevant measures, domestic measures India can adopt, and India's engagement in international fora.

Section 9 provides concluding remarks.



2 Methodology

This report employs a mixed-methods approach, combining quantitative and qualitative research methods and drawing on both primary data collected through semi-structured interviews and secondary data from a comprehensive literature review.

Primary research

Empirical research by way of interviews forms the backbone of this study's primary data collection. The authors conducted semi-structured interviews both in person – across Geneva, Brussels, Delhi, Kolkata, Mumbai, Pune, Ranchi, and Jamshedpur – and virtually. These interviews deepened the authors' understanding of the structure and distinctive characteristics of the Indian steel industry, including the central role of MSMEs. They also provided evidence on industry preparedness and responses to the EU CBAM, highlighted ongoing steel decarbonisation initiatives, and identified where increased cooperation is needed.

The authors deliberately interviewed a diverse set of stakeholders across relevant dimensions: steel-sector experts, sustainability and industrial decarbonisation experts, and trade and competitiveness experts. In terms of industry actors, interviewees included private-sector steel producers – both integrated steel plants (ISPs) and MSMEs – public-sector steel enterprises, and a range of industry associations representing both large industry and smaller MSME-focused bodies. The authors also spoke with Indian government officials, officials from multilateral organisations, academic experts and civil society representatives. While most of the interviews were conducted in India, the authors also spoke to stakeholders based in Europe and the United States (the US). Table 1 provides an indicative list of stakeholders interviewed for this study, with the full list included in Annex 1.

Table 1: Indicative list of stakeholders interviewed for the study

Stakeholder group	Indicative list of organisations interviewed
ISPs	The Steel Authority of India Limited (SAIL), Tata Steel, Jindal Steel Limited (JSL), JSW, ArcelorMittal/Nippon Steel
MSMEs	MSME interaction supported by the Engineering Export Promotion Council in Kolkata, e.g., with Electrosteel Castings Limited; MSMEs participating in Subcontract India 2025, e.g., CIRCLIPs Technologie Private Limited, BNR Exports, and Bhavani Industries India LLP
Industry support organisations	CleanCarbon.ai, Sentra World, Dastur Energy, PricewaterhouseCoopers India
Industry associations	**Large associations:** The Confederation of Indian Industry (CII), the Federation of Indian Chambers of Commerce and Industry (FICCI) **Steel-specific associations:** The Indian Steel Association, the Alloy Steel Producers Association of India (ASPA) **MSME-focused associations:** EECP India, the Federation of Indian Micro and Small & Medium Enterprises (FISME)
Government entities	India's Ministry of Steel, Ministry of Commerce and Industry, Ministry of New and Renewable Energy, the Bureau of Energy Efficiency; the European Commission
International organisations	The World Trade Organization (WTO), the Organisation for Economic Co-operation and Development (OECD), the Leadership Group for Industry Transition (LeadIT), the Asian Development Bank
Civil society and academics	The Energy and Resources Institute (TERI), the Centre for Social and Economic Progress (CESP), Climate Catalyst, Bruegel, the Geneva Platform for Resilient Value Chains

The authors identified stakeholders through purposive sampling and expanded the pool through snowball sampling to ensure broad and relevant coverage. They further validated the preliminary findings and sought expert inputs through a roundtable held at the margins of the WTO Public Forum in Geneva in September 2025.

Note: In this report, interview sources are referenced by category: industry representatives (integrated steel plants, MSMEs and other relevant firms such as Coal India Limited); industry support organisations (those assisting with CBAM compliance and emissions reduction, such as the World Steel Association or the Indian); industry associations (including large, steel-specific, and MSME-focused associations); Indian government; European Commission; international organisations; and civil society (encompassing academics and civil society representatives).

Secondary research and quantitative analysis

The study draws secondary information from publicly available datasets, government policy documents, official regulations and notifications, annual company reports, publications by industry associations, and working papers from think tanks and academic institutions. The authors applied triangulation across primary and secondary sources to test consistency and reduce the risk of bias.

The quantitative component rests on statistical analysis of data from authoritative sources. For the sections on production volumes, trade flows, input costs, and emissions intensity related to Indian steel production, the report relies predominantly on Indian sources, including the Ministry of Steel's Annual Reports, India's Green Steel Roadmap, and statistics compiled by the Joint Plant Committee (JPC), complemented by data from the World Steel Association (WSA) and the International Energy Agency (IEA). For trade data, the report uses figures from the OECD and trade databases maintained by the WTO, the International Trade Centre (ITC), the EU, and the US.

Approaches across the various sections

Different sections of the report apply these methods with varying emphases, reflecting the nature of the questions they address.

The overview of the Indian steel sector and its emissions profile (Section 3) is based on government data, supplemented by secondary research where necessary. Section 4.3, which assesses the Indian steel sector's exposure to the CBAM, takes a predominantly quantitative approach. It draws on various quantitative databases and econometric studies, including the World Bank's CBAM exposure indices and simulation tools such as the Sandbag CBAM Simulator and Materia, which the team uses to estimate potential trade and cost impacts under different policy scenarios. The section also draws on qualitative sources, including interviews with ISPs, MSMEs, and industry associations, as well as secondary literature on CBAM impacts.

The sections addressing the CBAM (Section 4.2), the CCTS (Section 5), and other EU steel-related regulations (Section 6) rely on the most recent official documents, including regulations and policy documents. The team conducted an independent scope assessment of the overlap between the new steel TRQ and the CBAM using official regulatory texts.

Section 7, which focuses on technologies for steel decarbonisation in India, draws on analyses by the IEA and the OECD, as well as civil-society research. The section on promoting investment (Section 7.3) draws on the official texts of recent, innovative investment agreements, including the EU–Ecuador Sustainable Investment Facilitation Agreement (SIFA) and the EU–South Africa Comprehensive Trade and Investment Partnership (CTIP).

Limitations

The methodology of this report imposes certain limitations. Data gaps remain, especially for MSMEs, and firms often keep cost structures and emissions data proprietary. While these constraints limit the granularity of the analysis, they do not affect the overall conclusions, which rest on consistent trends across multiple validated sources.

3 Background and Context

Decarbonising Indian steel – and the role trade can play in this process – cannot be approached in a vacuum. Instead, it must be embedded within the global context of steel production, the context of India's rapidly growing economy, and the distinctive structure of Indian steel production, including the country's heavy reliance on coal. As such, this report begins with an extensive discussion of the key characteristics of the Indian steel sector and its decarbonisation challenges and opportunities.

Specifically, this section starts by highlighting the global importance of decarbonising Indian steel (Section 3.1). This is followed by an overview of the importance of the steel sector to India's economic development (Section 3.2); a section about India's steel decarbonisation imperative (Section 3.3), which includes an overview of the Indian government's climate policies and initiatives (Section 3.3.1); key decarbonisation initiatives adopted by the Indian private sector (Section 3.3.2); characteristics of Indian steel production (Section 3.3.3); decarbonisation challenges and opportunities in India (Section 3.3.4); and the socio-economic implications of the steel sector's low-carbon transition (Section 3.3.5). Then, Section 3.4 provides context on the role of trade in the Indian steel sector. It maps India's steel import and export flows (Sections 3.4.1 and 3.4.2) and highlights the nation's import dependence on raw material inputs that are critical to Indian steel production and decarbonisation (Section 3.4.3).

3.1 Decarbonising Indian steel is critical to achieving global climate goals

Decarbonising global steel production is crucial to achieving the Paris Agreement's goal of limiting the rise in the global average temperature to well below 2°C above pre-industrial levels. Among the heavy industries, the steel sector ranks first in CO_2 emissions and second in energy consumption (IEA 2020). It directly accounts for 2.6 gigatonnes of carbon dioxide (Gt CO_2) emissions annually, which is 7% of the global total emitted by the energy system and more than the emissions from all road freight (IEA 2020). Despite an increase in the uptake of less energy-intensive production methods, the International Energy Agency (IEA) predicts an annual increase in CO_2 emissions of 2.7 Gt by 2050, which is 7% above 2020 levels (IEA 2020).

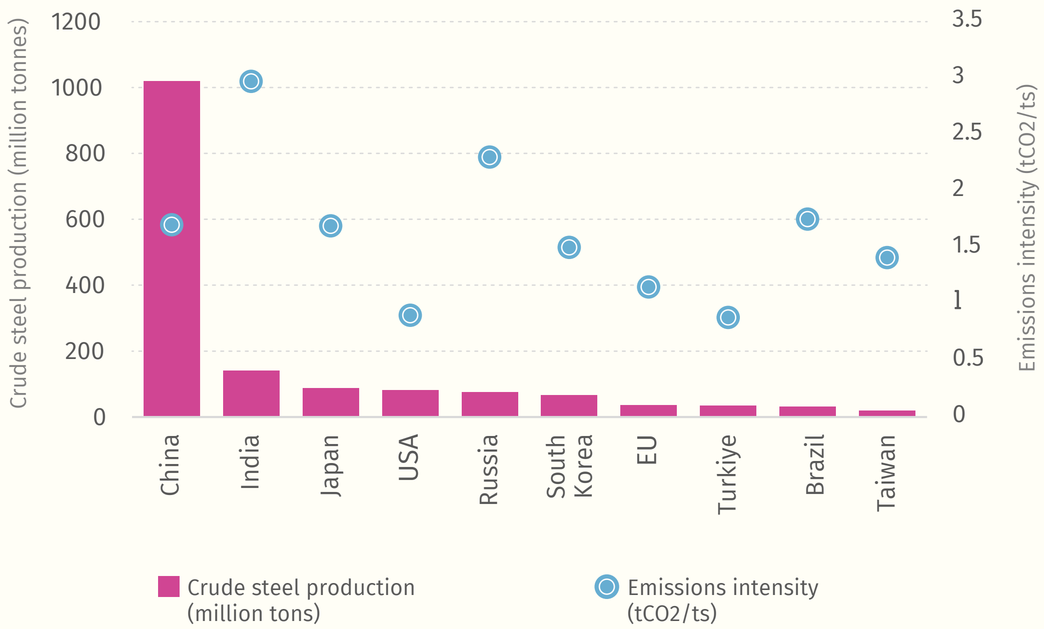
To meet global energy and climate goals, emissions from the steel industry must fall by at least 50% by 2050, with continuing declines towards zero emissions thereafter (IEA 2020). Getting there will be an uphill battle that requires not only more efficient use of energy and materials, but also nothing short of a revolution in innovation and the development of enabling decarbonisation infrastructure. India's steel sector must play a central role in achieving global climate goals. Currently, as the world's second-largest steel-producing country, trailing China, India accounts for over two-fifths of the global steelmaking capacity in development – 352 million tonnes per annum (MTPA) compared to just 40 MTPA in China (Grigsby-Schulte et al. 2025). India's steel production is projected to double by 2030 and quadruple by 2050 (based on 2019 production levels) to meet the rising demand in a rapidly expanding economy, particularly in the construction, infrastructure, and automotive sectors (Ministry of Steel 2017; IEA 2020). By 2050, India will be producing almost 20% of the world's steel, up from 7.4% today (Ministry of Steel 2017; Verma et al. 2024).

To meet global energy and climate goals, emissions from the steel industry must fall by at least 50% by 2050, with continuing declines towards zero emissions thereafter.

At the same time, India's steel production has a CO_2 emission intensity of 2.54 tonne of CO_2/tonne of crude steel (tCO_2/tcs; Verma et al. 2024). This is the highest among the top 10 global steel-producing countries,[2] and about 30% more intensive than the global average of 1.91 tCO_2/tcs (Figure 1; Verma et al. 2024; Sengupta 2024). Indian steel is also the third-most energy-intensive, using about a quarter more energy per tonne of steel than the global average. (Verma et al. 2024; Sengupta 2024; Hasanbeigi 2022). The high levels of energy and CO_2 emissions intensity are due to factors such as coal dependence, market structure, and technology mix, as discussed in more detail in Section 3.3.3.

2 When looking at all steel-producing countries, South Africa surpasses India in the CO2 emissions intensity of its steel sector.

Figure 1: Steel production emissions intensity of the world's top 10 steel-producing economies



Source: Authors' compilation, based on data from WSA (2024) and Koolen and Vidovic (2022)

While China is projected to remain the world's largest steel producer in 2050, the anticipated quadrupling of Indian steel production, coupled with India being responsible for the highest CO_2 emissions among the top steel producers and high energy intensity, makes the sector instrumental to meeting global climate goals.

3.2 The steel sector as the backbone of India's economic development

The steel industry is vital to the Indian economy, contributing nearly 2% of its gross domestic product (GDP) and employing around 2.5 million people in the steel and related sectors (Verma et al. 2024). Beyond this direct contribution, steel is indispensable to India's development because it is a foundational input for infrastructure, transport, housing, and manufacturing (OECD n.d.). As the world's fastest-growing country, India's expansion of steel production will be essential to its economic development. India's National Steel Policy, adopted in 2017, aims to create a technologically advanced and globally competitive steel industry, focused on increasing the per-capita steel consumption from 98 kilograms (kg) in 2023–2024 to 160 kg by 2030–2031 – still well below the global average of 223.7 kg in 2022 (Verma et al. 2024). This increase in demand will be predominantly attributable to the expansion of the infrastructure sector, railway networks, and the domestic shipbuilding industry; growth in the automobile and capital goods sectors; and construction in urban and rural areas (Verma et al. 2024). Increasing steel consumption will also be critical to lifting rural communities out of poverty. Indeed, India's rural per capita steel consumption is as low as 23 kg, a fraction of what is needed to support basic infrastructure and housing (Verma et al. 2024).

The steel industry is vital to the Indian economy, contributing nearly 2% of its gross domestic product (GDP) and employing around 2.5 million people in the steel and related sectors. Beyond this direct contribution, steel is indispensable to India's development because it is a foundational input for infrastructure, transport, housing, and manufacturing.

In response to rising demand, the Indian steel sector has grown at a compound annual growth rate (CAGR) of 7% since 2004, with nearly every major steel producer increasing its capacity. Production is expected to increase significantly in the years to come: India aims to double its crude steel production to 300 million tonnes (MT) by financial year (FY) 2030–2031 (Ministry of Steel 2025), compared to a baseline of 145 MT in FY 2023–2024, and to reach a capacity of 500 MT by 2047 (PIB 2025a).[3] Similarly, India seeks to increase its finished steel production to 230 MT by 2030, up from a baseline of 139 MT in FY 2023–2024 (Ministry of Steel 2025). Moreover, the Indian steel sector aims to meet the entire domestic demand for high-grade automotive steel and special steel by 2030–2031, a market currently being met by imports, reduce its dependence on coking coal imports from 85% to 65%, and expand its global presence in value-added/high-grade steel (Ministry of Steel 2017). India's National Steel Policy highlights the country's potential to emerge as a major player in global steel (Ministry of Steel 2017), and the government has set a long-term goal of exporting 25 MT annually by 2047 (PIB 2025b). India's proposed National Steel Policy 2025, which was not yet released at the time of writing this report, includes updated steel production targets.

Developing a strong domestic steel industry has been crucial to the country's economic planning since its independence in 1947, underscoring the vital role of steel in construction, transportation, energy, and defence. India established its Ministry of Steel in 1959 to support its industrial and economic growth objectives, and to coordinate production, pricing, and distribution. The Mahalanobis model, which was central to India's Second Five-Year Plan (1956 –1961), emphasised the development of heavy industries, including steel, as a key driver of India's long-term economic growth. A strong domestic steel industry is considered critical to expand industrialisation and reduce reliance on imports, thereby leading to a more self-reliant and prosperous economy (IBEF n.d.; Indian Government 2025). The concept of self-sufficiency, also known as Aatmanirbhar Bharat, is also a key driver of Prime Minister Narendra Modi's administration, which aims to boost domestic manufacturing, improve economic resilience, and increase India's participation in global supply chains (Indian Government 2025).

3.3 India's steel decarbonisation imperative

This section sets out India's steel decarbonisation imperative. It highlights the importance of decarbonising the steel sector, in line with the Indian government's climate goals, highlighting government-led green steel initiatives (Section 3.3.1), followed by an overview of industry-led decarbonisation actions (Section 3.3.2). It further unpacks key characteristics of the Indian steel sector, including its different steel production routes (Section 3.3.3), and analyses the decarbonisation challenges and opportunities arising from these features (Section 3.3.4). Finally, this section briefly considers the socio-economic implications of the steel sector's low-carbon transition.

3.3.1 An overview of the Indian government's green steel initiatives

With Indian steel production projected to nearly quadruple by 2050, a key challenge will be to align this growth with the country's climate goals. This is critical from a climate perspective, given that Indian steel production has an emission intensity of 2.54 tCO_2/tcs – around 30 times the global average (Verma et al. 2024; Sengupta 2024) – and accounts for 10–12% of India's total emissions (Verma et al. 2024). In addition, as elaborated on in Box 1, decarbonising Indian steel is critical to protecting Indian livelihoods.

Seeking to address climate challenges while supporting India's economic growth, the Indian government has established several climate targets and objectives. In its Nationally Determined Contributions (NDCs), announced at the 26th Conference of the Parties (COP26), India proposed a fivefold strategy. Panchamrit (the "five nectars") focuses on (i) achieving 500 gigawatts (GW) of non-fossil fuel–based energy capacity by 2030; (ii) reducing the carbon intensity of the Indian

3 India's proposed National Steel Policy 2025 has set a target to expand crude steel capacity to 400 MT by 2035-2036 (Arora 2026).

Box 1: The environmental and health implications of steel expansion in local communities

Beyond India's climate commitments, shifting the steel sector to low emissions is an environmental and public health imperative. The steel industry emits a range of pollutants, including particulate matter, sulphur and nitrogen oxides, carbon monoxide, and heavy metals such as lead and chromium. These emissions contribute to chronic respiratory disease, cardiovascular problems, and neurological harm in workers and neighbouring communities. They also degrade local ecosystems through smog, acid rain, and soil contamination.

The broader health burden is significant. For instance, a study estimated that the JSW Utkal Steel plant in the eastern Indian state of Odisha would add to the region's existing pollution and lead to 94 premature deaths each year, along with about 180 asthma-related emergency visits, 160 preterm births, and roughly 75,000 lost workdays. These environmental and health risks have triggered local opposition against the expansion of steel production in several regions. For instance, residents of Koppal protested an INR 2,345 crore (approximately EUR 219.16 million) investment by Mukand Sumi Special Steel, citing health concerns. Similarly, communities in Kohadiya have opposed the construction of new plants to protect their health and agriculture.

Source: Gounder (2025); Dahiya (2022); Times of India (2025a); Kay and Kaushik (2025)

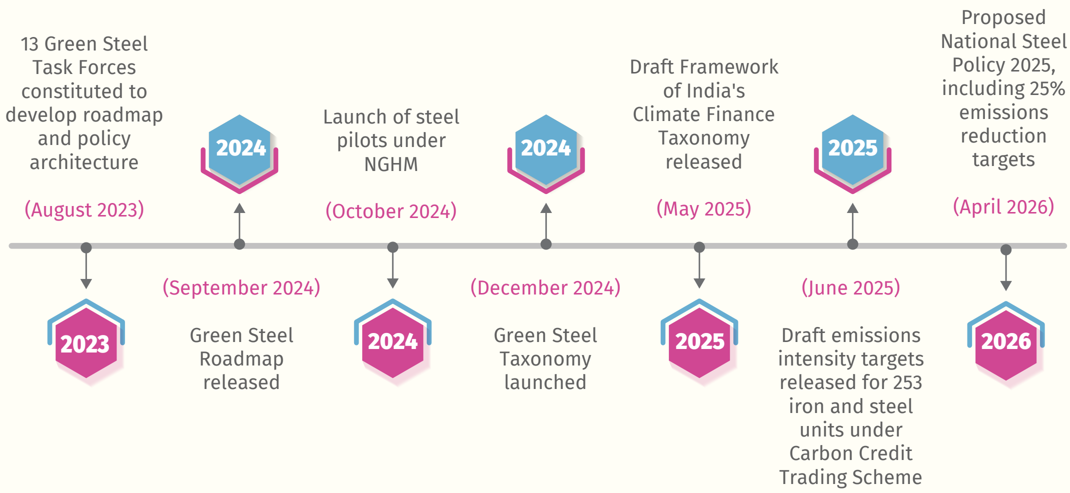
economy by 45% by 2030, compared to 2005 levels; (iii) reaching 50% cumulative electric power installed capacity from non-fossil fuel–based energy resources; (iv) reducing the projected carbon emissions by 1 MT by 2030; and (v) achieving net zero by 2070 (Verma et al. 2024). India's updated NDCs for the period 2031-2035 further increase the ambition of India's emission-reduction and renewable energy (RE) targets, reflecting the fact that India has achieved its RE target five years ahead of the timeline (PIB 2026a).

However, for India to meet its net-zero targets, deep decarbonisation of the industrial sector, including the steel sector, will be required (Verma et al. 2024). Unless India switches from coal-based steel production to cleaner technologies, the sector's CO_2 emissions will double compared to current levels as output expands (Gulia et al. 2023).

However, for India to meet its net-zero targets, deep decarbonisation of the industrial sector, including the steel sector, will be required.

Decarbonising the steel sector is gradually becoming a key policy objective for the Government of India, as evidenced by the various policies and initiatives it has adopted over the past few years (see Figure 2). For instance, in September 2024, the Ministry of Steel published the Greening the Steel Sector in India Roadmap and Action Plan (the Green Steel Roadmap), a comprehensive document outlining India's steel decarbonisation strategy to achieve its 2070 net-zero target. Box 2 provides an overview of the Roadmap.

Figure 2: Timeline of India's key green steel initiatives



Source: Authors' analysis based on PIB (2023), Verma et al. (2024), PIB (2024a), PIB (2024b), DEA (2025), BEE (2025), Singh Rimjhim (2025), Economic Times Manufacturing (2026)

Box 2: An overview of India's Green Steel Roadmap

The Green Steel Roadmap is an outcome of the 14 task forces constituted by the Ministry of Steel. It sets out measures to green the Indian steel industry across demand-side levers, supply transformation, and enabling frameworks.

Demand-side levers: The Roadmap outlines three ways to increase the demand for green steel. First, it suggests including a definition of green steel within a taxonomy. Second, it highlights the need to develop an ecosystem of monitoring, reporting, and verification (MRV) to comply with India's Carbon Credit Trade Scheme (CCTS). Third, it calls for market-based incentives, such as green steel public procurement, to stimulate demand.

Supply transformation: On the supply side, the Roadmap outlines various technological pathways in the short, medium, and long term to lower the emissions intensity while meeting India's rapidly growing steel demand. In the short term, it includes exploiting low-hanging fruit, such as enhancing energy and material efficiency, using RE for steelmaking, and utilising natural gas as a bridge fuel. In the medium to long term, it highlights the need for structural changes, such as scaling up electric arc furnace (EAF) production; introducing hydrogen-based direct-reduced iron (DRI) and carbon capture, utilisation, and storage (CCUS) technologies; and exploring alternative pathways such as the use of biochar.

Enabling measures: The Roadmap recognises that supply and demand shifts must be underpinned by enabling policies, financing, and institutional support. It highlights the role of research, development, and demonstration – a key enabling policy – to enable the steel sector's transition and position India as a leader in technology development. Acknowledging the challenges associated with attracting financing to green the Indian steel sector and the scale of finance required for this transition, the Roadmap outlines potential strategies to mobilise public and private sector financing. It also includes governance frameworks for its implementation. Additionally, the Roadmap situates India's efforts in the international context and identifies key areas of international collaboration.

Source: Verma et al. (2024)

The Roadmap does not outline specific financial commitments for low-carbon steel production in India, and its implementation is likely to remain challenging without adequate financial support and legislative action (Industry representative 2025; Civil society representative 2025). Nevertheless, it remains valuable, as it signals that decarbonising the steel sector is becoming an important objective of the Indian government, while highlighting the key opportunities and challenges involved in achieving it. Moreover, it lays the groundwork for upcoming frameworks that seek to better link India's climate objectives to its steel production targets – whether through the proposed National Green Steel Mission (NGSM), aimed at supporting the deep decarbonisation of the steel industry, including through offering incentives linked to emissions reduction (The Economic Times 2025; PIB 2022), or the proposed upcoming National Steel Policy.

The Roadmap does not outline specific financial commitments for low-carbon steel production in India, and its implementation is likely to remain challenging without adequate financial support and legislative action.

The increased importance of the low-carbon steel transition for the Indian government is reflected in the proposed National Steel Policy 2025, which includes targets to reduce carbon emissions in steel production to 2 tonne of co_2 /tonne of finished steel (tco_2/tfs) by 2035-36, a reduction of roughly 25% compared to the current emissions level of 2.65 tco_2/tfs (Economic Times Manufacturing 2026).[4] Further, to reduce emissions intensity, the draft policy proposes increasing gas-based steelmaking, promoting the use of scrap, offering incentives for decarbonisation, and coordinating with the Ministry of Petroleum and Natural Gas to secure overseas gas supplies (Economic Times Manufacturing 2026).

Existing policy initiatives that reflect the Indian government's intent to reduce carbon emissions in the steel sector include the Green Steel Taxonomy, released in December 2024, which provides criteria for defining and categorising low-emissions-intensity steel using a star-rating system (Ministry of Steel 2024). The Indian government has also adopted various scrap recycling policies to enhance domestic scrap recycling, which can significantly reduce the GHG emissions from steel production. This includes the Steel Scrap Recycling Policy (2019), the Recycling of Ships Act (2019), and the Vehicle Scrapping Policy (2022).

In terms of support for green technologies, the Indian government has allocated, as part of the National Green Hydrogen Mission (NGHM), budgetary support of INR 455 crore (around USD 51.9 million or EUR 44 million) for pilot projects in the steel sector up to FY 2029–2030 (PIB 2022). Moreover, the Indian Government has allocated INR 20,000 crore (around EUR 1.86 billion) in its FY 2026–2027 Union Budget to support the development and deployment of Carbon Capture, Use, and Storage (CCUS) technologies (Government of India 2026).

Additional industry decarbonisation policies are under development. The Bureau of Energy Efficiency (BEE) is in the process of establishing India's Carbon Credit Trading Scheme (CCTS) (IEA 2024), a mandatory, baseline-and-credit system aiming to reduce the greenhouse gas (GHG) emissions intensity from nine emissions-intensive sectors, including steel (see Section 5.2; BEE n.d.). The scheme is based on, and an expansion of, the existing Perform, Achieve, and Trade (PAT) scheme, established in 2012 to improve energy efficiency in emissions-intensive industries.

India is also developing broader, economy-wide measures that will affect the steel industry. These include extended producer responsibility measures (MoEFCC 2025), a climate finance taxonomy (Ministry of Finance, Department of Economic Affairs 2025), the Business Responsibility and Sustainable Reporting framework,[5] and initiatives that would support the use of nuclear energy via small modular reactors to produce low-emissions steel (PIB 2025c, Industry representative 2025).

4 This is based on a draft cabinet note dated March 10, 2026.

5 A mandatory framework requiring the top 1,000 listed companies (by market capitalisation) to disclose their environmental, social, and governance (ESG) performance (Sustainability Reporting Standards Board, ICAI 2024).

3.3.2 An overview of select green steel initiatives adopted by the private sector

Decarbonising Indian steel is essential not only to combat climate change but also to help firms remain competitive in a world marked by the growing adoption of border carbon adjustment (BCA) mechanisms and other green trade measures (see Sections 4 and 6). For Indian exporting companies, adopting steel decarbonisation becomes imperative to maintain a global competitive edge. This is particularly the case given India's aim to increase steel exports (PIB 2025b).

Decarbonising Indian steel is essential not only to combat climate change but also to help firms remain competitive in a world marked by the growing adoption of border carbon adjustment (BCA) mechanisms and other green trade measures.

Moreover, failure to adopt ambitious decarbonisation strategies increases companies' risk exposure, thereby reducing their access to capital and increasing borrowing costs. Indeed, access to preferential financing is increasingly linked to sustainability criteria. For example, the Union Bank of India has established a USD 1.5 billion (around EUR 1.27 billion) sustainability-linked loan, the interest rate of which will depend on the borrower's progress on three targets: cutting GHG emissions, sourcing metals responsibly, and expanding RE (BW Online Bureau 2021). Another example is Vedanta Aluminium, which raised USD 250 million (around EUR 211.86 million) based on specific decarbonisation performance indicators (Gupta et al. 2024).

As a result, India's large dominant steel producers, referred to as integrated steel plants (ISPs), are increasingly adopting green steel strategies to balance decarbonisation with continued sector growth. (see Section 3.3.3). All major ISPs (except the Steel Authority of India Limited (SAIL)) have more ambitious net-zero targets than the national net-zero target (Table 1). The steel industry is spearheading steel decarbonisation in India through the adoption of pilot projects for new technologies, increased reliance on RE, and greater energy and material efficiency (Pradhan 2025). Many ISPs are also partnering with foreign firms to deploy advanced decarbonisation technologies. For example, SAIL – a public sector undertaking – has signed a memorandum of understanding (MoU) with leading global resources company Broken Hill Proprietary Company Limited (BHP) to develop low-carbon steelmaking technology pathways for its blast furnace (BF) plants (BHP 2024). Similarly, Tata Steel has signed an MoU with the SMS Group to gain access to technological expertise to reduce carbon emissions at Tata Steel's plants across India (SMS Group 2022; Industry representative 2025).

ISPs are also increasingly looking to decarbonise their supply chains. For instance, Tata Steel is including sustainability criteria in its procurement system, aligning it with the Green Steel Taxonomy standards (Industry representative 2025). To help suppliers reach these thresholds, Tata Steel runs programmes that identify opportunities to integrate sustainability into their business models. This bottom–up approach ensures that smaller firms in the supply chain are not left behind and can fully participate in the transition. More details on the key steel decarbonisation initiatives adopted by ISPs, along with the technical challenges and opportunities, are provided in Section 3.3.4 below.

Table 2: Decarbonisation initiatives by India's key steel producers

Company name	Emissions intensity (tCO_2/tcs)	Climate goals and key sustainability initiatives
JSW Steel	2.36	• Achieve net zero by 2050. • Reduce the GHG emissions intensity of steel by 42% (base year 2021); achieve 20 GW of RE capacity and 40 gigawatt-hour (GWh) of storage capacity by 2030. • Focuse on raw material beneficiation, scrap-based steel, and green hydrogen uptake in the steel sector. • Implemented a pilot-scale carbon capture unit in the DRI plant in Dolvi, at 100 tonnes per day.
Jindal Steel Limited (JSL)	2.59	• Achieve net zero by 2047. • Achieve 35% reduction in carbon emissions by 2030. • Focus on carbon minimisation, carbon avoidance, carbon circularity, carbon capturing, routes of carbon utilisation/ sequestration, and carbon sequestration/sink. • Operate a 2,000 TPD carbon capture unit across its syngas[6] plant and a 1,500 TPD carbon capture unit in the DRI section.
Jindal Stainless Limited	2.1	• Achieve net zero by 2050. • Achieve a 300 megawatt (MW) combined RE capacity by 2026–2027. • Inaugurated a plant in Hisar to produce green hydrogen, currently to be used for annealing, with view to expand applications across the production chain.
Arcelor Mittal/Nippon Steel (AM/NS)	2–2.5	• Achieve net zero by 2050. • Reduce emissions by 20% to 1.8 tCO2/tcs, with 2021 as a baseline, by 2030. • Focus on energy-efficiency measures.
Tata Steel	2.32	• Achieve net zero by 2045. • Reduce emissions intensity to below 1.8 tCO2/tcs by 2030. • Implement technologies such as coal bed methane injection, hydrogen injection in blast furnaces, and commission carbon capture plants • Developed a fully scrap-based, small-scale EAF facility in Ludhiana, close to consumption hubs.
SAIL	2.49	• Achieve net zero by 2070. • Reduce the emissions intensity to less than 2 tCO2/tcs by 2030. • Deploy energy-efficiency measures.
Kalyani Steel	0.19	• Offer steel products that have a very low carbon emissions intensity. • Use 100% RE and more than 70% recycled scrap material to produce low-carbon-emissions steel.

Source: AM/NS India (2024); Transition Asia (2024); Verma et al. (2024)

6 Syngas, or synthesis gas is a fuel mixture primarily composed of hydrogen and carbon monoxide used in steel decarbonisation to replace coal/coke in ironmaking.

Decarbonisation efforts by micro, small, and medium enterprises (MSMEs) in the steel sector lag behind those of ISPs due to limited resources, inadequate research and development (R&D) support, limited access to suitable financing options, limited access to suitable technologies (see Section 7.2.1), and a shortage of trained workers. Nevertheless, some MSMEs are making efforts towards decarbonisation. For example, MSMEs in Odisha producing direct reduced iron (DRI) through the coal route are conducting trials of energy-efficiency measures, such as raw material preheating using flue gas, which can reduce coal consumption by 20–25% (Srivastava and Jena 2025). Others are focusing on integrating RE into their production processes and electric mobility into their logistics to reduce emissions from their operations (Industry representative 2025).

Decarbonisation efforts by micro, small, and medium enterprises in the steel sector lag behind those of ISPs due to limited resources, inadequate research and development support, limited access to suitable financing options, limited access to suitable technologies, and a shortage of trained workers.

3.3.3 Characteristics of Indian steel production

Despite increasing emphasis on decarbonising the Indian steel sector, doing so will be uniquely challenging. As highlighted earlier, India has the highest CO_2 emissions of all major steel producers worldwide. This reflects several structural factors associated with Indian steelmaking (Table 2). Most significantly, India's high carbon emissions reflect its heavy reliance on coal (over 90%) during the ironmaking phase (Kay and Kaushik 2025). Other challenges include the low quality of domestic coal and iron ore, which makes the iron reduction process more energy intensive; ISPs' reliance for their energy needs on captive coal–based thermal plants, which tend to have higher emissions than grids connected to RE; and relatively old blast furnaces, which tend to be less energy efficient (Verma et al. 2024). Moreover, scrap availability, which is crucial for decarbonising steel, is limited in India. Also, natural gas, which can serve as a transition fuel, must be imported due to its limited domestic availability, making it expensive and vulnerable to international price fluctuations (Verma et al. 2024). Another challenge is the large number of MSMEs active in Indian steel production, which lack the capital and economies of scale to invest in transformative technologies (Verma et al. 2024).

Table 3: Key factors making the Indian steel industry unique

Characteristics	World	India
CO_2 emissions contribution	8%	10–12%
Average emissions intensity	1.91 tco_2/tcs	2.54 tco_2/tcs
Use of scrap	31%	21%
Natural gas availability	High	Low
Quality of ore	High	Low
Emissions intensity of the grid	Low	High

Source: Verma et al. (2024)

To identify where policy interventions may be most effective for India's low-carbon transition, it is necessary to understand the characteristics of steel production in India. There are three key stages of steel production:

Stage 1: Making iron. Producing crude steel requires first producing iron from iron ore. In India, there are three main routes for iron production: (i) Blast furnaces (BFs) that produce pig iron from iron ore; and two DRI production routes that produce sponge iron: (ii) vertical shaft furnaces that use natural gas or syngas as fuel and (iii) rotary kiln (horizontal shaft) furnaces that use coal as fuel.

Stage 2: Converting iron into steel. This stage involves converting iron into steel. In India, this occurs in several ways. Pig iron produced in a BF is typically converted into steel through a basic oxygen furnace (BOF) route. Sponge iron produced through DRI is converted into steel either in an electric arc furnace (EAF) or an induction furnace (IF). Although less common, pig iron produced in a BF can also be turned into steel in an EAF. Stage 2 also covers converting scrap steel into crude steel using an EAF or IF (Verma et al. 2024). In practice, India's steel output is dominated by the BOF route (42.7%), followed by the IF (35.4%) and the EAF (21.9%) Ministry of Steel 2025).

Stage 3: Turning crude steel into finished steel. This process turns raw molten steel into usable products like coils, sheets, bars, and rods. This is done through various processes, including rolling, coating, and shaping. Both ISPs and a broad base of small firms are active in this stage. (Verma et al. 2024).

As noted above, stages 1 and 2 of steel making rely on three main production routes: BF-BOF, DRI-EAF, and DRI-IF. Box 3 provides a detailed overview of these key steelmaking routes, and Figure 3 illustrates their relative use.

Box 3: Overview of steel production routes in India

BF-BOF:

BF: Carbon or natural gas acts as a reducing agent that converts iron ore into liquid hot metal. The process begins with high-grade coking coal, which is heated in coke ovens to produce coke. Coke and iron ore are fed into the BF and, simultaneously, hot air and other materials are injected into the furnace to produce liquid hot metal. This process produces pig iron.

BOF: This route involves using liquid hot metal and scrap to produce steel. In this process, the liquid hot metal from the BF is charged into the BOF, and pure oxygen gas is injected into the furnace. This further oxidizes the remaining carbon and other elements to produce liquid steel. The liquid steel is typically cast into semi-finished steel products such as slabs, blooms, and billets via a continuous casting route or teemed into large ingots.

DRI-EAF/DRI-IF:

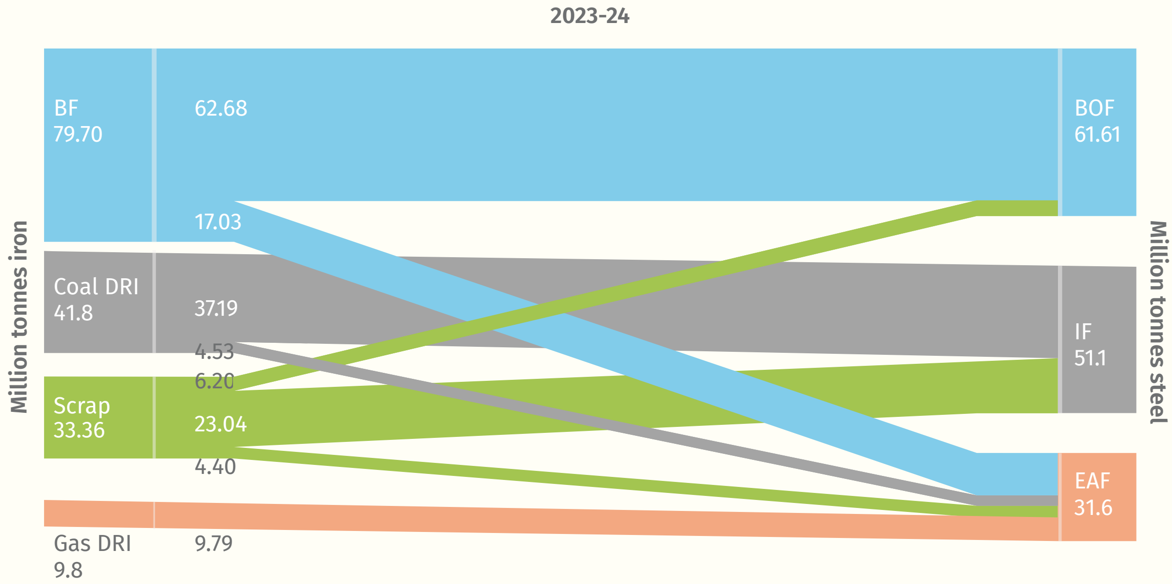
DRI: In this route, the iron ore is exposed to a reducing atmosphere of carbon monoxide at high temperatures, resulting in oxygen being removed from the ore in the form of CO_2. Since the production of iron from its ore occurs without melting, the result is called DRI or sponge iron. The DRI route typically involves shaft furnaces that use natural gas, syngas, or other industrial off-gases as fuel, and rotary kiln furnaces that use coal as fuel. In India, the majority of DRI production uses coal.

EAF: The EAF produces the heat required to melt, primarily, sponge iron and/or scrap steel, and any required additives, to produce crude steel. Some EAFs in India use a mix of hot metal, sponge iron, and scrap as the charge, depending on the availability of scrap. The proportion of scrap usage fluctuates, depending on the availability and price of scrap. The current proportion of scrap utilization in the EAF units to produce steel is in the range of 40–80%, while the remaining proportion is made up by DRI.

IF: The IF produces the heat required to melt, primarily, sponge iron and/or scrap steel, and any required additives, to produce crude steel. It does so by alternating magnetic fields to induce an electric current, which then heats up because of electrical resistance. Smaller plants and independent scrap steel processors use this route due to their small size and economical installation. The steel produced through this route is of lower quality than that produced by EAFs.

Source: Verma et al. (2024); World Steel Association (2023); IEA (2020)

Figure 3: Different steelmaking pathways in India and their relative use



Source: Verma et al. (2024)

India's steel sector is divided between ISPs, which hold 56% of the national capacity, and the secondary steel industry, which holds the remaining 44% (Verma et al. 2024; Shrivastava et al. 2023). Plants producing 1 MT or more per year are considered to be ISPs, whereas smaller units fall into the secondary segment (Civil society representative 2025).[7] The two groups generally rely on different production technologies and product specialisation. ISPs predominantly produce flat steel products, whereas the secondary sector dominates long steel production (around 60–65% of India's long steel output is produced by the secondary sector (PIB 2017)). This product segmentation reflects differences in scale, capital intensity, and technology between the two segments.

BF-BOF plants are highly capital-intensive and exclusively owned by ISPs – large facilities that carry out the entire steelmaking process within a single unit, from raw material preparation to finished product manufacturing, often with their own energy-generation systems. The BF-BOF emissions reflect intensive use of coal to produce coke as a reducing agent and meet electricity needs, the use of low-grade iron ore,[8] which dominates in India, and their average age of around 25 years, which tends to render them more energy inefficient (IEA 2020). EAFs in India are also predominantly owned by ISPs that have co-located gas-based DRI units and BFs for hot metal (Verma et al. 2024). They are less emissions-intensive, reflecting the ability to use higher percentages of scrap.

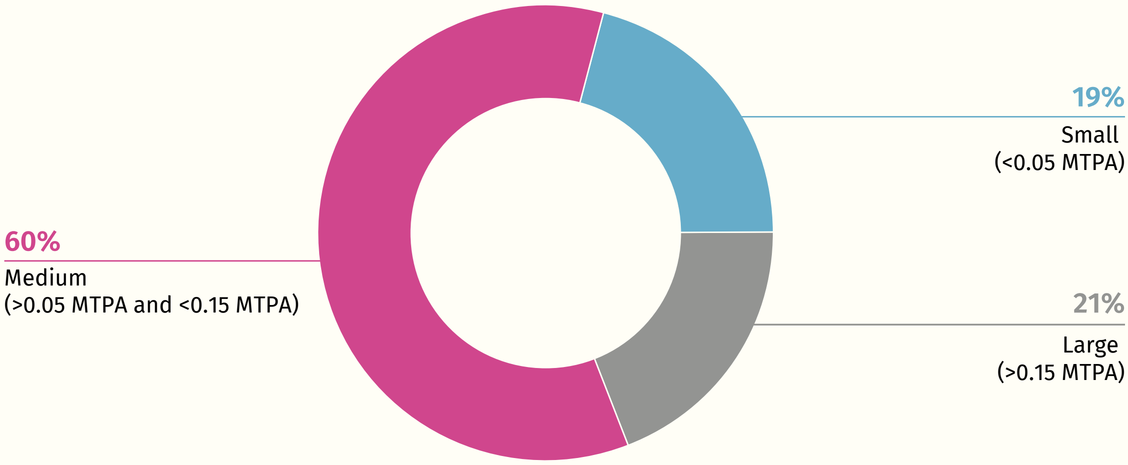
The secondary steel industry uses the DRI-IF and DRI-EAF routes for crude steel production (Shrivastava et al. 2023). MSMEs, which dominate this segment, predominantly use the coal-based DRI-IF route (Verma et al. 2024). There are 1,032 IFs in India, which accounted for 35.4% of India's crude steel output in FY 2023–2024, not far behind the 42.7% produced via just 20 BOFs—despite the dispersed nature of the IF production across more than 1,000 units (Verma et al. 2024). The MSMEs' preference for IF stems from their modular size, low capital requirements, and ability to utilise DRI and scrap of varying quality for steel production (Verma et al. 2024). Steel produced via the IF route tends to be of lower quality, limiting its use in specialised sectors such as

7 The secondary segment also includes DRI producers, even if these are not strictly considered secondary steel producers. Officially, the Indian government has stopped classifying producers as ISPs/primary steel industry or secondary steel industry because firms in the secondary segment oppose this label (Ministry of Steel 2016). The secondary steel industry label is often associated with lower-quality small-scale steel, while ISP output is generally viewed as being of higher quality. Producers fear that a formal distinction would reinforce this perception. However, the steel industry continues to be divided into these segments in the green steel Roadmap (Civil society representatives 2025).

8 Only 12% of India's iron ore is classified as high-grade, while 38% and 31% are classified as medium- and low-grade.

the automotive industry. The overall charge mix of IFs in India is roughly balanced – 59% DRI and 41% scrap (Verma et al. 2024). The widespread use of DRI in India – a process that uses iron and non-coking coal – reflects the limited domestic availability of coking coal (Verma et al. 2024). DRI is produced in 209 standalone and 135 composite units, the majority of which are medium-sized, as shown in Figure 4 (Verma et al. 2024).

Figure 4: DRI production is dominated by small- and medium-sized enterprises



Source: Verma et al. (2024, 33)

Finished steel in this segment is produced by a large network of more than 1,100 re-rolling mills and over 4,000 foundries, steel fabricators, refractory units, and related enterprises (Verma et al. 2024). These firms primarily use crude steel sourced from IF and EAF producers, many of which operate as MSMEs (Verma et al. 2024). Small-scale re-rolling mills alone account for nearly two-thirds of the country's long steel output, including bars, thermo-mechanically treated (TMT) rods, sectional products, and wires (Verma et al. 2024; BEE 2022). As a result, MSMEs dominate long-steel production, while ISPs dominate flat-steel production (Verma et al. 2024; BEE 2022). Given its dominance in long steel production, the secondary steel segment accounts for 80% of India's total bar exports (BEE 2022).

3.3.4 Decarbonisation challenges and opportunities

The emissions intensity of each steel production route varies, as illustrated in Table 3. The coal-based DRI-IF route, used predominantly by MSMEs, has the highest emissions intensity of all the production routes. While BF-BOF ranks second, the total carbon emissions produced through this route is more than double the total emissions produced through the coal-based DRI-IF route, reflecting the dominant role of BF-BOF steel making in India. Decarbonising the BF-BOF route, therefore, is critical to decarbonising Indian steel (Elango et al. 2023).

The high emissions of the coal-based DRI production also contribute significantly to the high emissions intensity of Indian steel (Civil society representatives 2025, Industry representatives 2025). The emission intensity of the DRI-IF route can, among other factors, be attributed to high coal use, low energy efficiency, and less advanced emissions-control technologies. Moreover, approximately half of the DRI production in India uses domestic high-ash coal, which requires greater processing and thereby increases CO_2 emissions (Global Energy Monitor 2024).

Table 4: Emissions from the Indian steel industry

Process route	CO_2 emissions intensity range (tCO2/tcs)
Coal-based DRI-IF route	2.70–3.10
Syngas (coal gasification)–based DRI-EAF route	2.50–2.90
BF-BOF route	2.20–2.60
Natural gas–based DRI-EAF route	1.40–1.60
100% scrap-based steelmaking through the EAF route	0.55–0.65

Source: Verma et al. (2024)

Both demand- and supply-side challenges in India make decarbonisation difficult. There is limited demand for green steel in India, a highly price-sensitive market, given that it requires paying a green premium of 15–40% over conventionally produced steel (Verma et al. 2024; Industry representatives 2025; Civil society representatives 2025). Indeed, an increase in steel prices risks eroding the competitiveness of the steel-dependent manufacturing sector, and would have important implications for the average Indian consumer, given India's low GDP per capita. As a result, firms investing in green steel for the Indian market may not be able to recoup their investments (see Box 4). The Indian government is considering boosting the demand for green steel through green public procurement, but doing so would involve carefully balancing cost increases and the risk of inflation with India's green steel objectives (Verma et al. 2024).

There is limited demand for green steel in India, a highly price-sensitive market, given that it requires paying a green premium of 15–40% over conventionally produced steel.

On the supply side, technologies to decarbonise exist but are difficult to deploy, reflecting various barriers.

Decarbonising the coal-based DRI-IF route: Decarbonising India's coal-based DRI-IF, the most intensive steel production route in India, requires transitioning towards natural gas, and eventually, green hydrogen-based DRI. Doing so would be incredibly costly and complex for the MSMEs that predominantly use this production route, as it would require a complete technology overhaul from a rotary kiln (horizontal) shaft furnace to a gas- or hydrogen-based (vertical) shaft furnace. (Ghosh, Vasudevan, and Kumar 2021). Moreover, as explained in Section 7.2.1, existing (foreign) technologies are not directly suitable for Indian MSMEs, reflecting mismatches in scope and scale, as well as financial constraints.

Decarbonising the BF-BOF route: Compared to MSMEs, ISPs are better positioned to invest in decarbonisation technologies and upskill their workforce (Sengupta 2024). Indeed, as discussed in Table 1, many ISPs have already set ambitious decarbonisation targets and are implementing various emerging decarbonisation technologies. A key challenge for ISPs seeking to decarbonise BF-BOF is the fact that many promising technologies are being developed, for example, the use of biochar or hydrogen as a substitute for coking coal, or CCUS, but they are mostly still at a pilot stage. Indeed, ISPs have initiated several pilot projects,[9] but large-scale decarbonisation of the BF-BOF production route would require greater investment and more mature technologies. Even then, decarbonising steel produced through the BF-BOF route is very challenging, as most green technologies will only reduce carbon emissions by a limited amount.

9 For example, Tata Steel has conducted trials of hydrogen injection in BFs at its Jamshedpur plant, resulting in ~7–10% CO2 emissions reduction per tcs and a 10% reduction in coke (Tata Steel 2023). Tata Steel and SAIL have used biochar as a substitute for coal to reduce emissions (Hall et al. 2022).

Decarbonising the gas DRI-EAF route: Compared with the BF-BOF route, which requires coking coal and offers few substitution options, decarbonising the gas-based DRI-EAF pathway is relatively straightforward and can be achieved by switching to hydrogen, eventually green hydrogen. JSW is constructing a green hydrogen facility for its DRI production that is expected to lower its emissions (Verma et al. 2024). Moreover, various ISPs, including Tata Steel and AM/NS, have outlined future projects focused on hydrogen-ready DRI-EAF.

As illustrated in Table 3, the scrap-based EAF route has the lowest CO_2 emissions because electricity consumption accounts for the majority of emissions. As discussed in Box 4, Kalyani Steel already produces steel through the EAF route using 100% RE and 70% scrap. In theory, EAFs could operate entirely on scrap if a high-quality supply were available (Kalyani Group 2022; see Box 4). Tata Steel's Ludhiana facility, which is expected to become operational in 2027, is another example of a scrap-based EAF. It is a mini mill that will melt locally sourced scrap and significantly reduce capital and energy intensity while optimising transport logistics.

Box 4: Kalyani FeRRESTA and Kalyani FeRRESTA Plus: One of India's greenest steel producers

Saarloha Advanced Materials Private Limited (Saarloha), part of the Kalyani Group, is widely regarded as one of India's most advanced low-carbon steel producers. It produces Kalyani FeRRESTA and Kalyani FeRRESTA Plus with an emissions intensity of <0.19 tCO2e/MTcs and net-zero emissions intensity per MT of crude steel, respectively. Its production model is built around scrap-based EAF technology and powered by RE. This positions the company at the forefront of India's transition toward cleaner steelmaking.

A key feature of Saarloha's operations is its integrated supply chain relationship with Bharat Forge, another Kalyani Group entity that facilitates its use of scrap and accounts for over 70% of its feedstock. As a result, the scrap is traceable and can be segregated at source into precise grades. This process allows Saarloha to make extensive use of high-purity scrap and refined ferro-alloys, thereby achieving high-quality output with a significantly lower carbon footprint.

Saarloha has also invested in a variety of process-efficiency measures. Its EAFs are supported by advanced automation, digital monitoring, waste heat recovery, and continuous process optimisation, all of which reduce energy losses. The company has pursued a technology-driven approach and maintains an active R&D programme. Notably, it has filed a patent for a production technology capable of achieving emissions as low as 32 kg CO_2/tcs – this intensity is far below typical industry ranges.

A substantial portion of Saarloha's electricity demand is met through long-term solar and wind procurement, further lowering the embedded emissions of its steel. This renewable energy integration is central to keeping lifecycle emissions among the lowest in India.

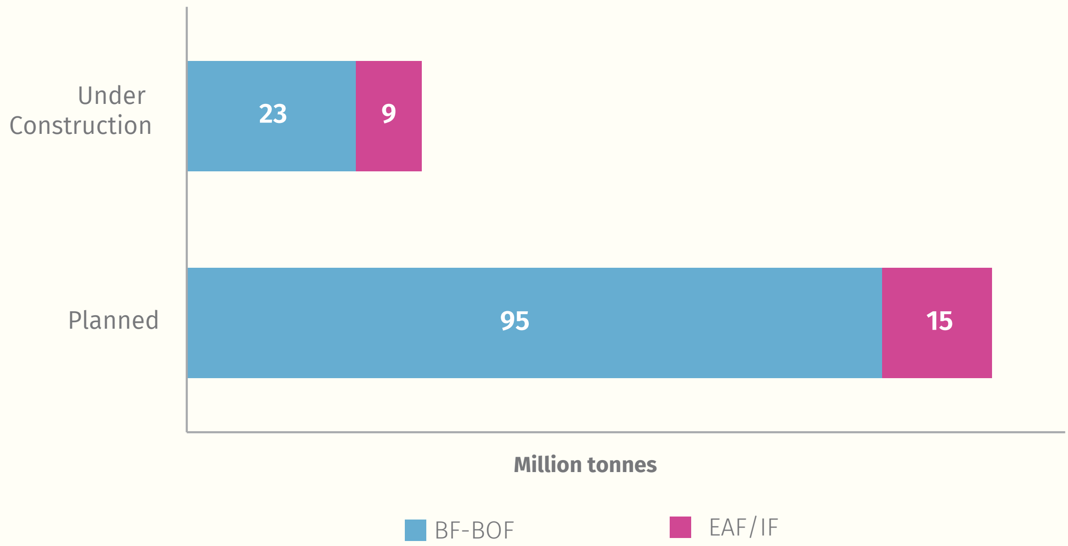
The company's strategic orientation is also shaped by its export profile, with 70–80% of its production being sold to the EU and the United States (US). For Saarloha, producing lower-emissions steel is essential to maintaining competitiveness under tightening global climate and trade rules. However, the absence of a price premium for green steel remains a commercial constraint. Current estimates suggest that on average, the green steel route costs 40% more than traditional steel production routes, a gap that is not yet fully recovered through market pricing. Therefore, the wider adoption of this model of steel production may face limits in India, given the price-sensitive domestic market and the fact that most steel is produced for domestic use.

Source: Attwood (2023); Saranga and Gupta (2024); Industry representative (2025)

However, these pathways face structural barriers. Scrap availability in India remains limited, constraining EAFs' ability to scale. The ecosystem of green hydrogen production, transport, and storage is also in its early stages. Moreover, the cost of green hydrogen is higher than the cost of conventional fuels used in the steel industry. Moreover, gas-based DRI accounts for only about 18% of India's total DRI production, meaning that even large-scale hydrogen substitution would have only a modest effect on the sector-wide emissions (Verma et al. 2024).

To decarbonise steel, the Indian steel industry should channel its new capacity into EAF furnaces. However, the 2017 National Steel Policy underscored that the BF-BOF route would remain the primary route in India and for 60–65% of crude steel capacity and production by Fiscal Year 2030–2031. Meanwhile, the remaining 35–40% would be produced through the EAF and IF routes (Ministry of Steel 2017). Indeed, as shown in Figure 5, the vast majority of both planned and under-construction capacity is in BF-BOF, with only a small fraction in EAF and IF. With a typical lifespan of around 50 years, the new coal-based infrastructure commissioned in the next decade will remain operational well beyond 2070 (Khadeeja and Swalec 2024). The majority of new EAF and IF facilities are expected to continue relying on coal-based DRI, with only a limited number of projects adopting scrap-based processes (Kashyap and Khurana 2023). This pattern suggests that India will utilise a large volume of carbon-intensive capacity, which, under typical operational scenarios, is projected to increase CO_2 emissions by more than 2.5 times that of current levels (Bansal et al. 2024).

Figure 5: India's announced capacity of steelmaking projects by 2032



Source: Dev et al. (2024)

3.3.5 Socio-economic implications of the low-carbon steel transition

The transition to low-carbon steel will have important socio-economic implications that must be considered. As highlighted earlier, it will lead to a contraction in coal use and its eventual phase-out (Elango et al. 2023). Projections indicate that the share of coal-based technologies will fall to 70% by 2030, to 29% between 2030 and 2050, and then decline to 0% between 2050 and 2070 (Gulia et al. 2023). Moreover, the low-carbon transition will drive substantial new demand for RE and hydrogen. Hydrogen-based steelmaking is projected to account for 12% of production by 2030 and 71% by 2070, in line with India's net-zero target (Gulia et al. 2023).

Different states will be affected differently, potentially creating regional winners and losers. Eastern and central Indian states, such as Jharkhand, Odisha, and Chhattisgarh, host most of the coal-based steel production capacity, reflecting their rich iron ore and coal deposits (Verma et al. 2024). This concentration of coal-based production constitutes a competitive disadvantage for producers in eastern and central India relative to those in the western and southern regions. These pressures could have significant implications for India's coal sector, which employs around 2.5 million workers, many of whom hold informal positions (Civil society representative 2025, PAGE 2023). Many such workers lack alternative skills or livelihoods. In particular, the implications of an eventual coal phase-out will be challenging for Jharkhand, as coal accounts for 16% of the state's revenue, and 18 of its 24 districts depend on it (Chaudhuri 2025). Steel and coal companies also provide essential public services, including schools, hospitals, and community infrastructure in Jharkhand (Indian government 2025).

At the same time, western and southern states such as Maharashtra, Gujarat, and Tamil Nadu exhibit significant RE potential. In other words, there is a misalignment between coal-producing states and states with high RE potential. What exacerbates this misalignment is that, in practice, interstate commerce in clean energy is highly complex in practice (Industry representative 2025; Industry association 2025).

To address these socio-economic implications, Jharkhand has established a Sustainable Just Transition Task Force, with a strong focus on the steel value chain (see Box 5 for further details). However, no similar just transition task force or initiative exists at the national level. Indeed, there is insufficient government funding for the just transition, even in Jharkhand (Civil society representatives 2025).

Box 5: An overview of Jharkhand's sustainable just transition task force

Jharkhand is the first and only Indian state to have adopted a formal just transition framework. Its early move reflects both its structural dependence on fossil fuels and the scale of the economic and social risks that a shift away from coal presents. The state is one of India's largest producers of fossil fuels, with around half of its districts being rich in coal deposits. About 32% of Jharkhand's direct revenue comes from the fossil fuel sector. Extraction companies also play an extraordinarily big role in providing essential services, such as schools, hospitals, and community facilities. As India accelerates its transition, concerns over who will maintain essential services once mining declines have prompted Jharkhand to establish this task force.

The task force has a broad mandate: to help the state plan for and manage the social, economic, and institutional dimensions of the shift away from coal, while leveraging emerging low-carbon opportunities. The task force operates across eight thematic areas – livelihoods, energy transition, decarbonization, green hydrogen, coal transition, sustainable mobility, investment and finance, and institutional frameworks. Steel is central to these plans. As India's hub for both steel and coal production, and with 99% of the domestically produced coking coal coming from the state, Jharkhand is positioning the steel sector as a key pillar of its transition strategy. According to stakeholder interviews, efforts include exploring renewable alternatives for coking processes, assessing the feasibility of biomass-derived char, and identifying RE clusters that can eventually supply low-carbon power to steel producers, including SMEs. Smaller firms in particular are seeking credible technologies and viability funding to participate in the transition. The task force aims to build mechanisms that can support them. District-level, economic-diversification plans are also being drafted to ensure that each district's unique resource base and industrial structure are reflected in transition pathways.

Source: Srivastava, Tiwari, and Jena (2025); Indian Bureau of Mines (2024); Indian government (2025)

3.4 The role of trade in the Indian steel sector

Trade plays an important role in the Indian steel sector, as India is both an importer and exporter of crude and finished steel products. India also relies heavily on raw material inputs for its steel production. This section unpacks these trade patterns, while highlighting key developments in export markets that will impact the steel sector.

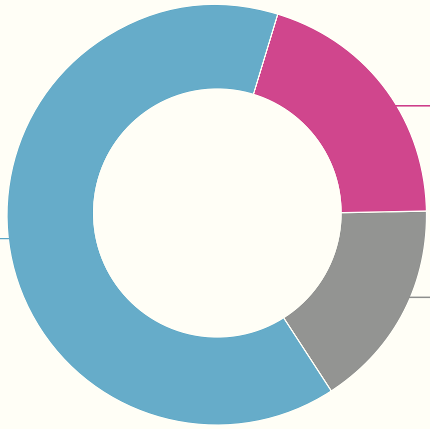
3.4.1 Indian steel exports

Overall, only a modest share of total Indian steel is exported (around 6% in 2024), with the majority produced for the domestic market (ITA 2024a). However, as Indian steel production increases, exports may rise as well. Indeed, India aims to more than double its total exports to 20 million tonnes by 2035-2036 (Arora 2026).

Based on 2024 figures, India is the world's 13th-largest steel exporter (excluding the EU as a bloc). In 2024, India exported 9.0 MMT of steel, with the top 10 export destinations accounting for 71.3% of its total steel exports (ITA 2024a). Italy accounted for the largest share of India's exports (19.2%), followed by the UK at 9.6%, Belgium at 8.85%, Nepal at 7.26%, Spain at 7.1%, the United Arab Emirates at 7.01%, Saudi Arabia at 0.35%, and Vietnam at 2.58% (ITA 2024a) . Within HS72, which covers raw materials, semi-finished, and certain primary forms of iron and steel products, flat steel products dominate Indian steel exports, comprising 51.7 % in 2024, followed by pipe and tube products at 14.7%, stainless products at 10.5%, and long products at 9.1 % (ITA 2024a).

The EU is the primary destination for Indian iron and steel exports, accounting for about 28% (authors' calculations based on data from ITC [n.d.]). At a more granular level, ~38% of India's steel classified under HS72 is shipped to the EU (authors' calculations based on data from ITC [n.d.]). The majority of steel products exported to the EU are flat products (~64%), followed by long steel (~20%) and raw and semi-finished steel (~16%), as illustrated in Figure 6. Moreover, 18% of HS73 exports, which covers articles of iron and steel, are shipped to the EU.

Figure 6: Flat steel dominates India's HS72 exports to the EU (2024)



Source: Authors' calculations based on data from ITC (n.d.)

As India seeks to increase its steel exports, it must increasingly navigate and comply with regulatory requirements, including the emergence of BCAs that tax embedded carbon emissions in exports. In particular, the EU CBAM, which entered into force on 1 January 2026, and the announced UK CBAM, which will enter into effect on 1 January 2027, will have important implications for Indian businesses (see Section 4.1.2).

With regards to the EU, Indian steel exporters must also navigate the emergence of other measures, including low-carbon steel and ecodesign standards under the Ecodesign for Sustainable Products Regulation (ESPR), the Corporate Sustainability Due Diligence Directive (CSDDD), which will hold large EU businesses legally responsible for preventing and mitigating environmental harm across their supply chains, and various trade defense instruments targeting steel, including the upcoming tariff-rate quota that will enter into force on 1 July 2026 (see Section 6). Moreover, as part of the Industry Accelerator Act, the European Commission is also developing low-carbon procurement requirements (European Commission 2025b). The implications of these regulations vary across product categories (see Section 4.2.2.3), reflecting the structure and concentration of India's export basket. In general, however, these developments will likely accelerate a push to derisk upstream materials such as iron and steel, including by reducing CO_2 emissions.

Moreover, Indian steel exports to the US, which comprise 3.38% of the total steel exports (ITA 2024a), will be affected by the Trump Administration's 2025 increase in steel tariffs from 25% to 50%. While the tariffs are anticipated to have a minimal direct impact, they could indirectly increase steel imports into India if countries more exposed than India seek alternative markets for their steel exports (Arora 2025).

3.4.2 Indian steel imports

India was the eleventh-largest steel-importing country[10] and a net importer of steel in 2024, importing around 11.3 MMT of steel (ITA 2024b; Ministry of Steel 2025). The country imports speciality steel that it does not produce domestically (Narayan 2025), as well as large volumes of flat steel (which accounted for 69.6% of its total steel imports in 2024) followed by stainless products (16.2%; ITA 2024b). The top five import sources – China, South Korea, Japan, Vietnam, and Indonesia – represented 85.87% of India's import volume, with China and South Korea each supplying roughly 27% (ITA 2024b). These imports are essential for price-sensitive downstream producers, many of which are MSMEs, and they exert competitive pressure on ISPs.

In response to mounting concerns from domestic producers, including several ISPs (DGTR 2025), the Government of India imposed a temporary 12% duty on certain steel products in April 2025 for a period of 200 days, based on a preliminary investigation (DGTR 2025). Subsequently, in August 2025, the Directorate General of Trade Remedies (DGTR) recommended a structured three-year duty on selected steel imports, beginning at 12% in the first year and declining by 0.5% annually (DGTR 2025). According to the Indian steel industry, as major importing economies such as the US and EU introduce tariffs and safeguard measures (see Section 3.4.1), exporters are likely to divert shipments to alternative markets. Such redirection, the industry argues, puts further downward pressure on global prices and is likely to increase steel imports into India (Narayan 2025; Malvania 2025).

Tension exists between ISPs, which are competing directly with some steel imports and pushing for additional safeguard measures on steel, and secondary steel producers in downstream sectors, which buy the imported steel and are therefore generally opposed to additional safeguards (Indian government 2025). This presents a crucial challenge for MSMEs, as they are well represented in downstream industries and dominate the secondary steel industry. The Government of India launched the Export Parity Price scheme to enable MSMEs to procure covered commodities from steel manufacturers at internationally competitive prices and to ensure that smaller manufacturers do not bear the brunt of price surges caused by policy interventions.[11] However, reports suggest that the implementation of this scheme has been limited (SSMB 2025). The Indian government also developed the Steel Import Monitoring System (SIMS) to ensure the availability of detailed steel import data to support informed policymaking and drive the growth of the domestic industry (PIB 2024c).

Tension exists between ISPs, which are competing directly with some steel imports and pushing for additional safeguard measures on steel, and secondary steel producers in downstream sectors, which buy the imported steel and are therefore generally opposed to additional safeguards.

10 This excludes the EU as a bloc.

11 The scheme covers hot-rolled coil (HRC), cold-rolled coil (CRC), wire rods, and alloy rounds.

3.4.3 Imported raw material inputs for the steel sector

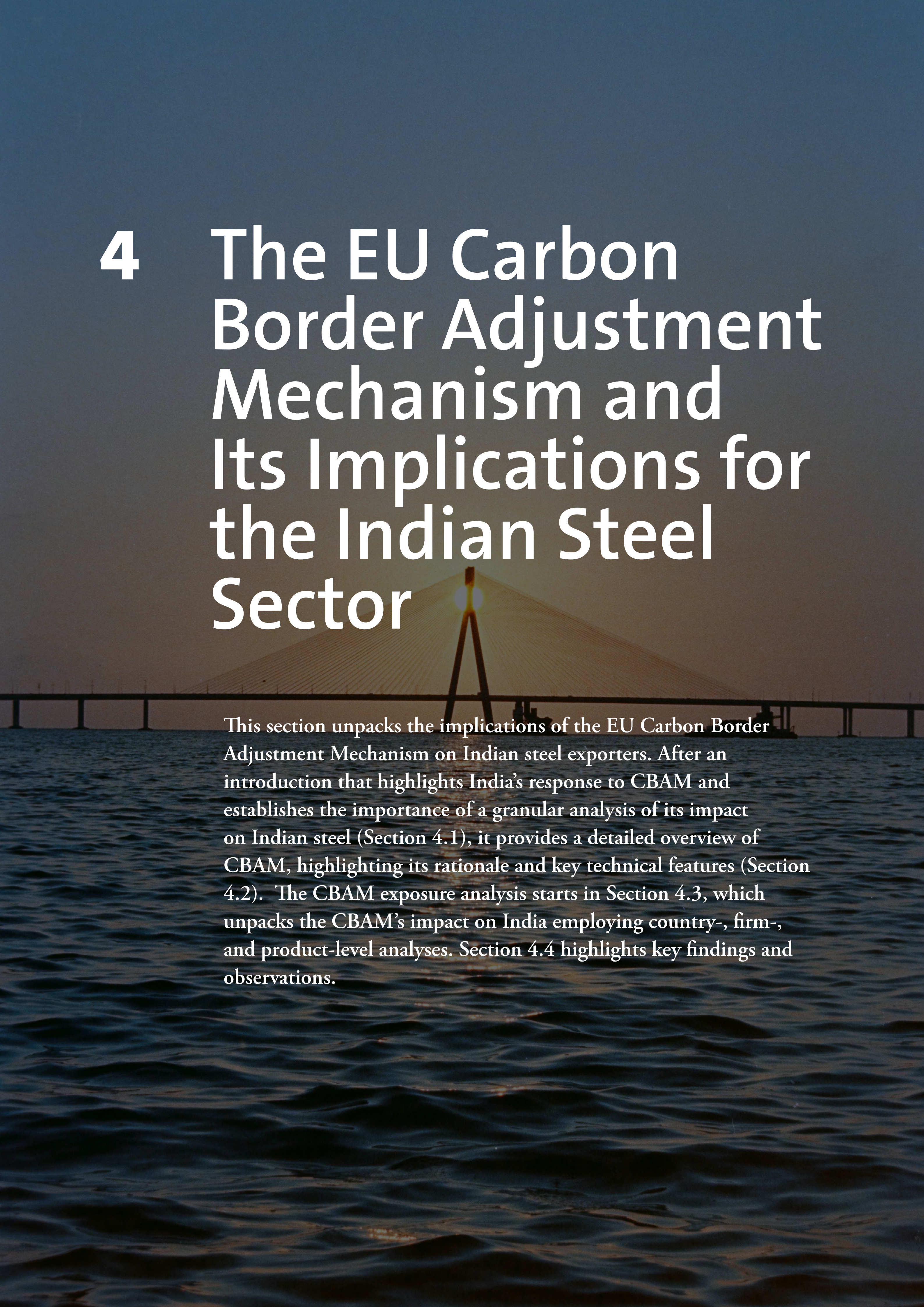
India's import reliance on coking coal, coupled with the concentration of sources of import – around 43% of India's total coking coal was imported from Australia in FY 2024–2025 – creates an energy security risk.

India is heavily reliant on raw materials imports for steel production. Although India possesses the fifth-largest coal reserves in the world, most of these reserves are unsuitable for steelmaking due to their high ash content (Krishnan and Balasubramanian 2014; PIB 2026b). As a result, 90% of the Indian steel industry's coking coal requirements are being met by imports (Ministry of Steel 2025). India's import reliance on coking coal, coupled with the concentration of sources of import – around 43% of India's total coking coal was imported from Australia in FY 2024–2025 (India Climate & Energy Dashboard Niti Aayog n.d.) – creates an energy security risk. In an apparent attempt to diversify India's sources, the February 2026 US–India Joint Statement highlights India's intention to purchase USD 500 billion (around EUR 590 billion) of US products, including coking coal, over the next five years.

Similarly, while India has extensive iron ore reserves and exports significant volumes of iron ore, these resources are of a low grade (Verma et al. 2024). This is problematic for steelmaking, as DRI processes require high-quality iron ore – impurities can increase costs and energy consumption during the EAF process (EY India 2024). Moreover, higher-grade iron ore improves BF productivity: a 1% increase in iron content raises the output by 2% while reducing coke consumption by 1% (EY India 2024). Therefore, India imports high-grade iron ore to blend with domestic ore for steelmaking. Major suppliers include Brazil, Oman, and Australia. (ITC Trade Map n.d.). Projections from the Indian Steel Association (ISA) indicate a shortage of iron ore exceeding 100 MT in the coming years, underscoring that India's import dependence will intensify (Russel 2025). This will add to India's economic security and decarbonisation risks (Russel 2025).

India also has insufficient domestic natural gas reserves. Natural gas is used as a critical "bridge fuel" that can halve emissions compared to coal-based technologies (see Table 3). As a result, India is forced to import natural gas. This exposes the country to global price volatility and fundamentally undermines the commercial feasibility of gas-based steelmaking. While the domestic steel industry requires gas prices in the range of USD 6–8 (EUR 5–6.7)/metric million British thermal unit (MMBtu) to remain competitive against incumbent coal-based technologies, the average landed cost of imported liquefied natural gas (LNG) fluctuates between USD 6–16 (EUR 5–14)/MMBtu (Verma et al. 2024). Moreover, reliance on imported natural gas raises energy security concerns (Civil society representative 2025), as demonstrated by India's natural gas shortages following the Strait of Hormuz blockage in March 2026. Logistical limitations, such as underdeveloped pipeline infrastructure, exacerbate these challenges.

Scrap, another critical input for decarbonising steel production, is insufficiently available in India. It is estimated that 70–80 MTPA of scrap will be required when Indian steel production rises to 250 MTPA, almost double the amount of scrap consumed in 2023–2024 (Ministry of Steel 2019). India bridges the gap in scrap supply and demand through imports. The nation is the world's second-largest scrap importer (accounting for 50% of the global scrap imports), meeting 25% of the domestic demand through imports (Goldar, Kumar, and Yadav 2025). More than 70% of India's scrap imports originate from just 10 countries – including some in the EU, the US, and the UK – creating further exposure risks (Goldar, Kumar, and Yadav 2025). With major suppliers considering or imposing export restrictions on scrap, India's reliance on this route for steel decarbonisation faces a material risk (see a detailed discussion in Section 5.3).



4 The EU Carbon Border Adjustment Mechanism and Its Implications for the Indian Steel Sector

This section unpacks the implications of the EU Carbon Border Adjustment Mechanism on Indian steel exporters. After an introduction that highlights India's response to CBAM and establishes the importance of a granular analysis of its impact on Indian steel (Section 4.1), it provides a detailed overview of CBAM, highlighting its rationale and key technical features (Section 4.2). The CBAM exposure analysis starts in Section 4.3, which unpacks the CBAM's impact on India employing country-, firm-, and product-level analyses. Section 4.4 highlights key findings and observations.

4.1 Introduction

In 2023, the European Union's Carbon Border Adjustment Mechanism (EU CBAM) entered into force, with full implementation having started on 1 January 2026. The CBAM aims to mitigate the risk of carbon leakage and to support the EU's goal of achieving climate neutrality by 2050. The operationalisation of the CBAM is an indication of a changing global trade landscape – one that increasingly factors in the emissions intensity of a good (Gupta, Pandey, and Sapatnekar 2024). Indeed, countries such as the United States of America (hereafter 'the US'), the United Kingdom (hereafter 'the UK'), Canada, and Australia are considering adopting their own border carbon adjustments (BCAs) to mitigate the risk of carbon leakage (World Bank 2025). Box 6 below provides a high-level overview of the key features of the EU CBAM and the UK BCA. Other countries, including Türkiye, Viet Nam, Thailand, and Indonesia, intend to implement carbon-pricing frameworks to mitigate their exposure to the EU CBAM (Gupta, Pandey, and Sapatnekar 2024; World Bank 2025).

Box 6: Key features of the UK CBAM

The UK CBAM, like the EU CBAM, aims to address carbon leakage by gradually phasing down free allowances under the ETS. Similar to the EU CBAM, the UK framework allows for the deduction of carbon prices already paid in the country of origin, although the detailed rules are yet to be specified.

However, it diverges from the EU CBAM on several important points.

The UK CBAM is scheduled to enter into force on 1 January 2027 and will cover the same sectors as the EU CBAM, with the notable exception of electricity. In terms of emissions coverage, the UK's approach in the initial stages is narrower than the EU CBAM. At launch, it will apply only to direct emissions, with the inclusion of indirect emissions deferred until 2029 at the earliest.

Another key point of departure lies in the compliance design. Unlike the EU CBAM, which includes a transitional reporting-only phase, the UK mechanism will impose financial obligations from the outset. It also operates through a different instrument: Rather than requiring the purchase and surrender of CBAM certificates, the UK will apply a tax administered by His Majesty's Revenue and Customs. The applicable rates will be set quarterly, calculated using the average UK ETS auction price from the previous quarter and adjusted to reflect free allocation levels.

The two systems also differ in their exemptions. The UK CBAM introduces a de minimis threshold of GBP 50,000 of covered goods over a rolling 12-month period, below which the obligations do not apply.

Finally, the UK CBAM will likely differ in its default values. While this part remains to be developed, it will likely use a single global average as the default value for each commodity code at launch, without differentiating by country.

Source: His Majesty's Treasury (2025).

As highlighted earlier, the CBAM has sparked significant debate, with India among its vocal critics. In particular, India holds that through the CBAM, the EU engages in regulatory imperialism and disregards the principle of common but differentiated responsibilities and respective capabilities (CBDR-RC) by imposing a carbon cost on imports equal to what EU firms pay – irrespective of a country's own climate strategy (WTO Council for Trade in Goods 2025; WTO Council for Trade in Goods 2024). By requiring trading partners to pay for the costs of carbon emissions, CBAM is expected to erode India's comparative advantage in world trade (Civil society representative 2025).[12] India has further expressed concern about the implications of the CBAM for micro, small, and medium enterprises (MSMEs), given their challenges in decarbonising and complying with monitoring, reporting, and verification (MRV) requirements (WTO Council for Trade in Goods 2024; WTO Council for Trade in Goods 2025). India's Commerce and Industry Minister Piyush Goyal even threatened to impose retaliatory duties if the EU proceeds with CBAM (PTI 2025).

12 This critique is similar to the stance of those criticising the minimum clause in the United States–Mexico–Canada Agreement (USMCA), which requires that vehicles have a minimum percentage of their value produced by workers earning at least USD 16 per hour (average wage).

The CBAM has been a key sticking point in the EU–India free trade agreement (FTA) negotiations, with Indian negotiators expressing concern that the CBAM could erode the benefits of any tariff liberalisation under the FTA (M. Kumar 2026). Ultimately, the agreement was signed without the exemptions or flexibilities India requested, but with an agreement to cooperate on various technical aspects of the deal and engage in capacity building, including through a dedicated annex on the CBAM (EU and India 2026a, Annex 14-a).

A comprehensive evaluation of the Indian steel industry's exposure to CBAM, however, requires going beyond high-level, normative discussions about the mechanism's impact and engaging in empirical analysis. Accordingly, this section assesses the CBAM's anticipated impact on Indian steel exports across three levels: country, firm, and product. Country-level indicators suggest India's steel sector is relatively highly exposed due to its higher carbon intensity compared to the EU and other trading partners; however, the aggregate macroeconomic effect is expected to be modest because the EU accounts for only a small share of India's steel output. Moreover, CBAM exposure is expected to be highly uneven across firms and products, driven by differences in firms' export orientation, emissions intensity, and the ability to measure and verify embedded emissions along fragmented supply chains – all factors that determine a firm's CBAM exposure. In this regard, a firm's exposure to CBAM is shaped less by absolute compliance costs and more by its competitive positioning and degree of dependence on the EU market (Civil society representative 2025).

In this regard, a firm's exposure to CBAM is shaped less by absolute compliance costs and more by its competitive positioning and degree of dependence on the EU market

4.2 The EU CBAM: An overview

4.2.1 The rationale for CBAM

The CBAM, which moved into its definitive phase on 1 January 2026, is a key component of the EU's Fit for 55 legislative package, designed to reduce the EU's net emissions of greenhouse gases (GHGs) by at least 55% by 2030 compared to 1990 levels and to reach net zero by 2050. Specifically, the CBAM introduces a carbon price on select imported goods, which is equivalent to the carbon price on EU-produced goods under its Emissions Trading Scheme (ETS), a cap-and-trade system designed to lower emissions through a carbon market.

The CBAM is designed to level the playing field between domestic and imported producers. It requires EU importers to buy CBAM certificates to cover the price difference between the carbon price paid in the producer country (if any) and the price of carbon allowances under the EU ETS. In doing so, the instrument aims to "prevent the risk of carbon leakage, thereby reducing global carbon emissions and supporting the goals of the Paris Agreement" (European Parliament and Council 2023, Art. 1). Carbon leakage for the EU would occur if EU climate policy led to increased emissions in other countries, thereby undercutting EU climate goals and competitiveness (European Commission 2025a). It results from businesses relocating production to regions with weaker emissions standards, or from firms from those regions taking market share from ETS-covered EU firms. Indeed, the CBAM is expected to play a critical role in protecting the EU's struggling steel industry, as further discussed in Section 6.

To date, the EU has mitigated the risk of carbon leakage by allocating 'free' emission allowances to certain industries, which allows them to emit specific amounts of GHGs without incurring costs. This shields them from the full carbon cost of the ETS (European Commission Climate Action n.d.).[13] The iron and steel sector is among the largest recipients of free allowances (EEA n.d.). The

13 According to the European Court of Auditors (Special Report 18/2020), free allocation of allowances under the EU ETS represented over 40% of total allowances in the 2013–2020 period, yet there is limited evidence that this contributed to effective decarbonisation, especially in the power, industry and aviation sectors. See European Court of Auditors (2020).

CBAM is fundamentally changing this framework by enabling a phase-out of the current free allowances system under the EU ETS for EU-based firms in hard-to-abate sectors, while minimising the carbon leakage risk. Free allowances for EU ETS installations producing CBAM goods will be gradually phased out between 2026 and 2034, alongside the gradual introduction of the CBAM for imported goods. This phase-out is essential to encourage emissions reduction.

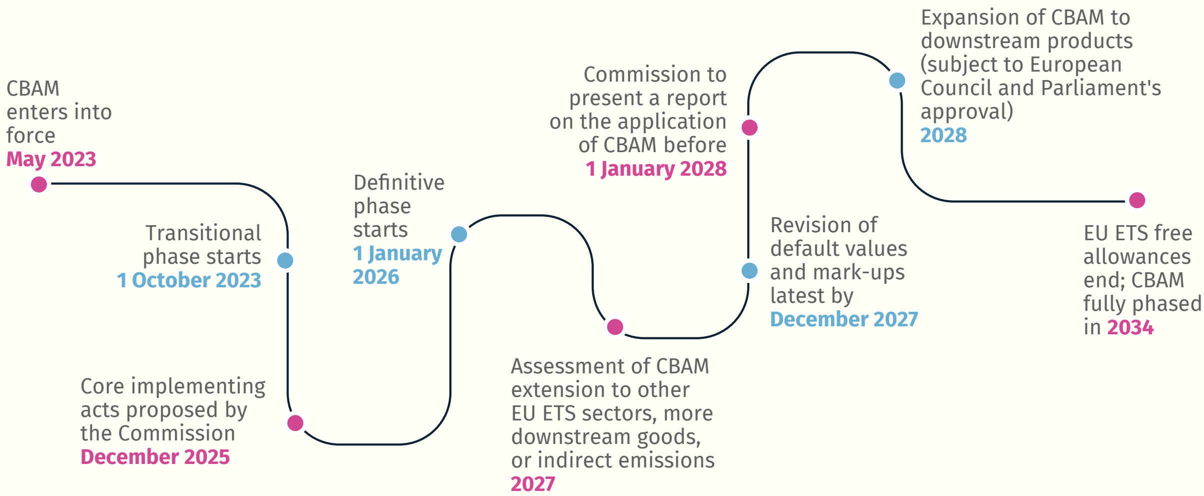
In addition to reducing the risk of carbon leakage, the CBAM also aims to "creat[e] incentives for the reduction of emissions by operators in third countries" (European Parliament and Council 2023, Art 1). This objective is also typically included in bilateral instruments such as FTAs. For instance, the Joint India–EU Comprehensive Strategic Agenda, concluded in parallel with the EU–India FTA of 27 January 2026, highlights cooperation on decarbonising heavy, hard-to-abate, energy-intensive sectors (European Commission 2026).

4.2.2 Salient features of the CBAM

This section sets out the key technical elements of the CBAM, including the latest package of delegated and implementing acts and CBAM amendments adopted or proposed by the European Commission in December 2025. In particular, it provides an overview of the CBAM's timeline, including the phase-out of free allowances under the EU ETS; key obligations; its scope, in terms of goods, geographies, and emissions covered; calculation of direct emissions; default values; benchmarks; verifier accreditation; and the deduction of carbon costs effectively paid in a third country. This is a highly technical section, but critical for the CBAM impact analysis in Section 4.3 and the subsequent analysis in Section 5 on the role of India's forthcoming carbon credit trading scheme (CCTS) in minimising CBAM exposure.

Timeline: CBAM started with a transitional period from 1 October 2023 to 31 December 2025, during which firms had quarterly reporting obligations but no financial requirements. The goal of this transitional period was to collect data and enable businesses to adapt their carbon accounting practices to the CBAM. On 1 January 2026, the CBAM entered its definitive phase, under which firms must pay for their embedded carbon emissions (Figure 7).

Figure 7: Timeline of CBAM Implementation



Source: Authors' analysis based on European Parliament and Council (2023); European Commission (2025d); European Commission (2025e); European Commission (2025f)

Between 2026 and 2034, CBAM certificates will be phased in in direct proportion to the reduction in free allowances across sectors under the ETS (European Commission 2024). By 2034, free EU ETS allowances will end, and the CBAM will be fully phased in. Box 7 details the calculation of free allowance adjustment under the CBAM.

Box 7: Benchmarks and free allowance adjustment under CBAM

The CBAM enables the EU to gradually phase out free emission allowances under the ETS. Prior to the CBAM, EU installations in sectors at risk of carbon leakage received free allowances allocated based on product benchmarks and historical production levels. These benchmarks reflect the emissions intensity of the most efficient installations and were used to determine the quantity of free allowances allocated.

Between 2026 and 2034, the free allowance adjustments allocated for sectors covered by the CBAM will be progressively reduced, as per a fixed schedule: 97.5% in 2026, 95% in 2027, 90% in 2028, 77.5% in 2029, 51.5% in 2030, 39% in 2031, 26.5% in 2032, and 14% in 2033, with full phase-out by 2034. Simultaneously, the CBAM will be proportionally phased in. For emissions embedded in imported goods, the share that is exempted under the CBAM free allocation adjustment will decline in line with the EU ETS free allocation, ensuring the equivalent treatment of carbon costs across EU producers and importers during the transition.

In other words, until 2034, free allowance adjustments can be subtracted from a firm's total CBAM costs. The number of free allocation adjustments that can be subtracted is determined by product-specific benchmarks at the level of EU's 8-digit Combined Nomenclature (CN) classification system, which differ for producers using production values and those using default emissions values provided by the EU (further discussed below). For many steel products, the default benchmark is the higher of the two, suggesting that exporters using default values to calculate overall emissions will have more free allowances they can subtract from their obligatory CBAM certificate purchases than those using production values.

Moreover, for some products, different benchmarks apply for different steel production routes, including BF-BOF, DRI-EAF, and scrap-EAF (for crude and low-alloy steel), reflecting different levels of emissions. For instance, for iron and non-alloy steel in puddled bars, the default benchmark values for BF-BOF, DRI-EAF, and DRI-scrap are 1,288, 0.475, and 0.066, respectively, tCO2e per tonne of the goods produced. This means that for iron and non-alloy steel, steel producers using the BF-BOF route will have 20 times the free allowances available to offset their CBAM certificate purchase obligations than the firms producing steel using scrap, and 2.7 times the free allowances available to firms using the DRI/EAF route.

Firms relying on default values based on a particular route must use the default benchmarks for that route to calculate free allowance adjustments.

Source: European Commission (2025g)

Key obligations: The CBAM requires EU importers to purchase and surrender CBAM certificates annually to cover the emissions embedded in the goods they import. The cost of CBAM certificates will be pegged to EU carbon allowance prices, specifically, the weekly average auction price of EU ETS allowances (EUR per tCO_2) in the relevant period (European Parliament and Council 2023).[14] Each importer must register as an "authorised CBAM declarant" (European Parliament and Council 2023), submit a CBAM declaration by the end of each year reporting total imports and verified emissions, and surrender a corresponding number of certificates (European Parliament and Council 2023). While the legal obligation to purchase CBAM certificates rests with the importer, in practice, it is the exporters who will bear most of the costs and compliance burden, as EU buyers will demand price adjustments and transparency of emissions data.

Scope of goods covered: The CBAM will initially cover a selection of carbon-intensive goods deemed to carry a high risk of carbon leakage. These include iron and steel, plus five other sectors: cement, aluminium, fertiliser, hydrogen, and electricity. The CBAM does not cover all iron and steel goods. It covers mainly agglomerated iron ore and concentrates, as well as certain downstream products, such as screws, bolts, nuts, and screw hooks.

In December 2025, the European Commission proposed to expand the scope of the CBAM to include 180 additional downstream steel and aluminium products at risk of carbon leakage and with high steel/aluminium content (European Commission 2025e; European Commission 2025h). Key downstream steel products included in the proposal are:

14 During 2026, prices will be published quarterly, based on the average weekly EU ETS prices, before shifting to a weekly publishing system from 2027 onwards.

- industrial components and fabrications (metal structures, fasteners, base metal mountings, etc.), machinery and equipment (casting machines, industrial radiators, sewing machines), and automotive parts (wheels, gearboxes, suspension systems);
- finished metal goods (steel-intensive household items, metal furniture, etc.);
- certain specific items (e.g., stranded wire, ropes, and cables);
- and complex assemblies such as washing machines, clothes dryers, and refrigerators.

Per the proposal and pending legislative approval, the extension of the CBAM's scope would take effect at the earliest after 1 January 2028 (European Commission 2025e).

Geographic scope: The CBAM applies to all countries, except those that are already applying the EU ETS or have a carbon pricing system fully linked to the EU ETS (European Parliament and Council 2023).[15] Currently, the exemption applies to Norway, Iceland, Liechtenstein, and Switzerland (European Parliament and Council 2023), with the UK and the EU having recently agreed to work toward linking their respective emissions trading systems (European Commission 2025i).

Emissions covered: The CBAM covers direct emissions[16] from the production of the good (e.g., CO_2 from fuel combustion and processes at a steel mill or cement plant) and, for certain goods, indirect emissions (i.e., emissions from electricity consumed in production).[17] For the iron and steel sector, only direct emissions are currently covered (European Parliament and Council 2023).

Actual emissions calculations: The CBAM requires importers to declare the emissions embedded in their products, using either actual emissions data or default values set by the Commission (see section below). From 1 January 2026, embedded emissions must be reported annually (European Parliament and Council 2023). Actual emissions must be calculated using primary data from the production processes of the exported goods (European Parliament and Council 2023). To determine the embedded tCO_2 in a product, installation-level emissions must be calculated and divided by the product's tonnage. These calculations are more complicated for installations that produce more than one product.

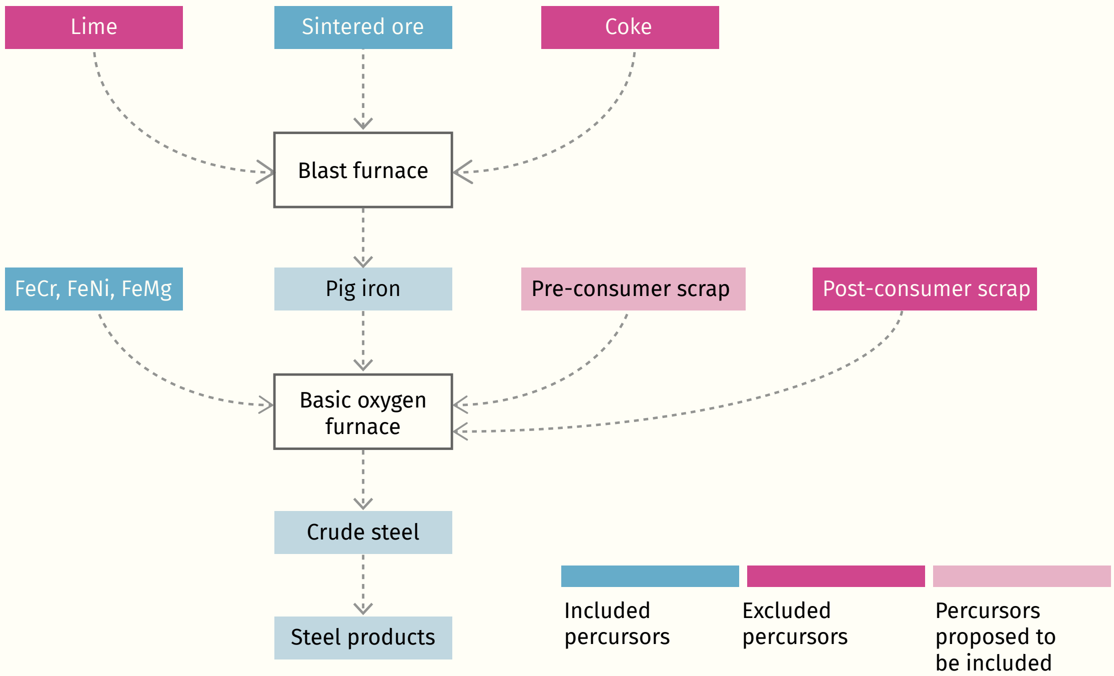
For complex goods, such as fabricated goods produced with carbon-intensive precursors, the calculation of embedded emissions must include those associated with both the final production stage and the CBAM-relevant precursors. In the steel sector, as illustrated in Figure 8, only a subset of precursors are covered: for the blast furnace and basic oxygen furnace (BF-BOF) route, hot metal, sintered ore, ferro-nickel, ferro-manganese, ferro-chromium are included, but coke, ferro alloys, and scrap steel are excluded; and for the electric arc furnace (EAF) route, direct reduced iron (DRI), hydrogen, ferro-nickel, ferro-manganese, and ferro-chromium are included, but lime and other ferro alloys are excluded (European Parliament and Council 2023; Assous et al. 2025). In December 2025, the Commission proposed expanding the scope of precursors for steel to include pre-consumer scrap, that is, metal scrap generated during the manufacturing process before a product reaches the end consumer (European Commission 2025e).

15 Article 2(6), CBAM Regulation: Third countries and territories are eligible for exemption from CBAM coverage if the EU ETS applies to that third country or territory, or an agreement has been concluded between that third country/territory and the Union to fully link the EU ETS and the emission trading system of that third country or territory; or the carbon price paid in the country in which the goods originate is effectively charged on the greenhouse gas emissions embedded in those goods without any rebates beyond those also applied in accordance with the EU ETS (European Parliament and Council 2023).

16 Per Article 3(21) of the CBAM Regulation, "direct emissions" are those embedded in the production processes of goods, including heating and cooling processes, irrespective of where the site of heat/coolness production is located (European Parliament and Council 2023).

17 Per Article 3(34) of the CBAM Regulation, "indirect emissions" emerge from the production of the electricity consumed during production processes, irrespective of where the site of electricity production is located (European Parliament and Council 2023).

Figure 8: Relevant vs non-relevant precursors for steel products produced through the BOF-BF route



Source: Adapted from Assous et al. (2025); European Commission (2025e)

Default values: Instead of calculating embedded emissions directly, importers may use default values under CBAM. Default values are determined based on either (i) the average sectoral emissions intensity of the exporting country plus markups (for products other than electricity) or, where no reliable data is available, (ii) the average sectoral emissions intensity of the top 10 exporting countries, considering the highest emissions for that good per the most reliable data available (European Parliament and Council 2023).[18]

An implementing act sets out country-specific default values for goods covered by the CBAM, including for India. For iron and steel, the default values are production-route-agnostic, even though most default values are calculated based on BF–BOF (European Commission 2025d). The markups on country-specific default values will be phased in gradually, from 10% in 2026 to 20% in 2027 and 30% in 2028 (European Commission 2025d).[19] For downstream products, no markup will apply on the default values (European Commission 2025e).

Verification: The actual emissions reported must be verified by an accredited verifier (European Parliament and Council 2025a). This requires appointing a verifier with the International Standards Organisation (ISO) 14065 accreditation from a national body in an EU member state (European Parliament and Council 2023). Non-EU firms are eligible to apply for accreditation to the national accreditation body of any EU member state (European Commission 2025j).

18 Point 4.1, Annex IV, as amended by the Omnibus Proposal: "'When reliable data for the exporting country cannot be applied for a type of goods, the default values shall be based on the average emission intensity of the ten exporting countries with the highest emission intensities for which reliable data can be applied for that type of goods." (European Parliament and Council 2025a)

19 The markup is based on the existing deviations of EU installations from the EU average. They are intended to encourage importers to use actual emissions data and to account for cases where individual installations have emissions levels higher than the average emissions intensity of the producer country. At the same time, the gradual phase-in is designed to avoid disproportionate and immediate impacts on the prices of goods, to allow economic operators time to adapt, and to allow for the expected increase in the number of accredited verifiers in the years following the transitional period (European Commission 2025d).

Accreditation requires demonstrating competence and the ability to properly verify emissions data and information. The national accreditation bodies should evaluate staff qualifications and experience, internal quality assurance procedures, independence and impartiality, and resources and systems in place for data review, testing, and reporting (European Commission 2025j). Once accredited, the verifier must, in the first year, physically visit the installation where the relevant goods are produced; however, they may subsequently conduct a virtual site visit or waive the site visit if specific criteria are met (European Commission 2025j; European Commission 2025k).[20] Alternatively, emissions can also be verified by registering the installation in the EU's third-country installation framework. This enables the authorised CBAM importer to use verified emissions data from the registered operator to fulfil its reporting obligations (European Parliament and Council 2023).

Importers that use default values are exempt from the verification requirement, given that the defaults are predefined.

Carbon prices paid in a third country: Importers can deduct a carbon price[21] "effectively paid" in the country of origin or in any third country from the number of certificates due (European Parliament and Council 2025a). An upcoming implementing act expected in 2026 will clarify the criteria that must be met to confirm that a "carbon price [is] effectively paid", and can thus be subtracted from CBAM costs. An issue currently under consideration is whether to include carbon credits under Article 6 of the Paris Agreement as a carbon price paid in a third country (European Commission 2025e).

De minimis exemption: If an importer brings in less than 50 metric tonnes per year of CBAM goods (cumulatively), then the importer falls within the *de minimis* threshold and is CBAM-exempt (European Parliament and Council 2025a).[22] Importantly, this *de minimis* threshold vests in EU importers; it does not, therefore, directly exempt smaller-scale exporters in EU trading partner countries, including India, from CBAM requirements. Occasional small shipments are thus spared the CBAM administration. The 50 metric tonne per year threshold replaces an earlier rule that exempted consignments valued at under EUR 150 (European Parliament and Council 2023). The Commission estimates this change will remove CBAM obligations for 90% (by number) of importers, while still covering over 99% of emissions embedded in imports (Director-General for Taxation and Customs Union 2025).

Temporary Decarbonisation Fund (TDF): The European Commission has proposed establishing a fund to provide temporary, targeted financial support to energy-intensive EU industries that remain exposed to a heightened risk of carbon leakage (European Parliament and Council 2025b).[23] The TDF is intended as a short-term measure, pending a broader review of how remaining carbon leakage risks should be addressed from 2028 onwards in the context of the scheduled review of the EU ETS.

20 The verifier may only do so if a physical site visit has been carried out during the previous year. Physical site visits should occur every two years at least. A verifier is also permitted to replace a physical site visit with a virtual site visit in cases where the verifier is prevented from carrying out a physical site visit due to serious, extraordinary, and unforeseeable circumstances.

21 Article 9, CBAM Regulation: Carbon price is defined as "the monetary amount paid in a third country, under a carbon emissions reduction scheme, in the form of a tax, levy or free or in the form of emission allowances under a greenhouse gas emission trading system, calculated on greenhouse gases…released during the production of goods."

22 This exemption does not apply to electricity and hydrogen imports, given their unique nature.

23 Concerns may arise regarding the consistency of the TDF with the World Trade Organization (WTO), especially if access to the Fund were de jure or de facto contingent on export, in violation of Article 3.1 of the WTO Agreement on Subsidies and Countervailing Measures (Agreement on Subsidies and Countervailing Measures, Marrakesh Agreement Establishing the WTO, 1994). At the time of writing this report, the Commission has framed the TDF's objective as addressing "remaining carbon leakage risk on third country markets", which is also known as export carbon leakage, suggesting that the Fund targets exporters.

The TDF is to be financed by contributions from EU member states – 25% of the revenues each member state collects from the sale of CBAM certificates for emissions declared in 2026 and 2027. Furthermore, the level of financial support is to be linked to the phasing out of EU ETS free allowances, with the monetary value determined by adjusting the allowances against those goods' share in production, multiplied by the average EU ETS allowance price in 2026 and 2027.

4.3 Unpacking the CBAM's impact on India's steel exports

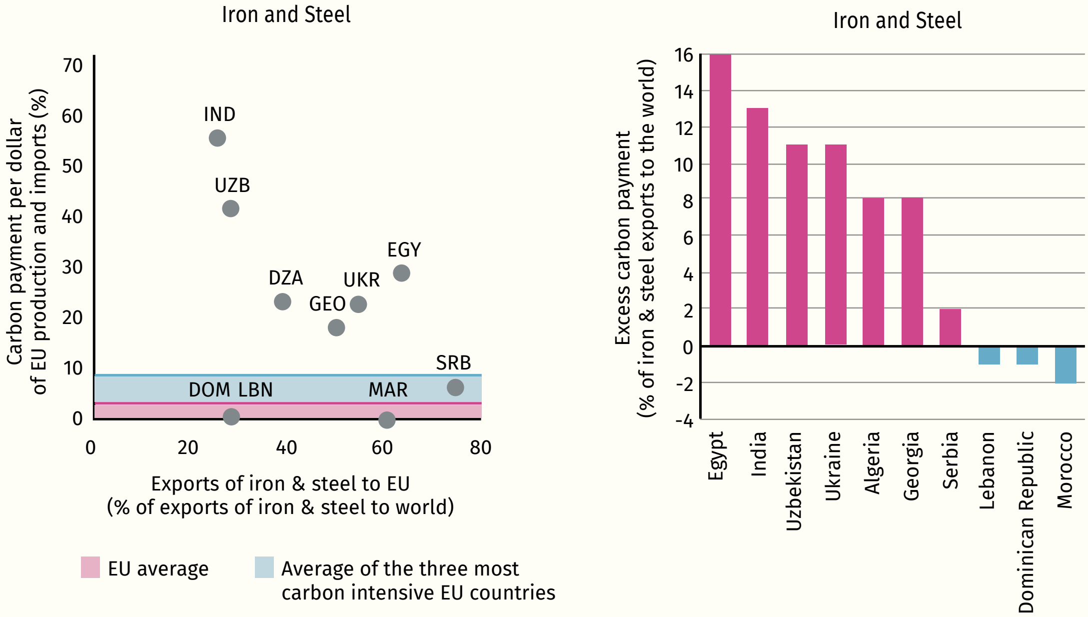
This section assesses the CBAM's likely impact on Indian steel exports across three levels: country, firm, and product. Country-level indicators suggest India's steel sector is highly exposed, primarily due to the high carbon intensity of its production processes. Yet the aggregate macroeconomic effect is expected to be modest because the EU accounts for only a small share of India's steel output. At a firm level, however, CBAM's exposure is expected to be highly uneven across firms and products, driven by differences in export orientation, emissions intensity, and the ability to measure and verify embedded emissions along fragmented supply chains. In particular, the analysis finds that while CBAM will have minimal implications for ISPs, it could have existential implications for India's MSMEs. These distributional effects also coincide with product-level exposure, as firm sizes tend to be concentrated in specific product segments.

4.3.1 India's country-level CBAM exposure

At the country level, India's iron and steel sector is generally highly exposed to CBAM, but exposure varies significantly depending on the variable used. There are several vantage points from which one can measure our CBAM exposure. Many of these produce a measurement in relative terms (e.g., as a percentage of a reference value). For example, 'trade exposure' measures carbon intensity in production compared to the average EU producer, coupled with the country's dependence on exports to the EU; 'economic exposure' measures the total excess carbon payments as a share of a country's GDP; and 'output exposure' measures the value of the excess carbon payments as a share of total sectoral output. (World Bank CBAM Exposure Indexes). In addition, some studies measure CBAM exposure using absolute metrics, such as CBAM revenue, export volumes, or carbon payments. This section examines CBAM exposure using a combination of these approaches.

Trade exposure: The Indian iron and steel sector has the second-highest trade exposure compared to the iron and steel sectors from other countries (Figure 9). The World Bank's Trade Exposure Index (TEI) measures trade exposure based on (i) carbon emissions intensity from the production of items covered by the EU CBAM compared to the average EU producer and (ii) how much the country depends on the EU market to sell that specific product. The TEI also assumes a notional CBAM certificate price of USD 100 per metric tonne of carbon dioxide (CO_2). The TEI highlights the excess carbon costs for India's iron and steel sector, amounting to 13% of its sectoral exports to the EU. This is primarily driven by the Indian steel sector's high carbon intensity.

Figure 9: The carbon cost intensity of India's iron and steel sector, its dependence on the EU for trade in this sector, and CBAM trade exposure



Source: Maliszewska et al. (2025a)

Note: **DOM** – Dominican Republic; **DZA** - Algeria; **EGY** – Egypt; **GEO** – Georgia; **IND** – India; **LBN** – Lebanon; **MAR** - Morocco; **SRB** – Serbia; **UKR** – Ukraine; **UZB** – Uzbekistan.

Economic exposure: CBAM exposure can also be measured through its impact on GDP. According to a study by the Centre for Social and Economic Progress (CSEP), in the CBAM-only scenario (where no domestic carbon price is imposed and CBAM revenues flow to the EU), India's GDP could contract by 0.02% to 0.03% (Ghosh and Verma 2025). The World Bank (2025) estimates that excess carbon payments for all CBAM-covered products amount to around 0.1% of India's GDP.[24] Relative to its GDP, India's CBAM exposure for the iron and steel sector, therefore, does not appear to be very high.

Output exposure: The World Bank measures output exposure as the value of excess carbon payments relative to total sectoral output. According to the World Bank (2025), India's steel sector has a relatively high output exposure of 3.6, behind only Georgia, Ukraine, and Egypt. In other words, excess carbon payments would amount to approximately 3.6% of India's gross output of iron and steel. This value appears to reflect predominantly the high carbon intensity of India's iron and steel sector, as opposed to the volume of India's EU exports relative to total output, given that only a relatively small share – around 1.7% of India's iron-and-steel production – is exported to the EU (using 2024 values; authors' estimations based on data from ITA [2024a] and ITC [n.d.]).

Export implications of the CBAM: In addition to the relative exposure variables, several studies have attempted to estimate the impact of the CBAM on India's exports to the EU. For instance, Golder et al. (forthcoming) find that the CBAM is expected to reduce India's steel exports to the EU by 8–14%. Based on simulations, the study shows that the decline could have ripple effects across the economy, adversely affecting backwards-linked industries such as coal and electricity, while potentially benefiting forward-linked sectors such as machinery and automobiles. However, a study by Majumder, Mathur, and Pohit (2024) predicts that the impact of the CBAM on Indian

24 An important limitation (self-acknowledged) of the World Bank data is that they are based on sector-wide averages – not individual firms' emissions (Maliszewska et al. 2025b). Especially in India's steel sector, as set out in Section 3.3.3, carbon emissions vary significantly, depending on the production method used. As a result, India's trade exposure in the iron-and-steel sector may have been overstated.

exports will be negligible. It suggests that, relative to competing nations, Indian exports – including those of iron and steel – will decline by only 0.06%.

Costs of the CBAM: The Investment Information and Credit Rating Agency (ICRA) projects that CBAM could lead to additional costs for Indian exporters ranging from USD 55 to USD 65 per MT during the period 2026–29, and these costs may increase to USD 90–145/MT by 2030–34, representing a substantial increase of ~9–22% over current steel prices (ASSOCHAM and ICRA 2024). These figures are expected to increase again by 2034, when steel imports will be fully phased in under the CBAM without any deductions, resulting in a projected total cost increase of approximately 50% relative to 2026 levels (Cornago and Berg 2024).

The 2025 Sandbag CBAM Simulator also provides sector-level estimates of CBAM costs, finding that – in the business-as-usual scenario – India's steel sector will incur the highest CBAM costs compared to other iron and steel exporters, at EUR 1,336 million/year. However, it also finds that these costs could be significantly reduced, and even result in net gains, when adjusted for different scenarios: India adopting its own carbon price (e.g., 25%, 50%, or 75% of the EU ETS carbon price); businesses engaging in resource shuffling, i.e., shipping their greener steel to the EU; or evolving (higher) selling prices in the EU. Conversely, expanding the scope of the CBAM to cover indirect emissions, precursors, and/or downstream products would increase a country's CBAM costs (Assous et al. 2025).

However, the findings of the Sandbag CBAM Simulator rely on assumptions that are likely to underestimate India's costs. This includes the assumption that India has sufficient volumes of steel scrap to export relatively low-emission steel to the EU and that India will implement a domestic carbon price that is at least 25% of the EU ETS price. Moreover, it only partially captures the heterogeneity of India's steel production landscape and the uneven capacities of its firms to decarbonise (Assous et al. 2025). At the same time, Sandbag CBAM's Simulator's ability to adjust for different scenarios around the CBAM highlights the difficulty of accurately anticipating its impact and the variability of CBAM costs over time and across firms.

In sum, the Indian steel sector is highly exposed to the CBAM, ranking second-highest in the World Bank's TEI, fourth-highest in the output exposure, and the highest in terms of CBAM costs – even though, relative to GDP, India's CBAM exposure seems to be less significant. These indicators suggest that, rather than causing a macroeconomic shock, the CBAM's impact on the Indian steel sector is likely to be predominantly sectoral. However, due to the inherent limitations of econometric modelling, these observations must be complemented and made more granular with firm- and product-level data.

In sum, the Indian steel sector is highly exposed to the CBAM, ranking second-highest in the World Bank's TEI, fourth-highest in the output exposure, and the highest in terms of CBAM costs – even though, relative to GDP, India's CBAM exposure seems to be less significant.

4.3.2 Firm-level CBAM exposure

This section examines firm-level CBAM exposure, distinguishing between integrated steel plants (ISPs) and the secondary steel industry, which is dominated by MSMEs. Firm-level CBAM exposure is shaped by a number of variables, including: (i) the share of steel production destined for the EU; (ii) the emissions intensity of this share; and (iii) the firm's ability to measure, report, and verify embedded emissions to avoid punitive default values. On these dimensions, ISPs are generally better positioned than MSMEs, resulting in asymmetric CBAM exposure.

4.3.2.1 Integrated Steel Plants

Despite high country-level CBAM exposure for iron and steel, as set out in Section 4.3.1, the impact on ISPs is likely to be limited. Based on in-person interviews with representatives of five of India's dominant ISPs[25] and a literature review (Tandon and Le Merle 2024; IEA 2020; Pandey 2024; Das and Bandopadhyay 2025; Grover and Ranjan 2025; Verma et al. 2024), the CBAM's limited impact on ISPs appears to be due to the following reasons: (i) the majority of the ISPs' steel production caters to the Indian market, implying the EU's share in the firm's output is lower; (ii) ISPs have the resources to decarbonise at least a part of their steel production and engage in resource shuffling; and (iii) ISPs are able to calculate directly embedded emissions in their steel plants to avoid punitive default values. Moreover, several ISPs also have steel plants in Europe, further mitigating the impact of the CBAM.

Export exposure: While ISPs dominate India's steel exports,[26] those interviewed for this project did not express concern about the CBAM, given India's strong domestic demand for steel (Industry representatives 2025). Indeed, ISPs export only between 10% and 20% of their total production. For example, Tata Steel exports about 11% of its total steel production (Tata Steel 2021), ArcelorMittal Nippon Steel (AM/NS) between 10% and 15% (Law, Indian steel-makers step up exports to Europe 2022), and JSW approximately 14% (JSW Steel 2024), with most of the ISPs' steel produced for the domestic market. With India's steel production projected to quadruple by 2050 to meet increased domestic demand, this domestic orientation is only likely to intensify (Industry Associations 2025; IEA 2020). This would continue to buffer the impact of the CBAM, with any surplus arising from reduced exports to the EU being absorbed domestically (Industry representatives 2025).

All of this aligns with studies that India is likely to be less affected by the CBAM than smaller developing economies that rely heavily on trade with EU countries (Das and Bandopadhyay 2025; Grover and Ranjan 2025). Nevertheless, ISPs also expressed continued interest in the EU market due to its size, existing buyer–supplier relationships (which take time to develop), and the EU's premium prices (Industry representative 2025).[27]

EU presence of ISPs: The CBAM is also less of a concern for Indian ISPs that have a European presence, such as Tata Steel (Industry representatives 2025). While the CBAM can be expected to increase costs for India-based ISPs overall, the instrument is considered beneficial for their EU branches, protecting them against foreign competition (Industry representatives 2025).[28] Moreover, the presence of EU branches opens up the possibility of redirecting production of EU-bound exports to the ISP's EU-based plant, which has already internalised the ETS and related costs (Industry representative 2025; Pandey 2024).[29] However, while such actions might limit CBAM exposure, they would yield limited environmental benefits and would also have profound implications for MSMEs supplying these ISPs (see Section 4.2.2.2) (Pandey 2024).

Moreover, the impact of the CBAM depends on relative carbon emissions, with higher-emitting plants facing a competitive disadvantage compared to lower-emitting plants. Indeed, empirical evidence from the CBAM's transitional phase confirms that Indian iron-and-steel firms with a

25 For this project, we interviewed at ArcelorMittal Nippon Steel (AM/NS), Jindal Stainless Steel, Jindal Steel and Power Limited (JSPL), Tata Steel, and the Steel Authority of India Limited (SAIL).

26 For instance, per Tandon and Le Merle (2024), JSW Steel accounted for 20.01% and Tata Steel for 11.43% of India's total iron-and-steel exports to the EU.

27 The adoption of a low-carbon-steel standard and eco-design requirements for steel, which are currently under development as part of the Industrial Accelerator Act and the Ecodesign for Sustainable Products Regulation, will likely increase premium prices for products aligned with these standards (see Section 5).

28 For instance, the Dutch parliament has approved about EUR 3 billion in environmental subsidies to Tata Steel Ijmuiden (Netherlands), making it the second-largest recipient of state decarbonisation aid (Tarasenko 2024).

29 That said, the verified emissions from the EU-based installations from these Indian-owned EU-based plants vary, thus establishing different ETS- and CBAM-adaptation paths (Tandon and Le Merle 2024).

high emissions intensity have faced a decline in average shipment sizes to and unit prices in the EU for their exports of CBAM-covered products, whereas firms with a low emissions intensity have maintained volumes and even realised modest price increases (Vriz et al. 2025).[30]

Steel decarbonisation initiatives and resource shuffling: Some ISPs are also comparatively less exposed to the impacts of the CBAM due to their greater capacity to produce low-carbon steel and, where permissible, engage in resource shuffling. While the dominant production route for ISPs is the carbon-intensive BF–BOF route, followed by DRI–EAF, ISPs have the financial resources and scale to invest in low-emissions technologies, thereby reducing their carbon emissions and CBAM fees. Indeed, seeking to limit exposure to environmental risk – an increasingly important consideration for accessing capital and managing borrowing costs – while maintaining competitiveness in a rapidly evolving global market, major Indian steel producers have set emission-reduction targets well below India's net-zero by 2070[31] target and are piloting decarbonisation technologies such as green hydrogen, biochar, and carbon capture, use, and storage – even though many of these technologies are not yet commercially viable (Verma et al. 2024; see Section 3.3.2). This creates a cost advantage, and thus a competitive edge relative to firms that lack the capital or operational flexibility to make similar investments, such as MSMEs, as discussed in Section 4.3.2.2 below. This also explains why Indian steel producers with very low carbon emissions – such as Kalyani Steel, which uses 70% scrap steel – or those using lower-emission gas-based EAF production methods, have expressed active support for the CBAM, as it provides them with a competitive edge while maintaining the price premium they need to recoup their investments (Industry representative 2025; Industry association 2025).

Most ISPs can only green a portion of their production process, but they may limit their CBAM exposure by engaging in resource shuffling – that is, by directing lower-footprint products to the EU market while maintaining overall competitiveness (Industry representatives 2025). For example, JSW Steel, one of India's largest exporters, is developing a natural-gas-based DRI plant with a capacity of up to 10 million tonnes per annum (MTPA) to serve the European market (Press Insider 2025). Steel produced at this facility is expected to generate roughly one-fifth of the emissions associated with conventional BF–BOF production, thereby substantially lowering the firm's potential CBAM liabilities (Vyas 2025). At the same time, ongoing uncertainty about the scope of the CBAM and anticipation of measures to counter resource shuffling have resulted in another firm halting its plans to establish a low-emission gas-based EAF plant in Orissa (Industry representatives 2025).

Most ISPs can only green a portion of their production process, but they may limit their CBAM exposure by engaging in resource shuffling – that is, by directing lower-footprint products to the EU market while maintaining overall competitiveness

ISPs are also increasingly exploring the option of investing in low-emission production plants outside India to limit their CBAM exposure. For example, JSPL is investing in a DRI plant in Oman, aiming to leverage the country's abundant natural gas, low energy prices, and geographic proximity to the EU (Industry representative 2025; PTI 2025). Other ISPs are also looking at the Middle East and North Africa (MENA) region (Industry association 2025; Industry representative 2025), reflecting an emerging trend in carbon arbitrage where production is located in jurisdictions with lower carbon intensity and easier market access under the CBAM.

30 This study integrates firm-level export data with third-party estimates of manufacturers' emissions and production.

31 For example, Tata Steel has committed to reducing its emissions intensity to below 1.8 tCO_2 per tonne of crude steel (tcs) by 2030, while AM/NS targets reducing emissions by 20% by 2030, and JSL has committed to achieve net zero for steel production by 2050.

MRV compliance: Another factor that minimises ISPs' CBAM exposure is their ability to comply with the instrument's MRV requirements. All ISPs were able to report emissions for the first quarter ending in January 2024, under CBAM's transitional phase (Industry representatives 2025; Kathuria, Gupta, and Kumar 2025). Their experience with domestic sustainability requirements, such as the Perform, Achieve and Trade (PAT) scheme and Business Responsibility & Sustainability Reporting (BRSR), as well as voluntary sustainability standards for steel, has enabled them to develop the requisite infrastructure and capacity to engage in direct accounting (Industry representative 2025). ISPs have also established dedicated compliance teams for CBAM-related reporting and tracking (Industry representatives 2025). This means that ISPs can avoid punitive default values when reporting carbon emissions under the CBAM.

Another factor that minimises ISPs' CBAM exposure is their ability to comply with the instrument's MRV requirements. All ISPs were able to report emissions for the first quarter ending in January 2024, under CBAM's transitional phase

In summary, while the CBAM imposes costs on Indian firms exporting steel to the EU, ISPs' exposure is limited, given their domestic market orientation and limited reliance on EU exports; their ability to invest in decarbonisation processes, engage in resource shuffling, and pursue carbon arbitrage; and their ability to comply with MRV requirements. Moreover, where relevant, ISPs can leverage their own European presence. Due to this limited exposure, the ISPs interviewed did not, by and large, consider the CBAM a significant concern; some even welcomed it, reflecting an understanding of their firm's competitive advantage under the scheme.

4.3.2.2 The secondary steel industry

In contrast to ISPs, the secondary steel industry – dominated by MSMEs – is likely to be significantly impacted by the CBAM. MSMEs are strongly represented in EU-bound exports of downstream products – articles of iron and steel such as tubes, pipes, and fasteners (especially HS73) and long-rolled products such as bars, rods, characterised by long, narrow dimensions (HS72) and are also indirectly exposed through supply-chain linkages where their intermediate outputs are embedded in exports by larger firms. Their vulnerability is compounded by limited MRV capacity, reliance on default values for CBAM compliance, and dependence on more emissions-intensive production routes (notably coal-based DRI–IF), with limited access to decarbonisation finance and technology. A distinctive feature of India's steel sector is the scale of MSME participation: MSMEs account for a substantial share of production (around 40%) and are deeply embedded across the value chain, from upstream steelmaking and re-rolling to downstream fabrication (Verma et al. 2024; Shrivastava et al. 2023). This value chain structure is a key factor in determining their CBAM vulnerability. Upstream production generates the most embedded emissions, while many downstream MSMEs operate in fragmented procurement networks, frequently sourcing steel through traders and intermediaries (Industry representative 2025). As a result, downstream exporters may be unable to obtain the upstream emissions data required to report actual embedded emissions per the CBAM, even when their own processing emissions are relatively small.

Export exposure: While official data on the share of MSMEs in India's steel exports are limited (Industry representative 2025; Industry association 2025), multiple sources indicate that MSMEs are strongly represented in EU-bound exports of downstream products classified under HS73, and dominate the export of long steel products under HS72.

According to CleanCarbon.ai, between 3,000 and 4,000 MSMEs will be impacted by the CBAM (S. Kumar 2026). A CSEP survey suggests that at least 1,000 MSMEs directly export steel and steel-containing products to the EU, with a large share concentrated in the HS73 category (Kathuria, Gupta, and Kumar 2025). Interviews with the Ministry of Steel and the Ministry of Commerce and Industry similarly indicate that EU-bound exports of HS73 products are MSME-intensive (Indian government 2025).

The Commission's December 2025 proposal to extend the scope of CBAM to an additional 180 downstream products for aluminium and iron and steel products will significantly increase the impact on India's MSMEs, given their dominance in these subcategories. The Commission's proposed expansion of scope – which will still have to go through the legislative process and will, at the earliest, enter into force on 1 January 2028 – would affect components and fabrications, steel-intensive household items, machinery and equipment, and automotive parts, all classified under HS73. The automotive components industry, in particular, is expected to feel a significant impact, given its heavy reliance on the EU market – the EU accounts for 27% of the total exports in this segment (Notani, Sathianathan, and Rastogi 2026).

The secondary steel industry also includes MSMEs that export crude steel, mostly long-rolled products (HS72), predominantly produced through the DRI–induction furnace (IF) and scrap-based IF routes. For instance, the Ludhiana belt is home to an export cluster of steel-producing MSMEs, comprised of approximately 650 steel firms, of which around 300 export 70–100% of their total production to Europe (Industry support organisation 2026). These MSMEs will also be impacted by the CBAM.

MSMEs can also be indirectly affected by the CBAM when they sell intermediate products to other firms (e.g., an ISP) that integrate them and export the final product to the EU (Industry representative 2025; Das and Bandopadhyay 2025). It is estimated that 25,000–30,000 MSMEs that indirectly export to the EU will be subject to the CBAM (Industry support organisation 2026; S. Kumar 2026).

Reliance on punitive default values: The CBAM's MRV requirements pose a disproportionate challenge to MSMEs. Downstream firms typically lack direct oversight of upstream emissions sources and depend on suppliers for embedded-emissions data, given that most emissions occur upstream in iron and steelmaking (Civil society representative 2025; Industry representative 2025; Industry support organisation 2026). In practice, obtaining emissions data can be difficult because (i) suppliers' commercial teams may not have CBAM-ready data accessible at the point of sale; and (ii) procurement often occurs through traders and intermediaries who aggregate inputs, obscuring sources (Industry support organisation 2026; Das and Bandopadhyay 2025; Kathuria, Gupta, and Kumar 2025; Banerjee 2026). Further changes proposed to the scope of the CBAM – such as accounting for embedded emissions in pre-consumer scrap – would further compound these challenges in a context where many MSMEs do not systematically distinguish pre- and post-consumer scrap streams (European Commission 2025e; Industry support organisation 2026; Verma et al. 2024).

Capacity constraints also limit MSMEs' ability to measure and report emissions. The evidence suggests substantial knowledge and capability gaps: One survey found that 57% of MSMEs lack the knowledge to measure their carbon footprint (Grover and Ranjan 2025). Many MSMEs lack the advanced metering and calibrated instruments required for emissions tracking, while the CBAM requires extensive reporting of plant- and process-level data (Policy Circle Bureau 2025). Third-party verification of reported emissions through EU-accredited entities adds cost and administrative complexity, as they require site visits (Industry support organisation 2026). This problem is compounded by the fact that India has a shortage of verifiers with CBAM-specific training and EU accreditation, while demand is expected to increase sharply from 2026 (Industry support organisation 2026; CleanCarbon n.d.). Even if Indian verifiers can be EU-accredited, there is limited activity to develop the industry.

Unless they can measure direct emissions and meet MRV requirements, MSMEs will have to apply punitive default emission costs to their CBAM calculations (see Section 4.2.2). For India, the default values for some steel products are particularly high, including for products predominantly exported by MSMEs. Downstream HS 73 products are assigned default values up to 6.490 tCO_2 equivalent per tonne (e/t) – indeed, this may go up to 8.437 tCO_2e/t inclusive of the 30% mark-up applicable from 2028 (European Commission 2025d). For example, tubes, pipes, and hollow profiles of stainless steel (HS 7306 69 10), which rank among India's top 10 iron-and-steel product exports to the EU, carry a default value of 8.45 tCO_2e/t, including the 30% mark-up (ITC n.d.; European Commission 2025d).

The disadvantage incurred by relying on default values is evidenced when comparing these figures to typical Indian emissions, which are, for the coal-based DRI–IF route – the most emission-intensive route in India – estimated to be between 2.7 and 3.2 tCO_2e/t (see Table 3 in Section 3 above). Thus, the default values can substantially exceed typical firm-reported emissions intensities, sometimes by a factor of two or more (Industry representatives 2025). These new default values are estimated to increase CBAM costs from EUR 80–120 per tonne of steel to EUR 250–300 per tonne (Industry support organisation 2026). Moreover, given that the default values do not vary across production routes,[32] they particularly penalise firms that produce steel through less carbon-intensive routes, such as gas-based DRI–EAF or scrap-based IF, as the default values are wholly unreflective of their production reality (European Commission 2025d).

Technology and finance constraints for decarbonisation: Even firms that can invest in MRV compliance may still be highly affected by the CBAM. The secondary steel sector is dominated by coal-based DRI–IF technologies, which have the highest carbon emissions intensity among India's production routes, ranging from 2.70 to 3.10 tCO_2/tcs. Decarbonising DRI–IF production requires moving from coal-based DRI to natural-gas-based DRI or hydrogen-based DRI – a shift that is technologically challenging, restricted by the limited availability of natural gas, and very costly for MSMEs with limited resources. MSMEs are also hindered by limited access to the financing necessary to green their production. Moreover, they operate on tight margins, which makes it difficult to justify significant investments in green infrastructure (Indian government 2025; Civil society representative 2025).

Moreover, when calculating actual production values, it is unclear which benchmarks can be used to determine free allowance adjustments for firms using the coal-driven DRI–IF route, as no specific values are assigned to this production route, which is unique to India (see Box 6 and European Commission 2025g). This will need attention to ensure that the phase-in of CBAM costs is equivalent to the phasing out of free allowances for the steel sector under the EU ETS.

In summary, unlike ISPs, Indian steel-exporting MSMEs that dominate the secondary steel sector will be highly impacted by CBAM. This reflects their greater exposure to the EU market, the application of punitive default values, and decarbonisation challenges. India's Parliamentary Standing Committee on Commerce (PSCC) has acknowledged these issues, emphasising that many MSMEs are financially ill-equipped to bear the costs of CBAM compliance and that failure to do so could lead to reduced profitability, loss of market access, or even business closures (PRS Legislative Research 2024). Without adequate support, MSMEs may lose market share in the EU to larger players, leading to market displacement rather than climate-mitigation outcomes.

32 They are either production-agnostic or calculated on the basis of BF–BOF production data.

4.3.3 Product-level CBAM exposure

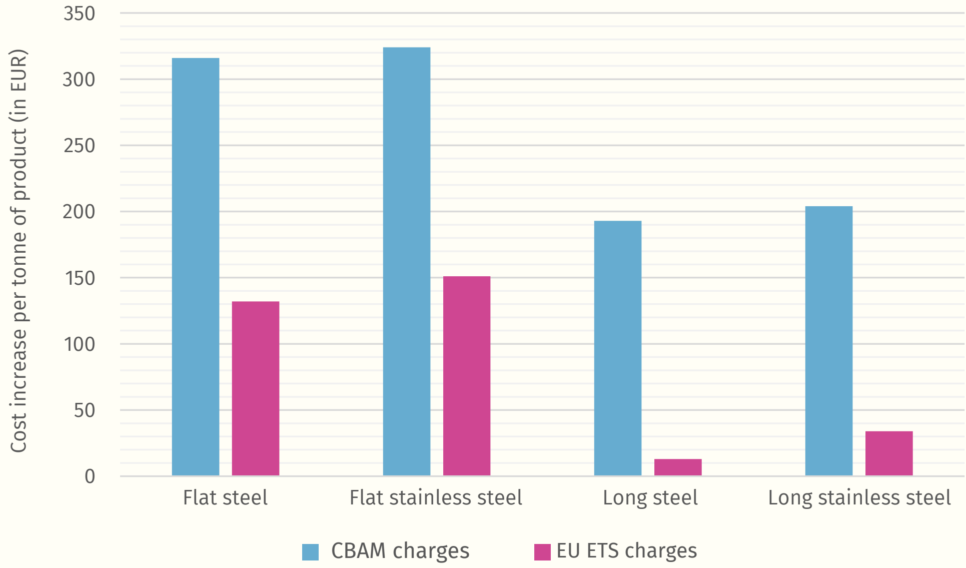
Reviewing the situation through the product lens helps further identify where CBAM exposure is likely to be heightened across India's steel export basket. To recall, iron and steel exports are classified under HS72 (iron and steel) and HS73 (articles of iron and steel). HS72 products are significantly more exposed to the EU market – of India's total iron-and-steel exports to the EU, around 68% (in value) fall under HS72, versus roughly 32% under HS73 (authors' calculations based on ITC n.d.).

This section focuses on two key finished steel product categories grouped under HS72: flat products and long products (primary and rolled mill forms) and downstream steel products grouped under HS73. A complex picture emerges: Compared to long products, flat products are highly exposed to the CBAM, accounting for the vast majority of India's steel exports to the EU under HS72, and are relatively more carbon-intensive. However, the fact that flat products are typically produced by ISPs, whereas long products are typically produced by MSMEs (see Section 3.3.3) suggests that the latter may face a greater competitive disadvantage under the CBAM. Downstream steel products, which will face increased exposure to the CBAM once it is expanded in scope as anticipated, are also predominantly produced by MSMEs.

Flat products (HS72): Flat products form the backbone of EU–India steel trade and account for about 64% of steel exports under HS72 (authors' calculations based on data from ITC n.d.; also see Section 3.4.1). Key products under HS72 include flat-rolled products made of iron or non-alloy steel, including clad, plated, or coated products (HS 7210), as well as hot-rolled (HS 7208) and cold-rolled (HS 7209) items (ITC n.d.). These are high-value steel products used in the automotive, construction, and engineering sectors; they are also comparatively easier to transport (Ravi, Lahoti, and Shah 2025). They are typically produced by ISPs, predominantly through the carbon-intensive BF–BOF and, in some cases, through EAF-based routes (PIB 2017). Given the BF–BOF emissions profile, the CBAM costs for flat products can be significant. For example, for HS 7210 and HS 7208 – a major portion of India's HS72 exports to the EU – the CBAM costs are estimated to account for a significant share of product prices (Materia n.d.). However, as discussed in Section 4.3.2.1, the ISPs are comparatively well-positioned to adapt through partial decarbonisation, resource reallocation, and robust MRV, which can moderate the impact on competitiveness.

Long products (HS 72): Long steel products, such as rebar and wire rods, are secondary to flat products in India–EU trade. They account for a small share of HS 72 exports (about 20% of India's steel exports to the EU in value) (authors' calculations based on data from ITC n.d.; also see Section 3.4.1). Long products from India tend to be less competitive compared to those from Türkiye, North Africa, and Eastern Europe. These products, however, are central to India's MSME-dominated secondary steel ecosystem. An estimated 1,100 re-rolling mills dominate India's long steel production, accounting for about two-thirds of the country's long steel output, including bars, thermos-mechanically treated (TMT) rods, sectional products, and wires (BEE 2022; Verma et al. 2024). These re-rolling mills rely on crude steel produced via the IF and EAF routes, which involve a comparatively higher level of scrap utilisation (Verma, et al. 2024). Accordingly, the anticipated CBAM fees are expected to be lower for long products compared to flat products (see Figure 10). Nevertheless, the price sensitivity of the long steel market, coupled with the likelihood that MSME-produced long-steel products will be subject to punitive default values (as discussed in Section 4.3.2.2), leaves these items highly vulnerable to the CBAM.

Figure 10: Product category-wise comparison of CBAM charges and EU ETS charges



Source: Sandbag (n.d.)

Downstream articles of steel (HS73): Once the proposed downstream scope extension comes into force, most likely after January 2028, the CBAM will have significant implications for HS73 exports. While they constitute about 32% of India's overall iron and steel exports to the EU and are secondary to India's flat steel trade with the EU, their production is dominated by MSMEs, as discussed in Section 4.3.2.2. This suggests that downstream steel products are highly vulnerable to the CBAM.

Stainless steel: Stainless steel products are covered by both HS72 and HS73. It is emissions intensity can be higher than that of carbon steel due to alloying elements (nickel, chromium, and molybdenum) and associated energy and material inputs (Teipel 2023). Comparative analyses suggest India's stainless-steel emissions intensity is, after South Africa, the highest for certain product categories (Danko et al. 2023). In 2024, India exported around 0.9 million tonnes of stainless steel in 2024 (approximately 10.5% of its total steel exports), accounting for a high share of the export value, second only to flat products (ITA 2024a). The EU is a key market, with member states such as Italy, Germany, the Netherlands, and Belgium accounting for meaningful shares in India's stainless steel exports (ITA 2024a). While large producers (e.g., Jindal Stainless Steel) dominate India's output, MSMEs remain numerically significant within the stainless-steel ecosystem and may be disproportionately affected by MRV and default-value dynamics (Nair 2024).

In summary, from the product-specific perspective, flat steel products are higher in carbon intensity than long products and dominate India's exports to the EU, and will, therefore, be highly exposed to the CBAM. However, these products are predominantly exported by ISPs, which are relatively well-positioned to lower or absorb CBAM costs. At the same time, long products and downstream products, while constituting a small percentage of India's steel exports to the EU, are mostly produced by MSMEs, which are highly exposed (see Section 4.3.2.2). As a result, long and downstream steel products will likely struggle the most under the CBAM.

4.4 Key Findings

4.4.1 Summary

This section has assessed the impact of the CBAM on the Indian steel sector, examining exposure at the country, firm, and product levels. What emerges is a complex picture: At the country level, the Indian steel sector has the second-highest trade exposure to the CBAM compared to the iron and steel sector in other countries, reflecting its high carbon intensity and coal-dependent production processes. The Commission's proposed extension of the CBAM to downstream products would further increase India's CBAM exposure, given the importance of these products to India's EU export basket. At the same time, the aggregate macroeconomic effect of the CBAM on India will be modest, as EU exports account for only a small share of India's steel output.

The industry-specific analysis has shed further light on the impact of CBAM on the heterogeneous landscape of Indian steel producers. It finds that CBAM exposure will be asymmetric, with ISPs being relatively well-positioned to absorb CBAM costs and manage compliance requirements, given the limited importance of EU exports compared to their overall production; their ability to decarbonise part of their production and engage in resource shuffling and carbon arbitrage; and their ability to meet MRV requirements. As a result, and given that many ISPs have an EU presence, these firms are not vocal in opposing the CBAM. Indeed, even though the CBAM raises firms' costs, to the extent they can ship low-carbon steel to the EU, it may also increase their competitiveness vis-à-vis firms that cannot. Continuing this logic, firms that use greener production routes (e.g., gas-based DRI–EAF or scrap–EAF) have even expressed support for CBAM, considering it an instrument that gives them a competitive edge and enables them to recoup investment costs (Industry Association 2025; Industry representative 2025).

By contrast, MSMEs, which dominate the secondary steel industry, are highly exposed to the CBAM and could face significant profitability losses and even business closure. This is due to their high level of participation in exports, either directly or indirectly, their lack of decarbonisation resources, and structural barriers in accessing emissions data, especially for downstream firms, leaving them more exposed to punitive default values under the CBAM. These default values can significantly exceed actual emissions, and for low-carbon firms, effectively penalise them not for higher emissions, but for limited capacity to engage in monitoring and reporting. Even if MSMEs were to improve their MRV compliance capacity, their heavy reliance on the carbon-intensive DRI–IF route and decarbonisation barriers would ensure that the higher CBAM exposure persists. Especially relative to ISPs, which do have the resources and capital to invest in decarbonisation initiatives, MSMEs that produce or source high-carbon steel face a competitive disadvantage. Conversely, MSMEs using the low-carbon steel-scrap route could gain a competitive advantage.

The product-specific analysis highlights that the CBAM adjustment risk is concentrated where export exposure overlaps with MSME presence. While flat products dominate India's EU exports and face higher CBAM charges per tonne than long products, they are typically produced by ISPs, which are relatively well-positioned to lower or absorb CBAM costs. At the same time, long and downstream products, while constituting a smaller percentage of India's steel exports to the EU, are mostly produced by MSMEs, which are highly exposed to the CBAM. As a result, targeted decarbonisation support for the MSME-intensive long and HS73 steel product segments is likely to be more consequential for competitiveness and inclusion than a strategy focused exclusively on the highest-emitting product categories.

4.4.2 Observations

A number of key policy observations emerge from this analysis of the CBAM's implications for the Indian steel sector.

First, the analysis underscores the limits of country-level assessments and highlights the importance of firm- and product-level heterogeneity. CBAM exposure and impact vary significantly across firms, depending on emissions intensity, the production route, and MRV capacity. This heterogeneity challenges the dominant narrative of uniform opposition to the CBAM in India. While carbon-intensive producers face clear competitive risks, firms with lower emissions intensity – particularly those using scrap-based EAF or gas-based DRI–EAF routes – may derive a competitive advantage. Similarly, ISPs – which possess stronger compliance capabilities and greater financial flexibility – are better positioned to absorb CBAM costs. As a result, some firms have shifted from opposing the CBAM to viewing it as a commercial opportunity, particularly where it aligns with existing decarbonisation strategies (Industry representatives 2025). This diversity of firm-level responses should be more accurately reflected in India's policy discourse.

Second, the CBAM is likely to exacerbate structural asymmetries within India's steel sector, particularly between ISPs and MSMEs. While ISPs are generally able to manage compliance requirements and mitigate cost impacts, MSMEs face significant constraints related to MRV capacity, access to finance, and technological upgrades. This creates a market displacement risk, where MSMEs may lose EU market share to larger, more compliant firms – domestic or foreign. To avoid such outcomes, policy support should be targeted and differentiated, with a focus on MSME-intensive segments, particularly long-product value chains and downstream HS73 products. A granular mapping of the MSME landscape – identifying these firms, their product baskets, and their production routes – would be critical for developing targeted policy support (see Section 8).

Third, the development of robust MRV systems emerges as a critical priority. MSMEs' reliance on default values – which are often significantly higher than actual emissions – can substantially increase their effective CBAM burden and undermine incentives to decarbonise. Strengthening MRV capacity, therefore, serves both competitiveness and climate objectives. In this regard, India's proposed CCTS, unpacked in more detail in Section 6, could provide an institutional foundation for emissions measurement and reporting. Complementary measures, such as expanding the pool of EU-accredited verifiers in India and standardising emissions data across supply chains, will also be essential. At the same time, there is a strong case for refining CBAM methodologies related to default values to better reflect the heterogeneity of production methods in countries such as India.

Fourth, the CBAM is likely to function as a limited and uneven driver of decarbonisation in India. Given that only a small share of India's steel production is exported to the EU, the CBAM's direct incentive effect is inherently constrained. While it may accelerate low-carbon investments among ISPs – particularly those already pursuing decarbonisation strategies – its impact on MSMEs is likely to be muted. Where firms rely on default values, the CBAM weakens the link between actual emissions reduction and cost savings, thereby diluting incentives to decarbonise. This raises broader questions about the CBAM's effectiveness as a global climate-policy instrument in contexts characterised by fragmented production structures and limited MRV capacity.

Taken together, these findings point to a clear policy imperative. The risk of declining competitiveness among MSME exporters, combined with the CBAM's limited effectiveness as a standalone climate lever, underscores the need for a proactive domestic response. The Government of India should prioritise (i) accelerating steel decarbonisation in line with national climate objectives, while (ii) reducing structural barriers that increase firms' exposure to the CBAM and similar future BCAs. This will require coordinated industrial, climate, and trade policies. As will be discussed in Section 5, India's forthcoming CCTS has the potential to play a central role in this transition by strengthening India's carbon accounting ecosystem.

5 Reducing CBAM Exposure through India's Carbon Credit Trading Scheme

This section examines the potential role of the Carbon Credit Trading Scheme (CCTS) in reducing Indian firms' exposure to the European Union's Carbon Border Adjustment Mechanism (EU CBAM). It starts by explaining the state of play of India's CCTS (Section 5.2.1), followed by a detailed overview of its architecture and scope (Section 5.2.2). Section 5.3 explores the potential and limitations of the CCTS for minimising CBAM costs, highlights how it can incentivise the development of MRV infrastructure and data collection for default values, and then explores specific challenges for MSMEs.

5.1 Introduction

A central focus in reducing India's exposure to the European Union's Carbon Border Adjustment Mechanism (EU CBAM) is the role of India's forthcoming carbon credit trading scheme (CCTS). The prominence of the CCTS in this context is reflected in the EU–India Free Trade Agreement (FTA) and Strategic Agenda, which emphasise cooperation on the design and implementation of India's CCTS and the EU Emissions Trading System (ETS), as well as the potential recognition of the CCTS in the CBAM schema (European Union and India 2026c).

The focus on India's forthcoming CCTS in the context of CBAM is linked to CBAM's provision that a carbon price "effectively paid" in a third country may be deducted from a firm's CBAM liability (see Section 4.2.2). Therefore, in principle, the CCTS could help reduce the carbon cost faced by Indian exporters under the CBAM. Another option that the Indian government has been exploring is a carbon price adjustment on exports (CPAE) (see Box 8; CSEP 2023).

This section moves beyond headline discussions to examine the CCTS framework in detail, focusing on its design, structure, scope, and ambition in the steel sector. It assesses both the scheme's potential and limitations with regard to reducing Indian firms' exposure to the CBAM and other border carbon adjustments, while supporting domestic decarbonisation. It finds that, in its current design, the CCTS is likely to deliver only limited CBAM deductions. However, its impact may evolve over time as the scheme matures and emissions intensity targets become more stringent.

More immediately, the rollout of the CCTS can play a critical role in establishing a robust carbon measuring, reporting and verification (MRV) ecosystem in India. This, in turn, can help firms comply with CBAM requirements and reduce reliance on punitive default values (Section 4.3.2.2). Furthermore, emissions data generated under the CCTS, through cooperation with the EU, could support the development of more accurate and representative default values for Indian production. However, these benefits will not be automatic for micro, small, and medium enterprises (MSMEs), which are largely outside the current scope of the CCTS. Targeted measures will therefore be needed to integrate these firms into carbon accounting and MRV systems.

Box 8: A carbon price adjustment on exports

To mitigate CBAM exposure, the Government of India has also been considering a carbon price adjustment on exports (CPAE). This would involve levying a carbon tax on exporters covered by the EU CBAM, to be deducted from the charges paid when exporting to the EU, per Article 9 of the CBAM (see Section 4.2.2). By charging an export tax on CBAM-covered goods, India would retain the revenue that would otherwise flow into the EU.

Such a scheme could have several benefits: compared to the CCTS, this approach could avoid the inflationary risk associated with an ambitious Indian carbon market; it would also be simpler to administer than the CCTS and quicker to establish. A CPAE would also support data collection, facilitating the creation of India-specific default values.

However, interest in developing a CPAE appears to have taken a back seat compared to the CCTS. Reasons may include apprehensions regarding the imposition of an export tax guided by foreign regulations, and uncertainty around whether a CPAE would be able to be deducted from CBAM, as the relevant implementing act is yet to be published. Moreover, unless the export tax is completely rebated – in which case it cannot be deducted from CBAM costs – simply shifting where a firm pays the tax on embedded emissions from the EU to India does not reduce its exposure.

There are also continuing legal ambiguities around levying an export tax on a subset of exporting firms and how they would align with the rules of the World Trade Organization (WTO).

Source: Industry representatives (2025); Indian Government (2025); Civil society representative (2025); European Commission (2025); Reuters (2023); Sharma (2023); CSEP (2023)

5.2 India's Carbon Credit Trading Scheme

5.2.1 Architecture and design

India's CCTS is currently under development. The scheme was officially notified on 28 June 2023 (Ministry of Power 2023), followed by the adoption of detailed procedures in 2024 (BEE 2024a). At the time of writing, it is not yet fully operational. In 2025, compliance cycles and project registration began, with emission targets announced for key industries. Full operationalisation is expected by mid-2026 (Anand 2025).

The CCTS builds on – and will gradually replace – the Perform, Achieve and Trade (PAT) scheme, a mandatory energy efficiency programme covering 1,300 industrial units across 13 energy-intensive sectors. It marks a shift in governmental focus from energy efficiency to carbon emissions. It should address key limitations of the PAT – for example, fuel switching (e.g., from coal to natural gas) does not significantly improve energy efficiency but is critical for reducing CO_2 emissions (Sheikh 2026). The development of the CCTS, therefore, represents a structural shift in India's climate policy architecture (PIB 2025). The CCTS is also shaped by external pressures, particularly the CBAM, to decarbonise hard-to-abate sectors (PIB 2025).

Unlike the EU ETS, the CCTS is not a cap-and-trade system. Instead, it operates as a baseline-and-credit system, assigning firm-level emissions intensity targets for greenhouse gases (GHGs) over a three-year period. Targeted entities must monitor and report emissions, as verified by Accredited Carbon Verification Agencies (ACVAs) (BEE 2024a). Based on verified performance, the BEE issues carbon credit certificates (CCCs) to entities that exceed targets, while those that fall short must purchase CCCs. These would be traded on power exchanges regulated by the Central Electricity Regulatory Commission (CERC)[33], with penalties for non-compliance (Ministry of Power 2023; CERC 2024; CERC 2025). Importantly, firms are required only to offset emissions that exceed their targets, not to mitigate their total emissions.

Unlike the EU ETS, the CCTS is not a cap-and-trade system. Instead, it operates as a baseline-and-credit system, assigning firm-level emissions intensity targets for greenhouse gases (GHGs) over a three-year period.

Accordingly, the CCTS generates a carbon price without a fixed emissions cap. Market dynamics depend on target stringency: lax targets may lead to surplus CCCs and low prices, whereas stringent targets increase demand and drive prices upward. Over time, ambition should scale up through progressively tighter targets. The system also accommodates economic growth, as absolute emissions may rise while emissions per unit remain within target levels. With plans to nearly double steel production by 2030, the CCTS could play a key role in decoupling industrial expansion from emissions growth. This reflects India's development-first approach – delaying absolute emissions caps while initially targeting emissions intensity (Jain, Deb, and Levitt 2024).[34]

In parallel, the CCTS includes a voluntary offset mechanism that enables non-covered entities to register projects that reduce, remove, or avoid GHG emissions in exchange for CCCs. This aims to expand mitigation beyond the compliance market and improve liquidity. Non-obligated entities, including MSMEs in the iron and steel sector, can use this mechanism to generate CCCs and offset decarbonisation costs (BEE 2025).

33 The CERC is designated as the regulator for trading activities within the Indian Carbon Market (ICM) framework.

34 Nationally determined contributions (NDCs), which sit at the heart of the Paris Agreement, recognise that "peaking of emissions will take longer for developing country Parties, and that emission reductions are undertaken on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty, which are critical development priorities for many developing countries" (UNFCCC n.d.).

5.2.2 Emissions intensity targets for the Indian steel sector

The iron and steel sector is a key focus of the CCTS. The draft notification released in June 2025 identified 253 entities to be covered in the steel sector – the highest number across industrial sectors – encompassing a wide range of operations, from integrated steel plants (ISPs) to sponge iron and ferro-alloy producers (MoEFCC 2025).[35] While the CCTS lacks a general MSME exemption, based on the scale of production of the obligated entities, it *de facto* excludes most steel-producing MSMEs.[36]

The June 2025 notification includes emissions intensity targets for the compliance years 2025–26 and 2026–27. These targets aim to reduce CO_2 emissions in the steel sector to 13% by 2030 (Sengupta 2024). The CCTS will require an average annual reduction in CO2 emissions of 0.06 tonnes of CO_2 equivalent per tonne of equivalent product (tCO_2e/ts) by 2026, approximately a 2% reduction (MoEFCC 2025; Selvaraju 2025). For the 2026–27 period, the average emissions reduction target will be approximately 4%. The CO_2 emissions figures and targets cover direct emissions (emissions from the production process of the obligated entity) and indirect emissions (emissions from the production of purchased electricity and heat) (BEE 2024a; Selvaraju 2025).[37] The targets are calculated based on installations or sites, rather than entire companies.[38]

GHG intensity targets differ across entities: firms already efficient (near best-in-class) are subject to less stringent reduction targets compared to firms that are among the highest emitters in their class. The cleanest ISPs (baseline ~2.3–2.5 tCO_2/ts) include ArcelorMittal Nippon Steel (AM/NS) in Hazira, Tata in Jamshedpur, and Tata in Kalinganagar (MoEFCC 2025). These have the lowest reduction targets (~4.4–4.8%). By contrast, the worst-performing ISPs (baseline ≥3.1), such as the older plants of the Steel Authority of India (SAIL), must cut emissions by ~6.1–6.3%. A similar pattern holds in the secondary/sponge sub-sector. The top 10 highest baseline figures for this group range from ~5.8 to ~7.0 tCO_2/ts, and most of these have reduction targets of around 6–7%. Meanwhile, the 10 lowest-intensity secondary units (baseline ~2.0–2.5) are asked to make cuts of approximately 4.5–5.5%, which is at the lower end of the ISP range.

Short-term CO_2 emissions reduction targets are likely achievable through improvements in energy efficiency and optimised operations, including heat recovery. Operationalising these would not require any breakthrough technologies. However, this strategy will likely lead to oversupply of carbon credits and low carbon prices early on. In the medium term, as targets tighten, firms would need to make more drastic emissions cuts, including through the expansion of the scrap-based electric furnace (EAF) route, gas or hydrogen pilots for direct reduced iron (DRI), and technologies such as carbon capture, utilisation, and storage (CCUS) (Bansal 2026) (See Section 7).

35 At the time of writing this report, the final emissions reduction targets for the steel sector have not yet been notified.

36 However, the draft notification does include numerous smaller-scale producers of under 100,000 tonnes of steel – e.g., B.R. Sponge & Power Limited Village (39,851 tonnes) and Ambey Metallic Ltd (30,599 tonnes).

37 Gate-to-gate emissions covers direct and indirect emissions resulting from the obligated entities process and operations (BEE 2024a).

38 This is similar to the ETSs of the EU, the United Kingdom (UK), and Switzerland.

5.3 Linking the CCTS to the CBAM

5.3.1 Deducting the CCTS carbon price from CBAM costs

In the context of the CBAM, India's CCTS is attracting significant attention for its potential to reduce CBAM exposure. To avoid double-pricing, Article 9 of the CBAM Regulation allows EU importers to claim a reduction in the number of CBAM certificates, taking into account "the carbon price paid[39] in the third country for the embedded emissions" (European Parliament and Council 2023, Art. 9). For this deduction to be claimed, the carbon price must have been "effectively paid" in the third country, taking into account "any rebate or other form of compensation available in that country" that would have resulted in a reduction of that carbon price (European Parliament and Council 2023, Art. 9; European Parliament and Council 2025a, Art. 1(8)). An implementing act establishing the criteria and a methodology to determine whether a carbon price is considered "effectively paid" and, therefore, eligible for CBAM deduction is expected to be released in 2026 (see Section 4.2.2). For Indian firms, a carbon price paid under the CCTS that complies with these criteria would render them eligible for a CBAM deduction.

However, even if these criteria are met, the extent to which Indian steel exporters may deduct carbon prices paid under the CCTS will be limited, given anticipated differences in carbon price, weak emission reduction targets, and scale and scope mismatches between India's CCTS and the EU CBAM.

First, a large gap in carbon prices is anticipated between the two jurisdictions, which would limit the amount Indian firms may deduct from CBAM costs. When the CCTS is launched, the carbon price is expected to be around EUR 8.5 per tonne (USD 10/t). By 2029, this might rise to EUR 12.7/t (USD 15/t) (Civil society representative 2025). This anticipated low carbon price reflects easy-to-meet CO_2 targets and a possible CCC oversupply. While indicative, this suggests that payments under the CCTS are expected to be well below the EU ETS carbon price, which is between EUR 60/t and 80/t (OPIS 2026).

Second, design differences between the CBAM and the CCTS will further limit CBAM deductions. Under the CCTS, a baseline-and-credit system, covered entities pay only for CO_2 emissions above their assigned targets. In other words, covered entities receive implicit free emissions up to their target. Given the relatively low emissions-reduction targets set for the next two years, most firms should be able to meet them and therefore would not be required to pay for embedded emissions (Selvaraju 2025). For firms that exceed the CCTS emissions reduction targets and purchase CCCs, these would cover only the CO_2 emissions that exceed the target, which would be a fraction of the installation's total CO_2 emissions. As a result, a firm would be able to deduct, at most, a fraction of its total emissions (Indian Government 2025).

By contrast, the CBAM requires firms to purchase certificates in line with gradually reducing benchmarks, reflecting the parallel phase-out of free allowances under the ETS, a cap-and-trade system (see Section 4.2.2). By 2034, 100% of the free allowances will be phased out under the EU ETS, and the CBAM will require firms to pay for all of their embedded emissions.

A third limitation concerns the scope of the covered emissions. Deductions can only be made for carbon prices that correspond to the CBAM's scope (European Commission 2025). A scope mismatch between the CCTS and the EU ETS–CBAM means that certain carbon prices effectively paid in India may not be deductible. While the CBAM currently covers only direct emissions for steel (scope 1), the CCTS covers direct and indirect emissions (scopes 1 and 2). Moreover, the CCTS will likely cover notional emissions in coke (Ministry of Power 2016), which are currently

39 This is defined in the Regulation as "a monetary amount paid in a third country under a carbon emissions reductions scheme" and can be "in the form of a tax, levy, or free or in the form of emissions allowances under a greenhouse gas emissions trading scheme".

not covered by the CBAM. Given this scope mismatch, not all carbon prices paid under the CCTS would be deductible from a firm's CBAM costs.

Finally, for entities not covered under the CCTS, including most MSMEs, there will be no deductions even if they participate in voluntary carbon credit schemes. More fundamentally, deducting carbon prices already paid requires MRV capacity – both under the CCTS and the CBAM – which is highly challenging for MSMEs to develop, as discussed in Section 4.3.2.2.

In sum, even if the criteria for a "carbon price effectively paid" are met, the CCTS carbon prices that Indian firms will be able to deduct from their CBAM certificates will be very minimal (Industry representative 2025). This reflects the anticipated carbon price gap, low-ambition targets, and differences in design and scope. Moreover, as MSMEs are largely excluded from the CCTS, they would not be eligible for any deductions. Finally, from a firm's perspective, whether it ends up paying for embedded carbon emissions under the CCTS or the EU CBAM is mostly immaterial.

5.3.2 The CCTS as an instrument to boost India's MRV infrastructure

In the short term, the CCTS' most promising role in limiting CBAM exposure is in enhancing firms' ability to engage in MRV – a key obstacle, especially for MSMEs that are forced to use punitive default values instead. As the CCTS requires firms to report their actual CO_2 emissions, it could be crucial in creating an MRV ecosystem in India that facilitates compliance with the CBAM's requirements as well.

Monitoring and reporting: Under the CCTS, firms will be required to submit an annual GHG emissions report, including data on activity levels, emissions factors used, the calculated intensity of total scope 1 and scope 2 emissions, and any reduction measures taken.[40] Specifically, the CCTS will require granular tracking of carbon emissions, motivating firms to invest in upgraded instrumentation and data systems. Covered entities must further develop a five-year GHG reduction plan that details measures to reduce emissions, including cost and savings estimates, encouraging firms to augment resources to account for embedded CO_2 emissions – in turn, better positioning them to comply with the CBAM's MRV requirements. The incentive to develop MRV capacity is further bolstered by India's Green Steel Taxonomy, further discussed in Section 6, which makes the capacity to directly measure emissions a prerequisite for classifying steel as 'green' (Verma et al. 2024). The CCTS will also enhance the standardisation of monitoring and reporting, thereby increasing the efficiency of data collection.

Even if the criteria for a "carbon price effectively paid" are met, the CCTS carbon prices that Indian firms will be able to deduct from their CBAM certificates will be very minimal. This reflects the anticipated carbon price gap, low-ambition targets, and differences in design and scope.

The BEE is expected to issue sector-specific monitoring and reporting guidelines under the CCTS, providing more detailed guidance on calculating embedded emissions. It is essential to align the methodology as closely as possible not only with the EU CBAM, but also – in light of the proliferation of BCAs worldwide – with other international standards and best practices. One way to do so is for the Ministry of Environment, Forest and Climate Change (MoEFCC) to mandate

40 The annual GHG emissions report should include the entity's registration number; plant head and energy manager (names, addresses, contact information); the reporting year; details of the monitoring plan and a reference to the latest submitted version; and disclosure of any operational changes during the period. It must also include details of the production process (including consumption of raw materials, categorised by process/sub-process) and comprehensive information on emissions sources and source streams (total emissions in tCO_2e, non-CO_2 GHGs in tonnes, calculation methodology, type of emission factors, activity data for fuel quantities and net calorific values as well as other source-stream quantities, and emission/oxidation/conversion factors). It should also set out the mass-balance methodology (mass flows and carbon content for each source stream, compared to calculated values), the sampling plan and procedures, the data-control arrangements, memo items for biomass, and a list of GHG-reduction measures implemented in the year.

mapping of emissions – and the domestic carbon price paid – not only at installation levels, but also at the levels of the eight Harmonized System (HS) Codes (Godbole 2025). The Organisation for Economic Co-operation and Development (OECD) has established the Inclusive Forum on Carbon Mitigation Approaches (IFCMA) to facilitate better data and information sharing on carbon accounting methodologies (OECD IFCMA n.d.). This could serve as a useful platform for discussing issues around CCTS–CBAM interoperability and alignment.

The BEE is expected to issue sector-specific monitoring and reporting guidelines under the CCTS, providing more detailed guidance on calculating embedded emissions. It is essential to align the methodology as closely as possible not only with the EU CBAM, but also – in light of the proliferation of BCAs worldwide – with other international standards and best practices.

Verification: Emissions data reported under the CCTS must be verified by an independent auditor accredited by the BEE, known as an Accredited Carbon Verification Agency (ACVA). This accreditation procedure requires agencies to meet the ISO 14065:2020 standard (or obtain formal ISO 14065 accreditation within one year), in addition to the BEE's scheme-specific criteria, including rigorous minimum requirements demonstrating financial stability (BEE 2024b). The reliance on ACVA will incentivise investment in India's auditing infrastructure for carbon emissions as well, which could also bolster development of verifiers for CBAM purposes – especially given the fact that the focus in India appears to be predominantly on monitoring and reporting, rather than on developing verification capacity (Industry support organisation 2026; Industry association 2025).

To issue a verification report for a CBAM declaration, an ACVA-accredited auditor must be accredited by an EU national body as well. As set out in Section 4.2.2, this requires establishing, implementing, monitoring, and evaluating a competence process; ensuring impartiality; establishing verification procedures, such as compliance with ISO 14065:2020 and ISO/IEC 17029:2019; and establishing a policy for communication with the operator and arrangements to safeguard confidentiality. This process is time-consuming and possibly costly. One way to enhance alignment between the two accreditation systems would be to agree on mutual recognition of accreditation bodies for the accreditation of verifiers, to support compliance with carbon border adjustment mechanisms – a possibility highlighted in the EU-India FTA, Annex 14a. (see also Section 8.2). Doing so would increase the number of verifiers available for CBAM declarations and potentially reduce costs, particularly for MSMEs, which do not have the same ability as ISPs to rely on EU-based verifiers (Industry representative 2025).

5.3.3 CCTS as a basis to develop more accurate default values

The CCTS could further be used to update the India-specific default values under the CBAM. As outlined in Section 4.2.2, it provides country-specific default values for iron and steel, many of which are calculated based on the BF–BOF route. These default values are considerably higher than the actual emissions of the Indian steel industry. The Commission updates these default values periodically, based on the newest, most reliable information, including those provided by a "third country" (European Parliament and Council 2023).

The CCTS provides a transparent basis for the Commission to accurately update the India-specific default values. The documentation that obligated entities must provide under the CCTS includes overall embedded CO_2 emissions in the covered installations. The data could be shared with the Commission to develop more accurate CBAM default values, including specific values for different technology pathways, such as DRI–EAF, DRI–IF, and scrap-based EAF. This is particularly important given their drastically different emissions intensities, which are not reflected in the EU's implementing regulation on default values (Civil society representative 2025).

Indeed, the CCTS' coverage of 253 Indian steel entities should produce a representative sample of the industry. However, the exclusion of MSMEs from this sample is a significant limitation, particularly given their different production methods: those that rely on scrap-based IF have among the lowest emissions, and those that use coal-based DRI–IF have high emissions (Civil society representative 2025). Other limitations include a scope mismatch in calculating CO_2 emissions between the CCTS and the CBAM, as discussed in Section 5.3.1 above, requiring that CCTS data be adjusted to align with the CBAM. These limitations must be addressed when developing the India-specific default values.

5.3.4 Leveraging the CCTS' offset mechanism to integrate MSMEs

As noted in the previous sections, a key limitation of the CCTS is that it *de facto* excludes MSMEs. To prevent a green steel divide between ISPs and MSMEs, while accounting for the latter's limited resources for greening their steel production, it is crucial that MSMEs gradually transition towards carbon accounting systems. MSMEs can do so by utilising the CCTS' voluntary offset mechanism, which enables non-covered entities to register projects that reduce, remove, or avoid GHG emissions in exchange for CCCs. In turn, this requires them to develop skills and resources to calculate direct emissions and comply with Indian MRV requirements, which could also bring them into compliance with the CBAM's MRV requirements. It will also enable them to monetise their emission reduction activities.

The Indian government should develop tailor-made, sector-specific MRV assistance for MSMEs seeking to participate in the CCTS' offset mechanism (Indian Government 2025). This is especially important given that sector registrations under the CCTS offset mechanism to date have been limited (Kesh, Sharma and Chaturvedi 2025). A starting point would be the BEE's plans to establish capacity-building programmes to guide MSMEs in registering their projects. Furthermore, the Assistance in Developing Energy Efficient Technologies in Industries & Establishments (ADEETIE) programme offers financial incentives for them to voluntarily invest in cleaner technologies to reduce emissions (BEE n.d.).

5.4 Key findings

From a monetary perspective, the CCTS is unlikely to materially reduce CBAM exposure. Even if firms meet the criteria for recognising the carbon price "effectively paid" (European Parliament and Council 2023, Art. 9) under the forthcoming delegated act, Indian steel exporters will be able to deduct only minimal amounts, at best. This reflects three structural constraints.

First, there is a significant carbon price gap: Expected carbon prices under the CCTS are likely to remain a fraction of those under the EU ETS. Second, fundamental design differences limit coverage under the CCTS. Under its baseline-and-credit scheme, firms incur costs only for emissions exceeding their targets, and therefore, only a portion of their total emissions. In contrast, under the EU ETS – and, by extension, the CBAM – free allowances will be fully phased out by 2034, exposing the full emissions profile to a carbon price. Third, differences in system boundaries further constrain deductions: The CCTS applies a gate-to-gate approach, whereas the CBAM uses a broader cradle-to-gate scope.[41] Fourth, MSMEs, which are *de facto* excluded, would not benefit from any CBAM deductions under the CCTS, pending improvements. Even if they purchase voluntary offsets, they will not be eligible for a CBAM deduction.

Looking ahead, the monetary value of potential deductions could increase as the CCTS matures. More ambitious emissions intensity targets would require firms to purchase more CCCs, thereby increasing the effective carbon price. This underscores the need for a gradual strengthening of the scheme's ambition, aligned with India's development priorities (see Section 8.4). Even so,

41 Cradle-to-gate covers upstream processes to the point the product leaves the factor gate.

firms will ultimately pay for their embedded emissions – whether under the CBAM or the CCTS (Indian Government 2025; Sharma 2023). In practice, firms may face higher total costs when subject to both systems simultaneously, particularly given the need to maintain parallel accounting frameworks.

The most significant way in which the CCTS can reduce firms' CBAM exposure is by incentivising a robust MRV ecosystem. By requiring firms to measure and verify actual emissions, rather than relying on default values, the CCTS can accelerate the development of carbon accounting capacity in India. To maximise this benefit, the BEE should align forthcoming steel-sector MRV methodologies with international standards, including CBAM requirements. In particular, emissions reporting should be mandated at the HS 8-digit level. India should also actively engage with initiatives such as the OECD's IFCMA to share data and best practices while addressing domestic constraints.

Scaling up verification capacity will be equally critical. The current shortage of accredited auditors represents a key bottleneck, including for CBAM compliance. This could be addressed by supporting Indian firms in obtaining CBAM accreditation or by negotiating MRAs for verifiers.

A further, indirect benefit of the CCTS would be the generation of high-quality emissions data. Systematic reporting by covered iron and steel entities should create a valuable evidence base that can be used, in cooperation with the EU, to develop more accurate, India-specific default values, including for different production routes. This will be most effective if data collection is aligned with product-level classifications, such as HS 8-digit codes.

Finally, MSMEs, which have the highest CBAM exposure levels (see Section 4.3.2.2) stand to benefit the least under the CCTS. The exclusion of MSMEs from the CCTS risks widening the emerging 'green divide' between ISPs and smaller firms. Expanding participation in the CCTS' voluntary offset mechanism would be a step forward, but it requires targeted technical and financial support from the BEE to integrate MSMEs into carbon accounting and MRV systems.

6 Beyond the CBAM: The ‘Spaghetti Bowl’ of EU Steel Regulations and Their Implications for the Indian Steel Sector

The European Union (EU) market access barriers for Indian firms do not stop at the Carbon Border Adjustment Mechanism (CBAM). Based on the available information at the time of writing, this section introduces the importance of adopting a more holistic approach when assessing EU steel measures (Section 6.1); provides an overview of existing and upcoming EU steel-related measures that will be important for Indian steel exporters (Section 6.2); and analyses the cumulative implications of these measures and how they impact firms’ CBAM exposure discussed in Section 4 (Section 6.3.1). This section further analyses the implications of a selected set of EU measures, including scrap restrictions and the tariff-rate-quota on steel, on decarbonising the Indian steel industry (Section 6.3).

6.1 Introduction

Beyond CBAM, numerous EU legislative developments concerning the steel industry will have significant implications for Indian steel exporters. The EU's Steel and Metals Action Plan (SMAP), adopted to boost the competitiveness of the EU industry, which is in crisis mode (see Box 9), includes references to ecodesign and performance requirements for steel under the Ecodesign for Sustainable Products Regulation (ESPR); the low-carbon procurement thresholds under the Industrial Accelerator Act (IAA); an increase in trade defence instruments (TDIs), most notably through the proposed EU steel safeguard that will operate as a tariff-rate quotas (TRQ) mechanism; and additional restrictions on scrap exports under the revised EU Waste Shipment Regulation and beyond.

Stakeholders interviewed for this project exhibited awareness of the EU's export scrap restrictions, and some, especially integrated steel plants (ISPs), also mentioned the upcoming steel TRQs. However, the ongoing developments regarding the ecodesign and performance requirements for steel and the IAA were not on stakeholders' radar (Industry representatives 2025; Indian Government 2025; Industry association 2025). By and large, most stakeholders' analyses of EU market restrictions focused almost exclusively on the CBAM. The lack of awareness is likely due to these measures not yet having entered into force, so their implications have not yet been felt at the border (Industry support organisation, 2025).

However, when assessing competitiveness in the EU market, it is imperative that Indian steel exporters have a clear understanding of the numerous measures that will affect future market access conditions and their cumulative implications, which can go well beyond CBAM. For instance, a 50% tariff on out-of-quota steel products could dwarf CBAM costs. The low-carbon steel procurement thresholds and ecodesign requirements for steel under the ESPR could significantly reduce the competitiveness of firms with higher carbon footprints, or those that are using CBAM default values, such as micro, small, and medium enterprises (MSMEs).

Moreover, the cumulative implications of EU regulations risk undermining the CBAM's (limited) potential to green India's steel sector. Indeed, the new proposed TRQ would imply a 50% tariff on out-of-quota steel, not differentiating between the carbon intensity of the steel that is coming into the EU market. At the same time, the EU's export restrictions on scrap steel could hinder India, a

Box 9: Competitiveness concerns of the EU steel industry

The EU's steel sector is under growing competitive pressure. Over the past decade, the EU's share of the global steel production has declined to just 7–8%, while its capacity utilisation has fallen to around 67% – well below the ~80% typically associated with a healthy industry. Since the 2008 financial crisis, the sector has lost nearly a quarter of its workforce, equivalent to around 100,000 jobs.

This decline reflects a combination of structural domestic challenges and intensifying global competition. Within the EU, steelmakers face high decarbonisation costs, driven by elevated electricity prices and the expenses associated with deploying low-carbon technologies. These pressures are compounded by weak demand for green steel, with customers often unwilling to pay a premium, and by regulatory frameworks that have yet to fully incentivise investment. As a result, several flagship decarbonisation projects have been delayed or cancelled. Notably, ArcelorMittal paused major European investments in November 2024, citing high energy costs and unfavourable market conditions.

At the same time, external pressures are mounting. Global overcapacity – currently estimated at around 602 MT and projected to rise to 721 MT by 2027 – is driving increased exports and intensifying price competition. Trade developments have further exacerbated the situation: the decision taken by the United States (US) to raise steel tariffs to 50%, while removing quotas, has redirected trade flows and added strain on EU markets. Together, these factors are compressing margins and placing EU producers at a clear cost disadvantage relative to global competitors.

Source: European Commission (2025l); EUROFER (2025); European Commission (2025c); Pitel, Hancock, and Plimmer (2025) net scrap steel importer, in its steel decarbonisation efforts, given that increasing the scrap use in steel production is an important way to lower carbon emissions (see Section 3.3.4).

6.2 Key (forthcoming) EU regulations and their impact on Indian steel exports and decarbonisation initiatives

This section provides an overview of key EU regulations that will affect Indian steel exporters to the EU and Indian steel decarbonisation pathways. In particular, it starts by highlighting ongoing developments under the ESPR to establish low-carbon, ecodesign, and transparency standards, and sets out how these standards, once they have entered into effect, could impact Indian steel exporters' competitiveness in the EU. Moreover, it provides an overview of the EU's forthcoming trade defence measures for steel and their implications for Indian steel exporters, followed by a section that sets out the EU's export scrap restrictions.

6.2.1 Low-carbon, circularity, and transparency standards for steel

6.2.1.1 Overview

The EU is in the process of adopting standards for low-carbon steel, the circularity of steel products, and information requirements. Two regulations are playing an important role in this process. First, the IAA, released on 4 March 2026, aims to boost the competitiveness of the EU industry and includes low-carbon procurement requirements for steel. Second, the ESPR, in force since July 2024, seeks to accelerate the uptake of circularity in the EU. A forthcoming delegating act, which is foreseen to be adopted by the end of 2026, will establish the ecodesign, performance, and information requirements for steel (European Commission 2025m). However, the requirements will most likely only apply in 2028, after the mandatory 18-month transition period (European Commission 2025p).

The Industrial Accelerator Act: Once in force, the IAA will require that 25% of the steel used in public procurement projects and subsidy-backed schemes be low-carbon (European Commission 2026a). This will enhance the demand for low-carbon steel in the EU and signal to investors that the costs of decarbonising steel can be recouped. While the Commission initially considered developing a low-carbon steel label as part of the IAA, it ultimately decided to delegate the process of defining low-carbon steel to the ESPR (European Commission 2026a).

However, leaked drafts of the voluntary low-carbon steel label limit the product scope to hot-rolled steel. This would indicate a product's carbon-emissions performance based on a classification system and threshold values to be established, with A representing the highest performance class and F the lowest (European Commission 2025n). Based on the drafts, the IAA would follow a sliding-scale method, used in many existing international standards, and further discussed in Box 10.

The Ecodesign for Sustainable Products Regulation: The ESPR establishes a horizontal framework for ecodesign, performance, and information requirements that products covered by the ESPR, including imports, must comply with (European Parliament and Council 2024).[42] It focuses on a product's lifecycle, including durability, repairability, reusability, recyclability, and remanufacturing. Meanwhile, it seeks to reduce the product's material footprint, including by emphasising the use of recycled materials. A key feature of the ESPR is that it introduces the information requirements through a digital product passport (DPP).

Secondary legislation will establish steel-specific product standards, including performance,

42 The ESPR does not apply to products for which ecodesign requirements are not suitable, or where other EU frameworks already provide for the establishment of such requirements; for example, certain agricultural and pharmaceutical products.

ecodesign, and information requirements (European Commission 2025m; European Commission 2026a). The approach that the Commission will adopt to establishing a steel standard (or standards) is unclear. It could entail merely establishing voluntary labelling requirements in line with the low-carbon steel standard that was excluded from the final IAA. Alternatively, it could mean setting performance thresholds; for instance, maximum carbon emissions per tonne of steel, or minimum amounts of scrap per tonne of steel, that would be mandatory for all products that fall within the scope. It will also include ecodesign requirements, such as those around scrap recovery and recyclability, and information requirements, as part of a DPP, which will necessitate full product lifecycle data, including carbon emissions, environmental footprint, and origin tracing. Some options that could be established in the ESPR for steel are set out in Table 5. This paper assumes that the ESPR will include a mix of these options and leaves open whether it will be implemented as a labelling scheme or a mandatory standard.

Table 5: Options for performance, ecodesign, and information requirements for steel under the forthcoming ESPR delegated act for steel

Performance requirements	Ecodesign requirements	Information requirements (as part of a DPP)
Maximum threshold of carbon content per tonne of steel	Design enabling the reuse of steel components	Full lifecycle data (environmental footprint, materials emissions, and compliance)
Minimum recycled steel (e.g., scrap) per tonne of steel	Requirements of scrap recovery and recyclability	Origin of raw materials
Benchmarks for energy use in production	Limits on elements that hinder recycling (e.g., copper, tin, and lead)	Reuse potential

Source: European Commission (2025l); Packaging Europe (2025)

In terms of scope, it is unclear whether an ESPR standard would apply to all steel products or only a subset. Based on a study on steel carried out by the Commission's Joint Research Centre,[43] the standards developed under the delegated act on steel will likely apply to the following products or a subset thereof: hot-rolled coil (HRC), galvanised cold-rolled coil (CRC), CRC, rod and wire rod, and stainless steel products.[44] Therefore, this report assumes that the ESPR will apply to these five sets of steel products.

6.2.1.2 Implications for Indian steel exporters

The ESPR could have significant implications for Indian exporters to the EU, whose products would fall within its scope (it will almost certainly apply to flat steel products (e.g., HRC and CRC), which are produced almost exclusively by ISPs). While ISPs are generally well-positioned to absorb the costs associated with the CBAM (see Section 4.3.2.1), aligning with the forthcoming ESPR steel standard may prove more challenging. In particular, performance requirements – such as maximum carbon emissions per tonne of steel or minimum scrap-content thresholds – could create market access barriers for ISPs. Depending on the thresholds adopted, facilities relying on the blast furnace-basic oxygen furnace (BF-BOF) or coal-based direct-reduced iron-electric arc furnace (DRI-EAF) production routes may find it difficult to meet stringent carbon-intensity limits. Similarly, BF-BOF production, which typically uses less scrap than EAF-based processes, may struggle to meet potential minimum scrap requirements.

43 European Commission's Joint Research Centre (JRC) aims to provide evidence-based scientific support to EU policymaking. While they will inform the drafting of secondary legislation under ESPR, delegated acts are currently being developed and final requirements may deviate from the proposals in these studies.

44 A Commission study has identified these products, taking into account EU consumption and production, EU supply dependencies, the carbon footprint of the products, and their economic importance (see Blanco Perez et al. 2024).

If such thresholds were embedded within a labelling scheme – similar to the low-carbon steel standard initially envisaged under the IAA – firms could face difficulties qualifying for higher categories (e.g., A or B), depending on the thresholds ultimately adopted. This reflects the higher average carbon intensity of steel production in India compared with the EU, which also contributes to differences in what constitutes green steel (see Box 10). However, the impact of the anticipated ESPR thresholds/labelling requirements could be mitigated if ISPs were able to engage in resource shuffling (see Section 4.3.2.1).

The chain-of-custody requirements associated with the ESPR's DPP go significantly beyond the CBAM's MRV requirements and are therefore likely to present a challenge for many ISPs.

The ESPR's DPP and product information requirements may also pose challenges for ISPs. While ISPs are generally able to measure carbon emissions and comply with the CBAM monitoring, reporting and verification (MRV) requirements, the chain-of-custody requirements associated with the ESPR's DPP go significantly beyond the CBAM's MRV requirements and are therefore likely to present a challenge for many ISPs. To date, only a limited number of ISPs (e.g., Tata Steel and JSW) have begun adopting certification frameworks that incorporate chain-of-custody traceability across the steel supply chain; this enables tracking the materials and their associated environmental attributes (Tata Steel 2022; JSW 2025). But most ISPs have yet to implement comprehensive product-level traceability systems, which would be critical to comply with the ESPR DPP requirements. This gap reflects the complexity of steel supply chains in India, the absence of standardised product-level accounting practices, and limited downstream traceability, particularly for scrap.

Box 10: Diverging approaches to defining low-carbon steel

India's Green Steel Taxonomy, discussed in Section 3.3.1, classifies steel as green if it is produced in a plant emitting less than 2.2 tCO_2e/t of finished steel. In contrast, the EU's forthcoming low-carbon steel standard under the ESPR is expected to rely on the best available technologies, the actual performance of covered installations, and relevant benchmarks under the EU Emissions Trading System (ETS). Additionally, it will likely set more stringent thresholds. This reflects the comparatively lower average CO_2 emissions intensity of steel production in the EU and the significant uptake of decarbonisation technologies, such as scrap-based EAF.

Other key differences are that the approach adopted under the Green Steel Taxonomy is technology-neutral. In contrast, the EU will almost certainly adopt a sliding-scale method which sets emissions-intensity thresholds that vary with the percentage of scrap used in the steelmaking process. Accordingly, sites that use more scrap, which is less emissions-intensive compared to virgin steel, are given stricter thresholds than those that use little scrap and are more emissions-intensive. As a result, all producers, regardless of their production route, can be recognised for their progress towards decarbonisation. Examples of initiatives that use the sliding-scale approach are the IEA's definition of near-zero steel and low-emissions steel; the Responsible Steel Certification (site-level certification); Low Emission Steel Standard – Wirtschaftsvereinigung Stahl (LESS – WV Stahl); and the Low Carbon Emission Steel Evaluation Method Standard developed by the China Iron and Steel Association.

An estimated 20–40 different standards, initiatives, and definitions exist globally, contributing to a fragmented regulatory landscape. This fragmentation increases administrative and compliance costs for producers operating across jurisdictions, and creates uncertainty around investment decisions. While the World Trade Organization (WTO), along with several public- and private-sector partners, has developed Steel Standards Principles on common emissions measurement methodologies, divergences remain regarding definitions of green steel and emissions-intensity performance thresholds.

In India and the EU, steel that qualifies as green under India's Green Steel Taxonomy will not necessarily be aligned with steel that is considered low-carbon in the EU, under the upcoming ESPR framework.

Source: Ministry of Steel (2024); Vass et al. (2024); WTO (2022); WTO (2023)

To the extent that the ESPR's requirements apply to long products, such as rods and wires, it could pose even greater market access challenges for India's secondary steel ecosystem and the MSMEs that dominate it (see Section 4.3.3). As discussed in Section 4.3.2 and 4.3.3, many of these firms lack the capacity to measure direct carbon emissions and comply with MRV requirements under the CBAM. As such, they will certainly be unequipped to comply with the much more complex chain-of-custody-type traceability requirements of the DPP. This reflects not only the high costs and the lack of suitable infrastructure, but also structural challenges. For example, MSMEs often source material inputs from traders who aggregate materials and are therefore unable to trace them to their source. Additionally, MSMEs largely rely on scrap from India's fragmented and largely informal scrap system, further obscuring origin tracing (Industry association 2025; Verma et al. 2024). This makes it difficult to obtain reliable data on material origin and composition, which are required under the DPP framework. Moreover, there are currently no discussions around the use of default values in the context of ESPR or related low-carbon steel requirements, as labelling and product information requirements are expected to rely on actual product-level data. This creates uncertainty about how MSMEs that rely on default values would have to demonstrate compliance with the ESPR standards, once they enter into force.

MSMEs largely rely on scrap from India's fragmented and largely informal scrap system, further obscuring origin tracing. This makes it difficult to obtain reliable data on material origin and composition, which are required under the DPP framework.

In summary, ongoing developments in the EU to establish standards for low-carbon steel, and performance, ecodesign, DPP, and information requirements, will have significant implications for Indian firms exporting steel to the EU – ISPs and especially MSMEs. Product information and traceability requirements will be particularly challenging to comply with. ISPs might still be able to mitigate the impact, especially if they already have chain-of-custody practices and engage in resource shuffling. Ultimately, the impact of the implementing act on steel on Indian exporters will depend on the steel standard(s) that are developed.

6.2.2 Trade defence instruments

To protect the EU steel industry, the Commission has already adopted more than 70 TDIs, making the steel sector the most protected industry in the EU (European Parliament 2025). However, to further shield it from growing overcapacity and surging imports, the SMAP proposes boosting the use of EU TDIs and other trade measures. These include the following, some of which are already underway:

- Enhancing the monitoring of trade flows and adopting a more proactive use of TDIs. This includes conducting anti-dumping and anti-subsidy investigations based on the threat of injury to the domestic industry, rather than waiting for the injury to materialise.
- Speeding up a safeguard investigation of ferro-alloys. This resulted in the imposition of safeguard measures on imports of certain ferro-alloys into the EU on 18 November 2025. These measures consist of country-specific TRQs for each ferro-alloy type, limiting the volume of imports entering the EU market. They will be in place for three years, until 17 November 2028 (European Commission 2025o).
- Adopting long-term measures to protect the steel sector from global overcapacity in the EU market beyond 30 June 2026, when the temporary safeguard on steel is set to expire and cannot be extended beyond its eight-year legal limit. In October 2025, the Commission proposed a regulation in the form of a TRQ to replace the current safeguard regime (European Commission 2025c). More detailed implementation rules, such as country-wise allocation of TRQs, will be set out in a subsequent secondary legislation.

Taken together, these measures will reduce the volume of steel and steel products imported into the EU, and have a direct impact on Indian exports. In particular, the steel TRQ proposed by the Commission will reduce the steel import quota by 47% (18.3 million tonnes per annum [MTPA]) compared to 2024 steel quotas; (ii) double the out-of-quota duty to 50% (compared to 25% under the existing safeguard); and (ii) strengthen the traceability of steel markets through the adoption of a 'melt and pour' rule to prevent circumvention (European Commission 2025e). Political agreement on the Commission's proposed TRQ has been reached, reflecting all the key elements of the proposal (European Commission 2026b). The proposed TRQ, which is expected to enter into force on 1 July 2026, will apply to imports of all 28 steel product categories currently covered by the EU's steel safeguard. But unlike the safeguard duties, these measures will not have a specified expiration date. Only European Economic Area members (Norway, Iceland, and Liechtenstein) will be exempted. All other trading partners, including those that hold a free trade agreement (FTA) with the EU, will fall within the scope of the new measures.

India is expected to receive an import quota of 1.6 million metric tonnes (MMT) of duty-free steel under the proposed TRQ. This amounts to about half of India's annual steel exports to the EU (Kumar and Acharya 2026). Indian steel exports that fall outside the quota will be subject to a 50% duty. This is expected to lead to reduced export volumes, lower export-driven revenues, and a scramble to find alternative markets, especially among covered MSME exporters, as it would effectively semi-close the EU market. Moreover, the EU's proposed steel TRQ raises the risk of increased trade diversion and intensifies the pressure on Indian steel producers, as some of the 12 MT of Asian steel exports to the EU could be diverted to alternative growth markets, including India (Dutt 2025).

India is expected to receive an import quota of 1.6 million metric tonnes (MMT) of duty-free steel under the proposed TRQ. This amounts to about half of India's annual steel exports to the EU.

In addition, the melt-and-pour rule, intended to address exporters' growing efforts to circumvent TDIs, would require importers to prove where steel components were initially melted and poured. As of now, the melt and pour rule is limited – it only requires producers to invest in tracing technologies and methods to provide information about a product's origin. However, should the Commission adopt the melt-and-pour rule as a rule of origin, with a direct impact on the application and enforcement of trade measures, it would further complicate supply chains and would make product tracing a prerequisite for EU competitiveness.

6.2.3 Restrictions on the export of scrap steel

Scrap plays a central role in the EU's strategy to enhance the competitiveness and promote the decarbonisation of the steel industry. The SMAP highlights the importance of scrap use in enhancing circularity, lowering CO_2 emissions from steel, and reducing EU dependence on imported raw materials. It points to diminishing EU scrap volume, reflecting reduced demand from the EU industry for steel, and higher scrap prices often paid for by producers in third countries. Further, the SMAP notes that EU ferrous scrap exports have more than doubled over the last few years, reaching a maximum of 19.43 MT in 2021 (about 20% of the total scrap generated in the EU). Accordingly, the Commission is considering imposing further restrictions on the export of scrap steel, for instance, through export tariffs (Blenkinsop and Payne 2025). These protectionist tendencies are echoed in the IAA, which encourages members to ensure that scrap metals are first made available within the EU (European Commission 2026a).

These restrictions would be added to the existing scrap export restrictions. Under the revised EU Waste Shipment Regulation,[45] which will take effect in May 2027, scrap exports to non-OECD countries are permitted only if the destination country applies for an exemption and demonstrates compliance with EU-equivalent environmental standards.[46] India has applied for an exemption, and eligible countries are expected to be announced by 21 November 2026 (DG Environment 2025).

These scrap restrictions on steel have an official environmental rationale, as the export of lower-quality recycled steel could harm the environment if used in production processes in countries with less stringent environmental regulations (Industry association 2025). This is somewhat ironic, given that EAFs, which use scrap, can significantly reduce overall emissions. However, the restrictions also reflect a protectionist element: European steelmakers are concerned that exporting scrap would enable third countries to produce cheaper, low-emissions steel, which would then be re-exported to the EU and create a competitive challenge for the EU steel industry (Industry associations 2025).

These new measures are expected to reduce EU ferrous scrap exports by 0.6–2 MT. In addition, scrap restrictions are projected to lower CO_2 emissions from the EU steel industry by 1–2.9 MTPA (Blanco Pérez et al. 2024). Any further tightening of export restrictions would likely amplify the decline in EU scrap exports, with significant implications for major importing countries such as India.

In 2023–2024, India imported approximately 25% of the scrap used in the country (Verma et al. 2024), with over 70% of these imports sourced from just ten countries (Goldar, Kumar, and Yadav 2025). The EU is an important source of scrap for India, accounting for around 8% of the total scrap imports (Kumar and Agrawal 2024). Proposed EU restrictions on scrap exports could therefore put a significant constraint on India's ability to expand the use of scrap in domestic steel production – an important pathway for decarbonisation. The demand for scrap, particularly imported scrap, is increasing among primary producers in India, driven by producers' carbon-reduction objectives (Industry association 2025).[47] As noted in Section 3.3.2 and 3.3.4, ISPs in India are already increasing investments in scrap-based steelmaking. However, scrap currently accounts for only 21% of India's metallic inputs, which is well below the global average of 31%. There is evidently substantial untapped potential to scale up its use (Verma et al. 2024). However, scrap is especially important to mitigate the impact of the CBAM on MSMEs, which primarily use the induction furnace (IF) production route (see Section 4.3.2.2). This is because these firms can decarbonise by using more scrap without major structural adjustments or large-scale investments in steel plants (Verma et al. 2024).

The EU is an important source of scrap for India, accounting for around 8% of the total scrap imports. Proposed EU restrictions on scrap exports could therefore put a significant constraint on India's ability to expand the use of scrap in domestic steel production – an important pathway for decarbonisation.

45 The Waste Shipment Regulation implements the Basel Convention on the control of transboundary movements of hazardous waste and their disposal, and the Organisation for Economic Co-operation and Development (OECD) decision on the control of transboundary movements of waste destined for recovery operations.

46 This includes a detailed description of a country's waste management strategy; a delineation of the established domestic legal framework for waste management; a description of the related legislations on protecting the environment and human health that are applicable to waste management operations; a delineation of the domestic legislation on the import and export of the waste concerned and implementation of the Prior Informed Consent procedure under Article 6 of the Basel Convention on the control of transboundary movements of hazardous waste and their disposal; a list of authorised facilities under the domestic legislation of the country involved in the import or export of the waste concerned; and information about the ratification status of a number of multilateral environmental agreements and how these are being implemented and enforced. See Annexes VIII and VIV of European Parliament and Council (2024).

47 At the same time, the Indian secondary steel sector is also increasingly using DRI, which is reducing the demand for imported scrap.

Reducing scrap imports risks undermining India's decarbonisation objectives. As noted in the Green Steel Roadmap, "the evolving geopolitical situation regarding restrictions on scrap exports from developed countries will exacerbate the challenges for incorporating material efficiency practices in India's steel sector" (Verma et al. 2024, 9). Private-sector stakeholders consulted during this project also highlighted the EU's export scrap restrictions as a concern in the context of their decarbonisation objectives (Indian Government 2025; Industry representatives 2025; Industry support organisation 2025). They noted that if the US were to adopt similar restrictions, it would pose even more obstacles for them (Industry representative 2025).

6.3 Cumulative implications of key EU's steel-related measures

Building on the previous sections, which examined the implications of individual EU regulatory measures on Indian steel exports, this section assesses their cumulative impact on EU competitiveness, focusing on its implications at both product and firm levels. This section also examines the implications of select EU measures in incentivising steel decarbonisation in India.

6.3.1 More market access barriers for Indian steel exporters

There is substantial overlap between the products covered by the CBAM and those subject to the EU steel TDIs (both the existing regime and the proposed steel TRQ). Of the 479 products (measured at the eight-digit HS level) covered by the proposed TRQ, 309 also fall within the scope of the CBAM. According to Commission estimates, these overlapping products accounted for 41% of CBAM imports in 2024 (European Commission 2025c). As such, imports of these products could be subject to both CBAM charges and a 50% tariff if they exceed the quota allocated to their country of origin.[48] At the same time, the CBAM covers an additional 180 products that fall outside the scope of the steel TRQ and would therefore face CBAM charges but not out-of-quota tariffs.

As shown in Table 6, within HS72, the proposed steel TRQ primarily targets finished steel products, including long and flat steel. It excludes semi-finished products and raw materials. Notably, it covers two product groups that together account for nearly half of India's flat steel exports to the EU and are dominated by ISPs: HS 7210, which accounts for around 24% of India's HS72 exports to the EU, and HS 7208, which also accounts for around 24% (Authors' calculations based on ITC [n.d.]).[49] Flat steel products are also covered by the CBAM. MSMEs are more active in long products, a subset of which is likewise covered by both the CBAM and the proposed steel TRQ.

The proposed steel TRQ's coverage under HS73 is considerably more limited (see Table 7), with reduced impact on downstream segments where MSMEs dominate. In particular, the measure does not apply to key product categories that account for a large share of India's HS73 exports to the EU, including HS 7325, HS 7326, HS 7318, and HS 7307. The CBAM, meanwhile, covers a large share of India's exports under HS73.

48 It remains to be seen how the Commission will distribute the quotas. The extent to which a firm's steel exports will be impacted by the proposed steel TRQ will depend on (i) the quantum of quotas the country of origin will get; and (ii) whether the export falls within the allocated quota or outside (and would be subject to the 50% tariff).

49 HS 7208 is only partially covered by the proposed steel TRQ.

Table 6: Comparative overview of HS72 steel products and their coverage under the CBAM and the proposed steel TRQ (at the four-digit HS)

Product code	Product label	CBAM	Proposed steel TRQ
Flat steel products			
7210	Flat-rolled products of iron or non-alloy steel, with a width of 600 mm or more, clad, plated, or coated.		
7208	Flat-rolled products of iron or non-alloy steel, with a width of 600 mm or more, hot-rolled, not clad, plated, or coated.		
7209	Flat-rolled products of iron or non-alloy steel, with a width of 600 mm or more, cold-rolled (cold-reduced), not clad, plated, or coated.		
7219	Flat-rolled products of stainless steel, with a width of 600 mm or more.		
7220	Flat-rolled products of stainless steel, with a width of less than 600 mm.		
7225	Flat-rolled products of other alloy steel, with a width of 600 mm or more.		
7212	Flat-rolled products of iron or non-alloy steel, with a width of less than 600 mm, clad, plated, or coated.		
7226	Flat-rolled products of other alloy steel, with a width of less than 600 mm.		
7211	Flat-rolled products of iron or non-alloy steel, with a width of less than 600 mm, not clad, plated, or coated.		
Long steel products			
7222	Other bars and rods of stainless steel; angles, shapes, and sections of stainless steel.		
7223	Wire of stainless steel.		
7221	Bars and rods, hot-rolled, in irregularly wound coils of stainless steel.		
7228	Other bars and rods of other alloy steel; angles, shapes, and sections of other alloy steel; hollow drill bars and rods of alloy or non-alloy steel.		
7215	Other bars and rods of iron or non-alloy steel.		
7216	Angles, shapes, and sections of iron or non-alloy steel.		
7217	Wire of iron or non-alloy steel.		
7229	Wire of other alloy steel.		
7214	Other bars and rods of iron or non-alloy steel, not further worked than forged, hot-rolled, hot-drawn, or hot-extruded, but including those twisted after rolling.		
7227	Bars and rods, hot-rolled, in irregularly wound coils of other alloy steel.		
7213	Bars and rods, hot-rolled, in irregularly wound coils of iron or non-alloy steel.		
Semi-finished/raw material products			
7202	Ferro-alloys.		
7206	Iron and non-alloy steel in ingots or other primary forms (excluding iron of heading 72.03).		
7207	Semi-finished products of iron or non-alloy steel.		
7218	Stainless steel in ingots or other primary forms; semi-finished products of stainless steel.		
7204	Ferrous waste and scrap; remelting scrap ingots of iron or steel.		
7224	Other alloy steel in ingots or other primary forms; semi-finished products of other alloy steel.		
7205	Granules and powders of pig iron, spiegeleisen, iron, or steel.		

Product code	Product label	CBAM	Proposed steel TRQ
7203	Ferrous products obtained by direct reduction of iron ore and other spongy ferrous products, in lumps, pellets, or similar forms; iron with a minimum purity by weight of 99.94%, in lumps, pellets, or similar forms.	Full coverage	
7201	Pig iron and spiegeleisen in pigs, blocks, or other primary forms.	Full coverage	

Note: The table groups flat steel, long steel, and semi-finished/raw material products together.

Legend:

Full coverage	Partial coverage	Full coverage (the CBAM product scope extension proposal)	Partial coverage (the CBAM product scope extension proposal)

Table 7: Comparative overview of HS73 steel products and their coverage under the CBAM and the new steel TRQ (at the four-digit HS)[50]

Product code	Product label	CBAM	Proposed steel TRQ
7325	Other cast articles of iron or steel.	Full coverage (the CBAM product scope extension proposal)	
7326	Other articles of iron or steel.	Full coverage	
7318	Screws, bolts, nuts, coach screws, screw hooks, rivets, cotters, cotter pins, washers (including spring washers), and similar articles of iron or steel.	Full coverage	
7304	Tubes, pipes, and hollow profiles, seamless, of iron (other than cast iron) or steel.	Full coverage	Partial coverage
7307	Tube or pipe fittings (e.g., couplings, elbows, and sleeves) of iron or steel.	Full coverage	
7306	Other tubes, pipes, and hollow profiles (e.g., open seam or welded, riveted or similarly closed) of iron or steel.	Full coverage	Full coverage
7308	Structures (excluding prefabricated buildings of heading 94.06) and parts of structures of iron or steel; plates, rods, angles, shapes, sections, tubes, and the like, prepared for use in structures of iron or steel.	Full coverage	
7323	Table, kitchen, or other household articles and parts thereof of iron or steel; iron or steel wool; pot scourers and scouring or polishing pads, gloves, and the like of iron or steel.	Partial coverage (the CBAM product scope extension proposal)	
7303	Tubes, pipes, and hollow profiles of cast iron.	Full coverage	
7312	Stranded wire, ropes, cables, plaited bands, slings, and the like of iron or steel, not electrically insulated.	Partial coverage (the CBAM product scope extension proposal)	
7320	Springs and leaves for springs of iron or steel.	Partial coverage (the CBAM product scope extension proposal)	
7315	Chain and parts thereof of iron or steel.		
7310	Tanks, casks, drums, cans, boxes, and similar containers for any material (other than compressed or liquefied gas) of iron or steel, of a capacity not exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment.	Full coverage	
7311	Containers for compressed or liquefied gas of iron or steel.	Full coverage	
7319	Sewing needles, knitting needles, bodkins, crochet hooks, embroidery stilettos, and similar articles, for use in the hand, of iron or steel; safety pins and other pins of iron or steel, not elsewhere specified or included.		

50 This takes into account both the scope of the CBAM set out in European Parliament and Council (2023) and the proposed scope expansion in European Commission (2025e). As noted in Section 4.2.2, the proposed scope expansion, if approved by the legislative, would go into effect only after 1 January 2028.

Product code	Product label	CBAM	Proposed steel TRQ
7302	Railway or tramway track construction material of iron or steel: rails, check rails and rack rails, switch blades, crossing frogs, point rods and other crossing pieces, sleepers (cross-ties), fishplates, chairs, chair wedges, sole plates (base plates), rail clips, bed plates, ties, and other material specialised for jointing or fixing rails.	Full coverage	Partial coverage
7301	Sheet piling of iron or steel, whether or not drilled, punched, or made from assembled elements; welded angles, shapes, and sections of iron or steel.	Full coverage	Partial coverage
7309	Reservoirs, tanks, vats, and similar containers for any material (other than compressed or liquefied gas) of iron or steel, of a capacity exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment.	Full coverage	
7305	Other tubes and pipes (e.g., welded, riveted, or similarly closed), with circular cross-sections, the external diameter of which exceeds 406.4 mm, of iron or steel.	Full coverage	Full coverage
7317	Nails, tacks, drawing pins, corrugated nails, staples (other than those of heading 83.05), and similar articles of iron or steel, whether or not with heads of other material, but excluding articles with heads of copper.	Full coverage (the CBAM product scope extension proposal)	
7324	Sanitaryware and parts thereof of iron or steel.		
7314	Cloth (including endless bands), grill, netting, and fencing of iron or steel wire; expanded metal of iron or steel.	Partial coverage (the CBAM product scope extension proposal)	
7321	Stoves, ranges, grates, cookers (including those with subsidiary boilers for central heating), barbecues, braziers, gas rings, plate warmers, and similar non-electric domestic appliances, and parts thereof of iron or steel.		
7316	Anchors, grapnels, and parts thereof of iron or steel.		
7322	Radiators for central heating, not electrically heated, and parts thereof of iron or steel; air heaters and hot air distributors (including distributors which can also distribute fresh or conditioned air), not electrically heated, incorporating a motor-driven fan or blower, and parts thereof of iron or steel.		
7313	Barbed wire of iron or steel; twisted hoop or single flat wire, barbed or not, and loosely twisted double wire, of the kind used for fencing, of iron or steel.		

Legend:

Full coverage	Partial coverage	Full coverage (the CBAM product scope extension proposal)	Partial coverage (the CBAM product scope extension proposal)

Source: Authors' analysis based on ITC (n.d.)

Identifying the overlapping scopes of steel products covered by the ESPR is more challenging, as the delegated act that will set product-specific requirements for steel is still being developed. However, the products that will likely be covered, including HRC, CRC, galvanised coil, rod and wire rod, and stainless steel products, will fall within the scope of both the CBAM and the proposed steel TRQ (Blanco Perez et al. 2024). This means that firms exporting these products may be required to comply with the CBAM and ESPR, and pay out-of-quota tariffs, provided they fall outside India's allocated quota.

This triple regulatory challenge, or emergence of a "green spaghetti bowl of regulation" (Keane and van der Ven 2025), introduces considerable complications for firms seeking to export to the EU. Indian firms exporting steel and steel products covered by all three regulations – predominantly ISPs, given the proposed steel TRQ's limited coverage of HS codes where the secondary steel industry dominates – will have to comply with a wide range of requirements simultaneously. This will include paying a carbon price for embedded CO_2 emissions in the product under the CBAM while complying with MRV (or resorting to punitive default values); ensuring ecodesign, performance, DPP, and transparency requirement compliance under the ESPR; and paying an additional 50% duty (half of the product's value) for steel exceeding India's quota under the proposed steel TRQ.

As with the CBAM, the implications of this triple regulatory challenge will differ for ISPs and MSMEs in the secondary steel sector. However, unlike in case of the CBAM, the divide between ISPs and MSMEs is less strict. More ISP-exported products will be exposed to the triple regulatory challenge than products from MSMEs, especially under the scope of the proposed steel TRQ. Under the ESPR, ISPs will likely struggle to comply with stringent DPP requirements that require a chain-of-custody approach to origin and emissions tracing and go well beyond CBAM emissions calculations. Thus, the cumulative effect of the triple regulatory challenge will create competitive constraints for ISPs, even if it would be comparatively easier for ISPs than for MSMEs to bear the costs and comply with the ESPR (see Section 4.3.2.1).

MSMEs, meanwhile, are less affected by the triple regulatory challenge, as the proposed steel TRQ covers only a subset of products that fall under the CBAM in segments where MSMEs are more prevalent (notably long products and HS73), and the ESPR is unlikely to apply immediately to downstream products. However, in product segments where MSMEs dominate and where all three measures will apply, the combined requirements would semi-close the EU market to MSMEs in the future.

Ultimately, the overall impact on India's steel exports will depend on the design and scope of the opposite measures, which necessarily adds a layer of uncertainty to this analysis.

6.3.2 The EU's regulatory spaghetti bowl could risk disincentivising steel decarbonisation in India

From a decarbonisation lens, the aggregate impact of EU steel regulations on Indian exporters could undermine the CBAM's role as a driver of decarbonisation – a role that, as highlighted in Section 4.4.2, is already limited. While, in theory, the ESPR requirements could incentivise greener, more circular steel production, these effects could be eclipsed by the additional compliance burden and costs associated with having to align with the CBAM, ESPR, and the possibility of paying 50% tariff on out-of-quota steel, which could deter firms from entering the EU market altogether.

In particular, the threat of a 50% duty on out-of-quota steel risks eclipsing any price advantages a firm may gain under the CBAM from investing in steel decarbonisation technologies and processes, and could potentially discourage green investment. This is especially the case given that the proposed steel TRQ does not differentiate between products based on their carbon emissions levels. In other words, a firm that has invested in clean steel production could still face a 50% tariff upon entering the EU, thereby reducing any competitive edge linked to a firm's decarbonisation investment. This could tip the balance away from firms reducing emissions under the CBAM towards them giving up on the EU market altogether. This, in turn, would diminish the CBAM's role in incentivising decarbonisation among trading partners.

> The juxtaposition of the CBAM – which, in addition to preventing carbon leakage, aims to create incentives to reduce emissions in third countries – and the EU's export restrictions on scrap, a key input for steel decarbonisation, sits uneasily with Indian stakeholders.

The EU's export restrictions on scrap steel could further undermine India's decarbonisation goals. Restrictions on scrap steel exports are expected to reduce scrap steel imports by 25% by 2030. Even if India were deemed eligible to import EU scrap under the new Waste Shipment Regulation, additional scrap restrictions, possibly in the form of tariffs, could limit imports, potentially hindering its progress towards steel decarbonisation (Goldar, Kumar, and Yadav 2025).

The juxtaposition of the CBAM – which, in addition to preventing carbon leakage, aims to create incentives to reduce emissions in third countries (see Section 4.2.1) – and the EU's export restrictions on scrap, a key input for steel decarbonisation, sits uneasily with Indian stakeholders. Both industry and government stakeholders interviewed for this report highlighted this tension, arguing that the EU's scrap restrictions suggest the EU is ultimately more focused on trade competitiveness than on genuine climate action (Industry association 2025; Indian Government 2025; Industry representative 2025).

6.4 Key messages

First, EU market access barriers for Indian steel exporters extend well beyond the CBAM. A growing "spaghetti bowl" of emerging EU steel-related measures—notably the ESPR for steel, currently under development, and the prospective steel TRQ – is creating additional compliance burdens and could significantly reshape competitive dynamics. While Indian firms are generally aware of scrap export restrictions and the proposed steel TRQ, upcoming ESPR requirements for steel and the low-carbon procurement thresholds under the IAA remain largely off their radar. It is therefore critical for Indian steel exporters to develop a comprehensive understanding of all relevant measures in the pipeline, enabling them to anticipate their impact on competitiveness in the EU market and prepare accordingly. Greater awareness would also allow Indian firms to engage more effectively with EU policymakers and ensure that the implications for Indian exporters are adequately reflected, including through more inclusive impact assessments.

Second, as with the CBAM, the implications of this emerging "triple regulatory challenge" will differ between ISPs and MSMEs in the secondary steel sector. However, unlike the CBAM, the divide between these groups is less pronounced. A larger share of ISP-exported products will fall within the scope of the triple regulatory challenge compared to those produced by MSMEs. The combined effect of these measures, particularly the 50% tariff applied to out-of-quota steel, will create competitive pressures that may have a significantly greater impact on ISPs than the CBAM alone (see Section 4.3.2.1). By contrast, product segments dominated by MSMEs are less exposed due to more limited scope overlap, especially with respect to the proposed steel TRQ. However, for MSME-produced goods that do fall within scope — such as tubes and pipes — the EU market may become effectively inaccessible. Indeed, even the CBAM alone already restricts market access for most MSMEs.

Second, as with the CBAM, the implications of this emerging "triple regulatory challenge" will differ between ISPs and MSMEs in the secondary steel sector. However, unlike the CBAM, the divide between these groups is less pronounced.

Third, the ability to calculate carbon emissions, engage with MRV, and trace product origin is rapidly becoming a prerequisite for accessing the EU market. While the CBAM still allows the use of default values, compliance with ESPR information requirements and the DPP will require firm-level actual data and the implementation of chain-of-custody approaches, going well beyond CBAM MRV requirements. In addition, under TDIs, the "melt and pour" rule may be introduced as an origin requirement, further necessitating traceability of steel inputs. MSMEs, and to a lesser extent ISPs, are likely to face significant challenges in meeting these more stringent reporting and traceability requirements, as such systems are not yet systematically embedded in India. In particular, the informal nature of India's scrap ecosystem presents a major barrier to effective origin tracing and the implementation of chain-of-custody systems. Strengthening regulation and formalising the scrap market will therefore be essential to ensure that Indian steel producers remain competitive in global markets.

Moreover, uncertainty persists regarding the interoperability of methodologies for calculating carbon emissions under the CBAM and the ESPR. The absence of default values under the ESPR further reinforces the importance of building firm-level capacity not only for MRV but also for more advanced data and traceability systems.

In the absence of a harmonised international standard for low-carbon steel, these differences are likely to complicate EU–India trade, particularly as the IAA, which links low-carbon steel to public procurement and subsidy frameworks, comes into force.

Fourth, divergences in the definition of low-carbon steel between the EU and India may create an additional barrier to market access. India's Green Steel Taxonomy and the EU's forthcoming low-carbon steel standard under the ESPR differ significantly in both design and level of stringency. India adopts a fixed, technology-neutral emissions threshold, whereas the EU is expected to implement a sliding-scale approach with progressively stricter thresholds linked to EU ETS benchmarks and best available technologies. In the absence of a harmonised international standard for low-carbon steel, these differences are likely to complicate EU–India trade, particularly as the IAA, which links low-carbon steel to public procurement and subsidy frameworks, comes into force.

Fifth, the cumulative burden of these EU measures may become sufficiently onerous that some firms, particularly MSMEs, opt to exit the EU market rather than invest in decarbonisation to comply with the CBAM. This risk is heightened by the proposed steel TRQ, which would apply irrespective of the carbon intensity of imported steel. Such dynamics could further weaken the already limited incentives created by the CBAM for decarbonisation in India. At the same time, tensions are emerging between the CBAM's objective of incentivising global steel decarbonisation and the EU's scrap export restrictions, which constrain access to a key low-carbon input for India, a net scrap importer. Given that increasing scrap use is one of the most effective and immediate pathways to reducing emissions—particularly for smaller producers—reduced access to scrap could slow India's transition to lower-carbon steel. This, in turn, risks undermining the EU's broader climate objectives while reinforcing perceptions of protectionism.

7 Decarbonising Indian Steel as the Starting Point: A Strategic Approach to Trade and Investment

Indian steel decarbonisation is critical to India's climate commitments and to global climate goals, but the transition faces considerable challenges. This section focuses on how growing momentum around EU-India cooperation can be leveraged to address these challenges, with a focus on the diffusion and development of critical steel decarbonisation technologies (Section 7.2); developing frameworks to protect, facilitate, and promote investment, including in clean supply chains (Section 7.3); and cooperation around the green hydrogen value chain (Section 7.4).

7.1 Introduction

A core objective of the CBAM, re-emphasised in the EU–India Free Trade Agreement (FTA) and the accompanying Joint EU–India Comprehensive Strategic Agenda, is to support industrial decarbonisation in trading partners and in India (European Union and India 2026a; European Union and India 2026b). Decarbonising Indian steel is crucial from both an Indian and a global climate perspective: the anticipated quadrupling of Indian steel production by 2050, coupled with India's highest CO_2 emissions among the top steel producers, makes the sector essential to meeting global climate goals (see Section 3.1).

However, as highlighted in Section 4, the CBAM alone is, at best, limited in its capacity to accelerate steel decarbonisation in India. This underscores the need for a broader and more comprehensive approach to EU–India cooperation. India's Green Steel Roadmap – outlining the country's pathway to decarbonise its steel sector in line with its 2070 net-zero target – offers a valuable starting point (see Section 3.3.1). Together with complementary policy initiatives, including the Green Steel Taxonomy and the Carbon Credit Trading Scheme (CCTS) framework, and the introduction of a potential 25% emission reduction target in India's proposed National Steel Policy, it signals that steel decarbonisation is gradually becoming a strategic priority for the Indian government, within the context of its development needs.

Stakeholder interviews acknowledged the importance of decarbonising Indian steel. None of the over 50 Indian stakeholders interviewed for this project questioned that India should green its steel sector. There was widespread acknowledgement about the importance of doing so. While stakeholders mostly did not question the 'why' of steel decarbonisation, they worried about the 'how', highlighting numerous structural and financial challenges (Civil society representatives 2025; Indian Government 2025). In this context, accelerating the deployment of low-carbon technologies is essential (Ministry of Steel 2017; Verma et al. 2024). Yet progress is constrained, *inter alia*, by heavy reliance on foreign technologies that are not always suitable in the Indian context, a lack of technology readiness, limited access to finance, inadequate research and development (R&D) investment, and low domestic demand for green steel.

Existing EU–India cooperation platforms, including the Trade and Technology Council (TTC) and the India-EU Clean Energy and Climate Partnership (CECP), the momentum generated by the FTA and Strategic Agenda, and the anticipated memorandum of understanding (MoU) on climate cooperation between the EU and India, offer important opportunities to strengthen collaboration. These frameworks already emphasise cooperation on industrial decarbonisation and clean supply chains, extending well beyond the scope of the CBAM. They reflect a shared recognition that both the EU and India can benefit from deeper collaboration on heavy-industry decarbonisation, leveraging their respective strengths and aligning with their industrial policy objectives. However, current efforts may not go far enough, particularly in terms of technology transfer, co-development, investment promotion, and facilitation (van der Ven and Tuljapurkar 2025). The sections below unpack how these instruments can be strategically employed to advance Indian steel decarbonisation, with a focus on the development and transfer of critical green steel technologies (Section 7.2), followed by investment (Section 7.3) and green hydrogen cooperation (Section 7.4).

7.2 Development and transfer of critical green steel technologies

Technologies to decarbonise steel production are being pioneered predominantly in developed countries. Many of these technologies are still in the pre-commercial stages, while some are already operational in pilot or trial settings. Overall, the uptake of critical green steel technologies in India is very low. This reflects a combination of factors, including technology-specific challenges such as intellectual property barriers and challenges in adapting existing low-carbon steel technologies to the Indian context; systemic challenges related to insufficient R&D financing and lending opportunities; and the lack of demand for green steel in India. This section sheds light on these issues and their implications for India. It also offers recommendations to expand EU–India cooperation on green steel technologies.

7.2.1 Geographic asymmetry in green steel innovation

This section provides an overview of the global low-carbon steel innovation landscape, highlighting the geographic asymmetry in low-carbon technologies for steel across developed and emerging markets. It also includes an analysis of the barriers to Indian steel firms deploying low-carbon steel technologies, focusing on access to technology (Section 7.2.1.1) and challenges related to technology suitability (Section 7.2.1.2).

7.2.1.1 Intellectual property as a limited access barrier

Green steel innovation is characterised by pronounced geographic asymmetries between where the innovation occurs and where future steel demand will grow. Most patenting and R&D for green steel technologies are concentrated in developed regions, particularly Europe, the United States (US), and Japan, where steel production has largely stabilised or peaked. India, which is home to most of the world's yet-to-be-built steel capacity, is not leading in patent development for low-carbon steel. This innovation mismatch risks slowing the uptake of green steel technologies in India and entrenching the decarbonisation divide between integrated steel plants (ISPs) and micro, small, and medium enterprises (MSMEs). More fundamentally, it means that most R&D resources are focused on developing low-carbon technologies for markets where production has plateaued, rather than on decarbonising the world's fastest-growing steel industry, where they would be most needed.

Green steel innovation is characterised by pronounced geographic asymmetries between where the innovation occurs and where future steel demand will grow.

Table 8 presents the key technological innovations for steel decarbonisation, which are highly relevant to India, and lists dominant patent ownership. It reflects a pattern of patent concentration, with most major steel decarbonisation technologies being developed in advanced economies. The figures are telling: between 2010 and 2024, of the 7,199 patents filed globally for green iron technologies, China accounted for 2,748 and the US for 2,242; meanwhile, India's presence in this domain remained negligible (Research and Markets 2024). The EU and Japan dominated the hydrogen-based iron and steel production technologies, accounting for over 55% of the international patent filings in this area between 2011 and 2020 (Alconchel y Ungria et al. 2023). Likewise, the patents for electrolysers, a critical component of green hydrogen production, are concentrated in Europe, Japan, and the US (Alconchel y Ungria et al. 2023). Many patents for key innovation technologies highly relevant to India have exclusivity until around 2040 (WIPO n.d.; Boston Metal n.d.). For example, fines dry magnetic separation (FDMS), which can advance iron ore beneficiation while reducing water intake, and molten oxide electrolysis (MOE), which can forego the need for hydrogen infrastructure. As set out in Box 11, the patent concentration pattern reflects disparities in R&D resources.

Box 11: **Disparities in R&D support**

India's low R&D investment of around 0.6% of its gross domestic product (GDP), compared to 3.5% in the US, 3.4% in Sweden, and 3.3% in Japan, partly explains why the intellectual property ownership of green steel technologies remains concentrated in developed economies and not in India. The country's limited investment is reflected in the steel sector's own R&D scheme, where the Ministry of Steel allocates just INR 5–10 crore (around EUR 460–950,000) per year to address challenges including climate change and resource efficiency. This gap is compounded by the private sector's limited role: private contributions account for only 36.4% of the R&D spending in India, versus 75% in the US, 74% in China, and 59% in the UK.

Capital expenditure (CAPEX) support for steel decarbonisation is similarly skewed, with the bulk concentrated in Europe and other developed economies such as Japan, the UK, and Canada, many of which also provide operational expenditure (OPEX) support. India's public mechanisms, including the National Green Hydrogen Mission (NGHM), the National Green Steel Mission (NGSM), and recent budget allocations – such as the INR 20,000 crore (approximately EUR 1.87 billion) for carbon capture, utilisation, and storage (CCUS) under the Union Budget 2026–2027 – are meaningful but represent only a fraction of what is needed. Estimates put the total investment required to green existing steel plants at USD 283 billion (about EUR 240 billion).

Beyond the funding gap, the cost of capital itself is a structural constraint. India's baseline cost of capital runs to approximately 9–10% for decarbonisation projects, partly owing to the perceived risk. Access to low-cost finance and effective de-risking mechanisms is, therefore, as critical as the quantum of public funding needed to enable India's steel transition.

Source: Selvaraju (2025); Verma et al. (2024); Civil society representative (2025); Ministry of Steel (n.d.)

India's resource and capacity constraints risk confining it to the role of a late-stage technology adopter, with limited influence on design choices and adaptation potential. Additionally, the country's reliance on patented foreign technologies for steel decarbonisation makes them more costly and difficult to access, and increases production costs (Civil society representative 2025). This has different implications for India's ISPs and secondary steel producers. For ISPs, patents raise the cost of technologies and determine institutional engagement. They do not, however, block access.

Firms such as Tata Steel, JSW Steel, and ArcelorMittal/Nippon Steel (AM/NS) have the financial and institutional capacity to access patented technology through licensing agreements, engineering, procurement, and construction (EPC) contracts, joint ventures, or technical partnerships (Industry representatives 2025; Civil society representative 2025). For instance, Tata Steel has partnered with Primetals Technologies to introduce hydrogen injection into blast furnaces, and with Paul Wurth on the coke oven gas injection. Meanwhile, JSW Steel has entered into a joint venture with POSCO to leverage its metallurgical expertise and operational capabilities (Verma et al. 2024; SMS Group 2022). JSW has also begun investing in pilot projects to develop hydrogen-direct-reduced iron (DRI; Singh 2026; JSW 2025).

Moreover, India-based ISPs with a European presence, such as Tata Steel and ArcelorMittal, hold patents on key innovations that they can use for their production in India. For instance, Tata Steel IJmuiden (Netherlands), in collaboration with Rio Tinto, developed the HIsarna process, an alternative ironmaking route that can reduce emissions by around 20% without carbon capture (Tata Steel 2017). Tata Steel has held full patent rights to this technology since 2017 and is exploring its deployment in India (Yermolenko 2026).

ISPs do not consider access to critical green steel technologies, such as Hydrogen Breakthrough Ironmaking Technology (HYBRIT), Midrex, Tenova DRI, and others (see Table 8), a key constraint for steel decarbonisation for ISPs. This was confirmed by sustainability officers at ISPs interviewed for this study (Industry representatives 2025). However, deploying them in India is not a straightforward process. For example, for Tata Steel, integrating the Hlsarna technology with carbon capture and storage (CCS) in India is proving challenging, reflecting not only differences in technological and resource conditions but also a lack of domestic incentives to deploy such technologies (Civil society representative 2025). This, in turn, ties back to the lack of demand for green steel in India.

As a result of the geographic asymmetry in green steel technology innovation, India's steel decarbonisation trajectory depends on its ability to access and absorb knowledge generated elsewhere, subject to adequate financing. Stakeholder interviews and the existing literature suggest that intellectual property is not necessarily an obstacle to accessing individual technologies, especially for ISPs (Malett and Pal 2022). However, intellectual property constraints become more significant as decarbonisation shifts toward integrated, optimised steelmaking systems (Malett and Pal 2022). At this stage, progress depends less on individual technologies and more on coordinated, system-wide transformation.

By contrast, access to patented green steel technologies is a key barrier for MSMEs that dominate the secondary steel sector. These firms are typically coal-dependent and cannot afford technologies that require high capital expenditure (Civil society representative 2025). For instance, hydrogen rotary kilns can cost up to hundreds of millions of dollars per plant (see Table 8), which is prohibitive for any MSME. MSMEs also lack the scale and bargaining power needed to license proprietary technologies or enter into joint ventures (AIST 2011). Technology licensing is also a challenge for them as these licences are often bundled with engineering design, proprietary equipment, commissioning support, and performance guarantees (AIST 2011). Additionally, they are typically prohibitive (Khor 2012), effectively excluding MSMEs from accessing them.

In India, where 40% of steel is produced by the secondary steel sector, these costs are a significant barrier to decarbonising the industry. As noted by an Indian stakeholder, MSMEs' participation in India's decarbonisation transition is crucial but currently not supported by effective mechanisms (Civil society representative 2025). This also risks further widening the ISP–MSME decarbonisation divide, as discussed in Section 4.3.2 in the context of the CBAM.

7.2.1.2 Technology (un)suitability challenges

While access to technology is, only to some degree, a challenge in India, a more significant issue is technology (un)suitability, which is directly related to the geographic asymmetry in patent innovation. Technologies developed in the EU and the US are designed to suit the realities of steel production and steel decarbonisation in these jurisdictions. They are not, however, directly suitable to be used in India, where steelmaking is characterised by unique conditions, as set out in Sections 3.3.3 and 3.3.4.

> Technologies developed in the EU and the US are designed to suit the realities of steel production and steel decarbonisation in these jurisdictions. They are not, however, directly suitable to be used in India, where steelmaking is characterised by unique conditions.

Many of the critical steel decarbonisation technologies listed in Table 8 cannot be deployed in India without significant modifications. For instance, the hydrogen rotary kiln is a key innovation that can reduce emissions from India's coal-driven DRI. However, it requires a system with a vertical shaft, whereas India's coal-driven DRI production uses horizontal shafts. Making a change would necessitate a full systems overhaul. Moreover, there is a size mismatch: India's sponge iron sector is dominated by MSMEs with capacities of approximately 0.05–0.15 million tonnes per annum (MTPA; Industry association 2025; Verma et al. 2024; SIMA 2023). In contrast, the minimum viable capacity of vertical shaft furnace technologies is typically around 0.8 MTPA; however, most commercial modules exceed 1 MTPA (Hall, Bhaskar, and Gornerup 2025; Verma et al. 2024). There is also a technological compatibility constraint: hydrogen shaft furnaces require iron ore pellets with an iron content of at least 67% and relatively low impurity levels (Hall, Bhaskar, and Gornerup 2025; Civil society representative 2025). This, in turn, would require energy- and capital-intensive beneficiation and palletisation of India's predominantly lower-grade iron ore resources (Hall et al. 2022; see Section 3.3.3). Moreover, shaft furnace technologies operate most efficiently at utilisation rates of 80–100%, which are not always achievable for MSMEs (Hall, Bhaskar, and Gornerup 2025).

Suitability challenges are also among the reasons that the uptake of advanced scrap sorting and processing technologies in India is limited, even at the ISP level.[51] Many advanced recycling technologies, such as large, automated shredders and sensor-based sorting systems, are best suited for large recycling facilities that process high volumes of scrap (Wang 2026). India's scrap-recycling sector, however, is highly fragmented and dominated by MSMEs and informal operators. This limits the economic viability of large-scale automated processing facilities (Verma et al. 2024; Ministry of Steel 2019). Moreover, in advanced economies, scrap streams often originate from well-organised, end-of-life vehicle systems and industrial waste streams, where materials are partially sorted prior to recycling. In India, however, scrap streams frequently originate from informal dismantling activities and mixed metal waste streams. This results in higher contamination levels and more heterogeneous material flows (Civil society representative 2025; Verma et al. 2024; Bansal et al. 2024). As such, advanced sensor-based sorting technologies may need to be adapted to ensure effective processing of heterogeneous scrap inputs (Civil society representative 2025).

There are also technology suitability challenges for CCUS in India's steel sector. Many capture technologies were originally developed for applications such as natural gas processing or coal-fired power plants, in Organisation for Economic Co-operation and Development (OECD) countries. Unlike power plants, which typically emit flue gases through a single stack, ISPs using the blast furnace-basic oxygen furnace (BF-BOF) route release emissions from multiple geographically dispersed sources, including power plants, sinter plants, coke ovens, and hot blast stoves (Sievert, Cameron, and Carter 2023). Capturing carbon from these sources requires connecting numerous emissions points within a single facility. The multiplicity and dispersion of sources needed for this vary significantly across plants. Therefore, standardisation is complicated and modular, or replicable capture solutions are difficult to apply. The challenge is compounded by the heterogeneous composition of steel plant flue gases, necessitating site-specific capture designs, tailored absorbent selection, and customised thermal integration strategies. As a result, CCUS deployment in steel plants requires extensive engineering customisation, which increases technical complexity, capital costs, and operational risks (He and Wang 2017; Transition Asia 2024; Sievert, Cameron, and Carter 2023). CCUS has not yet been successfully applied at a commercial scale in a BF-BOF plant. The costs associated with capturing sufficient carbon from coal-based steelmaking facilities may ultimately limit the financial viability of CCUS (Civil society representative 2025; Nicholas and Basirat 2024). Accordingly, CCUS is likely to remain inaccessible to MSMEs.

Beyond steel-specific considerations, CCUS deployment in India is constrained by broader techno-economic and geographical factors. Carbon utilisation technologies are in the early stages of development, and domestic markets for the fuels and chemicals derived from captured CO_2 are limited (Verma et al. 2024). In addition, India does not yet possess the infrastructure required for large-scale CO_2 transport and storage. Capture costs, estimated at USD 50–100 (~EUR 42-85)/ tCO_2, and the substantial energy requirements associated with operating CCUS systems, further weaken the case for CCUS from a business perspective (Martinex Castilla et al. 2025).

Technology suitability challenges also emerge with regard to innovative iron ore beneficiation techniques. A promising innovation is FDMS – a dry beneficiation technology capable of producing iron ore concentrate with an iron content of up to approximately 68%, without using water – developed by Brazilian mining company Vale SA and New Steel (Vale 2020). This technology could address India's water constraints in executing conventional beneficiation processes, which are significant in key iron ore–producing states such as Odisha, Jharkhand, and Karnataka. Moreover, FDMS would process India's low-grade fines, many of which are underutilised or exported. Indeed, FDMS can directly produce fines and convert them into higher-grade fines with 67–68% Fe content, rendering them suitable for green hydrogen production. However, a key limitation of

51 For example, while Tata Steel in Rohtak has established modern scrap-recycling facilities that draw on international best practices, it still predominantly relies on mechanical recycling.

the technology is that it is not suitable for separating the finer, weakly magnetic materials that are prevalent in India (Nzeh et al. 2024).

In sum, the green steel innovation asymmetry creates dependence on imported, proprietary technologies, raises costs, and creates inequality in firm-level access, where ISPs retain access, albeit at a cost, while MSMEs are unable to access the technologies. More fundamentally, however, geographic patent concentration skews innovation toward the production conditions prevalent in the regions where they are developed – mostly advanced economies. Most of these technologies are not directly suitable for India, especially Indian MSMEs, due to mismatches in scale and cost.

7.2.2 Options for EU–India cooperation on green steel technologies

This section identifies options to enhance EU-India cooperation on green steel technologies with a focus on addressing intellectual property barriers; identifying opportunities for technology co-development; and leveraging the existing and growing EU-India momentum around green steel cooperation.

7.2.2.1 Addressing intellectual property barriers

The challenges associated with accessing and deploying green steel innovations in the Indian market underscore the critical role of technology transfer and, more fundamentally, the need for increased investment in R&D tailored to India's specific steelmaking context and mineral characteristics (Industry representative 2025). In particular, a significant investment gap persists in developing green steel technologies that are suitable for MSMEs. India cannot easily bridge this gap due to limited financial capacity. Private technology providers are hesitant to invest in capital-intensive solutions at the pre-commercial stage, which carry substantial risks, especially when these technologies are customised for MSMEs (Civil society representative 2025). Compounding this issue, public R&D funding for green steel from the Ministry of Steel is insufficient to support incremental innovation, let alone enable transformative technological change (Civil society representative 2025).

Cooperation between the EU and India can play an important role in addressing the lack of technology investment in India. This gap can be addressed by incentivising technology transfer, particularly for technologies in which the EU leads innovation, where readiness levels are high and only minor adaptation would be required to make them suitable for the Indian context. This would include scrap-automation technologies or proton exchange membrane (PEM) electrolyser technologies needed to produce green hydrogen.[52] Fostering technology transfer would align with obligations under the Paris Agreement, which promotes cooperative action on technology development and transfer, and is aligned with the concept of Common but Differentiated Responsibilities and Respective Capabilities (CBDR-RC). Technology transfer is also reiterated in the Trade and Sustainable Development Chapter of the EU–India FTA (European Union and India 2026a, Trade and Sustainable Development Chapter, Art. 16.6(d)). Mechanisms for technology transfer can also be developed under the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement (see Box 12).

Other ways to enhance access to low-carbon technologies would be to reduce or remove the tariffs on relevant goods, such as scrap-recycling machinery, or make market access commitments in relevant service sectors, such as scrap-recycling services (Garsous and Worack 2021). This may already have been done as part of the EU–India FTA.[53]

52 The EU's position in advanced scrap-related technologies is strong, with many of the key patents held by EU-based entities and extending into the 2030s. This technological leadership is also evident in PEM electrolyser technology, with the EU leading research impact; there were 110 publications in 2022. The EU also dominates the global 1 gigawatt (GW) PEM capacity worldwide (Bolard et al. 2023; Program 2026; Verma et al. 2024).

53 At the time of writing, the relevant schedules had not been published.

Box 12: Technology transfer in trade and climate frameworks

The multilateral trade and climate frameworks recognise the importance of technology transfer more broadly, and specifically in the context of climate change. The TRIPS Agreement explicitly recognises that the protection of intellectual property rights should promote the transfer and dissemination of technology in a manner conducive to social and economic welfare. Many FTAs also include provisions for technology transfer and cooperation, particularly in areas such as R&D.

Beyond the multilateral trade regime, technology transfer is also a core component of international climate governance. The United Nations Framework Convention on Climate Change (UNFCCC) calls upon all parties to promote cooperation on the development and transfer of technologies that reduce greenhouse gas (GHG) emissions, placing a specific responsibility on developed countries to facilitate, finance, and support access to climate technologies for developing countries. The Paris Agreement further reinforces technology transfer as a key mechanism for enabling global climate action.

India has been a leading proponent of ensuring access to environmentally sound technologies (ESTs) for developing countries within the World Trade Organization (WTO) and UNFCCC frameworks. In its statements at Conferences of the Parties (COPs), including at COP30, India has underlined the need for reliable, affordable, and equitable access to climate technologies. Through submissions to the WTO Committee on Trade and Environment and the Working Group on Trade and Transfer of Technology, India has emphasised the need for enhanced financial mechanisms, capacity building, and equitable access to technology for climate mitigation and adaptation.

In its 2023 submission, India identified five priority areas for international cooperation within the WTO: focused WTO discussions, financial mechanisms, a database for ESTs, a technology transfer platform, streamlining licensing practices, and enabling developing countries to use TRIPS flexibilities. As a foundational step toward advancing the technology transfer of ESTs, India has also proposed a global mapping exercise.

Source: WTO (1994); Martínez-Zarzoso and Chelala (n.d.); Brandi et al. (2023); UNFCCC (n.d.); WTO Secretariat (2025); PIB (2025)

In some cases, addressing intellectual property barriers may also require more proactive instruments, such as patent pooling or public-interest licensing. For example, the EU and India could draw on precedents from the health sector, including the Medicines Patent Pool and the COVID-19 Technology Access Pool, to establish a green technology patent pool that covers key steel decarbonisation technologies (MPP n.d.; WHO n.d.). Under such a model, EU technology holders could share relevant patents in return for royalties. Indian firms would, therefore, gain access on fair, reasonable, and non-discriminatory terms. An EU–India patent pool could be established within existing institutional arrangements, such as the EU–India TTC and supported by EU funding instruments. To maximise impact, the pool could include open licensing arrangements for off-patent technologies and a forward-looking inventory of relevant patents expected to expire between 2030 and 2040 (LeadIT 2024). Together, these measures could lower transaction costs, reduce licensing asymmetries, and support wider technology diffusion, particularly among MSMEs (Civil society representative 2025).

7.2.2.2 Identifying priorities for technology co-development in green steel

Technology co-development is critical to address the innovation asymmetry in the steel sector and to allocate more resources to developing green steel technologies that are suitable for steel decarbonisation in India. Indeed, technology co-development would enable India to engage in early-stage development and ensure that the technologies are designed for Indian conditions. Such efforts will also allow Indian technology developers to learn from the collective wisdom of innovators elsewhere and to

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complement their own efforts, thereby fast-tracking the development of technologies appropriate to the national circumstances and requirements (MoEFCC India 2018).

Co-development can be done in different ways. One approach is to implement open or semi-open intellectual property models. With such models, participating firms and research institutions may retain ownership of their background intellectual property. Meanwhile, any new intellectual property generated through joint research is shared among participants, subject to mutually agreed terms. Such models are especially relevant for technologies characterised by cumulative or incremental innovation (Ghosh, Harihar, and Jain 2022). The India–US Joint Clean Energy Research and Development Centre offer relevant precedents in areas such as solar energy, energy efficiency, and biofuels (India and US n.d.; Reddy, Vedala, and Ghosh 2011; US and India 2019).

Another approach is to adopt public–private consortium-based collaboration models. This would be well-suited for technologies in the early stages of development, with long gestation periods and high development risk. By pooling expertise, sharing costs, and establishing clear rules on intellectual property ownership, data sharing, and commercialisation, consortia can reduce entry barriers for public research institutions and private firms, while accelerating learning in the broader steel ecosystem (Ghosh, Harihar, and Jain 2022). A relevant example of a consortium-based approach to co-development in the steel sector is the HyIron consortium, comprising German and Namibian renewable energy (RE) and engineering firms (DG INTPA 2025; NAM-H2 2024). This consortium is being developed under the EU–Namibia Strategic Partnership on Green Hydrogen and Sustainable Raw Material Value Chains, and financially supported by Germany and the EU (under the Global Gateway), with additional blended finance from the Netherlands expected in a subsequent phase (DG INTPA 2025).

For co-development to take off in the EU–India context, strategic priorities for steel decarbonisation technologies in India should be identified. Accordingly, Indian and EU partners can jointly develop, test, and scale the technologies. To bridge the current innovation gap, technologies suitable for MSME steel producers should be prioritised. One co-development pathway could be to pilot hydrogen-DRI in smaller operating units that are designed for lower-grade iron ore. This could build on the structure and technology being piloted within the Hylron consortium between the EU and Namibia. Specifically, the consortium is piloting small-scale hydrogen rotary kiln systems that can operate using lower-grade iron ore (Hall, Bhaskar, and Gornerup 2025). Instead of needing to build entirely new operating systems, this approach involves modifying existing horizontal rotary kilns to operate with hydrogen by making them gas tight. These rotary kilns have lower capital costs, can operate at smaller scales, and can accommodate variable utilisation rates of 20–100% (Hall 2025). They also offer greater feedstock flexibility, including the ability to process lower-grade iron ore lumps and fines, thus better aligning with India's steelmaking characteristics (see Table 1; Hall, Bhaskar; and Gornerup 2025).

One co-development pathway could be to pilot hydrogen-DRI in smaller operating units that are designed for lower-grade iron ore. This could build on the structure and technology being piloted within the Hylron consortium between the EU and Namibia.

Another approach would be to build on and use nascent Indian technology pilots and leverage EU–India cooperation to bring these technologies to higher levels of readiness. Indeed, researchers at the Indian Institutes of Technology (IIT) Bombay and engineering firm Dastur are exploring the possibility of developing smaller, lower-cost hydrogen-based DRI installations that are tailored to Indian conditions (Industry association 2025). However, major technology providers are unwilling to invest in this market segment due to the high risks involved (Civil society representative 2025).

Co-development of scrap-processing facilities that use EU-automated technologies, such as sensor-based sorting and automated shredding, along with digital traceability systems, in the Indian context could be another priority. Given the EU's technological leadership in advanced scrap processing (see Section 7.2.2.1), a joint EU–India initiative can focus on adapting it to the Indian context, where waste streams are more heterogeneous and contaminated, and sorting is typically done in smaller-scale facilities.

To ensure economies of scale and a bottom–up approach, co-development for technologies focused on MSMEs should be based on technology clusters. Indeed, steel-producing MSMEs typically operate in geographically concentrated clusters that have similar production processes and technology needs (Verma et al. 2024; Industry representative 2025). Cluster-based deployment models are, therefore, effective mechanisms for scaling technology diffusion (Malett et al. 2025). By aggregating the demand, standardising solutions, and sharing infrastructure, cluster-level approaches can reduce costs and improve the feasibility for smaller firms (Civil society representative 2025).

To ensure economies of scale and a bottom–up approach, co-development for technologies focused on MSMEs should be based on technology clusters.

One approach that can strengthen cluster-level deployment is an aggregator-based business model. Within this structure, a third-party entity pools demand from multiple steel producers and procures bulk inputs such as scrap, green steel, RE, and natural gas, often securing discounted rates through economies of scale (Verma et al. 2024). This model is especially relevant to MSMEs, as it promotes aggregated finance and improves access to the financial support needed to adopt sustainable practices. For example, ferrous scrap consumption is concentrated in certain clusters, such as Jalna in Maharashtra and Chennai in Tamil Nadu, which account for 35% of the total national ferrous scrap consumption (Bansal et al. 2026). These clusters may provide avenues for deploying advanced scrap-recycling technologies. Similarly, direct-reduced iron-induction furnace (DRI-IF) clusters in Chhattisgarh, Jharkhand, and West Bengal could be the focus of the technology co-development of hydrogen-based rotary kilns.

For effective uptake, programmes deploying such models should adopt a participatory approach that actively involves MSMEs in the design, adaptation, and implementation of technologies. Given the central role of MSMEs not only as steel producers but also as key actors in local communities, participatory engagement can strengthen buy-in, foster a sense of ownership, support the sustainable use of technologies, and enable incremental local adaptation and development over time (Pal 2006).

More generally, co-development consortia should include a variety of actors, including EU technology providers and engineering companies, Indian MSMEs, the IITs, and public–private funding mechanisms (including Global Gateway funding and funding under India's NGHM). Co-development should also involve subnational and regional governments, reflecting India's quasi-federal system and the opportunity for state-level governments to work on sector-specific areas of technological collaboration (Janardhanan et al. 2020). In addition, joint ventures could be an effective way to adapt existing technology to local circumstances. Indeed, joint ventures could institutionalise day-to-day collaborations and align incentives to adapt international technologies to domestic conditions. They are, therefore, among the most effective mechanisms for technology transfer in capital-intensive sectors such as steel (Industry representative 2025; Verma et al. 2024).

7.2.2.3 Leveraging momentum to strengthen EU–India technology cooperation

Numerous institutional platforms already exist to support enhanced cooperation between the EU and India on clean technologies. These include the EU–India TTC, the EU–India Clean Energy and CECP, and India's invitation to participate in Horizon Europe as an associate member. Together, these mechanisms form a robust framework for collaboration across the trade, technology, and climate domains. However, despite this dense institutional landscape, tangible progress toward industrial-scale co-development, particularly in steel decarbonisation, remains limited. Current cooperation has largely been confined to early-stage research, pilot projects, and policy-oriented exchanges. For example, under the TTC, the EU and India are jointly funding a waste-to-renewable hydrogen project through Horizon Europe (DIGIBYTE 2025). While this initiative reflects a shared commitment to expanding joint technology development portfolios, the collaboration remains at a nascent stage and has yet to translate into large-scale industrial application or deployment (EuroAccess 2025).

Similarly, under the EU–India CECP, cooperation has mainly focused on offshore wind planning, energy system modelling, and efficiency solutions, with joint efforts centred on data collection, analytical tools, and policy frameworks. However, the collaboration has yet to expand to include the co-development of core industrial decarbonisation technologies or the sharing of intellectual property, which are essential to scale innovation in hard-to-abate sectors.

New initiatives might bridge this gap: the EU–India Strategic Agenda calls for deeper cooperation on research and innovation, particularly in green hydrogen and wind energy. For instance, it has established an India–EU Task Force on Green Hydrogen and set up India–EU Innovation Hubs. It highlights that the parties will cooperate to support critical emerging technologies, including by "advance(ing) promising technologies from early-stage collaboration to promote industrial deployment and accelerate private-sector engagement" (European Union and India 2026b, 2.1.3). Moreover, it emphasises that the parties will explore research cooperation, including options for India to become associated with Horizon Europe, a process that is currently gaining momentum (van Erp 2026). Finally, the EU and India will sign an MoU on climate cooperation, and the EU has committed to paying EUR 500 million towards India's industrial transformation.

Bilateral technology cooperation mechanisms between EU member states and India are also emerging. For instance, the India–Sweden Leadership Group for Industry Transition (LeadIT) and the Industry Transition Partnership (ITP) have developed various projects to incentivise technology transfer, including steel decarbonisation technologies. However, stakeholders consulted for this report noted that LeadIT's results have so far been slow and limited (see Box 13; Indian Government 2025).

Box 13: India–Sweden technology collaboration through LeadIT and the ITP

Launched jointly by India and Sweden, LeadIT aims to mobilise public- and private-sector action for the global industrial transition. The initiative brings together 18 countries and 31 companies, including Tata Steel, JSW, and SAIL, committed to accelerating pathways towards an inclusive and equitable transition to net-zero emissions from heavy industry.

Under LeadIT, India and Sweden launched the ITP in 2023 to advance the decarbonisation of the steel and cement sectors, supporting technology diffusion through joint innovation, knowledge sharing, and the preparation of demonstration projects between Indian and Swedish partners. The Steel Working Group of the ITP has identified five technology areas for collaboration – hydrogen-based direct reduction of iron, biomass, operational excellence in blast furnaces, beneficiation of low and tailing grade iron ore, and CCUS. Moreover, Indian and Swedish industry partners have identified 19 specific project topics to explore collaboratively. Following a call for proposals, 7 pre-pilot feasibility projects involving 18 industry and research partners were selected. In the steel sector, selected projects include collaborations between Tata Steel, IIT Hyderabad, and Swedish firm GREEN14 around microwave plasma–assisted CO_2 conversion of blast furnace off-gas; and JSPL and Swedish partners Kanthal and SWERIM around electric heating technologies for reducing CO2 emissions from Indian steelmaking.

Despite this progress, stakeholders interviewed for this report, many of whom were interviewed prior to the announcement of these projects, noted that the results of LeadIT have so far been slow and limited. A further structural limitation identified by a stakeholder is that technology transfer ultimately occurs industry to industry. However, LeadIT operates as a public–private partnership, which may constrain its effectiveness as a transfer mechanism. The momentum that the recently announced projects will generate remains to be seen.

Source: Indian Government (2025); Ministry of Climate and Enterprise (2025); LeadIT (2025); LeadIT (n.d.)

The emergence of these new initiatives, alongside the TTC and EU–India CECP, signals growing momentum to deepen cooperation on clean technology innovation, including hydrogen and other solutions that are relevant to steel decarbonisation. However, to translate this momentum into tangible impact, EU–India cooperation must move beyond a narrow focus on clean energy deployment (e.g., solar, wind, and hydrogen) and commit to targeted collaborations centring green steel technologies. This shift will require structured involvement of both public and private actors, and the support of dedicated coordination mechanisms (see Box 14). Crucially, cooperation must evolve beyond early-stage research and toward industrial-scale co-development consortia, and draw on emerging models such as the Hylron consortium in Namibia.

Box 14: Platforms to consolidate the Indian steel industry

Leveraging the EU–India momentum in technology cooperation requires developing a common platform on the Indian side to engage with the wider international steel ecosystem. To this end, the Ministry of Steel has announced plans to unify Indian steel companies onto a common platform to facilitate engagement with foreign technology providers and collaborators. Such a platform would reduce information asymmetries and enable smaller firms to participate in international collaborations that would otherwise be difficult for them to pursue independently.

If designed effectively, this approach could complement consortium-based and joint-venture models by providing a structured interface between foreign technology holders and Indian producers, especially MSMEs, and by supporting a more systematic diffusion and adoption of decarbonisation technologies across the sector. The Steel Research Technology Mission of India (STRMI), which is already leading collaborative efforts among industry players through initiatives such as the SteelCollab portal, and supporting Indian innovation through various schemes, can spearhead industry-wide collaboration by linking ongoing Indian innovation and adaptation initiatives with international partners.

Source: STRMI (n.d.)

To enable this transition, both partners will need to navigate the growing number of largely non-binding cooperation initiatives; establish a central coordinating body (possibly the TTC) to ensure strategic alignment and minimise duplication; and jointly identify a prioritised portfolio of technologies suited to India's steel decarbonisation challenges and opportunities. Leveraging existing institutional frameworks to support co-development in these priority areas will be essential to move from fragmented collaboration to meaningful industrial transformation.

Both partners will need to navigate the growing number of largely non-binding cooperation initiatives; establish a central coordinating body (possibly the TTC) to ensure strategic alignment and minimise duplication; and jointly identify a prioritised portfolio of technologies suited to India's steel decarbonisation challenges and opportunities.

Table 8: Overview of the key decarbonisation technologies and their uptake barriers in India

Technology	Key patent holders	Deployment in India	Technology suitability for India	Technology readiness level (TRL)	Costs	Overall assessment
Decarbonising the integrated BF-BOF route						
Hydrogen injection is a retrofitting approach that aims to reduce the consumption of metallurgical coke by injecting hydrogen into existing blast furnaces.	ArcelorMittal (France), Paul Wurth (Luxembourg), NewSouth Innovations (Australia).	Tata Steel has conducted a five-day trial of injecting hydrogen into a blast furnace.	As a retrofittable technology, this can reduce emissions from India's large and relatively young fleet of blast furnaces without requiring their immediate replacement.	7–8 (pre-commercial demonstration/ first-of-a-kind commercial).	High cost of green hydrogen increases OPEX, although this is expected to decline as hydrogen costs fall. However, substantial upfront investment is still required to develop green hydrogen facilities, particularly for RE and electrolyser capacity.	Suitable transitional step for India, where the industry continues to rely on blast furnaces.
Slag heat recovery systems capture and repurpose the thermal energy from molten slag, a byproduct of steel manufacturing.	RecHeat SFTec (Finland), John Cockerill (Belgium), Nippon Steel Corporation (Japan).	Limited deployment, primarily at the pilot/R&D stage.	Suitable for Indian BFs that produce large quantities of slag. Recovering this energy can improve energy efficiency and create a higher-value granulated slag product for the cement industry.	3–4 (concept needs validation/early prototype).	High capital cost of slag heat recovery systems due to the need for specialised materials and complex equipment. The economic viability depends on the value of the recovered heat.	Suitable for India and can support reducing the country's reliance on imported coal.
Transitioning from coal- to hydrogen-/gas-based DRI						
Hydrogen-based DRI is a technology that uses green hydrogen to reduce iron ore, producing iron. This technology typically uses vertical shaft furnaces.	Midrex (US), Tenova (Italy), Danieli (Italy), Stegra, SSAB (Sweden), Blastr (Finland), HBIS (China), SALCOS (Germany).	JSW Steel, Jindal Steel & Power, and AM/ NS India, have begun investing in pilot projects and industrial trials involving these technologies, either through licensing agreements or joint industrial projects.	Low levels of suitability: • Incompatible with horizontal shaft rotary kilns (requires building new operations, not mere retrofitting); • Requires large-scale production (>1 MTPA); not suitable for MSMEs operating coal-based rotary kilns of 0.05–0.15 MTPA; • Needs high-grade ore pellets (>67% Fe) which are not widely available in India (would require beneficiation or import); and • Operates most efficiently at high utilisation rates (80–100%) often not feasible for smaller facilities.	6 (full prototype at scale).	Very high cost of green hydrogen makes OPEX prohibitive. The CAPEX for a new hydrogen-DRI plant plus the required multi-gigawatt RE and electrolyser capacity runs into billions of dollars per plant.	Key long-term pathway for ISPs, but inaccessible to MSMEs, reflecting a scale and technology mismatch, and high costs.

Technology	Key patent holders	Deployment in India	Technology suitability for India	Technology readiness level (TRL)	Costs	Overall assessment
A hydrogen fluidised bed uses green hydrogen to directly reduce iron ore fines, bypassing the need for palletisation.	Hydrogen-Based Fine-Ore Reduction (HYFOR) (Primetals, Austria), HyREX, POSCO (South Korea).	No.	• Well suited to India as low-grade iron ore would not be a problem; and • A barrier could be the requirement for large volumes of green hydrogen, which is challenging in India due to the high cost and limited infrastructure.	4 (early prototype).	OPEX will depend on the cost of green hydrogen.	Promising but not deployable in the near term, as the technology is in early stages of development.
A hydrogen rotary kiln modifies existing horizontal rotary kilns to operate with hydrogen by making them gas tight.	Hylron Consortium (consisting of German and Namibian engineering firms that co-developed the technology).	No.	Highly suitable: • Operates at smaller scales; • Requires retrofitting, not rebuilding the entire shaft; • Can accommodate variable utilisation rates; and • Offers greater feedstock flexibility, including the ability to process lower-grade iron ore lumps and fines.	5 (large prototype).	Lower CAPEX; OPEX depends on the cost of green hydrogen.	Highly promising but not deployable in the near term as the technology is in the early stages of development.
Ironmaking processes						
Fines dry magnetic separation technology is used to concentrate iron ore fines without water.	Vale, with exclusivity extending until 2042; licensing required.	No.	• Would be highly suitable given India's water scarcity. • It is highly ore-specific, and could require adaptation to India's different ores; there could also scale-related challenges.	6–7 (pilot to early commercial).	Very high, with the pilot plant costing USD 3 million (~USD 2.6 million).	This is potentially transformative but with limited diffusion.
Direct electrified ironmaking involves electrolysis of iron ore at ~1600°C, with no carbon inputs.	Boston Metal operates pilot cells in the US and uses MOE commercially at its Brazilian subsidiary to recover metals; commercial steel production expected from mid-2026.	No.	• Could be highly relevant for India, given that the electrolysis used bypasses the need for high quality iron ore, thus reducing various processing steps	3–5 (concept needs validation to large prototype).	Very high R&D and CAPEX for first-of-a-kind plants. However, it promises lower OPEX by eliminating multiple process steps.	There is potential for a long-term breakthrough only.

Technology	Key patent holders	Deployment in India	Technology suitability for India	Technology readiness level (TRL)	Costs	Overall assessment
CCUS for steel decarbonisation						
CCUS in steel captures CO_2 from industrial processes or energy production, transports it via pipelines or other infrastructure, and either stores it in geological formations or utilises it in industrial applications	ArcelorMittal, thyssenkrupp, Tata Steel, Vattenfall, SSAB (Sweden); patents cover key capture technologies, including advanced solvent systems, membrane separation technologies, and monitoring systems for geological storage.	Few large-scale CCUS demonstration projects.	Requires redesign for BFs with multiple capture points; needs process redesign. There is a lack of CO_2 transport/storage infrastructure.	5 (large prototype).	High investment, operating costs, and transportation costs.	Limited feasibility in India in the near term, reflecting prohibitively high costs and adaptation challenges.
Scrap automation						
Scrap automation technologies use artificial intelligence-powered cameras, X-ray fluorescence, and laser-induced breakdown spectroscopy to identify and separate metal types by grade and purity.	TOMRA (Norway), Steinert (Germany), MSS (US).	Limited.	Would require adapting to India's highly fragmented scrap system, which also tends to process more contaminated scrap and use smaller processing entities.	8–9 (commercially mature and widely deployed).	High CAPEX for installing technologies and training operators. OPEX will also include ongoing maintenance of the associated hardware and software systems.	This has high potential but requires formalisation of the Indian scrap industry.

Source: Authors' analysis based on various sources, including IEA (2019); Verma et al. (2024); Hall et al. (2022); IEA (2020); Witecka et al. (2024); IEA (2026)

Note: TRL assessments are indicative and may differ across specific technologies within a broader technology category.

7.3 Promote investment in steel decarbonisation in India

Financing is critical to catalyse India's green steel transition. The Ministry of Steel has estimated that decarbonising the Indian steel industry will require an investment of around USD 283 billion (about EUR 240 billion; Verma et al. 2024). This section explores how EU–India cooperation can address this financing gap. It focuses on (i) options to establish a de-risking mechanism to mobilise private investment; and (ii) frameworks to promote, protect, and facilitate EU investment, including in clean energy and green steelmaking in India.

7.3.1 De-risking mechanisms to mobilise private investment

As highlighted in Section 7.2, steel decarbonisation technologies require large upfront investment and supporting infrastructure, and the perceived risks of investing in developing economies often deter private capital. The Green Steel Roadmap refers to finance as the "most important lever for accelerating the transition in the steel sector" (Verma et al. 2024, 367). Financing will be instrumental in developing and scaling up technological innovations. Financial support is also needed for skill development, to set up training institutes and conduct training (Verma et al. 2024).

To address the funding gap, India is exploring Viability Gap Funding (its public–private risk-sharing mechanism) and Carbon Contracts for Difference (long-term price guarantees for clean technologies) (Oillic, Luthin, and Kienel 2025). The country has also been working with multilateral development banks (MDBs) and international partners. However, these institutions typically fund feasibility studies, not long-term technology development and demonstration projects, which are so crucial for India (Civil society representative 2025). Indeed, there are no good examples of large-scale climate projects in the Indian steel sector.

This calls for developing a de-risking mechanism that combines public, concessional, and private finance to deliver risk-adjusted returns and enable India to participate in early-stage technology development (Ghosh, Harihar, and Jain 2022). Such an approach aligns with the EU's intent to scale up Global Gateway investment in India and deepen cooperation, including through co-funding and coordinated calls, and by enabling Indian institutions and researchers to participate on equitable footing with EU partners (European Union and India 2026b). One way to do so would be for the parties to agree to establish a joint de-risking mechanism, as was done in the context of the EU–South Africa Clean Trade and Investment Partnership (CTIP), which is discussed in Box 15.

The EU can help de-risk financial investment in decarbonising Indian steel. The European Investment Bank (EIB) could play a leading role in this by providing blended finance and risk-sharing mechanisms under the Global Gateway and European Fund for Sustainable Development Plus. The EIB has already invested EUR 1 billion in India's green hydrogen deployment (EIB 2023). Funding made available through Horizon Europe would also lower barriers to investing in green steel technologies.

7.3.2 Protect, facilitate, and promote EU investment in clean energy and green steel

EU foreign direct investment (FDI) can play a pivotal role in advancing India's green transition by enabling long-term capital deployment alongside technology transfer and industrial capacity building. To this end, the EU and India aim to finalise negotiations on an investment protection agreement (IPA) to provide high, predictable standards of protection for investors and promote investment in

To accelerate steel decarbonisation in India, it is critical to adopt a new hybrid model that covers not only investment protection, but also investment facilitation and promotion.

selected high-growth, future-oriented sectors (European Commission 2026c). To accelerate steel decarbonisation in India, it is critical to adopt a new hybrid model that covers not only investment protection, but also investment facilitation and promotion. This would turn the IPA into an investment protection and facilitation agreement (IPFA).

In 2023, the EU's share of FDI stock in India reached EUR 140.1 billion, up from EUR 82.3 billion in 2019, making the EU a leading foreign investor in India (European Commission Trade and Economic Security n.d.). Yet this engagement falls short of its potential – EU investment in India is less than half of its investment in China or Brazil (CII 2025). Moreover, EU investment in clean energy and green steel technologies in India is limited. The top investment categories are services, computer software and hardware, the automotive industry, trading, and chemicals (DPIIT 2024). Stakeholders interviewed for this report highlighted that India has not done enough to attract large-scale investment in the green steel sector, with the EU sharing responsibility for this gap (Civil society representative 2025). Barriers to enhancing FDI in the Indian context include complex regulatory approvals, stringent land acquisition laws, rigid labour regulation, and corruption (Civil society representative 2025). For green steel specifically, investment barriers also reflect the high risks involved and uncertain returns, as highlighted in Section 7.2.

Increasing EU investment in clean energy and green steel technologies can be done by creating a more predictable investment environment, thereby reducing regulatory and financial risks. The IPA will be a step in the right direction, as it would likely establish the parameters that would create such predictability. For instance, looking at previously concluded investment agreements with the EU, the EU–India IPA will likely include classic investment provisions that create conditions of non-discrimination (most-favoured-nation and national-treatment requirements), and provisions for fair and equitable treatment and expropriation, while ensuring that the parties maintain the right to regulate.[54] It will be critical to ensure openness of the steel sector, as well as clean energy sectors like green hydrogen and renewables, to foreign investment.

In addition, an EU–India IPA should adopt a redesigned architecture that moves beyond traditional provisions on market access and investment protection to incorporate investment facilitation and promotion measures, particularly those supporting clean energy and green steel supply chains (Civil society representative 2025; Scott, Selvaraju, and García Bercero 2025). In other words, the IPA should become an IPFA. Indeed, focusing on investment facilitation would streamline the investment bureaucracy and improve transparency, thereby creating greater predictability in the process. A focus on promoting and streamlining investment in clean energy and hard-to-abate sectors would further support opportunities for EU investment in India, building on the parties' complementary strengths, including steel decarbonisation.

Focusing on investment facilitation and sustainability is becoming increasingly common in the EU. The EU has concluded sustainable investment facilitation agreements (SIFAs) with Angola and Ecuador and is currently negotiating a SIFA with Côte d'Ivoire and has signalled its intent to expand this model to additional partners (Sefcovic n.d.).

SIFAs build on the WTO Investment Facilitation for Development (IFD) Agreement. Moreover, the EU has rolled out a new partnership engagement model, the CTIP. CTIPs take a broader approach to third-country engagement, including investment facilitation and promotion provisions. The first CTIP has been concluded between the EU and South Africa (Box 15; García Bercero and Sapir 2025). An EU–India IPFA could build on these agreements. For instance, SIFAs and the WTO IFD include horizontal provisions on transparency of investment measures, streamlining and speeding up administrative procedures, establishing focal points, domestic regulatory coherence,

54 See, for example, European Union and Indonesia (2025), European Union and Singapore (2018), and European Union and Vietnam (2019).

and cross-border cooperation. These provisions could be considered for inclusion in an EU–India IPFA.[55]

Box 15: EU–South Africa CTIP

The EU–South Africa CTIP is built around the aim of creating new trade and investment opportunities while supporting decarbonisation objectives through a tailored, targeted approach. Under the CTIP, the parties, inter alia,

- seek to facilitate mutually beneficial public and private investment, including trade finance, for covered supply chains that include renewable energy, low-carbon and net-zero technologies, other technologies, and clean fuels such as low-carbon and renewable hydrogen;
- agree to deploy public investment to attract and support private investment, including by developing de-risking mechanisms through blended finance to support South Africa's National Development Plan and decarbonisation objectives, and ensure the participation of EU companies (see Section 7.3.1); and
- incorporating environmental, social, and governance (ESG) standards in the covered supply chains.

The parties agree to accompany the investment facilitation package with a Global Gateway investment package; exchange information on CTIP-covered investment and improve investment conditions; share information on trade and investment barriers encountered, including by investors; ensure effective access to public procurement; encourage initiatives that strengthen and promote meaningful partnerships, incentivising clean technologies, sharing know-how, fostering innovation and competitiveness, and advancing skill development in emerging technologies; promote investment opportunities within the covered supply chains through existing investment portals, including dedicated investment windows and matchmaking initiatives.

Source: European Union and South Africa (2025)

An EU–India agreement could also include provisions to facilitate and promote investment in clean energy and hard-to-abate industries, such as steel, which are particularly promising areas for EU investment in India (García Bercero and Sapir 2025). This could leverage the complementary strengths and weaknesses of the blocs to decarbonise steel: the EU possesses advanced technological know-how and skills but faces high electricity and manufacturing costs, while India offers low electricity costs and abundant renewable resources. The integration of clean supply chains through investment facilitation and promotion provisions should focus on areas that would advance India's steel decarbonisation efforts and industrial policy objectives, while ensuring the participation and relevance of EU companies and their technologies, and creating opportunities for the EU steel industry to import RE and green hydrogen created (García Bercero and Sapir 2025). This would include producing green hydrogen, exploring the possibility of producing green iron ore in India, including by investing in technology co-development that focuses on MSMEs, and implementing scrap-automation technologies (see Section 7.2).

Building on the Annex on Sustainable Energy and Raw Materials in the EU–Ecuador SIFA and the EU–South Africa CTIP, the EU–India agreement could include additional investment facilitation and promotion provisions for RE; low-carbon and green hydrogen; and low-carbon and net-zero technologies. These provisions could include establishing a platform – or using existing platforms, such as the TTC – to advance industry consultation. The aim would be to identify specific investment opportunities

Building on the Annex on Sustainable Energy and Raw Materials in the EU–Ecuador SIFA and the EU–South Africa CTIP, the EU–India agreement could include additional investment facilitation and promotion provisions for RE; low-carbon and green hydrogen; and low-carbon and net-zero technologies.

55 Even if India opposes the IFD process in the WTO context, this opposition is based on the process in which it was negotiated, not the investment facilitation itself. Indeed, the EFTA-India Trade and Economic Partnership Agreement includes various provisions to facilitate investment.

and barriers in clean energy and energy-intensive sectors like steel that could be the focus of bilateral engagement between the parties (García Bercero and Sapir 2025). It could further include provisions to share knowledge and foster innovation. For example, through the co-development of promising steel decarbonisation technologies relevant to Indian MSMEs (see Section 7.2), as well as a dedicated investment window and matchmaking initiatives. Other provisions should cover cooperation on blended financing via a de-risking mechanism to ensure that public money supports private investment, including through the Global Gateway and the EIB.

In summary, to promote EU investment in innovative and emerging steel decarbonisation technologies in India, the parties should consider adopting a hybrid approach to investment protection and facilitation. This approach should integrate elements from both traditional EU IPAs and from investment facilitation and clean supply chain integration in the IFD, SIFAs, and CTIPs. Ultimately, what matters more than the specific type of agreement is that the EU and India pursue a multifaceted strategy for cooperation in clean energy and steel decarbonisation. Their strategy should combine trade and investment liberalisation, investment protection and facilitation, public–private dialogue, financial risk-mitigation mechanisms, and joint technology development and transfer. While the CBAM and other EU low-carbon measures are, in part, accelerating investments in low-carbon technologies, domestic measures, such as strengthening India's CCTS (see Section 5) and green public procurement, will also be critical to create demand for green steel technologies in India (Industry association 2025).

7.4 Cooperation across the green hydrogen value chain

Strengthening EU-India cooperation on green steel technology will require identifying two or three specific areas that have promise and could lead to benefits for both the EU and India. An example of a structurally complementary area that can help deepen EU–India cooperation is green hydrogen,56 a key enabling technology to decarbonise steel and potentially green iron ore. Green hydrogen can replace coking coal as both a reducing agent and an energy source in both BFs and DRI, as discussed in Section 7.2 (see also Table 8). There are three different stages in the green hydrogen/steel-making value chain where cooperation can be further explored: (i) electrolyser manufacturing; (ii) green hydrogen; and (iii) green iron.

Electrolyser manufacturing in India: developing electrolyser capacity – a critical step in green hydrogen production – in India offers a potential cooperation opportunity. Doing so would be aligned with the Indian government's National Green Hydrogen Mission, launched in 2023, which aims to make India a global hub for the production, use, and export of green hydrogen and its derivatives. The Government of India has allocated INR 17,490 crore (approximately EUR 1.6 billion) in production-linked incentives to support electrolyser manufacturing and hydrogen production. It is targeting an annual production quantum of 5 MT by 2030 and the potential to develop 10 million metric tonnes (MMT) per annum for exports – about 10% of the projected global demand (Indian Government 2025).

On the Indian side, EU cooperation would be crucial to boosting investment in this sector and ensuring access to advanced electrolyser technologies. India's current electrolyser manufacturing predominantly uses alkaline technologies, with only limited allocations for the more efficient PEM and other emerging technologies (Argus 2025; Mehta and Steensma 2026).

> EU–India cooperation should focus on making PEM technologies accessible to Indian electrolysis manufacturing, including through licensing and joint ventures.

56 For ease of reference, this section employs the term 'green hydrogen'. Within the EU regulatory framework, the relevant category is 'renewable hydrogen' (classified as renewable fuels of non-biological origin [RFNBOs]). Where specific policies use this term, it is retained accordingly. Definitions and certification requirements differ across jurisdictions; these divergences are examined in the next section.

The EU is a key player, hosting nine of the world's top 15 electrolyser manufacturers, accounting for approximately 60% of new PEM project deployments globally, and being at the forefront of innovation in Solid Oxide Electrolyser Cell ("SOEC") and Anion Exchange Membrane ("AEM") technologies (Systemiq n.d.). EU–India cooperation should focus on making PEM technologies accessible to Indian electrolysis manufacturing, including through licensing and joint ventures.

At the same time, the EU is seeking to diversify its hydrogen technology supply chains, especially given that China currently accounts for 40% of the global electrolyser manufacturing capacity (H2 2025; Turlapati 2024). Establishing a giga-scale facility in India may require roughly one-third of the capital investment required in Europe, owing to lower construction, equipment, and land costs (Maheshwari, Mantri and Karnwat 2023).

This complementarity makes boosting electrolyser manufacturing in India a natural focus for EU–India cooperation. The deployment of electrolyser technologies in India is already underway; for example, GreenH electrolysis, a joint venture between Spain's H2B2 Electrolysis Technologies of Spain and India's Castlegreen Energy (GreenH Electrolysis n.d.). However, these initiatives need to be scaled up (Collins 2024). The EU should invest in blended finance mechanisms to support the development of electrolyser manufacturing in India, given the high cost of capital. Concessional financing or guarantees from European development finance institutions or climate funds could de-risk the financing for large electrolyser manufacturing facilities and advanced component production.

Green hydrogen production: Stepping up green hydrogen production in India, in part for EU export, is another area to be explored. India's abundant RE resources (particularly solar, wind, and hydropower) and its low-cost production model make it well positioned to produce cost-competitive green hydrogen at scale (Mukherjee et al. 2025; Green Hydrogen Organisation n.d.). Conversely, the high energy costs, low renewable potential, and stringent regulatory frameworks drive up green hydrogen costs in the EU. Indeed, while estimates vary, India could likely achieve green hydrogen costs near USD 2/kg by 2030 – about half the expected price of USD 4/kg of hydrogen in the EU (Tongia and Patel 2024).57

On the EU side, green hydrogen has been identified as critical to industrial decarbonisation and energy diversification, as reflected in the binding targets for green hydrogen.58 Moreover, the Commission acknowledges the significant role that imports will play in meeting the EU's demand for green hydrogen. The EU is targeting 10 MT of domestic renewable hydrogen production and an additional 10 MT of imports by 2030 (European Commission 2023). Therefore, not only could India's green hydrogen production help meet the EU demand, but it would also enable the EU to strengthen its industrial resilience.

However, despite the cost advantage of producing green hydrogen in India, it is unclear whether this opportunity will materialise. Indeed, a key challenge of outsourcing green hydrogen production lies in transportation (Industry representatives 2025). Although hydrogen has a very high energy content by weight, its very low energy density by volume means it must be compressed to high pressures or liquefied at extremely low temperatures for transportation – both of which consume substantial energy and increase costs. Infrastructure for large-scale hydrogen transport is underdeveloped and would require major investment. Transporting hydrogen also raises safety concerns, as it is highly flammable. While hydrogen derivatives, such as ammonia, can ease transport challenges, the extra processing steps and energy losses – which can be up to 50% – reduce overall efficiency and economic viability. As a result, it is unclear whether trade in green hydrogen is a realistic option in

57 Moreover, India's estimated costs for delivering green ammonia to the Port of Rotterdam – which include not only electrolysis production but also transport and conversion into ammonia – are cost-competitive with other green hydrogen producers like Brazil and Chile (Kogekar, Malyan, and Ningthoujam 2026).

58 The Renewable Energy Directive III introduces binding targets for hydrogen: 42% and 60% of the hydrogen used by industry in 2030 and 2035, respectively, must be in the form of RFNBOs (European Commission 2025p).

the near future (Industry representatives 2025; Civil society representative, 2025).

EU-India trade in green hydrogen would also require regulatory alignment regarding the parties' respective certification frameworks. India uses the Green Hydrogen Certification Scheme of India (GHCI), and the EU has the RFNBO requirements, which require certification under voluntary sustainability schemes such as CertifHy, International Sustainability and Carbon Certification, and REDcert. While both the EU and Indian frameworks share the goal of credible green hydrogen certification, they diverge on emissions accounting, power sourcing rules, system boundaries, and feedstock eligibility. Thus, green hydrogen trade would require cooperation in aligning these schemes.

Green iron: To address the challenges associated with transporting green hydrogen, the EU and India should also explore cooperation on trade in green iron (Oillic, Luthin and Kienel 2025). Many stakeholders interviewed for this report highlighted that, in the future, trade would focus on shipping processed products, including green iron (often in hot briquetted iron [HBI] form; Civil society representatives 2025). This would address the transport challenges associated with exporting ammonia, while enabling India to export higher-value-added products (it would allow for about 40% value addition in India) (Civil society representative 2025). Exporting HBI might also be a more feasible strategy for India compared to exporting green steel (Civil society representative 2025). At the same time, importing HBI could help meet the EU's demand for green iron, going well beyond what domestic hydrogen-DRI production can produce competitively (Oillic, Luthin, and Kienel 2025). Indeed, independent modelling by Agora Industry suggests that India could produce green iron at competitive prices (Agora Industry 2024).

To address the challenges associated with transporting green hydrogen, the EU and India should also explore cooperation on trade in green iron

While some ISPs in India are piloting HBI using green hydrogen, doing so for the export market is not currently a focus for the stakeholders consulted for this project. This reflects, in part, the challenges related to India's low-quality iron ore. Additional research is needed to better understand the competitive advantages of producing HBI in India, including its position vis-à-vis other countries and regions that may be well positioned to produce HBI competitively, such as Brazil and the Middle East (Civil society representative 2025). This must also take into account transport routes and costs.

Existing frameworks and next steps: Recognising the potential for mutually beneficial cooperation, various EU–India platforms and initiatives are already focusing on strengthening green hydrogen cooperation. For instance, the TTC has identified green hydrogen production from biogenic waste (waste-to-hydrogen) and cooperation on hydrogen-safety standards, and the EU–India CECP has included activities involving renewable hydrogen as part of its third phase in 2025–2028 (European Union and India 2025; European Commission Energy, Climate Change, Environment n.d.). The Global Gateway also seeks to support India's hydrogen policy through dialogue on standards, certifications, pilot initiatives and research and innovation. Further, the EIB has already invested EUR 1 billion in Indian green hydrogen deployment (Delegation of the European Union to India n.d.; European Investment Bank 2023).

These platforms can be used to advance research on cooperation across the three steps of the green hydrogen value chain, and to identify which areas are most feasible and should be prioritised in the near future. Moreover, a critical element of EU–India cooperation on green hydrogen production in India is ensuring that, ultimately, both India and the EU can use green hydrogen to decarbonise steel production. This will be difficult to do within the next 5–10 years, given the low demand for green steel in India and the fact that green hydrogen will increase steel production costs (Indian

Government 2025). However, by 2035, once the technology has matured and costs have fallen, it will be important for Indian steel producers to be able to access the green hydrogen produced in India. What should be avoided is a situation in which India becomes a mere green hydrogen/HBI exporter, facilitating the decarbonisation of the EU steel sector while Indian steel plants remain coal-driven and emit CO2 per tonne of steel among the world's highest. EU–India cooperation must ensure that, in time, India also benefits from the green hydrogen capacity it develops. One model to explore could be that once the demand for green hydrogen in India picks up, EU investors in electrolysers/green hydrogen production in India would be allowed to ship half of their production at a discounted rate to the EU, while the other half would be used in the Indian market (Civil society representative 2025).

A critical element of EU–India cooperation on green hydrogen production in India is ensuring that, ultimately, both India and the EU can use green hydrogen to decarbonise steel production.

7.5 Key takeaways

The development of green steel technologies is highly uneven globally. At present, innovation is concentrated in developed economies such as the EU, the US, and Japan, where steel production has peaked. Meanwhile, limited innovation is taking place in India, where steel production is rapidly expanding. This geographic asymmetry limits India's ability to adopt and shape these technologies, increasing the country's reliance on expensive, patented foreign solutions. These technologies can be accessed through partnerships and licensing. However, MSMEs, which make up a significant share of India's steel sector, are largely excluded due to their limited bargaining power and lack of financing, and the high costs of these technologies.

Beyond access, a major challenge lies in the (un)suitability of these technologies for Indian conditions. Many innovations are designed for production systems in developed countries and do not align with India's smaller-scale, resource-constrained, and coal-dependent steel industry. Issues such as incompatible infrastructure (coal-based rotary kilns vs. hydrogen-based shafts), lower-grade iron ore, fragmented scrap systems, and a lack of supporting infrastructure (e.g., for hydrogen or carbon capture) make deployment complex and costly. These mismatches mean that even when technologies are available and accessible, they often require significant adaptation. This limits their scalability and effectiveness in India.

Addressing this challenge requires technology co-development, in which Indian and EU researchers, academic institutions, and private-sector players collaborate to develop technologies tailored to Indian needs, particularly for MSMEs. Moving beyond early-stage research toward industrial-scale collaboration, supported by coordinated institutions and financing mechanisms, will be critical. Without such efforts, India risks remaining a late adopter of green steel technologies. This will undermine both its industrial growth and global climate goals.

To address the risks involved in and capital required to invest in unproven, green technologies, the EU and India should develop a joint de-risking mechanism that combines public, concessional, and private finance. The aim will be to deliver risk-adjusted returns and enable India to participate in early-stage technology development. This should be linked to Global Gateway financing, the European Fund for Sustainable Development Plus, and the EIB, and build on existing investments.

Stepping up EU investment in innovative and emerging steel decarbonisation technologies and clean energy in India is also critical. To do this, the parties should aim to conclude IPA negotiations as soon as possible. They should also consider adopting a hybrid approach that combines trade and investment liberalisation provisions with investment protection and facilitation elements. Focusing on investment facilitation would streamline the investment bureaucracy and improve transparency, thereby creating greater predictability in the process. Moreover, promoting and streamlining investment in clean energy and hard-to-abate sectors would further support opportunities for EU investment in India, building on the complementary strengths of the parties, including steel decarbonisation.

Finally, EU–India cooperation would be most effective in areas that lead to clear mutual benefits. One such area is green hydrogen. In particular, EU–India cooperation on green hydrogen should focus on further exploring three value chain segments: electrolyser production in India; trade in green hydrogen; and trade in HBI. Stepping up electrolyser production in India is probably the easiest area to make progress in the short term, but additional research must be undertaken to determine whether, and when, green hydrogen can be transported cost-effectively and safely, while opportunities to trade in HBI must also be further explored. Ultimately, it would be critical to EU-India cooperation to ensure that India's green hydrogen is not developed exclusively for export but can also be deployed domestically to decarbonise Indian steel.

8 Policy Recommendations

This section provides policy recommendations to enhance cooperation between the European Union (EU) and India on steel decarbonisation. It also includes various recommendations to address obstacles to steel decarbonisation in India. It is organised around five key pillars:

1. Reframing EU–India cooperation on steel decarbonisation around India's challenges
2. Reducing the exposure of micro, small, and medium enterprises (MSMEs) to the EU's Carbon Border Adjustment Mechanism (CBAM)
3. Mitigating the (cumulative) impact of other EU steel measures
4. Strengthening domestic policy measures to accelerate steel decarbonisation in India
5. Enhancing India's strategic engagement on steel decarbonisation on multilateral platforms

These five pillars, further developed in the sections below, include recommendations for the European Commission and the Government of India to implement domestically, advance bilaterally through EU–India cooperation, and pursue at the multilateral level.

8.1 Reframing EU–India cooperation on steel decarbonisation around India's challenges

Recent developments in EU–India relations signal a shift toward more structured cooperation on climate and industrial policy. However, unlocking meaningful progress in steel decarbonisation requires moving beyond high-level commitments toward targeted, operational measures.

This section presents a set of actionable recommendations to guide such engagement, focusing on the importance of leveraging the existing EU–India momentum (8.1.1); reframing EU-India cooperation around Indian steel decarbonisation (8.1.2); establishing a joint de-risking mechanism (8.1.3); incentivising technology transfer (8.1.4); creating opportunities for technology co-development (8.1.5); concluding negotiations for a hybrid investment protection and facilitation agreement (8.1.6); advancing regulatory cooperation (8.1.7); anchoring cooperation in areas of mutual strengths, including around green hydrogen (8.1.7); and establishing a steel coordinating body (8.1.8).

8.1.1 Leverage the EU–India FTA momentum

There is growing – and unprecedented – momentum to strengthen EU–India cooperation on steel decarbonisation. The conclusion of the EU–India Free Trade Agreement (FTA) and the Joint EU–India Comprehensive Strategic Agenda, the establishment of a Strategic Task Force on Green Hydrogen, ongoing discussions on India's potential association with Horizon Europe, and the signing of a climate cooperation MoU all signal a clear recognition by both parties that hard-to-abate sectors and clean energy must be central to bilateral engagement. Notably, the CBAM Annex to the Regulatory Cooperation chapter of the EU-India FTA explicitly states that "cooperation and support…shall aim to promote India's domestic greenhouse gas reduction and long-term industrial transformation" (European Union and India 2026a, Annex 14A, Art. 4[3]). These developments build on, and complement, existing cooperation frameworks – particularly the Trade and Technology Council (TTC) and the EU-India Clean Energy and Climate Partnership (CECP) – and together create a dense and increasingly strategic institutional architecture for collaboration.

However, translating this momentum into meaningful decarbonisation outcomes will require a fundamental shift in approach. Current discussions remain overly focused on the Carbon Border Adjustment Mechanism (CBAM), which, on its own, does not provide Indian producers with the tools needed to decarbonise. Given that the majority of Indian steel production serves the domestic market, CBAM offers only limited incentives for emissions reduction within India. EU–India cooperation must therefore pivot towards mutually beneficial, solution-oriented approaches that leverage the two parties' complementary strengths. This, in turn, requires a more nuanced understanding of each side's industrial context and decarbonisation pathway – particularly India's economic realities and structural constraints, which will ultimately shape the pace and nature of its steel sector transition (Karkare 2026).

8.1.2 Reframe cooperation around the objective of Indian steel decarbonisation

To support its rapidly growing economy, India's steel production is projected to double by 2030 (relative to 2019 levels) and quadruple by 2050. While there is clear political commitment to decarbonisation, reflected in initiatives such as the Green Steel Roadmap, the Green Steel Taxonomy, the National Green Hydrogen Mission (NGHM), and the draft National Steel Policy, which proposes a 25% decarbonisation target, structural and resource constraints make large-scale progress in the near term highly challenging.

Key barriers include India's continued reliance on coal, limited domestic natural gas reserves, limited availability of scrap, limited access to suitable technologies, constrained access to finance, high investment risks, and weak domestic demand for green steel. Addressing these barriers requires moving beyond siloed approaches to trade, investment, and policy instruments for technical and financial assistance, towards adopting a more integrated cooperation strategy for steel decarbonisation.

A more effective EU-India partnership on steel decarbonisation should be built around four building blocks: (i) establishing a joint de-risking mechanism, including through Global Gateway support; (ii) incentivising technology transfer/co-development; (iii) creating a more enabling environment for investment in clean energy and decarbonisation; and (iv) strengthening regulatory cooperation around clean technologies, carbon pricing, and the relevant standards. Doing so would reflect the building blocks of the Clean Trade and Investment Partnerships (CTIPs), as set out in the Clean Industrial Deal, the first of which was concluded between the EU and South Africa in November 2025 (European Commission 2025b). These building blocks are further unpacked in the sections below.

8.1.3 Establish a joint de-risking mechanism

The EU and India should establish a joint de-risking mechanism that combines public, concessional, and private finance to deliver risk-adjusted returns and enable India to participate in early-stage technology development. The European Investment Bank could take a leading role in this by providing blended finance and risk-sharing mechanisms under the Global Gateway and the European Fund for Sustainable Development Plus (EFSD+). The European Investment Bank has already invested EUR 1 billion in India's green hydrogen deployment (see Section 7.3.1); additional funding should be made available to focus on other key steel decarbonisation opportunities and challenges.

8.1.4 Incentivise the transfer of low carbon steel technologies

EU–India cooperation can play a critical role in addressing the current shortfall in technology investment in India's steel sector. This should include actively incentivising technology transfer, particularly in areas where the EU holds a comparative advantage, technologies are already at high levels of readiness, and only limited adaptation is required for deployment in the Indian context. Priority areas include scrap-processing and automation technologies, as well as Proton Exchange Membrane (PEM) electrolyser technologies essential for green hydrogen production. In parallel, mechanisms such as patent pooling and public-interest licensing should be more systematically explored to lower access barriers and accelerate technology diffusion.

Trade liberalisation in environmental goods and services can further support this process, provided that priority technologies are clearly defined and trade instruments are carefully aligned with India's broader industrial policy objectives.

8.1.5 Create opportunities for technology co-development

Where existing steel decarbonisation technologies are not suited to India's steelmaking conditions, the EU and India must prioritise joint technology co-development tailored to the Indian context. This is particularly critical for the MSME segment, where the innovation gap is most pronounced. Cooperation must therefore move beyond early-stage research and feasibility studies and shift decisively toward co-development.

To achieve this, the EU and India should establish dedicated co-development consortia. By pooling expertise, sharing costs, and setting clear frameworks for intellectual property ownership, data sharing, and commercialisation, such consortia can lower entry barriers for both public research institutions and private firms, while accelerating technology learning across the broader steel ecosystem. Both sides must identify a set of strategic priority technologies for India's steel decarbonisation. These should then serve as the basis for joint development, testing, and deployment within the consortium. One promising area is piloting hydrogen-based direct-reduced iron (DRI) solutions adapted for smaller operating units and lower-grade iron ore, an approach currently being explored through the HyIron consortium in Namibia (see Section 7.2.2). Tailoring such technologies to Indian conditions could unlock scalable pathways for decarbonisation across a wider segment of the industry.

8.1.6 Conclude negotiations for a hybrid investment protection and facilitation agreement

Creating a more predictable and facilitative foreign direct investment (FDI) environment will be critical to scaling investment in clean energy value chains and technologies relevant for steel decarbonisation. To this end, the EU and India should consider adopting a hybrid investment framework that combines elements of traditional EU investment protection agreements with modern investment facilitation approaches. This could draw on existing models such as the Investment Facilitation for Development (IFD) Agreement, Sustainable Investment Facilitation Agreements (SIFAs), and CTIPs.

Such a framework should include horizontal provisions aimed at improving the overall investment climate, including enhanced transparency of investment measures; streamlined and accelerated administrative procedures; the establishment of dedicated focal points to serve as first points of contact for investors; strengthened domestic regulatory coherence; and mechanisms for cross-border cooperation.

Importantly, investment facilitation should extend beyond administrative simplification to actively identifying and addressing structural investment barriers. This could be achieved through the establishment of a structured business-to-government dialogue, similar to the model adopted under the EU–South Africa CTIP, enabling stakeholders to raise concerns related to investment constraints. These inputs should systematically feed into government-to-government processes to ensure responsiveness and policy follow-through.

Such a dialogue, alongside existing platforms such as the TTC, should also be leveraged to proactively identify and prioritise concrete investment opportunities in clean energy and energy-intensive sectors, including steel. These priority areas can serve as the basis for targeted bilateral engagement, helping translate high-level cooperation into bankable projects and tangible outcomes.

8.1.7 Advance regulatory cooperation in carbon accounting and green steel

Another key pathway to advance steel decarbonisation – while simultaneously addressing emerging trade barriers – is to strengthen regulatory cooperation, particularly on clean technologies, carbon pricing methodologies, and decarbonisation-related standards. A central area for EU–India collaboration, explicitly referenced in the Joint EU–India Comprehensive Strategic Agenda, is the design and implementation of carbon trading systems – namely the EU Emissions Trading System (ETS) and India's Carbon Credit Trading Scheme (CCTS) (European Union and India 2026b, 1.2.13).

While these systems differ fundamentally – the EU ETS operating as a cap-and-trade mechanism and the CCTS as a baseline-and-credit system – structured exchange of best practices in carbon-pricing methodologies is essential. Such engagement would support greater methodological alignment and help identify pathways for partial interoperability, which will become increasingly important as carbon pricing begins to shape trade flows more directly.

Regulatory cooperation should also be deepened in the area of decarbonisation-related standards. The Joint EU–India Comprehensive Strategic Agenda underscores the need to exchange best practices in defining low-carbon materials, including steel, while ensuring a level playing field (European Union and India 2026b, 1.3.11). In this context, efforts should focus on aligning underlying methodologies, particularly given expected differences between India's Green Steel Taxonomy and the EU's forthcoming low-carbon steel standard under the Ecodesign for Sustainable Products Regulation (ESPR). Greater convergence in definitions and measurement approaches will be critical to avoid future trade frictions.

Finally, the EU and India should prioritise regulatory cooperation on green hydrogen certification frameworks. This will be particularly important for enabling trade in electrolysers and hydrogen-related value chains, as discussed in more detail in Recommendation 8.1.8 below.

8.1.8 Anchor cooperation in areas of mutual strengths, including trade and investment opportunities around electrolysers, green hydrogen and green iron

Cooperation should be firmly anchored in areas of clear strategic alignment between the EU and India. Green hydrogen – and in particular the manufacturing of electrolysers, the core technology underpinning its production – already stands out as a priority domain where cooperation can effectively leverage complementary strengths. The EU is seeking cost-competitive access to electrolyser technology while reducing supply chain risks, whereas India requires capital, technology, and market access to establish itself as a global manufacturing hub. Targeted cooperation in this area can therefore simultaneously advance India's industrial development and decarbonisation objectives, while supporting the EU's climate and energy security goals. Reflecting this alignment, green hydrogen has been identified as a key pillar in the Joint EU–India Comprehensive Strategic Agenda, including through the establishment of a Task Force on Green Hydrogen "to foster cooperation on hydrogen production, storage, and distribution to support efforts to decarbonise hard-to-abate sectors" (European Union and India 2026b, 1.3.4).

At the same time, the export of green hydrogen and its derivatives from India to the EU warrants more focused and systematic exploration. This pathway aligns with India's ambition to become a major exporter of green hydrogen and the EU's recognition that a significant share of its future demand will need to be met through imports. However, realising this opportunity will require addressing substantial barriers, including high production and transport costs, technological constraints, and safety considerations associated with long-distance hydrogen trade.

In this context, the export of green iron – rather than hydrogen itself – may offer a more practical and economically viable pathway. By embedding decarbonisation within the production process in India and exporting a higher-value intermediate product, this approach could reduce transport-related challenges while delivering mutual benefits for both EU and Indian steel decarbonisation efforts. However, further studies are needed to assess India's relative competitiveness as a potential iron exporter, especially given India's import dependence on high-quality iron.

Beyond hydrogen-related pathways, EU–India cooperation should be deliberately expanded to encompass a broader set of steel decarbonisation and clean energy solutions. Particular emphasis should be placed on technologies and business models that can support the transition of India's MSME-dominated steel ecosystem, where targeted cooperation could deliver disproportionate impact.

8.1.9 Establish an institutional coordinating body

Institutional fragmentation remains a key challenge that must be addressed. As noted earlier, a growing number of institutions, platforms, and task forces have emerged to advance EU-India cooperation on trade and climate change, many of which could also support collaboration on steel decarbonisation. While this proliferation reflects strong political interest and momentum, it also risks diluting focus and creating fragmented, overlapping initiatives.

To translate this momentum into tangible outcomes, a central coordinating mechanism is needed. This role could be assumed by the Trade and Technology Council (TTC) or by the strategic partnership platform envisaged under the EU's proposed MoU. Such a mechanism should align existing initiatives, prioritise key technologies, and ensure coherence across trade, investment, and climate policy.

At the same time, effective coordination must be complemented by a strong bottom-up approach. Meaningful progress will depend on the systematic involvement of technical experts, industry stakeholders, and research institutions from both the EU and India. This should include representatives from large integrated steel plants (ISPs) as well as MSMEs. Broad-based stakeholder engagement is essential to identify commercially viable, context-specific solutions and to ensure that cooperation is grounded in operational realities rather than limited to high-level commitments.

Delivering this approach will require more structured and coordinated engagement on both sides. On the Indian side, this could be facilitated by establishing an inter-ministerial, public–private platform to support engagement with EU counterparts. Such a platform could build on the model currently under consideration by the Ministry of Steel (see Box 14).

Without stronger coordination and deeper stakeholder integration, there is a significant risk that current political momentum will not translate into meaningful implementation, resulting in limited on-the-ground impact.

8.2 Reducing CBAM exposure, with a focus on MSMEs

The heterogeneous impact of the CBAM across India's steel sector underscores the need for differentiated policy responses. The divide between ISPs and MSMEs is particularly pronounced. ISPs are relatively well-positioned to adapt to the CBAM, owing to their lower emissions intensity, stronger technical capabilities, and greater access to finance. Meanwhile, MSMEs face structural constraints, including limited access to capital and technology, and a lack of capacity to comply with monitoring, reporting, and verification (MRV) protocols. Without targeted intervention, the CBAM risks worsening existing asymmetries and marginalising MSMEs in the export market. Indeed, the CBAM Annex in the EU-India FTA acknowledges the importance of supporting India's MSMEs in reducing greenhouse gas emissions and complying with carbon border measures (European Union and India 2026(a), Annex 14-A, Art. 1[c]).

There are six different ways in which the challenges MSMEs experience under the EU CBAM can be addressed: engaging in a mapping exercise to better understand MSMEs' exposure (8.2.1); engaging in targeted MRV capacity building for MSMEs (8.2.2); developing a pool of India-based CBAM verifiers, including by negotiating a mutual recognition agreement (MRA) (8.2.3); revising and developing production-route-specific default values under the CBAM (8.2.4); and building awareness of CBAM development and updates for MSMEs (8.2.5); and promoting awareness about CBAM (8.2.6).

8.2.1 Map Indian MSME participation in steel exports

India and the EU should anchor CBAM cooperation in a more granular understanding of the MSME steel production and export landscape. While it is clear that MSMEs comprise a significant share of Indian steel exporters and dominate the export of downstream products under HS73 and long steel products under HS72, accurate official statistics on their role in steel exports are difficult to find (Industry representatives 2025; Industry association 2025; Das and Bandopadhyay 2025). Indeed, none of the government officials or industry associations consulted for this project could share this information.

The absence of detailed data on MSME exporters requires developing a mapping exercise that gathers data on the percentage of India's total exported steel produced by MSMEs; the percentage of MSME-produced steel that is being exported (by product category, e.g., proportions of HS72 and HS73 products, and by geographic region); production routes, carbon emissions, and scrap reliance. Conducting such a study would be a necessary precondition for targeted capacity building to minimise CBAM exposure.

8.2.2 Build the MRV capacity of MSMEs

A more immediate priority is to strengthen MSMEs' capacity for MRV. As highlighted in Section 4, MSMEs' reliance on default values — often significantly higher than their actual emissions — substantially increases their effective CBAM burden, weakening not only their competitiveness vis-à-vis firms that can rely on their direct emissions, but also the incentives to decarbonise. Strengthening MRV systems would enable firms to report their actual carbon emissions, thereby reducing their CBAM costs. Moreover, MRV capacity is important not only to remain competitive under CBAM, but will be increasingly important under emerging steel measures (see section 8.3 below), and a requirement to participate in India's CCTS. Thus, equipping MSMEs with MRV capacity is critical to address the emerging green divide between ISPs and MSMEs.

Crucially, MRV support must move beyond technical dialogue and translate into technical and financial support to build infrastructure, training, and institutional capacity. EU-India engagement should focus on areas where Indian MSMEs struggle the most. This involves supporting the digital infrastructure needed for emissions monitoring, including continuous emissions monitoring systems and automated, Internet of Things-enabled sensors – given that many MSMEs currently use manual logging and spreadsheet tracking. Data storage and related issues must also be addressed. Ensuring access to accredited verifiers would be critical (see recommendation 8.2.3). Moreover, given the complexity of the current CBAM data reporting sheets, there may also be a push to simplify MRV requirements, especially for MSMEs.

Given the fragmented nature of the MSME sector, technical and financial support would likely be most effective through a cluster-based approach (see recommendation 8.4.3). Shared MRV infrastructure, verification services, and data platforms at the cluster level could significantly reduce compliance costs and improve accessibility (Civil society representative 2025).

8.2.3 Facilitate access to accredited verifiers

Access to EU-accredited verifiers is a prerequisite to being able to comply with MRV under the CBAM. While EU rules permit non-EU entities to become accredited, the process is complex and resource-intensive, requiring establishing, implementing, monitoring, and evaluating a competence process; ensuring impartiality; establishing verification procedures, such as compliance with ISO 14065:2020 and ISO/IEC 17029:2019; and establishing a policy for communication with the operator and arrangements to safeguard confidentiality.

The EU and India should develop a Mutual Recognition Agreement (MRA) between EU and Indian accreditation bodies, which could substantially expand the pool of eligible verifiers in India and reduce compliance costs, thereby improving MSMEs' market access. The CBAM Annex in the EU–India FTA identifies the development of an MRA for verifiers as an area of further technical dialogue. (European Union and India 2026a, Annex 14-A, Art. 3[c]). This reflects political will on both sides to support easier verification procedures for Indian firms.

8.2.4 Establish more accurate, production-route-specific default values under the CBAM

A key challenge for MSMEs under CBAM is their inability to comply with MRV and their reliance on punitive default values. The existing default values under the CBAM and their gradually increasing punitive markup could significantly exceed MSMEs' actual emissions, effectively penalising firms not for higher emissions but for their limited capacity to engage in MRV. Improving the accuracy of the EU-established default values for India is therefore essential to reducing CBAM exposure for MSMEs that rely on them. Indeed, this is highlighted as an area of EU-India engagement in the CBAM Annex to the EU–India FTA, which notes that the parties shall exchange information and technical data to facilitate the establishment of default values under BCAs and other measures (European Union and India 2026a, Annex 14-A, Art. 3[b]).

Data generated under the CCTS, which aims to cover 253 steel units, could provide a strong basis for revising India's default steel values. In particular, this data could serve as a basis for developing production-route-specific default values. Currently, the India-specific default values are predominantly based on the blast furnace-basic oxygen furnace (BF–BOF) production route, which is significantly more carbon-intensive than the scrap-based electric arc furnace (EAF) route (but less intensive than the coal-based direct reduced iron–induction furnace (DRI–IF) pathway). Firms using less carbon-intensive production routes should not be penalised by being forced to apply the BF–BOF average emission values with a punitive markup.

However, to use the data generated by the CCTS to refine the EU's India-specific default values, the scheme must be effectively operationalised, and methodological differences between the CBAM and the CCTS must be accounted for, particularly regarding scope differences (the EU ETS currently covers only scope 1 for steel, but the CCTS covers scopes 1 and 2). As noted in Section 5, facilitating methodological interoperability and/or mutual recognition between data collected under the CCTS and the CBAM would also be critical for reducing Indian firms' CBAM costs. One way to do this would be by aligning data collection under the CCTS with product-level classifications, such as HS 8-digit codes.

8.2.5 Establish clarity around CBAM deductions

A carbon price effectively paid outside the EU may be deducted from CBAM costs. The Commission must promptly clarify the criteria for a carbon price to be considered effectively paid in a third country, so it is eligible for CBAM deduction. As the implementing act that will provide this information is yet to be released, uncertainty continues about whether, for instance, a carbon export tax or Paris Agreement Article 6 credits qualify under the scheme. Moreover, this clarification would be important for firms subject to the forthcoming CCTS to prepare the requisite information needed to obtain a deduction. Indeed, it remains unclear what substantive and procedural requirements must be met to claim a CBAM deduction. Clarity on these criteria is essential, both to enable firms to assess their financial exposure and to inform policy measures to mitigate the impact on Indian exporters.

Nevertheless, even if the carbon price firms have paid under the CCTS qualifies for CBAM deductions, the extent of the deduction that may be claimed will likely be limited, due to the anticipated gap between the carbon price in India and the EU, as well as the scope and coverage mismatches between the two systems.

8.2.6 Promote awareness of the CBAM and establish focal points in both India and the EU

As CBAM updates, amendments, and implementing acts are released at a rapid pace, it is challenging for Indian firms, especially MSMEs, to stay up to date. In addition, many implementing documents are highly technical and require expert interpretation. To ensure that exporting MSMEs, as well as suppliers and other intermediaries, are apprised of the latest standards and requirements, focal points that could serve as a helpdesk must be established at both the EU and Indian levels. These could take various forms.

At the EU level, such a focal point could serve as a help desk for all third-country producers covered by CBAM (not just India), where firms can ask CBAM questions and access relevant materials/guiding documents. Possibly, using specifically trained artificial intelligence systems to respond to questions would ensure that this helpdesk would not overload resources on the EU side. Targeted country programs, including for India, should accompany this helpdesk. EU delegations could play an important role in doing so. These efforts would be important complements to the Commission's existing outreach efforts, including its CBAM self-assessment tools.

In addition, an India-specific EU steel exporters helpdesk should be established in India. This platform would cover CBAM and also raise awareness of other upcoming EU measures, as expanded upon in recommendation 8.3.2. This could be done within the Indian Ministry of Commerce, and/or through industry associations. It could build on the recently established India CBAM Registry, a national, industry-led digital platform, supported by the Services Export Promotion Council and the Federation of Indian Chambers of Commerce & Industry (FICCI), designed to advance matchmaking between CBAM-ready Indian companies and EU buyers (PTI 2026). This platform could serve as a basis for supporting firms' CBAM-readiness, including by providing regular updates and serving as a CBAM helpdesk. In particular, it would be key to include MSME-oriented industry associations in these initiatives.

Beyond adopting MRV and facilitating CBAM compliance, reducing CBAM costs – especially for coal-based DRI–IF plants owned by MSMEs – would require the adoption of ambitious decarbonisation strategies. This will be further discussed in Section 8.4 below.

8.3 Mitigating the (cumulative) impact of other EU steel measures

While the CBAM has dominated the policy discourse, the broader suite of EU steel-related measures is likely to have equally significant, if not greater, implications for Indian exporters. Managing this evolving regulatory landscape will require moving beyond a narrow focus on CBAM towards a more comprehensive strategy that combines awareness-raising, policy alignment, phased implementation, and institutionalised EU-India cooperation. Without such a comprehensive approach, the cumulative burden of these measures' risks being an obstacle to Indian firms' EU market access while weakening incentives for domestic decarbonisation, particularly for companies already facing structural constraints.

This section highlights seven recommendations to mitigate the cumulative implications of existing and forthcoming EU measures on steel exporters. This includes creating awareness by introducing a steel-specific focal point in India (8.3.1); ensuring EU policy coherence and avoiding sending contradictory signals (8.3.2); enhancing Indian participation and coverage in the upcoming impact assessment for the delegated act on steel under the ESPR (8.3.3); adopting a gradual and sequenced ESPR implementation in the EU (8.3.4); aligning emissions accounting methodologies between EU measures (8.3.5); enhancing convergence between EU and India low carbon steel definitions (8.3.6); and developing Digital Product Passport (DPP) pilot projects (8.3.7).

8.3.1 Create awareness about the growing complexity of EU steel regulations, including through a steel-specific focal point in India

A growing "spaghetti bowl" of EU steel-related measures (Keane and van der Ven 2025) – most notably the forthcoming delegated act for steel under the ESPR and the new tariff-rate quota (TRQ) regime for steel (to enter into effect in July 2026) – is set to fundamentally reshape market access conditions for steel exporters. Taken together, these measures are poised to introduce a layered, increasingly complex compliance environment that extends well beyond the CBAM and will significantly increase the regulatory burden on a subset of Indian steel producers covered by these measures.

Despite their far-reaching implications, awareness among Indian stakeholders remains strikingly limited. In particular, there is little understanding of the ESPR's emerging requirements, including labelling of low-carbon steel, ecodesign and performance standards, enhanced transparency obligations, and the introduction of DPPs. This lack of preparedness means that, once these measures come into effect, it might catch firms by surprise. This means that it is key to create awareness among Indian firms of these upcoming measures that could affect steel competitiveness when exporting to the EU. This could be done by creating a steel-specific helpdesk that raises awareness of CBAM and other EU steel measures exporters must be aware of. This initiative can build on the existing India CBAM Registry (see recommendations 8.2.6 above).

8.3.2 Ensure EU policy coherence and avoid sending contradictory signals

Beyond awareness, the design of the EU measures raises more fundamental concerns about policy coherence. In particular, there is an emerging disconnect between the EU's stated objective in CBAM and beyond of supporting global decarbonisation efforts, and the design of certain trade-related instruments.

Restrictions on steel scrap exports, for example, directly constrain India's ability to scale scrap-based production – one of the most cost-effective decarbonisation pathways. Similarly, trade defense instruments, that (will) apply irrespective of a product's carbon intensity, risk diluting incentives for low-carbon production. If left unaddressed, these inconsistencies could undermine both the effectiveness and credibility of the EU's international climate agenda. Ensuring continued access to scrap under the revised Waste Shipment Regulation (see Section 6.2.3) and exploring avenues to address the impact of upcoming trade defense instruments on decarbonisation incentives will therefore be critical.

8.3.3 Strengthen the coverage of India in EU impact assessments, especially the upcoming impact assessment for the Delegated Act for steel under the Ecodesign for Sustainable Products Regulation

To ensure that forthcoming EU regulations anticipate and address market access implications for third countries, including India, it is critical that impact assessments adequately cover their impact on trading partners. This is not always the case, as most impact assessments focus predominantly on the EU stakeholders.

A key opportunity to enhance focus on India, a key steel exporter to the EU, is the upcoming Delegated Act for steel under the ESPR, anticipated to enter into effect in 2028. There will be an impact assessment to support this Delegated Act, and this impact assessment must unpack the upcoming steel requirements' impacts on EU steel trading partners, including India, and adapt the scope and requirements to mitigate any negative spillovers and to give steel exporters to the EU sufficient time to adapt.

At the same time, the Government of India can assist these efforts by conducting its own steel ESPR impact assessment and providing detailed information on how the proposed low-carbon and ecodesign standards for steel, as well as DPPs, would impact Indian steel-producing firms, including MSMEs. Moreover, in this process, it would be important for India to highlight implementation challenges, which may be aggravated by other EU measures. For instance, if the ESPR were to require a minimum scrap content in steel products, this requirement might be difficult for India to fulfil, given its reliance on scrap imports. EU scrap restrictions risk making these requirements even more difficult.

8.3.4 Adopt a gradual and sequenced implementation approach of the Delegated Act on steel under the Ecodesign for Sustainable Products Regulation

To mitigate trade barriers on Indian exporters, a gradual, sequenced implementation of ESPR-related measures will be essential. A phased approach – starting with voluntary standards for a limited set of products, followed by a progressive tightening of requirements – would allow firms to build the necessary capabilities over time. Moreover, it is essential that the initial scope of the low-carbon steel and ecodesign standards under the ESPR would be limited to a subset of products. Otherwise, there is a real risk that compliance burdens will disproportionately affect firms with limited adaptive capacity, particularly MSMEs, and could ultimately lead to market exit rather than decarbonisation.

8.3.5 Align methodologies for carbon emissions accounting between EU measures

Reducing regulatory fragmentation also requires greater methodological alignment. In particular, allowing non-EU producers to rely on CBAM methodologies for emissions calculations across ESPR-related instruments would significantly lower compliance costs and administrative complexity. One way to mitigate compliance burdens across the board, once the ESPR and other related measures relevant to steel have entered into force, would be by creating a digitalised MRV platform that could serve as a one-stop shop for carbon emissions accounting under the CBAM, ESPR, and other relevant measures (Scott 2025).

Meanwhile, clarification is needed on the extent to which CBAM default values can be used under these frameworks or whether verified plant-level data will be required. Ensuring consistency across methodologies is essential to avoid duplicative reporting requirements and to facilitate compliance across multiple regulatory regimes.

8.3.6 Enhance convergence between EU and Indian low-carbon steel standards

While full alignment between the EU's low-carbon steel standards and India's Green Steel Taxonomy is unlikely – due to differences in scope, ambition, and industrial context (see Section 6) – there is scope to progressively strengthen convergence. Efforts should focus on enhancing methodological interoperability, sharing best practices, and, where feasible, exploring limited forms of mutual recognition. Over time, such cooperation could help reduce fragmentation and support the development of more integrated low-carbon steel markets.

8.3.7 Prepare for digital product passports by establishing a pilot program

DPPs, which will be introduced under the ESPR, are a particularly demanding upcoming requirement. For most Indian firms, especially MSMEs, the underlying prerequisites – robust emissions data, supply chain traceability, and digital infrastructure – are not yet in place (See Section 4.3.2.2). Without targeted preparation, compliance will be highly challenging. Developing pilot DPP schemes for selected products, aligned with international lifecycle assessment standards and informed by emerging practices in jurisdictions such as the United Arab Emirates (UAE) (UAE Ministry of Industry and Advanced Technology n.d.) and the People's Republic of China (Marketers MEDIA Newswire 2025), would provide a practical pathway forward. Close engagement with the EU will also be necessary to ensure realistic transition timelines and adequate technical support.

In the interim, Indian firms – particularly ISPs – can take proactive steps by adopting voluntary traceability and sustainability frameworks, such as the World Steel Association's chain-of-custody guidelines and ResponsibleSteel certification (see Section 6.2.1.2). Early adoption of these frameworks would not only facilitate eventual compliance with DPP requirements but also strengthen firms' positioning in increasingly carbon-sensitive markets.

8.4 Strengthening domestic policy instruments to accelerate Indian steel decarbonisation

Building on the previous recommendations, which focus predominantly on EU-India cooperation, this section highlights several additional initiatives that the Indian Government could consider domestically to catalyse steel decarbonisation in the context of its rapidly growing steel industry. In particular, it highlights the importance of decoupling steel production from carbon emissions (8.4.1); scaling up funding and enhancing access to financing for MSME-specific decarbonisation technologies (8.4.2); strengthening institutional coordination across ministries in the Indian government (8.4.3); operationalising and scaling the CCTS (8.4.4); gradually integrating MSMEs into the CCTS (8.4.5); formalising and modernising the Indian scrap system (8.4.6); creating demand signals for steel decarbonisation (8.4.7); engaging with MSMEs on a cluster basis (8.4.8); and leveraging the role of state governments.

8.4.1 Decouple steel production from carbon emissions

At a macro level, the Indian government must more effectively integrate its steel decarbonisation objectives into its steel production expansion strategy. This requires decoupling steel production from carbon emissions. The draft National Steel Policy 2025 – although not yet publicly available at the time of writing this report – appears to be heading in this direction by aiming to increase production to 400 million metric tonnes (MMT) of crude steel by 2035–36, alongside a 25% reduction in emissions intensity (Arora 2026)59 Establishing these headline carbon-reduction targets, along with production expansion goals, underscores the importance of India's decarbonisation objectives, signalling its attempt to reconcile rapid industrial growth with long-term climate commitments (Pradhan 2026). It also signals that decarbonising steel is increasingly important to the Indian government, especially compared to the National Steel Policy 2017, which does not include a steel decarbonisation target. However, to effectively achieve decoupling requires translating headline targets into actionable policy instruments, including financing mechanisms, technology development and deployment, and regulatory incentives.

59 Specifically, the draft National Steel Policy 2025 aims to reduce carbon emissions to 2 MT of CO2 per finished tonne of steel by 2035–36 (see Section 3.3.1).

8.4.2 Scale funding and facilitate access to finance to support MSME steel decarbonisation

A critical constraint is the insufficient allocation of funds to research and development (R&D) and deployment of, particularly, MSME-relevant technologies. Current public R&D spending in the iron-and-steel sector – estimated to be INR 5–10 crore (around EUR 460,000–950,000) annually (see Section 7.2.1.1) – falls significantly short of the scale required to support the adoption of transformative technologies such as hydrogen-based DRI or molten oxide electrolysis (MOE), which require investments of the order of thousands of crores (see Section 7). Moreover, existing funding priorities, as reflected in the recent budgetary focus on carbon capture, utilisation, and storage (CCUS) (Section 3.3.1), favour capital-intensive technologies more suited to ISPs, with limited near-term relevance for MSMEs.

The Indian government should increase the budget allocation for R&D in the steel sector to achieve its climate objectives. To address the emerging green divide, it should also adopt a strategic reorientation of public funding toward technologies tailored to MSMEs' needs, including hydrogen-based rotary kilns.

In addition, the Indian government should focus on enhancing access to financing for MSMEs. Along these lines, a recent government initiative is offering micro and small MSME exporters of 167 specific iron and steel products interest rate subsidies to reduce borrowing costs, allowing them to take out loans at reduced interest rates (Mukesh 2026). This is a step in the right direction, and expanding the scheme to cover all firms categorised as MSMEs – not just the small and micro ones – could further enhance its impact.

8.4.3 Adapt cluster-based approaches to MSME decarbonisation

Given the spatial concentration and technological homogeneity of India's secondary steel sector, cluster-based approaches offer a highly effective model for decarbonisation. Industrial clusters – such as those in Odisha (Rengali and Kuarmunda), Jharkhand (Chandil), Chhattisgarh (Raipur and Raigarh), Maharashtra (Jalna), and others – enable collective action that can compensate for the limited financial and technical capacity of individual MSMEs (Verma et al. 2024).

Cluster-level initiatives could include shared MRV infrastructure, joint procurement of low-carbon technologies, awareness-building on regulatory requirements (such as the CBAM, CCTS, and ESPR), and collective engagement with policymakers and international partners. By aggregating demand and pooling resources, clusters can reduce costs, mitigate collectively the risks, and enhance the bargaining power of all firms.

8.4.4 Strengthen institutional coordination across Indian ministries

Indian line ministries often work in siloes. Effective steel decarbonisation, which spans multiple cross-cutting policy areas, requires stronger coordination among (for example) the Ministry of Steel, the Ministry of Commerce, the Ministry of New and Renewable Energy, the Ministry of Environment, Forests, and Climate Change and the Ministry of Finance, to identify strategic priorities, especially in the context of international trade and investment cooperation. Indeed, to identify strategic priorities for steel decarbonisation for EU–India cooperation, coordination across all these ministries, and potentially others, is required.

Specifically, enhanced inter-ministerial coordination is required to better identify priority areas for advancing EU–India cooperation, as well as multilateral cooperation (see section 8.5), on steel decarbonisation, and ensure that these existing cooperation platforms are leveraged strategically and translate into tangible outcomes.

8.4.5 Operationalise and scale the CCTS

The timely operationalisation of the CCTS, expected to be launched by mid-2026, must be a key priority. Doing so will be instrumental in developing a carbon accounting ecosystem in India, which is increasingly important not only for remaining competitive internationally but also for achieving India's climate objectives.

Beyond implementation, a strong case can be made for progressively increasing the CCTS' ambition in line with India's industrial growth trajectory. A more ambitious CCTS would, also, over time, enable firms to deduct a greater share of CBAM costs.

Increasing the CCTS' ambition can be done by gradually establishing tighter reduction targets, broader sector coverage, and stronger price signals. Experts have also suggested that the CCTS' ambition could be stepped up by integrating carbon taxes currently included in other schemes, such as the coal cess, which is now part of the goods and services tax (GST) (Industry representative 2025). Aligning these instruments with the CCTS or integrating them over time could help establish a clearer, more consistent carbon-pricing framework.

8.4.6 Integrate MSMEs into the CCTS

Ensuring MSMEs' participation in India's decarbonisation framework is critical. At present, MSMEs are de facto excluded from the CCTS. However, keeping them out of the CCTS system risks widening the green divide between ISPs and MSMEs.

An intermediate step to gradually integrate MSMEs into India's carbon accounting ecosystem is to step up their participation in the voluntary offset mechanism of the CCTS, which provides MSMEs with opportunities to monetise their decarbonisation efforts. However, registrations from steel-producing MSMEs to participate in this scheme have so far been very low (Kesh, Sharma, and Chaturvedi 2025). This reflects a lack of awareness as well as bureaucratic complexities related to registering.

Therefore, the Indian government should actively promote MSME participation in the voluntary offset mechanism, including through simplifying registration procedures, strengthening MRV capacities, improving awareness, and establishing robust monitoring frameworks (Kesh, Sharma, and Chaturvedi 2025). Over time, MSMEs should be progressively integrated into the CCTS to ensure an inclusive green transition.

8.4.7 Formalise and modernise the Indian scrap ecosystem

Increasing scrap use represents one of the most immediate and cost-effective pathways to reduce emissions, particularly for MSMEs. However, India's scrap ecosystem remains highly fragmented and informal, limiting both availability and quality. Formalisation is therefore essential, not only to improve collection rates and reduce contamination, but also to enable traceability, which is likely to be increasingly important for compliance with EU requirements (e.g., the ESPR, CBAM, the melt and pour rule, and the EU's upcoming steel TRQ) and new domestic standards.

Doing so will require stronger enforcement of existing scrap policies, such as the Vehicle Scrappage Policy (2022). Indeed, as of 2025, 350,000 vehicles have been scrapped under this policy, just under 3% of eligible vehicles (Kumari 2025). One way to incentivise enforcement is to provide a certificate to owners who bring their vehicles for scrappage, which can be used to avail of tax benefits (Civil society representatives 2025). Another option is to offer cheaper loans tied to scrappage-linked purchases. Moreover, the scrappage ecosystem has to be strengthened to enhance enforcement. This can be done by increasing the number of scrappage facilities across states, as well as by integrating digital systems to link scrappage.

More generally, formalising the scrap sector would require automation to support optimal resource use. EU-India cooperation can help access the requisite technologies, many of which are developed in the EU. Fiscal measures are also key: scrap currently attracts 18% GST, which discourages its formalisation (Industry association 2025). Reducing this to 5% would help formalise the sector (Industry association 2025). The fact that a number of large firms, including Tata Steel, have entered the scrap market (see Sections 3.3.2 and 3.3.3) provides an opportunity to drive formalisation, as it leads to more structured, traceable supply chains (Industry association 2025). Formalising the scrap market would also require creating new opportunities for the scrap collectors that are dominating the current informal system.

8.4.7 Create demand signals for steel decarbonisation

A key bottleneck to decarbonising steel in India is the lack of domestic demand for green steel. While India has already adopted the Green Steel Taxonomy, which defines different categories of green steel, progress on linking these definitions to procurement targets has been limited. India should continue to explore how best to integrate green steel requirements into its public procurement framework, while being mindful of the country's economic realities and inflation risks. One way to do so is for India to draw on international best practices to inform its policy design (World Bank 2024; Office of Federal Chief Sustainability Officer n.d.; Government of South Korea n.d.).60

ISPs can also play a role by leveraging their market influence to support sustainable procurement. For instance, Tata Steel ensures that sustainability is incorporated along the supply chain by providing suppliers that meet sustainability criteria with value-based points that carry weight in procurement decisions (Industry representatives 2025).

8.4.9 Leverage the role of state governments

India's quasi-federal structure requires that due importance be given to state-level engagement. State governments play a critical role in shaping the enabling environment for industrial decarbonisation, including through control over land, electricity, infrastructure, and local industrial policy. They are also well-positioned to support cluster-level initiatives and help ensure that domestic policies and international cooperation efforts align with on-the-ground realities. As such, they must play a key role in accelerating the decarbonisation of the Indian steel industry. Moreover, in the context of EU-India cooperation, state governments, particularly those hosting major steel clusters, should also be consulted.

8.5 Strengthening India's strategic engagement on steel decarbonisation on multilateral platforms

In addition to national and bilateral policy initiatives, India should adopt a more proactive, strategic leadership role on multilateral platforms to accelerate policy action on trade-related issues around steel decarbonisation. This requires moving beyond a predominantly reactive stance to instruments such as the CBAM and other border carbon adjustments, to using international fora to foreground India's domestic decarbonisation challenges. This would help ensure that the structural characteristics of India's steel sector – such as the central role of MSMEs, limited access to scrap, dependency on coal, and constrained availability of natural gas – are better reflected in global policy frameworks. This is critical not only for India's own transition but also for the success of global decarbonisation efforts, given that India's steel demand is projected to expand rapidly and its emissions intensity remains among the highest globally.

60 These policies should not be simply transplanted into India, but rather adapted to its developmental context and industrial structure, ensuring that the procurement policy functions as an active and scalable lever to boost domestic demand for green steel.

Several existing international platforms already provide opportunities for such engagement, although their effectiveness to date has been uneven. The United Nations Framework Convention on Climate Change (UNFCCC), and the associated processes of the Conference of the Parties (COP), remain central to discussions on climate finance, technology transfer, and development. However, progress in these areas, particularly in scaling finance for industrial decarbonisation and facilitating meaningful technology transfer, has been limited (see Section 7).

Financial commitments have consistently fallen short of the needs of developing countries, while existing mechanisms for technology transfer have delivered only modest results (see Section 7). Nevertheless, continued and more targeted engagement within the UNFCCC framework – particularly with a stronger focus on hard-to-abate sectors such as steel – could help India build coalitions with similarly placed countries and advocate for better-tailored financial and technological support.

In this context, India's engagement with the Industrial Deep Decarbonisation Initiative (IDDI) is particularly relevant (UNIDO n.d.). The initiative, supported by the United Nations Industrial Development Organization (UNIDO), focuses on creating demand for low-carbon industrial products, including steel, through public procurement, standard-setting, and voluntary purchasing commitments. India has already taken a leadership role within the IDDI, contributing to efforts to standardise carbon accounting methodologies, promote green public procurement, and incentivise investments in low-carbon materials. Complementing this, the Plan to Accelerate Solutions for Steel under the IDDI seeks to address key systemic barriers, including financial risks, the need for technology roadmaps, and the integration of steel decarbonisation into Nationally Determined Contributions (NDCs), while also emphasising inclusive participation, including that of MSMEs (UNFCCC n.d.). Sustained and deepened engagement with such initiatives would enable India to shape emerging global norms in ways that better reflect its own industrial structure.

India is also a participant in the First Movers Coalition, convened by the World Economic Forum (WEF), which aims to catalyse demand for low-carbon technologies across hard-to-abate sectors, including steel (PIB 2023). Leveraging its influence on such platforms, India can help shape demand-side signals for green steel while ensuring they remain compatible with developing-country production realities. Continued engagement with these initiatives will be important to bridge the gap between early-stage commitments and large-scale industrial deployment.

Multilateral engagement is also critical to addressing the growing fragmentation of standards and methodologies in steel decarbonisation. The global proliferation of carbon accounting frameworks, green steel definitions, and emerging border adjustment mechanisms risks increasing compliance costs and creating new trade barriers. These challenges are likely to intensify as more jurisdictions introduce their own climate-related trade measures. As highlighted in this report, the UK, along with other countries, is developing its own border carbon adjustment. Moreover, aligning definitions and standards is becoming increasingly important as additional traceability and reporting requirements emerge, such as DPPs and life-cycle analysis. The need to align standards across geographies is also emerging as a critical issue for green hydrogen.

In this context, India must actively participate in existing platforms, such as the Organisation for Economic Co-operation and Development (OECD) Inclusive Forum on Carbon Mitigation Approaches, which provides an important venue for improving transparency, enhancing the comparability of carbon mitigation efforts, and advancing methodological alignment (OECD IFCMA n.d.).

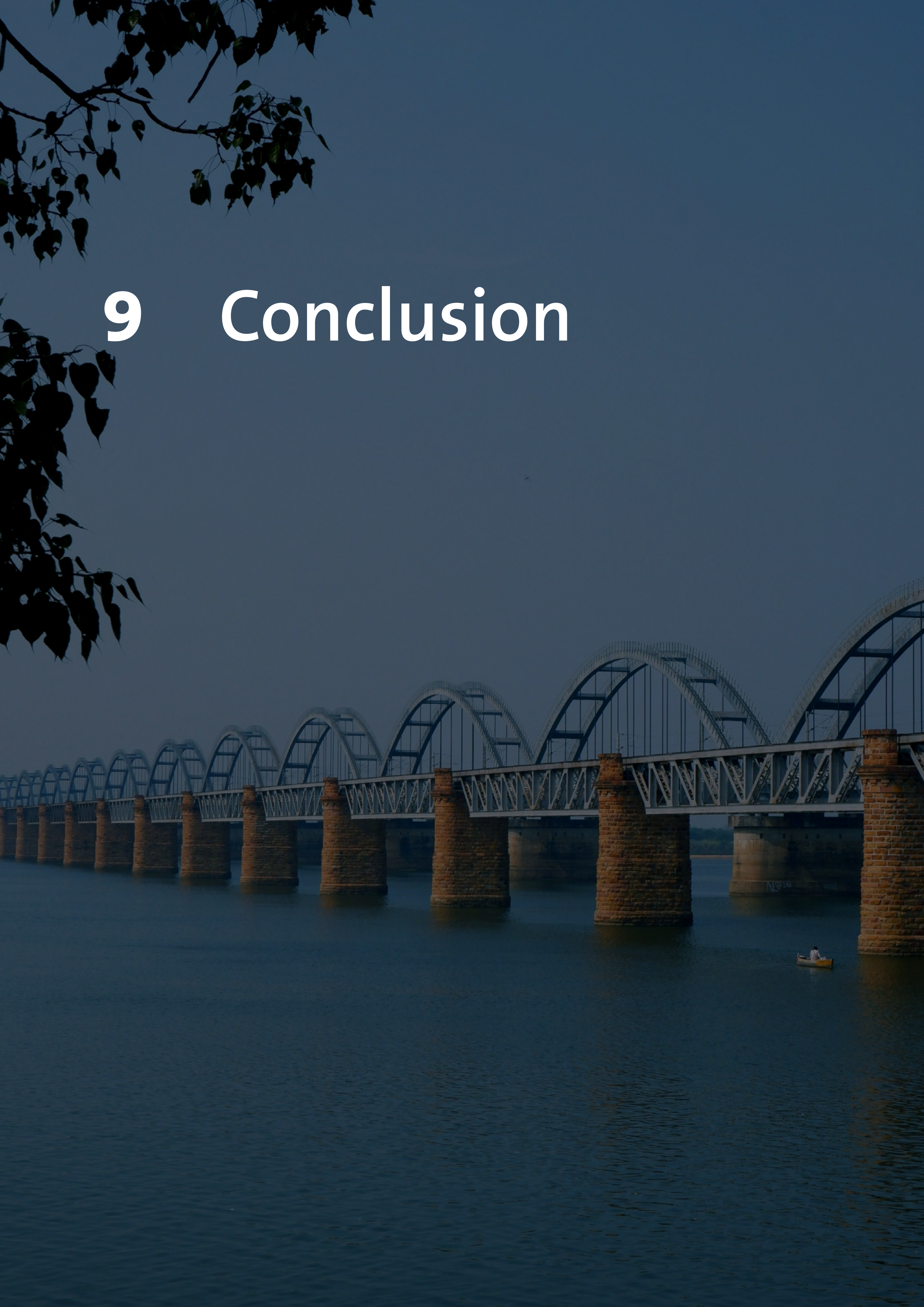
Similarly, the WTO has begun to engage more directly with climate-related standards, including through initiatives such as the Steel Standards Principles launched at the COP28 (WTO 2023). These efforts aim to promote common methodologies for measuring emissions in the steel sector and have already attracted broad support from industry and standard-setting bodies, including

Indian firms. Strengthening engagement in such processes would allow India to influence the development of globally recognised standards and reduce the risk of regulatory fragmentation.

Finally, emerging platforms such as the Integrated Forum on Climate Change and Trade (IFCCT), launched at COP30, offer a promising avenue to bridge the longstanding divide between trade and climate policy discussions (IFCCT n.d.). With its explicit focus on the trade–development–environment nexus, the IFCCT provides a space for addressing issues that are not adequately covered in existing fora (Lamy et al. 2023). Active Indian participation in these fora could help identify shared challenges across emerging economies, foster South–South cooperation, and encourage joint technology development and knowledge exchange towards steel decarbonisation.

Overall, while multilateral platforms have thus far delivered limited tangible outcomes, they remain critical arenas for shaping the global governance of industrial decarbonisation. More assertive and strategically coordinated Indian engagement, focused on aligning global frameworks with domestic realities, will be essential to ensure that international processes support, rather than constrain, India's steel decarbonisation pathways.

9 Conclusion



As India's steel production continues to expand over the next decade(s), the urgency of decarbonising the sector will intensify. This report has examined how the trade and investment frameworks of the European Union (EU) can support this transition, grounded in a detailed empirical analysis of the impact of CBAM on Indian steel exporters. The findings highlight differentiated impacts across firms: while integrated steel producers (ISPs) and lower-emission producers are likely to be only moderately affected, micro, small, and medium enterprises (MSMEs) – which contribute a critical share of India's steel exports – face disproportionately high adjustment costs. This heterogeneity underscores the complexity of ground realities and challenges the prevailing narrative in India that largely frames the CBAM as a uniformly negative trade measure.

At the same time, the CBAM is unlikely to be a significant driver of steel decarbonisation in India. With only around 6% of India's steel production destined for the EU market, its incentivising effects are confined to a relatively small segment of the industry. Decarbonising the Indian steel sector will, therefore, require moving beyond a narrow focus on the CBAM towards a more comprehensive strategy that directly addresses the structural constraints within the Indian steel sector.

The EU–India Free Trade Agreement (FTA) and the Joint Comprehensive Strategic Agenda provide a timely opportunity to operationalise such an approach. This report recommends a policy package that integrates trade, investment, and regulatory cooperation, including financial de-risking mechanisms, technology transfer and co-development, a hybrid investment protection and facilitation agreement, and closer alignment on carbon pricing frameworks. Critically, the effectiveness of these instruments will depend less on their individual design and more on their ability to operate in a coordinated manner, targeting the interlinked barriers to steel decarbonisation in India, which range from financing constraints and technological unsuitability to issues related to investment facilitation.

A central insight emerging from this analysis is the inherent complexity of aligning policy across jurisdictions and sectors. Policymaking in both the EU and India remains fragmented, with parallel initiatives – spanning trade policy, climate regulation, industrial strategy, and resource governance – often developed in isolation. This creates risks of policy incoherence, where measures such as the CBAM, scrap export restrictions, and intellectual property regimes may unintentionally undermine broader decarbonisation objectives. These challenges are further compounded by asymmetries in institutional understanding: Indian policymakers must navigate a complex and evolving EU regulatory landscape, while European counterparts often lack a granular appreciation of India's industrial structure and constraints. Addressing these gaps will require stronger bottom-up coordination mechanisms, deeper technical engagement, and better integrated policy design.

This report has sought to provide a foundation for broader discussions on the role of trade in steel decarbonisation. However, further in-depth analysis is needed to fully capture the complexity of this transition, bringing together technical, industrial, legal, and policy perspectives. Only through such an interdisciplinary and bottom-up approach can EU–India cooperation move beyond fragmented efforts and contribute to the systemic transformation required to decarbonise one of the world's most carbon-intensive industries.

Annex 1: List of interviews

This study draws on more than 80 interviews conducted between April 2025 and March 2026, both online and in person. The list below provides the name, title, organisation, and interview mode for each interviewee. Where anonymity was requested, this has been noted.

Industry representatives

1. **Acharya, Prabodha**, Group Chief Sustainability Officer, JSW Group (In person, Mumbai)
2. **Agarwal, Aman**, Deputy Manager (Exports), Electrosteel Castings Limited (In person, Kolkata)
3. **Bhatia, Gautam,** Chief General Manager; and other members of the Environment Management Division, Steel Authority of India Limited (In person, Kolkata)
4. **Bhattacharya, Sutirtha**, Former Chairman-cum-Managing Director, Coal India Limited (In person, Kolkata)
5. **Bodhankar, Arvind**, Chief Sustainability Officer, ArcelorMittal Nippon Steel (Online)
6. **Dutta, Debabrata**, Executive Director (In person, Kolkata)
7. **Ganguly, Adity**, Head Corporate Sustainability Projects, Tata Steel (In person, Jamshedpur)
8. **Garodia, Arun Kumar**, Managing Director, Corona Steel Industry Private Limited (In person, Kolkata)
9. **Goyal, R. K.,** Managing Director; Chandan Bharambe, Senior Manager (Corporate Strategy), Kalyani Steels Limited (In person, Pune)
10. **Jindal, Abhyuday**, Managing Director; Ashish Goyal, Associate Vice President; and Kalyan Kumar Bhattacherjee, Chief Sustainability Officer, Jindal Stainless Limited (In person, Delhi)
11. **Kakati, Koustuv**, Head of Regulatory Affairs (Trade and Economy), Tata Steel (In person, Delhi)
12. **Madhur, Rajat,** Chief Procurement Services; and other members of the Procurement Team, Tata Steel; and Tata Steel's suppliers, including representatives of Greenline; Lechler India; Bharat Roll Industry Private Limited; and IndFab (In person, Jamshedpur)
13. **Mangal, Rajiv**, Vice President (Safety, Health and Sustainability); Saurabh Kundu, Chief Corporate Sustainability
14. **Mukherjee, Sandip**, Chief General Manager, JSW Group (In person, Kolkata)
15. **Pai, Rajaram,** Chief Business Officer, JSW Industrial Parks (In person, Delhi)
16. **Priya, Prachi**, Vice President and Head (Policy Advocacy and Economics), Hindalco Industries Limited (In person, Mumbai)
17. **Saxena, Ajit Kumar,** Chairman-cum-Managing Director, MOIL Limited (In person, Delhi)
18. **Sen, Shibashish,** Executive Officer, Engineering Export Promotion Council (EEPC) India; and other members of EEPC India (In person, Kolkata)
19. **Singh, Sanjay**, Director (Strategy and External Relations); Pratik Ghosh, Associate Vice President (Sustainability and ESG); and Aman Dayal, Deputy Manager (Corporate Affairs), Jindal Steel Limited (In person, Delhi)

20. Participants at Subcontract India, such as representatives of BNR Exports, CIRCLIPs Technologie Private Limited, and Bhavani Industries (In person, Pune)

Industry associations

21. **Adler, Adina Renee,** Executive Director, Global Steel Climate Council (Online)
22. **Bala Kumar, Vinoth**, Senior Counsellor, CII Sohrabji Godrej Green Business Centre (India Green Steel Coalition) (Online)
23. **Bhan, Ravinder Kumar,** Senior Director, Indian Steel Association (In person, Delhi)
24. **Bharadwaj, Anil,** Secretary General, Federation of Indian Micro and Small and Medium Enterprises (In person, Delhi)
25. **Broadbent, Clare**, Head of Sustainability, World Steel Association (Online)
26. **Chanchal, Amar,** Director, Research Manufacturing, Confederation of Indian Industry (CII) (In person, Delhi)
27. **Chaudhuri, Sumanta,** Principal Advisor (International Trade Policy), Confederation of Indian Industry (CII) (In person, Delhi)
28. **Chauhan, Mansi**, Expert (Steel), World Wide Fund for Nature (WWF)-India (Online)
29. **Dev, Vishal,** Director (Sustainable Business), World Wide Fund for Nature (WWF)-India (Online)
30. **Dhawan, Anil,** Director General, Alloy Steel Producers Association (In person, Delhi)
31. **Ghai, Dinesh**, Senior Counsellor, Confederation of Indian Industry (CII) (In person, Delhi)
32. **Gupta, Arpan**, Director (Mines, Metals, Cement, Hydrocarbons & Energy), Federation of Indian Chambers of Commerce and Industry (In person, Delhi)
33. **Kashiva, Deependra**, Director General, Sponge Iron Manufacturing Association (In person, Delhi)
34. **Nair, Arun**, Senior Consultant (International Trade Policy), Confederation of Indian Industry (CII) (In person, Delhi)
35. **Plazinic, Veronica**, Technical Advisor, Recycling Europe (Online)
36. **Sahay, Alok**, Secretary General, Indian Steel Association (In person, Delhi)
37. **Singh, Amar**, Secretary General, Material Recycling Association of India (In person, Mumbai)

Government

38. **Alam, Maimun**, Director, Ministry of Steel, India (In person, Delhi)
39. **Bakre, Abhay**, Mission Director, Ministry of New and Renewable Energy, India (In person, Delhi)
40. **Chandorkar, Ashish**, Counsellor, Permanent Mission of India to the World Trade Organization (In person, Geneva)
41. **Chatterjee, Ashish**, Additional Secretary, Ministry of Steel, India (In person, Delhi)
42. **Chaudhary, Himanshu**, Senior Sector Expert, Bureau of Energy Efficiency (In person, Delhi)
43. **Kumar, Amitabh**, Additional Secretary, Department of Commerce, Ministry of Commerce & Industry, India (In person, Delhi)
44. **Kumar, Ashwini**, Economic Advisor, Ministry of Steel, India (In person, Delhi)
45. **Rastogi, Ajay Kumar**, Chairman, Jharkhand Task Force on Sustainable Just Transition (In person, Ranchi)
46. **Ray, Rajasree**, Economic Advisor, Ministry of Environment, Forest and Climate Change, India (In person, Delhi)

47. **Srinivas, L. Satya**, Special Secretary, Department of Commerce, Ministry of Commerce & Industry, India (In person, Delhi)
48. **Tripathi, Vinod**, Joint Secretary, Ministry of Steel, India (In person, Delhi)
49. **Verma, Neha**, Director, Ministry of Steel, India (In person, Delhi)
50. **Wadhawan, Anup**, Former Commerce Secretary, India (Online)
51. **Anonymous**, Senior Expert, European Commission (Online)

Civil society

52. **Balani, Sakshi**, Director (India) and Director (Policy), Climate Catalyst (Online)
53. **Bansal, Karthik**, Associate Fellow, Centre for Social and Economic Progress (CSEP), India (In person, Delhi)
54. **Bataille, Chris**, Global Fellow, Center on Global Energy Policy, Columbia University (Online)
55. **Bercero, Ignacio García**, Senior Fellow, Bruegel (Online)
56. **Choudhary, Aditi Roy**, Deputy Project Manager, SwitchOn Foundation (Online and in person, Kolkata)
57. **Dang, Kinshu**, Senior Manager (Networks and Partnerships), Climate Catalyst (Secretariat of India Green Steel Network) (Online)
58. **Das, Abhijit**, Former Head, Centre for WTO Studies (In person, Delhi)
59. **Dubey, Priti**, Associate Fellow (Growth Finance and Development), Centre for Social and Economic Progress (CSEP), India (In person, Delhi)
60. **Frederick Luthin, Carl**, Strategy Consultant (Climate Protection), Future Matters (In person, Brussels)
61. **Garg, Vibhuti**, Director (South Asia), Institute for Energy Economics and Financial Analysis (Online)
62. **Gaur, Mansi**, Senior Fellow and Project Director for Industrial Decarbonisation, Center on Inclusive Trade and Development, Georgetown University Law Center (Online)
63. **Godbole, Sangeeta**, Former Indian Revenue Service officer (In person, Delhi)
64. **Kundu, Aditi**, Senior Research Manager, SwitchOn Foundation (Online and in person, Kolkata)
65. **Luckscheiter, Jochen**, Director, Heinrich-Böll-Stiftung (In person, Delhi)
66. **Mallya, Hemant**, Fellow, Council on Energy, Environment and Water (Online)
67. **Nandi, Uddip**, Senior Deputy General Manager, SwitchOn Foundation (Online and in person, Kolkata)
68. **Nedumpara, James**, Professor and Head, Centre for Trade and Investment Law (In person, Delhi)
69. **Oillic, Maxime**, Senior Policy Manager (Climate Protection), Future Matters (In person, Brussels)
70. **Pal, Prosanto**, Director, The Energy and Resources Institute (TERI) (Online and in person, Delhi)
71. **Patel, Utkarsh**, Fellow, CSEP India (In person, Delhi)
72. **Palit, Debajit**, Centre Head, Centre for Climate Change and Energy Transition, Chintan Research Foundation (In person, Delhi)
73. **Ray, Anup**, Senior Advisor, SwitchOn Foundation (Online and in person, Kolkata)
74. **Scott, Jesse**, Adjunct Professor, Hertie School; Senior Fellow, Observer Research Foundation; Senior Fellow, School of Transnational Governance, European University Institute (Online)
75. **Selvaraju, Sangeeth**, Policy Fellow (Sustainable Finance – India and ASEAN), Grantham Research Institute, London School of Economics (Online)

76. **Sethi, Girish**, Senior Director, The Energy and Resources Institute (TERI) (Online and in person, Delhi)

77. **Sivamani, Ganesh**, Associate Fellow (Natural Resources), Centre for Social and Economic Progress (CSEP), India (In person, Delhi)

78. **Sohail, Sadia**, Programme Coordinator (Ecology), Heinrich Böll Stiftung (In person, Delhi)

79. **Srivastava, Ajay**, Founder, Global Trade Research Initiative (Online)

80. **Trivedi, Saurabh**, Lead Specialist (Sustainable Finance and Carbon Markets, South Asia), Institute for Energy Economics and Financial Analysis (Online)

81. **Wooders, Peter**, Co-founder and Lead (Renewables), Geneva Platform for Resilient Value Chains (In person, Geneva)

Others

82. **Andersson, Per,** Head of Secretariat, Leadership Group for Industry Transition Secretariat (Online)

83. **Birch, Jane,** Senior Communications and Impact Officer, Leadership Group for Industry Transition Secretariat (Online)

84. **Jernigan, William,** Lead, Net Zero Climate Strategy, World Economic Forum (Online)

85. **McDaniels, Devin,** Economic Affairs Officer, World Trade Organization (In person, Geneva)

86. **Sanchez, Felipe,** Policy Fellow, Leadership Group for Industry Transition Secretariat (Online)

87. **Sultania, Abhinav,** Energy Specialist, Asian Development Bank (Online)

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