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THROUGH



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**FINANCING
 DECARBONIZATION OF
 THE SECONDARY STEEL
 SECTOR IN INDIA**
 Towards an Enabling Environment



FINANCING DECARBONIZATION OF THE SECONDARY STEEL SECTOR IN INDIA

Towards an Enabling Environment

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About the Project

The SNAPFI (Strengthening National Climate Policy Implementation: Comparative Empirical Learning & Creating Linkages to Climate Finance) project explores how international climate finance can support the implementation of NDCs in emerging economies and EU countries through comparative analyses and by providing a better understanding of the interface between finance and policy implementation. It is coordinated by DIW Berlin, the German Institute for Economic Research.

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Abbreviations

ADB	Asian Development Bank
BAT	Best Available Technologies
BEE	Bureau of Energy Efficiency
BEE-SME	National Program on Energy Efficiency and Technology Upgradation of SMEs
BF/BOF	Blast Furnace/ Blast Oxygen Furnace
CIF	Climate Investment Fund
CGTMSE	Credit Guarantee Fund Trust for Micro and Small Enterprises
CLCSS	Credit Linked Capital Subsidy Scheme for Technology Upgradation
CTF	Clean Technology Fund
DRI	Direct Reduction Iron
EAF	Electric-Arc Furnace
EE	Energy Efficiency or Energy-efficient
EEFP	Energy Efficiency Financing Platform
EERF	Energy Efficiency Revolving Fund
GCal	Giga Calories
GCF	Green Climate Fund
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IF	Induction Furnace
ICF	International Climate Finance
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau Development Bank
LCT	Low-Carbon Transition
MDB	Multilateral Development Bank
MoEFCC	Ministry of Environment, Forest and Climate Change
MSME	Micro, Small, and Medium Enterprises
MT	Million Tonnes
MTOE	Million Tonnes of Oil Equivalent
MTPA	Million Tonnes Per Annum
NAPCC	National Action Plan on Climate Change
NBFI	Non-Banking Financial Institution
NMEEE	National Mission for Enhanced Energy Efficiency
PAT	Perform, Achieve, and Trade
PRGFEE	Partial Risk Guarantee Fund for Energy Efficiency
RAMP	Raising and Accelerating MSME Performance
SAPCC	State Action Plan on Climate Change
SBI	State Bank of India
SEC	Specific Energy Consumption
SECF	State Energy Conservation Funds
SIDBI	Small Industries Development Bank of India
SSRM	Secondary Steel Re-rolling Mills
TADF	Technology Acquisition & Development Fund
TEQUP	Technology and Quality Upgradation (TEQUP) Support to MSMEs
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNDP	United Nations Development Programme
VCFEE	Venture Capital Fund for Energy Efficiency



Executive Summary



EXECUTIVE SUMMARY

India is the second-largest producer of crude steel as well as the second-largest consumer of finished steel in the world. The sector contributes to about 2% of the total GDP of the country and employs 2.6 million people directly and indirectly through allied sectors. The Indian steel sector is further bifurcated into the primary and secondary steel sector based on their production pathways. The secondary steel sector largely utilizes the Direct Reduction-Electric Arc Furnace (DRI-EAF) route or the DRI-Induction Furnace (DRI/IF) route for crude steel production and is also involved in the production of finished steel through re-rolling mills. Overall, the secondary sector accounts for about 40% of steel production in India.

The secondary steel sector also remains highly emission-intensive, being responsible for around 50 million tonnes (MT) of GHG emissions, annually. Excessive reliance on low-quality coal, iron ore, and low shares of scrap input coupled with heterogeneous scattered units of operations add to the deep decarbonization challenge for the secondary steel sector in India. To align India's ambitious growth visions with its commitment to reach net-zero emissions by 2070, it is vital to enable the low-carbon transition (LCT) of the secondary steel sector, particularly through the development of a suitable enabling environment to scale-up the flow of finance for the adoption of low-carbon technologies by the sector.

The Secondary Steel Sector Value Chain Potential Pathways for Decarbonization

The value chain of the secondary steel sector involves the production of sponge iron through the direct reduction route (DRI plants), which is followed by the production of crude steel (semi-finished steel) through Electric Arc Furnaces (EAF) or Induction Furnaces (IF). Lastly, finished steel products are produced through steel re-rolling mills. There are approximately 333 DRI plants, 55 EAFs, 1103 IFs, and 1313 Steel-re-rolling mills scattered across the country. The DRI process accounts for about 30 MTCO₂ emissions annually, while the IFs and EAFs emit 13.4 MTCO₂ and 0.1 MTCO₂, respectively. Additionally, the re-rolling mills are responsible for 6 MTCO₂ emissions annually.

Potential Pathways for Decarbonization and their Financing Needs

The potential pathways to decarbonization for the secondary steel sector in India involve short-term incremental pathways with limited potential and low investment requirements, and long-term transitional pathways which would require greater investment. The incremental pathways include integrating the best available technologies (BATs) in DRI, EAF, IF, and Re-rolling mills' production processes, integrating input-based solutions, and renewable energy utilization. The transitional pathways involve converting coal-based DRI plants to hydrogen/natural gas-based plants, and direct re-rolling integration with the DRI-EAF route.

Notably, for 333 DRI plants, 55 EAF units, 1103 IF units, and 1257 re-rolling units (TERI-GIZ, 2022), the financing requirements for incremental pathways would be USD 15,129 million and further rise to a cumulative total of USD 169,583 million when transitional pathways are accounted for as well.

Finance for the Secondary Steel Sector

The secondary steel sector receives finance from diverse international, national, private, public, formal and informal sources. However, its overall access to institutional financing for decarbonization technologies remains low. Several barriers hinder the secondary steel sector's access to financing for LCT technologies. These can be broadly classified into:

- » **Knowledge-based barriers** such as awareness gaps, documentation requirements, lacking financial expertise, and high perceived risks from financiers.
- » **Cost of Capital-related barriers** such as high transaction costs, low margins for institutions, high interest rates, payback periods, due diligence requirements, and inadequate maximum funding limits from financiers.
- » **Creditworthiness-based barriers** such as poor cashflow, delayed payments, low credit scores, and low collateral holdings.

While several financial tools such as revolving funds, credit lines, technical grant programs, guarantees and risk-sharing facilities have been deployed around the world to support the uptake of clean-tech, the unique case of the secondary steel sector in India – in terms of its twin requirements of financing and technical handholding, suggest that unique considerations for an enabling environment would be required to support its decarbonization goals. Furthermore, a combination of diverse financial instruments might be required to address sub-sectoral diversity and needs.

Recommendations for Financing the Secondary Steel Sector

Keeping in mind the unique composition and sub-sectoral necessities of the secondary steel sector in India, the report lays out the following recommendations.

Interventions at the National-Level

- » **Development of a Multi-Stakeholder Platform** with the participation of government institutions, knowledge institutions, industry associations, financial associations, and technology providers. The platform can crucially address information gaps for the industry on financial provisions and due diligence, as well as enable financiers to know better about emerging technologies.
- » **Cluster-level Interventions** to essentially map secondary steel units into clusters which could be supported through securitization to secure loans for working capital requirements, and large-scale revolving funds. Up-take of clean technologies could be initiated in clusters with programmatic partnerships, performance-based mechanisms, technical support, and hand-holding.
- » **Development of a Dedicated National Fund for Steel Decarbonization** to facilitate the financing of low-carbon transition of the Indian steel sector. Such a fund could be housed with the Ministry of Steel and SIDBI could be assigned a facilitative role for financing.
- » **A Financially backed Scheme for the Integration of Waste Heat Recovery Systems** which could provide incentives for adoption to facilitate energy efficiency and emission-reduction in a short amount of time.
- » **Dedicated Renewable Energy Supply for the IF/EAF Units** to effectively mitigate scope 2 emissions from the sector. Importantly, centre-state policy coordination on power supply would need to be streamlined, alongside an overall expansion of the power grid.
- » **Enhancing Scrap Availability and Collection** to amplify scrap utilization and promote a circular economy model for the secondary steel sector's sustainable future. To ensure material availability, the successful implementation of policies such as the National Vehicle Scrappage Policy would be essential.

Interventions to Enhance the flow of International Climate Finance

- » **Multi-level Risk Guarantee Mechanisms** dedicated to de-risking financing low-carbon transition technologies with longer payback periods need to be developed to attract private investment. For layered-risk funding mechanisms, the first layer of guarantee can be provided at the sub-national/national level, which could be further supported by international climate finance. Consequently, requirements of due diligence on documentation, reporting, and monitoring can also be assigned at local levels to overcome the cost of capital-related barriers to accessing international climate finance.
- » **A Sector-Level Modernization Programme supported by ICF** – International climate finance needs to be viewed as a major source to finance the LCT of the secondary steel sector. A sector level modernisation programme could be prepared to address the decarbonization challenge in phases – starting with the adoption of energy efficiency measures and alternative fuels; and shall be posed to the World Bank or the GCF for funding and accessing international climate finance.



SECTION 1:

Introduction



INTRODUCTION

1.1 Background to the Study

The iron and steel industry forms the backbone of development and is essentially the lifeline for the growth of several sectors of an economy. With high strength, durability, and recyclability, steel provides input for sectors like infrastructure, buildings, and transport. Consequently, it plays an indispensable role in ensuring a sustained growth trajectory for an economy. Globally, the iron and steel sector generates a revenue of about USD 1.6 trillion directly and employs over 6 million people.¹

India is the second-largest producer of crude steel as well as the second-largest consumer of finished steel in the world. The sector contributes to about 2% of the total GDP of the country and employs 2.6 million people directly and indirectly through allied sectors.² The Indian steel industry comprises primary and secondary steel producers, differentiated by their size and routes of steel production. The primary producers largely utilize the Blast Furnace/Blast Oxygen Furnace (BF/BOF) route, while the secondary producers are involved in the Direct Reduction-Electric Arc Furnace (DRI-EAF) route or the DRI-Induction furnace (DRI/IF) route for crude steel production. Additionally, the secondary steel sector is also involved in the production of finished steel through steel re-rolling mills, forging, and foundries. In total, the secondary sector accounts for about 40% of steel production in India.³

In India, about one-fifth of industrial energy consumption comes from the iron and steel sector, and of its total energy input of 70 Mtoe (million tonnes of oil equivalent), 85% comes from coal. Consequently, the excessive reliance on low-quality coal, iron ore, and smaller share of scrap input as compared to the global average (23% as compared to the global average of 32%), adds to the deeper transitional challenge for the hard-to-abate steel sector in India (IEA, 2020). The secondary steel sector further remains highly emission-intensive, being responsible for around 50 million tonnes (MT) of GHG emissions annually – about 60% of which comes from the DRI process, 26.8% from IFs, 0.2% from EAFs, and 13% from Steel-re-rolling mills (TERI & GIZ, 2022). Significantly, the secondary units are also relatively smaller in their operation, scattered, and quite heterogeneous in their production routes and functions, which makes their low-carbon transition a greater challenge.

For India to align its ambitious growth vision with its commitment to reach net-zero emissions by 2070, it is vital to enable the low-carbon transition (LCT) of the secondary steel sector, particularly by scaling up finance for the adoption of low-carbon technologies in the sector. Low-carbon transition for the secondary steel sector simply implies an approach to replace current high-emitting production processes with relatively lower emitting options- in a phased manner. While certain commercially viable energy-efficient technologies have been available to the secondary steel sector, their adoption remains lukewarm. Several technical barriers relating to low awareness and technological unfamiliarity, alongside limited access to institutional finance, restrict the low-carbon transition of the secondary steel sector. Furthermore, beyond the scope of targeting technological low-hanging fruits in the short term, the long-term decarbonization strategy for the secondary steel sector would require large-scale financing from domestic, as well as international sources. Consequently, directing focused attention towards developing a favourable enabling environment to attract large-scale financing for the secondary steel sector garners great imminence. It emerges fundamental to addressing the financing needs of the sector. The promotion of circularity and greater scrap availability and utilization by the secondary

¹ World Steel in Figures 2022. (2023, June 1). World Steel Association. <https://worldsteel.org/steel-topics/statistics/world-steel-in-figures-2022>

² JSW - Steel and Indian Economy: An Upward Curve. (n.d.). <https://www.jsw.in/steel/steel-and-indian-economy-upward-curve#:~:text=Steel%20now%20contributes%20about%202,in%20the%20global%20steel%20market>

³ Ministry of Steel - Annual Report 2022-23. (2023, June 20). <https://steel.gov.in/sites/default/files/MoS%20AR%202022-23.pdf>

steel sector would also hinge on the development of an conducive ecosystem, and shall further support the lowering of standalone investment costs.

This study focuses on understanding the secondary steel sector's access to finance, and the possible ways of enhancing its access to international climate finance through the development of a suitable enabling environment.

The Study utilizes an extensive literature review and draws from stakeholder consultations for the validation of preliminary findings. A diverse group of stakeholders was consulted for the study, varying from industry associations to research experts and financial associations. A list of stakeholders consulted for this study has been provided in Annexure-1.

Structurally, section 2 of the report elaborates on the value chain of the secondary steel sector and gives a breakdown of its energy and emission intensity. Section 3 discusses various potential pathways to decarbonize the secondary steel sector in the short and the long term, alongside the financial requirements for each of the pathways. Section 4 focuses on aspects of finance. It discusses the sources of finance for the secondary steel sector and the challenges faced by the sector in accessing finance. Furthermore, it elaborates on the role that international climate finance can play in facilitating the decarbonization of the sector, citing examples of international experience alongside, and mapping the financial instruments that can be deployed. Lastly, section 5 provides recommendations for scaling up the flow of international climate finance to the secondary steel sector in India, through the enrichment of an enabling environment, in order to accelerate the low-carbon transition of the sector.

SECTION 2:

Dynamics of the Secondary Steel Sector in India

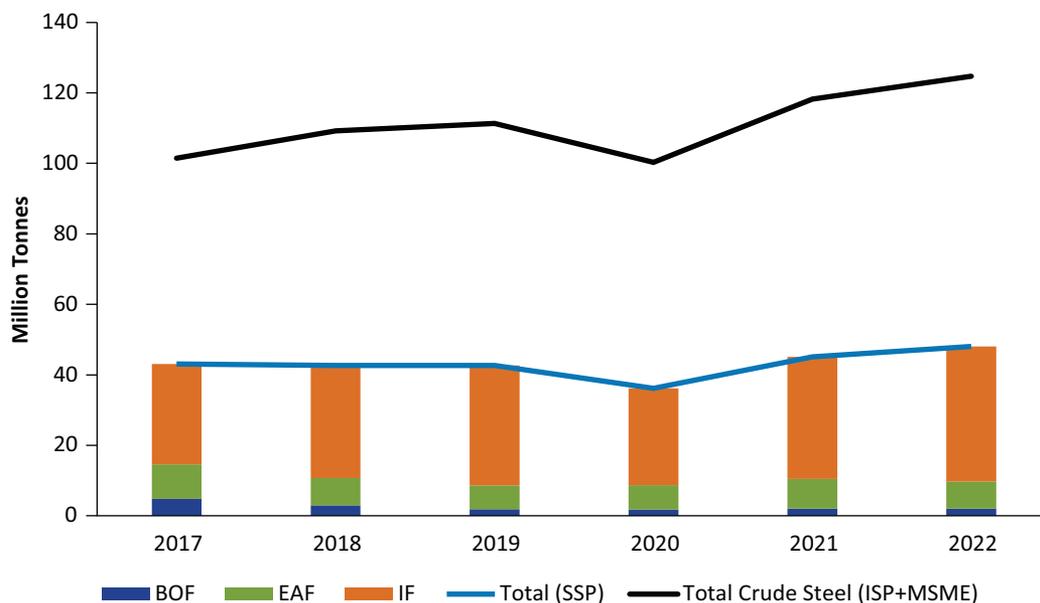


2. DYNAMICS OF THE SECONDARY STEEL SECTOR IN INDIA

2.1 The Secondary Steel Sector Value Chain

The value chain of the secondary steel sector involves the production of sponge iron through the direct reduction route (DRI plants), which is followed by the production of crude steel (semi-finished steel) through Electric Arc Furnaces (EAF) or Induction Furnaces (IF). Lastly, finished steel products are produced through steel re-rolling mills which involve hot and cold rolling units, as well as galvanizing units. There are approximately 333 DRI plants, 55 EAFs, 1103 IFs, and 1313 Steel-re-rolling mills scattered across the country contributing to the value chain of the secondary steel sector (TERI & GIZ, 2022).

Graph 1 represents the total volume of crude steel production by the secondary steel sector between the years 2017 and 2022, through different production routes. As the graph highlights, the average steel production by the secondary steel sector during the period is approximately 42 MT - accounting for 38-40% of total crude steel production in the country, annually (Ministry of Steel, 2023). Deductively from the total production output, the integrated steel plants have recovered substantially post the COVID-19 pandemic. On the contrary, sluggish demand, poor cashflow liquidity, and technological backwardness has seen a slow recovery for the secondary steel sector.



GRAPH 1: Total Volume of Crude Steel Production by the Secondary Steel Sector in India

Source: MoS, 2022-23

2.2 Energy and Emission Intensity of the Secondary Steel Sector

The secondary steel sector is highly energy and emission-intensive due to its excessive dependence on coal and inefficient technological processes. Figure 1 represents the share of each sub-segment of the total emissions made by the secondary steel sector. The DRI process is the most emission-intensive, greatly due to its dependence on coal. Although IFs are responsible for about 14% of the total emissions and EAFs add up to only 0.2% of the total emissions, it is important to note that their individual efficiencies are identical and require similar amount of attention to improve energy-efficiency. As affirmed by the industry stakeholders, it is largely due to the historical development of the secondary steel industry that there are more indigenous IF units in the country, as compared to the EAFs, that had to be imported. Furthermore,

another contributing factor to more emissions from the IF segment is its greater reliance on sponge iron from the DRI route, rather than on scrap for input. In comparison, the EAF segment has more utilization of scrap.

Since the largest mitigation potential is in the top value chain of the secondary steel sector (DRI, IF, EAF, and re-rolling processes), the next section discusses these segments individually.

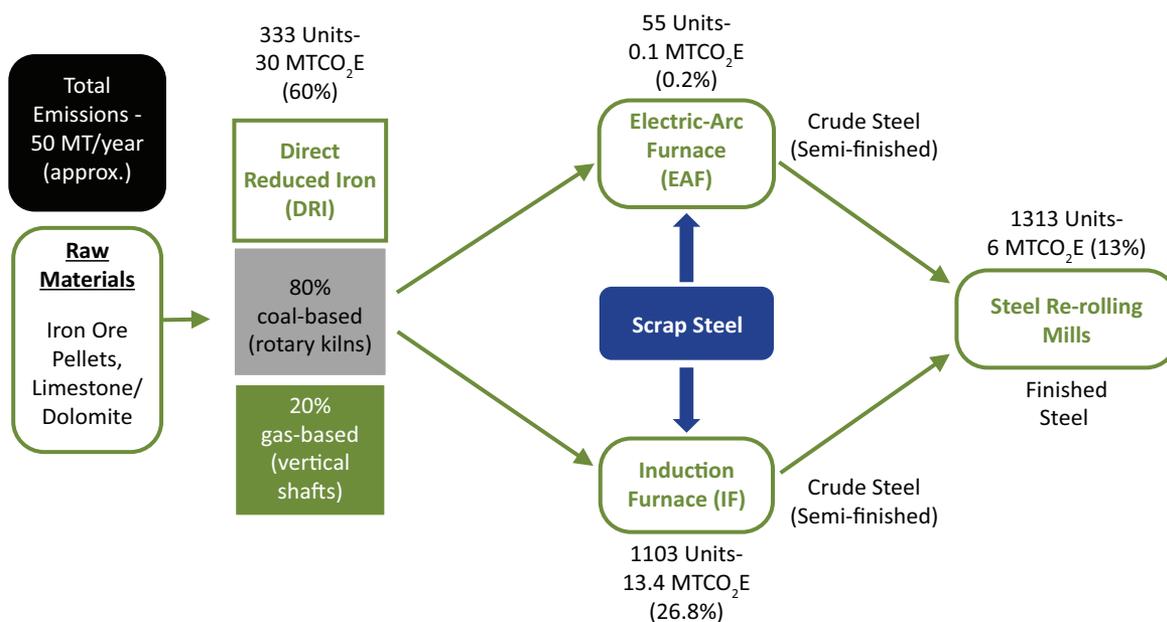


FIGURE 1: Value Chain and GHG Emissions of the Secondary Steel Sector

Data Source: TERI & GIZ, 2022

2.2.1 Direct Reduction Iron (DRI)

India is the largest global producer of sponge iron through the DRI route – accounting for 36% of the total global production (Ghosh et al., 2021). In this process, the iron ore is reduced directly to produce metallic iron. For the reduction of iron ore, coal, natural gas, and hydrogen can be used as reducing agents. Most sponge iron production in India comes from coal-based rotary kilns - with a total installed capacity of 36.74 MT (about 80% of the total sponge iron production), while the remaining capacity of 11.10 MT is constituted by natural gas-based vertical shafts (Ministry of Steel, 2023).

About 98% of the energy consumption of coal-based DRI plants comes from thermal sources, while the remaining 2% comes from electricity utilized to power motors and other allied equipment. The average specific energy consumption (SEC) of coal-based DRI plants is 4.51 Giga calories per ton (Gcal/t) (varying from 4.10 to 5.26 Gcal/t). On the other hand, the SEC of natural gas-based DRI plants is much lower, but due to the limited availability of natural gas pipelines, and the easy availability of coal, most of the DRI plants rely on coal-based fuel (Ghosh et al., 2021)

2.2.2 Electric Arc Furnaces and Induction Furnaces (EAF & IF)

The EAF & IF plants are crucial mid-stream segments in the production of crude steel through the melting pig iron, sponge iron, or scrap. The notable difference between EAFs and IFs lies in their heating and thermal efficiency. IFs tend to heat faster and are more efficient.

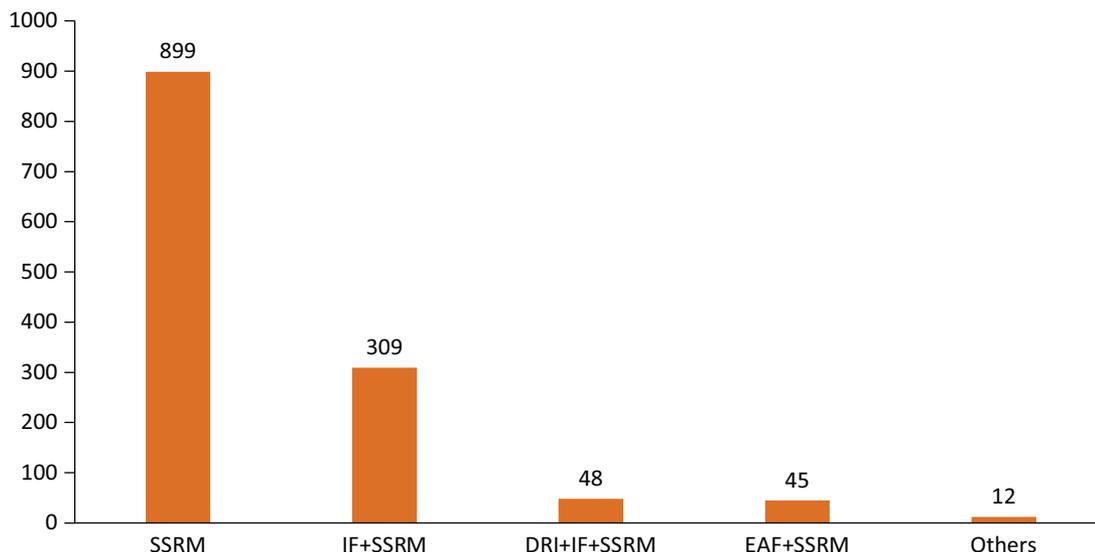
These units exist as both, standalone, and composite units. The total production capacity of IFs in India is about 52 MTPA, with the average capacity utilization of plants being around 70-75% annually (TERI & GIZ, 2022). For EAF units, the production capacity is about 42 MTPA and the average capacity utilization is about 65-68% by producing about 25-28 MT annually (TERI & GIZ, 2022). The major energy input for EAFs and IFs comes from electricity (75-80%), while the remaining comes from chemical energy (20-25%) (TERI, 2017).

The current proportion of utilization of scrap in the EAF units to produce steel ranges from 40-80%, while the remaining proportion is made up by utilizing sponge or pig iron. The proportion of scrap usage fluctuates, depending on the availability and pricing of scrap. For EAF and IF routes, the estimated SEC is 420 to 755 kWh per ton of liquid steel - much lower than the DRI route. (TERI, 2017). Thus, while the usage of scrap offers great energy and emission-saving potential, its utilization remains limited due to scrap deficiency in the country.

2.2.3 Secondary Steel Re-rolling Mills (SSRM)

The majority of secondary steel sector units in India are involved in the production of finished steel through re-rolling processes. About 65% of finished steel produced in India comes from secondary steel sector re-rolling mills (TERI & GIZ, 2022). Moreover, about 75% of the 1313 steel re-rolling mills in the country are small-scale units with an installed capacity of 24 to 240 Tonnes per day (TPD) (TERI & GIZ, 2022). These re-rolling mills can also be differentiated on the basis of their processes, into - 1) standalone units (reheating and rolling) and 2) composite units (melting and rolling in the same plant). Graph 2 breaks down the number of re-rolling units based on the plant type.

Conventionally the key equipment for re-rolling mills includes reheating furnaces, compressors, blowers, rolling mill strands, and roller tables. The direct energy utilization of the segment comes from the fuel used for reheating furnaces, i.e., coal, gas, or oil, and electrical energy. The share of thermal energy (coal, gas, or oil) for finished steel production through re-rolling mills accounts for 77% of total energy consumption, while the rest 23% is met by electricity (UNIDO, 2020). The use of reheating furnaces and the dependency on coal for sourcing fuel are two major reasons for high energy consumption and CO₂ emissions from the re-rolling segment.



GRAPH 2: Number of Steel Re-rolling Mills based on Plant Types

Source: TERI & GIZ, 2022

Steel Re-Rolling Mills in India

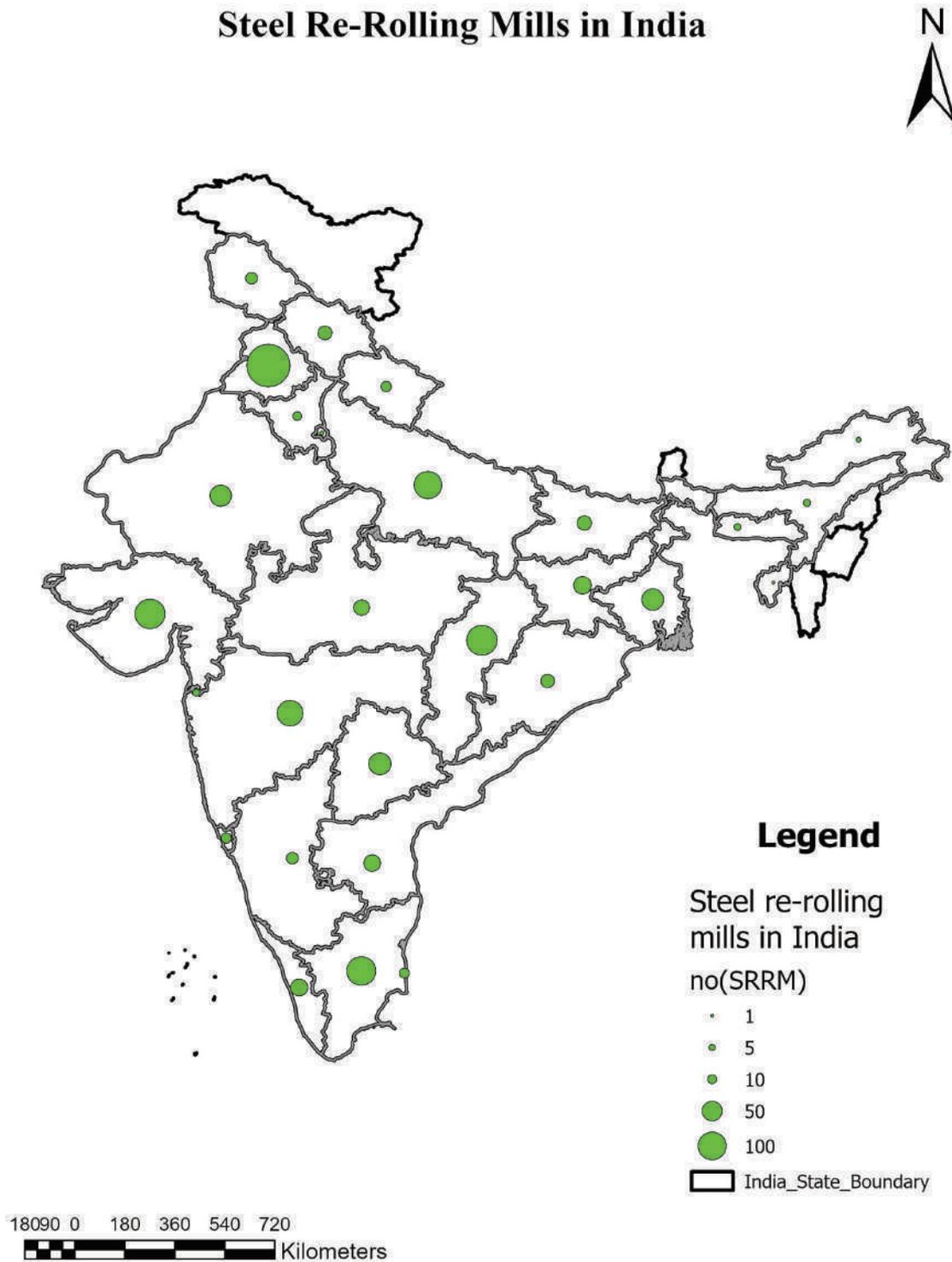


FIGURE 2: Distribution of Steel Re-rolling Mills in India

Source: TERI & GIZ, 2022

SECTION 3:

Potential Pathways for Decarbonization



3. POTENTIAL PATHWAYS FOR DECARBONIZATION

Section 3 discusses two potential pathways for decarbonizing the secondary steel sector, alongside their mitigation potential, investment requirements, and the maturity status of concerned technologies. The short-term pathway focuses on targeting low-hanging fruits and focuses on incremental options – to integrate the best available technologies (BATs) in DRI, EAF, IF, and Re-rolling mills' production processes. The rationale behind the incremental approach is targeting emission-reduction by replacing outdated technologies with relatively lower investment. Additionally, as an incremental option, input substitution for DRIs, EAFs and IFs could also be a game changer for both – short-term and long-term low-carbon transitioning.

The long-term strategy for decarbonization identifies potential transitional options for the secondary steel sector. These include the replacement of coal-based DRI plants to natural gas/hydrogen based DRI plants, and integration of direct re-rolling with DRI, EAF and IF units.

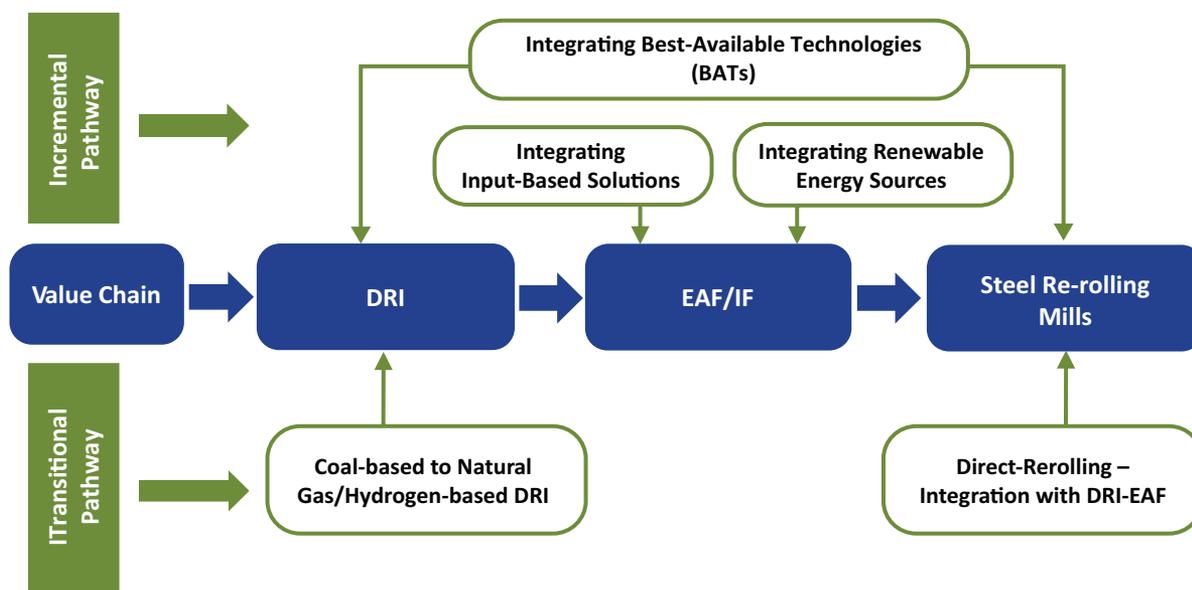


FIGURE 3: Potential Pathways for Decarbonization of the Secondary Steel Sector

3.1 Incremental Pathways

3.1.1 Integrating the Best Available Technologies (BATs)

a) DRI Process

In coal based DRI rotary kilns, the flue gases generated in the kiln are emitted at temperatures of about 950-1025 °C and are a major source of emissions. For a 100 TPD capacity plant, the volume of off-gases generated varies in the range of 24,000±1500 Nm³ per hour. Conventionally, off-gases are cooled down—increasing energy consumption and reducing efficiency. These off-gases generated from the rotary kiln during the process can be recovered by using the Waste Heat Recovery (WHR) system to generate a high-pressure system for power generation, and preheating raw materials (coal, iron ore, etc.) for moisture reduction. Integration of WHR system by DRI plants for power generation and pre-heating raw materials can have a GHG reduction potential of 28,960 tCO₂/year (reduction about 40 per cent of the total emissions) (Ghosh et al, 2021). However, as gathered by TERI from the stakeholder consultation with the industry associations, only 50 DRI plants in India have adopted waste heat recovery systems yet.

For 333 DRI plants with an overall production capacity of 52 MT, the estimated investment requirement is about USD 9,309 million for all BATs, including the WHR system

Some adoption barriers for WHR systems in secondary steel plants have been the high upfront investment and long payback periods associated with them. Other barriers such as space limitations, seasonal operation of units, added operational costs, and the complexity of integrating WHR system controls with the existing processes also limit their adoption. However, the plants that encounter such limitations can still integrate other possible BATs (as listed in Annexure-3). These include technologies such as coal-gasification for partial substitution, energy-efficient motors and pumps, and decentralized VFDs for shell air fans, which have a cumulative mitigation potential of 7,603 tCO₂/year (Ghosh et al, 2021). The integration of these technologies would need a low amount of investment, in the range of USD 12,000-120,000 each. For 333 DRI plants with an overall production capacity of 52 MT, the estimated investment requirement is about USD 9,309 million for all BATs, including the WHR system (listed in Annexure-3).

b) EAF & IF Processes

Even though energy and emission intensities are the lowest in the EAF segment of secondary steel producers, their current utilization of outdated technologies suggests a significant scope for energy savings and GHG emissions reduction through technological improvements. In EAFs currently, about 15-20% of heat is lost in the form of off-gases generated during the production process (TERI, 2017). The majority of EAF units use cooling water to reduce the temperature of these off-gases. WHR systems offer the potential to effectively recover and reuse the off-gases for pre-heating scrap and to save feedwater by reducing heat losses. For instance, for a 50-tonne EAF, integrating WHR for boiler feed water requires an estimated investment of USD 0.012 million and can mitigate CO₂ emission by 1510 tCO₂/year. Similarly, integrating WHR for scrap pre-heating for a 50-tonne furnace requires an estimated investment of USD 0.50 Million, and can mitigate CO₂ emissions by 8,860 tCO₂/year (TERI, 2017).

Considering the highest mitigation potential for EAF units, the best way to utilize off-gases would be through pre-heating of scrap materials. But a particular barrier towards its adoption has been the space constraints for these units. Besides the WHR systems, other potential mitigation solutions include integrating energy-efficient systems in pumps (cooling water systems) and variable frequency drives for fumes extraction, which would require an estimated investment of USD 0.017 million (TERI, 2017).

For IF units, similarly, the adoption of WHR systems offers a high potential for energy savings and emission-reduction. However, none of the IF units in India have adopted WHR systems due to space constraints and a lack of technical capacity.

For a total 55 EAF units and 1,103 IF units with an overall production capacity of 93 MT, the estimated cumulative investment requirement would be about USD 2,381 million for all BATs, including WHR systems (Listed in Annexure-4).

c) Re-rolling Process

Standalone re-rolling mills are highly energy intensive in their production processes. To produce one ton of long steel, about 100-200 kg of coal or 35-40 litres of furnace oil and 80-150 kWh of electricity are required by the re-heating furnaces in the re-rolling process. This accounts for 66% share of the total energy utilized in the re-rolling process.

In most of the re-rolling mills, the re-heating furnaces are powered by pulverized coal systems with very low levels of automation. Remarkably, the integration of an energy-efficient and automated control system alongside a high-efficiency metallic recuperator in a re-heating furnace can mitigate about 2,883 tCO₂/year. Both these technologies are importantly at the mature-level of technological readiness (TRL-11, see Annexure-7), and viably deployable.

The integration of BATs (Listed in Annexure-5) in the existing re-rolling mills offers a saving potential in the range of 5-35%, depending on the technology, and has a GHG mitigation potential of 43,800 tCO₂/year (UNIDO, 2020). For 1257 steel re-rolling units with an overall production capacity of 91 MT, the estimated cumulative investment requirement for enlisted BATs would be about USD 3,524 million.

For a total 55 EAF units and 1,103 IF units with an overall production capacity of 93 MT, the estimated cumulative investment requirement would be about USD 2,381 million for all BATs, including WHR systems

For 1257 steel re-rolling units with an overall production capacity of 91 MT, the estimated cumulative investment requirement for enlisted BATs would be about USD 3,524 million

3.1.2 Integrating Input-based Solutions

Input-based solutions such as the substitution of fossil-fuel-based fuel inputs with cleaner fuels, utilization of iron ore pellets for DRI, and scrap steel for EAFs and IFs hold the potential to be a big game-changer for reducing the carbon intensity of steel production, as well as in the achievement of circular economy targets. The advantages of input substitution are that it doesn't require any significant technological modification at the plant level and requires low investment, given the suitable availability of inputs.

For instance, pelletized iron ore fines can be directly charged into the DRI process. This utilization of iron ore pellets instead of iron-ore lumps has an energy-saving potential of about 15% and can further improve the yield and reduce thermal load during the production process. Additionally, the substitution of fossil fuels-based fuel inputs with natural gas, biomass, and coal-based methane for powering re-heating furnaces in steel re-rolling mills can increase efficiency and offer a high mitigation potential in the range of 9,000 – 14,500 tCO₂/year. (UNIDO, 2020). The maturity status of the technologies for fuel substitution in re-rolling mills, however, is in TRL-8-9 and faces shortages in the availability of alternative fuels (natural gas, biomass and coal-based methane).

In terms of scrap utilisation, EAF and IF units use scrap steel in combination with pig iron and sponge iron to produce steel. The overall domestic supply of scrap steel in India is around 25-30 MT, and around 6-7 MT is imported. The National Scrap Policy estimates the requirement of 70 scrap processing centres to produce the currently imported amount of scrap steel (1 Lakh tonne per scrap processing centre). Additionally, 300 collection and dismantling centres would also be required (Steel Scrap Recycling Policy, 2019). In terms of prospective future requirements, 2800-3000 collection and dismantling centres would be needed to process the future demand of 70-80 MT of steel scrap, if at all it could be sourced domestically (Steel Scrap Recycling Policy, 2019). Notably, to set up 70 steel recycling centres with a plant capacity of 1 MT each, as needed to match the current scrap requirements, an estimated cumulative investment of about USD 114 million would be required.

Crucially, the lack of availability of quality scrap can result in poor quality of steel production with the EAF/IF route. Barriers such as contamination of steel with other metals (copper, alloys, etc.) and low-quality recycling challenge the utilization of scrap steel. However, more optimistically, the Scrap Recycling Policy and the Vehicle Scrappage Policy envision increasing the availability of scrap steel by 50 MT by 2030, by targeting scrap collection, processing, and utilisation, which could aid the sector's emission reduction. It can also help reduce the dependence on the DRI process, since EAFs can produce steel with 100% scrap sourcing.

3.1.3 Integrating Renewable Energy Sources

Most of the IF and EAF units in the secondary steel sector are standalone units. About 70% of the energy input for these units comes from electricity and the dominant share of this electricity is sourced from fossil-fuel-based power plants. Thus, the integration of renewable energy sources for these standalone units can accelerate the low-carbon transition of the secondary steel sector. A mix of solar rooftops and grounded solar panels installed at the cluster level could meet the energy requirements for steel production. For the installation of a solar power plant with a capacity of 1 MW, and an electricity generation potential of about 4,000 kWh per day, the capital investment required is about USD 0.6 million.⁴ Considering the energy requirements for the current production of steel through EAF and IF routes, the cumulative estimated investment required to set up solar panels would be about USD 200 million.

3.2 Transitional Pathways

3.2.1 Coal-Based DRI to Natural Gas DRI

Currently, less than 20% of the total sponge iron production in India is undertaken through the natural gas route. On the other hand, the use of natural gas as a reducing agent in the DRI route has a high mitigation potential. For instance, the emissions from natural gas-based DRI are about 0.415 tCO₂ per

⁴ <https://amplussolar.com/blogs/1mw-solar-power-plant>

ton of crude steel- much lower than coal-based DRI. In combination, the emissions from the natural gas-based DRI-EAF route are only about 1.0 tCO₂/t of steel produced. However, in India, only 3 plants produce sponge iron through the natural gas-based DRI route as of yet.⁵ The transition of coal-based DRI plants would be challenging as it would require a complete transition from coal-based rotary kilns to gas-based vertical shafts. Additionally, high investment requirements and limited availability of natural gas pose substantial challenges as well. The estimated capital investment required for the transition of a coal-based DRI plant to Natural Gas-based DRI plant is about USD 220 million assuming a plant capacity of 1 MT (Table 1).

TABLE 1: Estimated Investment Requirements for Transition to Natural Gas-based DRI

Capacity	Estimated Investment required USD million	Estimated Savings/ year	Energy saving (Gcal/year)	Emissions tCO ₂ /t
1.0 Mt	219.512	NA	NA	0.415

Source: Stakeholder consultation with sectoral experts

3.2.2 Coal-based DRI to Hydrogen-based DRI

In the DRI process, hydrogen (H₂) can also be used as a reducing agent instead of coal or natural gas. Green hydrogen is produced through renewable energy, and currently, the cost of producing green H₂ is approximately 4-5 USD/kg. Owing to such a high production cost, hydrogen can be blended with natural gas or syngas to decrease the operational cost during the transition phase. Significantly, the cost of production of steel would remain high initially, and only decrease over time (Table 2). The investment required for blending hydrogen in the DRI process in various ratios is highlighted in Table 2 for a plant with 0.5 MTPA production capacity. For producing one tonne of steel using green hydrogen with emissions as low as 0.25 tCO₂/t, the estimated cost would be about USD 386. Consequently, the estimated cost of producing the current total output of the sponge iron (41 MT) would be about USD 15.82 million. Since the utilization of hydrogen is still in the demonstration stage (TRL-5-8), it remains an option for only large-scale steel production. Its application for the secondary steel segment remains unlikely in the foreseeable future.

TABLE 2: Estimated Investment Requirements for Hydrogen based-DRI

Green H2 blend in process	Estimated Investment required (USD million)	Production Cost in USD per ton of crude steel	Emissions tCO ₂ /t
9%	18.163	443	0.74
60%	17.384	424	0.41
100%	15.826	386	0.25

(Source: CEEW, 2021)

3.2.3 Integrating Direct-Rerolling with DRI-EAF/IF

Considering that the re-heating furnaces in standalone re-rolling mills are highly energy intensive, their utilization can altogether be eliminated potentially- by directly rolling hot billets through continuous casting machines that would be integrated with DRI-EAF/IF units. For a composite plant with a re-rolling capacity of 15 tonnes/hour, the integration of continuous casting machines has a GHG reduction potential of 15,015 tCO₂/year. This would require an estimated capital investment of USD 0.12 Million (Table 3). This mitigation potential and investment cost may vary based on existing plant capacity.

However, it is important to note that the adoption of continuous casting machines would be faced with technical barriers in terms of their exclusive applicability for composite units and varying physical feasibility, depending on the plant layout.

⁵ Sponge Iron Manufacturers Association. (2021). DRI Update. <https://www.spongeironindia.com/images/publications/DRI-UPDATE%20March,%202021.pdf>

TABLE 3: Estimated Investment Requirements for Integrating Direct-Rerolling with DRI-EAF/IF

Estimated Investment (USD million)	Estimated Savings/year (USD million)	Energy saving (Gcal/year)	GHG reduction (tCO ₂ /year)	Payback (Year)
0.12	0.61	39,196	15,015	Less than 1 Year

Source: UNIDO, 2020

3.3 Overall Financial Requirements

Table 4 summarizes the cumulative investments required for the potential pathways. As a short-term strategy, the integration of BATs in the three segments of the secondary steel sector would require about **USD 13,000 million** (which is greater than the Just Energy Transition Partnership for South Africa). On the other hand, the transitional pathways of converting the coal-based DRI process to natural gas and hydrogen-based DRI production would require an estimated capital investment of **USD 150,750 million**. Considering the high investment requirements for both pathways, the flow of international climate finance becomes indispensable for the LCT of the secondary steel industry in India.

TABLE 4: Summary of Overall Financial Requirements for the Potential Pathways

	Potential pathways for decarbonization	No. of Plants	Current Production Capacity (MTPA)	Mitigation Potential MTCO ₂ /yr	Estimated Capital Cost USD Million	Comments
Incremental Pathways	Integrating BATs - DRI	223	52.30	0.66	9,309.4	Based on the existing production capacity, the cost of technology is for 100 TPD, assuming 300 production days
	Integrating BATs - EAF and IF	1037	93.00	0.42	2,380.8	Based on the existing production capacity, the cost of technology is for 100 TPD, assuming 300 production days
	Integrating BATs - Re-rolling	1257	91.00	1.49	3,124.3	Based on the existing production capacity, the cost of technology is for 150 TPD, assuming 300 production days

TABLE 4: Summary of Overall Financial Requirements for the Potential Pathways

	Potential pathways for decarbonization	No. of Plants	Current Production Capacity (MTPA)	Mitigation Potential MTCO ₂ /yr	Estimated Capital Cost USD Million	Comments
	Material Substitution - Increasing Scrap Input		30.00		114.00	For installing scrap processing units with additional capacity of 30MTPA
	Integrating Renewable Energy in EAF and IF	1037	93		200.5	Based on actual production 60MTPA.
Transitional Pathways	Coal to natural gas based DRI	223	52.30		20,000	Not suitable for SSP MSMEs as min. capacity needed is 1 MT.
	Coal to hydrogen based DRI	223	52.30		130,750	
	Direct-Rerolling - Integrating with DRI-EAF	899	91.00	0.51	3,699.19	Converting standalone units to composite.
TOTAL					169,583.2	

Colour coding is based on the Technological Readiness level for the potential pathways (Annexure-7).

■ TRL-11 Proof of Stability Reached ■ TRL-6 Full Prototype at Scale ■ TRL-9 Commercially Viable

Source: Gosh et al. (2021), TERI (2017), UNIDO (2021), CEEW (2021), & Authors Analysis.

SECTION 4:

Finance for the Secondary Steel Sector



4. FINANCE FOR THE SECONDARY STEEL SECTOR

4.1 Sources of Finance for the Secondary Steel Sector

The secondary steel sector receives finance from diverse sources. These sources can be broadly classified into four categories – (1) International sources, (2) Domestic public sources (including national institutions, as well as national and state-level schemes and funds), (3) Domestic private sources, and (4) Self-financing or informal sources.

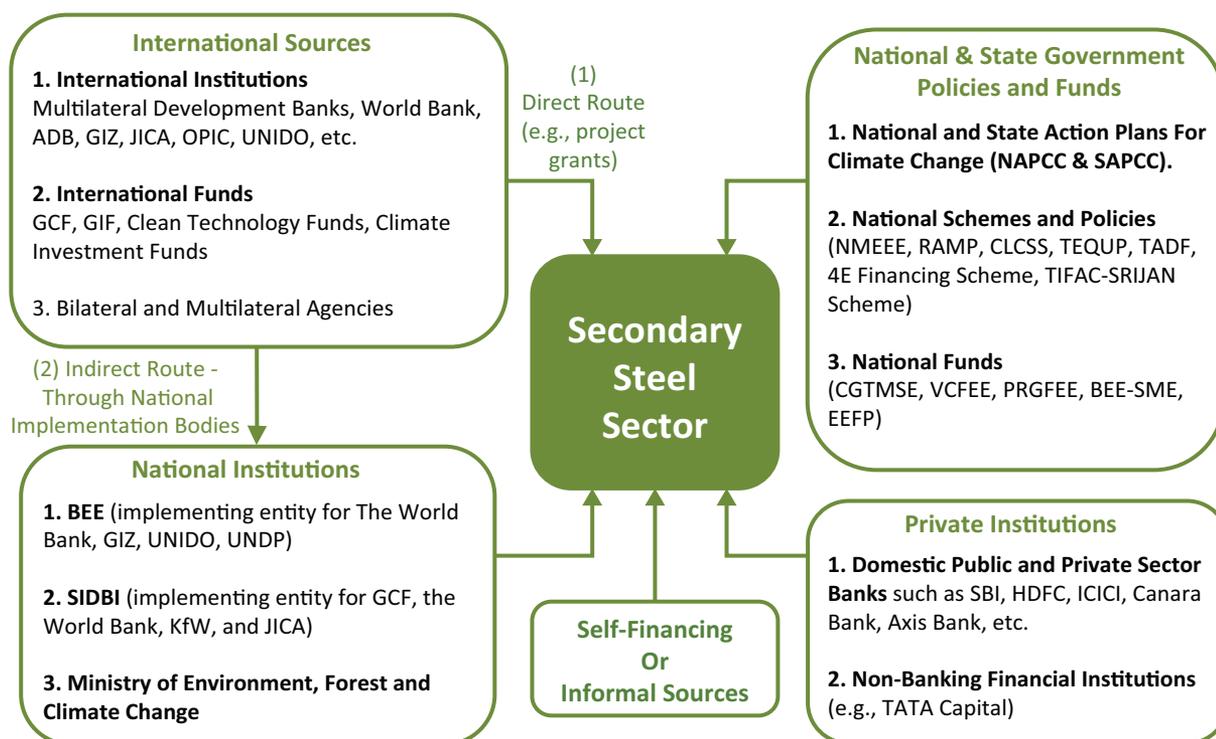


FIGURE 4: Financial Sources for the Secondary Steel Sector

- International Sources:** International sources of finance for the secondary steel sector include several international institutions such as the World Bank, Japan International Cooperation Agency (JICA), and United Nations Industrial Development Organization (UNIDO), multilateral development banks such as the Asian Development Bank (ADB), international funds such as UNFCCC's Green Climate Fund (GCF), and Clean Technology Funds (CTFs), and bilateral and multilateral agencies. International climate finance is either extended directly in the form of grants, concessional loans, venture capital, or partial risk guarantees (such as the World Bank Group's Partial Risk Sharing Program), or indirectly disseminated into different projects through domestic implementation agencies and financial institutions.
- Domestic Public Sources:** National and state-level policies, schemes, and funds form a major part of domestic public finance for the secondary steel sector. The National Action Plan on Climate Change (NAPCC) and the State Action Plans on Climate Change (SAPCCs) articulate the climate policy at the national and sub-national levels, respectively, and include the National Mission for Enhanced Energy

Efficiency (NMEEE) which forms the rationale behind several policies that are rolled out through ministries and implementation bodies. National-level implementation bodies include the likes of the Bureau of Energy Efficiency (BEE), and the Small Industries Development Bank of India (SIDBI), which is the apex financial institution serving the financing and development of MSMEs in India. Both SIDBI and BEE channel domestic and international finance into several projects concerning the development, capacity-building, and greening of MSME units- including those under the secondary steel sector.

Domestic policies, schemes, and funds providing financial support to the secondary steel sector include the likes of the NMEEE, the Venture Capital Fund for Energy Efficiency (VCFEE), the National Program on Energy Efficiency and Technology Upgradation of SMEs (BEE-SME), etc. A table in Annexure 2 enlists the provisions of several national schemes providing finance to MSMEs in the secondary steel sector. Even though these schemes have been operational for a considerable number of years, there remains a lack of dedicated attention towards financing the low-carbon transition of the secondary steel sector and technological upgradation, in particular. Furthermore, the scale of project financing for energy-efficiency uptakes remains small, and the sector itself remains reluctant to avail several institutional schemes for various reasons such as documentation requirements, due diligence, and lacking awareness.

- c) **Domestic Private Sources:** Private finance is also extended to the secondary steel sector in the form of debt financing through loans via public and private sector banks, as well as non-banking financial institutions (NBFIs). Several banks such as the State Bank of India (SBI), HDFC Bank, Axis Bank, etc., have lending policies for the industrial sector. Some examples of NBFIs that extend loans to the sector include TATA Capital and JSW One Platforms.
- d) **Self-Financing and Informal Sources:** A majority chunk of units in the secondary steel sector is made up of MSMEs which notably lack a sizeable scale of operations, collateral holdings, credit history, and organized bookkeeping to source their financial requirements from organized sources. As a result, they remain largely dependent on self-financing or informal sources, particularly to meet their working capital needs.

4.2 Barriers to Accessing Finance

The secondary steel sector is vastly heterogenous in its composition and consists of a large number of MSME units that struggle with poor creditworthiness alongside several knowledge-based and cost of capital-related barriers that hinder their access to institutional finance.

a) Knowledge-based Barriers

The units in the secondary steel industry often lack awareness about financial assistance provisions available to them through primary lending institutions. Additionally, the utilization of business development services, preparation of syndication for loans, and familiarity with digital platforms are largely absent as well. Often, these units also struggle with information on documentation requirements to acquire commercial loans. An overall lack of financial expertise and poor financial management alongside limited handholding support makes the sector particularly weak in acquiring formal credit.

As their business operations often underperform under a lack of skilled guidance, credit risk perception from the domestic financial sources against the sector sharpens as well. Consequently, from the supply side, the secondary steel sector is perceived with high risks. Furthermore, a lack of consistency in bookkeeping and reporting financial data develops opacity around the information on the financial affairs of MSMEs in the sector and further contributes to risk perception over their business profitability. Besides, among financiers, the knowledge of mitigation technologies, their maturity status, and their payback periods remains meagre. Thus, they find it hard to ascertain the suitability of various financial instruments to support the deployment

TABLE 5: Barriers to Accessing Finance for the Secondary Steel Industry

	Industry	Domestic Financial System	International Financial System
Knowledge-based barriers	<ul style="list-style-type: none"> • Awareness gaps • Documentation requirements • No financial expertise 	<ul style="list-style-type: none"> • Low technological awareness • High perceived risks 	<ul style="list-style-type: none"> • Limited direct exposure to the sector • High perceived risks
Cost of Capital-related barriers	<ul style="list-style-type: none"> • High transaction cost • High interest rates • Long payback periods 	<ul style="list-style-type: none"> • Low margin • High transaction cost • Interest rates • Inadequate (low) maximum funding limits 	<ul style="list-style-type: none"> • Lending prerequisites • Due diligence • High transaction cost • Larger scale of operations
Creditworthiness-based barriers	<ul style="list-style-type: none"> • Irregular cash flow • Delayed payments 	<ul style="list-style-type: none"> • Lack of collateral • Seasonal operations • Low credit score 	<ul style="list-style-type: none"> • Low credit score

of low-carbon technologies. The international sources of finance, additionally, have limited direct exposure to the sector. Green finance in India largely remains concentrated on projects around adaptation or renewable energy.

b) Cost of Capital-related Barriers

Commercial lending to the secondary steel sector for low-carbon technologies can have a high cost of capital due to the long payback periods on the technologies, the need for monitoring and engagement with the MSME units, and low-profit margins from such loans. For the industry, non-concessional rates of interest on commercial loans raise the cost of loans and disincentivize a shift to low-carbon technologies.

Due diligence and limiting pre-requisites and standards from financiers also limit the capabilities of the secondary steel sector to mobilize upfront investment. For instance, ICF institutions require structured procedures, verification processes, and channels for the processing and accreditation of finance, which the secondary steel sector finds hard to keep up with. Additionally, conditionalities such as existing WHR system installations are required to be eligible to access finance (Banerjee et al., 2022). Significantly, ICF often has a larger scale of operations, and the high transaction costs of servicing the MSME sector furthers the divide between the two.

c) Creditworthiness-based Barriers to Finance

Secondary steel sector units, particularly the MSMEs, often have a low credit score which makes it difficult for them to acquire finance. Inadequate collateral holdings, the seasonal nature of their operations and consequent irregularities in cash-flow, high non-performing assets, and limited equity, all restrain the creditworthiness of the industrial units.

Moreover, the secondary steel sector MSMEs also face the problem of delays in payments and aid. The steel ministry in its December 2022 year-end review said its central public sector enterprises had made a payment of INR 4,747.53 crore (approx. USD 578 million) to steel MSMEs between April and November 2022 - 41.35% higher than the same period last year.⁶ However, at the same time, as of March 2, 2023, the amount pending

⁶ 41% higher payment made by steel CPSEs to MSMEs during April-Nov 2022 from year-ago period; Govt. (2022, December 26). Financial Express. <https://www.financialexpress.com/industry/sme/msme-fin-41-higher-payment-made-by-steel-cpse-to-msmes-during-april-nov-2022-from-year-ago-period-govt/2927215/>

to be cleared by CPSEs to MSMEs overall (in all sectors), stood at INR 2,679.22 crore (approx. USD 326 million) in 2,886 delayed payment applications (Soni, 2023). Such delays pile up with liquidity crunches and further strangle MSME operations.

4.3 The Role of International Climate Finance (ICF)

As elaborated by the earlier sections, the goal of decarbonization of the Indian secondary steel sector would require a significant amount of policy attention, technical handholding, and importantly, financial support to be realized. The sheer scale of finance that would be required to decarbonize the industrial sector cannot be met by domestic sources of finance alone in the long run. International finance can play a significant role in enabling the transition to low-carbon steel production. International finance can instrumentally enable the de-risking of private investments and mobilization of private capital through various sources.

4.3.1. Indian Secondary Steel Sector's Exposure to ICF

In the past decade and a half, the flow of ICF in India has greatly remained focused on climate adaptation, or on specific sectors such as renewable energy and electric vehicles. The steel industry, particularly the secondary steel sector, has largely remained underattended through dedicated ICF initiatives or investments. For instance, the World Bank recently approved USD 1.5 billion in financial assistance to accelerate India's development of low-carbon energy. The crux of financing under the initiative would be on renewable energy expansion, the development of green hydrogen, financing green energy investments, funding a national carbon credit trading scheme, and the issuance of sovereign green bonds.⁸

At the same time, financial assistance that has been serviced to the sector from international financial institutions has come indirectly through energy efficiency initiatives for the MSME sector (such as World Bank-GEF-BEE's 'Financing Energy Efficiency at SMEs' project), through MSME investment programs (such as UNIDO's SME Investment Promotion) and credit guarantees, or in some instances, through project grants.

JICA and SIDBI's 'Financing Scheme for Energy Saving Projects' is one such initiative that was availed by the secondary steel sector MSMEs during the last decade. The scheme focused on providing financial assistance at concessional rates of interest to promote energy-saving projects. Concessional financing was provided through banks, state finance corporations, and non-banking financial companies. Eligible sub-projects under the scheme included the acquisition of energy-saving equipment, building equipment/heating systems/lighting in compliance with the energy conservation building code, and projects involving intervention at the cluster level for technological or procedural upgradation.⁹

Other major international schemes facilitating the secondary steel sector include the World Bank-GEF funded 'Partial Risk Sharing Facility in Energy Efficiency' and the 'Financing Energy Efficiency at SMEs' project being implemented by SIDBI and BEE, respectively. The World Bank and GEF's Partial Risk Sharing Facility in Energy Efficiency is a USD 37 million de-risking facility that provides partial credit guarantees to cover a share of default risk for financial institutions in extending loans for EE projects through Energy Service Companies (ESCOs).¹⁰

UNIDO's SMEs Investment Promotion Programme in India was undertaken between 2008 and 2011 with a budget of 800,000 Euros, in cooperation with the Italian organization CONFIDI to train SIDBI staff members for 4 years in international best practices for the management of mutual credit guarantee scheme. It helped strengthen SIDBI and develop mutual credit guarantee schemes suitable to the Indian ecosystem.⁷

⁷ UNIDO Partnership Strategy with Development Finance Institutions. https://www.unido.org/sites/default/files/2015-05/DFI_Publication_0.pdf

⁸ World Bank Approves \$1.5 Billion in Financing to Support India's Low-Carbon Transition. (2023, June 29). <https://www.worldbank.org/en/news/press-release/2023/06/29/world-bank-approves-1-5-billion-in-financing-to-support-india-s-low-carbon-transition>

⁹ JICA - SIDBI Financing Scheme for Energy Saving Projects in MSME Sector (Phase III). (n.d.). Foundry Informatics Centre. http://www.foundryinfo-india.org/pdf/JICA_Brochure.pdf

¹⁰ Partial Risk Sharing Facility in Energy Efficiency. (2021, May 12). IEA. <https://www.iea.org/policies/6203-partial-risk-sharing-facility-in-energy-efficiency>

Table 6 further elaborates on some programs that have been implemented with funding from international agencies like GEF for improving EE. These programs were remarkably effective in providing financial as well as much-needed handholding support to enable emission reductions for the units. However, the scale of these initiatives was small and focused on only specific target groups of MSMEs and clusters.

TABLE 6: Energy Efficiency (EE) Programs for MSMEs in the Indian Secondary Steel Sector¹¹

Program	Time Period	Target Areas	Funding	Objectives / Achievements
GEF-UNDP-MOS EE in Steel-Rolling Mills (Phase-1)	2004-13	14 states; 38 Model MSME units	USD 14.03 million (GEF – USD 6.75 million & Steel Development Fund – USD 7.28 million)	<p>Aim- To improve the level of adoption of EE technologies and reduce emissions.</p> <p>Achievements</p> <p>a. Establishing low as well as high investment benchmarks for eco-tech packages, effective knowledge dissemination, and capacity-building of units.</p> <p>b. Reduction of specific electrical energy consumption by 10-20% & Specific Thermal Energy Consumption by 20-50% & reduction of GHG by 1000-2500 tCO₂/per unit per year.</p>
UNIDO, GEF & BEE - Financing EE at SMEs Project	2011 - (active)	14 MSME Clusters 80 MSMEs	USD 26.1 million (overall)	<p>Aim- Market development for EE and renewable energy technologies.</p> <p>Achievements (until 2019)¹²</p> <p>a. Energy savings of 7,894 toe, and reduction of carbon emissions by 49,896 Tonnes, annually.</p> <p>b. Monetary savings of USD 6.62 million.</p>
UNDP, AusAID-MoS (Phase - 2)	2013-16	PAN India; 285 MSME units	USD 2.44 million	<p>Aim- To improve EE, mitigate GHG emissions, and enhance technical capacity and productivity.</p> <p>Achievements</p> <p>a. Technical assistance to enable energy audits, implementation of energy efficiency measures, cost-benefit interventions, & knowledge development.</p> <p>b. 24% energy savings and 28% reduction in GHG emission per ton of mill output.</p>

4.3.2 International Examples of Financing LCT and MSME Support

International experience in financing low carbon transitions of hard-to-abate sectors such as steel can crucially provide insights into technology transfer, capacity-building initiatives, and financial instruments that can be deployed to facilitate the decarbonization of the Indian secondary steel sector.

¹¹ Upscaling Energy Efficient Production in Small-Scale Industry in India. (2016, January). In UNDP. <https://info.undp.org/docs/pdc/Documents/IND/00074684%20Terminal%20Evaluation%20Report%2000086974.pdf>

¹² GEF-UNIDO-BEE Project. (n.d.). Bureau of Energy Efficiency. <https://beeindia.gov.in/en/programmesdemand-side-managementsmall-medium-enterprise/gef-unido-bee-project>

For instance, Energy Efficiency Revolving Funds (EERF) have been established around the world with support from international institutions such as the World Bank and the GEF. These EERFs have performed diversified functions and undertaken various routes to support LCT initiatives. Some have provided guarantees (for e.g., in Bulgaria, Hungary, and Slovenia) or credit lines (in Thailand) to commercial banks to mobilize private sector financing. Some have exclusively financed EE investments, while others have included the scopes of renewable energy (in Armenia and Mexico), environmental protection (in Slovenia), and urban infrastructure (in India) (Lukas, 2018). In India, The State Energy Conservation Funds (SECF) are also being promoted to facilitate the implementation of EE projects. A major part of the funds disseminated under the SECF initiative would be designated as Revolving Investment Fund, to support various EE initiatives.¹³

International financial institutions in the past couple of decades have also shown a growing interest in circular business models, and sustainability-linked financing. Between 2010 to 2015, for instance, the Russian government leveraged European Bank for Reconstruction and Development (EBRD) and UNIDO's expertise to overcome barriers relating to EE in Russian industries. In partnership with the Russian Energy Agency, enhanced policy frameworks were developed for dedicated capacity building of market stakeholders and investment amplification to generate a push for industrial energy efficiency and reducing GHG emissions.

In Africa, credit guarantee schemes have facilitated MSME financing post the covid-19 pandemic by ensuring lesser market distortions than other policy interventions such as direct lending programs. They have also encouraged a greater financial inclusion of MSMEs, enabled opportunities for service providers, helped unlock private capital to optimize scarce resources, and tackled issues of information asymmetry and creditworthiness-based barriers to finance for MSMEs.¹⁴ Credit guarantees have also been successful in several other parts of the world. Chile's *FOGAPE*, for instance, is one of the most efficient public credit guarantee schemes in the world and takes only 15 days (about two weeks) to make the full payment to the lender. In comparison, the CGTMSE in India takes up to 30 days to pay 75% of the guaranteed amount to the lender. Such delays in the processing of payment discourage lenders from using public guarantees for lending to small enterprises.

Similarly, the GCF has an MSME Pilot Programme in Guatemala, Mexico, Mongolia, and Ghana, with an allocation of USD 200 million to finance MSME initiatives at different stages of growth. Despite having the world's second-largest base of MSMEs, no such program exists for the Indian MSME sector (Maltais et al., 2022). Thus, alongside a dedicated policy focus on the LCT of the sector, innovation in the utilization of diverse financial instruments would be required to service the Indian secondary steel sector.

4.4 Financial Instruments for Financing Decarbonization

The LCT of the secondary steel sector would require financing for two types of costs- the direct upfront capital cost of low-carbon technologies, and the cost of covering technical assistance and enabling these technologies. Significantly, loans can't be the primary financial instrument to enable decarbonization for the secondary steel sector. Even though there have been several ICF-based initiatives in the past, their scale of operations hasn't been adequate. Moreover, no single financial instrument would be able to definitively address all the barriers faced by the sector toward potential LCT.

The LCT of the secondary steel sector would require financing for two types of costs- the direct upfront capital cost of low-carbon technologies, and the cost of covering technical assistance.

¹³ Contribution to State Energy Conservation Fund. (n.d.). Bureau of Energy Efficiency. <https://saathee.beeindia.gov.in/Common/BEEContent?MID=1&SMID=21>

¹⁴ Credit Guarantee Schemes: Facilitating MSME Financing in Africa During The COVID-19 Pandemic. In Alliance for Financial Inclusion. (2022, March). https://www.afi-global.org/wp-content/uploads/2022/03/Credit-Guarantee-Schemes-Facilitating-MSME-Financing-in-Africa-during-the-COVID-19-Pandemic_070322.pdf

Various alternative instruments of finance can be utilized to service the secondary steel sector depending on the suitable risk/return arrangements and purpose-based requirements. Blended financing and innovative solutions with a focus on insurance and layered-risk mechanisms would be key to overcoming some challenges relating to the risk perception of investors servicing the sector. Deployment of financial instruments in varying combinations can help address diverse issues faced by the secondary steel sector in accessing finance, which a single instrument otherwise may not be able to cover. Some financial instruments that can be deployed for the sector include multi-layer risk funds and guarantees, cluster-level securitization, hybrid financing, and large-scale grants/equity funding for revolving funds.

Layered-risk funds can instrumentally channel finance and technical guidance to underfunded sectors, as the risk safety mechanism enables independent financing institutions to invest more while attracting investment from safeguarded private investors, who can provide technical guidance.¹⁵ It could also help broaden the

TABLE 7: Financial Instruments & their Suitability against Barriers to Finance

Bottlenecks/ Challenges Covered	Financial Instruments and Examples							
	Asset-based Finance	Securitization	Leasing	Guarantee Funds	Technical Grants	Hybrid Financing	Risk-sharing Funds/ Facility	Revolving Funds
Examples				CGTMSE	UNIDO, GEF&BEE; GEF-UNDP-MOS	Concessional Subordinae Debt	BEE-World Bank-GEF (partial)	EERFs for credit lines, guarantees
Lengthy Documentation & Processing Time	High	High	Moderate	Moderate	High	Moderate	Moderate	Moderate
Inadequate Collateral Holdings	Low	Moderate	High	High	High	High	Moderate	Moderate
High Rate of Interest	High	High	High	High	High	High	High	High
Low Credit Scores	High	High	High	High	High	High	Moderate	Low
High Transaction Costs	Low	Moderate	Moderate	Moderate	High	High	High	Moderate
Technical/Financial Capacity Building	High	Low	Low	Low	High	High	High	Moderate
High Technological Upgradation/Capital Costs	Moderate	Moderate	High	High	Moderate	High	High	High
Investor Risk Protection	Moderate	High	High	High	High	Moderate	High	High
Large-scale Coverage	Low	Low	Low	High	Low	Low	High	High

(Source: Author's Analysis)

[Note: ■ High efficacy against the barrier ■ Moderate efficacy against the barrier ■ Low efficacy against the barrier.]

¹⁵ Innovative climate finance products. (2015). European Investment Bank. https://www.climateaction.org/images/uploads/documents/innovative_climate_finance_products_en.pdf

investor base to potentially include global investment funds, as well as institutional investors like insurance companies and philanthropic capital. Guarantee funds, on the other hand, can help cover long-term, initially risky/uncertain investments in MSME firms (Csaky et al., 2017). They can be deployed for credit enhancement, and their flexibility allows lenders to extend the payment tenor for risky borrowers – shaping it to their capital expenditure requirements and monthly payment abilities.

In terms of lending, securitization can be utilized for lending based on receivables. It can also be advantageous to banks by reducing their exposure to credit risk, and consequently, their overall cost of financing (OECD, 2015). Similarly, hybrid financing instruments such as subordinate debt can be extended for diverse purposes such as technological investment and high-cost capital replacement. It offers the advantage of not diluting the firms' investors' equity and is also free from enforced operating covenants as in the case of traditional debt or leases. Lastly, blending private finance with grants and public concessional funds can unlock investments from diverse investors and multilateral climate funds.



SECTION 5:

Recommendations



RECOMMENDATIONS

To address the identified challenges for leveraging finance for the low-carbon transition of the secondary steel sector, this report makes recommendations for interventions at the national level, as well as at a broader international level to ensure a greater enabling environment for the flow of international climate finance to the secondary steel sector.

5.1 Interventions at the National-Level

- 1) **Development of a Multi-Stakeholder Platform** – A multi-stakeholder information-sharing platform could be developed with the participation of government institutions, knowledge institutions, industry associations, financial associations, and technology providers. The platform can crucially address information gaps for the industry on financial provisions and due diligence, as well as enable financiers to know better about emerging technologies, to ascertain suitable financial instruments for extending credit for their uptake. Greater organization of information about the dynamics of the sector and its requirements could also help attract international investment in the longer future.
- 2) **Cluster-level Interventions** need to be made to essentially map secondary steel units into clusters which could be supported through securitization to secure loans for working capital requirements. Up-take of clean technologies could also be initiated in clusters with programmatic partnerships, performance-based mechanisms, technical support, and handholding. Large-scale revolving funds could be developed as financial pipelines for such programmatic interventions for a large number of heterogeneous clusters. These funds shall be supported by international climate finance through grants.
- 3) **Development of a Dedicated National Fund for Steel Decarbonization** – To facilitate the financing of low-carbon transition of the Indian steel sector, a dedicated national fund can be developed. Such a fund could be housed with the Ministry of Steel and SIDBI could be assigned a facilitative role for financing. Furthermore, specific SIDBI windows could be developed to support results-based financing. It could also be divergently developed as time-bound close-ended fund to support the uptake of clean technology- like the SIDBI Tex Fund Scheme which focused on investing in emerging fields in the textile industry.

Additionally, policy frameworks and regulations would further be required to streamline the secondary steel industry's access to finance in the long run. Extension of finance through a dedicated decarbonization fund can also be allied with emission intensity reduction targets- with financial or fiscal incentives of varying quantum associated with the targeted achievements.

- 4) **A Financially-backed Scheme for the Integration of Waste Heat Recovery Systems** – Waste heat recovery is a disruptive technological option that can serve as a low-hanging fruit for the low-carbon transition of the secondary steel sector units. Despite a relatively low level of investment requirements and quicker payback periods, waste heat recovery remains grossly under-utilized by the secondary steel sector. A national-level scheme that subsidizes waste heat recovery technologies or provides incentives for their adoption could strongly facilitate energy efficiency and emission-reduction in a short amount of time.
- 5) **Dedicated Renewable Energy Supply for the IF/EAF Units** – Most of the IF and EAF units in the secondary steel sector are standalone units with constrained operating sizes to develop any captive power facilities. More than 70% of the energy input for these units comes from electricity and the dominant share of this electricity is sourced from fossil-fuel-based power plants. Dedicated allocation of a certain percentage of renewable energy supply to these units from state and private discoms could effectively mitigate scope 2 emissions from the sector. Importantly, center-state policy

coordination on power supply would need to be streamlined, alongside an overall expansion of the power grid.

- 6) **Enhancing Scrap Availability and Collection** - Amplifying scrap utilization and promoting a circular economy model for the secondary steel industry is key to its sustainable future. Currently, the downstream sector remains import-dependent for sourcing scrap. To reverse this dependence, India would need to remarkably improve scrap recycling. As outlined by the National Steel Scrap Recycling policy, setting up scrap recycling centres with an effective formalization of scrap collection, segregation, and dismantling would be required to attain higher recycling rates (80-90%) as in Europe, Japan, and South Korea. To ensure material availability, the successful implementation of policies such as the National Vehicle Scrappage Policy would be essential.

5.2 Interventions to Enhance the flow of International Climate Finance

- 1) **Multi-level Risk Guarantee Mechanisms** dedicated to de-risking financing low-carbon transition technologies with longer payback periods need to be developed. As discussed in the earlier section, private finance would play a key role in meeting the overall financial requirements of the sector and consequently de-risking mechanisms would need to be included in the fold. For layered-risk funding mechanisms, the first layer of guarantee can be provided at the sub-national/national level, which could be further supported by international climate finance. Consequently, requirements of due diligence on documentation, reporting, and monitoring can also be assigned at local levels to overcome the cost of capital-related barriers to accessing international climate finance. International climate finance needs to be viewed as a major source to finance the LCT of the secondary steel sector.
- 2) **A Sector-Level Modernization Programme supported by ICF** - International climate finance needs to be viewed as a major source to finance the LCT of the secondary steel sector. Consequently, a sector level modernisation programme could be targeted. Such a programme could be prepared to address the decarbonization challenge in phases - starting with the adoption of energy efficiency measures and alternative fuels. This sectoral modernization programme plan shall be posed to the World Bank or the GCF for funding and accessing international climate finance.

Conclusion

This report has laid out the complex and intertwined landscape of the steel sector when it comes to production of almost twenty-five percent of steel in India via the over 1000 MSME units. It establishes the deep dependencies on coal-based direct reduction of iron that have locked in high emitting technologies. Glaringly, the historical reasons for this have been the sector trying to avoid dependencies on imported cooking coal, the lack of affordable natural gas and regional development of industry goals. While seemingly there exists a lot of low-hanging fruit in terms efficiency improvements for the MSME steel sector like investments in waste heat recovery, whether this alone is a decarbonization and modernization strategy for this sector remains doubtful. Even with these improvements these production processes will remain disproportionately carbon and energy intensive and may thus also continue to face uncertain economic perspectives.

Thus, a clarity on strategy for how to transition the sector and its myriad moving parts and stakeholders is an essential precursor. The strategy shall take under consideration the important role of the MSME steel industry for local economies and identify what primary or secondary production technologies can offer long-term perspective for steel production and processing in the emerging national and global steel value chain. The strategy shall also enhance clarity for private investors, international public funders and domestic banks as mixed signals and uncertainties will hamstring access to capital.

Our proposition as the pathway for this strategy evolves is that we consider the challenges in getting international finance for coal based DRI as even with efficiency improvements they will remain carbon intensive. Also, a shift to CCS or hydrogen-based production technologies are challenging to apply here given the small size of installations and requisite CO₂ capture infrastructure that would be needed. We instead recommend exploring the feasibility of transitioning coal based DRI installations to recycled steel making, as these facilities keep their EAF or and get financing for those, while phasing down the coal DRI installations of their facility.

Significantly, this transformation might reduce the value add of the plant but might not have drastic implications for jobs, as labor intensity is further downstream (rolling, casting, use for manufacturing/construction). All the while there might be other co-benefits to the local firms and communities in terms of local air pollution and stabilization of the sites to realize investments in upgrading EAF's and downstream activities. The implication of this would be that a large share of steel scrap would go to the local small-scale installations. This would offer co-benefits, given the challenges in scrap collection, scrap quality and scrap processing requirements are actively worked at.

Importantly, prioritizing finance for improvements within the secondary steel sector in India becomes imperative. Such enormous shifts in production pathways of the sector might be currently uncertain to predict but unavoidable to acknowledge for the future. Crucially, as pivotal changes in the operational nature of the sector would demand substantial support in terms of financing and capacity building, access to international climate finance indubitably would need to become the facilitative landscape which would catalyse and incentivize this sectoral transformation.

Strikingly, to adopt the mere best-available technologies (BATs), the Indian secondary steel sector would require upfront investments of above 14,000 million USD and considerable technical handholding. Thus, a low-carbon development strategy for the secondary steel sector becomes imperative to formulate. Phased steps towards cleaner production pathways need to be outlined to strike a balance between emission intensity reduction and ensuring a business case for the sector. And, most importantly, the development of a strategy is critical to provide an outlay to avail finance for the sector, alongside programmatic technical support. The realisation that implementation of a decarbonization strategy for the sector hinges on the availability of international financial backing is central to a cleaner future of the sector. Beyond technology transfer and upgradation, international climate finance would also be key to enabling capacity building programs, labour skill formation and overall sustainable development within the sector. The development of an ecosystem conducive to facilitating the attraction, absorption, and dissemination of finance emerges as the need of the hour for the secondary steel sector. A clear strategy through a phased roadmap for LCT shall facilitate the overall development of an enabling environment, support both- financial and technical assistance.

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Annexures

Annexure – 1

List of Stakeholders for Consultation

Financing Institutions - International

United Nations Industrial Development Organization (UNIDO)

Asian Development Bank

GEF Capital Partners

Financing Institutions - Domestic

YES Bank

Small Industries Development Bank of India (SIDBI)

Energy Efficiency Services Limited (ESSL)

Industry

Confederation of Indian Industry (CII)

Minmet Consultants

Sponge Iron Manufacturers Association (SIMA)

All India Induction Furnaces Association (AIIFA)

All India Steel Re-Rollers Association (AISRA)

Alloy Steel Producers Association of India

Think Tank/Institutions

German Corporation for International Cooperation (GIZ)

The Energy and Resources Institute (TERI)

Shakti Sustainable Energy Foundation

Climate Policy Initiative (CPI)

Government Institutions

Ministry of Steel Task Force on Financing Steel Sector

Bureau of Energy Efficiency (BEE)

Annexure – 2

Selected List of Active Funding Schemes for the Secondary Steel Sector

Scheme	Year of Introduction	Implementing body	Features / Provisions
NMEEE (National Mission for Enhanced Energy Efficiency)	2011	Ministry of Power & BEE	<ul style="list-style-type: none"> Includes initiatives such as the PAT scheme, EEEP, and the Framework for Energy Efficiency Economic Development (FEEED) to build capacities of institutions to fund EE projects.
VCFEE (Venture Capital Fund for Energy Efficiency) (BEE, accessed 2023)	2017	BEE	<ul style="list-style-type: none"> Last-mile equity support for specific energy efficiency projects through Special Purpose Vehicle (SPV). 15% of total equity or INR 2 Crores provided. Union Government approved amount for the fund is INR 210 crores.
RAMP (Raising and Accelerating MSME Performance)	FY 2022-23 to FY 2026-27	Ministry of MSME	<ul style="list-style-type: none"> Accelerate MSME sector's performance by strengthening financial institutions, enhancing centre-state partnerships, addressing issues with late payments and the greening of MSMEs. It involves strategic investment plans (SIPs). 2023-24 rollout - an outlay of Rs 6,000 crore (Finextra, 2023).
SIDBI-4E Scheme (End to End Energy Efficiency)	2014	SIDBI	<ul style="list-style-type: none"> Provide financial assistance to MSMEs, promote energy efficiency and sustainability. Loan amount between ₹10 Lakhs to ₹5 Crores at 6.4% to 7.5% interest rate.
PRGFEE (Partial Risk Guarantee Fund for Energy Efficiency) (BEE, accessed 2023)	2008	BEE	<ul style="list-style-type: none"> Provides financial institutions with partial coverage of the risk involved in extending loans for energy efficiency projects. 50% of the loan amount/Rs. 10 crore per project.
CGTMSE (Credit Guarantee Fund Trust for Micro and Small Enterprises)	2000	Ministry of MSME & SIDBI	<ul style="list-style-type: none"> Credit guarantee for lenders up to 50-85% on defaults made by MSME borrowers on collateral-free loans extended through primary lending institutions. FY24 - Infusion of around Rs 9,000 crore into the fund - lowered the cost of credit by 1% to allow the MSME sector to avail cumulative collateral-free credit guarantee of Rs 2 trillion (Finextra, 2023).
CLCSS (Credit Linked Capital Subsidy Scheme for Technology Upgradation)	2000; Revamped in 2005	Ministry of MSME - 12 nodal banks including SIDBI	<ul style="list-style-type: none"> Implemented through 12 nodal agencies such as SIDBI & other Primary Lending Institutions. Facilitation of technology upgradation - an upfront subsidy of 15% on institutional credit up to ₹ 1 crore for MSMEs in various sub-sectors.
SRIJAN Scheme (TIFAC-SIDBI Revolving Technology Innovation Fund)	2010	SIDBI	<ul style="list-style-type: none"> Financing for development, demonstration, and commercialization of innovative technology projects by MSMEs. Maximum loan amount of up to INR 2 Crores at 5% interest rate.

Annexure – 3

Integrating Best Available Technologies and Input-based Solutions in the DRI process (Ghosh et al., 2021)

Best Available Technologies (Short & Medium term)	Technology Description	Estimated Investment required (USD million)	Estimated Savings (USD million)	Energy saving (Gcal/year)	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
Coal gasification for partial substitution	The producer gas is supplied instead of coal in the rotary kiln. The process consists of pyrolysis and gasification. The producer gas (CO and H ₂) is partially substituted instead of coal for combustion	1.3167	0.3148	21840	7500	NA	100 TPD (the plant will have to invest in setting up a producer gas system of corresponding capacity)
Use of iron ore pellets in DRI	To reduce the thermal load and increase the load of Iron ore pellets.		0.3947	27300	9400	NA	100 TPD
Thermostatic controller for cooling tower	The cooling tower is equipped with an automatic control system to regulate fan operation instead of manual controls. It reduces the temperature of incoming water based on wet bulb temperature and relative humidity of ambient conditions.	0.0002	0.0005	12	11	0.5	For a motor with a 10 Kw capacity for 100 TPD
FRP blades for cooling tower fans	The metal blades in cooling tower fan can be replaced with lighter fibre-reinforced plastic (FRP) blades, which would reduce the power consumption of the cooling tower system.	0.0008	0.0003	9	8	2.4	For a motor with a capacity of 7.3 kW
Energy-efficient pumps	Energy-efficient centrifugal pumps can be used in place of inefficient pumps, which provide advantages such as high-flow rates, smooth and non-pulsating delivery, and regulation of flow rate over a wide range.	0.0024	0.0029	72	69	0.8	The motor rating of an energy-efficient system will be 18.5 kW, replacing 30-kW inefficient pumps
Decentralized VFDs for shell air fans	VFD for each fan can be used to attain precise control of temperature. The main advantage of the use of decentralized VFDs is that it eliminates the manual intervention in controlling airflow across the kiln, leading to close control over the temperature in each zone.	0.0036	0.0006	16	16	5.2	Decentralized VFD systems for shell air fans for 100 tpd capacity rotary kiln

Best Available Technologies (Short & Medium term)	Technology Description	Estimated Investment required (USD million)	Estimated Savings (USD million)	Energy saving (Gcal/year)	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
Energy-efficient motors	The motive loads are the major consumers of electricity, which includes equipments like kiln drive, ID fan, shell air fans, crushers, cooling tower pumps, material handling system, and air compressor. For a 100-tpd coal-based DRI plant, the motor capacity is in the range of 7.5 kW to 75 kW. Most of the motors used are of standard type.	0.0036	0.0008	19	18	4.8	A typical example of electrical motor application is ID fan in rotary kiln, which uses 75 kW standard motor in a 100-tpd plant. This standard motor can be replaced with an IE3 (4-pole) motor
VFDs for air compressors	The VFD is used to minimize electricity consumption during unloading in the rotary screw compressor. VFD-enabled air compressors can deliver variable airflow to maintain set pressure based on end-use points.	0.0036	0.0028	71	67	1.3	VFD with a rated power of 22 Kw and with a full time load of 3,110 h/year
Mullite-based kiln lining	The high-alumina low-cement castable refractory material can be replaced with mullite-based high alumina castable refractory for reducing the outer-shell temperature and heat loss through the kiln shell by 30 per cent.	0.0605	0.0436	3033	1050	4.1	Mullite-based lining of rotary kiln of 100 tpd capacity
WHR - Vapour Absorption Chiller	A vapour absorption machine (VAM) can be utilised to replace existing cooling arrangements. The existing standalone air conditioning system can be replaced with WHR based VAM.	0.0085	0.0035	36	34	2	Energy saving that can be achieved by replacing conventional chillers with a VAM-based system of 10 TR (cooling load) capacity
WHR - Coal moisture reduction	The WHR-based rotary drum dryer can be installed for moisture removal in coal using the off-gases generated from the rotary kiln during the process for iron production.	0.1211	0.0799	5539	1900	1.5	100 TPD
WHR- Iron ore preheating	The off-gases generated from the rotary kiln during the process can be recovered using the WHR boiler to generate a high-pressure system for preheating of iron ore, resulting in lower coal consumption.	0.4238	0.3935	22360	7726	1.1	200 TPD

Best Available Technologies (Short & Medium term)	Technology Description	Estimated Investment required (USD million)	Estimated Savings (USD million)	Energy saving (Gcal/year)	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
WHR - Power generation	The off-gases generated from the rotary kiln during the process can be recovered using the WHR boiler to generate a high-pressure system for power generation	3.3902	1.0582	20227	19300	3.2	A kiln with 200 TPD production capacity has a WHR power generation facility of 4 MW. A kiln with 100 TPD production capacity would have a power generation potential of 1.5-2.5 MW

Annexure – 4

Integrating Best Available Technologies in EAF and IF processes (TERI, 2017)

Best Available Technologies (Short and Medium term)	Technology Description	Estimated Investment required USD million	Estimated Savings/year (USD million)	Energy saving	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
FRP blades in cooling tower	The metal blades in the cooling tower fan can be replaced with 'fibre reinforced plastic' (FRP), lighter blades. Using FRP blades would reduce the power consumption of the cooling tower system.	0.0024	0.0024	Reduction in electricity consumption of cooling tower fan by 15-25%	40	0.8	Values based on cooling tower of 1.5 lakh kCal capacity
Installation of EE pumps	Generally, the pumps' efficiency in the cooling water circuit is in the range of 40-60 %. The installation of EE pumps for pumping water for cooling could increase energy savings.	0.0061	0.0097	energy savings with use of EE pumps in cooling water system is about 15-25%.	90	0.5-1	Values based on a 100 hp pump
Variable frequency drives in ID fans	The off gases generated from various reactions inside EAF are removed from the EAF using a fumes extraction system, which is typically equipped with a high-power ID fan.	0.0091	0.0091	Reduction in electricity consumption by 15 to 20%	120	1	50 tonne furnace

Best Available Technologies (Short and Medium term)	Technology Description	Estimated Investment required USD million	Estimated Savings/year (USD million)	Energy saving	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
Waste heat recovery for boiler feed water	To reduce the overall energy consumption, the waste heat gases (900-1200°C) can be recovered and reused for pre-heating.	0.0121	0.0484	Furnace oil saving by 22 kg/hr	1510	0.2-0.5	NA
Scrap preheating (bucket System)	To reduce the overall energy consumption, the waste heat gases (900-1200°C) can be recovered and reused for a pre-heating scrap charging bucket.	0.2422	0.3245	41 kWh/t	5900	0.5-1	50 tonne furnace
Scrap preheating (Continuous System)	To reduce the overall energy consumption, the waste heat gases (900-1200°C) can be recovered and reused for a continuous pre-heating scrap charging system.	0.4843	0	NA	8860	1	50 Tonne furnace
Ladle Pre-heating (BEE)	To reduce the overall energy consumption, the waste heat gases (900-1200°C) can be recovered and reused for pre-heating ladle used to transport molten liquid.	0.0121	0.0121	10-15 ToE/yr	150	1	steel IF with 5 tonnes capacity with 8 heats per day and 12,000 tonnes of annual production

Annexure – 5

Integrating Best Available Technologies and Input-based Solutions in the Steel Re-rolling Process (Unido, 2020)

Best Available Technologies (Short and Medium term)	Technology Description	Estimated Investment required USD Million	Estimated Savings/year (USD million)	Energy saving (Gcal/year)	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
Modified pulverized coal feeding system	Conventionally, the pulveriser is inefficient due to no proper control over air and fuel leading to improper combustion. In an efficient system, coal is pre-crushed and dried to remove the moisture and then coal is fed into the pulveriser.	0.02	0.031	1811	718	0.9	Considering a 10 t/h SRRM plant
Conversion of fossil fuel to Natural gas based reheating furnace	Natural gas is used instead of coal for better combustion and to reduce burning losses.	0.05	0.052	31391	14800	0.11	Considering a 15 t/h furnace

Best Available Technologies (Short and Medium term)	Technology Description	Estimated Investment required USD Million	Estimated Savings/year (USD million)	Energy saving (Gcal/year)	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
Energy Efficient Re-heating Furnace	Typically, all conventional furnaces have various losses due to inefficient design. The energy-efficient design of the re-heating furnace consumes less fuel and heat losses by increasing productivity.	0.18	0.199	8526	94.6	1.5	15 t/h furnace fired by pulverized coal
Conversion of fossil fuel to Coal-Based Methane (CBM) based reheating furnace	Coal-based methane is a carbon-neutral fuel extracted from coal beds. It's a form of natural gas used in re-rolling instead of solid fuel.	0.18	0.289	6354	9365	0.8	Considering a 15 t/h furnace
Conversion of fossil fuel to biomass-based producer gas re-heating furnace	Biogas is a carbon-neutral fuel generated from agricultural waste that can be used in re-rolling instead of solid fuel.	0.18	0.605	4543	11915	0.2	Considering a 15 t/h SRRM unit
Installation of high efficiency metallic recuperator in re-heating furnace	The waste heat generated from the re-heating furnace is recovered by the installation of recuperator.	0.03	0.099	5724	2,262	0.4	15 tph furnace capacity
Installation of automation & control system in re-heating furnace	Installation of automatic and control system basic monitoring instruments like thermocouples can increase the furnace efficiency at optimal level.	0.03	0.061	1331	526	0.5	15 tph furnace capacity
Installation of Energy Efficient Pulveriser	The critical components of energy-efficient pulverisers such as a Hammer, a mild steel liner (Use grooved EN-31 hardened steel plates or cast high manganese), a classifier, and an in-built blower. This can enhance the efficiency of the furnace by reducing energy consumption.	0.02	0.010	911	359	0.7	Considering a 10 t/h SRRM plant
Installation of Coal Drying system	The flue gases from the re-heating furnace are passed through a cyclone dryer for removing the moisture from the coal.	0.02	0.052	3032	1198	0.5	Considering a 15 t/h SRRM plant
Swirl Burner Used for Pulverized Coal Firing	Swirl burners are used for proper control of air fuel-mixture in re-heating furnaces	0.02	0.009	1001	395	0.6	Considering a 15 t/h SRRM plant
Installation of Anti-friction Roller Bearing in Rolling Mill Strands	Anti-friction roller bearing is used instead of conventional metal bearing for improving transmission efficiency and reducing energy consumption.	0.06	0.138	730	763	0.5	Considering a 15 t/h SRRM plant

Best Available Technologies (Short and Medium term)	Technology Description	Estimated Investment required USD Million	Estimated Savings/year (USD million)	Energy saving (Gcal/year)	GHG reduction (tCO ₂ /year)	Payback (Year)	Plant Capacity
Installation of Universal Couplings/ Spindles in Rolling Mill	Universal spindles and couplings are used instead of conventional wobblers couplings and spindles.	0.06	0.062	350	371	1	considering a 15 t/h SRRM unit
Installation of Y-table / Tilting Table / Repeaters in Rolling Mill	To reduce the temperature and energy consumption the Automatic Material handling system is installed.	0.06	0.166	2221	1025	0.4	considering a 15 t/h SRRM unit
Replacement of Existing Motors with IE3 Class Efficiency Energy Efficient Motors	Replacement of energy efficient motors instead of conventional motors improves process efficiency.	0.0005	0.001	7	7.6	8	Considering a 20 hp motor
Revamping of rolling mill	Conventionally, the re-rolling mills are built without proper layout design. The revamping of the rolling mill significantly determines the mill's productivity, energy consumption and efficiency.	0.12	0.27	4373	1972	0.5	Considering a 15 t/h SRRM unit

Annexure 6

Assumptions for the Calculation of Overall Investments

Production Route	Production Route	Plant Capacity	Cost - USD Million	Comments	Source
DRI	Natural Gas Based Plant	1.0 Mt	225-400	The minimum capacity of gas based DRI plant should be 1.50 Mt.	As per stakeholder consultation the cost of a 1 MT natural gas based DRI plant is about USD 400 million
	Hydrogen Based Plant	1.0 Mt	2300-2500		As per stakeholder consultations the cost of a 1 MT greenfield hydrogen based DRI plant is about USD 2.3 - 2.5 billion
	BATs for DRI	100TPD	5.34	Total value of all BATs for DRI - Check Sheet - DRI_BATs	Gosh et al, TERI 2021
EAF and IF	BATs for EAF and IF	100 TPD	0.77	Total value of all BATs for EAF/IF	TERI, 2017
Steel Re-rolling mills	BATs for Re-rolling Mills		1.03	Total value of all BATs for Re-rolling	UNIDO, 2020
Scrap Input	Processing Plant	1 MT	3.80		David. M., 2021

Production Route	Production Route	Plant Capacity	Cost - USD Million	Comments	Source
	Energy required per tonne of liquid steel	KWH	420-755		TERI, 2017
Renewable energy		1 MW	5		Amplus Solar, 2023
	Cost of 1 MW Solar Plant	KW energy produced in 1 MW per day	4000		
Currency Conversion	Conversion rate - USD to INR - 82 INR = 1 USD				

Annexure - 7

Guide to Technological Readiness Level (TRL) (Source: IEA, 2021)

Stage	TRL	Description	
Concept	1	Initial Idea	Basic principles have been defined
	2	Application Formulated	Concept & application of solution have been formulated
	3	Concept needs Validation	Solution needs to be prototyped and applied
Small Prototype	4	Early Prototype	Prototype proven in test conditions
Large Prototype	5	Large Prototype	Components proven in conditions to be deployed
	6	Full Prototype at Scale	Prototype proven at scale in conditions to be deployed
Demonstration	7	Pre-Commercial Demonstration	Solution working in expected conditions
	8	First of a Kind Commercial	Commercial demonstration, full scale deployment in final form
Early Adoption	9	Commercial Operation in Relevant Environment	Solution is commercially viable, needs evolutionary improvements to stay competitive
	10	Integration Needed at Scale	The solution is commercial & competitive, but needs further integration efforts
Mature	11	Proof of Stability Reached	Predictable growth



We are an independent, multi-dimensional organization, with capabilities in research, policy, consultancy and implementation. We are innovators and agents of change in the energy, environment, climate change and sustainability space, having pioneered conversations and action in these areas for over four decades. We believe that resource efficiency and waste management are the keys to smart, sustainable and inclusive development. Our work across sectors is focused on (a) promoting efficient use of resources; (b) increasing access and uptake of sustainable inputs and practices; and (c) reducing the impact on environment and climate. Headquartered in New Delhi, we have regional centers and campuses in Gurugram, Bengaluru, Guwahati, Mumbai, Panaji, and Nainital. Our 1,000-plus team of scientists, sociologists, economists and engineers delivers insightful, high quality action-oriented research and transformative solutions supported by state-of-the-art infrastructure.

Decarbonising Coal-based Direct Reduced Iron Production

Surveying the Landscape in Steel Clusters of India

Kartheek Nitturu, Pratheek Sripathy, Rishabh Patidar, Sabarish Elango, Deepak Yadav, and Hemant Mallya

Issue Brief | July 2024



Image: Sabarish Elango/CEEW

CEEW's researchers visited a 200 tonnes per day (TPD) coal-DRI rotary kiln in Raipur, Chhattisgarh, as part of the DRI plants survey.

Executive summary

India is an emerging economy whose steel demand is growing at a significant pace. Given the nature and technology mix of the steel sector in India, coal-based direct-reduced iron (DRI) is expected to play a significant role in the upcoming ramp-up of steel production. The *National Steel Policy, 2017* projects that by 2030, of the 80 million tonnes per annum (MTPA) of DRI production, 70 per cent will be coal-based. In addition, the installed steel production capacity in India is 155 MTPA, and the installed iron capacity is 136

MTPA, of which coal-based DRI plants contribute 37 MTPA (Joint Plant Committee 2023). Coupled with the fact that the type of coal and iron ore utilised for DRI production has an impact on the emission footprint, it is necessary to quantify the impact of the quality and quantity of the input materials. Given this context, the survey was initiated to study raw material, type of fuel, and extent of decarbonisation achievable in coal-based DRI production in the steel industry.

We surveyed 30 plants across the Bellary (Karnataka), Raipur (Chhattisgarh), and Raigarh (Chhattisgarh) clusters, representing nearly 14 per cent of the total installed steel capacity in the country. This survey was aimed at understanding energy consumption patterns, the associated operational challenges, and the adoption of energy-efficient practices, which can inform decarbonisation in DRI plants. The key findings are as follows.

A. Key findings

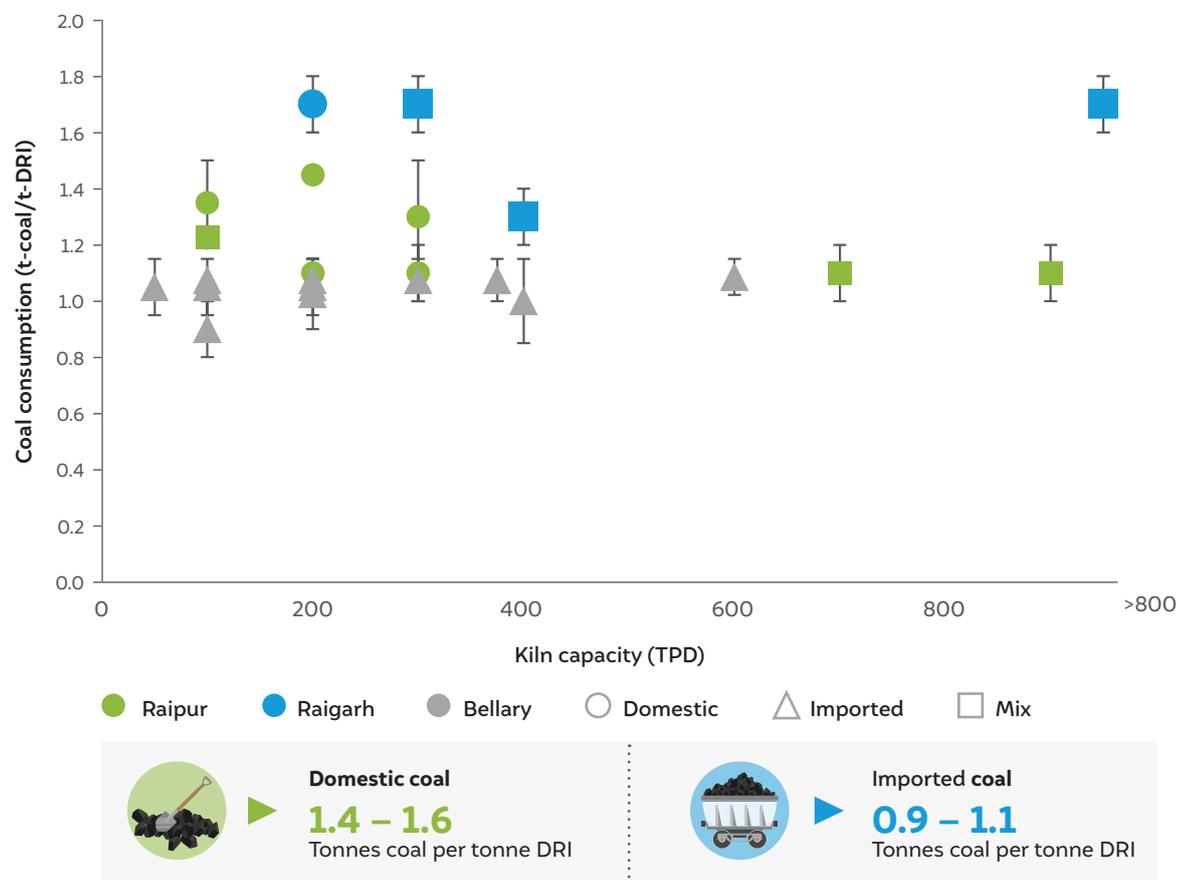
This section compiles the findings of the survey and is a synthesis of the responses received from the plant operators at the clusters in focus.

- Ore and coal consumption:** Our survey findings indicate that the consumption of lump ore is higher compared to that of pellets, with respective consumption rates of 1.8 to 2 t-ore/t-DRI for lump ore compared to 1.4 to 1.6 t-pellets/t-DRI for pellets. Additionally, imported coal consumption ranges from 0.9 to 1 t-coal/t-DRI (tonnes of coal per tonne DRI). This varies depending on whether the coal used is

domestically sourced or a mix, with consumption ranging from 1.4 to 1.8 t-coal/t-DRI. This is depicted graphically in Figure ES1. The type of coal consumed varies by region. The Bellary cluster relies mostly on imported coal, while the clusters in Raipur and Raigarh depend on a mix of imported and domestic coal or exclusively on domestic coal.

- Electrical consumption:** The average electrical consumption is in the range of 55 kWh/t-DRI to 65 kWh/t-DRI (kilowatt-hour per tonne DRI). Depending on the coal and ore consumption, emissions related to DRI are estimated to range from 1.54 to 2.08 t-CO₂/t-DRI (tonne CO₂ per tonne DRI). Other than coal-based DRI plants, we also examined induction furnaces (IFs), which had a spectrum of scrap utilisation percentages, averaging around 12.5 per cent across IF plants. Power consumption in plants using scrap varies from 800 to 900 kWh. We engaged with industry experts who remarked that IFs using 100 per cent scrap typically consumed only about 550 kWh of electricity. Thus, increasing scrap utilisation would increase energy efficiency.

Figure ES1 The quantity of coal consumption is directly linked to the quality of the coal



Source: Authors' compilation

- **Penetration levels of energy-efficiency technologies:** Our survey also revealed that some plants are yet to adopt energy-efficient measures. Notably, most plants with a capacity of less than 200 tonnes per day (TPD) do not have waste heat recovery (WHR) systems installed. Beyond energy efficiency, alternative energy sources like natural gas, hydrogen and renewable power emerge as the next frontier in decarbonising this sector. It is evident from the survey that the incorporation of alternative energy sources is crucial to reduce the carbon footprint further.

To summarise, our survey showed that the rate of coal consumption in a particular cluster is highly dependent on the source of the coal. It also showed that the rate of iron ore consumption depends on the form of consumption – that is, lump ore or pellets. More importantly, the survey also revealed that there is significant room for improvement in terms of the adoption of energy-efficient technologies, particularly in plants with a capacity of less than 200 TPD. It reaffirmed that opting for pellets over lump ore and minimising the ash and sulphur content in coal leads to a reduction in emissions. When utilising domestic coal and lump ore, the emission rate is 2.08 t-CO₂/t-DRI, whereas when using pellets, it decreases to 1.84 t-CO₂/t-DRI. The combination of pellets with imported coal results in an even more substantial emissions reduction, reaching 1.53 t-CO₂/t-DRI.

B. Recommendations

The following recommendations can address key issues and opportunities identified in our study to facilitate decarbonisation of coal-DRI in India.

- Due to the wide variation in fuel and raw material consumption, there is a lack of clear understanding of the functioning of rotary kilns. A detailed study should be conducted to characterise rotary kilns and evaluate their potential for decarbonisation.
- An assessment of waste heat recovery (WHR) potential and potential incentives is necessary to promote wider adoption in the SME sector.
- The economics of pelletisation should be evaluated, considering the trade-offs involved w.r.t lower coal consumption but higher pellet cost.
- Explore the potential of alternative decarbonisation options such as alternative fuels, through the implementation of pilot studies.

1. Introduction

India is the largest producer of coal-based DRI, a key component of steel production (World Steel Association 2022). The steel demand is significant in India, given that it is a growing economy. The installed steel production capacity in India is 155 MTPA, and the installed iron capacity is 136 MTPA, of which coal-based DRI plants contribute 37 MTPA (Joint Plant Committee 2023). *The National Steel Policy, 2017*, projects that by 2030, of the 80 MTPA of DRI produced, 70 per cent will originate from coal-based DRI processes (National Steel Policy 2017). Therefore, coal-based DRI plants are expected to contribute significantly to India's steel production capacity in the near future.

The Indian steel sector is highly heterogeneous. The blast furnace industry has a small number of large players. About 54 pig iron plants in India produce 78 MTPA of hot metal output. In contrast, the DRI sector is dominated by many small players. About 283 DRI plants produced 31 MTPA of DRI in 2021. There is a lack of data regarding variations in energy and material consumption in the DRI sector across clusters. To bridge this gap, the Council on Energy, Environment and Water (CEEW) conducted a survey to collect primary data regarding the technical, operational, and other plant-specific parameters of the DRI sector. The technical details studied include the kind of kilns in use, the quality and quantity of incumbent fuels, which are predominantly coal, and operational details, like the fuel source and the use of energy efficiency measures.



Image: Sabarish Elango/CEEW

Scrap based induction furnace unit in Bellary.

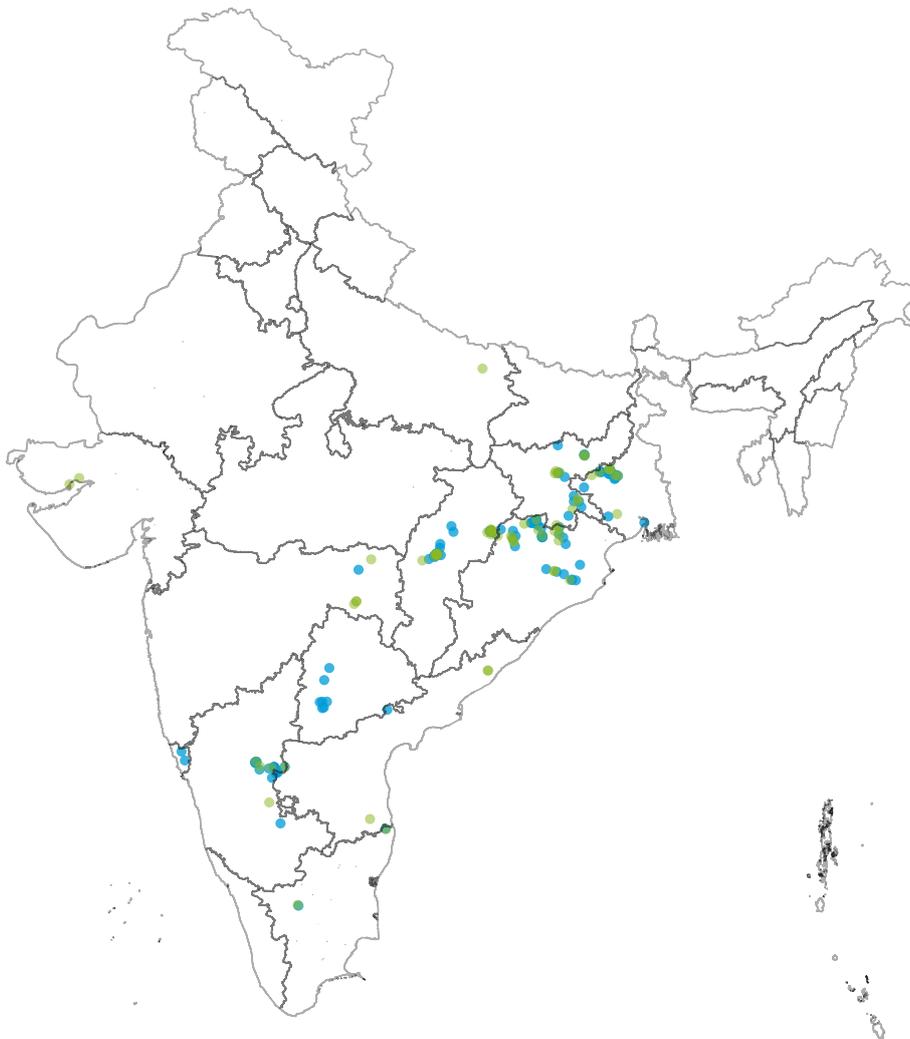
2. Sample size of the survey

The 37 MTPA of coal-based DRI production capacity is distributed across various states, as depicted in Figure 1. It is seen that all these plants are strategically situated near ore-rich locations. While 283 plants are officially listed, it's important to note that there are more than 300 plants across the country (Ghosh, Vasudevan, and Kumar 2021). It is difficult to clearly demarcate 'big' and 'small' DRI plants due to the absence of definitive parameters. Nevertheless, plants with a capacity below 300 TPD are generally considered smaller, while those surpassing this capacity are categorised as larger plants, as shown in Figure 2. Notably, 193 plants fall within the smaller capacity range. As illustrated in Table 1, the

This survey covers Raipur, Raigarh, and Bellary clusters that constitute 13% of total DRI production in the country.

states of Chhattisgarh, Odisha, Karnataka, West Bengal, and Jharkhand collectively contribute to 86 per cent of India's sponge iron production. Through this survey, we aim to collect diverse plant-level data from various clusters and identify the challenges that industries face while transitioning to low-carbon-emission alternatives. To do so, we visited the Raipur, Raigarh, and Bellary clusters. These clusters were specifically chosen since they are representative of most DRI plants in the country, and the results of the survey can be assumed to be uniformly applicable.

Figure 1 DRI plants are proximal to ore-rich areas in the eastern parts of the country



Sponge iron cluster in Raipur, Raigarh (Chhattisgarh), and Bellary (Karnataka) were covered for the assessment

● Large Coal DRI ● Small Coal DRI

Source: Authors' compilation; JPC 2023. Iron & Steel Database. Kolkata: Joint Plant Committee

Table 1 86% of the DRI production capacity is in five states

Parameter	Capacity of small coal DRI plants (MTPA) (no. of plants)	Capacity of large coal DRI plants (MTPA) (no. of plants)	Total DRI capacity (MTPA) (no. of plants)
Chhattisgarh	2.88 (48)	6.4 (21)	9.28 (69)
Odisha	2.77 (52)	7.94 (23)	10.71 (75)
Karnataka	1.95 (30)	1.49 (7)	3.44 (37)
West Bengal	1.34 (24)	3.98 (11)	5.32 (35)
Jharkhand	0.87 (13)	2.58 (11)	3.45 (24)
Telangana	0.49 (10)	0 (0)	0.49 (10)
Gujarat	0.24 (3)	1.08 (5)	1.32 (8)
Uttar Pradesh	0.24 (3)	0.3 (1)	0.54 (4)
Maharashtra	0.16 (3)	0.85 (4)	1.01 (7)
Tamil Nadu	0.13 (3)	0.4 (3)	0.53 (6)
Andhra Pradesh	0.12 (2)	0.64 (3)	0.76 (5)
Goa	0.1 (2)	0.13 (1)	0.23 (3)
Total	11.3 (193)	25.8 (90)	37.1 (283)

Source: Authors' compilation; JPC. 2022. *The Indian Iron and Steel Database 2021–22*. Kolkata: Joint Plant Committee

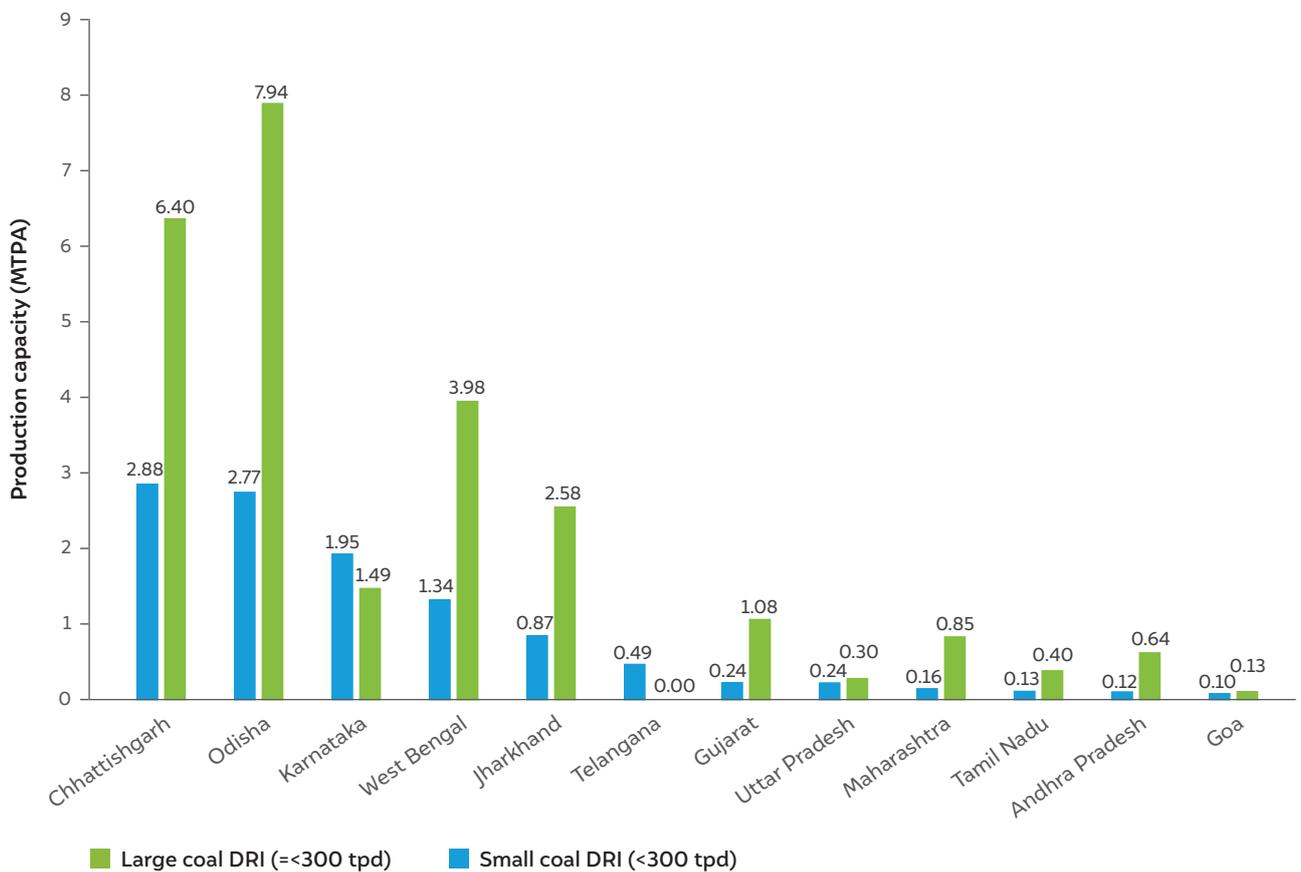
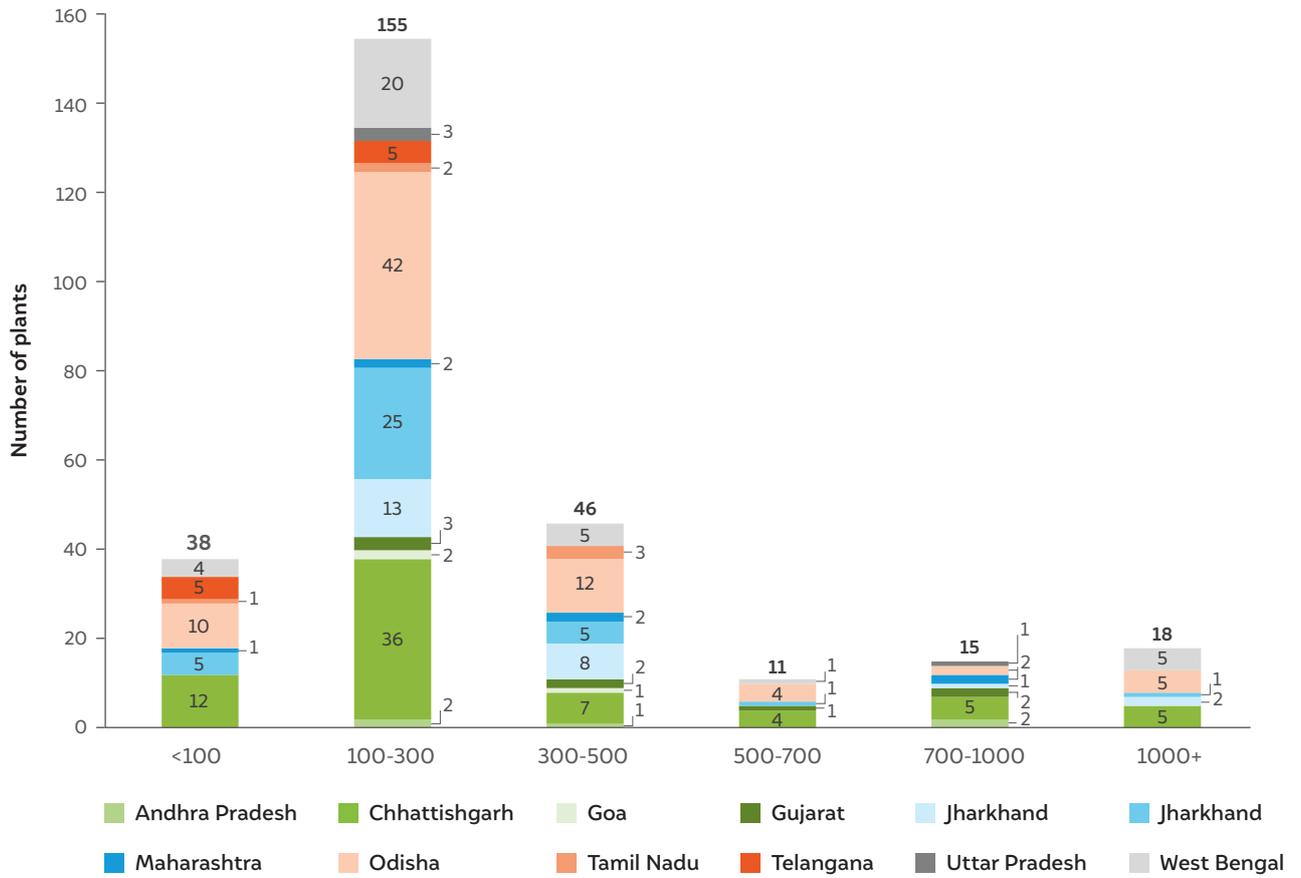
Note: Small coal DRI kiln <300 TPD; large coal DRI kiln ≥ 300 TPD (in MTPA)



Image: Sabarish Elango/CEEW

A 100 tonnes per day rotary-kiln in the Raipur cluster, Chhattisgarh.

Figure 2 Most DRI plants have a capacity range of 100 to 300 TPD and 23% of which is located in Chhattisgarh

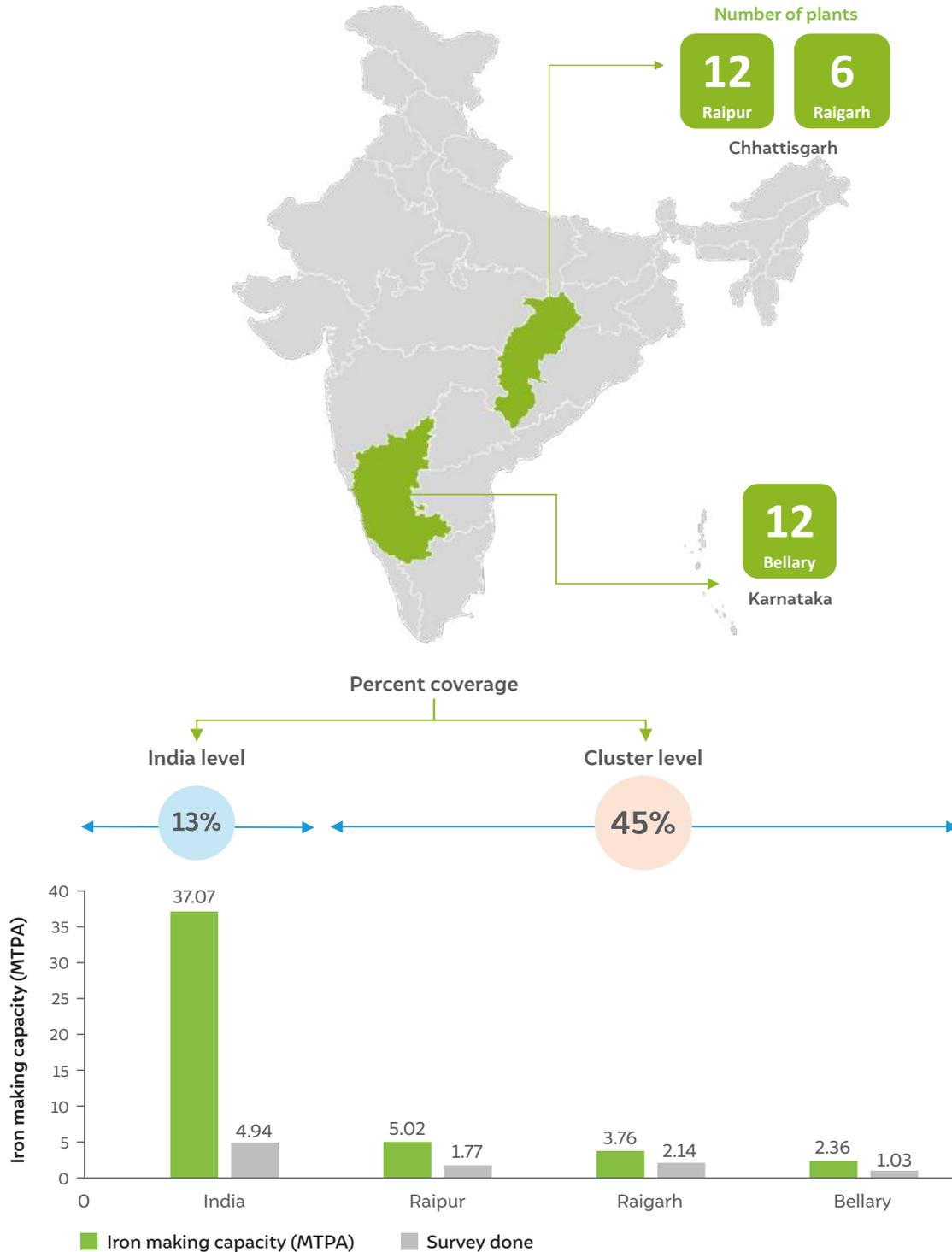


Source: Authors' compilation; JPC 2023. Iron & Steel Database. Kolkata: Joint Plant Comm

Our survey encompassed manufacturing units with a total capacity of 4.94 MTPA, which constitutes 13 per cent of the overall capacity of coal-based DRI plants. The coverage of the survey is schematically shown in Figure 3. The three clusters surveyed – Bellary, Raipur, and Raigarh – are responsible for 45 per cent of India’s total production capacity. In Raipur, where the installed capacity is 5.02 MTPA, our coverage encompassed 12

plants, accounting for 1.77 MTPA. In Raigarh, which has an installed capacity of 3.76 MTPA, six plants were surveyed, accounting for 2.14 MTPA. In Bellary, which has an installed capacity of 2.36 MTPA, our coverage spanned 1.03 MTPA across 12 plants. It’s worth noting that our sample includes plants with a range of capacities, from 50 TPD to larger plants.

Figure 3 13% of production capacity across India was surveyed



Source: Authors' compilation

3. Insights from the survey

Our survey collected data regarding the source, quality, and quantity of inputs and the penetration level of decarbonisation measures at each of the plants visited. It was observed that most of the plants in India primarily employ the Stelco-Lurgi/Republic Steel-National Lead (SL/RN) technology, while some use a variation of this technology. Although input materials may be different, operating conditions remain largely similar. The primary inputs for coal-based DRI plants include iron ore, coal, electricity, and supplementary materials like dolomite and limestone. The survey also collected details regarding the quality of coal and the share of electricity from different sources like captive power plants and the grid. It is crucial to note the types of coal and iron ore being utilised because the emissions produced by these plants are closely related to the type of input (Nduagu et al. 2022).

3.1 Iron ore consumption

Iron ore is used in the form of pellets, lump ore, or a mix of both in DRI production. Pellets are produced from beneficiated ore or iron ore fines, which have a higher concentration of iron oxides. In contrast, lump ore is produced directly by crushing and separating raw iron ore into fines and lumps. Figure 4 schematically shows the distribution of iron ore/pellet use across the clusters surveyed. Our observations in Bellary indicate

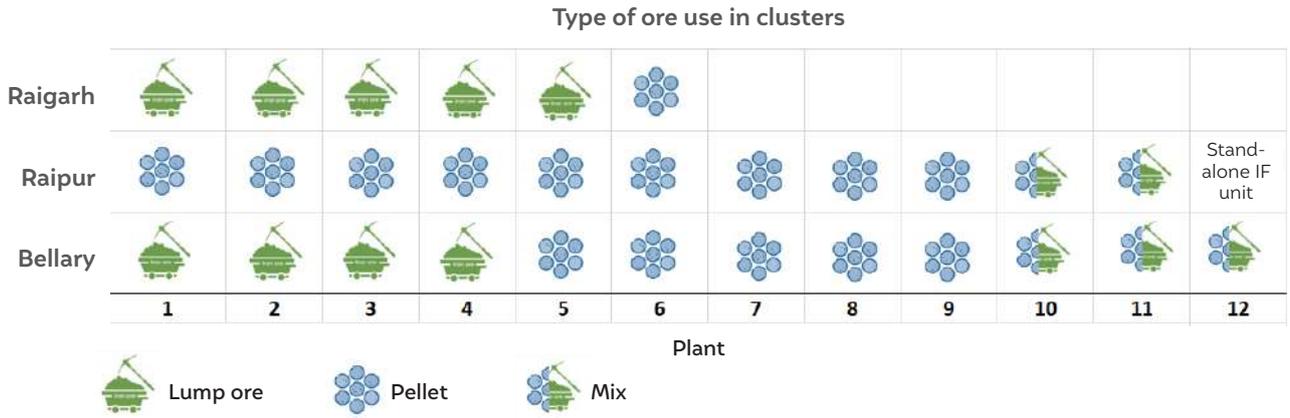
that among the 12 plants, only 5 utilise pellets, while the remainder opt for a mix or exclusively use lump ore. In Raipur, the majority of plants utilise pellets, except for two plants. In Raigarh, however, most plants use lump ore except for one plant. In addition, it can be concluded that the use of lump ore is still prevalent due to the lack of availability of sufficient quantities of pellets. This assessment is in correlation with the findings of the Ministry of Steel (Ministry of Steel 2023). However, among the plants surveyed, ~30 per cent of plants apparently use lump ore because of operational issues, such as ring formation.

The graph in Figure 5 shows the ore consumption pattern across the clusters surveyed. Based on the survey findings, we can infer that iron ore consumption is comparatively lower in the form of pellets, ranging from 1.4 to 1.5 t-ore/t-DRI and peaking at a maximum of 1.6 t-ore/t-DRI. Conversely, with lump ore, consumption ranges from 1.8 to 2 t-ore/t-DRI. This essentially means that in terms of resource efficiency, the use of pellets is more beneficial for DRI production. It is important to note that in the case of the Raipur cluster, the difference in the quantity of ore consumption is much lower in comparison to others since only two plants used lump ore along with pellets, while all the others surveyed used pellets exclusively. Hence, we can safely conclude that the Raipur cluster predominantly uses iron ore in the form of pellets.



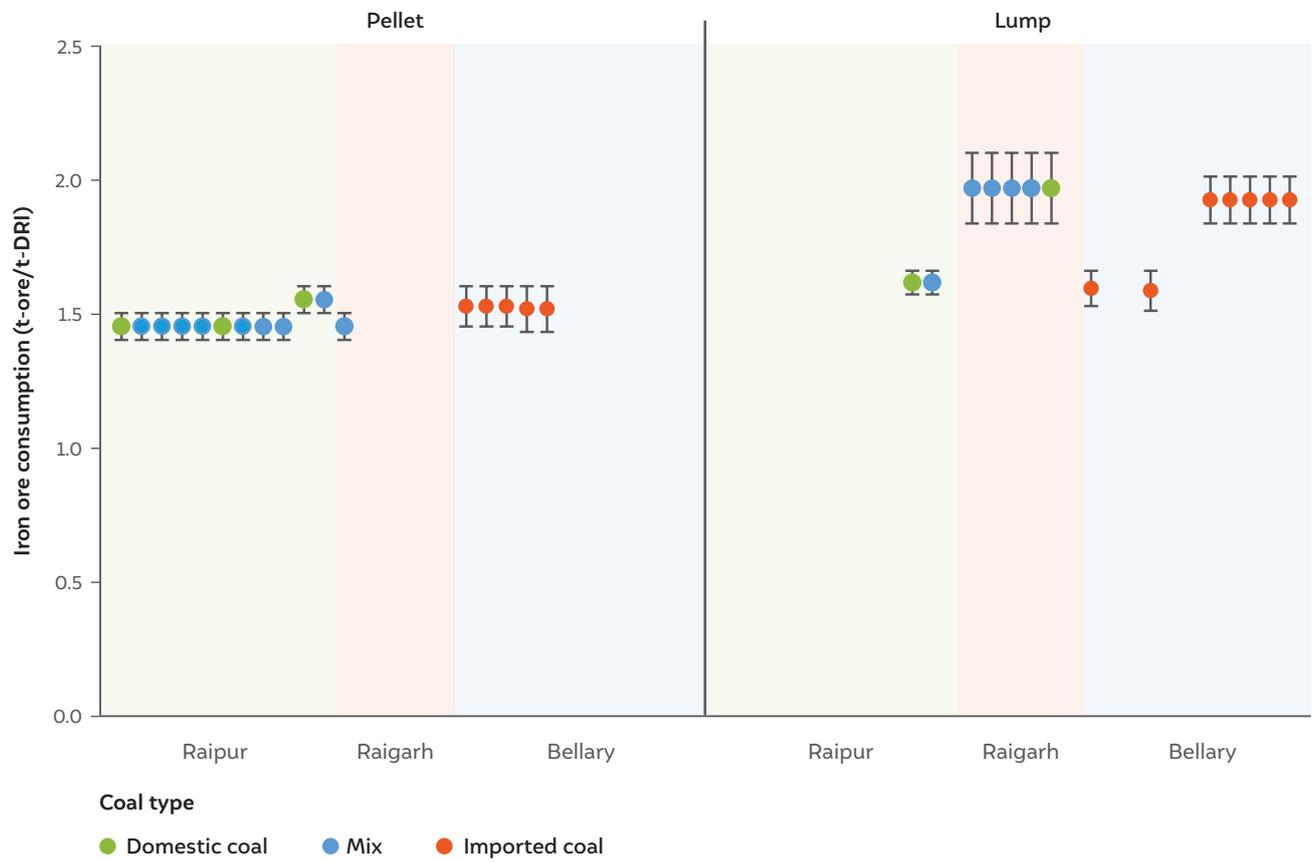
An employee showing a CEEW researcher, dolomite being fed via conveyor belts to the rotary kiln, in Raipur, Chhattisgarh.

Figure 4 The use of lump ore for DRI production is still significant



Source: Authors' compilation

Figure 5 Pellets use results in efficient resource consumption



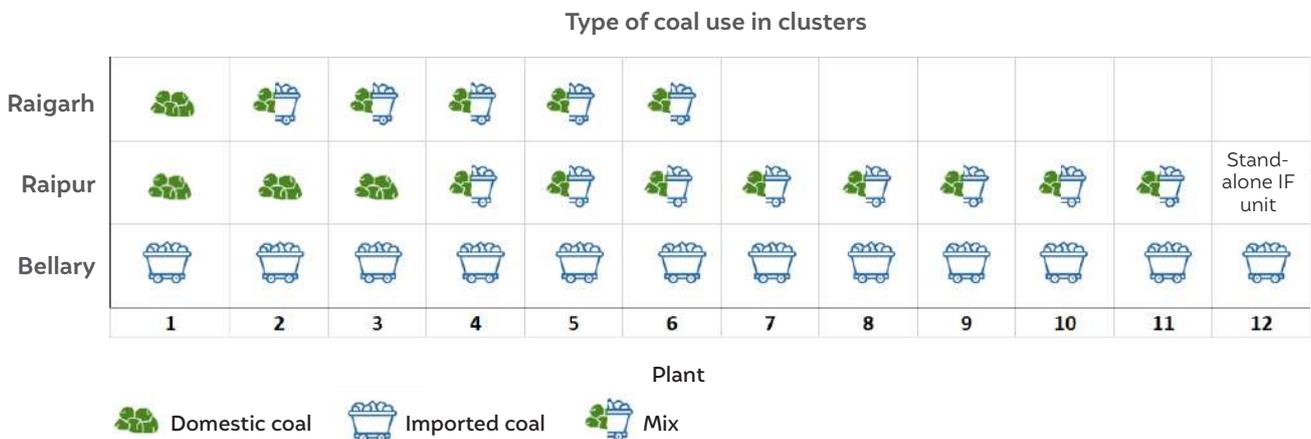
Source: Authors' compilation

3.2 Coal consumption

A significant proportion of DRI manufacturers in the country use various grades of coal imported from countries such as South Africa, Russia, and Indonesia, while others use domestic coal or a mix of both. As depicted in Figure 6, all the plants in the Bellary cluster use imported coal. In contrast, in the Raipur and Raigarh clusters, most plants use a combination of domestic and imported coal. Only one plant in Raigarh and three plants in Raipur use domestic coal solely. The use of imported coal seems to be more region-specific and supply-dependent.

Drawing from the survey, it is evident that coal consumption varies based on whether the coal is imported or domestic. In the case of domestic coal, consumption ranges from 1.4 to 1.6 t-coal/t-DRI. However, with imported coal, consumption is notably lower, ranging from 0.9 to 1.1 t-coal/t-DRI. This disparity is attributed to factors such as the high ash and sulphur content and, consequently, the lower calorific value of domestic coal. Figure 7 shows that coal consumption per tonne of DRI in Raigarh is highest due to the higher proportion of domestic coal used, while in clusters like Bellary, it is significantly lower since high-quality imported coal is used. Furthermore, our survey also revealed that consumption varies depending on whether pellets or lump ore are used.

Figure 6 The use of imported coal is significant in the DRI industry



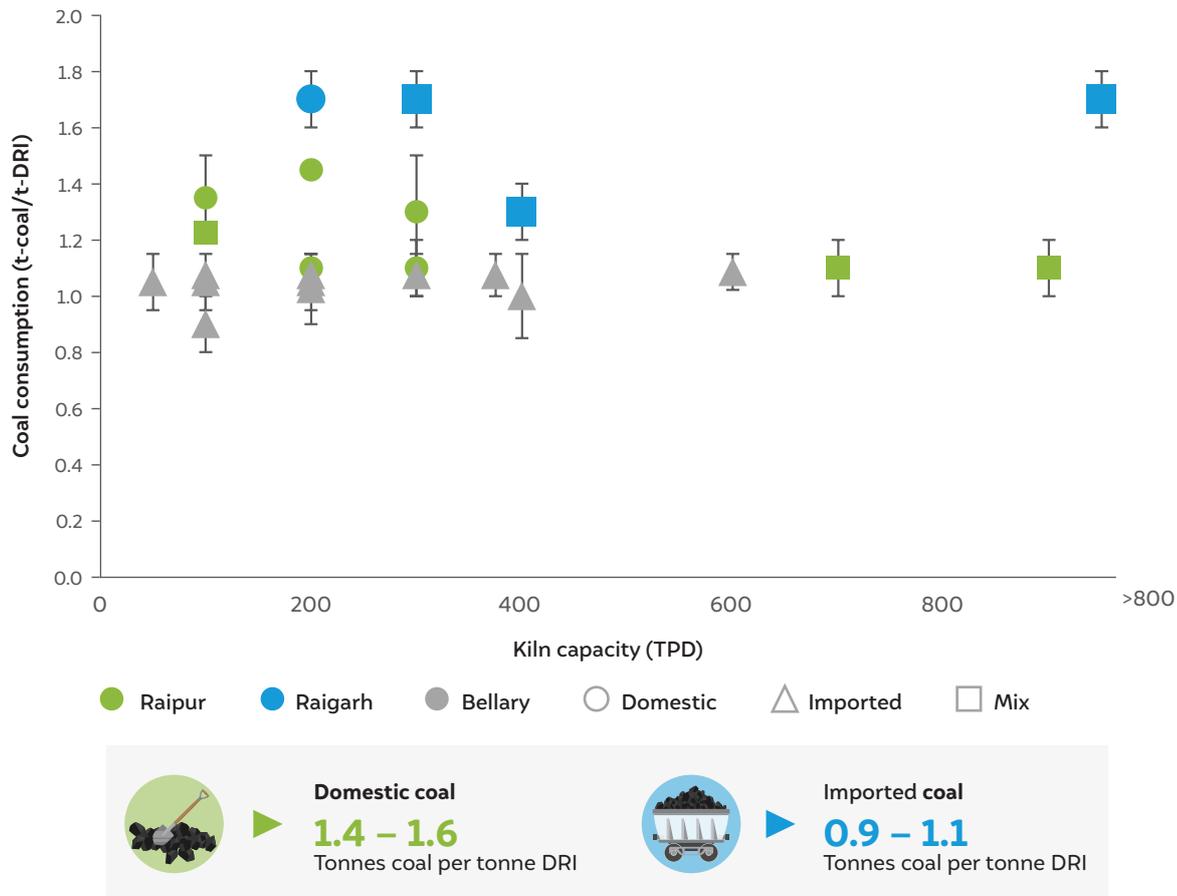
Source: Authors' compilation



Spherical iron ore pellets are used in the DRI kiln when higher-grade lump ore is not available.

Image: Sabarish Elango/CEEW

Figure 7 The quantity of coal consumption is directly linked to the quality of the coal



Source: Authors' compilation

Coal consumption with respect to the type of ore

From Figure 7, it can be seen that in the Bellary region, a majority of the coal consumed comes from imported sources. There is also a discernible difference in consumption depending on whether pellets or lump ore are used. Specifically, when using pellets, the coal consumption per tonne of DRI tends to be lower. Although the difference is not substantial, there's a definite trend towards reduced coal usage. Additionally, it's important to highlight that a lower amount of coal is consumed when it has a uniform composition, size, porosity, and swelling index as well as when it has been dried to minimise moisture. Thus, the use of well-processed materials translates to smoother kiln and furnace operations, contributing to enhanced productivity of the plant.

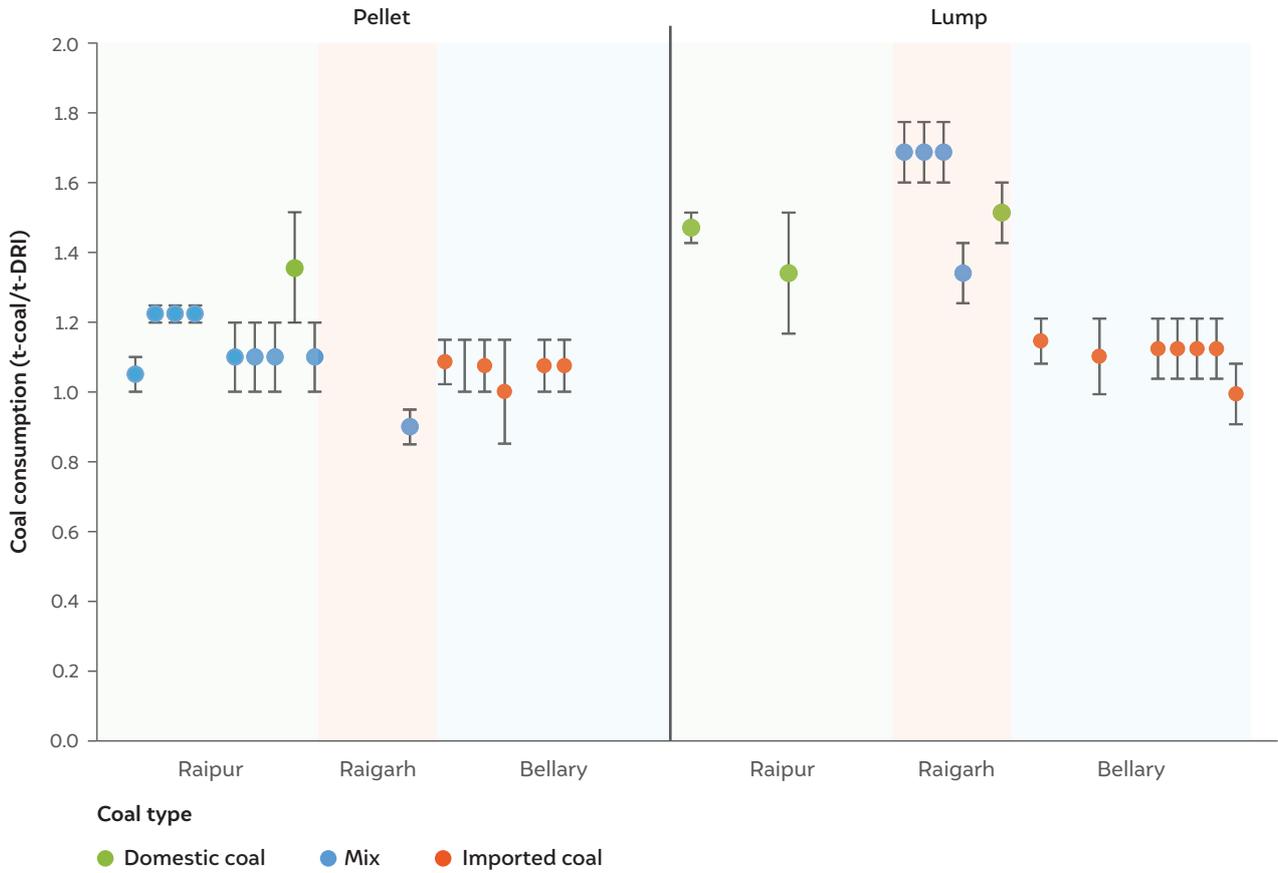
Notable differences in coal consumption are seen in Raigarh and Raipur especially, based on pellet or lump ore usage, with the former consuming lower amounts

of coal when using pellets. It should, however, be noted that pellet production also requires energy, which leads to emissions. As apparent in Figure 7 and 8, coal usage is dominant in Raigarh, while Raipur experiences a mixture of coal types. Importantly, we observed far more domestic coal is required to generate a tonne of DRI compared to mixed coal.

3.3 Electrical consumption

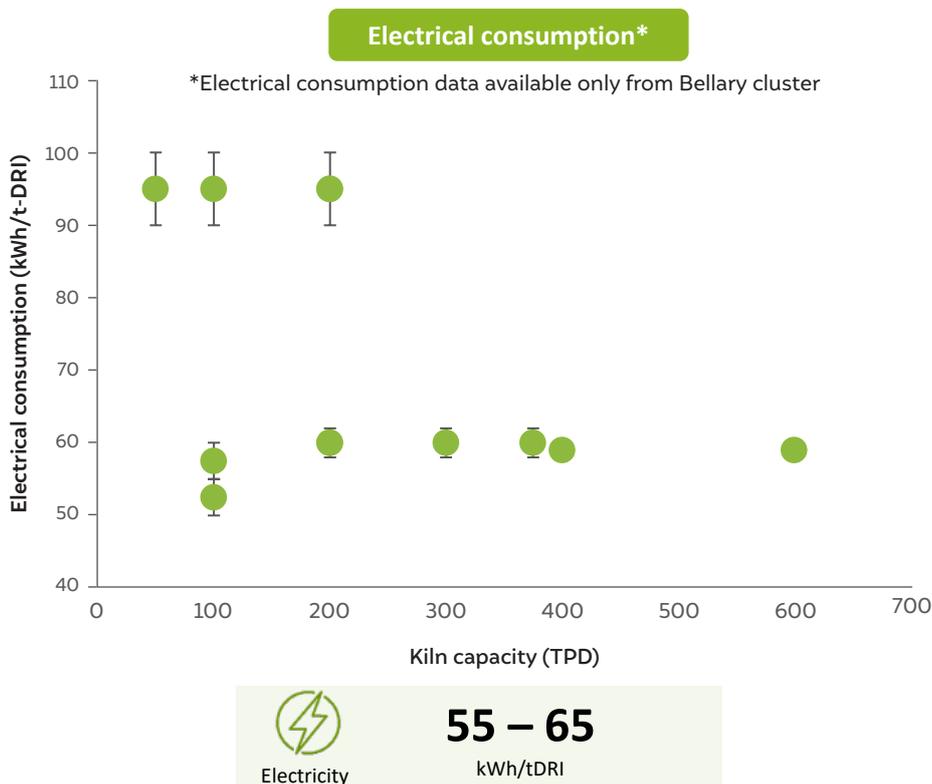
This section highlights power consumption patterns across DRI plants only in the Bellary cluster since data for the other two clusters were not available (Figure 9). The data revealed that most DRI plants consumed between 55 and 65 kWh/t-DRI, while some consumed 80 to 100 kWh/t-DRI. The survey also showed that plants with capacities greater than 300 TPD have installed captive power plants, while smaller entities rely completely on grid supply.

Figure 8 Coal consumption is directly influenced by the type of ore used



Source: Authors' compilation

Figure 9 Most DRI plants consume 55 to 65 kWh/t-DRI



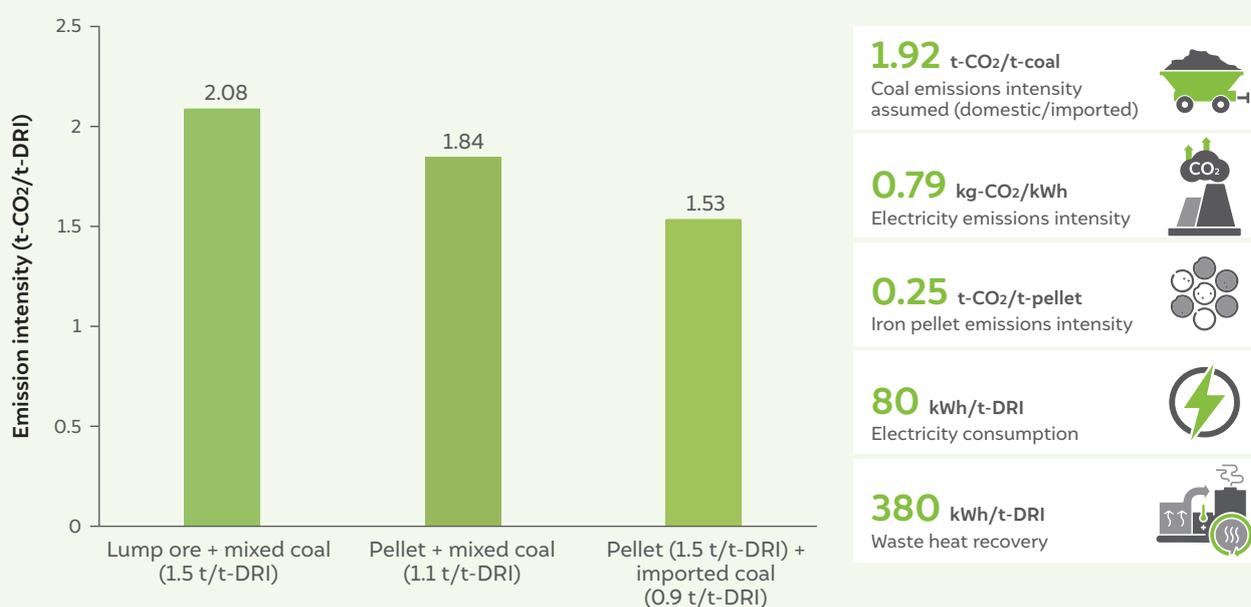
Source: Authors' compilation

BOX 1

The choice of raw materials has a direct effect on the emission intensity of the DRI

The information gathered from our survey enabled us to estimate CO₂ emissions based on certain industry-applicable criteria. It reaffirmed that opting for pellets over lump ore and minimising the ash and sulphur content in coal leads to a reduction in emissions. When utilising domestic coal and lump ore, the emission rate is 2.08 t-CO₂/t-DRI, whereas when using pellets, it decreases to 1.84 t-CO₂/t-DRI. The combination of pellets with imported coal results in an even more substantial emissions reduction, reaching 1.53 t-CO₂/t-DRI, as depicted in Figure 10. It is worth noting that our analysis considers the emissions associated with pellet-making at 0.25 t-CO₂/t-pellet (Lv, Sun, and Su 2019). In essence, the reduction in emissions is due to the reduction in coal consumption. As previously discussed, coal consumption is intricately linked to the quality of coal and type of ore. Thus, the choice of material has a significant impact on carbon emissions.

Figure 10 The use of pellets and imported coal results in the lowest emissions intensity for DRI plants



Source: Authors' compilation

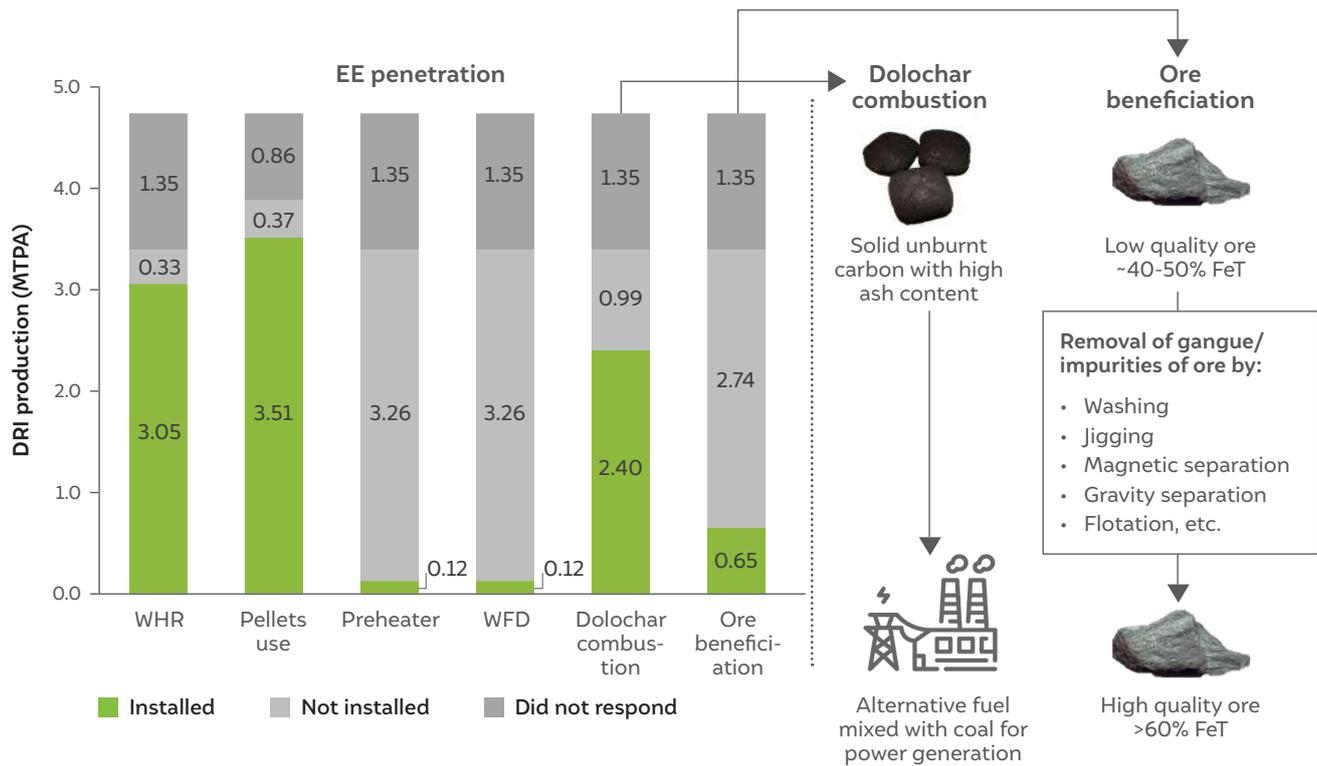
Source: Authors' compilation

3.4 Penetration of energy-efficiency technologies

The survey showed that there is still significant room for adopting energy-efficient technologies in DRI manufacturing. The implementation of energy efficiency measures results in a notable reduction in emissions. Figure 11 shows the penetration of energy-efficient technologies in the surveyed plants, where the region shaded in green represents the percentage of technology adoption, and the grey represents the share of plants that have not responded to the survey. However, by and large, energy efficiency measures have not been implemented. An important point to highlight is that the penetration of energy-efficient technologies is

based on the total capacity of all the surveyed plants rather than the number of plants. The penetration rate of waste heat recovery boilers (WHRBs) stands at 65 per cent, while pellet use has an adoption rate above 70 per cent. Similarly, the combustion of dolochar, the residual unburnt carbon produced as a by-product of coal-based DRI production, exhibits a penetration level exceeding 50 per cent. While WHRBs make use of waste flue gases from the kiln to generate power, dolochar acts as low-grade fuel that can be mixed with coal to produce power. It can also be sold directly in the market. Other energy efficiency measures, such as preheating, variable voltage frequency drive (VVF), and ore beneficiation, have a penetration rate of less than 10 per cent.

Figure 11 The penetration of energy efficiency measures in small-scale entities is low



Source: Authors' compilation

Installation of waste heat recovery

WHR from rotary kiln flue gases offer significant power-generation potential. The schematic in Figure 12 shows that an average installation of around 2 MW has been achieved for every 100 TPD, equivalent to 450 kWh/t-DRI. However, in practice, the industry can expect to recover a maximum of 350 to 380 kWh/t-DRI. From our survey, we found that facilities with production capacities greater than 300 TPD have already implemented WHR systems, while plants with lower capacities have not. Of the 16 plants in our survey that have capacities lower than 300 TPD, only one has installed a WHRB. This can be explained by the fact that larger plants (>300 TPD) are covered under the Bureau of Energy Efficiency's (BEE) *Perform, Achieve, and Trade (PAT) scheme*, which effectively incentivises energy efficiency measures. Smaller facilities, on the other hand, may not have installed WHR systems because the scheme excluded the majority of them. It has been estimated that for every 100 TPD kiln capacity, 1.5–2.5 MW waste heat recovery capacity is installed.

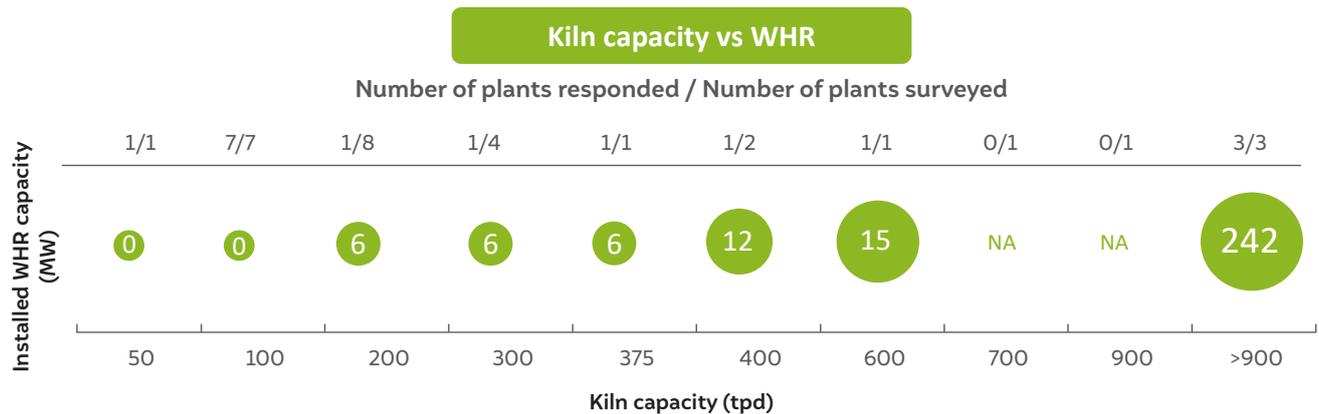
In addition, according to our internal analysis, the average capacity of rotary kilns for plants with capacities lower than 300 TPD is 171 TPD. Assuming an average capital investment of INR 9 crore/MW (USD ~1 million/MW), an average 3 MW capacity WHRB needs an investment of about INR 27 crore (Elango et al. 2023).

In the absence of enforcement schemes, like PAT, or carbon pricing and financing mechanisms, like energy service companies, these small-scale entities will prioritise production capacity addition over making existing infrastructure more efficient.

3.5 Scrap share and electrical consumption in IFs

Another aim of our survey was to gather specific insights into the characteristics of IFs. Our findings revealed that there is approximately 10 to 20 per cent scrap utilisation in IF plants. On average, the scrap content in these IF plants is 12.5 per cent. The power consumption in these plants varies from 800 to 900 kWh per tonne of crude steel (tcs). A notable insight emerged in discussions with industry representatives: when 100 per cent scrap is used in the IF, the electricity consumption could be reduced significantly to around 550 kWh/tcs. Our survey found that IF entities located near DRI production clusters used DRI and only a low proportion of scrap. However, we can infer that stand-alone IFs situated far from clusters are likely to utilise a low proportion of DRI and maximise the use of scrap, with the possibility of reaching 100 per cent scrap utilisation.

Figure 12 Survey shows that waste heat recovery is unfavourable for plants with kiln capacities less than 200 TPD



Source: Authors' compilation

4. Conclusion

Coal-based DRI is vital to India's steel industry, contributing 37 MTPA of steel capacity. Our survey, covering 4.94 MTPA (13% of the total coal-based DRI capacity), highlighted the decarbonisation challenges across different steel-making clusters, offering a comprehensive industry perspective.

Most plants in India currently employ the SL-RN technology or variations of SL-RN exclusively. While there may be variations in input materials, operating conditions remain largely similar. The survey also concluded that most coal-based DRI manufacturers in the country still use lump ore due to the lack of an adequate supply of pellets, leading to higher coal consumption and, hence, emissions. For 1 tonne of DRI, the plants require 1.4 to 1.6 tonnes of pellets. In the case of lump ore, this increases to 1.8 to 2 tonnes of lump ore. Apart from this effect of pellets and lump ore on coal consumption, the quality of coal also plays an important role. When a mix of imported and domestic coal is used with lump ore, consumption ranges from 1.4 tonnes/t-DRI to 1.6 tonnes/t-DRI. Conversely, when using imported coal solely, consumption is notably lower, ranging from 0.9 tonnes/t-DRI to 1.1 tonnes/t-DRI with pellet use. It can be concluded that the use of lump ore is still prevalent due to the lack of availability of sufficient quantities of pellets. It is worth noting that our analysis considers the emissions associated with pellet-making at 0.25 t-CO₂/t-pellet (Lv, Sun, and Su 2019).

Our survey also focused on the penetration level of energy-efficient technologies, which play a vital role in decarbonising the steel industry. It was found that there

is significant room for improvement in terms of adopting energy efficiency measures. A key insight gained during the survey was that 65 per cent of kilns with capacities higher than 300 TPD have installed WHR units, whereas those with lower capacities are lagging. Similarly, with regard to the use of pellets, which are known for their environmental and cost benefits, the adoption rate is 70 per cent. However, not all efficiency measures were adopted at the same pace. Technologies like preheating, VVFD, and ore beneficiation had low adoption rates of below 10 per cent.

Our study extended beyond coal-based DRI plants and also included IFs. These furnaces operate differently and rely on scrap metal. We found a range of scrap utilisation percentages, from 20 to 10 per cent, across IF plants. On average, these plants used about 12.5 per cent scrap, shedding light on how they operate with regard to their charge mix. Moreover, we talked to industry experts who believed that if IFs used 100 per cent scrap, they would typically consume only around 550 kWh of electricity.

Our survey has unveiled information about coal-based DRI plants and IFs with regard to their coal consumption patterns, the penetration of the energy efficiency measures they use, and the role of IFs in the DRI sector. The survey showed that for coal-based DRI production, only a limited number of decarbonisation levers have been explored. Given that the energy efficiency measures used are limited in terms of their decarbonisation potential, there is a real need to explore the techno-economics of alternative fuel use for cost-effective decarbonisation of the Indian DRI industry.

5. Recommendations

Following recommendations can help coal-DRI industry achieve decarbonisation:

- Due to the wide variation in fuel and raw material consumption, there is a lack of clear understanding of the functioning of rotary kilns. A detailed study should be conducted to characterise rotary kilns and evaluate their potential for decarbonisation.
- An assessment of waste heat recovery (WHR) potential and potential incentives is necessary to promote wider adoption in the SME sector.
- The economics of pelletisation should be evaluated, considering the trade-offs involved w.r.t lower coal consumption but higher pellet cost.
- Explore the potential of alternative decarbonisation options such as alternative fuels, through the implementation of pilot studies.



Image: Sabarish Elango/CEEW

Hot-rolled steel coils made from steel billets or slabs from an induction furnace.

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Decarbonisation Options for Rotary Kiln-Induction Furnace Process of Crude Steel Production

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The iron and steel industry is one of the significant contributors to global greenhouse gas emissions, and iron-making is the most energy- and emission-intensive step. India is the world's second-largest steel producer and the largest producer of sponge iron. The Indian sponge iron industry is primarily rotary kiln based and integrated with a captive power plant and a steel-making unit. This study investigates various decarbonisation options and their impact on the rotary kiln process for sponge iron production. The current process uses two different streams of coal, which can be replaced with bio-char and natural gas, whereas the low-grade dolomite can be replaced with a better grade one. The rotary cooler and magnetic separator in a conventional sponge iron plant can be replaced with a gravimetric separator enabling hot charging of sponge iron to the steel-making furnace. The savings in energy and carbon dioxide (CO₂) emissions are estimated based on the changes in electricity production/demand and the reduction in CO₂ emissions due to the elimination of coal. The options considered can reduce the emission intensity of crude steel production by 2,579 kg CO₂/t crude steel.

1. Introduction

The iron and steel industry is one of the world's largest carbon dioxide (CO₂) producing sectors due to its high production volume, with 1,816.6 Mt of crude steel produced in 2018. The direct emission from this sector is 2.6 Gt CO₂ which is 7 % of the global CO₂ emissions from energy systems (International Energy Agency, 2020). The average emission and energy intensities of this industry of crude steel (tcs) are 1.81 t CO₂/t and 19.51 GJ/t (World Steel Association, 2023).

Many studies on the decarbonisation of the iron and steel sector were reported in the literature. Hasanbeigi et al. (2013) discussed a model to estimate the energy efficiency improvement and CO₂ emission reduction possibilities for the Chinese iron and steel industry. Li and Zhu (2014) discussed the impact of various technology options on energy and emission savings and the associated cost for the Chinese iron and steel industry. Dey et al. (2015) analysed the energy aspects of the rotary kiln process for sponge iron production and discussed the possibilities of energy conservation through heat integration. Toktarova et al. (2020) proposed various future scenarios for steel-making based on different decarbonisation measures and compared them based on the cost and CO₂ intensity of steel. Nwachukwu et al. (2021) investigated the role of forest biomass in decarbonising the iron and steel industry. Fan and Friedman (2021) discussed the technology options and their economic assessment for the global iron and steel industry, considering all major processes. Nduagu et al. (2022) performed the life cycle assessment of greenhouse gas emissions for the Indian sponge iron industry considering rotary kiln and shaft furnace-based processes.

Most studies on the decarbonisation of the iron and steel industry analysed the blast furnace–basic oxygen furnace and electric arc furnace routes. Only a few research works focused on the rotary kiln–induction furnace process in detail, including technological and economic analysis. This paper analyses a 350 t/day (tpd) sponge iron plant integrated with an induction furnace and a captive power plant. Several decarbonisation options, such as the use of a gravimetric separator, better grade dolomite, use of biochar, and natural gas injection, are identified. The impact of these decarbonisation options on direct CO₂ abatement, power loss/power savings, and additional power generation is discussed in this work, along with their economic evaluation.

2. Indian iron and steel sector

India is the second largest iron and steel producer, with 111 Mt of crude steel production in 2018-19 (Ministry of Steel, 2020), and contributes to 6.0 % of the global crude steel output. Indian iron and steel sector is one of the most diversified iron and steel sectors in the world, with an estimated 44.5 % of production from the Blast Furnace – Basic Oxygen Furnace process, 19.6 % from the Rotary Kiln-Induction Furnace process, and 5.1 % from the Shaft Furnace- Electric Arc Furnace process (Ministry of steel, 2020). The remaining production is from blast furnaces combined with electric arc furnaces, scrap processing in electric furnaces, and other processes like Corex. With a specific energy consumption of 25.1-27.2 GJ/t (Ministry of Steel, 2021) and a CO₂ emission intensity of 2.3 t CO₂/t (International Energy Agency, 2020), the Indian iron and steel sector is both energy- and emission-intensive.

India is the world's largest producer of sponge iron, contributing to nearly one-third of the global sponge iron output. Global sponge iron production in 2018 was 104 Mt. Contrary to other geographies of the world where sponge iron is produced in shaft furnaces using natural gas, 80.1 % of the sponge iron produced in India is from the coal-based process (Ministry of Steel, 2020). The rotary kiln process uses iron ore (hematite), non-coking coal, and dolomite as feed material. Most of these sponge iron plants are integrated with a captive power plant for waste heat recovery and induction furnaces to convert sponge iron into crude steel. Indian sponge iron industry uses locally available high-grade iron ore (>60 %). However, using low-grade non-coking coal makes the Indian sponge iron industry more energy- and emission-intensive.

2.1 Process description

In the rotary kiln process, feed (iron ore, coal, and dolomite) and slinger coal (also called injection coal) enter the kiln through the feed and discharge end. Air is injected into the kiln through the discharge end and portholes along the length of the kiln. A schematic diagram of a typical rotary kiln-based sponge iron plant is shown in Figure 1.

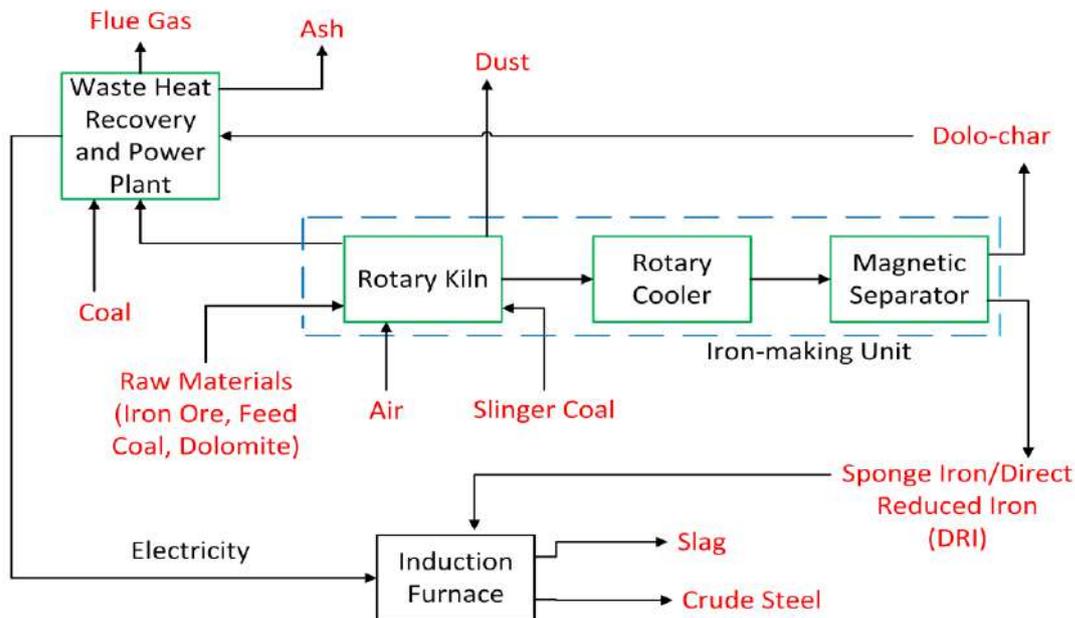


Figure 1: Schematic diagram of a rotary kiln-based sponge iron plant integrated with a captive power plant and induction furnace for crude steel production

Coal is a source of reductant and thermal energy and dolomite acts as a sulfur absorber. The iron ore (Fe_2O_3) is reduced to metallic iron in the kiln. Due to counter-current motion, waste gas leaves through the feed end, and sponge iron, calcined dolomite, and coal char leave as a solid mixture through the discharge end. This solid mixture is indirectly cooled in a rotary cooler to 110 °C (Dey et al., 2015), and the sponge iron is separated from the solid mixture using a magnetic separator. The sponge iron is finally melted in an induction furnace to make crude steel. Kiln off-gas with unburnt hydrocarbons is combusted, and the heat is recovered in a waste heat recovery boiler (WHRB). Dolo-char from the magnetic separator unit is mixed with coal and used as fuel in the captive power plant. The overall energy balance for the rotary kiln process is given in Eq(1).

$$Q = \Sigma m_2 h_2 - \Sigma m_1 h_1 + \Delta H_{reduction} + \Delta H_{calcination} + \Delta H_{loss} \tag{1}$$

Where Q is the energy required; m_2 and m_1 are the mass of products and reactants; h_2 and h_1 are the specific enthalpies of products and reactants; $\Delta H_{reduction}$ and $\Delta H_{calcination}$ are the energy required for the reduction of iron ore (Fe_2O_3) to iron (Fe), and calcination of dolomite; and ΔH_{loss} represents the kiln energy losses. The mass and energy balances considering 1 t of crude steel as the basis are shown in Figures 2 and 3. The calculated CO_2 emissions in the various steps of the rotary-kiln process are mentioned in Table 1. The power plant produces nearly 29 % of the emissions with an emission intensity of 1.21 kg CO_2 /kWh. Surplus power generated is supplied to the grid. The plant can be given power generation credit in terms of CO_2 , which is equal to the power supplied to the grid multiplied by the captive power plant emission intensity. Various decarbonisation options, their methodology of calculation, and their impact is discussed in section 3.

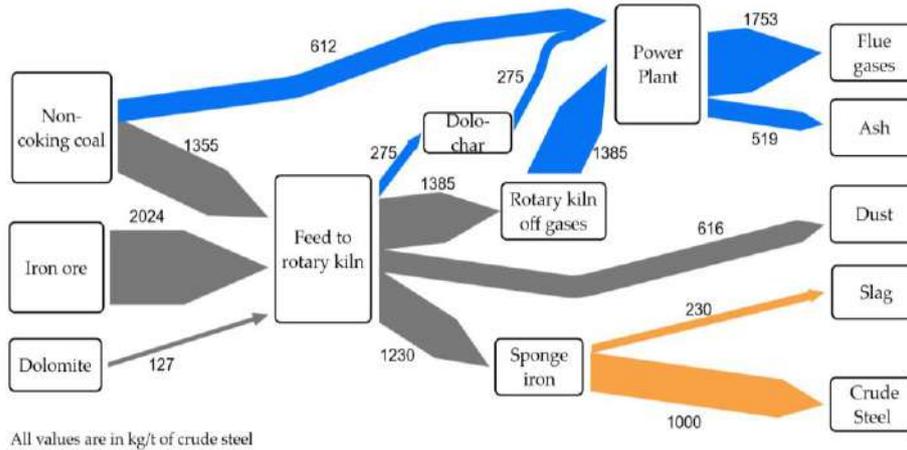


Figure 2: Mass balance for rotary kiln – induction furnace process for crude steel production (basis: 1 t of crude steel)

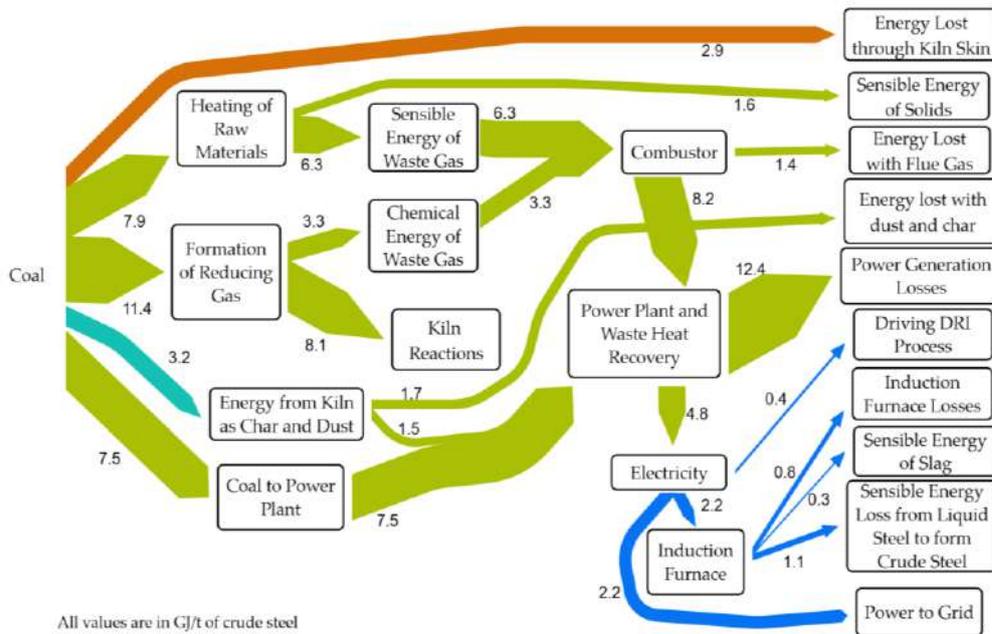


Figure 3: Energy balance for rotary kiln – induction furnace process for crude steel production (basis: 1 t of crude steel)

Table 1: CO₂ emissions in various process heads in the rotary kiln-induction furnace process of crude steel production (Surplus power generated is supplied to the grid. Power generation credit equals the power supplied to the grid multiplied by the captive powerplant emission intensity.)

Process heads	CO ₂ emissions (kg CO ₂ / tcs)
Coal combustion (rotary kiln)	2114
Dolomite calcination	56
Char combustion (power plant)	165
Coal combustion (power plant)	711
Total CO ₂ emissions	3046
Power generation (credit)	-750
Net CO ₂ emissions	2296

3. Decarbonisation measures

Decarbonisation of the rotary kiln–induction furnace process is necessary to improve the emission intensity of the Indian iron and steel sector. Four emission reduction measures – one each encompassing energy efficiency, material efficiency, fuel change, and use of renewable energy – are considered in this study. Their impacts and the corresponding carbon abatement costs are mentioned in Table 2. The total cost of an option is calculated by adding the fixed cost, maintenance cost, and operation cost. Annual maintenance cost is assumed to be 10 % of the fixed cost. The annualised fixed cost is the fixed cost times the capital recovery factor.

Table 2: CO₂ abatement potential and associated costs for various decarbonisation options

Sl. No.	Decarbonisation options	Type of options	Direct CO ₂ abatement (kg/tcs)	Loss in power generation (kWh/tcs)	Net CO ₂ abatement (kg/tcs)	Carbon abatement cost (US\$/t CO ₂)
1	Gravimetric separator	Energy efficiency	0.0	-175.9	213.7	-39.5
2	Bio-char replaces feed coal	Use of renewable energy	1,241.5	-378.7	1701.6	45.4
3	Better grade dolomite	Material efficiency	56.6	0.0	56.6	45.8
4	Natural gas injection	Fuel change	607.1	180.8	607.1	66.0

3.1 Use of gravimetric separator

In the conventional process, the sponge iron leaving the rotary kiln at 1,020 °C (Dey et al., 2015) is cooled to 110 °C for two reasons: (i) to prevent re-oxidation of the sponge iron when exposed to air, and (ii) ease of magnetic separation owing to the strong magnetic properties of iron at a lower temperature. In the proposed alternative, a gravimetric separator can separate calcined dolomite, char, and sponge iron based on the differences in their densities. In plants with appropriate induction furnace capacity, a gravimetric separator can replace the rotary cooler and magnetic separator (see Figure 4). The hot sponge iron from the gravimetric separator can be directly fed to the induction furnace. The total electricity conserved in the induction furnace, rotary cooler, and magnetic separator is subtracted from the energy consumed by the gravimetric separator resulting in a net electricity savings of 175.9 kWh/tcs. The operating cost is calculated as the cost of power saved, which is negative due to electricity savings.

3.2 Bio-char replaces feed coal

Due to the high temperature inside the rotary kiln at the feed end, part of the feed coal is converted to char. This coal char helps form carbon monoxide (CO), which reduces the iron ore to sponge iron. The feed coal can be replaced with biochar. Biochar is substituted on an energy-equivalent basis. This helps to decrease the amount of fossil carbon consumed in processing sponge iron and crude steel. The amount of CO₂ savings is estimated by adding the emissions from feed coal and the emissions for the same amount of power generated from biomass pyrolysis by-products and subtracting the emissions due to power loss in waste heat recovery due to char substitution. Operating cost is estimated by subtracting the cost of coal and extra power generated from the cost of woody biomass required for biochar production.

3.3 Use of better-grade dolomite

Dolomite is added in the rotary kiln to absorb the sulfur present in coal, which is otherwise absorbed by sponge iron and reduces its quality. Calcination of dolomite releases CO₂ into the atmosphere. The amount of lime in dolomite that absorbs sulfur varies from 20 % to 60 %, depending upon the mines from which it is sourced (Yrjas et al., 1995). The use of better-grade dolomite helps decrease emissions from the calcination step. The net CO₂ abatement is calculated by adding the direct emissions from calcination and the emissions due to the coal (energy) used for it. This option doesn't have a fixed cost. Operating cost is calculated by subtracting the cost of energy (coal) from the extra cost incurred due to the use of better-grade dolomite.

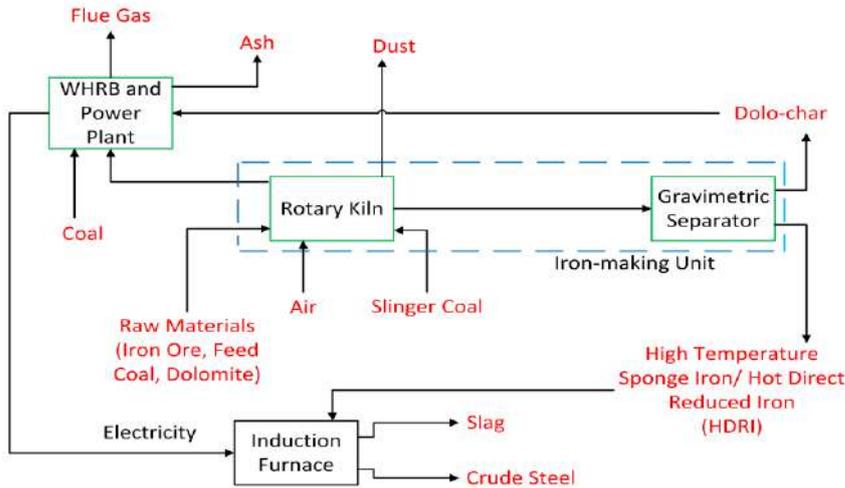


Figure 4: Schematic diagram of rotary kiln – induction furnace process for crude steel production retrofitted with gravimetric separator

3.4 Natural gas injection

Coal is a solid fuel and is more carbon-intensive than a gaseous fuel like methane. Natural gas can replace slinger coal for a less carbon-intensive and energy-efficient process. In the kiln, slinger coal has a combustion efficiency of 71 %, while that of natural gas is 95 %. The fuel substitution is done on an energy-equivalent basis. The CO₂ saving is estimated by subtracting emissions due to natural gas injection from emissions due to slinger coal and adding the emissions due to power loss because of natural gas injection. Operating cost is calculated by adding the cost of natural gas and the cost of power lost due to natural gas usage and subtracting the cost of slinger coal.

4. Discussion

A gravimetric separator option has a net negative cost of CO₂ abatement, implying CO₂ abatement is economically rewarding, and the rest of the decarbonisation options require a net positive cost (see Table 2). The negative cost of CO₂ abatement is due to the electricity conserved. Despite better-grade dolomite usage being a material efficiency option, there is a net CO₂ abatement cost due to the higher price for a better-grade material. The use of biochar is a decarbonisation option due to the use of renewable woody biomass. The marginal abatement cost curve for the decarbonisation options considered is presented in Figure 5. Together, all these options can help abate nearly 56 Mt of CO₂ annually in the Indian iron and steel sector.

5. Conclusions

Among the options considered, the use of biochar to replace feed coal has the highest CO₂ abatement potential because of the carbon-neutral nature of biomass. The overall CO₂ abatement by all four options is higher than the current emission intensity of 2,296 kg CO₂/tcs because of the surplus power generation from biomass pyrolysis gas generated during the production of biochar. However, there is actual emission of 448.7 kg CO₂/tcs from natural gas combustion and calcination. These decarbonisation options are difficult to implement from a commercial perspective because of the high associated costs, as nearly 90 % of the emission abatement cost is in the range of 40-70 US\$/t CO₂ abated. By implementing the gravimetric separator option completely and the bio-char option partially, 399.7 kg CO₂/t of crude steel can be abated without a net cost. This shows that the rotary kiln-based process route can be completely decarbonised conceptually, provided there are suitable

incentives for the industry and consumers. Future work is directed towards the inclusion of other decarbonisation options like painting the rotary kiln with low emissivity paint, use of variable frequency drives, replacement of slinger coal with bio-syngas, etc., for the cost-effective decarbonisation of the sponge iron sector.

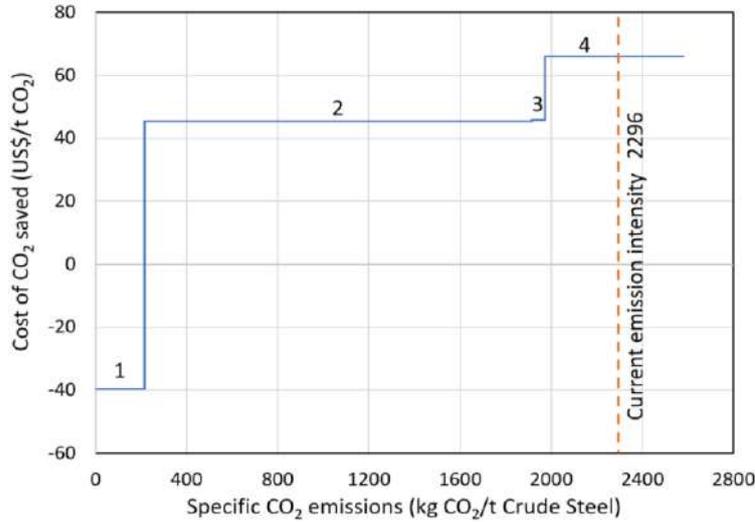


Figure 5: Marginal abatement cost curve for various technology options for decarbonisation of the rotary kiln-induction furnace process of crude steel production (Considering all four decarbonisation options, more CO₂ seems to be abated than actually emitted because of the power credit from biomass pyrolysis gas generated during biochar production.)

Acknowledgments

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ANNEXURE -A/18

Annexure 1 Coal Based DRI Plant					
Sr.No.	Company Name	Ec Granted	Year	Location	TPA
1	ORISSA METALIKS PRIVATE LIMITED	MOEFCC	2024	ODISHA	240000
2	SREE METALIKS LIMITED	MOEFCC	2024	ODISHA	165000
3	GIRIDHAN METAL PRIVATE LIMITED	MOEFCC	2024	WEST BENGAL	594000
4	ALAKNANDA BALMUKUND ISPAT PRIVATE LIMITED	MOEFCC	2024	WEST BENGAL	313500
5	KRISHNA POWER UTILITIES LIMITED	MOEFCC	2024	TELANGANA	120000
6	PACIFIC METASTEEL PRIVATE LIMITED	MOEFCC	2024	MADHYA PRADESH	400000
7	JANKI CORP LIMITED	MOEFCC	2024	KARNATAKA	36000
8	SHRI TIRUPATI STEEL CAST LIMITED	MOEFCC	2024	KARNATAKA	60000
9	SUPRA STEEL & POWER PRIVATE LIMITED	MOEFCC	2024	KARNATAKA	82500
10	SHASHI ALLOYS PRIVATE LTD	MOEFCC	2024	KARNATAKA	132000
11	VAP ISPAT PRIVATE LIMITED	MOEFCC	2024	CHHATTISGARH	231000
12	ISKCO IRON & STEEL PRIVATE LIMITED	MOEFCC	2024	CHHATTISGARH	132000
13	RAMA POWER AND STEEL PVT LTD	MOEFCC	2024	CHHATTISGARH	132000
14	RAIPUR POWER AND STEEL LTD	MOEFCC	2024	CHHATTISGARH	150000
15	CPCBL STEELS AND POWER PRIVATE LIMITED	MOEFCC	2024	CHHATTISGARH	231000
16	RAIGARH ISPAT AND POWER PRIVATE LIMITED	MOEFCC	2024	CHHATTISGARH	693000
17	MAHENDRA SPONGE AND POWER LIMITED	MOEFCC	2024	CHHATTISGARH	15000
18	SALASAR STEEL AND POWER LIMITED	MOEFCC	2024	CHHATTISGARH	396000
19	MSM & SNDB ISPAT & POWER PRIVATE LIMITED	MOEFCC	2024	CHHATTISGARH	99000
20	NEERGANGA ISPAT PRIVATE LIMITED	MOEFCC	2024	CHHATTISGARH	231000
21	MAA MANSA IRON AND POWER PRIVATE LIMITED	MOEFCC	2024	CHHATTISGARH	132000
22	RANGINENI STEEL AND POWER PRIVATE LIMITED	SEIAA	2024	KARNATAKA	62700
				Total	4647700

EXECUTIVE SUMMARY

India is currently one of the fastest-growing economies in the world. However, several challenges confront India's development agenda, including climate change. It is seen that India's historical contribution to the accumulation of GHGs is about 4%, even though it is home to 17% of the global population. Nevertheless, India is committed to combating climate change by making development choices that can ensure economic growth along the low-carbon pathways. Further, India has revised its nationally determined contributions (NDCs) and has achieved considerable progress in deploying renewable energy (RE) capacity and greening the grid. However, achieving the aggressive climate goals such as 2070 net zero targets will also require India to decarbonise its industrial sector, including steel.

India is the second largest crude steel producer in the world, with a capacity to produce 179.5 million tonnes of crude steel and the largest production capacity of sponge iron in the world at 55 million tonnes in FY 2023-24. However, the per capita steel consumption in India is only 97.7 kg in FY 2024 compared with the global average per capita consumption of 221.8 kg in 2022. The National Steel Policy 2017 aims to increase the per capita consumption to 160 kg by 2030. Therefore, given India's lower per capita steel consumption, it is expected that India's steel sector will continue to grow rapidly even beyond 2030.

The structure of the steel sector in India is significantly different from other countries. Developed countries have a higher share of scrap in total steel production, pellet uptake is high, the grid is less carbon-intensive, and low-carbon fuels like natural gas are available at affordable prices. Conversely, India has a limited scrap availability and natural gas is significantly expensive. Additionally, India has low-grade coal and iron ore, whose usage increases overall energy consumption and emissions. In addition, integrated steel plants (ISPs) rely on captive coal-based thermal power plants that have significantly higher emissions intensity of power than cleaner grids in developed countries. In summary, the Indian steel industry is constrained to use coal-based blast furnaces and rotary kilns for steelmaking due to a lack of affordable alternatives. Consequently, the emission intensity of steel produced in India, at 2.54 T CO₂/T Crude Steel (tCO₂/TCS), is significantly higher than the global average of 1.91.

The steel industry accounts for 10-12% of India's total emissions. Therefore, the sector's decarbonisation is imperative for India to meet its climate goals. In response to India's climate commitments and in a bid to create a globally competitive and sustainable steel industry, the Ministry of Steel constituted 14 task forces that cover the pertinent aspects of decarbonisation of the steel industry. The initiative, summarised in Figure ES1, focuses on three key pillars: the incentivisation and ecosystem development for green steel, levers to enable decarbonisation, and avenues to support the transition. This report is an outcome of the key findings from the 14 task forces and contains a harmonised action plan for steel decarbonisation in the country.

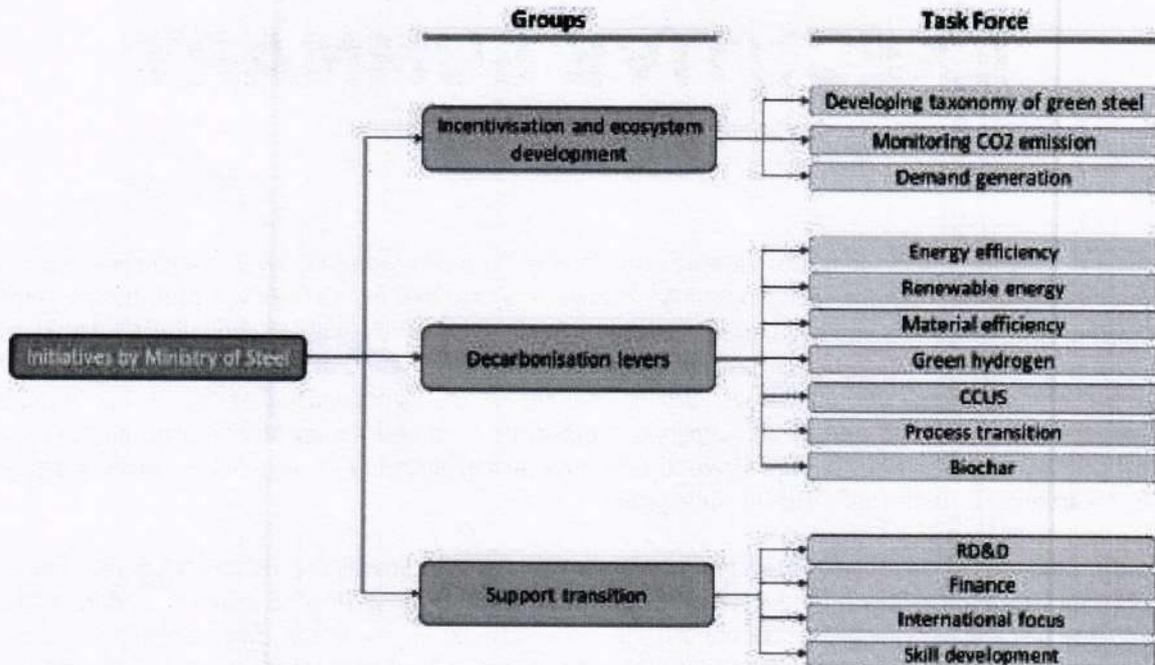


Figure ES1: List of task forces constituted by the Ministry of Steel

Incentivisation and ecosystem development

Defining green steel

The definition of green steel (or any other related terminology) is a prerequisite for developing a coherent policy for decarbonising the sector and creating demand for products with green attributes. Globally, there is no commonly accepted definition of green steel yet, though multiple organisations and various countries are working on it. There are multiple challenges to defining green steel in the Indian context. The cost of producing 'fossil-free' and 'near-zero emissions' steel is prohibitively high today. Further, the disparity in the availability of resources like natural gas, scrap, etc. and different milestone years across countries for achieving net zero emissions will be key challenges for developing a globally accepted definition of green steel. Within India, developing a just and fair definition that will incentivise incremental decarbonisation across various production pathways and creating an ecosystem equipped with monitoring, reporting and verification (MRV), green steel certification and registry would be critical to ensure cost-effective decarbonisation of the sector.

Given this background, there are a few design considerations that can be used to define green steel in the Indian context. These considerations, listed in Figure ES2, are an outcome of definitions proposed globally and focus on various aspects related to defining green steel. Based on globally proposed definitions, a key deliberation would be to have scrap-agnostic or scrap-centric targets on the emission intensity of steel that can be further used to estimate the amount of green steel. Further, given the heterogeneity of India's steel industry, the emissions intensity targets could either be production route agnostic or production route specific. The targets on the emission intensity of steel could also be one single value or multiple bands of emissions intensity can be considered for categorising steel based on emissions intensity. The future targets on emissions intensity of steel could either be dynamic, implying that it can be changed in the future based on the progress achieved, or it can be a static value where, irrespective of the progress made by the sector, the targets for future years will not be changed.

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Most steel plants in India are geographically located within a few districts, while the SSIs mostly operate in clusters. Therefore, a cluster-based approach might be suitable for accelerating decarbonisation in the sector by providing access to alternative fuels like green hydrogen, biochar, syngas and deep decarbonisation levers like CCS that can facilitate shared infrastructure, innovation, and resource optimisation. This approach enables the steel industry to collectively tackle common challenges and is useful for SSIs with less financial wherewithal to adopt high-cost interventions. Similarly, the aggregator model supports aggregating green steel demand, the deployment of renewable energy and the uptake of natural gas on a larger scale by pooling investments and resources. Finally, RD&D initiatives are crucial for driving innovation, developing indigenous technologies and making India a manufacturing hub for new-age technologies.

The Bureau of Energy Efficiency (BEE) is developing targets for emissions intensity of steel production in India for the obligated entities under the ambit of Indian Carbon Markets through its Carbon Credit Trading Scheme (CCTS). The proposed industry-wide targets for emissions intensity of steel are indicated in Figure ES13. It is seen that under the CCTS scheme, it is aimed to reduce the average emissions intensity of steel from 2.54 TCO₂/TCS in 2023-24 to 2.2 TCO₂/TCS by 2029-30.

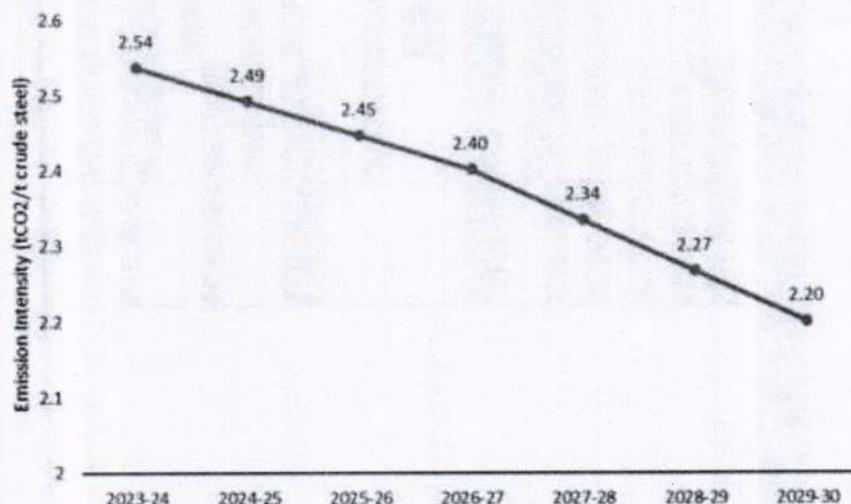


Figure ES13: Proposed emissions intensity targets for the steel sector

The Ministry of Steel may support the steel industry for meeting the targets set by BEE and ensure decarbonisation of the steel sector in India. Figure ES14 shows the timeline for major action items under each of the task forces from FY 2025 to 2030. Some actions are immediate and short-term, such as developing a definition for green steel and creating an MRV framework for CO₂ emissions monitoring, set to be completed by FY 2025 and 2026, respectively. Continuous efforts extending until 2030 include promoting energy efficiency, achieving 45% renewable energy penetration, and increasing the use of biochar and circular economy practices. Certain initiatives, like demonstrating pilots for green hydrogen use and establishing pilot plants for CCUS, are scheduled to start later in the timeline but are critical for long-term decarbonisation goals. The implementation of RD&D projects and enhancing finance availability for the steel sector, as well as ensuring just transition, are ongoing efforts that will span across the years, ensuring sustained progress towards reducing emissions. The emission intensity targets are also shown in the figure from FY 2025 to 2030, reducing from 2.54 to 2.2 T/TCS. This may be achieved by the successful implementation of the roadmap.

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Sr. No	Action Items	2024	2025	2026	2027	2028	2029	2030
1	Taxonomy a. Developing a definition of green steel in consultation with all relevant stakeholders.							
2	Monitoring CO2 a. To develop an MRV framework for CO2 emission monitoring in steel sector							
3	Demand Generation a. To develop a policy for green public procurement in steel sector							
4	Energy Efficiency a. To ensure increased penetration of BATs in both existing steel plants and new steel plants							
5	Renewable Energy a. To achieve 45% RE penetration in the steel sector by 2030 b. To create aggregator model for using renewable energy in steel industry							
6	Material Efficiency a. To promote circular economy by increasing the use of scrap by 2030 b. To ensure increased uptake of pellets in ISPs							
7	Green Hydrogen a. To demonstrate pilots for use of Green hydrogen in blast furnace, gas shaft furnace and 100% green hydrogen DRI							
8	CCUS a. To support development of a policy for CCUS in India b. To establish pilot plants in CCUS in India							
9	Process Transition for DRI a. To ensure increased availability of Natural gas for steel production b. To aggregate demand from steel industry and negotiate long term offtake contracts with LNG							
10	Biochar a. To ensure increased utilization of Biochar							
11	RD&D a. Release RD&D roadmap for steel decarbonisation in India b. Implement the identified RD&D projects in the report							
12	Finance a. Establish dedicated funds for SSIS b. Ensure enhanced availability of funds for steel sector							
13	International Focus a. To increase the availability of technology and finance in India through international collaboration							
14	Skill Development a. To ensure just transition							
	Target % Reduction in Emission	0.00%	1.38%	2.75%	4.81%	6.96%	8.98%	11.00%
	Target Carbon Emission Intensity (T/CS)	2.472	2.438	2.404	2.353	2.3	2.25	2.2

Figure ES14: Roadmap for demand and supply side action items from 2025 to 2030.

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Figure ES15 illustrates the roadmap for decarbonising the steel industry in India, highlighting key milestones from 2023 to 2070. The journey begins in 2023 with the establishment of 14 task forces by the Ministry of Steel. In 2024, the focus is on defining green steel and developing an MRV framework. In 2025, a policy framework for green public procurement (GPP) will be developed, followed by initiatives to increase energy efficiency and renewable energy penetration. The roadmap then emphasises the uptake of pellets and scrap utilisation in steel production. By 2030, significant actions include biochar utilisation and the pilot testing of green hydrogen (GH2) and carbon capture, utilisation, and storage (CCUS) technologies. The period leading up to 2047 involves deep decarbonisation through commercial GH2 steelmaking, advanced CCUS, and breakthrough technologies like direct electrolysis. Finally, the roadmap aims to retire high-emission capacity and achieve net zero emissions by 2070.

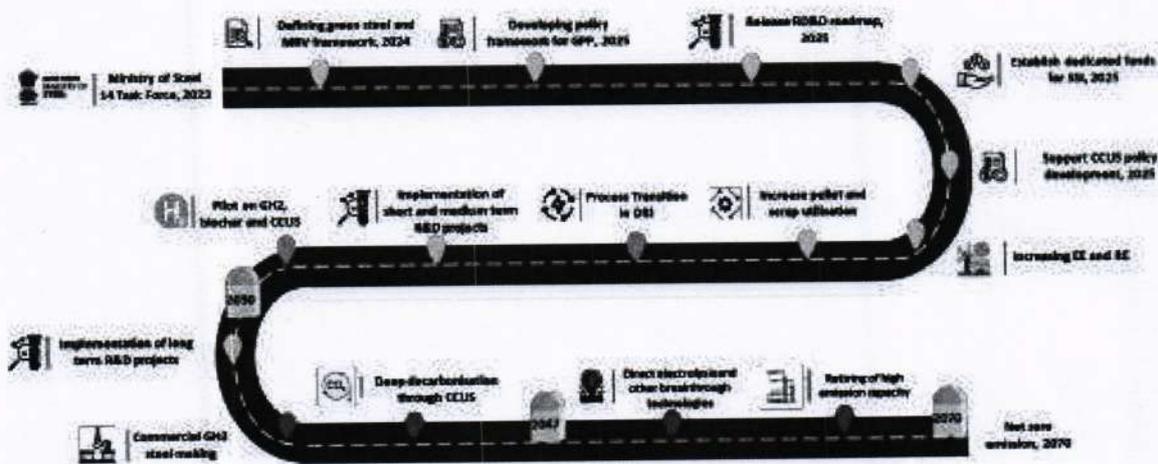


Figure ES15: Roadmap for net zero transition in India

2.1. Introduction

The definition of green steel is a prerequisite for developing a coherent policy for decarbonising the sector and creating demand for products with green attributes. A clear, credible and standardised taxonomy provides a common language and framework for producing low-carbon emission steel, differentiating the market for green steel from conventional steel and enabling its procurement. Further, a green steel taxonomy is essential for drawing in financial support for the production of greener steel. It is also important to foster international collaboration and cooperation in advancing sustainable steel production and trade. While developing the definition of green steel is not a direct tool for reducing carbon emissions in the steel sector, it is a crucial enabler of the transition that supports 'push' and 'pull' factors for decarbonisation.

India has a functioning market for the trade in Energy Savings Certificates (ECerts) arising from the success of the PAT scheme. The BEE regularly collects data regarding plant-level energy consumption, which can be used for measuring emissions intensity of steel. The Government of India has notified the Carbon Credit Trading Scheme (CCTS) that will enable the creation of Indian Carbon Markets (ICM). BEE is already developing sectoral and plant-level targets for decarbonising the steel sector. Further, ISPs in India voluntarily disclose data regarding their emissions intensity in their sustainability reports and as a part of Worldsteel's Climate Action Data Collection¹. However, a crucial gap remains due to the absence of an accepted and robust definition of 'green steel' in India. This lack of clarity creates challenges in comparing the environmental performance and decarbonisation initiatives of different steel producers. It hinders effective policy implementation, thus leading to uncertainty for producers seeking to invest in green technologies and consumers seeking environmentally friendly options.

Globally, there is no common, accepted definition of green steel yet, although multiple organisations and various countries are working on developing one. With this background, the chapter discusses various efforts taken across the globe, assesses their suitability to India and lists possible approaches for defining green steel in the Indian context to enable transitions in the sector and catalyse the green steel market in the country.

2.2. Developing taxonomy for green steel

Developing a taxonomy for green steel involves multiple components, from coining an accepted terminology to having a reliable certification system. This section briefly discusses the steps for developing a green taxonomy in India.

1. **Terminology:** It is important to coin the correct terminology to enable trade in green steel. Multiple terminologies like low-carbon steel, green/sustainable/responsible steel, net-zero/carbon-neutral steel, low(er) embodied carbon steel, near-zero steel, zero-carbon steel, and fossil-free steel have been discussed globally. However, there is no globally accepted terminology yet. The first step towards developing a taxonomy would be finalising the terminology. In the absence of a globally accepted taxonomy, "green steel" has been used as a terminology for decarbonised steel in this report. The word "Green" does not indicate near-zero emissions. It is, however, indicative of incremental efforts to decarbonise the steel sector.
2. **Definition:** This is the most critical step in defining green steel. Multiple definitions of green (or any related terminology) steel have been proposed globally. Given the heterogeneity, India's national climate commitments, and challenges related to fuel, raw material, scrap, power availability, etc., faced by the Indian steel industry, it would be important to develop a green steel definition for the Indian context.
3. **Benchmarking:** This step involves establishing the current emissions intensity of steel, at sectoral and

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plant levels. Further, based on India's climate commitments, the next step would be to identify emissions intensity milestones for intermediate years to ensure that the sector is on track to reducing its carbon emissions.

4. **Scoping of emissions:** The scope of emissions - scopes 1, 2 and 3 - should be decided while setting up targets on the emissions intensity of steel. Establishing a level playing field for all steel plants across various production pathways is important. For example, one steel plant might source beneficiated raw material from an external supplier, while the other might have an in-house beneficiation unit. Consequently, if the scope of emissions intensity is decided purely based on the physical plant boundaries, then it might be unfair for the steel plant with an in-house beneficiation unit. Therefore, establishing an emissions boundary will be integral to this effort.
5. **Monitoring, reporting, and verification (MRV):** A well-functioning market for green steel can only be developed based on transparency related to the emission intensity of steel. A robust MRV framework and methodology, along with accredited agencies capable of implementing it, will be instrumental in developing investors' and stakeholders' confidence in decarbonising the sector.
6. **Certification:** Green steel will most likely be available at a premium over the conventionally produced steel. Therefore, the end-consumers of green steel will need a guarantee of the green attributes of the product. Certification from accredited agencies through a proper governance structure for the steel industry would be imperative for creating the demand side pull in the sector. Certification of green steel would include identifying certification bodies in India, developing mechanisms for banking green steel certificates, labelling products, etc.

2.3. Review of suggested green steel definitions across the globe

This section of the report summarises the major definitions of green (or any other related terminology) steel. Table 2.1 lists the key definitions of green (or other terminologies) steel that are evolving globally and identifies the challenges in directly adopting them in India. A detailed description of these definitions can be found in the references provided in Table 2.1.

Table 2.1: Summary of key definitions of green (or other terminologies) steel globally

S. No.	Organisation / Consortium	Critical review in the India Context
1	International Energy Agency (IEA)	The International Energy Agency (IEA) is a Paris-based international intergovernmental organisation of 29 industrialised countries under the Organisation for Economic Development and Cooperation (OECD). IEA follows the sliding scale methodology for the emission intensity of steel. The targets for the intensity of steel emissions are set based on the percentage of scrap steel used for steelmaking. As per this definition, a steel plant with a higher scrap share will have to meet a lower emissions intensity target than a plant that has lower scrap use. Essentially, this definition negates the use of scrap as a decarbonisation lever and intends to create a level-playing field between the primary and scrap-based steel producers. Further, the IEA definition also quantifies the amount of low-emission steel produced based on the actual emissions intensity and targeted intensity per the sliding scale.

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S. No.	Organisation / Consortium	Critical review in the India Context
		<p>A globally accepted sliding scale will benefit a scrap-deficient country like India. Countries that, on average, have higher scrap share will have to meet stringent emissions intensity targets compared to India. However, a challenge with global acceptance of this definition arises from different national commitments to achieve net zero goals. India has committed to achieving net zero by 2070, whereas developed countries plan to reach net zero by 2050. Therefore, having an equivalence between countries with varying net zero targets might be a challenge for global acceptance of this methodology.</p> <p>Another challenge with the sliding scale approach is that it does not differentiate between various processes and fuels used for producing steel. For example, the targets on emissions intensity for coal-based blast furnaces, rotary kilns and natural-gas-based shaft furnaces will remain the same if they use the same share of scrap. Steel plants located in a few countries might have access to affordable natural gas, while Indian steel plants do not have access to it. Consequently, coal-based Indian steel plants might not be able to compete with gas-based DRI plants located in the developed world for the same emissions intensity values (assuming similar scrap uptake) and risk losing market share. This will be detrimental to the interest of Indian steel plants. Therefore, a globally acceptable definition of green steel should account for the disparity in resource availability across countries to ensure a just and equitable transition in the steel sector.</p> <p>The IEA definition differentiates the emission intensity targets based on the quantum of scrap use. Given that scrap is a key decarbonisation lever, especially in a country like India, where its availability is limited, it is important that steel scrap may not be disincentivised. Further, in India, scrap-based IFs are operated by smaller players that have limited avenues to decarbonise.</p>
2	Responsible Steel	<p>ResponsibleSteel, headquartered in Australia, is a global, not-for-profit organisation created to maximise steel's contribution to a sustainable world. ResponsibleSteel has proposed a sliding scale for emission intensity targets of steel. Similar to the IEA approach, ResponsibleSteel considers scope 1, scope 2, and upstream scope 3 emissions to estimate the overall emission intensity of steel². However, unlike the IEA approach, ResponsibleSteel does not quantify the amount of low-emission steel produced.</p> <p>The challenges with ResponsibleSteel's approach to setting targets on emissions intensity are similar to the sliding scale proposed by IEA. Further, the inclusion of upstream scope 3 emissions in accounting is also challenging given that India is significantly import-dependent on coking coal and natural gas, the emissions of which cannot be directly attributed to steel produced within India. It might also be challenging to measure the emissions intensity of fuels and raw materials produced in another country.</p>

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S. No.	Organisation / Consortium	Critical review in the India Context
3	ArcelorMittal	<p>ArcelorMittal is a Luxembourg-based multinational steel manufacturing corporation headquartered in Luxembourg City. ArcelorMittal has identified six bands (A-E) of steel based on the targetted emissions intensity and scrap share³. The approach is based on the sliding scale principle proposed by IEA and ResponsibleSteel, which negates the effect of using scrap as a decarbonisation lever. However, unlike the IEA definition that quantifies the amount of green steel produced, the ArcelorMittal definition only proposes bands.</p> <p>The challenges with ArcelorMittal's approach to setting targets on emissions intensity are similar to the sliding scale proposed by IEA and ResponsibleSteel. Further, a band-based approach has additional challenges, given that there is no incentive for an industry to reduce its emissions intensity if it reaches a particular band. For example, there is no incentive for a steel plant to reduce its emissions intensity within band D of the proposed definition unless it wants to meet the criteria set for band C.</p>
4	HYBRIT	<p>HYBRIT – Hydrogen Breakthrough Ironmaking Technology – is a joint venture, based out of Sweden, between SSAB, LKAB and Vattenfall, aiming to replace coal with hydrogen in the steelmaking process. The HYBRIT project defines 'fossil-free' steelmaking as using non-fossil sources like green hydrogen and renewable energy to produce steel⁴. However, given that green hydrogen is significantly expensive today, such 'fossil-free' steelmaking can only be considered in the medium-to-long term after the cost of green hydrogen reduces.</p>
5	Industrial Deep Decarbonisation Initiative (IDDI)	<p>The Clean Energy Ministerial - Industrial Deep Decarbonisation Initiative (IDDI) is a global coalition of public and private organisations that are working to stimulate demand for low-carbon industrial materials. It is co-led by the UK and India, and current members include Canada, Germany, Japan, Saudi Arabia, Sweden, the United Arab Emirates (UAE), and the United States. IDDI proposes to directly adopt the IEA definition for low emission and near-zero steel production as a robust starting point⁵. IDDI is now focussing on harmonising Product Category Rules (PCRs), refinement and extension of IEA definitions along the value chain, the GHG emission boundary definition for each product stage, and the data quality requirements on the use of facility-specific GHG reporting data and background data.</p>

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S. No.	Organisation / Consortium	Critical review in the India Context
6	First Movers Coalition (FMC)	<p>First Movers Coalition (FMC) is an initiative by the Geneva-based World Economic Forum (WEF) that aims to advance the most critical, emerging climate technologies by leveraging members' collective purchasing power. FMC⁶ followed the sliding scale methodology proposed by IEA to define near-zero emissions steel. As per FMC definition, near-zero emissions steel has an emissions footprint of <0.4 t (with 0% scrap inputs) to <0.1 t (with 100% scrap inputs) of CO₂ per tonne of crude steel produced.</p> <p>The approach adopted by FMC does not incentivise incremental decarbonisation but focuses on achieving absolute near-zero emissions of steel production. Achieving near-zero emissions, irrespective of the corrections on the emissions intensity targets with scrap share, will be very challenging in India due to the presence of coal-based blast furnaces and rotary kilns that significantly depend on the CCUS route for deep decarbonisation. The CCUS ecosystem is still evolving in India and will take time to achieve scale and commercialisation.</p>
7	Global Steel Climate Council (GSCC)	<p>The Global Steel Climate Council (GSCC) is a Canada-based non-profit association organised to advance climate strategy by establishing standards and advocating for carbon emissions reductions by members of the steel industry. The GSCC standard provides a set of criteria for evaluating and certifying flat and long steel products based on their carbon intensity. GSCC has proposed different emissions reduction trajectories for long and flat products⁷ for 5 years from 2022 to 2050. According to this definition, the long products have a more stringent emission intensity target.</p> <p>In India, the long products are produced by the DRI+IF route, which is dominated by the smaller players. It might be challenging to the smaller players to have a lower emissions intensity target as they might not have the wherewithal to meet the stringent emissions intensity targets. Further, the smaller players cannot compete with ISPs in terms of production costs, primarily due to higher scrap costs.</p>
8	Kloekner Metals Corporation	<p>Kloekner Metals Corporation is one of North America's largest metals manufacturing, supply, and service companies. Kloekner Metals defines six categories of finished steel based on absolute carbon emissions intensity⁸ starting with 1.75 to 0.4 tCO₂/t finished steel product. This definition considers scopes 1, 2, and 3 emissions and is based on the absolute emission intensity of steel. There is an analogous system for stainless steel and aluminium.</p> <p>A challenge with the category or band-based approach is that a steel industry at the extreme ends of a particular band will command the same premium in the market. For example, as per the proposed methodology by Kloekner Metals, steel plants with an emissions intensity of 1.41 tonnes CO₂/tcs and 1.01 tonnes CO₂/tcs will be categorised under the same band 'step'. Consequently, there is no incentive for the industry at 1.41 tonnes CO₂/tcs to move to a lower value until it reduces enough to move to the next band.</p>

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S. No.	Organisation / Consortium	Critical review in the India Context
9	SteelZero	SteelZero is a global initiative by the London-based Climate Group that aims to bring together leading organisations to speed up the transition to a net-zero steel industry. The STEELZERO ⁹ initiative has adopted ResponsibleSteel's sliding-scale methodology for setting decarbonisation targets.
10	World Steel Association (WSA)	World Steel Association (WSA) is a Brussels-based international industry association for the iron and steel sector. WSA has discussed multiple definitions of decarbonised steel, such as low-carbon, near-zero, carbon neutral, fossil-free, clean, carbon-free steel, etc. However, no single definition has been proposed or adopted by WSA ¹⁰ .

2.4. Indian scenario of green taxonomy

Bharat Stage Emission Standards (BSES) for automobiles: BSES are a set of regulations implemented by the Government of India to control the output of air pollutants from internal combustion engine vehicles and equipment. Modelled after the European emissions standards, they establish limits on the emission of pollutants such as carbon monoxide (CO), nitrogen oxides (NO_x), hydrocarbons (HC), and particulate matter (PM). The implementation timeline of BSES is as follows:

1. **Bharat Stages I and II:** Introduced in 2000 and 2001 respectively, to target initial reductions in vehicle emissions.
2. **Bharat Stage III and IV:** Implemented progressively from 2005 to 2017, with BS IV covering the entire country by 2017.
3. **Bharat Stage VI:** BS VI was directly enforced on April 1, 2020, setting more stringent emission limits comparable to Euro 6 standards.

Ongoing enhancements in emission standards are expected as India continues to align its regulations with global practices and pursues further reductions in vehicle-related pollution.

Star labelling of consumer appliances by BEE: The Star Labelling Programme, launched by the Bureau of Energy Efficiency (BEE) under the Government of India, is a voluntary initiative that rates the energy efficiency of appliances on a scale from 1 to 5 stars. Categorization of the ratings is done on the basis of star rating, energy efficiency ratio, product details and BEE registration number. This labelling system guides consumers in choosing energy-efficient appliances by highlighting their potential for energy savings and cost reduction. The program, which was developed through a collaborative and consensus-driven process, involves active participation from various stakeholders to ensure its effectiveness.

2.5. Challenges

There are challenges for fossil-free and near-zero emission steel production concerning the scalability of technologies and avenues for achieving near-zero emissions in the sector. There are also challenges to developing a globally acceptable definition of steel. This section deliberates on these challenges and identifies the bottlenecks for driving sustainability practices in the steel sector.

GREENING THE STEEL SECTOR IN INDIA

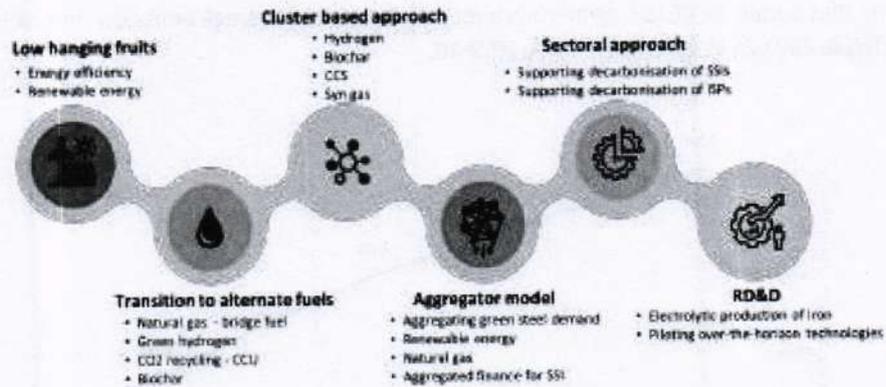


Figure 17.4: Strategies for transition in the steel sector

Cluster-based approach

It is useful to synergise decarbonisation efforts within the sector. It is seen that most steel plants do not have space within the existing plants for producing green hydrogen. Further, most steel plants in India are geographically located within a few districts, while the SSIs mostly operate in clusters. Therefore, a cluster-based approach might be suitable for accelerating decarbonisation in the sector by providing access to alternative fuels like green hydrogen, biochar, syngas, and deep decarbonisation levers like CCS that can facilitate shared infrastructure, innovation, and resource optimisation. This approach enables the steel industry to collectively tackle common challenges and is useful for SSIs with less financial wherewithal to adopt high-cost interventions.

Aggregator model

This model supports aggregation of demand for green steel, renewable energy, and natural gas on a larger scale by pooling investments and resources. It is a business model that involves a third-party entity (the aggregator) that shall pool together the demand from multiple steel producers. The aggregator shall then procure these resources in bulk, often at a discounted rate due to economies of scale, and distribute them to the steel producers. This model is especially important for the SSIs that can potentially benefit from the economy of scale. Additionally, it promotes aggregated finance for SSIs, ensuring that smaller entities within the steel sector have access to the financial support needed to adopt sustainable practices. The key features involved are demand aggregation, bulk procurement, risk management, distribution, financial management, and market analysis.

RD&D

RD&D initiatives are crucial for driving innovation, developing indigenous technologies, and making India a manufacturing hub for new-age technologies. For the steel sector, breakthrough technologies like electrolytic production of iron, and piloting over-the-horizon technologies like hydrogen-based steel production and CCUS hold significant promise. RD&D can also help the steel sector in developing technologies that will help incremental decarbonisation of the existing processes for producing iron and steel.

17.4. Emissions intensity trajectory for the steel sector

The Bureau of Energy Efficiency (BEE) is developing targets for emissions intensity of steel production in India for the obligated entities under the ambit of Indian Carbon Markets through its Carbon Credit Trading Scheme (CCTS). The proposed industry-wide targets for emissions intensity of steel are indicated in Figure

GREENING THE STEEL SECTOR IN INDIA

17.5. It is seen that under the CCTS scheme, it is aimed to reduce the average emissions intensity of steel from 2.54 t-CO₂/TCS in 2023-24 to 2.2 t-CO₂/TCS by 2029-30.

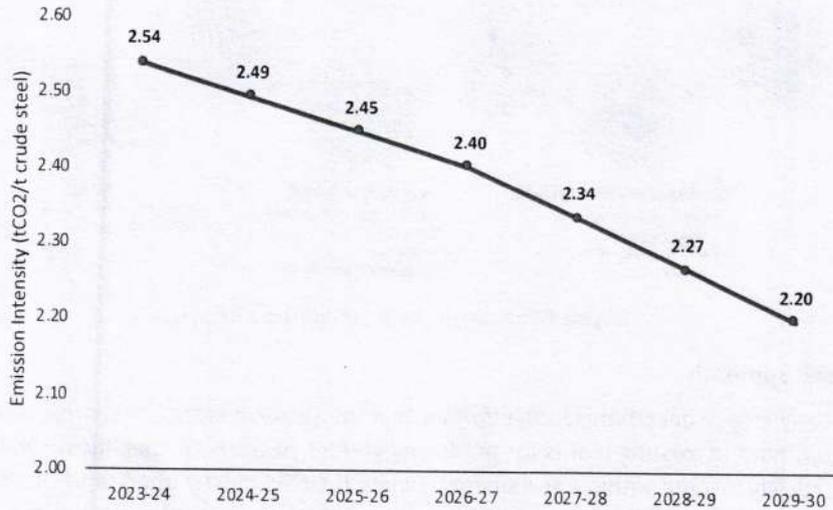


Figure 17.5: Proposed emissions intensity targets for the steel sector

17.5. Roadmap

Figure 17.6 illustrates the envisioned trajectory for transitioning the steel industry, spanning short-term (up to 2030), medium-term (up to 2047), and long-term (up to 2070) objectives. In the short term, until 2030, the emphasis lies on maximising the adoption of energy efficiency and renewable energy sources. Additionally, there is a concerted effort to maximise the utilisation of pellets and to increase the incorporation of scrap in steel production. These technologies are already deployed in some parts of the industry and can be readily incorporated throughout the sector.

In the medium term, until 2047, the focal points shift towards initiatives such as the development of green hydrogen, biochar, and CCUS, alongside enabling the process transition of the DRI industry. Finally, in the long term, attention may turn to the deployment of direct electricity technologies and other disruptive innovations aimed at facilitating the transition to achieve net-zero emissions.

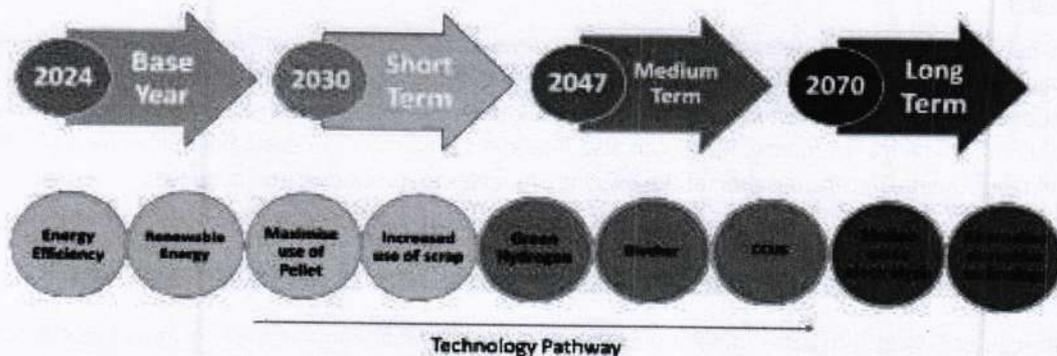


Figure 17.6: Strategy for net zero transition in India

CO₂ data report 2023

2022 Data year [for data providing members only]

CO₂ emissions from
the steel industry

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Version History

22 Sep 2023 v1: Report launch.

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Foreword

Thank you to all the participating worldsteel members in your diligence in submitting data representing your sites' activities and CO₂ emissions and energy performance. For the 2023 CO₂ report, worldsteel received 230 site-level submissions covering 2022 production activities (in comparison to 221 site submissions available covering the previous year after updates to the dataset).

Regular worldsteel members submit their CO₂ data voluntarily under the Climate Action Programme on an annual basis. This reporting system is transparent, well documented, and internationally recognised. Regular data submission allows participating companies track their performance over time and compare it with the rest of the industry.

In the Climate Action data collection programme, data is reported using a simplified template and sites are then classified into 5 operational production routes. For 2022 activity year, the 230 sites were assigned as 56 BF-BOF sites, 116 Scrap-EAF, 20 DRI-EAF, 25 Others, and 13 Stainless.

The data submission is the first step for a member to assess their operations in terms of CO₂ intensity. The composite number (tCO₂/tCS) is heavily influenced by a multitude of factors. This written report is inherently limited to a static set of analyses. worldsteel has endeavoured to enhance the functionality of the [online system](#) over the years and users can now carry out detailed analyses in the **Analytics** section of the platform and see the impact of the aforementioned factors within a comparable group anonymously.

There is an ever-increasing pressure from public and stakeholders for the steel industry to reduce emissions. Given the steel industry is at the start of a long manufacturing chain, calls for transparency of the entire value chain translate into a need for clear metrics that account for emissions in the making of steel products.

Whilst breakthrough technologies are being developed, commercial deployment at scale will take a while. In the meantime, reduction and control of CO₂ emissions remains the most significant challenge for the industry and there is a compelling case for the steel industry to focus its efforts towards reducing the CO₂ and energy intensity of its process and products.

Process Efficiency is a critical short-term opportunity for the steel industry. The **Step Up** programme launched in 2019 is based on a set of 4-levers: raw material quality, energy efficiency, yield improvement and asset reliability. Participation in this program is open to all worldsteel members where sites can carry out gap analysis assisted by worldsteel's Step Up team and identify pockets of opportunities in lowering energy and CO₂ intensity. Over 20 sites have been reviewed and site diagnostics led to a clear demonstration of potential reduction in emissions and savings in OPEX for all participating sites.

Online tools have been developed to track and identify improvement in process yield (% losses), energy intensity (GJ/t) including the impact raw materials quality have on productivity and ensure process reliability (overall equipment; OEE).

Our analysis of the 2022 data indicates that CO₂ intensity can be reduced by up to 19% in the BF-BOF process route and more than 43% for the scrap – EAF route if the industry moves towards practices used by the better-performing sites.

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By participating in **Step Up** programme, your organisation can demonstrate its commitment to reducing emissions and transition to a low-carbon future now as all your sites progress towards performance levels achieved by better performing sites. The industry needs a visible trackable KPI to show it is doing all that is possible in a timely fashion to meet its obligations to its stakeholders.

The steel industry's hard won high level of credibility and integrity is at risk if we cannot demonstrate continuous progress in reducing our CO₂ emissions and invest in new technologies now these are proven to be as they reach commercial maturity.

worldsteel looks forward to your continued input to the **Climate Action** data collection programme and participation in the **Step Up** programme in the coming year.

Dr Rizwan A. Janjua | Head, Technology
World Steel Association

1. 2023 CO₂ report summary

This report sums up findings from the 2022 worldsteel CO₂ data collection, an activity initiated by worldsteel in 2008 aimed at establishing reference baselines and tracking trends in CO₂ emissions for the steel industry globally.

Site-level data is submitted voluntarily by worldsteel members following the worldsteel CO₂ methodology, developed by worldsteel and industry experts, which has been used as the basis for the ISO standard series 14404.

The worldsteel CO₂ data system is flexible and robust covering key technological routes and site configuration. In the analysis stage, each site gets classified into one of five operating routes through a specific classification algorithm. With the support of the CO₂ Reporting Advisory Group consistent of member experts, this year worldsteel implemented adjustments to the classification algorithm, which were applied throughout the time series.

Sites are classified into five main process routes: BF-BOF, Scrap based EAF, DRI-EAF, Stainless, and Others. Findings and aggregated indicators for these routes are presented and discussed in specific sections of this report. The reader is encouraged to visit the [Online System](#) which contains an extensive set of analytics for individual needs.

1.1. Global CO₂ and Energy indicator

Apart from the report and analytics offered to participating worldsteel members, the CO₂ data collection dataset is used to calculate the global CO₂ and Energy indicators as part of the worldsteel [sustainability indicators report](#). This indicator aims to provide an industry-wide representative CO₂ intensity level.

From 2007 until 2020, these indicators were calculated based on the information from the two most prevalent steel producing routes: Blast Furnace – Basic Oxygen Furnace (BF-BOF) and scrap-based Electric Arc Furnace (EAF). From the activity year of 2021 onwards, the global average value also incorporates a contribution from Direct Reduced Iron (DRI)-based EAF steel production, given its rising importance as a key steel making process. Figure 1 presents the equations used from 2007-2020 and the new approach from 2021 onwards, and the same approach is used to calculate the Energy intensity indicator.

Figure 1: Global CO₂ intensity equation

up to 2020 activity year

$$\text{Global CO}_2 \text{ Intensity} = \left[\text{BF-BOF CI} \times \text{Share of BOF steel in global production} \right] + \left[\text{Scrap-EAF CI} \times \text{Share of EAF steel in global production} \right]$$

From 2021 onwards

$$\text{Global CO}_2 \text{ Intensity} = \left[\text{BF-BOF CI} \times \text{Share of BOF steel in global production} \right] + \left[\text{Scrap-EAF CI} \times \text{Share of scrap EAF steel in global production} \right] + \left[\text{DRI-EAF CI} \times \text{Share of DRI EAF steel in global production} \right]$$

We consider that this new approach to calculating the global metric more accurately reflects global steel production today and in the future.

worldsteel aims to keep its CO₂ methodology in pace with the developments in the steel industry, as advised by our CO₂ Reporting Advisory Group. Recent changes offer ways to make the data more representative of local site conditions, including the option to use CO₂ intensity factors representative of local electricity grids. Beyond the worldsteel reference global intensity grid, users can represent the upstream emissions from electricity consumption using a global grid mix factor annually updated, a national or regional mix factor, and/or a local site-contract grid mix if available, in GJ/MWh and tCO₂/MWh.

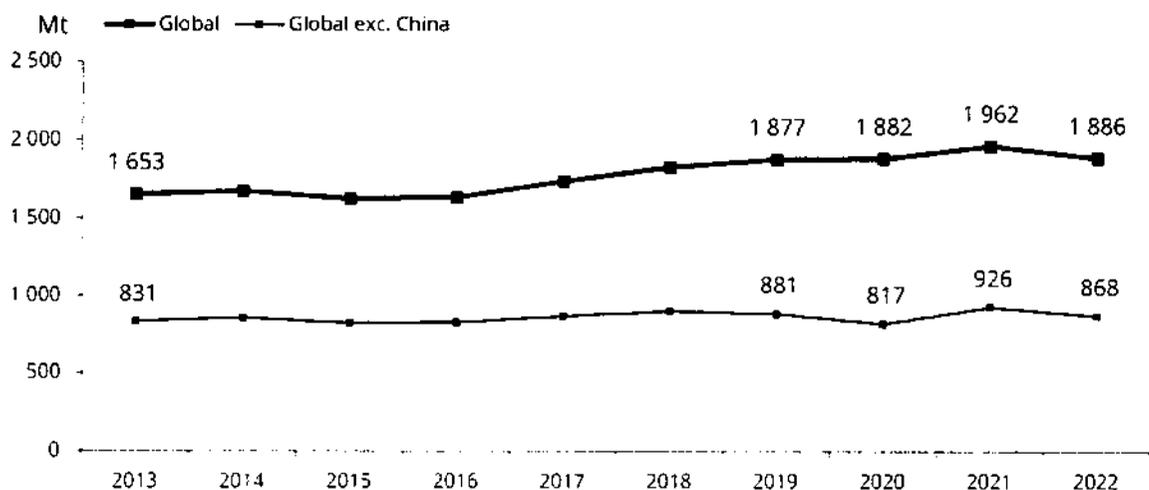
In addition to these changes, the dataset considers CO₂ credits coming from avoided emissions due to the sale and use of co-products such as slags and CO₂ gases by other industries. This information has always been monitored in the CO₂ methodology. However, it is becoming apparent that the indicators presented in the CO₂ reports should be explored in the context of growing calls for industrial synergies, with inter-connected industries working together to lower net CO₂ emissions through re-use of co-products.

The impact of these criteria can be further investigated through the Analytics panels available in the [benchmarking system](#).

1.2. Global steel production and coverage by the CO₂ dataset sample

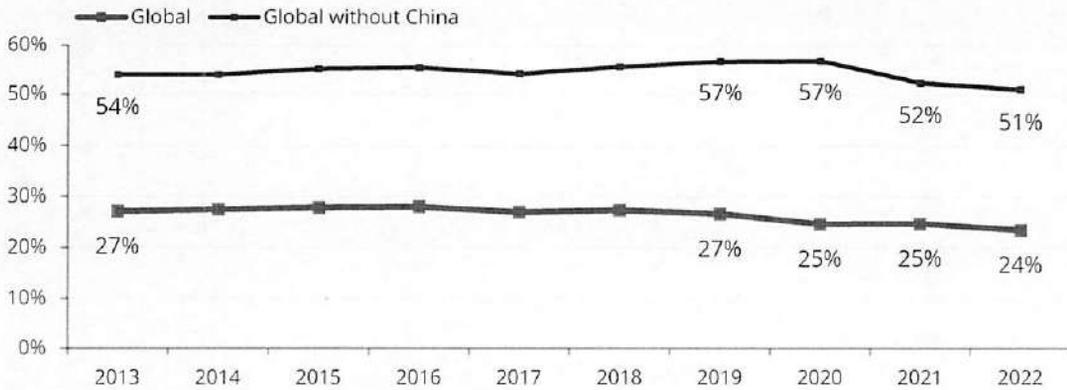
The CO₂ dataset used for this report covers 443.4 million tonnes of steel from all routes, or 22.6% of the global steel production of 1 886 Mt in 2022, based on figures from worldsteel statistics (Figure 2). In comparison, if Chinese steel production is disregarded, coverage increases to 48% of steel production in the rest of the world. Coverage percentage remained largely stable globally when Chinese production growth is not considered. In 2022 a dip in coverage is observed largely due to the non-participation of Russian members that currently hold a passive status in worldsteel (Figure 3).

Figure 2: Global crude steel production, 2013-2022



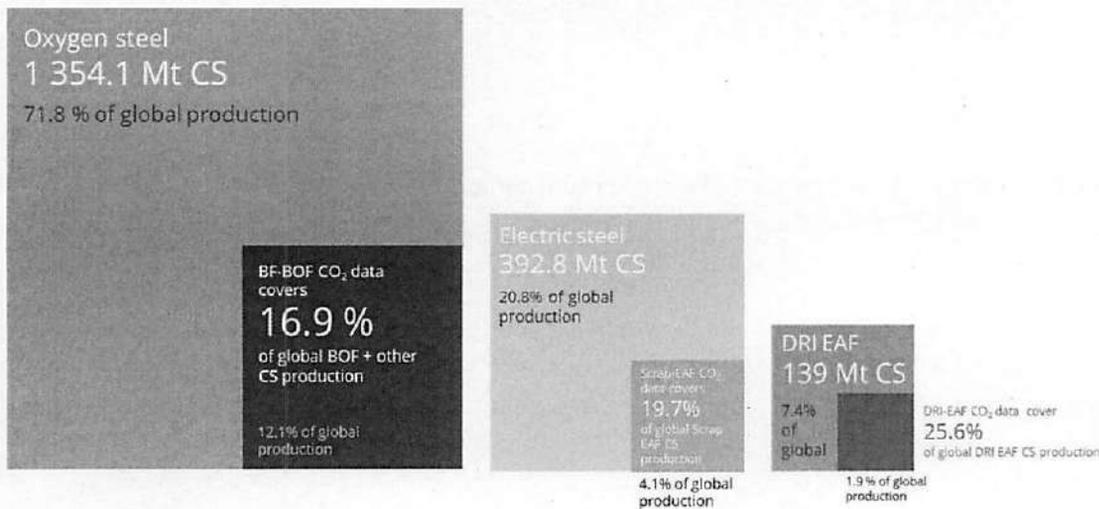
Source: worldsteel statistics

Figure 3: Coverage of global production by the worldsteel CO₂ dataset, all site classes and routes

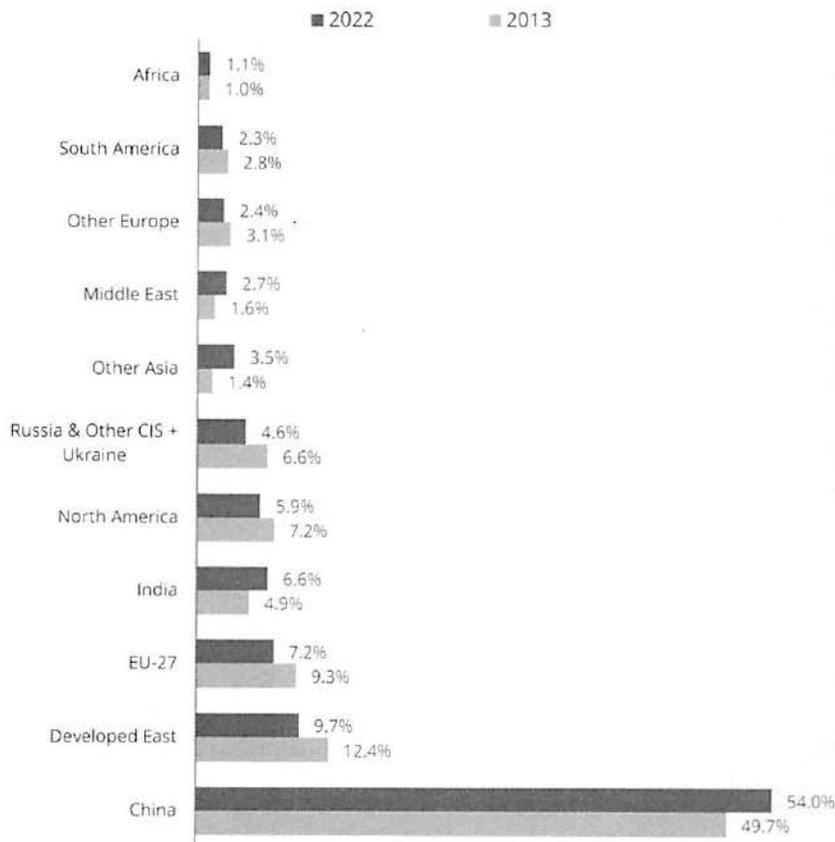


As shown in Figure 1, the global CO₂ indicator in 2022 is calculated using the CO₂ intensity calculated from sites using the three major production routes, BF-BOF, Scrap EAF and DRI EAF. CO₂ data from the BF-BOF sites submitting data covered 228 Mt CS, or 17% of the global production of 1,354 Mt from ore-based and other production routes. For the electric routes, CO₂ data for scrap-EAF sites covered 77 Mt CS and data for DRI-EAF sites covered 35 Mt CS, combined representing 21 % of the 532 Mt produced via the electric steel route globally (Figure 4).

Figure 4: Coverage of 2022 global production by the worldsteel CO₂ data for the three main production routes

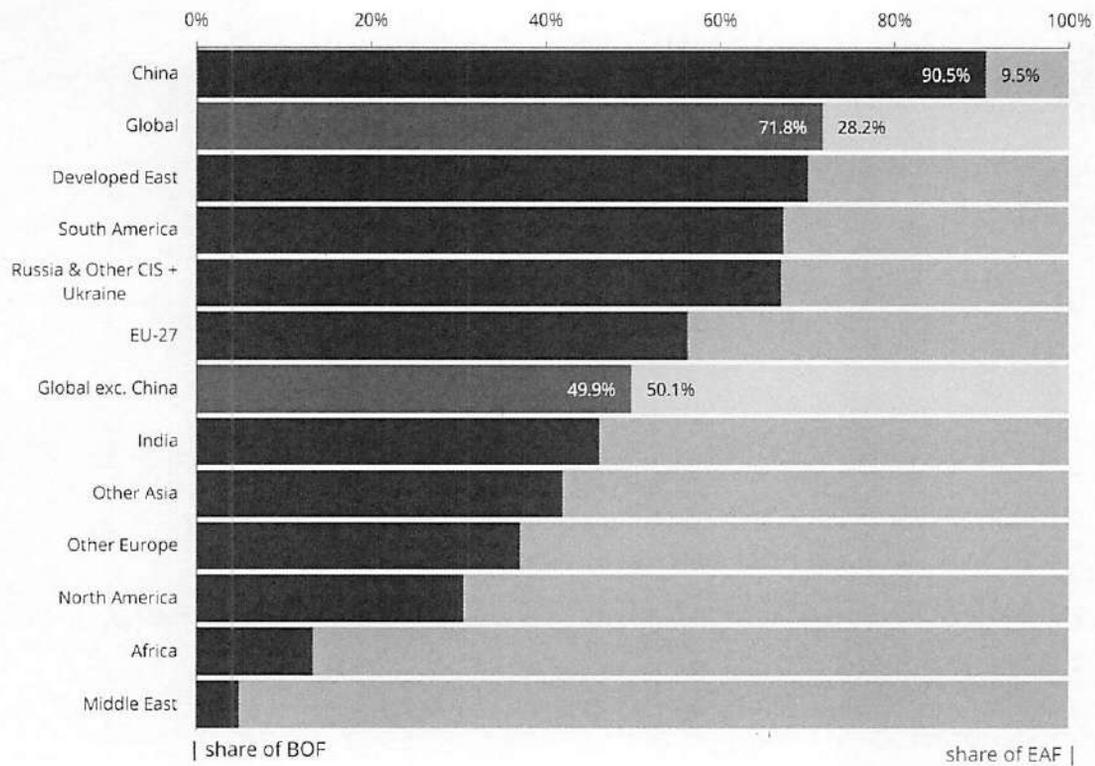


Looking at the change in steel production by region over 2013 – 2022 (Figure 5), production volume in China has increased and remains significantly high in comparison to the rest of the world. The only other regions which have seen slight growth are India, Other Asia, Middle East and Africa.

Figure 5: Change in share of global production by region, 2013 v 2022

Source: worldsteel statistics

This regional configuration explains the share of global production between the oxygen and electric production routes, that impacts the calculation of the worldsteel aggregated global CO₂ intensity for the steel industry (Figure 6).

Figure 6: Global and regional share of production by main operating routes, 2022

Source: worldsteel statistics

Following on from the global and regional overview of steel production by the two main routes, Table 1 and Table 2 summarise the coverage of the steel industry through actual site-level CO₂ data submissions. This report is based on 230 site-level CO₂ data submissions representing the year 2022, verified by worldsteel. This number includes carbon and stainless steel producing sites. These sites were submitted by a total of 59 steel producing companies and 2 contributing steel associations that will have their contribution recognised by worldsteel via the issuance of Climate Action data provider certificates for 2022.

Table 1: Number of CO₂ data providing steel producing sites by process route

Routes	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BF-BOF*	66	62	63	62	62	60	62	58	57	56
Scrap-EAF*	106	100	102	98	94	99	115	109	110	116
DRI-EAF*	18	22	20	15	15	16	18	18	19	20
Others	17	22	21	21	20	23	25	25	24	25
Stainless	2	6	6	14	13	12	13	11	11	13
Total	209	212	212	210	204	210	233	221	221	230

For the Global Indicator, only sites classified as BF-BOF, Scrap-EAF, and DRI-EAF are used. Indicators are not calculated in cases where data from only 2 or fewer sites is available.

Table 2: Number of CO₂ data providing steel producing sites by regional participation

Region	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
EU-27	58	55	55	57	50	51	52	46	45	53
Other Europe	7	7	7	7	8	7	10	10	10	10
Russia & Other CIS + Ukraine*	4	5	5	3	5	7	9	11	8	4
North America	64	62	54	49	44	48	58	49	52	50
South America	20	25	25	25	23	26	31	32	30	29
Africa	7	6	6	5	5	5	5	6	5	7
Middle East	5	5	5	5	5	5	5	5	6	7
Developed East	39	41	42	42	43	41	42	41	41	44
Other Asia	1	1	1	3	7	7	7	7	9	9
China	0	0	0	0	0	0	0	0	0	0
India	4	5	12	14	14	13	14	14	15	17
Total	209	212	212	210	204	210	233	221	221	230

*The reduction of number of participating sites for this region is due to the absence of Russian based sites from members that hold a passive status as members of worldsteel at the time of release of this report.

1.3. Calculated industry CO₂ intensity and iterations

Table 3 shows industry-level global CO₂ intensity, as well as calculated intensity for each of the main routes considered by this report.

CO2 data report 2023

Table 3: CO₂ intensities (tCO₂ /tCS) by process routes

Routes	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BF-BOF*	2.28	2.29	2.32	2.31	2.30	2.27	2.27	2.31	2.33	2.33
Scrap-EAF*	0.68	0.62	0.63	0.66	0.66	0.67	0.67	0.67	0.67	0.68
DRI-EAF*	1.46	1.47	1.52	1.45	1.43	1.49	1.45	1.30	1.40	1.37
Others	2.20	2.28	2.24	2.23	2.27	2.31	2.38	2.37	2.33	2.30
Stainless	<i>na</i>	2.86	2.95	2.95	2.89	2.91	2.83	2.97	2.88	2.91
Global*	1.87	1.85	1.90	1.89	1.85	1.81	1.82	1.88	1.91	1.91
Global* exc. China	1.56	1.54	1.58	1.57	1.54	1.51	1.51	1.52	1.51	1.50

*For the Global Indicator, only sites classified as BF-BOF, Scrap-EAF, and DRI-EAF are used. *na* indicates not enough data is available to calculate a representative figure.

The global indicator is calculated based on the weighted average CO₂ intensity of the three main routes, and the split for 2022 global production volume (ref. worldsteel statistics) of 71.8 % from the integrate iron ore route, which includes BOF and others steel processes, leaving 28.2 % for the EAF route, further split into 20.8 % for the scrap-based route and 7.4 % for the DRI-based route.

$$2.33 \text{ tCO}_2/\text{tCS} \times 71.8 \% + 0.68 \text{ tCO}_2/\text{tCS} \times 20.8 \% + 1.37 \text{ tCO}_2/\text{tCS} \times 7.4 \% = 1.91 \text{ tCO}_2/\text{tCS}.$$

The impact of credits from the sale of co-products and use of local-specific electricity grid factors in indicators is explored in online Analytics panels available to participating members. It is worth underlining that this subset of analyses is only for the analytic purposes of this programme and will not be incorporated in indicators published.

1.4. Default trend and options to decarbonise

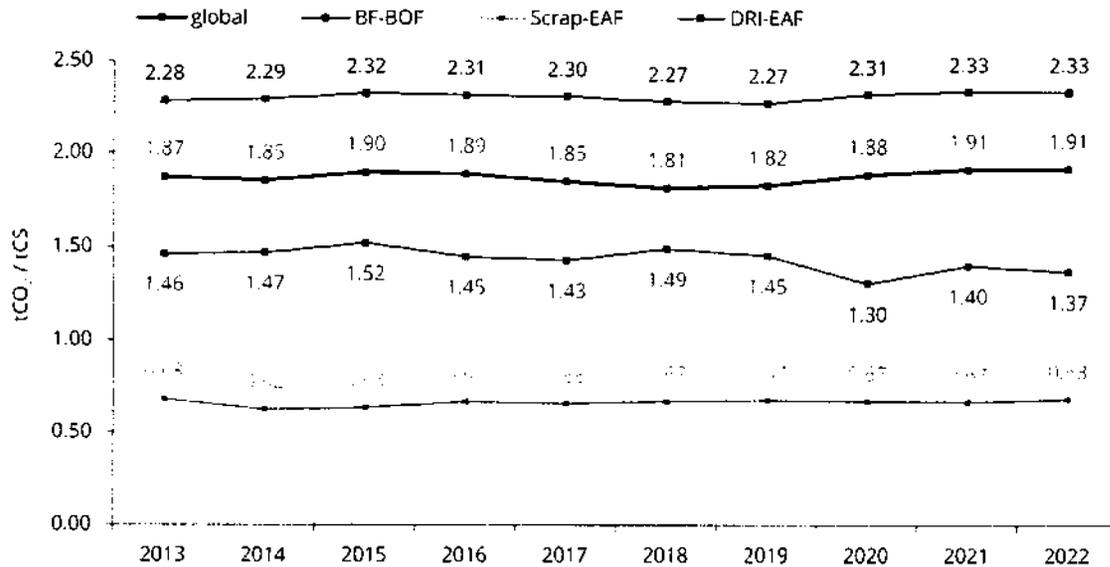
The global CO₂ intensity indicator, as well as the intensity for the main production routes, has varied little over the past 10 years. Although many decarbonisation plans and pilot plants have been installed in this period, they have yet to result in a industry-level significant reduction in CO₂ intensity, as far as it can be identified through this dataset. It is important to keep in mind that variations in the split of global production by routes shown in Table 4 also impact the indicator.

Table 4: Share of global production by main operating routes

Global Statistics	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Share of BF-BOF	74.4%	73.8%	74.8%	74.2%	72.2%	71.1%	72.2%	73.8%	71.9%	71.8%
Share of Scrap EAF	20.2%	20.7%	19.9%	20.4%	21.8%	22.4%	21.2%	20.0%	21.4%	20.8%
Share of DRI EAF	5.4%	5.5%	5.3%	5.4%	6.0%	6.5%	6.6%	6.3%	6.8%	7.4%

Source: worldsteel statistics

Figure 7: CO₂ intensities (tCO₂/tCS) for routes BF-BOF, Scrap-EAF and aggregated Global, with default performance, from 2013 to 2022



This report, representing 2022 data, shows that both the BF-BOF and scrap-EAF routes have not shown significant improvements and remains around the 2.3 tCO₂/tCS and 0.65 tCO₂/tCS level for the last 10 years running, as seen in Figure 7. The DRI-EAF show some variability, although this may be an effect of the smaller sample of sites providing data for this route.

This means that the global average CO₂ intensity is operating at a similar level of performance with little change over the period 2013 – 2022, and that the new low carbon options have not yet made an impact in reducing CO₂ intensities of the industry overall.

As noted in the foreword, the **Step Up** programme allows a steelmaking site to analyse its processes in a holistic way giving clear indication of areas with the potential of improvement and the level it can achieve. This process relies on the best practices adopted by leading sites. Tables presented in sections below highlight operational performance from the better performing sites (top 15%) and the rest being the remaining 85%, and the overall group performance per production route. The crude steel production represented by each of these samples, along with their calculated energy intensity, is also presented as a measure of relevance and representativeness.

Significant improvement potential is available by maximising the scrap ratio, which changes the ratio between ore-based and scrap-based iron units. This will also be the case in Asia (particularly in China) once a higher volume of scrap becomes economically available from post-consumer scrap, likely from 2030 onwards (average first recycle period of steel products is 40 years).

Using the **Step Up** programme the industry can work towards the best current performance for both the main process routes. In doing so, the industry can obtain their full potential within the coming years.

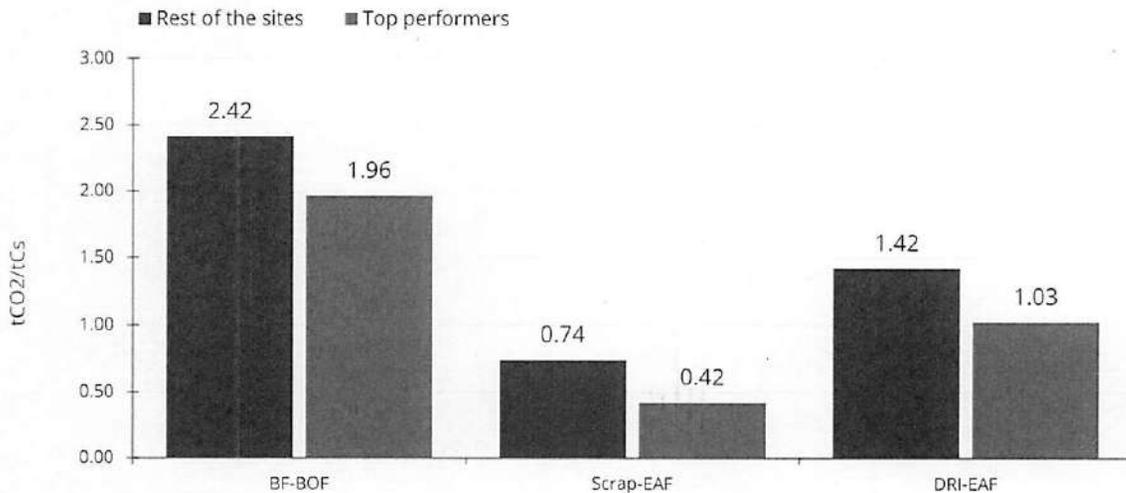
CO₂ data report 2023

Figure 8 outlines the gap in CO₂ intensities between top-performers and the rest of the sites. A quick calculation to follows estimating the potential of CO₂ reduction should the industry perform at levels commensurate with the best performing sites:

Using the split between the two major process routes, this would result in

$$1.96 \text{ tCO}_2/\text{tCS} \times 71.8 \% + 0.42 \text{ tCO}_2/\text{tCS} \times 20.8 \% + 1.03 \text{ tCO}_2/\text{tCS} \times 7.4 \% = 1.57 \text{ tCO}_2/\text{tCS}$$

Figure 8: Improvement potential for steelmaking sites



This is 0.34 tCO₂/tCS below (18%) the current average 2022 level of 1.91 tCO₂/tCS

Operating practices (raw materials selection & use, process reliability, process yield, energy intensity and management decisions) have proven to be most influential on operational performance and consequently on CO₂ emissions. **These reductions also result in savings in opex.**

The raw materials quality purchased or demanded, and the proportion of scrap used in the BOF are significant factors in the emission intensity rate. By adopting leading operating practices and optimising their operations, sites can improve their performance, and this will in turn shift the average performance towards the level of the current top performing companies (using existing technologies on site) for both the BF-BOF and EAF route.

worldsteel members are encouraged to participate in the **Step Up** and **Climate Action** data collection programmes.

The four stage **Step Up** programme focuses on raw materials quality, energy intensity, process reliability and the resulting process yield. Improvements will result in the minimum emissions intensity for any site as well as significant OPEX savings per tonne, typically between 5-20 USD/t crude steel. By using existing technologies as installed on most sites, companies can likely reach levels of performance achieved by better performers adopting the following four recommendations.

1. Use the best quality raw materials economically available.
2. Maximise economically available scrap input in all process routes.

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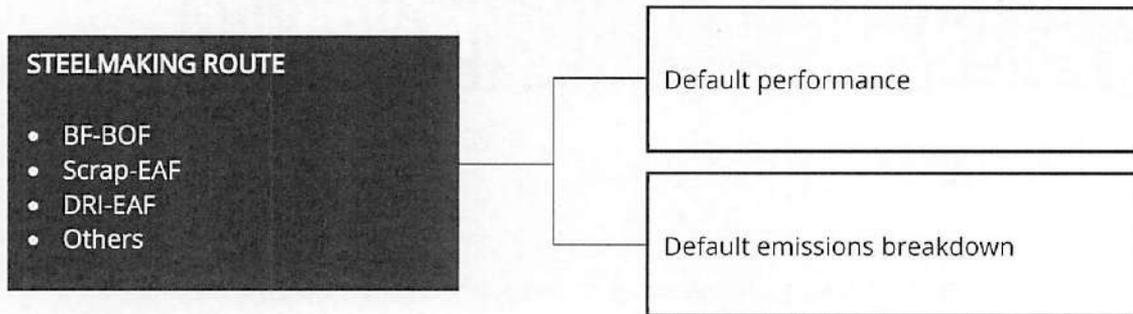
3. Initiate and implement the worldsteel Step Up programme.
4. Invest in low carbon steelmaking technology appropriate for the site location.

Information on how to join and benefit from the Step Up Programme is available at worldsteel Extranet.

2. CO₂ intensity summary for 2022 data by route

The analyses contained in this chapter are organised in a logical way allowing detailed examination of emissions by process route (Figure 9). Interactive panels with more detailed information are available to participating members in the [benchmarking system](#). For an analysis of stainless steel CO₂ emissions results from this data collection programme, please refer to the [world stainless CO₂ report](#).

Figure 9: Schema of analyses based on steelmaking routes



2.1. BF-BOF route

BF-BOF is the major route for the global steel industry. This is especially true in developing countries, as scrap sources are still insufficiently mature or ready to allow for a larger proportion of EAF based recycling.

Steel products become available as end-of-life scrap after an average service life of 40 years. It is possible to extend the useful service life using principles of circular economy for a range of products. This is an active area of research, discussion, and policy around the world.

The BF-BOF route performance by the better sites has nearly reached its limit as far as energy intensity is concerned at around 20 GJ/tCS, and using the traditional carbon reduction agents these sites emit approximately 1.96 tCO₂ / t crude steel without credits for slag or gas sales.

2.1.1. BF-BOF default performance

The default performance shows the process route as reported over previous years and is used as a reference to allow the industry to track its own improvement performance. This group represents 228.3 Mt of production over 56 BF-BOF sites.

As noted earlier, it is possible to flatten the pareto to the level of better performing sites through efficiency improvement such as **Step Up**. Following that, the long-term goal of low-carbon steelmaking would require use of breakthrough technologies.

Table 5 provides the details of the total group performance and the better performing sites below.

Figure 10: 2022 BF-BOF sites ranked by CO₂ intensity, following default performance.

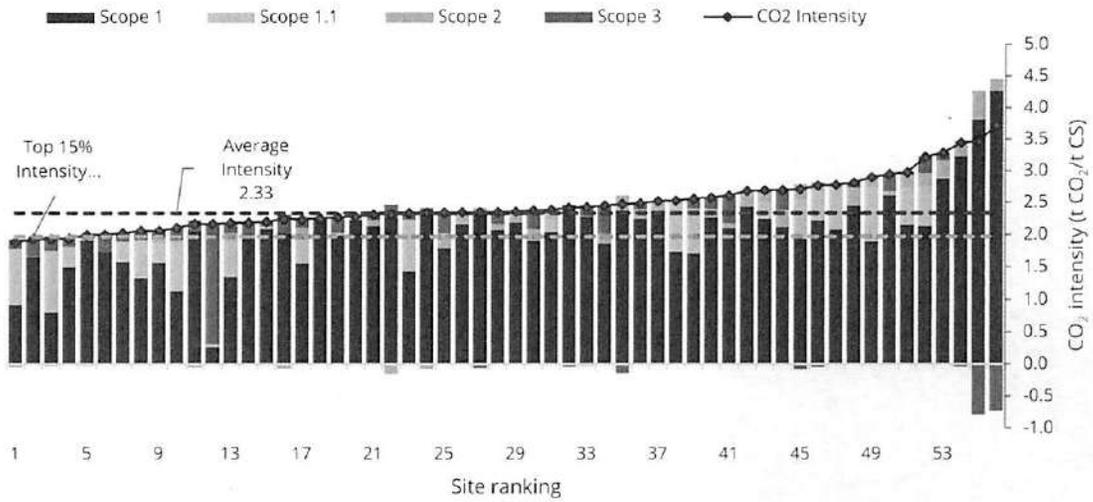


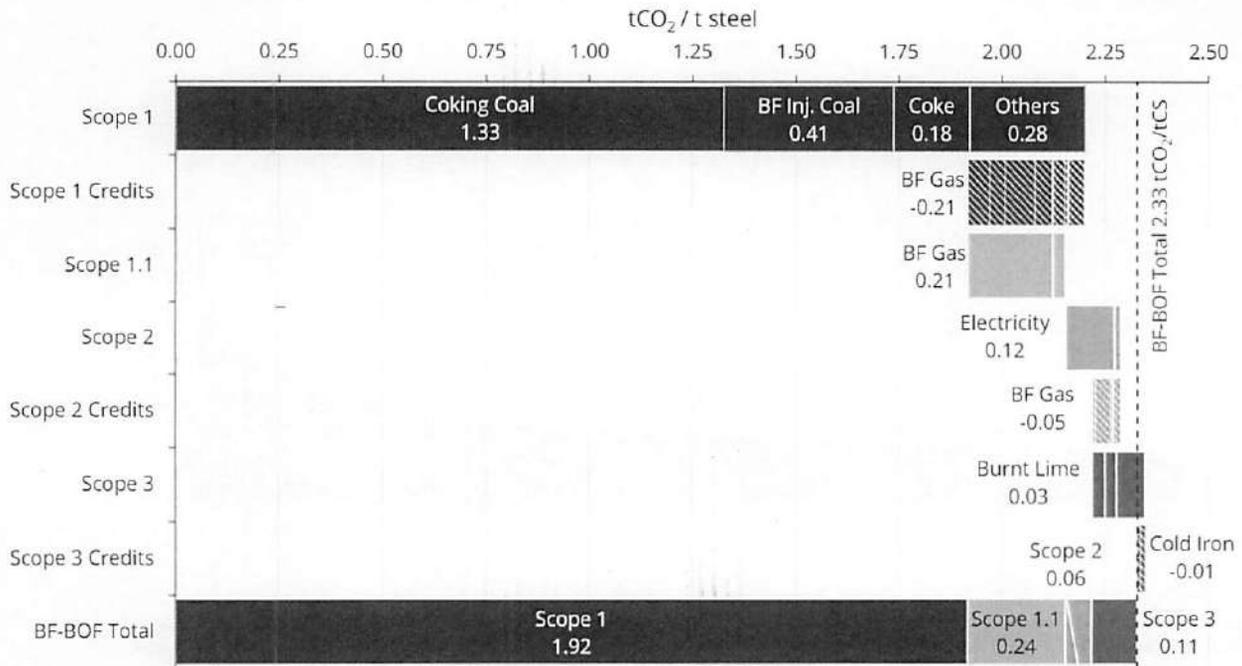
Table 5: Summary of BF-BOF sites CO₂ and energy intensities, following default performance, by samples.

Summary 2022 BF-BOF data	Sample	Production	Total CO ₂ Intensity (tCO ₂ /tCS)			CO ₂ Intensity by Scope (tCO ₂ /tCS)				Energy Intensity (GJ/tCS)
						Scope 1	Scope 1.1	Scope 2	Scope 3	
	# of sites	tCS	Avg	Max	Min	Avg	Avg	Avg	Avg	Avg
Top 5 best performing sites	5	28,771,040	1.93	1.99	1.88	1.32	0.44	0.01	0.16	19.97
Top 15% performers	8	43,892,833	1.96	2.06	1.88	1.39	0.41	0.00	0.16	19.70
Rest of sites 85%	48	184,414,071	2.42	3.71	2.06	2.04	0.20	0.08	0.10	24.99
Total group	56	228,306,904	2.33	3.71	1.88	1.92	0.24	0.06	0.11	23.98

2.1.2. BF-BOF default emissions breakdown by scopes

Using the total group of reporting BF-BOF sites, the average CO₂ emissions intensity can be broken down as shown in Figure 11.

Figure 11: 2021 BF-BOF average CO₂ emission intensity breakdown by scopes



2.2. Scrap-EAF route

Ferrous scrap consisting of almost pure iron units makes this the lowest emitting process in place at present. Scrap is available in various grades and in addition to cleanliness, the most important characteristic is density as it affects productivity. When available, DRI is added as a top up in some cases or supplemented with hot metal if easily accessible.

Dedicated sites tend to use scrap only from nearby region or country as shipping adds a significant cost to scrap, making it prohibitive to use. Availability is one of the major issues depending on the effectiveness of the local recycling industry.

In total 116 sites submitted data in this category with 17 being in the top performing group.

The pareto and table below show the performance with the historical condition and then the credits for slag and CO₂ gas sales and for this group the higher impact of the electricity grid mix. The combination of the two groups will continue to be reported in the future.

2.2.1. Scrap-EAF default performance

Figure 12: 2022 Scrap-EAF sites ranked by CO₂ intensity, following default performance

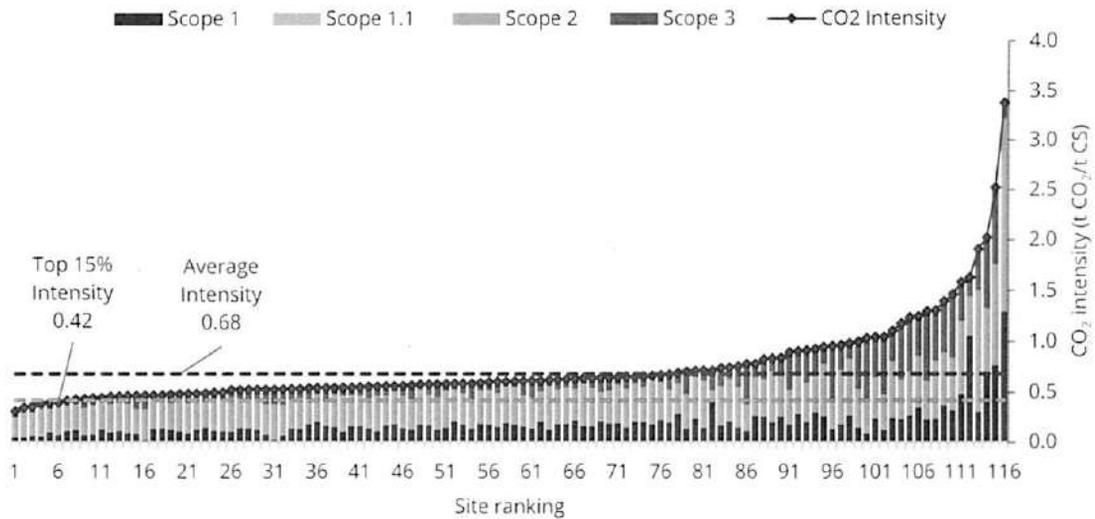


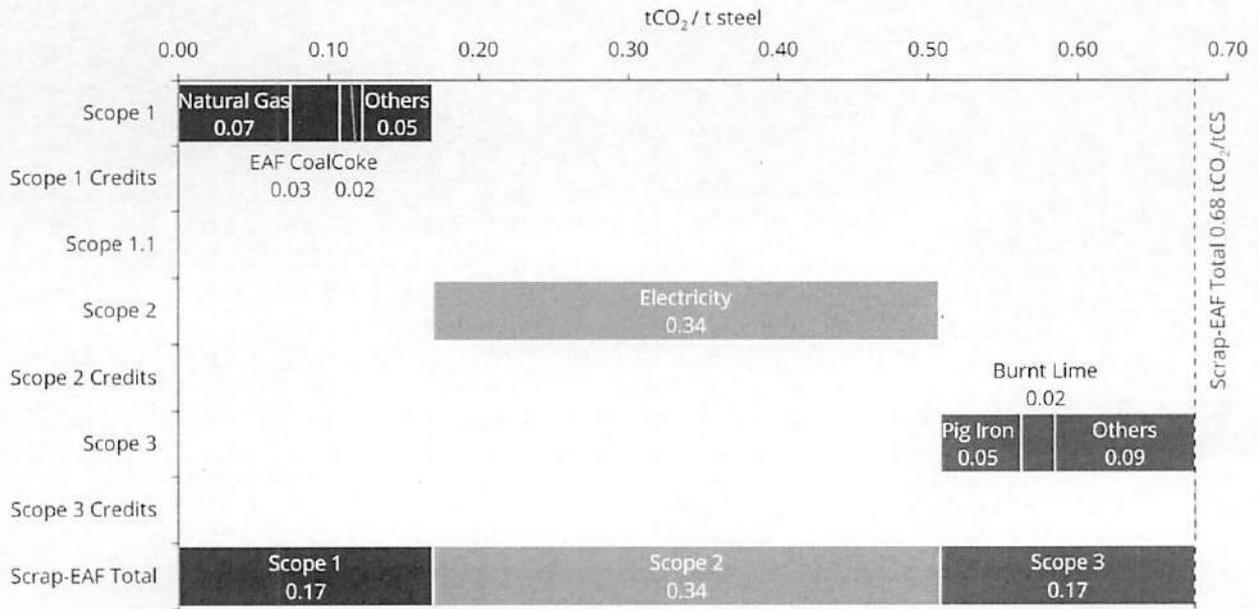
Table 6: Summary of Scrap-EAF sites CO₂ and energy intensities, following default performance, by samples

Summary 2022 Scrap-EAF data	Sample	Production	Total CO ₂ Intensity (tCO ₂ /tCS)			CO ₂ Intensity by Scope (tCO ₂ /tCS)				Energy Intensity (GJ/tCS)
						Scope 1	Scope 1.1	Scope 2	Scope 3	
	# of sites	tCS	Avg	Max	Min	Avg	Avg	Avg	Avg	Avg
Top 5 best performing sites	5	3,347,742	0.34	0.40	0.31	0.06	0.00	0.22	0.06	5.23
Top 15% performers	17	14,483,390	0.42	0.47	0.31	0.08	0.00	0.28	0.07	6.79
Rest of sites 85%	99	62,740,428	0.74	3.38	0.47	0.19	0.00	0.35	0.20	10.98
Total group	116	77,223,818	0.68	3.38	0.31	0.17	0.00	0.34	0.17	10.20

2.2.2. Scrap-EAF default emissions breakdown

Considering the total group of reporting Scrap-EAF sites, the average CO₂ emission intensity can be broken down as shown in Figure 13.

Figure 13: 2022 Scrap-EAF average CO₂ emission intensity breakdown by scopes



2.3. DRI-EAF route

2.3.1. DRI-EAF default performance

Figure 14: 2022 DRI-EAF sites ranked by CO₂ intensity, following default performance.

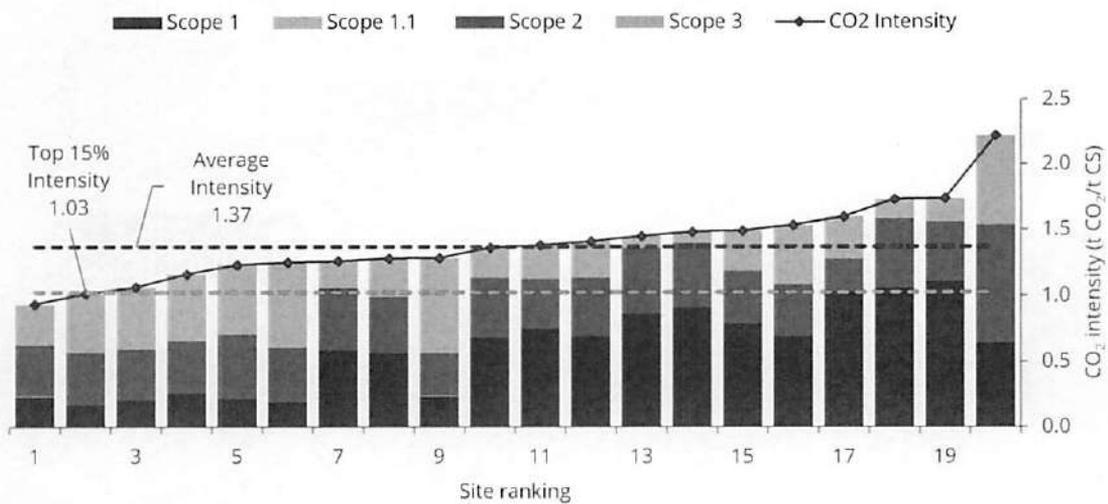


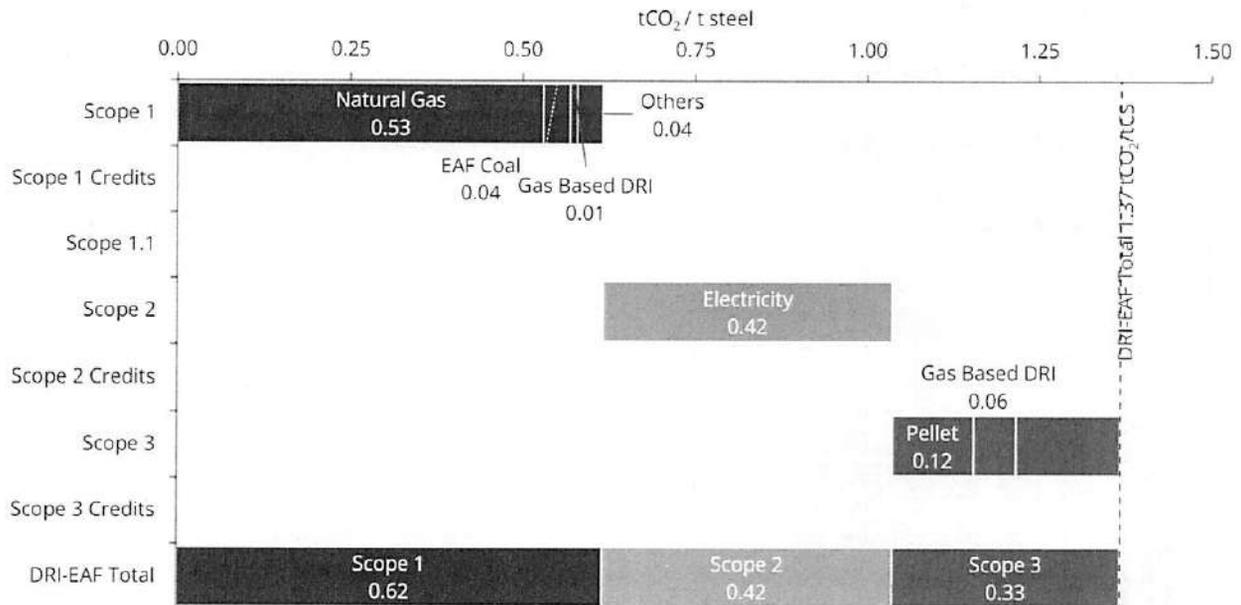
Table 7: Summary of DRI-EAF sites CO₂ and energy intensities, following default performance, by samples.

Summary 2022 DRI-EAF data	Sample	Production	Total CO ₂ Intensity (tCO ₂ /tCS)			CO ₂ Intensity by Scope (tCO ₂ /tCS)				Energy Intensity (GJ/tCS)
						Scope 1	Scope 1.1	Scope 2	Scope 3	
	# of sites	tCS	Avg	Max	Min	Avg	Avg	Avg	Avg	Avg
Top 5 best performing sites	5	6,566,955	1.07	1.23	0.94	0.21	0.00	0.41	0.46	16.80
Top 15% performers	3	4,853,047	1.03	1.07	0.94	0.20	0.00	0.39	0.44	16.09
Rest of sites 85%	17	30,752,020	1.42	2.22	1.16	0.68	0.00	0.43	0.31	23.36
Total group	20	35,605,067	1.37	2.22	0.94	0.62	0.00	0.42	0.33	22.37

2.3.2. DRI-EAF default emissions breakdown

This section contains information on DRI-EAF sites with the average CO₂ emission intensity broken down according to sources.

Figure 15: 2022 DRI-EAF average CO₂ emissions breakdown by scopes



2.4. Others

The Others category is composed of sites that do not fit any of the main categories. It includes sites that may employ a production approach that combines aspects of the main traditional routes, such as operating both Basic Oxygen Furnaces and Electric Arc Furnaces on the same site. It also includes sites that employ production options that are unique to a specific location and cannot be globally applied, such as the extensive use of renewable biomass.

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Due to this, the CO₂ intensity of sites gathered in this category display a significant spread and cross analysis does not offer significant learning options. Ideally, this category can be further broken down in the future into new categories, in case a stable sample of sites with similar production approaches reporting data consistently is formed.

2.4.1. Other sites default performance

Figure 16: 2022 Other processes sites ranked by CO₂ intensity, following default performance.

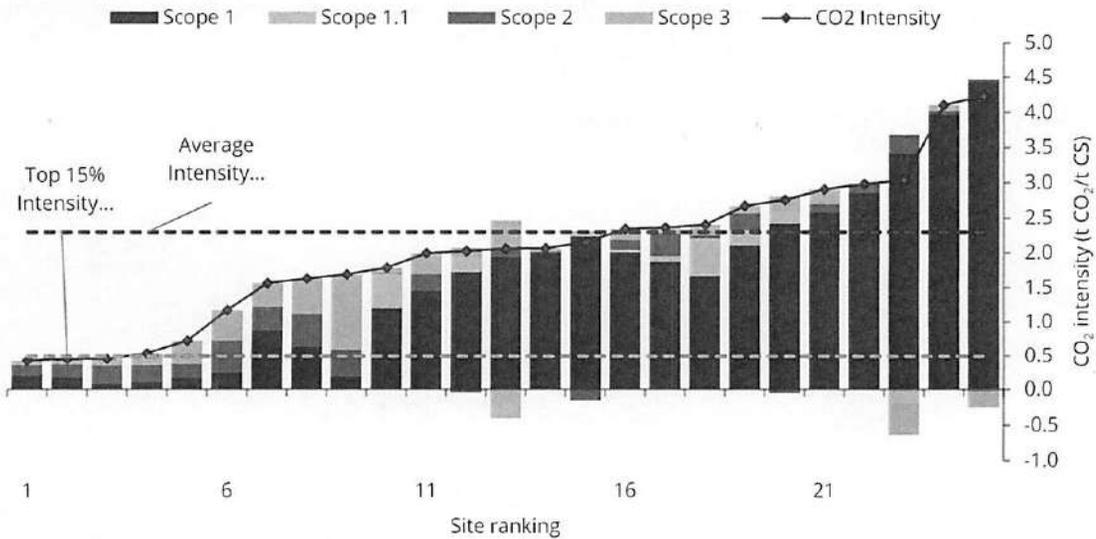


Table 8: Summary of Other sites CO₂ and energy intensities, following default performance, by samples.

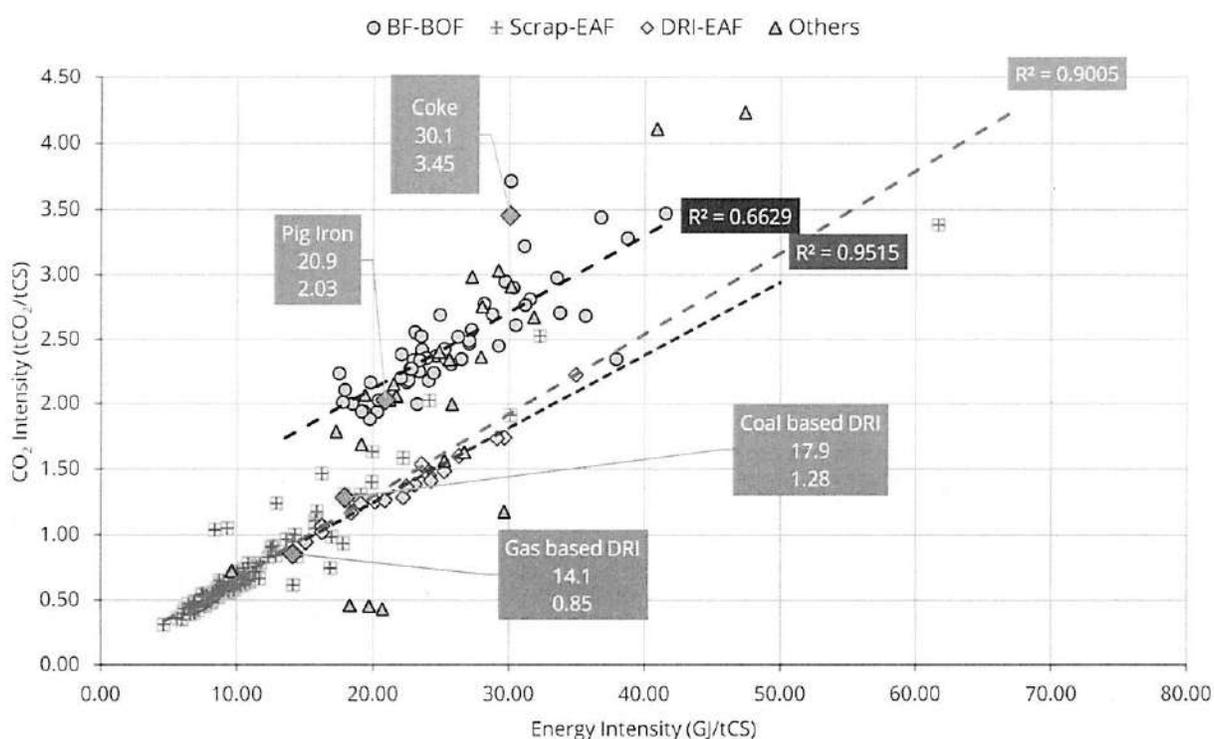
Summary 2022 Others data	Sample	Production tCS	Total CO ₂ Intensity (tCO ₂ /tCS)			CO ₂ Intensity by Scope (tCO ₂ /tCS)				Energy Intensity (GJ/tCS)
						Scope 1	Scope 1.1	Scope 2	Scope 3	
	# of sites		Avg	Max	Min	Avg	Avg	Avg	Avg	Avg
Top 5 best performing sites	5	4,576,173	0.62	0.72	0.43	0.15	0.00	0.23	0.25	12.00
Top 15% performers	4	1,976,752	0.49	0.54	0.43	0.12	0.00	0.24	0.13	15.12
Rest of sites 85%	21	93,243,589	2.34	4.23	0.72	1.98	0.04	0.13	0.19	25.50
Total group	25	95,220,341	2.30	4.23	0.43	1.94	0.04	0.13	0.19	25.29

3. CO₂ emission intensity versus energy intensity

Fossil fuels, the majority of which being coal, have been the primary source of energy at the integrated sites. The steel industry has made strides in reducing the energy intensity over the past decades. However, it has now reached a point where the better performing sites are operating close to the technological ceiling.

Figure 17 serves as a yearly snapshot of CO₂ vs energy intensity. As breakthrough technologies are scaled up and industry emissions decarbonise, the ratio of CO₂ intensity versus energy intensity will change accordingly. This section provides a good measure of tracking developments where the correlation between the CO₂ intensity and the energy intensity changes.

Figure 17: CO₂ intensity versus Energy intensity for 2022 data



4. General report comments

The steel industry has been tracking its CO₂ intensity annually since 2007 with the first report published in 2009. Serving as a base and trend line of CO₂ emissions for the iron and steel industry, the annual reports are a reference material for the reporting members.

The methodology developed by worldsteel has been adopted by the International Organization for Standardization (ISO) as the basis for the ISO standard 14404 part 1, 2, 3, and 4.

As usual, the data used in this report has been approved by the reporting members and verified by worldsteel staff. The weighted average CO₂ intensity (t CO₂ / t crude steel) for the steel industry is based on weighted average of steel production by process route in the Steel Statistical Yearbook and calculated emissions using the worldsteel methodology. Information on emissions from each company or site is reported anonymously and securely. The report is distributed to company Superusers and their chief executive officers (CEOs) or the listed Main Member Representative (MMR). The report is only available to the worldsteel member companies who participated in 2022 in submitting data for the 2021 calendar year operating period.

worldsteel is confident that these annual reports are mature and statistically robust, providing the industry with a reliable assessment of its emission intensity on a site-by-site basis. This report allows participating businesses to establish a plan to reduce CO₂ intensity from their sites and compare these to their country sector and overall targets and work towards the intended reductions as per the Paris Agreement (2015).

5. Acknowledgements

This report is due to the significant efforts of worldsteel staff and members who have provided and analysed this data.

The immediate worldsteel staff and fellows who developed the methodology, process and prepared the annual report are:

- Ikuo Jitsuvara General manager, Technology and Environment NSSMC (2006 – 2009)
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- Henk Reimink worldsteel Director, Industry Excellence (2008 – 2021)
- Felipe Maciel worldsteel (2020 – present)
- Rizwan Janjua worldsteel Head, Technology (2021 - present)

Many thanks to all Superusers who have provided the worldsteel team with feedback on the report format and the reporting advisory group who have ensured the methodology remains robust and have assisted this process and methodology being use the basis for an ISO standard (ISO 14404, Pt. 1,2,3,4) in 2013 - 2019.

This important work will continue annually to be able to identify a reducing trend in CO₂ intensity emissions for the steel industry. This will form part of the worldsteel Safety, Environment and Technology teams supported by the Data Management team at worldsteel and with the dedicated support of the Superusers and users from participating worldsteel member companies.

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सत्यमेव जयते

भारत का राजपत्र

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EXTRAORDINARY

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PART II—Section 3—Sub-section (i)

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इस्पात मंत्रालय

अधिसूचना

नई दिल्ली, 12 दिसम्बर, 2024

सा.का.नि. 763(अ).—भारत के लिए ग्रीन इस्पात वर्गीकरण सामान्य जानकारी हेतु एनद् द्वारा प्रकाशित की जाती है---

1. "ग्रीन स्टील" को इस्पात के ग्रीननेम प्रतिशत के संदर्भ में परिभाषित किया जाएगा, जोकि 2.2 टन कार्बन डाइऑक्साइड प्रति टन तैयार इस्पात (tfs) से कम तीव्रता वाले समकक्ष उत्सर्जन के साथ इस्पात संयंत्र से उत्पादित होता है। इस्पात संयंत्र की उत्सर्जन तीव्रता 2.2 t-CO₂e/tfs सीमा की तुलना में कितनी कम है, के आधार पर इस्पात की ग्रीननेस के प्रतिशत के रूप में व्यक्त किया जाएगा।

एक संयंत्र के अंदर उत्पादित इस्पात की ग्रीननेम को मापने के लिए तकनीकी स्पष्टीकरण परिशिष्ट-1 में दिया गया है।

2. ग्रीननेम के आधार पर, ग्रीन इस्पात का निर्धारण निम्नानुसार किया जाएगा:

फाइव स्टार ग्रीन-रेटेड इस्पात: 1.6 t-CO₂e/tfs से कम उत्सर्जन तीव्रता वाले इस्पात को फाइव स्टार ग्रीन-रेटेड इस्पात के रूप में परिभाषित किया जाएगा। फोर स्टार ग्रीन-रेटेड इस्पात: 1.6 और 2.0 t-CO₂e/tfs के बीच उत्सर्जन तीव्रता वाले इस्पात को फोर स्टार ग्रीन-रेटेड इस्पात के रूप में परिभाषित किया जाएगा।

थ्री स्टार ग्रीन-रेटेड इस्पात: 2.0 और 2.2 t-CO₂e/tfs के बीच उत्सर्जन तीव्रता वाले इस्पात को थ्री स्टार ग्रीन-रेटेड इस्पात के रूप में परिभाषित किया जाएगा।

t-CO₂e/tfs से अधिक उत्सर्जन तीव्रता वाले इस्पात किसी भी ग्रीन निर्धारण के लिए पात्र नहीं होगा।

3. ग्रीन इस्पात की स्टार रेटिंग निर्धारण को परिभाषित करने की सीमा की हर तीन माल में समीक्षा की जाएगी।
4. उत्सर्जन के दायरे में तैयार इस्पात उत्पादन में लेकर स्कोप 1, स्कोप 2 और सीमित स्कोप 3 तक शामिल होंगे। स्कोप 3 उत्सर्जन में समूहन (एग्लोमेरेशन) (मिंटिंग, प्लेट मेकिंग, कोक मेकिंग सहित), बेनिफिशिएशन, और खरीदे गए कच्चे माल तथा मध्यस्थ उत्पादों में सन्निहित उत्सर्जन शामिल होंगे, लेकिन इसमें एक इस्पात संयंत्र के अंदर और बाहर होने वाले अपस्ट्रीम खनन, डाउनस्ट्रीम उत्सर्जन और परिवहन उत्सर्जन शामिल नहीं होंगे।
5. पंजीकृत इस्पात संयंत्र के इस्पात की ग्रीन स्टार-रेटिंग खंड-3 में यथा वर्णित सीमित स्कोप-3 के साथ तैयार इस्पात उत्पादन चरण तक किए गए उत्सर्जन पर आधारित होगी।
6. नेशनल इस्टीमेट ऑफ मेकेडरी स्टील टेक्नोलॉजी (एनआईएसएमटी) माप, रिपोर्टिंग और मत्यापन (एमआरवी) के साथ-साथ इस्पात के लिए ग्रीननेम सर्टिफिकेट और स्टार रेटिंग जारी करने के लिए नोडल एजेंसी के रूप में काम करेगा।
7. ग्रीन-रेटेड इस्पात का प्रमाण पत्र में संयंत्र का नाम, तैयार इस्पात स्तर पर सन्निहित उत्सर्जन, तैयार इस्पात स्तर पर ग्रीननेम प्रतिशत, इस्पात की स्टार रेटिंग और मात्रा निर्दिष्ट होगी।
8. दिनांक 28 जून, 2023 को अधिमूचित कार्बन क्रेडिट व्यापार योजना (सीसीटीएम) के तहत, जुलाई, 2024 में 'सीसीटीएम के अधीन अनुपालन नंत्र हेतु विस्तृत प्रक्रिया' (प्रमाणन की तारीख तक संशोधित) दस्तावेज में ऊर्जा दक्षता ब्यूरो (वीईई) द्वारा प्रकाशित उत्सर्जन एमआरवी की पद्धति लागू होगी।
9. इस्पात संयंत्र अपने उत्पादों के लिए ग्रीननेम प्रमाणपत्र और स्टार रेटिंग प्राप्त करने के लिए एनआईएसएमटी के साथ पंजीकरण कर सकते हैं।
10. रजिस्ट्री के लिए, एनआईएसएमटी द्वारा प्रति इस्पात संयंत्र 10,000 रुपये की एकमुश्त राशि ली जाएगी।
11. प्रमाणन के लिए, प्रमाणित प्रत्येक 500 टन तैयार इस्पात के लिए 1,000 रुपये की राशि का शुल्क लिया जाएगा।
12. प्रमाणपत्र वार्षिक आधार (वित्तीय वर्ष) पर जारी किया जाएगा। यदि इस्पात संयंत्र अधिक बार एमआरवी का विकल्प चुनते हैं, तो आवश्यकता के अनुसार वर्ष में एक से अधिक बार प्रमाणपत्र जारी किया जा सकता है।
13. एनआईएसएमटी द्वारा ग्रीन-रेटेड इस्पात की रजिस्ट्री का रख-रखाव किया जाएगा।

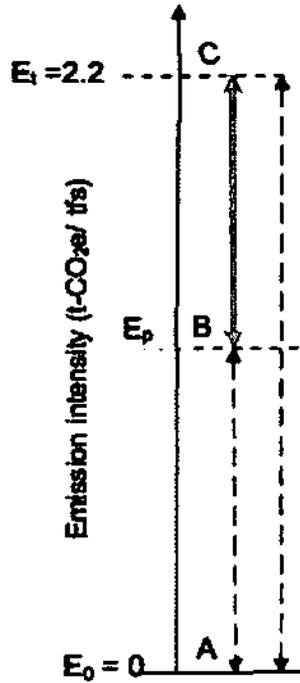
[फा. सं. 1(6)-2024-ID-2]

बिनोद कुमार त्रिपाठी, मंयुक्त सचिव

परिशिष्ट -I

ग्रीन इस्पात बर्गीकरण का तकनीकी स्पष्टीकरण:

विचार कीजिए कि इस्पात की सीओ₂ समतुल्य उत्सर्जन तीव्रता को वार्ड-अक्ष पर दर्शाया गया है। चित्र-1 में दर्शाये गए अक्ष पर सबसे निचला बिंदु (बिंदु A), शुद्ध-शून्य उत्सर्जन इस्पात (E₀ = 0) को दर्शाता है। संयंत्र की वास्तविक उत्सर्जन तीव्रता (E_p) को बिंदु B पर दर्शाया जाना है, बिंदु C इस्पात की ग्रीननेम को परिभाषित करने के लिए विचार किए गए उत्सर्जन तीव्रता सीमा (E_i) का दर्शाता है। उत्सर्जन तीव्रता सीमा 2.2 CO_{2e}/tfs का एक निश्चित मान है।



चित्र 1

उत्सर्जन तीव्रता सीमा (E_t) से कम उत्सर्जन तीव्रता (E_p) वाला एक इस्पात संयंत्र ग्रीननेस प्रमाणीकरण के लिए निम्नानुसार होगा।

1. यदि $E_p = E_0$, तो संयंत्र को 100% हरित इस्पात का उत्पादन करने वाला माना जा सकता है।
2. यदि $E_p > E_t$ है, तो संयंत्र किसी भी ग्रीननेस वाले इस्पात का उत्पादन नहीं कर रहा है।
3. हालांकि, यदि $E_0 < E_p < E_t$, तो संयंत्र की ग्रीननेस प्रतिशत (G%) को निम्नानुसार परिभाषित किया जा सकता है:

$$G\% = \frac{|BC|}{|AC|} \times 100 = \frac{|AC - AB|}{|AC|} \times 100 = \frac{(E_t - E_p)}{E_t} \times 100 = \left(1 - \frac{E_p}{E_t}\right) \times 100$$

$$\text{or, } G\% = \left(1 - \frac{E_p}{2.2}\right) \times 100$$

उदाहरण के तौर पर, ग्रीन इस्पात की परिभाषा को 2.0 t-CO₂e/tfs की सीओ₂ समकक्ष उत्सर्जन तीव्रता (E_p) वाले इस्पात संयंत्र पर विचार करके समझाया जा सकता है। ऊपर बताई गई पद्धति के आधार पर संयंत्र द्वारा उत्पादित कुल इस्पात का ग्रीननेस प्रतिशत (G%) 9.1% होगा। इसलिए परिभाषा के अनुसार उक्त संयंत्र द्वारा उत्पादित इस्पात 9.1% ग्रीन होगा।

MINISTRY OF STEEL

NOTIFICATION

New Delhi, the 12th December, 2024

G.S.R 763(E).—The Taxonomy for Green Steel for India is hereby published for general information---

1. "Green Steel" shall be defined in terms of percentage greenness of the steel which is produced from the steel plant with CO₂ equivalent emission intensity less than 2.2 tonnes of CO₂ e per tonne of finished steel (tfs). The greenness of the steel shall be expressed as a percentage, based on how much the steel plant's emission intensity is lower compared to the 2.2 t-CO₂e/tfs threshold.

The technical explanation for measuring greenness of the steel produced within a plant is provided in Appendix I.

2. Based on the greenness, the steel shall be rated as follows:

Five-star green-rated steel: Steel with emission intensity lower than 1.6 t-CO₂e/tfs shall be defined as five-star green-rated steel.

Four-star green-rated steel: Steel with emission intensity between 1.6 and 2.0 t-CO₂e/tfs shall be defined as four-star green-rated steel.

Three-star green-rated steel: Steel with emission intensity between 2.0 and 2.2 t-CO₂e/tfs shall be defined as three-star green-rated steel.

Steel with emission intensity higher than 2.2 t-CO₂e/tfs shall not be eligible for green rating.

3. The threshold limit for defining star rating of Green Steel shall be reviewed every three years.

4. The scope of emissions shall include Scope 1, Scope 2, and limited Scope 3, up to finished steel production. Scope 3 emissions shall include agglomeration (including sintering, pellet making, coke making), beneficiation, and embodied emissions in purchased raw materials and intermediary products, but shall not include upstream mining, downstream emissions and transportation emissions, both within and outside the gates of a steel plant.

5. Green star-rating of the steel of the registered steel plant shall be based on emissions incurred till finished steel production stage with the limited scope-3 as described in Clause-3.

6. The National Institute of Secondary Steel Technology (NISST) shall serve as the nodal agency for measurement, reporting, and verification (MRV) as well as for issuing greenness certificates and star ratings for steel.

7. The certificate of green-rated steel shall specify plant name, embodied emissions at finished steel level, greenness percentage at finished steel level, star rating of the steel and the quantity.

8. The methodology for emissions MRV, as published by Bureau of Energy Efficiency (BEE) in the document 'Detailed Procedure for Compliance Mechanism under CCTS' in July 2024 (as amended up to date of certification), under Carbon Credit Trading Scheme (CCTS), as notified on 28 June 2023, shall be applicable.

9. Steel plants may register with NISST to obtain greenness certificates and star rating for their products.

10. For registry, a one-time amount of Rs. 10,000 shall be charged per Steel Plant by the NISST.

11. For certification, an amount of Rs. 1,000 shall be charged for every 500 tonnes of Finished Steel certified.

12. The certificate shall be issued on yearly basis (financial year). In case the steel plants opt for MRV more frequently, then the certificate may be issued more than once in a year as per the requirement.

13. A registry of green-rated steel shall be maintained by NISST.

[F. No. 1(6)-2024-ID-2]

VINOD KUMAR TRIPATHI, Jt. Secy.

Appendix I

Technical explanation of Green Steel Taxonomy:

Consider that the CO₂ equivalent emission intensity of steel is represented on the y-axis. The lowest end on the axis (point A), indicated in Figure 1, represents net-zero emissions steel ($E_n = 0$). The actual emission intensity of the plant (E_p) is represented at point B. Point C represents the emission intensity threshold (E_t) considered for defining greenness of steel. The emission intensity threshold is a fixed value of 2.2 t-CO₂e/tfs.

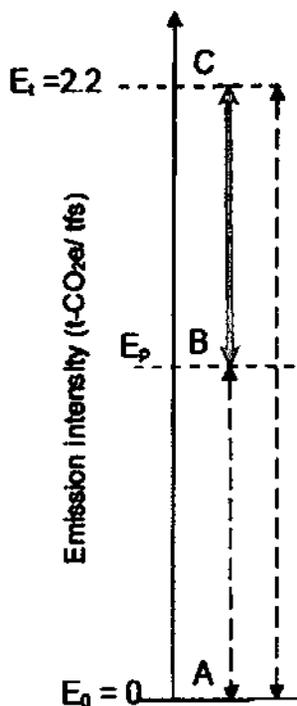


Figure 1

A steel plant with emission intensity (E_p) lower than the threshold emission intensity (E_t) shall be eligible for a greenness certification as explained below.

- 1). If $E_p = E_t$, then the plant can be considered to be producing 100% green steel.
- 2). If $E_p > E_t$, the plant is not producing steel with any greenness.
- 3). However, if $E_t < E_p < E_t$, then the greenness percentage (G%) of plant can be defined as:

$$G\% = \frac{|BC|}{|AC|} \times 100 = \frac{|AC - AB|}{|AC|} \times 100 = \frac{(E_t - E_p)}{E_t} \times 100 = \left(1 - \frac{E_p}{E_t}\right) \times 100$$

$$\text{or, } G\% = \left(1 - \frac{E_p}{2.2}\right) \times 100$$

As an example, the green steel definition can be explained considering a steel plant having a CO₂ equivalent emission intensity (E_p) of 2.0 t-CO₂e/tfs. The greenness percentage (%G) of the total steel produced by the plant will be 9.1% based on the methodology indicated above. Therefore, as per the definition, the steel produced by the said plant will be 9.1% green.

ANNEXURE-A/22

Ministry of Environment, Forest and Climate Change



Net zero emissions target

Posted On: 03 AUG 2023 5:04PM by PIB Delhi

India is an emerging economy where Greenhouse Gas emissions are set to increase, albeit from a low base, in pursuit of its development and poverty eradication goals. It is to be noted that India's historical cumulative emissions from 1850 to 2019 amount to less than 4 percent of cumulative carbon dioxide emissions of the world from the pre-industrial era, despite being home to 17 per cent of the world's population. Hence, India's responsibility for global warming thus far has been minimal and even today its annual per capita emissions are only about one-third of the global average.

India, at the 26th session of the United Nations Framework Convention on Climate Change (COP 26) in November, 2021, announced its target to achieve net zero by 2070. In recognition of the Para 19 of Article 4 of the Paris Agreement, India's long-term low-carbon development strategy, has been submitted to the United Nations Framework Convention on Climate Change, and it reaffirms the goal of reaching net-zero by 2070. India's long-term low-carbon development strategy is based on the principles of equity and climate justice and the principle of Common but Differentiated Responsibilities and Respective Capabilities.

India's long-term low-carbon development strategy rests on seven key transitions to low-carbon development pathways. These include i) low-carbon development of electricity systems consistent with development, ii) develop an integrated, efficient and inclusive transport system, iii) promote adaptation in urban design, energy and material efficiency in buildings, and sustainable urbanisation, iv) promoting economy-wide decoupling of growth from emissions and development of an efficient, innovative low emission industrial system, v) development of carbon dioxide removal and related engineering solutions, vi) enhancing forest and vegetation cover consistent with socioeconomic and ecological considerations and vii) economic and financial needs of low-carbon development. With respect to each of

these transitions, India's low-carbon development strategy document has elaborated the international and national context as relevant, the current policies and programmes already being implemented as well as the key elements for each transition, potential benefits and challenges.

There are several indices which rank countries on their performance to combat the challenge of climate change. However, there are many differences and disagreements with respect to the methodology, the conceptual framework as well as outcome of these indices both for India and the World.

Government has taken several actions to address the rapidly growing environmental problems in the country. Some of the noteworthy actions are listed below:

- The Ministry of Environment, Forest and Climate Change (MoEF&CC) has launched the National Clean Air Programme (NCAP) in January, 2019 with an aim to improve air quality in 131 cities (non-attainment cities and Million Plus Cities) in 24 States/UTs by engaging all stakeholders. The programme envisages to achieve reductions up to 40% or achievement of National Ambient Air Quality Standards for Particulate Matter₁₀ (PM₁₀) concentrations by 2025-26. 95 cities showed improvement in PM concentration in FY 2021-22 in reference to 2017-18 & 20 cities are within the National Ambient Air Quality Standards (NAAQS) in FY 2021-22. To monitor air quality, till now 1,366 Monitoring Stations (910 Manual stations in 389 cities, 28 states & 7 UTs and 456 CAAQMS in 227 cities, 27 states & 4 UTs) have been installed.
- PRANA a portal for monitoring implementation of NCAP has been launched. Under Swachh Vayu Survekshan (SVS) 2022, which is the evaluation of self-assessment report of NCAP cities, top 9 best performing cities have been awarded.
- The Commission for Air Quality Management in NCR and Adjoining Area (CAQM) has come out with a policy to curb air pollution in NCR, along with a standard list of approved fuels for NCR for industrial and other applications.
- Levels of PM_{2.5} and PM₁₀ in Delhi had registered a dip of almost 30% since 2016 while the number of clean air days had increased by almost 50% during the same period.
- Country has leapfrogged from BS-IV to BS-VI norms for fuel and vehicles from 1st April, 2020.
- Sustainable Alternative Towards Affordable Transportation (SATAT) has been launched as an initiative to set up Compressed Bio-Gas (CBG) production plant and make CBG available in the market for use in automotive fuels.
- Installation of Vapour Recovery System (VRS) in new and existing petrol pumps selling gasoline >100kl per month in million plus cities and those selling >300kl per month in cities with population between 1 lakh to 1 million. Subsidy on E-vehicles under Faster Adoption and manufacture of (Hybrid &) Electric Vehicles in India.
- For conservation of rivers, Ministry of Jal Shakti supplements efforts of the States/UTs by providing financial and technical assistance for abatement of pollution in identified stretches of rivers in the country through the Central Sector Scheme of Namami Gange for rivers in Ganga basin and the Centrally Sponsored Scheme of National River Conservation Plan (NRCP) for other rivers.

- India added ten wetlands to the List of Wetlands of International Importance (also called Ramsar Sites) within the framework of the Ramsar Convention, taking the total number of Ramsar Sites in India to incredible 75, the highest in Asia by August 2022.
- The government has taken a defining step to eliminate single use plastics. A ban has been imposed on identified single use plastic items from 1st July 2022.
- Desertification and Land Degradation Atlas of India, published by Space Applications Centre (SAC) Indian Space Research Organisation, Ahmedabad, provides the extent of land degradation and desertification in India, states that the land degradation and desertification in the country has been estimated to be 97.84 million hectares in 2018-19. It provides state-wise area of degraded land which is helpful in planning and implementation of schemes aimed at restoration of land by providing important data and technical inputs.
- Ministry has initiated the work of Circular Economy. 11 Committees constituted for development of circular economy (CE) action plans for different categories of wastes have finalized CE Action Plans for 10 waste categories. EPR rules have been notified for 4 categories of waste a) Plastic waste, b) Waste tyre, c) Batteries, and E-Waste.

In consonance with National Forest Policy (NFP), 1988 which envisages the national goal to have a minimum of one-third of the total land area under forest or tree cover and two-third of the area under such cover in the hill and mountainous regions of the country, various afforestation related schemes implemented by Ministry of Environment, Forest and Climate Change (MoEFCC) and other ministries aim at promoting tree plantations. MoEFCC supports the States/Union Territories for carrying out various afforestation/tree plantation activities under Centrally Sponsored Schemes like National Mission for a Green India (GIM), Nagar van Yojana, compensatory afforestation under Compensatory Afforestation Fund Management and Planning Authority (CAMPA) etc. State/UTs also implement various schemes promoting tree plantation activities under State/UT Plan, MGNREGA etc.

Further, the Trees Outside Forests in India (TOFI) program has been launched by the MoEFCC, Government of India and the U.S. Agency for International Development (USAID) for implementation in seven states including Andhra Pradesh, Assam, Haryana, Odisha, Rajasthan, Tamil Nadu, and Uttar Pradesh with an outlay of \$ 25 million for a period of five years. The purpose of this program is to expand the planting of trees outside of forests (TOF) for enhanced provision of ecosystem services, especially carbon sequestration, and increased inclusive livelihoods and economic opportunities for the rural population.

This information was given by Union Minister of State for Environment, Forest and Climate Change Shri Ashwini Kumar Choubey in a written reply in the Rajya Sabha today.

MJPS/NSK

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EUROPEAN COMMISSION

DIRECTORATE-GENERAL
TAXATION AND CUSTOMS UNION
Indirect Taxation and Tax Administration
CBAM, Energy and Green Taxation

Brussels, 22 December 2023

**DEFAULT VALUES FOR THE TRANSITIONAL PERIOD OF THE
CBAM BETWEEN 1 OCTOBER 2023 AND 31 DECEMBER 2025**

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1 INTRODUCTION

The Carbon Border Adjustment Mechanism (CBAM) is an environmental policy instrument designed to support the EU climate ambitions of achieving a net reduction of greenhouse gas (GHG) emissions of at least 55% by 2030 and of reaching climate neutrality by 2050 at the latest. The CBAM will apply the same carbon price to imported goods as would be paid by installations operating in the European Union (EU). In doing so, the CBAM reduces the risk of the EU's climate objectives being undermined by production relocating to countries with less ambitious decarbonisation policies (so-called 'carbon leakage') and introduces a strong signal to producers in third countries to decarbonise.

The CBAM does not target countries, but the embedded greenhouse gas emissions of goods imported into the EU for a number of specific sectors that are within the scope of the EU Emissions Trading System (EU ETS) and that are at high risk of carbon leakage. These are: iron and steel, cement, fertilisers, aluminium, hydrogen and electricity. It also includes some precursors and some downstream products of the aforementioned sectors (hereinafter referred to as "CBAM goods").

CBAM will be introduced gradually. The transitional period from 1 October 2023 to 31 December 2025 is important to allow for a careful, predictable and proportionate transition for EU and non-EU businesses, as well as for public authorities. During this period, importers of CBAM goods will only have to report greenhouse gas emissions (GHG) embedded in their imports emissions embedded in their imported goods (direct and indirect emissions), without paying any financial payments or adjustments.¹ The monitoring and reporting rules for the transitional CBAM period are laid out in Implementing Regulation (EU) 2023/1773.² Verification of those emissions by an external third party will be purely voluntary.

The Implementing Regulation on reporting requirements and methodology provides for flexibility when it comes to the values used to calculate embedded emissions on imports during the transitional phase.

Until the end of 2024, companies will have the choice of reporting in three ways:

- (a) full reporting according to the new methodology (EU method);
- (b) reporting based on an equivalent method (three options) and
- (c) reporting based on default reference values (only until July 2024, i.e for Q4 of 2023 and Q1&Q2 of 2024)

⁽¹⁾ Regulation (EU) 2023/956 of the European Parliament and of the Council of 10 May 2023 establishing a carbon border adjustment mechanism. OJ L 130, 16.5.2023, p. 52–104. Available from: <http://data.europa.eu/eli/reg/2023/956/oj>.

⁽²⁾ Commission Implementing Regulation (EU) 2023/1773 of 17 August 2023 laying down the rules for the application of Regulation (EU) 2023/956 of the European Parliament and of the Council as regards reporting obligations for the purposes of the carbon border adjustment mechanism during the transitional period. OJ L228, 15.9.2023, p. 94–195. Available from: <https://eur-lex.europa.eu/eli/reg/2023/1773/oj>.

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As of 1 January 2025, the implementing regulation provides that only the EU method will be accepted. The Commission will assess this in view of the experience during the first 4 reporting periods.

In order to help declarants with their reporting obligations, additional simplifications or facilities have been integrated (or will be integrated soon) in the online dedicated reporting tool, the CBAM transitional registry. Some of them are the following:

- Option for recording emission data of a specific good to be reused in subsequent reports (feasible from the second quarterly report in April 2024)
- Option for reconducting the previous report updating the imported quantities
- Option for reporting data based on an XML file to allow reporting declarants automatise their own process to reuse previous reports data whenever appropriate
- Clarification that for operators, the default reporting period is twelve months to allow them to collect representative data that reflects an installation's annual operations. The twelve-month reporting period may be either a calendar year or alternatively a fiscal year. However, operators may also choose an alternative reporting period, of a least three months, if the installation participates in an eligible MRV system and the reporting period coincides with the requirements of that MRV system.

Access to the CBAM transitional registry should be requested through the National Competent Authority (NCA) of the Member State in which the importer is established.

Default values play a specific role in CBAM implementation during the transitional period as presented in the next sections:

- Section 2 of this document outlines the use of default values for CBAM goods other than electricity
- Section 3 of this document outlines the use of default values for determining indirect emissions embedded in CBAM goods other than electricity
- Section 4 of this document outlines the use of default values for electricity as CBAM good

The European Commission has also issued two written guidance documents to help importers and installation operators outside the EU to navigate the transitional period (1 October 2023 – 31 December 2025) with the reporting obligations. These guidance documents are updated regularly.

2 DEFAULT VALUES FOR CBAM GOODS OTHER THAN ELECTRICITY IN THE TRANSITIONAL CBAM PERIOD

2.1 General

Whilst the general approach for imported CBAM goods other than electricity is that declarants will have to report based on actual embedded emissions according to the monitoring methodology that is laid out in Implementing Regulation (EU) 2023/1773 (with the flexibilities mentioned above), Default values do play a specific role in CBAM implementation during the transitional period in particular if importers do not have all the necessary information:

- i. During the three first quarterly reports (Q4 of 2023 and Q1&2 of 2024), declarants may report embedded emission based on default values made available and published by the European Commission without quantitative limit
- ii. From Q3 of 2024 and until the end of 2025, declarants can still report emissions based on estimations but only for complex goods and with a limit of 20% of the total embedded emissions. Using default values would qualify as ‘estimation’.

This section of the document provides the default values for CBAM goods other than electricity that may be used for reporting embedded emissions during the transitional CBAM period until 31 December 2025, under the conditions listed above. Declarants should use them when they do not have or are not able to report actual emissions. These default values will be regularly revised, from the first reporting quarter, to take into account the data collected in that first reporting period as well as feedback from both the EU industry and from non-EU producers of CBAM goods.

The values in this section represent a ‘world’ average, weighted by production volumes. They are based on estimations on embedded emissions in CBAM goods (i.e. iron and steel, cement, fertilisers and aluminium) as carried out by the Commission’s Joint Research Centre (JRC). The emission intensities were estimated for different countries through a transparent methodology on the basis of publicly available data. The JRC study³ focused on the EU’s main trading partners, covering around 15 to 20 countries for each sector in the CBAM scope. The default values for hydrogen are based on a separate JRC report⁴, published in November 2023.

The default values in this section apply independently of the country of origin of the CBAM goods and only until the end of the transitional period on 31 December 2025. From 2026 onwards, another set of default values will apply. Those values will be set at the average emission intensity of each exporting country, increased by a proportionately designed mark-up. Those default values will be determined through an implementing act planned for adoption in 2025.

⁽³⁾ Vidovic, D., Marmier, A., Zore, L. and Moya, J., *Greenhouse gas emission intensities of the steel, fertilisers, aluminium and cement industries in the EU and its main trading partners*, Publications Office of the European Union, Luxembourg, 2023, doi: 10.2760/359533, JRC134682. Available from: <https://publications.jrc.ec.europa.eu/repository/handle/JRC134682>.

⁽⁴⁾ Dolci, F. and Arrigoni, A., *Estimation of the global average GHG emission intensity of hydrogen production*, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/744837, JRC135067. Available from: <https://publications.jrc.ec.europa.eu/repository/handle/JRC135067>.

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The sector tables below give default values at the 4, 6 and 8-digit CN code level⁵ for use in the transitional CBAM period.

- Default values given at a 4-digit CN code level apply to all goods falling within this 4-digit CN code category.
- Default values supplied at a 6-digit CN code level apply to all goods falling within this 6-digit CN code category.
- Default values supplied at an 8-digit CN code level only apply to the specific goods listed under the 8-digit CN code.

Default values are given in tonnes of CO₂e emissions per tonne of goods. If a row in the table contains several CN codes, but only one set of default values (i.e. one direct, one indirect and one total), those default values apply to all CN codes in that row.

⁽⁵⁾ Commission Implementing Regulation (EU) 2020/1577 of 21 September 2020 amending Annex I to Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Customs Tariff. OJ L 361, 30.10.2020, p.1–1063. Available from: <https://eur-lex.europa.eu/eli/reg/2020/1577/oj>.

2.2 Default values for the transitional period for iron and steel

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
Sintered Ore	2601 12 00	Agglomerated iron ores and concentrates, other than roasted iron pyrites	0,31	0,05	0,36
Pig iron	7201	Pig iron and spiegeleisen in pigs, blocks or other primary forms	1,90	0,17	2,07
FeMn	7202 1	Ferro-manganese	1,44	2,08	3,51
FeCr	7202 4	Ferro-chromium	2,07 ⁶	3,38	5,45
FeNi	7202 6	Ferro-nickel	3,48 ⁶	2,81	6,26
DRI	7203	Ferrous products obtained by direct reduction of iron ore and other spongy ferrous products	4,81	0,00	4,81
Crude steel	7206	Iron and non-alloy steel in ingots or other primary forms (excluding iron of heading 7203)		See below	
	7206 10 00	Ingots	2,52	0,23	2,75
	7206 90 00	Other	1,97	0,23	2,20
	7207	Semi-finished products of iron or non-alloy steel		See below	
	7207 11 11	Of free-cutting steel			
	7207 11 14	Of a thickness not exceeding 130 mm			
	7207 11 16	Of a thickness exceeding 130 mm			
	7207 12 10	Rolled or obtained by continuous casting			
	7207 19 12	Rolled or obtained by continuous casting			
	7207 19 80	Other	1,89	0,32	2,21
	7207 20 11	Of free-cutting steel			
	7207 20 15	0,25 % or more but less than 0,6 % of carbon			
	7207 20 17	0,6 % or more of carbon			
	7207 20 32	Rolled or obtained by continuous casting			
	7207 20 52	Rolled or obtained by continuous casting			
	7207 20 80	Other			
	7207 11 90				
	7207 12 90				
	7207 19 19	Forged	2,65	0,62	3,27
	7207 20 19				
	7207 20 39				
	7207 20 59				

⁶ The value is based on the constant GHG emission intensity value given for individual countries in the JRC study³. This corrects a small inconsistency detected for the weights that were applied for calculating the weighted average values in that report.

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
	7218	Stainless steel in ingots or other primary forms; semi-finished products of stainless steel		See below	
	7218 10 00	Ingots and other primary forms			
	7218 99 19 7218 99 80	Forged	2,51	2,10	4,61
	7218 91	Of rectangular (other than square) cross-section			
	7218 99 11	Rolled or obtained by continuous casting	2,18	1,90	4,08
	7218 99 20	Rolled or obtained by continuous casting			
	7224	Other alloy steel in ingots or other primary forms; semi-finished products of other alloy steel		See below	
	7224 10	Ingots and other primary forms			
	7224 90 18 7224 90 90	Forged	2,41	0,79	3,20
	7224 90 02	Of tool steel			
	7224 90 03	Of high-speed steel			
	7224 90 05	Containing by weight not more than 0,7 % of carbon, 0,5 % or more but not more than 1,2 % of manganese and 0,6 % or more but not more than 2,3 % of silicon; containing by weight 0,0008 % or more of boron with any other element less than the minimum content	1,95	0,40	2,35
	7224 90 07 7224 90 14	Other			
	7224 90 31	Containing by weight not less than 0,9 % but not more than 1,15 % of carbon, not less than 0,5 % but not more than 2 % of chromium and, if present, not more than 0,5 % of molybdenum			
	7224 90 38	Other			
Iron or steel products	7205	Granules and powders, of pig iron, spiegeleisen, iron or steel (if not covered under category pig iron)	1,90	0,17	2,07
	7208	Flat-rolled products of iron or non-alloy steel, of a width of	2,01	0,27	2,28

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
		600 mm or more, hot-rolled, not clad, plated or coated			
	7209	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, cold-rolled (cold-reduced), not clad, plated or coated	2,03	0,36	2,39
	7210	Flat-rolled products of iron or non-alloy steel, of a width of 600 mm or more, clad, plated or coated	1,97	0,39	2,35
	7211	Flat-rolled products of iron or non-alloy steel, of a width of less than 600 mm, not clad, plated or coated		See below	
	7211 13 00	Rolled on four faces or in a closed box pass, of a width exceeding 150 mm and a thickness of not less than 4 mm, not in coils and without patterns in relief	2,01	0,27	2,28
	7211 14 00	Other, of a thickness of 4,75 mm or more			
	7211 19 00	Other			
	7211 23	Containing by weight less than 0,25 % of carbon	2,03	0,36	2,39
	7211 29 00	Other			
	7211 90	Other			
	7212	Flat-rolled products of iron or non-alloy steel, of a width of less than 600 mm, clad, plated or coated	1,97	0,39	2,35
	7213	Bars and rods, hot-rolled, in irregularly wound coils of iron or non-alloy steel	1,89	0,32	2,21
	7214	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		See below	
	7214 10 00	Forged	2,65	0,62	3,27
	7214 20 00	Containing indentations, ribs, grooves or other deformations produced during the rolling process or twisted after rolling	1,89	0,32	2,21
	7214 30 00	Other, of free-cutting steel			
	7214 91	Of rectangular (other than square) cross-section			
	7214 99	Other			
	7215	Other bars and rods of iron or non-alloy steel	1,89	0,32	2,21
	7216	Angles, shapes and sections of iron or non-alloy steel	1,89	0,32	2,21

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
	7217	Wire of iron or non-alloy steel		See below	
	7217 10	Not plated or coated, whether or not polished	1,88	0,49	2,37
	7217 20	Plated or coated with zinc			
	7217 30	Plated or coated with other base metals	1,95	0,51	2,46
	7217 90	Other			
	7219	Flat-rolled products of stainless steel, of a width of 600 mm or more		See below	
	7219 11 00	Of a thickness exceeding 10 mm			
	7219 12	Of a thickness of 4,75 mm or more but not exceeding 10 mm			
	7219 13	Of a thickness of 3 mm or more but less than 4,75 mm			
	7219 14	Of a thickness of less than 3 mm	2,18	1,90	4,08
	7219 21	Of a thickness exceeding 10 mm			
	7219 22	Of a thickness of 4,75 mm or more but not exceeding 10 mm			
	7219 23 00	Of a thickness of 3 mm or more but less than 4,75 mm			
	7219 24 00	Of a thickness of less than 3 mm			
	7219 31 00	Of a thickness of 4,75 mm or more			
	7219 32	Of a thickness of 3 mm or more but less than 4,75 mm			
	7219 33	Of a thickness exceeding 1 mm but less than 3 mm	2,21	1,99	4,19
	7219 34	Of a thickness of 0,5 mm or more but not exceeding 1 mm			
	7219 35	Of a thickness of less than 0,5 mm			
	7219 90	Other			
	7220	Flat-rolled products stainless steel, of a width of less than 600 mm		See below	
	7220 11 00	Of a thickness of 4,75 mm or more	2,18	1,90	4,08
	7220 12 00	Of a thickness of less than 4,75 mm			
	7220 20	Not further worked than cold-rolled (cold-reduced)	2,21	1,99	4,19
	7220 90	Other			
	7221	Bars and rods, hot-rolled, in irregularly wound coils, of stainless steel	2,14	2,17	4,30
	7222	Other bars and rods of stainless steel; angles, shapes and sections of stainless steel		See below	
	7222 11	Of circular cross-section			
	7222 19	Other			
	7222 20	Bars and rods, not further worked than cold-formed or cold-finished	2,14	2,17	4,30
	7222 40	Angles, shapes and sections			

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
	7222 30	Other bars and rods	2,51	2,10	4,61
	7223	Wire of stainless steel		See below	
	7223 00	Wire of stainless steel	2,13	2,36	4,49
	7225	Flat-rolled products of other alloy steel, of a width of 600 mm or more		See below	
	7225 11 00	Grain-oriented			
	7225 19 10	Hot-rolled			
	7225 30	Other, not further worked than hot-rolled, in coils	1,95	0,40	2,35
	7225 40	Other, not further worked than hot-rolled, not in coils			
	7225 19 90	Cold-rolled			
	7225 50	Other, not further worked than cold-rolled (cold-reduced)	1,98	0,49	2,46
	7225 91 00	Electrolytically plated or coated with zinc			
	7225 92 00	Otherwise plated or coated with zinc	1,92	0,51	2,43
	7225 99 00	Other			
	7226	Flat-rolled products of other alloy steel, of a width of less than 600 mm		See below	
	7226 11 00	Grain-oriented			
	7226 19 10	Not further worked than hot-rolled			
	7226 20 00	Of high-speed steel	1,95	0,40	2,35
	7226 91	Not further worked than hot-rolled			
	7226 19 80	Other			
	7226 92 00	Not further worked than cold-rolled (cold-reduced)	1,98	0,49	2,46
	7226 99	Other	1,92	0,51	2,43
	7227	Bars and rods, hot-rolled, in irregularly wound coils, of other alloy steel	1,86	0,57	2,43
	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		See below	
	7228 10 20	Not further worked than hot-rolled, hot-drawn or extruded; hot-rolled, hot-drawn or extruded, not further worked than clad			
	7228 10 90	Other	1,86	0,57	2,43
	7228 20	Bars and rods, of silico-manganese steel			
	7228 30	Other bars and rods, not further worked than hot-rolled, hot-drawn or			

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
		extruded			
	7228 50	Other bars and rods, not further worked than cold-formed or cold-finished			
	7228 60	Other bars and rods			
	7228 70	Angles, shapes and sections			
	7228 80 00	Hollow drill bars and rods			
	7228 10 50	Forged			
	7228 40	Other bars and rods, not further worked than forged	2,41	0,79	3,20
	7229	Wire of other alloy steel	1,84	0,75	2,59
	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	2,03	0,36	2,39
	7302	Railway or tramway track construction material of iron or steel, the following: rails, check-rails and rack rails, switch blades, crossing frogs, point rods and other crossing pieces, sleepers (cross-ties), fish-plates, chairs, chair wedges, sole plates (base plates), rail clips, bedplates, ties and other material specialised for jointing or fixing rails	1,93	0,29	2,21
	7303 00	Tubes, pipes and hollow profiles, of cast iron	2,21	0,35	2,56
	7304	Tubes, pipes and hollow profiles, seamless, of iron (other than cast iron) or steel		See below	
	7304 11 00	Of stainless steel			
	7304 22 00	Drill pipe of stainless steel			
	7304 24 00	Other, of stainless steel			
	7304 41 00	Cold-drawn or cold-rolled (cold-reduced)	1,86	0,35	2,20
	7304 49	Other			
	7304 51	Cold-drawn or cold-rolled (cold-reduced)			
	7304 59	Other			
	7304 19	Other			
	7304 23 00	Other drill pipe			
	7304 29	Other			
	7304 31	Cold-drawn or cold-rolled (cold-reduced)	1,93	0,29	2,21
	7304 39	Other			
	7304 90 00	Other			
	7305	Other tubes and pipes (for example, welded, riveted or similarly closed), having circular cross-sections, the external diameter of which exceeds 406,4 mm, of iron or steel	2,03	0,36	2,39

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
	7306	Other tubes, pipes and hollow profiles (for example, open seam or welded, riveted or similarly closed), of iron or steel		See below	
	7306 11 00	Welded, of stainless steel			
	7306 21 00				
	7306 40 20	Cold-drawn or cold-rolled (cold-reduced)	1,98	0,46	2,44
	7306 61 10	Of stainless steel			
	7306 69 10				
	7306 19 00	Other			
	7306 29 00		2,03	0,36	2,39
	7306 30 12	Cold-drawn or cold-rolled (cold-reduced)			
	7306 30 18	Other	2,01	0,27	2,28
	7306 30 41	Plated or coated with zinc			
	7306 30 49	Other			
	7306 30 72	Plated or coated with zinc			
	7306 30 77	Other			
	7306 30 80	Exceeding 168,3 mm but not exceeding 406,4 mm	1,97	0,39	2,35
	7306 61 92	With a wall thickness not exceeding 2 mm			
	7306 61 99	With a wall thickness exceeding 2 mm			
	7306 69 90	Other			
	7306 90 00				
	7306 40 80	Other	1,95	0,33	2,28
	7306 50 29				
	7306 50 21	Cold-drawn or cold-rolled (cold-reduced)	1,97	0,41	2,38
	7306 50 80	Other			
	7307	Tube or pipe fittings (for example, couplings, elbows, sleeves), of iron or steel		See below	
	7307 11	Of non-malleable cast iron	2,54	0,57	3,11
	7307 19 10	Of cast iron			
	7307 19 90	Other	0,61	1,05	1,66
	7307 21 00	Flanges			
	7307 22	Threaded elbows, bends and sleeves	1,87	0,43	2,30
	7307 23	Butt welding fittings			
	7307 29	Other			
	7307 91 00	Flanges			
	7307 92	Threaded elbows, bends and sleeves	1,93	0,29	2,21
	7307 93	Butt welding fittings			
	7307 99	Other			
	7308	Structures (excluding prefabricated buildings of heading 9406) and parts of structures (for example, bridges and bridge-sections, lock-gates,	2,46	2,55	5,01

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
		towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds for doors, shutters, balustrades, pillars and columns), of iron or steel; plates, rods, angles, shapes, sections, tubes and the like, prepared for use in structures, of iron or steel			
	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	1,97	0,39	2,35
	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	1,97	0,39	2,35
	7311 00	Containers for compressed or liquefied gas, of iron or steel	1,89	0,32	2,21
	7318	Screws, bolts, nuts, coach screws, screw hooks, rivets, cotters, cotter pins, washers (including spring washers) and similar articles, of iron or steel		See below	
	7318 11 00	Coach screws			
	7318 12 90	Other			
	7318 13 00	Screw hooks and screw rings			
	7318 14 91	Spaced-thread screws			
	7318 14 99	Other	1,89	0,32	2,21
	7318 19 00				
	7318 21 00	Spring washers and other lock washers			
	7318 24 00	Cotters and cotter pins			
	7318 29 00	Other			
	7318 12 10	Of stainless steel	2,10	1,99	4,10
	7318 14 10				
	7318 15	Other screws and bolts, whether or not with their nuts or washers	1,89	0,32	2,21
	7318 16	Nuts	1,89	0,32	2,21
	7318 22 00	Other washers	1,89	0,32	2,21
	7318 23 00	Rivets	1,89	0,32	2,21
	7326	Other articles of iron or steel		See below	

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
	7326 11 00	Grinding balls and similar articles for mills			
	7326 19	Other	2,65	0,62	3,27
	7326 90 92	Open-die forged			
	7326 90 94	Closed-die forged			
	7326 90 96	Sintered			
	7326 20 00	Articles of iron or steel wire	1,95	0,51	2,46
	7326 90 30	Ladders and steps			
	7326 90 40	Pallets and similar platforms for handling goods			
	7326 90 50	Reels for cables, piping and the like	1,89	0,32	2,21
	7326 90 60	Non-mechanical ventilators, guttering, hooks and like articles used in the building industry			
	7326 90 98	Other articles of iron or steel	1,97	0,39	2,35

Source: JRC, 2023.³

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2.3 Default values for the transitional period for cement

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
Calcined clay	2507 00 80	Other kaolinic clays ⁷ <i>(nb: applicable for calcined clay only)</i>	0,23	0,08	0,32
Cement clinker	2523 10 00	Cement clinkers ⁸	0,83	0,04	0,87
Cement	2523 21 00	White Portland cement, whether or not artificially coloured	1,16	0,10	1,26
	2523 29 00	Other Portland cement ⁹	0,81	0,06	0,87
	2523 90 00	Other hydraulic cements ¹⁰	0,59	0,04	0,63
Aluminous cement	2523 30 00	Aluminous cement ¹¹	1,75	0,15	1,90

Source: JRC, 2023.³

⁽⁷⁾ In the case of ‘non-calcined clay’ zero emissions may be indicated with clarification in the comments section of the report

⁽⁸⁾ The default values are based on the JRC estimates for grey cement clinkers.

⁽⁹⁾ The default values are based on the JRC estimates for grey Portland cement.

⁽¹⁰⁾ The default values are based on the JRC estimates for other grey hydraulic cements.

⁽¹¹⁾ Also referred to as ‘calcium aluminate cement’.

2.4 Default values for the transitional period for fertilisers

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
Nitric acid	2808 00 00	Nitric acid; sulphonitric acids	2,56	0,05	2,60
Ammonia	2814	Ammonia, anhydrous or in aqueous solution	2,68	0,14	2,82
Mixed fertilisers	2834 21 00	Nitrates of potassium	1,82	0,06	1,88
	3102	Mineral or chemical fertilisers, nitrogenous		See below	
	3102 10	Urea, whether or not in aqueous solution	1,78	0,12	1,9
	3102 21 00	Ammonium sulphate	0,86	0,09	0,94
	3102 29 00	Double salts and mixtures of ammonium sulphate and ammonium nitrate	1,54	0,10	1,63
	3102 30	Ammonium nitrate, whether or not in aqueous solution	2,32	0,07	2,39
	3102 40	Mixtures of ammonium nitrate with calcium carbonate or other inorganic non-fertilising substances	1,77	0,06	1,84
	3102 50 00	Sodium nitrate	3,99	0,07	4,06
	3102 60 00	Double salts and mixtures of calcium nitrate and ammonium nitrate	1,87	0,08	1,95
	3102 80 00	Mixtures of urea and ammonium nitrate in aqueous or ammoniacal solution	1,28	0,06	1,34
	3102 90 00	Other including mixtures not specified in the foregoing subheadings ¹²	1,65	0,10	1,74
	3105	Mineral or chemical fertilisers containing two or three of the fertilising elements nitrogen, phosphorus and potassium		See below	
	3105 10 00	Goods of this chapter in tablets or similar forms or in packages of a gross weight not exceeding 10 kg ¹³	0,94	0,08	1,02
	3105 20	Mineral or chemical fertilisers containing the three fertilising elements nitrogen, phosphorus and potassium	1,23	0,11	1,35
3105 30 00	Diammonium hydrogenorthophosphate (diammonium phosphate)	0,69	0,06	0,75	

⁽¹²⁾ The default values are based on a weighted average of all other CBAM goods under CN 3102, with weighting according to the volumes of imports into the EU in 2019.

⁽¹³⁾ The default values are based on a weighted average of all other CBAM goods under CN 3105, with weighting according to the volumes of imports into the EU in 2019.

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
	3105 40 00	Ammonium dihydrogenorthophosphate (monoammonium phosphate) and mixtures thereof with diammonium hydrogenorthophosphate (diammonium phosphate)	0,44	0,05	0,49
	3105 51 00	Other mineral or chemical fertilisers containing the two fertilising elements nitrogen and phosphorus (nitrates and phosphates)	1,29	0,11	1,4
	3105 59 00	Other mineral or chemical fertilisers containing the two fertilising elements nitrogen and phosphorus (other)	1,29	0,11	1,4
	3105 90	Other ¹³	0,94	0,08	1,02

Source: JRC, 2023.³

2.5 Default values for the transitional period for aluminium

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
Unwrought aluminium	7601	Unwrought aluminium	2,36	8,14	10,49
Aluminium products	7603	Aluminium powders and flakes	2,48	8,4	10,88
	7604 10 10	Bars and rods of aluminium, not alloyed	2,31	7,49	9,80
	7604 10 90	Profiles of aluminium, not alloyed	2,73	9,30	12,04
	7604 21 00	Hollow profiles of aluminium alloys	2,73	9,30	12,04
	7604 29 10	Bars and rods of aluminium alloys	2,31	7,49	9,80
	7604 29 90	Profiles of aluminium alloys	2,73	9,30	12,04
	7605	Aluminium wire	2,31	7,49	9,80
	7606	Aluminium plates, sheets and strip, of a thickness exceeding 0,2 mm	2,86	9,25	12,11
	7607	Aluminium foil (whether or not printed or backed with paper, paperboard, plastics or similar backing materials) of a thickness (excluding any backing) not exceeding 0,2 mm	2,86	9,25	12,11
	7608	Aluminium tubes and pipes	2,73	9,30	12,04
	7609 00 00	Aluminium tube or pipe fittings (for example, couplings, elbows, sleeves)	2,73	9,30	12,04
	7610	Aluminium structures (excluding prefabricated buildings of heading 9406) and parts of structures (for example, bridges and bridge-sections, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds for doors, balustrades, pillars and columns); aluminium plates, rods, profiles, tubes and the like, prepared for use in structures	2,73	9,30	12,04
7611 00 00	Aluminium reservoirs, tanks, vats and similar containers, for any material (other than compressed or liquefied gas), of a capacity exceeding 300 litres, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment	2,86	9,25	12,11	
7612	Aluminium casks, drums, cans, boxes and similar containers (including rigid or collapsible tubular containers), for any material (other than compressed or liquefied	2,86	9,25	12,11	

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
		gas), of a capacity not exceeding 300 litres, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment			
	7613 00 00	Aluminium containers for compressed or liquefied gas	2,86	9,25	12,11
	7614	Stranded wire, cables, plaited bands and the like, of aluminium, not electrically insulated	2,31	7,49	9,80
	7616	Other articles of aluminium		See below	
	7616 10 00	Nails, tacks, staples (other than those of heading 8305), screws, bolts, nuts, screw hooks, rivets, cotters, cotter pins, washers and similar articles	2,86	9,25	12,11
	7616 91 00	Cloth, grill, netting and fencing, of aluminium wire	2,86	9,25	12,11
	7616 99 10	Other - Cast	2,48	8,40	10,88
	7616 99 90	Other - Other	2,86	9,25	12,11

Source: JRC, 2023.³

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2.6 Default values for the transitional period for hydrogen

Aggregated goods category	CN code	Description	Default values (tonne CO ₂ e/tonne goods)		
			Direct emissions	Indirect emissions	Total emissions
Hydrogen	2804 10 00	Hydrogen	10,4	0,0	10,4

Source: JRC, 2023.⁴

3 DEFAULT VALUES FOR DETERMINING INDIRECT EMISSIONS EMBEDDED IN CBAM GOODS OTHER THAN ELECTRICITY IN THE TRANSITIONAL CBAM PERIOD

The general approach for determining embedded indirect emissions in CBAM goods other than electricity is to use default values for the emission factor for electricity. Indirect emissions are then calculated by multiplying those default values with the amount of electricity consumed to produce the respective CBAM goods.

The default values represent the average emission factors of the country of origin electricity grid, based on data from the International Energy Agency (IEA).¹⁴ These data are not published in this document but are made available to reporting declarants through the CBAM Transitional Registry.

The default values in the CBAM Transitional Registry represent the 5-year average emission factors for electricity covering the years 2016 to 2020. They are provided for around 150 countries. If a default value is not available for a specific country, the Registry attributes the world average emission factor as provided by the IEA. In the case of a few countries, the IEA dataset does not contain emission factors for the years 2016 to 2020, due to the high share of renewable electricity in the electricity grid. In the case of these few countries, the default values are set to zero.

If a reporting declarant does not want to use the default values made available by the Commission, there is also the possibility to use any other emission factor of the country of origin electricity grid based on publicly available data representing either the average emission factor or the CO₂ emission factor. Moreover, actual emission factors for electricity may be used in the case of a) a direct technical link between the installation in which the good is produced and the electricity generation source or b) a power purchase agreement between the consumer and the producer of the electricity for an amount of electricity that is equivalent to the amount for which the use of a specific value is claimed. Provisions on the use of emission factors other than those provided by the Commission can be found in Annex III, Section D.4 of Implementing Regulation (EU) 2023/1773.

The default values referred to in this section apply only until the end of the transitional period on 31 December 2025. From 2026 onwards, another set of default values will apply. Those values will be set as the average of:

- the emission factor of the Union electricity grid,
- the emission factor of the country of origin electricity grid, or
- the CO₂ emission factor of price-setting sources in the country of origin.

The default values for the determination of indirect emissions applicable from 2026 onwards will be determined through an implementing act planned for adoption in 2025.

⁽¹⁴⁾ International Energy Agency (IEA): Emission factors 2021.

4 DEFAULT VALUES FOR ELECTRICITY AS CBAM GOOD IN THE TRANSITIONAL CBAM PERIOD

The general approach for determining embedded direct emissions for electricity as CBAM good is to use default values for the CO₂ emission factors. CO₂ emission factor means the weighted average of the CO₂ intensity of electricity produced from fossil fuels within a geographic area. Embedded direct emissions are then calculated by multiplying those default values with the amount of electricity imported into the EU.

The default values represent the average emission factors of the electricity produced from fossil fuels in the country of origin, based on data from the International Energy Agency (IEA).¹⁴ These data are not published in this document but are made available to reporting declarants through the CBAM Transitional Registry.

The default values in the CBAM Transitional Registry represent the 5-year average CO₂ emission factors covering the years 2016 to 2020. They are provided for around 15 countries, representing the countries from which electricity is currently exported to the EU or potentially in the near future.

Under certain conditions, other emission factors may be used, as specified in Annex III, Section D.2 of Implementing Regulation (EU) 2023/1773.

The default values referred to in this section apply only until the end of the transitional period on 31 December 2025. From 2026 onwards, another set of default values will apply. Those values will be set at the CO₂ emission factor in the third country, group of third countries or region within a third country, based on the best data available to the Commission. They will be determined through an implementing act planned for adoption in 2025.

5 GLOSSARY

Term	Definition
Actual emissions	emissions calculated based on primary data from the production processes of goods and from the production of electricity consumed during those processes
Aggregated goods category	a group of CBAM goods with their CN codes, used for the purpose of defining system boundaries of production processes
CO₂ emission factor	weighted average of the CO ₂ intensity of electricity produced from fossil fuels within a geographic area. With respect to the geographic area, the default values for the CO ₂ emission factors for electricity as CBAM good referred to in this document refer to countries.
Combined nomenclature (CN)	classification of goods, designed to meet the needs of: i) the Common customs tariff, setting import duties for products imported into the European Union (EU), as well as the Integrated tariff of the European Communities (Taric), incorporating all EU and trade measures applied to goods imported into and exported out of the EU; ii) the international trade statistics of the EU. The CN provides the means of collecting, exchanging and publishing data on EU international trade statistics. It is also used for the collection and publication of international trade statistics in intra-EU trade
Default value	value that is calculated or drawn from secondary data, which represents the embedded emissions in goods
Direct emissions	emissions from the production processes of goods including emissions from the production of heating and cooling that is consumed during the production processes, irrespective of the location of the production of the heating and cooling
Embedded emissions	direct emissions released during the production of goods and indirect emissions from the production of electricity that is consumed during the production processes
Emissions	release of greenhouse gases into the atmosphere from the production of goods
Emission factor for electricity	default value, expressed in CO ₂ e, representing the emission intensity of electricity consumed in production of goods
Goods	goods listed in Annex I to the CBAM Regulation (EU) 2023/956
Indirect emissions	emissions from the production of electricity, which is consumed during the production processes of goods, regardless of the location of the production of the consumed electricity
Installation	a stationary technical unit where a production process is carried out

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Term	Definition
Operator	any person who operates or controls an installation in a third (i.e. non-EU) country
Reporting declarant	<p>any of the following persons:</p> <p>(a) the importer who lodges a customs declaration for release for free circulation of goods in its own name and on its own behalf;</p> <p>(b) the person, holding an authorisation to lodge a customs declaration referred to in Article 182(1) of Regulation (EU) No 952/2013, who declares the importation of goods;</p> <p>(c) the indirect customs representative, where the customs declaration is lodged by the indirect customs representative appointed in accordance with Article 18 of Regulation (EU) No 952/2013, when the importer is established outside the Union or where the indirect customs representative has agreed to the reporting obligations in accordance with Article 32 of Regulation (EU) 2023/956</p>
Specific embedded emissions	embedded emissions of one tonne of goods, expressed as tonnes of CO _{2e} emissions per tonne of goods
Tonne of CO_{2e}	one metric tonne of carbon dioxide ('CO ₂ '), or an amount of any other greenhouse gas listed in Annex I to the CBAM Regulation with an equivalent global warming potential ('CO _{2e} ')



भारत का राजपत्र The Gazette of India

असाधारण

EXTRAORDINARY

भाग II—खण्ड 3—उप-खण्ड (i)

PART II—Section 3—Sub-section (i)

प्राधिकार से प्रकाशित

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नई दिल्ली, 8 मई, 2017

सा.का.नि.452(अ).— राष्ट्रीय इस्पात नीति, 2017 सामान्य जानकारी हेतु एतद्वारा प्रकाशित की जाती है।

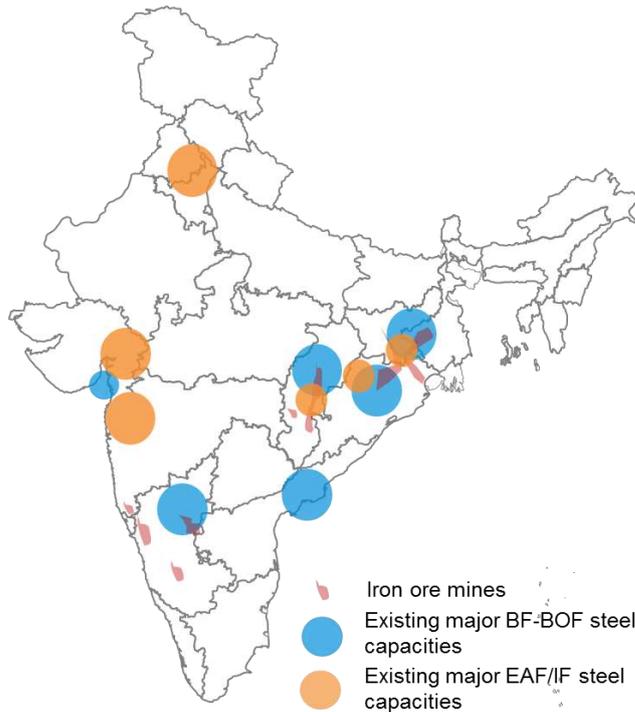
राष्ट्रीय इस्पात नीति 2017

1. प्रस्तावना

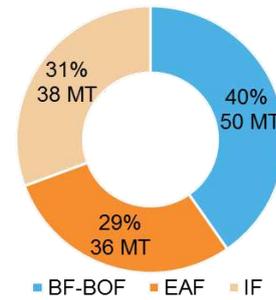
- 1.1. इस्पात एक बड़े और प्रौद्योगिकीय दृष्टि से जटिल उद्योग का उत्पाद है, जहां कि मेटिरियल फ्लो और आय सृजन के संदर्भ में ठोस फारवर्ड और बैकवर्ड लिंकेज उपलब्ध हैं। यह आधुनिक विश्व के अतिमहत्वपूर्ण उत्पादों में से भी एक है और किसी भी औद्योगिक राष्ट्र के लिए इसका रणनीतिक महत्व है। निर्माण और औद्योगिक मशीनरी से लेकर उपभोक्ता उत्पादों तक इस्पात का भिन्न-भिन्न प्रकार से उपयोग होता है। यह एक ऐसा भी उद्योग है जहां प्रयुक्त कच्चे माल की प्राकृति और मात्रा के आधार पर विभिन्न प्रौद्योगियों की विद्यमानता है। भारत में जीडीपी पर स्टील का उत्पादन गुणक प्रभाव लगभग 1.4X और रोजगार गुणक घटक 6.8X है।
- 1.2. यह विशाल इस्पात उद्योग ऐतिहासिक रूप से देश के त्वरित औद्योगिक विकास की आधारशिला रहा है। तेज औद्योगिक विकास के कारण वित्तीय वर्ष 1991-92 में नियंत्रण मुक्त व्यवस्था से पहले मौजूद 22 एमटी की छोटी सी क्षमता से लेकर वित्तीय वर्ष 2015-16 में 90 एमटी उत्पादन और 122 एमटी की क्षमता के साथ भारत विश्व में इस्पात का तीसरा सबसे बड़ा उत्पादक बन गया है। आज भारतीय इस्पात उद्योग देश की जीडीपी में लगभग 2 प्रतिशत का योगदान करता है और प्रत्यक्ष रूप से लगभग 5 लाख लोगों और अप्रत्यक्ष रूप से लगभग 20 लाख लोगों को रोजगार प्रदान करता है। राष्ट्रीय इस्पात नीति 2017 (एनएसपी-2017) में इस्पात उद्योग द्वारा अपनी पूर्ण क्षमता को प्राप्त करने तथा, हाई एण्ड मूल्यवर्द्धित इस्पात को वैश्विक दृष्टि से प्रतिस्पर्धात्मक बनाने हेतु इस पर ध्यान देने के साथ इस्पात का उत्पादन बढ़ाने के लिए उद्योग को मार्ग पर लाने का एक प्रयास है।
- 1.3. राष्ट्रीय इस्पात नीति 2005 (एनएसपी-2005) में तत्कालीन अर्थव्यवस्था से सृजित होने वाले लाभों को समेकित करने के तरीके इंगित किये गये थे और भारतीय इस्पात उद्योग के लिए स्थिर और दक्ष विकास का एक रोड मैप तैयार किया गया था। तथापि, भारत और विश्व स्तर पर भी इस्पात बाजार की मांग और आपूर्ति दोनों पक्षों में स्पष्ट हुए विकास कार्यों ने एनएसपी-2005 के विभिन्न घटकों पर पुर्नविचार अनिवार्य बना दिया है।

- 1.4. इस्पात के उत्पादन में भारत के प्रतिस्पर्धात्मक लाभ उच्च ग्रेड के लौह अयस्क और गैर कोकिंग कोल- जो कि इस्पात उत्पादन के लिए दो महत्वपूर्ण आदान सामग्रिया है, की स्वदेशी उपलब्धता पर निर्भर करते है। इसके अतिरिक्त, यह इस्पात, मजबूत एमएसएमई क्षेत्र और प्रतिस्पर्धात्मक श्रम लागतों के साथ अपेक्षाकृत युवा जनशक्ति के लिए वृहद और तीव्र गति से बढ़ता बाजार उपलब्ध कराता है।
- 1.5. वर्ष 2004 के बाद मांग सकारात्मक होने और इस्पात की कीमतें अधिक होने से भारतीय इस्पात क्षेत्र के अंतर्गत उड़ीसा, झारखण्ड, कर्नाटक और छत्तीसगढ़ में निवेशों की लहर दौड़ी है। पर्याप्त नई क्षमता सृजित हुई थी और विद्यमान संयंत्रों को आधुनिकीकृत बनाया गया था। इन निवेशों के एक बड़े भाग को बैंकों द्वारा और अन्य प्रकार के ऋणों से वित्त पोषित किया गया था।
- 1.6. भारत वर्ष 2015 में इस्पात का तीसरा सबसे बड़ा उत्पादक बन गया है और अब चीन के बाद दूसरा सबसे बड़ा उत्पादक बनने की राह पर खड़ा है। विश्व में इस्पात की प्रति व्यक्ति खपत 208 किलोग्राम की तुलना में भारत में इस्पात की प्रति व्यक्ति खपत बहुत कम अर्थात 61 किलोग्राम होने के मद्देनजर विकास की वृहद सम्भावनाएं यहाँ मौजूद है। अवसंरचना और निर्माण क्षेत्र पर वृहद जोर देने के साथ भारतीय अर्थव्यवस्था तेजी से आगे बढ़ रही है। विभिन्न पहलों यथा सस्ते आवास, रेलवे नेटवर्क का विस्तार, घरेलू शिप निर्माण उद्योग का विकास, निजी भागीदारी के लिए रक्षा क्षेत्र को खोलना और ओटोमोबाईल क्षेत्र में प्रत्याशित वृद्धि इत्यादि से यह आशा है कि देश में इस्पात की अधिक मांग बढेगी। इसके अतिरिक्त, विकसित पश्चिम और विकासशील पूर्व के निकट स्थित होने के कारण इस उद्योग का मुख्य जोर घरेलू बाजार पर है, क्योंकि यह एक ऐसा महत्वपूर्ण स्थान है जो इस उद्योग को फिनिशड माल के निर्यात और कुछ दुर्लभ कच्चे माल के आयात का अवसर प्रदान करता है।
- 1.7. भारतीय इस्पात उद्योग रूटवार उत्पादन यथा बीएफ-बीओएफ, ईएएफ और आईएफ के आधार पर तीन विस्तृत श्रेणियों में विभाजित है। बीएफ-बीओएफ रूट के उत्पादकों के पास इस्पात निर्माण की वृहद एकीकृत सुविधाएं विद्यमान है जिसके अंतर्गत इस्पात के उत्पादन के लिए लौह अयस्क और कोकिंग कोल का उपयोग किया जाता है। अन्य बड़े इस्पात उत्पादकों के विपरीत भारतीय इस्पात उद्योग में कई संख्या में छोटे इस्पात उत्पादकों की विद्यमानता है जो इस्पात निर्माण के लिए स्पंज आयरन, मेल्टिंग स्क्रैप और गैर कोकिंग कोल (ईएएफ/आईएफ रूट) का उपयोग करते है। मार्च, 2016 की स्थिति के अनुसार स्पंज आयरन के 308 उत्पादक थे, जो इस्पात उत्पादन के लिए फीड स्टॉक जुटाने के लिए लौह अयस्क / पैलेट और गैर कोकिंग कोल/गैस का इस्तेमाल करते है; 47 इलेक्ट्रिक आर्क फर्नेस और 1128 इंडक्शन फर्नेस मौजूद थे, जो सेमी फिनिशड इस्पात का उत्पादन करने के लिए स्पंज आयरन और/अथवा मेल्टिंग स्क्रैप का उपयोग करते है और 1392 रि-रोलर्स मौजूद थे, जो उपभोक्ता के अंतिम उपयोग के लिए सेमी फिनिशड इस्पात से फिनिशड इस्पात के उत्पाद तैयार करते हैं।

आंकड़े 1: भारत में इस्पात का वर्तमान फुटप्रिंट



Capacity as on 1st January 2017



Total Capacity – 125 MT

स्रोत: इस्पात मंत्रालय, जेपीसी

- 1.8. विगत 2 दशकों में भारतीय इस्पात उद्योग ने विश्व में मौजूद उत्तम पद्धतियों के समान विभिन्न प्रकार के मूल्य वर्द्धित इस्पात का उत्पादन करने की क्षमताएं विकसित की है, जो कि अंतिम उपभोक्ता उद्योगों की विभिन्न आवश्यकताओं की आपूर्ति करते हैं। तथापि, भारत को कई मूल्य वर्द्धित उत्पादों जैसे कि हाई एण्ड अनुप्रयोगों के लिए ओटोमोटिव स्टील, इलेक्ट्रिकल स्टील (सीआरजीओ), विद्युत उपस्कर, एरोस्पेस, रक्षा और न्यूक्लियर अनुप्रयोगों के लिए विशेष उत्पाद और अलॉय का घरेलू स्तर पर उत्पादन करने के लिए विशेष प्रयास करने की आवश्यकता है।
- 1.9. तथापि, उच्चग्रेड के लम्पी मैंगनीज अयस्क एवं क्रोमाईट, कोकिंग कोल, स्टीलग्रेड लाईम स्टोन, रिफ्रैक्ट्री राँ मेटिरियल, निकल, फ़ैरस स्क्रैप इत्यादि जैसे कुछेक अनिवार्य कच्चे माल की सीमित उपलब्धता होने के कारण भारतीय इस्पात क्षेत्र अलाभप्रद स्थिति में है। घरेलू कोकिंग कोल की मात्रा और गुणवत्ता दोनों दृष्टि से कमी होने के कारण भारत में पिग आयरन के उत्पादकों/बीएफ ऑपरेटरों को कोकिंग कोल के लिए आयातों पर अधिक निर्भर रहना पड़ता है।
- 1.10. हाल ही में कई मुद्दों ने भी इस्पात क्षेत्र को प्रतिकूल प्रभावित किया है, यथा लौह अयस्क और कोयला खान आवंटनों का निरस्तीकरण तथा भूमि अधिग्रहण और पर्यावरणीय स्वीकृतियों में विलम्ब इत्यादि जिसके फलस्वरूप कई परियोजनाएं लागत और समय वृद्धि का सामना कर रही हैं। इसके अतिरिक्त, कंपनियों को लाँजिस्टिक एवं कच्चे माल की बढ़ी हुई लागतों और अन्य प्रभावों के कारण अपनी प्रचालन लागतों में वृद्धि का सामना करना पड़ा है।
- 1.11. वर्ष 2011 के बाद इस्पात की वैश्विक कीमतों में गिरावट की शुरुआत हुई, जिसने इस्पात की वैश्विक मांग में कमी होने और चीन समेत कई देशों में अत्यधिक क्षमताओं की विद्यमानता होने के कारण विश्व इस्पात उद्योग में मंदी शुरू होने के संकेत दिये। जनवरी, 2011 की तुलना में जुलाई, 2015 तक कीमतों में 50 प्रतिशत की गिरावट हो गई थी जो कि दशकों में सबसे कम थी, क्योंकि वैश्विक इस्पात बाजार सस्ते आयातों से भर गया था। मांग और आपूर्ति के बीच इस महत्वपूर्ण ढाँचागत विरूपता ने भी बड़ी संख्या में भारतीय कंपनियों को प्रभावित किया, जिससे आयातों में वृद्धि हुई तथा परिणामतः कीमतों में कमी आई, लाभप्रदता कम हुई, क्षमता का उपयोग कम हुआ और यहाँ तक कि कुछ मामलों में क्षमताएं भी बंद पड़ गईं।
- 1.12. इस नये वातावरण में एक उपयुक्त नीतिगत सहायता प्रदान करके उद्योग को मार्गनिर्देशित करना है, जिससे कि यह सुनिश्चित हो सके कि इस्पात का उत्पादन इसकी खपत में वृद्धि की प्रत्याशित गति के अनुरूप हो। यह सुनिश्चित करने के लिए विशेष जोर दिये जाने की आवश्यकता है कि उद्योग पर्यावरण की अनुकूलता, खनिज संरक्षण, इस्पात उत्पादों की गुणवत्ता, प्रौद्योगिकी के उपयोग के संबंध में विकास की स्थिर गति को प्राप्त करें तथा यह सुनिश्चित करने के लिए घरेलू आरण्डडी प्रयास किये जाए कि देश इस्पात उत्पादन की प्रौद्योगिकी और हाई एण्ड स्टील के उत्पादन के मामले में विश्व में अग्रणी बनने के लिए समय के साथ वैश्विक क्षमता मानकों को प्राप्त कर सकें।

2. राष्ट्रीय इस्पात नीति- 2017 का विजन, मिशन और लक्ष्य

- क) **विजन:** ऐसे इस्पात उद्योग का निर्माण करना जो प्रौद्योगिकीय दृष्टि से विकसित हो, और वैश्विक स्तर पर प्रतिस्पर्धात्मक हो, ताकि आर्थिक विकास को प्रोत्साहन मिल सके।
- ख) **मिशन:** निम्न को प्राप्त करने के लिए वातावरण तैयार करना-
- निजी निर्माताओं, एमएसएमई इस्पात उत्पादकों, सीपीएसई को नीतिगत सहायता और मार्ग निर्देशन प्रदान करके तथा पर्याप्त क्षमता वृद्धि को प्रोत्साहित करके इस्पात उत्पादन में आत्म निर्भरता
 - विश्व स्तर पर इस्पात निर्माण की प्रतिस्पर्धात्मक क्षमताओं का विकास
 - लौह अयस्क, कोकिंग कोल और प्राकृतिक गैस का किफायती उत्पादन और अत्यधिक घरेलू उपलब्धता
 - विदेशों में कच्ची सामग्री की परिसंपत्तियों के अधिग्रहण में निवेश को सुविधाजनक बनाना
 - घरेलू इस्पात मांग को बढ़ाना
- ग) **उद्देश्य:** राष्ट्रीय इस्पात नीति का उद्देश्य निम्नलिखित लक्ष्यों को प्राप्त करना है-
- (i) उद्योग को विश्व स्तर पर प्रतिस्पर्धात्मक बनाना
 - (ii) भारत में इस्पात की प्रति व्यक्ति खपत को वर्ष 2030-31 तक 160 किलोग्राम तक बढ़ाना
 - (iii) वर्ष 2030-31 तक महत्वपूर्ण अनुप्रयोगों के लिए उच्च ग्रेड के ऑटोमोटिव इस्पात, विद्युत इस्पात, विशेष इस्पात और एलॉय की समस्त मांग को घरेलू स्तर पर पूरा करना
 - (iv) धुले हुए कोकिंग कोल की घरेलू उपलब्धता को बढ़ाना, ताकि वर्ष 2030-31 तक कोकिंग कोल पर आयातों पर निर्भरता को ~85% से कम करके ~65% किया जा सके
 - (v) मूल्यवर्द्धित/उच्च ग्रेड के इस्पात के संबंध में विश्व स्तर पर अपनी उपस्थिति को बढ़ाना

- (vi) पर्यावरणीय दृष्टि से उपयुक्त कम विद्युत खपत वाले इस्पात उत्पादन में उद्योग को विश्व में अग्रणी बनाने के लिए प्रोत्साहित करना
- (vii) घरेलू उद्योग को किफायती और गुणवत्ता पूर्ण इस्पात उत्पादक के रूप में स्थापित करना
- (viii) औद्योगिक सुरक्षा और स्वास्थ्य की दृष्टि से वैश्विक मानक प्राप्त करना
- (ix) इस्पात उद्योग के कार्बन फुटप्रिंट में पर्याप्त कमी लाना

3. विकास का वर्तमान संदर्भ और दीर्घकालीन परिदृश्य

- 3.1. घरेलू मांग ने भारतीय अर्थव्यवस्था के विकास को सहायता प्रदान की है और परिणामतः इस्पात का उपयोग करने वाले क्षेत्र भारतीय इस्पात क्षेत्र की मुख्य विशेषता बने रहे है। वर्ष 1991 में भारतीय इस्पात उद्योग के उदारीकरण से पूर्व का दशक कूड स्टील के उत्पादन में 5.2 प्रतिशत की सीजीआर वृद्धि का गवाह रहा है। उदारीकरण के पश्चात् 6.1 प्रतिशत की दशकीय सीएजीएआर वृद्धि देखी गई है जो वर्ष 2000-01 से 2015-16 के बीच 8.3 प्रतिशत तक बढ़ी है।
- 3.2. तथापि, भारत में इस्पात उद्योग धीमे आर्थिक विकास और विश्व स्तर पर इस्पात की अप्रयुक्त क्षमता से संबंधित वाह्य चुनौतीपूर्ण परिस्थितियों का सामना कर रहा है। विश्व स्तर पर कमजोर अर्थव्यवस्था होने से भारतीय इस्पात उद्योग को अपने भविष्य के लिए घरेलू खपत की वृद्धि पर अधिक निर्भर रहना पड़ेगा।

4. नीति

राष्ट्रीय इस्पात नीति - 2017 निम्नलिखित नीतिगत क्षेत्रों को शामिल करती है-

- इस्पात की मांग
- इस्पात क्षमता
- कच्ची सामग्री
- भूमि पानी और विद्युत
- अवसंरचना एवं लॉजिस्टिक
- उत्पाद गुणवत्ता
- प्रौद्योगिकीय कुशलता
- एमएसएमई क्षेत्र
- स्टेनलेस इस्पात में मूल्यवर्धन
- एलॉय और विशेष इस्पात में मूल्यवर्धन
- पर्यावरण प्रबंधन
- सुरक्षा
- व्यापार
- वित्तीय जोखिम
- सीपीएसई की भूमिका और आगे की योजना
- हाई एंड अनुसंधान पर जोर देना : स्टील रिसर्च एंड टेक्नोलॉजी मिशन ऑफ इंडिया

4.1. इस्पात की मांग

- 4.1.1. वर्ष 2015 में भारत ही विश्व में एक मात्र ऐसी बड़ी अर्थव्यवस्था थी, जहां इस्पात की मांग में 5.3 प्रतिशत की धनात्मक वृद्धि जारी रही, जबकि चीन में -5.4 प्रतिशत और जापान में -7.0 प्रतिशत की ऋणात्मक वृद्धि थी। भारत में शहरी अवसंरचना में वृद्धि और निर्माण क्षेत्र यह इंगित करते हैं कि आगे आने वाले वर्षों में मांग के अधिक बने रहने की सम्भावना है। यदि भारत को एक विकसित राष्ट्र होने का लक्ष्य प्राप्त करना है, तो इस्पात उद्योग को एक महत्वपूर्ण भूमिका निभानी चाहिए जैसा कि सभी प्रमुख विकसित देशों और पूर्वी एशियाई देशों यथा जापान, दक्षिण कोरिया और चीन में हुआ है।
- 4.1.2. वर्तमान चुनौतियों के बावजूद भी भारतीय इस्पात उद्योग के पास विकास की वृहद सम्भावना मौजूद है जो कि इस तथ्य से प्रमाणित हो जाती है कि भारत में इस्पात की प्रति व्यक्ति खपत 61 किलोग्राम (10 किलोग्राम की ग्रामीण खपत समेत) है जबकि यह 208 किलोग्राम के विश्व औसत की तुलना में बहुत कम है। इसके अतिरिक्त, अवसंरचना क्षेत्र में खर्च की बढ़ोतरी, रेलवे नेटवर्क का विस्तार, घरेलू शिप निर्माण उद्योग का विकास, निजी भागीदारी के लिए रक्षा क्षेत्र को खोलना, ओटोमोबाईल और पूंजीगत सामान उद्योग में प्रत्याशित विकास, शहरी एवं ग्रामीण क्षेत्रों में निर्माण कार्य इत्यादि से प्रत्याशा है कि देश में इस्पात की मांग पर्याप्त बढ़ेगी।
- 4.1.3. किसी भी देश में इस्पात खपत में वृद्धि विशेष रूप से वहाँ आर्थिक विकास और इस्पात के उपयोग से जुड़ी हुई होती है। जहां एक ओर जीडीपी में वृद्धि समग्र खपत में वृद्धि होने का महत्वपूर्ण निर्धारक होता है वहां किसी भी अर्थव्यवस्था के लिए स्टील खपत एक निश्चित पैरामीटर होती है और यह समय के साथ-साथ खपत की तुलना में इस्पात की मांग में वृद्धि दर का निर्धारण करती है।

- 4.1.4. यह प्रत्याशा की जाती है कि जीडीपी विकास की वर्तमान दर से अगले 15 वर्षों के भीतर वर्ष 2030-31 तक इस्पात की मांग तीन गुना बढ़कर 230 एमटी हो जायेगी जैसा कि **अनुबंध-1** में उदाहरण दिया गया है। तथापि, यहां तक कि वर्ष 2030-31 तक फिनिश इस्पात की इस मांग के साथ भी भारत की प्रति व्यक्ति खपत मात्र 158 किलोग्राम तक ही पहुंचेगी जो कि 208 किलोग्राम के वर्तमान विश्व औसत की तुलना में काफी कम है (**अनुबंध -11**)।
- 4.1.5. देश में इस्पात मांग का सृजन करना इस दिशा में शुरू किये जाने वाले एक बड़े कार्यों में से है। मंत्रालय ने इस्पात की मांग बढ़ाने के लिए निर्माण और विनिर्माण क्षेत्रों यथा ग्रामीण विकास, शहरी अवसंरचना, सड़क एवं राजमार्ग, रेलवे इत्यादि की पहचान की है जो कि मुख्य जोर दिये जाने वाले क्षेत्र है और सरकार **निम्नलिखित के जरिये इसकी प्राप्ति के लिए कदम उठायेगी :**
- 4.1.5.1. इस्पात ढांचे काफी किफायती है और इनको स्थापित करने में अपेक्षाकृत काफी कम समय लगता है तथा अच्छी डिजाइन के साथ इनकी स्थिरता अधिक होती है। इसलिए भवन एवं ढांचों में इस्पात के उपयोग को प्रोत्साहित किये जाने की आवश्यकता है। परियोजनाओं का मूल्यांकन करते समय समस्त कार्यशील जीवन की लागत को कम करने पर जोर देने के प्रयास किये जायेंगे जिससे सरकार और निजी क्षेत्र में इस्पात के अधिकाधिक उपयोग को प्रोत्साहित किया जा सकेगा।
- 4.1.5.2. सरकार ने वर्ष 2022 तक सबके लिए आवास की अति महत्वाकांक्षी योजना तथा अन्य स्कीमों यथा प्रधानमंत्री आवास योजना, सांसद आदर्श ग्राम योजना की रूप रेखा तैयार की है। इन स्कीमों में अधिक इस्पात खपत वाले ढांचों एवं डिजाइनों के उपयोग, प्रि-फेब्रीकेटिड और प्रिकास्ट स्टील ढांचों इत्यादि के उपयोग के वृहद अवसर मौजूद हैं। इसलिए, मंत्रालय इन स्कीमों के अंतर्गत इस्पात की अधिक खपत वाले ढांचे / डिजाइनों के उपयोग को बढ़ाने हेतु सभी आवश्यक प्रोत्साहनात्मक उपाय करेगा।
- 4.1.5.3. वाणिज्यिक एवं आवासीय भवनों और फ्लाइ ओवरों में भी इसके उपयोग के अत्यधिक अवसर मौजूद है। विद्यमान पुलों, पेबमेंट, सड़क एवं राजमार्गों में इस्तेमाल होने वाले क्रेस बैरियरों के प्रतिस्थापन लाभों का मूल्यांकन करने के लिए तथा इनके स्थान पर क्रमशः स्टील पुलों, स्टील रिइनफोर्स्ड पेबमेंट और स्टील क्रेस बैरियरों के इस्तेमाल की परियोजनाओं पर विचार करने के लिए सड़क, परिवहन और राजमार्ग मंत्रालय के साथ मिलकर आवश्यक प्रयास किये जायेंगे।
- 4.1.5.4. रेलवे में इस्पात का उपयोग रेलवे लाईन बिछाने, रोलिंग स्टॉक, वैगन, प्लेटफार्म और कोच तक ही सीमित है। रेलवे स्टेशन, फुट ओवर ब्रिज, रेल कोच, विशेष रूप से रेलवे कालोनी के भूकम्प सम्भावित क्षेत्रों में इस्पात आधारित भवनों के निर्माण, डेडिकेटेड फ्रेट कारिडोर एवं सुपर-फास्ट रेल कारिडोर के निर्माण तथा और अधिक इस्पात पुलों के निर्माण में इस्पात का उपयोग बढ़ाने के लिए प्रयास किये जाएंगे ताकि समय और पूंजीगत खर्च में बचत हो सके।
- 4.1.6. **“मेक इन इंडिया”** पहल से निर्माण, अवसंरचना, ऑटोमोबाइल, शिप निर्माण और विद्युत क्षेत्रों में अत्यधिक निवेश होने की सम्भावना है जिससे इस्पात की मांग में वृद्धि होगी। इस प्रकार के लाभ घरेलू इस्पात उत्पादकों तक पहुंचाने के प्रयास किये जाएंगे। किफायती और प्रतिस्पर्धात्मक ‘भारत में निर्मित इस्पात’ के उपयोग से देश में अवसंरचना विकास और निर्माण कार्यों का मार्ग प्रशस्त होगा।
- 4.2. इस्पात क्षमता**
- 4.2.1. यह प्रत्याशा है कि उपर उल्लेखित मांग अनुमानों के आधार पर वर्ष 2030-31 तक 300 एमटी कूड इस्पात क्षमता अपेक्षित होगी। तथापि, 300 एमटी कूड इस्पात क्षमता को प्राप्त करने के लिए अधिक मात्रा में प्राकृतिक संसाधन, वित्त, जनशक्ति और भूमि समेत अवसंरचना जुटाये जाने की आवश्यकता होगी।
- 4.2.2. भारत में इस्पात उत्पादन के प्रतिस्पर्धात्मक लाभों पर विचार करते हुए देश के पास पर्याप्त मात्रा में इस्पात का निर्यात करने और विश्व बाजार में अग्रणी बनने की क्षमता विद्यमान है जिससे भारतीय उद्योग की विशेष रूप से कोकिंग कोल के लिए कच्चे माल के विश्व बाजार में जाने से उत्पन्न होने वाली विदेशी विनिमय जोखिम कम हो जायेगी।
- 4.2.3. वर्ष 2030-31 तक बीएफ-बीओएफ रूट का कूड इस्पात की क्षमता और उत्पादन में लगभग 60 - 65% का योगदान रहने की प्रत्याशा है जबकि शेष 35 - 40% का योगदान ईएएफ और आईएफ रूट के जरिये होगा।
- 4.2.4. इलेक्ट्रिक आर्क अथवा इंडक्शन फर्नेसों में कार्स्टिंग और सप्लीमेंट्री मेटलीक जैसे व्यापारिक उपयोग के लिए पिग आयरन की मांग के वर्ष 2030-31 तक 17 एमटी तक बढ़ जाने का अनुमान है। इसी प्रकार, स्पंज आयरन की मांग के वर्ष 2030-31 तक 80 एमटी तक बढ़ जाने का अनुमान है जैसा कि **अनुबंध -1** में उदाहरण दिया गया है। यह अनुमान है कि स्पंज आयरन की क्षमता वर्ष 2030-31 तक बढ़कर 114 एमटी² हो जायेगी, जिसमें लगभग 30% हिस्सेदारी बढी हुई पर्यावरणीय चिन्ताओं और गैस की दीर्घकालीन उपलब्धता के मद्देनजर गैस आधारित क्षमताओं से होगी।
- 4.2.5. प्रत्याशित मांग को पूरा करने के लिए अतिरिक्त क्षमता के सृजन हेतु वर्ष 2030-31 तक लगभग 10 लाख करोड़ रुपये के महत्वपूर्ण पूंजी निवेश की आवश्यकता होगी और इससे विभिन्न प्रौद्योगिकियों को अपनाये जाने के परिणाम स्वरूप ओटोमेशन के आधार पर वर्ष 2030-31 तक रोजगार सृजन भी 25 लाख के वर्तमान स्तर से बढ़कर 36 लाख हो जायेगा।

- 4.2.6. उद्योग का अधिकतम विकास सुनिश्चित करने के लिए और अत्यधिक क्षमता की विद्यमानता की स्थितियों से बचने के लिए मंत्रालय इस्पात उद्योग में निवेशों को निरन्तर आधार पर मॉनीटर करने के वास्ते सभी हितधारकों के साथ कार्य करेगा तथा इससे खनिज पदार्थों से संपन्न उड़ीशा, छत्तीसगढ़, झारखण्ड और कर्नाटक राज्यों में एसपीवी की स्थापना भी सुगम हो जायेगी।
- 4.2.7. सागरमाला परियोजना के तहत तटवर्ती क्षेत्रों में इस्पात संयंत्रों की स्थापना आरम्भ की जायेगी। इन संयंत्रों की स्थापना दुर्लभ कच्ची सामग्री के आयात और इस्पात उत्पादों के निर्यात के विचार पर आधारित होगी। मंत्रालय एमएसएमई इस्पात क्षेत्र में कलस्टर आधारित दृष्टिकोण को प्रोत्साहित करेगा और साथ ही भूमि के अधिकतम उपयोग, कच्चे माल की आसान उपलब्धता और मितव्ययिता के लिए कंसोर्टियम दृष्टिकोण के आधार पर कॉमन अवसंरचना को प्रोत्साहित करेगा।
- 4.2.8. गैस आधारित इस्पात संयंत्र, इलेक्ट्रिक स्टील मेकिंग, ब्लास्ट फर्नेस में गौण ईंधन का उपयोग और अन्य प्रौद्योगिकियों को प्रोत्साहित करने के लिए आवश्यक नीतिगत वातावरण प्रदान किया जायेगा जिससे इस्पात के उत्पादन में कोकिंग कोल का उत्पादन कम हो जायेगा। ऊर्जा की कार्यकुशलता में सुधार और जीएचजी उत्सर्जन में कमी पर अधिक बल प्रदान करने के साथ स्वदेशी कोयले के इस्तेमाल से इस्पात निर्माण के वैकल्पिक रूट को सुविधाजनक बनाने हेतु भी प्रयास किये जाएंगे।
- 4.2.9. भारत के लिए इस्पात निर्माण हेतु इंडक्शन फर्नेस रूट के कई लाभ मौजूद हैं जैसे कि कोकिंग कोल की आवश्यकता न होना, पूंजीगत लागत कम होना और भूमि की कम आवश्यकता इत्यादि। तथापि, इस्पात निर्माण का यह रूट इसकी रिफाइनिंग क्षमताओं के कारण बाधित हो रहा है। इस प्रकार उच्च गुणवत्तापूर्ण इस्पात के उत्पादन के लिए रिफाइनिंग के निरन्तर और किफायती तरीकों के विकास को प्रोत्साहित करने हेतु उपयुक्त प्रयास किये जाएंगे।

4.3. कच्ची सामग्री

इस्पात उद्योग के विकास के लिए प्रतिस्पर्धात्मक दरों पर कच्ची सामग्री की उपलब्धता आवश्यक है इस्पात उद्योग हेतु कच्ची सामग्री की वर्ष 2030-31 तक की अनुमानित आवश्यकता के ब्यौरे अनुबंध -III में दिये गये हैं।

4.3.1. लौह अयस्क

- 4.3.1.1. सरकार ने माइन्स एण्ड मिनरल्स (डेवलपमेंट एण्ड रेग्यूलेशन) अमेंडमेंट एक्ट, 2015 पहले ही अधिसूचित कर दिया है जिसके अंतर्गत समयबद्ध खान विकास, खनिज खोज कार्य पर अधिक बल और स्थिर खनन परिचालनों पर अधिकाधिक जोर प्रदान किया गया है। इस अधिनियम के तहत खान आवंटन की प्रक्रिया (नीलामी के जरिये) और खनन पट्टों के नवीनीकरण प्रक्रिया के प्रति पारदर्शिता बनाई गई है तथा इसमें किसी विशेष अंतिम उपयोग के लिए किसी विशेष खान का आवंटन करने का प्रावधान किया गया है और साथ ही ऐसे पात्र अंतिम उपभोक्ताओं के मध्य नीलामी करने की अनुमति की शर्तें निर्धारित की गई हैं।
- 4.3.1.2. जब खनन पट्टों की अवधि समाप्त होगी तो खान मंत्रालय के साथ मिलकर उपयुक्त प्रयास किये जाएंगे, ताकि नियमित तरीके में खनिज ब्लॉकों की नीलामी सुविधाजनक बन सके। समयबद्ध तरीके में खनिज उत्पादन आरम्भ करने के लिए भावी पट्टों को मार्गनिर्देशित करने हेतु मंत्रालय सुदृढ़ योजनाओं के विकास को भी सुविधाजनक बनायेगा ताकि लौह अयस्क की पर्याप्त उपलब्धता सुनिश्चित हो सके।
- 4.3.1.3. लौह अयस्क के कैप्टिव खनिकों के खान स्थलों पर पड़े हुए कम ग्रेड वाले चूरे का इस्तेमाल करने के लिए प्रोत्साहित किया जायेगा और नियमों में किसी प्रकार के परिवर्तन, जो अपेक्षित हो, के लिए संबंधित मंत्रालय के साथ मिलकर उनका मूल्यांकन किया जायेगा।
- 4.3.1.4. उपयुक्त सहायता प्रदान करके बेनिफिशिएसन और एग्लोमरेशन उद्योगों को सशक्त बनाया जायेगा। लौह अयस्क चूरे का पेलेटाइजेशन यूनिटों तक संवहन स्लरी पाइप लाइनों और कनवेयरों के माध्यम से किया जायेगा क्योंकि इससे प्रदूषण घटेगा और खनन क्षेत्रों में परिवहन अवसंरचना की भीड़ कम होगी। इस पर्यावरण अनुकूल परिवहन को बढ़ावा देने के लिए इस्पात मंत्रालय आने वाले वर्षों में स्लरी पाइप लाइन परियोजनाओं तथा उनके और अधिक विस्तार को समय पर पूरा करवायेगा।
- 4.3.1.5. लौह अयस्क की दीर्घावधि आपूर्ति सुनिश्चित करने के लिये रिसोर्स बेस में वृद्धि करने हेतु गहन एवं अपेक्षाकृत अधिक गहरी खुदाई में तेजी लाना। खदान अनुसंधान संस्थानों के सहयोग से पश्चिमी घाटों में जमा मेरेटाइट अयस्क के अधिकतम उपयोग के लिए पर्यावरण अनुकूल महत्वपूर्ण भूमिगत खनन तकनीक का पता लगाया जायेगा।
- 4.3.1.6. वैश्विक प्राकृतिक संशोधन उद्योग में कार्यनीतिक फुटप्रिंट विकसित करने के लिये विकसित देशों के साथ दो पक्षीय वार्ता के जरिए समुद्र पार से भी खनिज संपदा अर्जित की जाएगी। इस्पात क्षेत्र के उद्यमियों को स्वयं अथवा भागीदारी के आधार पर वैश्विक परियोजनाएं अर्जित एवं विकसित करने के लिए प्रोत्साहित किया जाएगा।
- 4.3.1.7. खनिज मंत्रालय के सहयोग से इस्पात मंत्रालय लौह अयस्क की बिक्री प्रक्रिया में पारदर्शिता लाने एवं भावी संभावनाओं का पता लगाने के लिए एकरूप देश व्यापी बिक्री प्लेटफार्म स्थापित करेगा।

4.3.2 लोह अयस्क पेलेट्स

4.3.2.1 मेकेनाइज्ड खनन के दौरान 60 से 70 % उत्पादन 10 एमएम से कम आकार के फाइन्स के रूप में होता है। ट्रान्सपोर्टेशन तथा हैंडलिंग के दौरान भी ये फाइन्स उत्पन्न होते हैं और इन फाइन्स का किफायती उपयोग करने के लिए इन्हें सिन्टर्स अथवा पेलेट्स में परिवर्तित करने के लिए उपयुक्त संचयन प्रक्रिया आवश्यक है।

4.3.2.2 पिछले समय तक घरेलू इस्पात उद्योग द्वारा मुख्यतः उच्चतर ग्रेड के लोह अयस्क तथा उच्चतर अनुपात में लम्प्स का उपयोग किया जाता है क्योंकि ये सुगम्य एवं सुलभ हैं। लेकिन स्लाइम्स तथा डम्प फाइन्स सहित निम्न ग्रेड लोह अयस्क का उपयोग करने की आवश्यकता पर जोर दिया जा रहा है क्योंकि ये विभिन्न खदानों के स्टॉक में संचित हैं। इसलिये उच्च ग्रेड अयस्क के संरक्षण पर विशेष जोर देते हुए मौजूदा निम्न ग्रेड लोह अयस्क संसाधनों के अधिकतम उपयोग को प्रोत्साहित किया जाएगा। वर्ष 2015-16 के अनुसार पेलेटाइजेशन क्षमता लगभग 85 एमटी है और इसकी उपयोग क्षमता 32.5 % है। अब पेलेट उद्योग पर जोर दिया जायेगा क्योंकि यह उच्च ग्रेड लोह अयस्क के स्थान पर ब्लास्ट फरनेस में प्रत्यक्ष फीड स्टॉक के रूप में काम करते हुए खनिज संरक्षण में सहायक है।

4.3.3 कोकिंग कोल और गैर कोकिंग कोल

4.3.3.1 इस समय घरेलू इस्पात उद्योग की लगभग 85% कोकिंग कोल आवश्यकता आयात के जरिए पूरी की जा रही है। इस्पात मंत्रालय समुद्र-पार परिसंपत्तियों के अर्जन के जरिये कोकिंग कोल की उपलब्धता में वृद्धि करने हेतु कोयला मंत्रालय के साथ समन्वय स्थापित करेगा और यह सुनिश्चित करेगा कि पर्याप्त संख्या में आधुनिक कोकिंग कोल वाँशरीज स्थापित की जाएं। इस्पात क्षेत्र की बढ़ती जरूरतों को पूरा करने के लिए उपयुक्त उपाय किए जाएंगे।

4.3.3.2 इसके अलावा इस्पात क्षेत्र में इस्पात उद्यमियों को कोयले की आपूर्ति सुनिश्चित करने के लिये सीआईएल द्वारा विशेष कोल लिंकेज ई-नीलामी विंडो स्थापित कराने हेतु कोयला मंत्रालय के साथ वार्ता की जाएगी। इस्पात मंत्रालय भी समय समय पर कोकिंग कोल ब्लॉकों की नीलामी करेगा जिससे इस्पात उद्योग को अपनी समर्पित कोकिंग कोल खदान विकसित करने में प्रोत्साहन मिलेगा।

4.3.3.3 देश में स्वदेशी कोकिंग कोल रिजर्व्स का केवल इस्पात क्षेत्र को आवंटन करने के भी प्रयास किए जाएंगे और यह कोयला किसी अन्य क्षेत्र को नहीं दिया जाएगा।

4.3.3.4 कोकिंग कोल की दीर्घावधि उपलब्धता सुनिश्चित करने के लिए कोयला मंत्रालय के सहयोग से इस्पात मंत्रालय अत्यधिक गहराई में स्थित कोकिंग कोल रिजर्व्स की खुदाई एवं उनका अधिकतम उपयोग करेगा। कोकिंग कोल की घरेलू उपलब्धता में सुधार लाने के लिए झरिया कार्रवाई योजना को तेजी से लागू करने के लिए भी प्रयास किए जाएंगे।

4.3.3.5 पीसीआई/सीडीआई सहित पुलवराइज्ड कोल इंजेक्शन (पीसीआई) / कोल्ड डस्ट इंजेक्शन (सीडीआई) अथवा प्राकृतिक गैस/ साइनगैस इंजेक्शन जैसी सहायक ईंधन इंजेक्शन प्रौद्योगिकी को अपनाते हुए अपनी कोकिंग कोल खपत को घटाकर विश्व की श्रेष्ठतम व्यवस्थाओं के बराबर लाने के लिए एकीकृत इस्पात संयंत्रों से भी अनुरोध किया जाएगा।

4.3.4 प्राकृतिक गैस

4.3.4.1 पैरिस संधि के अंतर्गत (सीओपी 21) भारत को उत्सर्जन सघनता 2005 के स्तर से 2030 तक अपने जीडीपी का 33-35% तक घटानी है। इस लक्ष्य को प्राप्त करने के लिए भारत को ऐसे उर्जा अनुकूल संसाधनों का पता लगाने की जरूरत है जिसका वह खर्च वहन कर सके और वे उपलब्ध भी हों।

4.3.4.2 एमएसएमई क्षेत्र में गैस आधारित रूट को कोयला आधारित डीआरआई क्षमता का प्रोन्नयन करने के लिए गैस आधारित प्रौद्योगिकी की दी गई भावी क्षमता का इस क्षेत्र के लिए केप्टिव गैस आधारित उर्जा संयंत्रों की आवश्यकता है और ब्लास्ट फर्नेस में आयातित धातुकर्मिय कोयले (कोकिंग तथा पीसीआई दोनों) पर निर्भरता को कम करने के लिए प्राकृतिक गैस को इंजेक्ट करने के विकल्प की आवश्यकता है क्योंकि गैस आधारित इस्पात निर्माण प्रौद्योगिकी में निवेश को बढ़ावा देने के लिए सुनिश्चित प्राकृतिक गैस आपूर्ति अनिवार्य है।

4.3.4.3 गैस आधारित इस्पात संयंत्रों के मामले में जो कि घरेलू स्रोतों से प्राकृतिक गैस की आपूर्ति न होने के कारण असहाय हो गए हैं, के लिए इस्पात क्षेत्र को घरेलू गैस आपूर्ति बहाल करने के लिए पेट्रोलियम तथा प्राकृतिक गैस मंत्रालय के साथ समन्वय करके विकल्पो का पता लगाया जाएगा। इसके अलावा पर ढांचे की विसंगतियों के प्रभाव को दूर करने के लिए भी प्रयास किए जाएंगे।

4.3.4.4 प्राकृतिक गैस की दीर्घावधि उपलब्धता सुनिश्चित करने के लिए प्राकृतिक गैस के नए रिजर्व्स का पता लगाने हेतु पेट्रोलियम एवं प्राकृतिक गैस मंत्रालय से संपर्क किया जाएगा। डीआरआई संयंत्रों में बाद के उपयोग के लिए साइनगैस के उत्पादन हेतु कोयले के गैसीकरण की प्रौद्योगिकी को भी बढ़ावा दिया जाएगा।

4.3.5 लाइम स्टोन, मैग्नीज अयस्क तथा क्रोमाईट अयस्क

4.3.5.1 देश में लाइम स्टोन, मैग्नीज अयस्क तथा क्रोमाईट अयस्क के संसाधन जुटाने के लिए मंत्रालय बड़े हुए खुदाई प्रयासों को पर्याप्त सहायता देगा। इस्पात ग्रेड लाइम स्टोन, उच्च ग्रेड निम्न फॉस्फोरस मैग्नीज अयस्क तथा उच्च ग्रेड क्रोमाईट लंपी अयस्क के मामले में इस्पात उद्योग को आयात पर ही निर्भर रहना पड़ सकता है। इस सामग्री के आयात को प्रोत्साहित करने के लिए समुचित उपाय किए जाएंगे क्योंकि यह सीमित मात्रा में उपलब्ध है। यह मंत्रालय हिमाचल प्रदेश और राजस्थान में उपलब्ध हाई ग्रेड लाइम स्टोन के पर्यावरण अनुकूल चिर स्थाई अधिकतम उपयोग की संभावना का भी पता लगाएगा। इस उभरते उद्योग को इस सामग्री की निरंतर अपूर्ति बनाए रखने के लिए विश्व स्तर पर ऐसी परिसंपत्तियों के अर्जन हेतु भी इस उद्योग को प्रोत्साहित किया जाएगा। मैग्नीज तथा क्रोमाईट अयस्क की और अधिक अनुसंधान के लिए

4.3.6 फेरो एलॉय

4.3.6.1 फेरो एलॉय उर्जा के अधिक उपयोग वाला उद्योग है इसलिए फेरो एलॉय संयंत्रों में केप्टिव विद्युत उत्पादन को काफी सहायता दी जाएगी। चूंकि देश में इस्पात के उत्पादन के साथ-साथ फेरो एलॉय की मांग भी बढ़ने वाली है, इसलिए पर्याप्त स्तरीय अर्थ व्यवस्था प्राप्त करने के लिए इस उद्योग को और अधिक बड़ी यूनितें लगाने के लिए प्रोत्साहित किया जाए। फेरो एलॉय यूनितों को बढ़ावा देने के लिए आवश्यक कच्चा माल लिकेंज और स्थिर बिजली सप्लाई हेतु प्राथमिकता के आधार पर प्रयास किए जाएंगे।

4.3.7 रिफ्रेक्टरी रॉ-मैटेरियल

4.3.7.1 भारत में मुख्य रिफ्रेक्टरी रॉ-मैटेरियल, जैसे बॉक्साइट (रिफ्रेक्टरी ग्रेड) और मैग्नीसाइट के अच्छी किस्म के भंडार नहीं हैं तथा वह अधिकतर आयात पर निर्भर है। अतः इस्पात क्षेत्र में रिफ्रेक्टरीज की बढ़ती मांग को पूरा करने के लिए उपयुक्त उपाय तथा प्रक्रियागत सरलीकरण किया जाएगा।

4.3.7.2 भू-विज्ञान की दृष्टि से फायर-क्ले रिफ्रेक्टरीज निर्माण के लिए एक महत्वपूर्ण कच्चा माल है जो प्रायः कोल भंडारों के साथ ही पाया जाता है लेकिन इन कोल भंडारों के साथ पाए जाने वाले इसके घरेलू संसाधनों का पूर्णतया उपयोग बहुत ही मुश्किल है। इसलिए घरेलू उद्योग को फायर-क्ले की सप्लाई बढ़ाने के लिए इसे निकालने की क्षमता का अध्ययन किया जाएगा।

4.3.8 निक्कल

4.3.8.1 फेरो एलॉय तथा एलॉय/स्टेनलेस स्टील उद्योग से निक्कल की निरंतर मांग बन रही है। व्यावहारिक तौर पर निक्कल देश में उपलब्ध नहीं है और अनरॉट किस्म की समस्त मात्रा तथा अन्य प्रकार के निक्कल की आवश्यकताएं आयातित निक्कल से पूरी की जाती हैं इसलिए इस उद्योग को इसकी निरंतर अपूर्ति बनाए रखने के लिए ऐसी परिसंपत्तियों को विश्व स्तर पर अर्जित करने हेतु उद्योग को प्रोत्साहित किया जाए।

4.3.9 फेरो स्क्रैप

4.3.9.1 देश में स्क्रैप आधारित इस्पात निर्माण प्रौद्योगिकियों के उपयोग को बढ़ावा देने के साथ-साथ जीएचजी उत्सर्जन सघनता को कम करने के लिए फेरो स्क्रैप की उपलब्धता बढ़ाने हेतु कार्रवाई आरंभ की जाएगी। स्क्रैप छंट्टाई(किस्मवार), एकीकृत करने, प्रोसेसिंग तथा रीसाइक्लिंग नीति विकसित करने हेतु अन्य संबंधित मंत्रालयों के साथ समन्वय स्थापित कर के भी विकल्पों की तलाश की जाएगी।

4.3.9.2 अच्छी किस्म के स्क्रैप की पर्याप्त मात्रा की उपलब्धता सुनिश्चित करने के लिए देश में आधुनिक इस्पात श्रेडिंग संयंत्रों को बढ़ावा देने के लिए संगठित एवं पर्यावरण अनुकूल स्थापित की जाएगी।

4.3.9.3 देश में स्क्रैप आधारित स्टील निर्माण के बढ़ते उपयोग को प्रोत्साहित करने के लिए इस क्षेत्र में बिजली की उपलब्धता सुनिश्चित करने हेतु उर्जा मंत्रालय से समन्वय करके प्रयास किए जाएंगे।

4.4 भूमि, पानी और विद्युत

4.4.1 भारतीय इस्पात उद्योग की विकास योजनाएं भूमि अर्जन में आने वाली कठिनाइयों के कारण भी प्रभावित रही हैं। कई परियोजनाएं नीति तथा प्रक्रियागत मामलों के कारण वरीयता वाले स्थानों पर पर्याप्त भूमि अर्जन करने में हुए विलम्ब के कारण रुकी रही। लगभग 300 एमटी की कूड स्टील क्षमता को प्राप्त करने के लिए हरित पट्टी विस्तार को ध्यान में रखते हुए अनुमानतः ~91000 एकड़ अतिरिक्त भूमि की आवश्यकता है और इन परियोजनाओं को शीघ्र लागू करने के लिए इन उद्योगों को समय पर भूमि की उपलब्धता सुनिश्चित करने के लिए संबंधित राज्य सरकारों के साथ समन्वय स्थापित करेगा।

4.4.2 स्टील क्लस्टर (खासकर एमएसएमई स्टील यूनितों के लिए), सर्विस सेंटर तथा स्टील प्रोसेसिंग सेंटर स्थापित किए जाएंगे और भूमि का अधिकतम उपयोग सुनिश्चित करने के लिए भागीदारी के आधार पर संबंधित ढांचे के निर्माण को बढ़ावा दिया

जाएगा। इसी प्रकार भूमि अर्जन की सुविधा को ध्यान में रखते हुए एफडीआई परियोजनाओं सहित लघु तथा मध्यम इस्पात उद्यमों को पीपीपी (पब्लिक प्राइवेट पार्टनरशिप) के अंतर्गत औद्योगिक परिसरों तथा क्लस्टरों में अपनी यूनिटें स्थापित करने के लिए प्रोत्साहित किया जाएगा।

- 4.4.3 यह देखा गया है कि आम तौर पर इस्पात उद्योग के लिए पानी के आबंटन को कम प्राथमिकता दी जाती है। लेकिन यह पूर्वानुमान है कि 2030-31 तक इस्पात उद्योग को लगभग 1500 मिलियन क्यूबिक मीटर पानी की वार्षिक आवश्यकता होगी। इसे ध्यान में रखते हुए यह मंत्रालय इस्पात उद्योगों को प्राथमिकता के आधार पर पानी के आबंटन के लिए संबंधित राज्य सरकारों के साथ समन्वय स्थापित करेगा। सभी स्तरों पर जल संरक्षण को बढ़ावा दिया जाएगा और उद्योग के प्रयासों में सहायता दी जाएगी।
- 4.4.4 चूंकि जल एक दुर्लभ स्रोत है इसलिए इसके महत्व को ध्यान में रखते हुए इस्पात संयंत्रों से इसके रिसाव को कम करने के लिए सरकार द्वारा मुख्य जोर दिया जाता रहा है। जिसके लिए अवशिष्ट जल को प्रभावशाली ढंग से रिसाईकल करने हेतु इनोवेटिव सॉल्यूशन्स तथा तकनीकों की जरूरत होगी। इसलिए इस्पात उद्योग इस्पात उत्पादन में प्रति टन विशिष्ट जल खपत को कम करने की योजनाओं व कार्यनीतियों को बढ़ावा देगा।
- 4.4.5 चूंकि इस्पात एक बिजली खपत वाला उद्योग है इसलिए यह मंत्रालय इस्पात निर्माण प्रसुविधाओं को बिजली की उपलब्धता पर जोर देगा। वर्ष 2030-31 तक इस उद्योग की बिजली की आवश्यकता अनुमानतः 27,717 एमडब्ल्यू तक बढ़ जाएगी। कोल ब्लॉकों के डि-एलोकेशन के बाद इस्पात क्षेत्र की अनेक यूनिटें खासकर स्पंज आयरन प्लांट उंची दर पर बिजली खरीदते आ रहे हैं। इसलिए इस्पात मंत्रालय इन यूनिटों को ओपन एक्सेस के जरिए बिजली उपलब्ध कराने हेतु ऊर्जा मंत्रालय के साथ वार्ता करेगा।
- 4.4.6 इस्पात मंत्रालय अन्य मंत्रालयों के साथ परामर्श करके इस्पात संयंत्रों में वेस्ट हीट रिकवरी के उपयोग की व्यवस्था करेगा। एमएसएमई क्षेत्र में कैप्टिव उर्जा के उपयोग के लिए तथा कर व्यवस्था में विसंगतियों के प्रभाव को अनुकरणीय करने के लिए भी प्रयास किए जाएंगे।
- 4.4.7 इस्पात क्षेत्र के जरिए विकासमान परिदृश्य को देखते हुए इस्पात मंत्रालय ग्रीन फील्ड कैपेसिटी वृद्धि के लिए विशेष कार्य वाहकों (एसपीवी) की व्यवस्था करेगा और ये एसपीवी भूमि के अधिग्रहण, आवश्यक कानूनी अनुमोदन प्राप्त करेंगे, जल आपूर्ति तथा लौह अयस्क आपूर्ति के अलावा इस्पात संयंत्रों की स्थापना हेतु आवश्यक आधारभूत ढांचा विकसित करेंगे। तत्पश्चात् ये इस्पात एसपीवी इच्छुक पार्टियों द्वारा इस्पात संयंत्रों की स्थापना के लिए पारदर्शी तरीके से खुली बोली के लिए उपलब्ध करायेंगे। इसी तरह ये खनन एसपीवी, इस्पात एसपीवी को दीर्घावधि तक लौह-अयस्क उपलब्ध करायेंगे।

4.5. अवसंरचना एवं लॉजिस्टिक

- 4.5.1 चूंकि अधिकतर क्षमता वृद्धि तीन पूर्वी राज्यों उड़ीसा, छत्तीसगढ़ तथा झारखण्ड में होने वाली है, इसलिए **रेलवे, रोडवेज, बिजली उत्पादन एवं वितरण** आदि जैसे क्षेत्रों की बढ़ी हुई उद्योग मांग को पूरा करने के लिए इस्पात मंत्रालय इन क्षेत्रों में समय रहते पर्याप्त ढांचागत विकास करवायेगा।
- 4.5.2 इस्पात की मांग व उत्पादन में वृद्धि के कारण पर्याप्त अवसंरचना की जरूरत और बढ़ जाएगी। सरकार को इसमें लगने वाली समयावधि को कम करने के लिए **निष्क्रमण अवसंरचना** के विकास तथा दुलाई की दूरी को कम करने के लिए आवश्यक संयोजन व्यवस्था करने हेतु काफी बड़े निवेश की जरूरत होगी। इस्पात मंत्रालय भी **बेहतर प्लांट लेआऊट डिज़ाइन, इंजीनियरिंग, प्रौद्योगिकियों तथा आर्थिक क्षमता के अधिकतम उपयोग को बढ़ावा देने के लिए** इस्पात उद्यमियों को प्रोत्साहित करेगा।
- 4.5.3 भविष्य में बड़ी संख्या में ब्लास्ट फर्नेस लगाने की योजनाओं के साथ पैलेट्स का उपयोग भी बढ़ जाएगा जिसके लिए अयस्क/फाइन्स के अल्ट्राफाइन साइज ग्राइंडिंग की जरूरत होगी और इसलिए स्लरी पाइपलाइन्स में निवेश बढ़ेगा। इसे सरकार की ओर से उपयुक्त नीतिगत सहायता के जरिए प्रोत्साहित किया जाएगा।
- 4.5.4 स्लरी पाइपलाइन्स तथा कन्वेयर्स जैसे कच्चे माल के परिवहन के वैकल्पिक मोड्स से खनन क्षेत्र में प्रदूषण तथा सघन परिवहन नेटवर्क की समस्याओं को कम करने में काफी सहायता मिलेगी। पर्यावरण अनुकूल परिवहन को प्रोत्साहित करने के लिए अवसंरचना उद्योग, स्लरी पाइपलाइन्स को भी सभी उपलब्ध सुविधाएं देने के प्रयास किए जाएंगे।
- 4.5.5 देशीय जलमार्गों और तटीय जहाजरानी के जरिए भी कच्चे माल व परिष्कृत माल के परिवहन को प्रोत्साहित किया जाएगा। ड्रेजिंग के जरिए देश में जल मार्ग परिवहन, घाटों के आधुनिकीकरण, पर्यावरण अनुमति तथा तटीय नियामक क्षेत्र (सीआरजेड) की अनुमति के लिए अनुमोदन प्रक्रिया के सरलीकरण, समर्पित कॉरीडोर के जरिए सड़क मार्ग से बेहतर सम्पर्कता और रेल आदि में बाधाओं को दूर करने के लिए अन्य संबंधित मंत्रालयों के साथ-साथ देश में भारतीय जलमार्ग प्राधिकरण के सहयोग से आवश्यक प्रयास किए जाएंगे।

- 4.5.6 निर्यात अवसरों को प्रोत्साहित करने तथा प्रतिस्पर्धी बनने के लिए **सागरमाला कार्यक्रम** के तत्वाधान में भारत सरकार बंदरगाहों के पास **इस्पात कलस्टर्स** का विकास करने पर विचार कर रही है। जहाजरानी मंत्रालय के सहयोग से ये **तटीय इस्पात संयंत्र** लगाए जाएंगे।
- 4.5.7. इस्पात उत्पादन की मांग में आशातीत वृद्धि करने और कच्चे माल की पश्चवर्ती जरूरत को पूरा करने के लिए देश में विशेषकर कोर्किंग कोल आयात बंदरगाहों को खास तौर पर सुदृढ़ करने की जरूरत है। इस्पात उद्योग के सहयोग से ऐसी बंदरगाहों की पहचान की जायेगी और इस्पात उद्योग को कोर्किंग कोल की निर्वाध आपूर्ति सुनिश्चित करने के लिए इस मामले को जहाजरानी मंत्रालय के साथ उठाया जायेगा।
- 4.6 **उत्पाद गुणवत्ता**
- 4.6.1 भारतीय मानक ब्यूरो ने देश में उत्पादित अधिकतर लौह एवं इस्पात उत्पादों के विकास के लिए काफी बड़ी संख्या में भारतीय मानक तैयार किए हैं। लेकिन, उद्योगों द्वारा इन मानकों का वास्तविक कार्यान्वयन सीमित है जिसके कारण बड़े पैमाने पर उत्पादन, आयात और घटिया माल का उपयोग हो रहा है और इससे अवसंरचना तथा जन-सुरक्षा के लिए खतरा बना हुआ है।
- 4.6.2 **गुणवत्ता नियंत्रण आदेश:** उत्पादकों और उपभोक्ताओं को मानक अपनाने के लिए कहा जाएगा तथा अनिवार्य गुणवत्ता प्रमाणन सुनिश्चित किया जाएगा। अभी हाल ही में इस्पात तथा इस्पात उत्पाद (गुणता नियंत्रण) और स्टेनलेस स्टील (गुणता नियंत्रण) आदेश लागू किया गया है जिससे कुछ उत्पादों के लिए भारतीय मानक ब्यूरो का प्रमाणन अनिवार्य है। भारतीय मानक ब्यूरो के सहयोग से इस आदेश के कार्यान्वयन पर कड़ाई से निगरानी रखी जाएगी। बीआईएस की इस अनिवार्य गुणवत्ता प्रमाणन मार्क योजना के अंतर्गत तैंतीस (33) इस्पात उत्पाद पहले ही अधिसूचित किए गए हैं। मानव स्वास्थ्य की सुरक्षा, पर्यावरण तथा संरक्षा सुनिश्चित करने के लिए क्रिटिकल एंड-यूज एप्लीकेशन्स के उपयोग में लाए जाने वाले और अधिक इस्पात उत्पादों को इसमें शामिल करने के प्रयास किए जाएंगे।
- 4.6.3 एमएसएमई क्षेत्र की यूनियों, खासकर स्मॉल रि-रोलिंग मिल्स तथा इंडक्शन फर्नेस यूनियों के पास इन-हाऊस गुणता जांच सुविधाओं की कमी है। इन स्टील हब्स में ये गुणता जांच सुविधाएं स्थापित की जाएंगी तथा संभावित बढ़ती मांग को पूरा करने के लिए पहले से स्थापित सुविधाओं को और अधिक सुदृढ़ किया जाएगा। इस्पात तथा उत्पाद (गुणता नियंत्रण) आदेश की शर्तों का पालन करने के अलावा इस्पात मंत्रालय खासकर एमएसएमई क्षेत्र में अनुसंधान एवं विकास करवाकर और प्रौद्योगिकीय हस्तक्षेप तथा वित्तीय सहायता देकर बढ़िया इस्पात का उत्पादन करवायेगा। इस दिशा में और भी कदमों को प्रोत्साहन दिया जाएगा।
- 4.6.4 इस्पात और इस्पात उत्पाद (गुणता नियंत्रण) आदेश की शर्तों के अनुपालन के अलावा इस्पात मंत्रालय खासकर एमएसएमई क्षेत्र में अनुसंधान एवं विकास तथा प्रौद्योगिकीय हस्तक्षेप करके और वित्तीय सहायता प्रदान करके गुणता युक्त इस्पात का उत्पादन भी कर रहा है।
- 4.7 **प्रौद्योगिकीय कुशलता**
- 4.7.1 हालांकि प्रौद्योगिकी का चयन तकनीकी-आर्थिक घटकों के आधार पर उद्यमियों द्वारा किया जाएगा, लेकिन इस्पात मंत्रालय भी प्रौद्योगिकीयों को अपनाने के लिए प्रोत्साहित करेगा, जो इस प्रकार है:
- 4.7.1.1 ये पर्यावरण को न्यूनतम नुकसान पहुंचाने वाली और महत्वपूर्ण औद्योगिक एवं वैज्ञानिक उद्योगों के लिए अपेक्षित उच्च किस्म के खास इस्पात के उत्पादन हेतु घरेलू संसाधनों को प्रभावी एवं दक्षतापूर्ण उपयोग के लिए अनुकूल है।
- 4.7.1.2 इस्पात निर्माण के विभिन्न स्तरों में पर्यावरण नुकसान को न्यूनतम करना।
- 4.7.1.3 संसाधनों का अधिकतम उपयोग तथा इस्पात उद्योग का आधुनिकीकरण ताकि उत्पादकता एवं दक्षता के वैश्विक मानक प्राप्त किए जा सकें।
- 4.7.1.4 फ्रंट-एंड तथा स्ट्रेटेजिक इस्पात आधारित सामग्री का विकास करना।
- 4.7.2. इस उद्योग की प्रतिस्पर्धात्मकता में सुधार लाने के लिए इस्पात यूनियों के तकनीकी-आर्थिक पैरामीटरों में सुधार करना महत्वपूर्ण है। इस्पात उद्योग के 2030-31 तक के अनुमानित तकनीकी-आर्थिक निष्पादन पैरामीटरों का विवरण **अनुबंध-IV** में दिया गया है। उपयुक्त एजेंसी के सहयोग से इस्पात मंत्रालय विश्व की सर्वोत्तम प्रणालियों के साथ-साथ देश के सभी इस्पात संयंत्रों के तकनीकी-आर्थिक निष्पादन पर निरंतर निगरानी रखेगा। इसके अलावा इन चार्ज मिक्स पर मौजूद दबाव के बढ़ते उपयोग और ब्लास्ट फर्नेस में पीसीआई के अपेक्षाकृत अधिक उपयोग को भी बढ़ावा दिया जाएगा।
- 4.7.3. प्रौद्योगिकीय तौर पर अपेक्षाकृत अधिक उन्नत उत्पादों के उत्पादन एवं विकास के लिए महत्वपूर्ण संयुक्त उद्यम स्थापित करने के लिए इस्पात कंपनियों को प्रोत्साहित किया जाएगा। ऑटोमोटिव स्टील के उत्पादन हेतु तथा उत्पाद विकास/बॉयलर

गुणता प्लेट्स एवं अलॉय ट्यूब सामग्री, इलेक्ट्रिकल स्टील सहित अन्य विशिष्ट इस्पातों के लिए प्रौद्योगिकी हस्तांतरण उपलब्ध कराया जाएगा।

4.7.4. इस्पात मंत्रालय द्वारा कम संसाधन खपत तथा कम ऊर्जा खपत वाली इस्पात निर्माण प्रौद्योगिकियों के साथ-साथ नए उत्पादों का विकास करने के लिए देश में ही अनुसंधान संस्थानों को प्रोत्साहित किया जाएगा।

4.8 एमएसएमई इस्पात क्षेत्र

4.8.1. भारत ने पिछले वर्षों के दौरान मजबूत एमएसएमई क्षेत्र विकसित किया है (जिसमें डीआरआई-ईएएफ/आईएफ रूट आधारित इस्पात उत्पादक तथा रोलिंग मिल शामिल हैं) जो भारत में एकमात्र है। इसमें भारतीय इस्पात उद्योग की उद्यमशीलता और नवोन्मेषी शक्तियां निहित हैं जो बीएफ-बीओएफ रूट को एक अवसर में परिवर्तित करने वाली कोकिंग कोल की अनुपलब्धता का एक मुख्य इनपुट है।

4.8.2. तथापि, इसकी विभिन्न यूनितों में ऑपरेशन के मापदंड, प्रोडक्ट मिक्स तथा प्रौद्योगिकी के रूप में अनेक भिन्नताएं हैं। स्पंज लौह उद्योग सहित एमएसएमई क्षेत्र रोजगार उपलब्ध कराने, थोड़ी मात्रा में अपेक्षित कुछ खास उत्पादों की मांग को पूरा करने तथा अंदरूनी इलाकों में इस्पात की स्थानीय मांग को पूरा करने में महत्वपूर्ण भूमिका निभाता है। इसके अलावा इस क्षेत्र का निर्यात भी अत्यधिक है जिससे देश को विदेशी मुद्रा अर्जित करने में सहायता मिलती है।

4.8.3. एमएसएमई इस्पात क्षेत्र तथा सम्बद्ध इस्पात उद्योग के निष्पादन में सुधार लाने के लिए नीचे दिए गए अनेक उपाय किए जाएंगे:

4.8.3.1 केवल इस्पात/स्पंज लौह क्षेत्र के लिए नॉन कोकिंग कोल की नीलामी और घरेलू बाजार में लौह अयस्क की उपलब्धता बढ़ाकर कच्चे माल की उपलब्धता सुनिश्चित की जाएगी।

4.8.3.2 सम्पूर्ण उत्पादकता में सुधार लाने एवं बिजली की खपत कम करने के लिए एमएसएमई इस्पात क्षेत्र में ऊर्जा किफायती प्रौद्योगिकियों को अपनाने को प्रोत्साहन दिया जाएगा।

4.8.3.3 भूमि का अधिकतम उपयोग करने के लिए और मितव्ययिता प्राप्त करने के लिए, लोहा और इस्पात निर्माण की लघु और मध्यम आकार की यूनितों को प्रस्तावित इंडस्ट्रियल कोरिडोर में और क्लस्टर में स्थापित होने के लिए प्रोत्साहित किया जाएगा।

4.9 स्टेनलेस इस्पात में मूल्य वर्धन

4.9.1 यद्यपि भारत इस्पात का विश्व में तीसरा सबसे बड़ा उत्पादक है, फिर भी यह हाई एंड उपयोगों में प्रयुक्त होने वाले स्टेनलेस स्टील के लिए अभी भी पूर्ण रूप से आयातक बना हुआ है। इस्पात की मांग में वृद्धि होने और वर्ष 2030 - 31 तक 200 एमटीपीए अतिरिक्त क्षमता का निर्माण करने की आवश्यकता होने से स्टेनलेस स्टील के लिए भी पर्याप्त क्षमता अभिवृद्धि करने की आवश्यकता होगी। भारतीय इस्पात क्षेत्र के अधिकतर क्षेत्रों के समान स्टेनलेस स्टील उद्योग भी विगत 3-4 वर्षों से कठिनाई का सामना कर रहा है। आज कम मूल्य वाले आयातों में वृद्धि होने और कीमतों में गिरावट होने के कारण स्टेनलेस स्टील के घरेलू उद्योग का क्षमता उपयोग बहुत ही कम है जो कि लगभग 50% है। इस प्रकार स्टेनलेस स्टील की विद्यमान और भावी क्षमताओं को व्यापार की अनुचित पद्धतियों से बचाने के लिए उपयुक्त उपचारी उपाय करते हुए आवश्यक प्रयास किए जाएंगे।

4.9.2 इसके अतिरिक्त, गुणवत्ता के महत्व से पहले मूल्य प्रतिफल और स्टेनलेस स्टील के आयात पर विचार करना पड़ जाता है। आवश्यक अंतिम अनुप्रयोगों के लिए देश स्टेनलेस स्टील के सुपर डुप्लेक्स, सुपर ऑस्टेनिटिक और उच्च अलॉय प्रकारों के लिए आयातों पर निर्भर है। मंत्रालय स्टेनलेस स्टील के आवश्यक अंतिम अनुप्रयोगों समेत प्रौद्योगिकीय दृष्टि से और अधिक जटिल उत्पादों के उत्पादन और विकास के लिए रणनीतिक व्यवसाय स्थापित करने हेतु इस्पात उत्पादकों को प्रोत्साहित करेगा।

4.9.3 प्रतिस्पर्धात्मक सामग्रियों के खतरों का सामना करने के लिए विशेष रूप से ग्रामीण क्षेत्रों में बड़े अभियानों के जरिए स्टेनलेस स्टील के उपयोग को प्रोत्साहित किया जाएगा। देश के तटीय और भूकंप प्रभावित क्षेत्रों में आवासीय अथवा वाणिज्यिक निर्माण कार्यों में स्टेनलेस स्टील का अधिकाधिक उपयोग किए जाने को भी प्रोत्साहित किया जाएगा। नुकसानदायक गुणवत्ता से बचने के लिए पेयजल पाइपलाइनों, जल भंडारण और अनाज सामग्री की पैकेजिंग में उच्च गुणवत्ता वाले स्टेनलेस स्टील के उपयोग को बढ़ावा दिया जाएगा।

4.10 अलॉय और विशेष इस्पात में मूल्यवर्धन

- 4.10.1 जहां एक और देश में कई प्रकार के मूल्यवर्धित इस्पात उत्पादों का घरेलू स्तर पर उत्पादन किया जा रहा है, वहीं दूसरी ओर देश अभी भी उच्च निष्पादन वाले और मूल्यवर्धित इस्पात उत्पादों जैसे कि इलेक्ट्रिकल स्टील, ऑटोमोटिव ग्रेड के स्टील इत्यादि तथा रक्षा, अंतरिक्ष एवं न्यूक्लीयर अनुप्रयोगों में इस्तेमाल किये जाने वाले विशेष इस्पात के लिए अभी भी आयात पर निर्भर है।
- 4.10.2 भविष्य में मांग के बढ़ने और बड़ी विस्तार परियोजनाओं के विचाराधीन होने के मद्देनजर अलॉय और विशेष इस्पातों पर अधिक जोर दिए जाने की आवश्यकता है, क्योंकि इससे इस्पात निर्माताओं और उपभोक्ताओं दोनों के लिए बेहतर लाभ सुरक्षित होते हैं। ये उत्पाद मुख्य रूप से फिनिशड इस्पात हैं और अपने उपयोग अथवा ऑटोमोबाइल एवं उपभोक्ता वस्तु क्षेत्रों में अंतिम उपयोग पर निर्भर करते हैं। इस प्रकार, इस उद्देश्य के लिए तकनीकी और रणनीतिक सहयोग के लिए विदेशी व्यवसायियों के साथ सहयोग स्थापित करने के आवश्यक प्रयास किए जाएंगे।
- 4.10.3 गत 2 वर्षों से विभिन्न बाजार क्षेत्रों से अनुप्रयोग के सख्त मानकों को पूरा करने के लिए अलॉय और विशेष इस्पात, अथवा मूल्यवर्धित इस्पात की मांग बढ़ रही है। भारतीय इस्पात निर्माताओं का भावी विकास भी मूल्यवर्धित उत्पादों द्वारा संचालित होगा। इन प्रीमियम ग्रेड के उत्पादों का उत्पादन करने से न केवल उन्हें मूल्य प्राप्ति में सुधार की सहायता प्राप्त होगी, बल्कि इससे इस्पात निर्माताओं का टॉप लाइन विकास भी आगे बढ़ेगा। इस प्रकार, मंत्रालय अलॉय स्टील और इलेक्ट्रिकल स्टील के हाई एंड प्रकारों समेत प्रौद्योगिकीय दृष्टि से जटिल उत्पादों के उत्पादन और विकास हेतु रणनीतिक उद्योग स्थापित करने के लिए इस्पात उत्पादकों को प्रोत्साहित करेगा।

4.11 पर्यावरण प्रबंधन

- 4.11.1 यद्यपि इस्पात कंपनियां प्रौद्योगिकीय अपग्रेडेशन/ आधुनिकीकरण के माध्यम से और/अथवा संयंत्रों में कम ऊर्जा खपत वाली और पर्यावरण के अनुकूल प्रौद्योगिकियों के माध्यम से अपने संयंत्रों में ऊर्जा एवं पर्यावरण संबंधी मुद्दों का स्वयं समाधान कर रहे हैं, फिर भी मंत्रालय विभिन्न प्लेटफार्मों/ व्यवस्थाओं के जरिए इस्पात संयंत्रों के ऊर्जा और पर्यावरण परिदृश्य में सुधार किए जाने को सुविधाजनक बनाएगा।
- 4.11.2 मंत्रालय उत्तम पद्धतियों को तैयार करने के लिए तथा ऐसी नीतियों और कार्यक्रमों को प्रोत्साहित करने के लिए एक फोरम के सृजन को सुविधाजनक बनाएगा, जिससे स्वच्छ ऊर्जा की अर्थव्यवस्था बनाए जाने को प्रोत्साहन मिल सके और इसमें शीघ्रता लाई जा सके। कम ऊर्जा खपत के इन सख्त मानकों की अनुपालना के अतिरिक्त, इस्पात कंपनियों को उपलब्ध उत्तम प्रौद्योगिकियों और पद्धतियों को अपनाने के लिए भी प्रोत्साहित किया जाएगा, ताकि स्वच्छ और प्रदूषण मुक्त पर्यावरण मिल सके।
- 4.11.3 ऊर्जा और पर्यावरण प्रबंधन एक सतत प्रक्रिया है और यह प्रक्रिया लोहा और इस्पात संयंत्रों द्वारा अपनाई गई प्रौद्योगिकियों से प्रत्यक्ष रूप से जुड़ी हुई है। मंत्रालय अब तक ऊर्जा की कार्यकुशलता में सुधार को सुविधाजनक बनाने के लिए कुछ व्यवस्थाओं का सफलतापूर्वक क्रियान्वयन कर चुका है जैसे कि सीपीएसई में नीडो मॉडल योजनाएं तथा स्टील रि-रोलिंग मिलों में यूएनडीपी- एयूएसएआईडी-एम्ओएस स्टील परियोजना इत्यादि। इन व्यवस्थाओं को सुदृढ़ बनाने के लिए आगे भी प्रयास किए जाएंगे, जिसके तहत और अधिक स्टील रि-रोलिंग मिलों और इंडक्शन फर्नेस यूनिटों को शामिल किया जा सकेगा।
- 4.11.4 सभी अपशिष्ट पदार्थों को एक कम मूल्य वाली संपत्ति मानते हुए, मंत्रालय शून्य अपशिष्ट पर अतिरिक्त जोर प्रदान करने अथवा अपशिष्ट पदार्थों की रि-साइक्लिंग हेतु अपशिष्ट प्रबंधन योजना बनाने के लिए इस्पात कंपनियों को प्रोत्साहित करेगा। सड़क निर्माण, रेल ब्लास्ट, निर्माण सामग्री, सॉइल कंडिशनर इत्यादि जैसे वैकल्पिक उपयोगों में लोहा और इस्पात स्लैग के इस्तेमाल को प्रोत्साहित करने के लिए मंत्रालय द्वारा आगे भी ठोस प्रयास किए जाएंगे। साथ साथ ही इस्पात संयंत्रों को एसएमएस स्लैग विदरिंग/ स्टीम एजिंग प्लांट्स स्थापित करने के लिए प्रेरित किया जाएगा, ताकि वे सड़क निर्माण और रेल ब्लास्ट इत्यादि के लिए प्रोसेस किया हुआ/ उपयुक्त आकार के एसएमएस स्लैग की आपूर्ति कर सकें।
- 4.11.5 इस्पात मंत्रालय पार्टिकुलेट मैटर के उत्सर्जन, एसओएक्स एंड एनओएक्स, पानी की खपत और शून्य अथवा शून्य के लगभग तरल पदार्थों के डिस्चार्ज के संबंध में विश्व स्तर पर उपलब्ध पद्धतियों के समान मानकों को तैयार करने और उनको अपनाने में सुविधा प्रदान करेगा।

4.11.6 भारत ने हाल ही में पेरिस घोषणा- पत्र (सीओपी 21) पर हस्ताक्षर किए हैं, जिसके अंतर्गत वर्ष 2005 के स्तर की तुलना में वर्ष 2030 तक इसके जीडीपी में से 33 से 35% उत्सर्जन कम करने का इरादा तय किया गया है। इस संबंध में इस्पात मंत्रालय लोहा और इस्पात क्षेत्र में जीएच जी उत्सर्जन को कम करने के लिए इंटेडेड नेशनली डिटरमाइंड कंट्रीब्यूशन (आई एन डी सी) प्रस्तुत कर चुका है, जो अन्य के साथ-साथ अंतिम वर्ष 2030 तक बीएफ -बीओएफ रूट से प्रति टन क्रूड स्टील के उत्पादन में 2.2 - 2.4 टन सीओ₂ उत्सर्जन और डीआरआई- ईएएफ रूट से प्रति टन क्रूड स्टील के उत्पादन में 2.6 -2.7 टन उत्सर्जन को प्रक्षेपित करता है। मंत्रालय एक संभावित सीमा तक विश्वस्तर पर उपलब्ध उत्तम पद्धतियों के समान उक्त मानकों को प्राप्त करने के लिए उद्योग के साथ परामर्श करके साधन व तरीकों का पता लगाएगा।

4.11.7 कोयला आधारित रूटों के जरिए क्षमता वृद्धि करने से पर्यावरण में गिरावट की दृष्टि से भारत के लिए दूरगामी परिणाम प्राप्त होंगे, इसलिए आईएनडीसी लक्ष्यों के अनुसार इस्पात क्षेत्र के कार्बन फुटप्रिंट को कम करने के लिए उत्पादन रूटों का एक विवेक संगत मिश्रण बनाने के प्रयास किए जाएंगे।

4.12 सुरक्षा

4.12.1 इस्पात मंत्रालय आवधिक समीक्षाओं के जरिए निजी क्षेत्र समेत अपनी सभी इस्पात कंपनियों के सुरक्षा निष्पादन को निरंतर मॉनिटर करेगा। सुरक्षा के सुस्पष्ट परिभाषित मानकों और इसके लक्ष्य तैयार किये जाने को प्रोत्साहित करने के लिए आवश्यक प्रयास किए जाएंगे, ताकि कार्यस्थल शून्य दुर्घटना वाला बन सके।

4.12.2 इस्पात मंत्रालय यह सुनिश्चित करने के लिए इस्पात कंपनियों के साथ समन्वय स्थापित करेगा कि इस्पात कंपनियों के कर्मचारियों को कार्यस्थल सुरक्षित रखने के संबंध में ऑन जॉब ट्रेनिंग प्रदान की जा सके। स्टील रिसर्च एंड टेक्नोलॉजी मिशन ऑफ इंडिया (एसआरटीएमआई) द्वारा इस प्रकार के प्रशिक्षण के आयोजन के लिए छोटे आकार की उन यूनितों को सुविधा प्रदान की जाएगी जो अपने स्तर पर प्रशिक्षण का आयोजन करने में सक्षम नहीं हो सकते हैं।

4.13 व्यापार

4.13.1 भारत वर्ष 2013 -14 में इस्पात का एक शुद्ध रूप से निर्यातक था। इस्पात की मांग में विश्व स्तर पर मंदी आने और चीन एवं जापान जैसे बड़े इस्पात निर्माता देशों में अत्यधिक क्षमता की विद्यमानता होने के कारण भारत में वर्ष 2014 -15 में आयातों में अधिक वृद्धि देखी गई है, जोकि वर्ष 2015 16 में भी इसी प्रकार जारी रही वर्ष 2013-14 से फिनिशड इस्पात के उत्पादन, खपत, आयात और निर्यात के ब्यौरे **अनुबंध -V** में दिए गए हैं।

4.13.2 इस्पात उद्योग के आवर्ती स्वभाव को देखते हुए, भविष्य में भी भेदभावपूर्ण व्यावसायिक परम्पराओं की स्थितियां संभावित हैं। ऐसी स्थिति बार-बार न आए, इसके लिए सरकार लगातार सावधान रहेगी और आवश्यकतानुसार विश्व व्यापार संगठन के दिशा-निर्देशों और/या विदेश व्यापार नीति के अनुसार उपयुक्त व्यापारिक उपचारात्मक उपायों के साथ बाजार में हस्तक्षेप करती रहेगी ताकि घरेलू उत्पादकों के लाभ सुरक्षित रह सकें।

4.13.3. इस्पात मंत्रालय को न केवल बेसिक श्रेणी के इस्पात, अपितु उच्च गुणवत्ता वाले इस्पात, जो फिलहाल कुछ चुनिंदा अंतर्राष्ट्रीय इस्पात कंपनियों द्वारा ही उत्पादित किया जा रहा है, में प्रतिस्पर्धा में रहने और अपनी वैश्विक उपस्थिति विकसित करने के लिए प्रोत्साहित किया जाएगा। विभिन्न केन्द्रीय और राज्य करों व प्रभारों के संबंध में निर्यात उत्पाद ज़ीरो रेटेड सुनिश्चित करने के लिए इस्पात मंत्रालय वाणिज्य मंत्रालय से परामर्श करेगा।

4.13.4. इसके अतिरिक्त, अन्य देशों द्वारा भारतीय इस्पात उत्पादों पर कतिपय व्यापारिक प्रतिबंध भी लगाए गए हैं। अतः अपनी शिकायतें उन देशों के साथ व्यापारिक उपचारात्मक प्रक्रियाओं के दौरान सम्प्रेषित करने के लिए घरेलू इस्पात उद्योग को प्रोत्साहित किया जाएगा।

4.13.5 आज की दुनिया में सूचनाओं के महत्व को देखते हुए, संयुक्त संयंत्र सिमिति (जेपीसी) और आर्थिक अनुसंधान इकाई (ईआरयू) जैसे विद्यमान संस्थानों को उद्योग की आवश्यकता और स्टील और कच्चे माल से संबंधित बाजार की जानकारी के मद्देनजर और सुदृढ़ किया जाएगा। उद्योग को इस्पात और उसके कच्चे माल संबंधी बाजार जानकारी और उसकी आवश्यकताओं की पूर्ति के लिए विदेशों में इस्पात और संबंधित क्षेत्रों में लगातार नीतिबद्ध अनुसंधान, वैश्विक व्यापार में विकास की सतत ट्रैकिंग, इस्पात उद्योग में वैश्विक निवेश, इस्पात और इससे संबंधित क्षेत्रों में आने वाली नई प्रौद्योगिकियों और लौह अयस्क, कोयला आदि में नई खनन सम्पदाओं के आंकड़ों पर भी सहयोग किया जाएगा। अंतर्राष्ट्रीय और घरेलू इस्पात मांग पर

लगातार अनुसंधान को भी प्रोत्साहित किया जाएगा और विदेशों में इस्पात और तत्संबंधी उद्योगों में निवेश के खतरों का भी लगातार आकलन किया जाएगा।

4.14. वित्तीय जोखिम :

4.14.1. अपेक्षित इस्पात क्षमता को बढ़ाने और इस्पात उद्योग की वर्तमान स्थिति में सुधार करने के लिए, वित्तीय संसाधनों की अत्यधिक आवश्यकताओं को देखते हुए इस उद्योग के लिए पर्याप्त पूंजी की व्यवस्था करना भविष्य के लिए एक बड़ी चुनौती होगा। अतः, इस्पात उद्योग को पूंजीगत लागत घटाने और ऋण तथा सेवा इक्विटी को न्यूनतम रखने के लिए पूंजी का समुचित स्वरूप विकसित करने में नवीनतम बनाए रखने के लिए प्रोत्साहित किया जाएगा।

4.14.2. इस्पात मंत्रालय इस्पात क्षेत्र में डूबत ऋण का पता लगाने का भी प्रयास करेगा। ऐसी कंपनियों को आरबीआई के दिशा-निर्देशों के अनुसार बैंक से परामर्श कर उचित ऋण पुनर्संरचना अपनाकर ऋण/ईबीआईटीडीए अनुपात कम करने के लिए प्रोत्साहित किया जाएगा।

4.15. सीपीएसई की भूमिका और आगे की योजना

4.15.1. कंपनी एक्ट, 2013 दिनांक 29 अगस्त, 2013 को अधिनियमित हुआ था और इसने कंपनी एक्ट, 1956 को प्रतिस्थापित किया था। इसके अतिरिक्त, कारपोरेट कार्य मंत्रालय ने भी प्रबंधन और प्रशासन (मार्च 2015), निदेशकों की योग्यता और नियुक्ति (जनवरी 2015), बोर्ड की बैठक व उसकी शक्तियां (मार्च 2015) और लेखा (अक्टूबर 2014) पर कंपनी नियम 2014 अधिसूचित किया है। कंपनी एक्ट, 2013 कंपनी नियमों के साथ कारपोरेट गवर्नेंस के लिए एक संतुलित फ्रेमवर्क उपलब्ध कराता है। ये सांविधिक प्रावधान सीपीएसई पर भी लागू होते हैं।

4.15.2. वर्तमान परिदृश्य में, इस्पात बनाने वाले सीपीएसई को न केवल निजी संघटित इस्पात प्लेयर्स से प्रतिस्पर्धा करने और एमएसएमई स्टील क्षेत्र की जरूरतों की पूर्ति करने की आवश्यकता है अपितु वैश्विक स्तर पर भी प्रतिस्पर्धी बने रहने की जरूरत है। मितव्ययता के लिए सीपीएसई को अपनी महत्वपूर्ण क्षमताओं पर ध्यान केंद्रित करने के लिए प्रोत्साहित किया जाएगा और मर्जर व रिस्ट्रक्चरिंग के माध्यम से उनकी कम महत्वपूर्ण परिसम्पत्तियों को खत्म किया जाएगा।

4.15.3. अभी, सीपीएसई ने हाई एंड उत्पाद विकास के संदर्भ में सीमित मूल्यवर्द्धन के साथ समान इस्पात क्षेत्र के ब्राऊन फील्ड एक्सपेंशन में मुख्य रूप से ध्यान दिया है और निवेश किया है। मंत्रालय सीपीएसई को भावी निवेश के लिए पॉलिसी विकसित करने के लिए प्रोत्साहित करेगा ताकि मूल्यवर्द्धित इस्पात क्षमता का विकास किया जा सके और विश्वस्तर पर श्रेष्ठ परम्पराओं के साथ नवीन प्रौद्योगिकी को समानता से ग्रहण किया जा सके।

4.15.4. इसके अतिरिक्त, सीपीएसई को इस बात के लिए भी प्रोत्साहित किया जाएगा कि वह इस्पात उद्योग और उसके समुदाय के विकास में मुखिया की भूमिका निभाए, अधिक बेहतर बिजनेस मॉडल अपनाए, अपने सीएसआर व्यय बढ़ाए, इंजीनियरिंग डिजाइन और इंजीनियरिंग के लिए आरएण्डडी में निवेश करे तथा आयात के प्रतिस्थापन हेतु उत्पाद का विकास करे। इसके आगे, सीपीएसई को इस बात के लिए भी प्रोत्साहित किया जाएगा कि वह सड़क, रेलवे, ब्रिज, क्रैश बैरियर्स इत्यादि के लिए अधिक स्टील खपत वाले डिजाइनों के विकास के मार्फत अधिक इस्पात उपयोग को बढ़ावा देने में प्रमुखता दिखाए।

4.15.5. तदनंतर, समान सीपीएसई में सहयोग को बढ़ावा देने के लिए, समान/स्वतंत्र सीपीएसई में स्वतंत्र निदेशकों की नियुक्ति सुनिश्चित करने के प्रयास किए जाएंगे।

4.16. हाई एंड अनुसंधान पर जोर देना : स्टील रिसर्च एण्ड टेक्नोलॉजी मिशन ऑफ इंडिया (एसआरटीएमआई)

4.16.1. भारत में, फिलहाल लोहा एवं इस्पात क्षेत्र में वास्तविक आरएण्डडी सेल, टाटा स्टील, जेएसडब्ल्यू, आदि जैसी प्रमुख स्टील कंपनियों द्वारा करवाया जा रहा है, जिन्होंने कच्चा माल परिष्करण, एकत्रीकरण और उत्पाद विकास के क्षेत्र में कोई उल्लेखनीय कार्य निष्पादित किया है। तथापि, सामान्यतया आरएण्डडी का मुख्य फोकस दिन-प्रतिदिन के कार्यकलापों तक सीमित है और इसलिए विघटनकारी परिवर्तनों की कमी है।

4.16.2. इस्पात क्षेत्र में भारत का आरएण्डडी निवेश वास्तविक शब्दों तक ही सीमित नहीं है, अपितु टर्नओवर के प्रतिशत के रूप में भी है जो कि विदेशों में प्रमुख इस्पात कंपनियों के 1% की तुलना में 0.05-0.5% है। भारतीय इस्पात कंपनियों को अपना आरएण्डडी व्यय टर्नओवर के कम से कम 1% तक बढ़ाने के लिए समयबद्ध कार्ययोजना बनाने की जरूरत है।

4.16.3. पर्यावरणीय नुकसानों को न्यूनतम बनाए रखने के उद्देश्य से आरएण्डडी कार्यक्रमों के संयुक्त सहयोग से देश के प्राकृतिक संसाधनों के साथ सहयोगात्मक रूप से उत्पादों और प्रक्रियाओं के विकास के लिए विनिर्माण क्षमता विकसित करने के प्रयास किए जाएंगे।

- 4.16.4 लोहा एवं इस्पात क्षेत्र में आरएण्डडी को बढ़ावा देने के लिए इस्पात मंत्रालय ने भारतीय इस्पात उद्योग में प्रौद्योगिकीय परिदृश्य का सम्पूर्ण संज्ञान ले लिया है और इसके लिए एक व्यापक ब्लू प्रिंट तैयार करने की नई पहल प्रारंभ कर दी गई है। सभी हितधारकों को अत्यावश्यक व महत्वपूर्ण राष्ट्रीय प्रकरणों पर इस्पात अनुसंधान को बढ़ावा देने और एक ही प्लेटफॉर्म पर लाने के लिए, एक संस्थागत प्लेटफॉर्म, नामतः “स्टील रिसर्च एण्ड टेक्नोलॉजी मिशन ऑफ इंडिया” स्थापित किया है जिसका उद्देश्य लोहा व इस्पात में आरएण्डडी को राष्ट्रीय महत्व का स्थापित करना, अग्रणी अनुसंधान आयोजन के लिए अत्याधुनिक सुविधाओं का सृजन, विशेषज्ञता और कौशल-विकास विकसित करना, मानव संसाधनों का प्रबंधन और उद्योगों, राष्ट्रीय आरएण्डडी लैबोरेटरीज और शैक्षणिक संस्थानों के बीच त्रिपक्षीय अवलम्ब बनाना है।
- 4.16.5 इस्पात क्षेत्र (भावी प्रौद्योगिकी) में नवीनताओं को बढ़ावा देने के लिए, एसआरटीएमआई के तत्वावधान में एक समयबद्ध कार्ययोजना विकसित की जाएगी जिससे भारतीय इस्पात सीपीएसई के आरएण्डडी व्यय में वृद्धि हो सके। एसआरटीएमआई के मार्फत मंत्रालय इस्पात क्षेत्र में निजी व सार्वजनिक क्षेत्र में समान रूप से कॉर्पोरेट्स को उनके लाभों की कुछ राशि सतत उद्योग तत्वावधान के अनुसंधान में लगाने के लिए प्रोत्साहित करेगा। इसके अतिरिक्त, उन्हें अपना अलग से इस्पात प्रौद्योगिकी केन्द्र और विश्वविद्यालयों में इस्पात क्षेत्र जनित अनुसंधान और शिक्षण संकाय बनाने के लिए भी प्रोत्साहित किया जाएगा ताकि उच्च गुणवत्ता, न्यून मूल्य के इस्पात उत्पादों के विकास और शिक्षा, आरएण्डडी संस्थानों और उद्योगों के लिए अच्छा तारतम्य बनाने के लिए प्रौद्योगिकी आधारित समाधानों पर ध्यान केंद्रित किया जा सके।
- 4.16.6. उत्पादों का विकास भी भारतीय इस्पात उद्योगों के लिए एक और चुनौती है जिसने अधिकांश मूल्यवर्धित उत्पाद जैसे कि उच्चस्तरीय विनियोगों के लिए ऑटोमोटिव स्टील, सीआरजीओ जैसे विद्युत इस्पात और ऑर्मोफोरस स्टील तथा स्पेशल स्टील और विद्युत उपकरणों के लिए अलॉय, एयरोस्पेस, रक्षा व आणविक विनियोग के आयात को बढ़ावा दिया है। इन मूल्यवर्धित, फ्रंटएंड और स्ट्रेटेजिक उत्पादों का उत्पादन संयुक्त उद्यम स्थापित करके विदेशी प्रौद्योगिकी प्राप्त करके या विदेशी कंपनियों की सहायता से या स्वदेशी विकास से ही सुविधाजन्य हो सकेगा। आयात निर्भरता कम करने के लिए ऐसे सभी विशिष्ट स्टील व अलॉय का विकास सुनिश्चित करने के उपाय किए जाएंगे।
- 4.16.7. भारतीय इस्पात उद्योग अभी इस्पात संयंत्रों के लिए प्रौद्योगिकी और महत्वपूर्ण उपकरण तथा प्रणालियों को आयात कर रहा है। अतः आरएण्डडी का स्तर उठाने के लिए और इन सब उपकरणों और प्रणालियों को विकसित करने के लिए श्रेष्ठतम श्रेणी की विनिर्माण क्षमताएं पाने हेतु एसआरटीएमआई के संरक्षण में आवश्यक प्रयास किए जाएंगे।
- 4.16.8 सीपीएसई को घरेलू और सहकर्मि समूहों की बेंचमार्किंग के आधार पर मानवश्रम और अतिरिक्त व्यय को कम करने के लिए प्रोत्साहित किया जाएगा। इसके अतिरिक्त सीपीएसई को इस बात के लिए भी प्रोत्साहित किया जाएगा कि वह समयोपरांत प्रौद्योगिकीय विकास के समनुरूप सुपरएन्युएशन/सेपरेशन/इनटेक के माध्यम से मानवश्रम को सही आकार में रखा जाए और श्रम उत्पादकता सुधारने के लिए स्वैच्छिक सेवानिवृत्ति योजना (वीआरएस) के उपयुक्त विकल्प दिए जाएं।
- 4.16.9 कौशल विकास के प्रारम्भ में स्टील डोमेन विशेषज्ञ तैयार करने, उपलब्ध कराने और आकर्षित करने के लिए शिक्षण प्रणाली को री-एलाइन करने हेतु मंत्रालय अपने संरक्षण की तकनीकी संस्थाओं और आइएमएसडीएजी से समन्वय करेगा।
5. नीति संशोधित करने का अधिकार
- 5.1 उपर्युक्त अनुच्छेदों में कही गई बातों के बावजूद इस्पात मंत्रालय, सक्षम अधिकारी के अनुदान से कार्यान्वयन, मार्केट डायनेमिक्स, उपभोक्ता के हित आदि के दौरान प्राप्त अनुभवों के आधार पर समय-समय पर इस पॉलिसी के विभिन्न पहलुओं में संशोधन कर सकता है।

[फा.सं.18(2)/2016-आईडीडी]

सय्यदैन अब्बासी, संयुक्त सचिव

अनुबंध - I : वर्ष 2030-31 तक लोहा और इस्पात की मांग और उत्पादन का पूर्वानुमान (सभी मूल्य एमटी में, जब तक उल्लेख न हो)

क्र.सं	पैरामीटर	अनुमान (2030 – 31)
1	कुल कूड इस्पात क्षमता	300
2	कुल कूड इस्पात की मांग / उत्पादन	255
3	कुल फिनिशड इस्पात की मांग / उत्पादन	230

6	स्पंज लोहे की मांग / उत्पादन	80
7	पिग आयरन की मांग / उत्पादन	17
8	प्रति व्यक्ति फिनिशड इस्पात की खपत किलोग्राम में	158

स्रोत: इस्पात मंत्रालय, आईएनएसडीएजी, मेकाँन

पिग आयरन और स्पंज आयरन के अनुमानों के आधार पर औसत मूल्य यह दर्शाता है कि वर्ष 2030-31 में इस्पात उत्पादन का 60-65 प्रतिशत बीएफ-बीओएफ रूट और शेष ईएएफ/आईएफ रूट के जरिये पूरा किया जायेगा।

अनुमान:

- वर्ष दर वर्ष 7.5 %⁴ का जीडीपी वृद्धि दर अनुमानित
- जीडीपी के साथ इस्पात मांग में लोच=वित्तीय वर्ष 20 तक 0.8 और वित्तीय वर्ष 20 के बाद से 1.0
- वर्ष 2030-31 तक इस्पात निर्माण क्षमता की 300 एमटी तक पहुंच।
.....
- कोयला आधारित रूट के जरिये तैयार डीआरआई: 70% {शेष गैसे आधारित रूट के जरिये}
- वर्ष 2010-15 के दौरान भारत के औसत जीडीपी का वृद्धि दर 7.5 % था। (विश्व बैंक)

अनुबंध- II: भारत में क्षेत्रवार इस्पात खपत एमटी में जब तक उल्लेख न हो

क्र.सं.	मद	वर्तमान मांग 2015-16	वर्ष 2030-31 में अनुमानित मांग
1	निर्माण और अवसंरचना परियोजनाएं - इस्पात, तेल, राजमार्ग, पुल, हवाई अड्डे, बंदरगाह, शहरी अवसंरचना, जल परिवहन, प्री-फेब्रिकेटिड भवन, ट्रांसमिशन सहित विद्युत परियोजनाएं, तेल और गैस पाइपलाइन - रियल एस्टेट - आवासीय और औद्योगिक)	50.5	138
2	इंजीनियरिंग और निर्माण कैपिटल गुड्स, कंज्यूमर ड्यूरेबल, इलेक्ट्रिकल गुड्स, सामान्य इंजीनियरिंग, ट्यूब मेकिंग, कोल्ड रिड्यूसिंग, वायर ड्राइंग, इंडस्ट्रियल बॉडीज एंड प्रेशर वेसल्स, सामान्य फैब्रिकेशन, रक्षा उपकरण)	18	50
3	ऑटोमोटिव	8.2	28
4	अन्य परिवहन (रेल लाइन, वैगन्स कोच, जहाज निर्माण, तटवर्ती)	2.4	8
5	पैकेजिंग और अन्य (उपर्युक्त में शामिल नहीं) (पेट्रोलियम, गैर-पेट्रोलियम, एलपीजी गैस सिलिंडर्स)	2.4	6
कुल फिनिशड इस्पात की खपत एमटी में		81.5	230
प्रति व्यक्ति फिनिशड इस्पात की खपत किलोग्राम में		61	158

स्रोत: इस्पात मंत्रालय, मेकाँन

अनुबंध- III: वर्ष 2030-31 तक मुख्य कच्ची सामग्री की आवश्यकता का पूर्वानुमान

क्र.सं.	कच्ची सामग्री	अनुमानित (2030-31)
1	लौह अयस्क की आवश्यकता	437
2	कोकिंग कोल की आवश्यकता	161
3	पीसीआई के लिए गैर-कोकिंग कोल की आवश्यकता	31
4	डीआरआई के लिए गैर-कोकिंग कोल की आवश्यकता	105
5	प्राकृतिक गैस (एमएमएससीएमडी ⁵ मे)	20
6	मैंगनीज अयस्क की आवश्यकता	11
7	क्रोमाइट अयस्क की आवश्यकता	5
8	लाइम स्टोन और डोलोमाइट की आवश्यकता	86
9	फेरो-अलॉय	4
10	रिफ्रैक्टरी	3
11	स्क्रेप	16

स्रोत: इस्पात मंत्रालय, मेकॉन

अनुमान इस आधार के औसत मूल्य को दर्शाता है कि वर्ष 2030-31 में इस्पात उत्पादन का 60-65% बीएफ-बीओएफ रूट और शेष ईएफ/आईएफ रूट के जरिये पूरा किया जायेगा।

अनुमान:

बीएफ-बीओएफ रूट: 60-65%; ईएफ/आईएफ रूट: 35-40% (2030-31)

बीओएफ के चार्ज मिक्स में स्क्रेप%: 15

डीआर-ईएफ चार्ज मिक्स पर विचार कर लिया गया: 63% डीआरआई, 35% हॉट मेटल और 2% स्क्रेप

⁵मिलियन मैट्रिक स्टेण्डर्ड क्यूबिक मीटर प्रतिदिन

(गैस आधारित रूट के जरिये प्राकृतिक गैस का उपयोग करके 100 प्रतिशत डीआरआई का उत्पादन अनुमानित है। यदि डीआरआई सिनगैस, कोक ओवन गैस, कोरेक्स गैस इत्यादि जैसे गैसों का उपयोग करके बनाया जाता है, तदनुसार प्राकृतिक गैस की मांग में कमी होगी।)

डीआर-आई चार्ज मिक्स पर विचार कर लिया गया : 80% डीआरआई और 20% स्क्रेप

बीएफ में चार्ज मिक्स पर विचार कर लिया गया: 60% सिंटर, 25% पैलेट और 15% लम्प ओर

गैस आधारित डीआर संयंत्र में चार्ज मिक्स पर विचार कर लिया गया : 30% लम्प ओर & 70% पैलेट

कोयला आधारित डीआर संयंत्र में चार्ज मिक्स [50% क्लिन पैलेट पर और 50% लम्प ओर पर चल रही हैं]

कोयला आधारित रूट के जरिये डीआरआई का निर्माण : 70% {शेष गैस आधारित रूट के जरिये}

बीएफ में अपेक्षित स्क्रिप कोक: 450 कि.ग्रा/ टीएचएम

बीएफ में मान्य औसत पीसीआई इंजेक्शन पर विचार कर लिया गया : 150 केजी कि.ग्रा/ टीएचएम

बीएफ में प्रति टन हॉट मेटल के लिए अपेक्षित लौह अयस्क : 1.65 टी

डीआर संयंत्र में प्रति टन ठोस चार्ज के लिए अपेक्षित लौह अयस्क : 1.55 टी

डीआरआई उत्पादन के लिए प्रति टन अपेक्षित प्राकृतिक गैस : 280 एसएम³

अनुबंध- IV: प्रौद्योगिकीय-आर्थिक निष्पादन के लिये लक्ष्य

पैरामीटर	इकाई	अंतर्राष्ट्रीय महत्वपूर्ण प्रयोग	वर्तमान मूल्य	वर्ष 2030-31 हेतु लक्ष्य
कोक दर	कि.ग्रा /टीएचएम	275 - 350	400 - 600	300 - 350
सीडीआई दर	कि.ग्रा /टीएचएम	200 - 225	50 - 200	180 - 200
बीएफ उत्पादकता	टन /एम ³ /दिन	2.5 - 3.5	1.3 - 2.2	2.5 - 3.0
विशिष्ट ऊर्जा खपत	जीसीएल/टीसीएस	4.5 - 5.0	6.2 - 6.7	5.0 - 5.5

स्रोत: इस्पात मंत्रालय

अनुबंध- V: फिनिशड इस्पात का उत्पादन, खपत, आयात और निर्यात

(एमटी में)

अवधि	बिक्री के लिए उत्पादन	आयात	निर्यात	खपत
अप्रैल 2016 – जनवरी 2017	82.9	6.1	5.9	68.9
2015-16	91	11.7	4.1	81.5
2014-15	91.5	9.3	5.6	77
2013-14	87.7	5.5	6	74

स्रोत: इस्पात मंत्रालय, जेपीसी

अनुबंध- VI: भारतीय इस्पात क्षेत्र – उद्योग विश्लेषण

आपूर्तिकर्ता की शक्ति
<ul style="list-style-type: none"> + लौह अयस्क-एनएमडीसी, ओएमसी और ओडिशा के खनिकों पर निर्भरता + कोकिंग कोयला/प्राकृतिक गैस- आयातों पर निर्भरता + थर्मल कोयला- सीआईएल/एससीसीएल + प्राकृतिक गैस- सरकारी आवंटन, आर-एलएनजी संविदा + मुख्य आपूर्तिकर्ताओं पर अत्यधिक निर्भरता + इस्पात निर्माताओं के लिये उच्च स्विचिंग लागत + बहुत कम इस्पात निर्माताओं के पास केपिटव खदानें हैं जो बाजार की अनिश्चितताओं पर निर्भर नहीं हैं। + उद्योग की कुल खरीद से संबंधित कच्चे माल की ऊँची लागत। — फ्रेगमेंटेड कोक आपूर्तिकर्ता — प्रमुख आपूर्तिकर्ताओं द्वारा आगे एकीकरण का कम खतरा

नये प्रवेशकों का डर
<ul style="list-style-type: none"> + इस्पात क्षेत्र में 100% एफडीआई + सरकारी निवेश की सुविधा + बहुत कम प्रतिस्पर्धियों के आर्थिक मापदण्ड हैं। + मुख्य इनपुट्स (नीलामी) हेतु सरलतर पहुंच + कम ब्रांड परिचय (सामग्री) और कम स्विचिंग लागत + कम मालिकाना उत्पाद और प्रतिकार की कम सम्भावनाएं — उच्च पूंजीगत लागत और प्रवेश बाधाएं — स्विचिंग आपूर्तिकर्ताओं के लिये हाई साइकोलॉजिकल कास्ट — कच्चे माल की सुरक्षा और उच्च तार्किक लागत के मुद्दे — बैंकों द्वारा इस्पात क्षेत्र की तनाव के रूप में पहचान — भूमि और पर्यावरण की लम्बी प्रक्रियाएं अनुमोदन — बहुत अधिक पूंजी और प्रौद्योगिकीय तीव्रता वाला उद्योग

उद्योग प्रतिद्वंद्विता
<ul style="list-style-type: none"> + उद्योग कुछ एकीकृत इस्पात विनिर्माताओं और अनेकवित्त एमएसएमई इस्पात प्रतिस्पर्धियों के बीच विभाजित है + घरेलू उत्पादकों में प्रतियोगिता + विदेशी प्रतिस्पर्धियों, विशेष रूप से चीन से प्रतियोगिता + सीपीएसई द्वारा निवेश और क्षमता विस्तार

विकल्पों का डर
<ul style="list-style-type: none"> + सीमित विकल्प- एल्यूमिनियम, प्लास्टिक और कार्बन फाइबर — अधिक स्विचिंग लागत और विकल्पों की अदला बदली का अधिक निष्पादन — विकल्पों की तरफ ग्राहकों का कम झुकाव

खरीददारों की शक्ति
<ul style="list-style-type: none"> + 5-6% सीएजीआर पर बढ़ रही मांग + फिनिशड और सेमी-फिनिशड इस्पात उत्पादों की बिक्री को सुविधाजनक एवं पारदर्शी बनाने के लिये ई-प्लेटफार्म एमएसटीसी मेटल मंडी का शुभारम्भ किया गया। + ओटोमोबाइल और इंजीनियरिंग सामग्री में उपयोग होने वाले इस्पात बाजार पर निजी प्रतिस्पर्धियों का प्रभुत्व — विनियमित क्षेत्र, लेकिन सरकार व्यापार के लिये उपचारात्मक उपाय कर सकती है जिससे घरेलू खुदरा मूल्य अप्रत्यक्ष रूप से प्रभावित होते हैं। — निर्माण और इन्फ्रा क्षेत्र में उपयोग होनेवाला इस्पात मुख्यतः सरकार इन्टिटी द्वारा प्राप्त किया जाता है — फ्रेगमेंटेड एमएसएमई इस्पात प्रतिस्पर्धी

	High
	Medium
	Low

परिशिष्ट I: संक्षिप्तियों की सूची

बीएफ- बीओएफ	ब्लास्ट फर्नेस - ब्लास्ट ऑक्सीजन फर्नेस
सीएजीआर	मिश्रित वार्षिक वृद्धि दर
सीडीआई	कोयला डस्ट इंजेक्शन
सीडीआर	कॉर्पोरेट ऋण पुनर्गठन
सीआईएल	कोल इंडिया लिमिटेड
सीआईएस	स्वतंत्र राज्यों के राष्ट्रमंडल
सीओपी	दलों का सम्मेलन
सीपीएसई	सेंट्रल पब्लिक सेक्टर एंटरप्राइजेज
सीआरजेड	तटीय विनियमन क्षेत्र
सीआरजीओ	कोल्ड रोल्लड ग्रेन ओरिएण्टेड
डीपीई	सार्वजनिक उद्यम विभाग
डीआरआई	डायरेक्ट रिड्यूज्ड आयरन
ईएएफ	इलेक्ट्रिक आर्क फर्नेस
ईवीटी	इसेनिट्रक बोटम टैप
एफडीआई	प्रत्यक्ष विदेशी निवेश
एफटीए	निःशुल्क व्यापार समझौता
जीडीपी	सकल घरेलू उत्पाद
जीएसटी	वस्तु एवं सेवा कर
आईएफ	इंडक्शन फर्नेस
आईएनडीसी	इंटेडड नेशनल डिटरमिंड इंड कंट्रिब्यूशन
एमएमएससीएमडी	मिलियन मीट्रिक स्टेण्डर्ड क्यूबिक मीटर पर-डे
एमओपीएनजी	पेट्रोलियम और प्राकृतिक गैस मंत्रालय
एमओएस	इस्पात मंत्रालय
एमटीपीए	मिलियन टन प्रति वर्ष
एनएमडीसी	राष्ट्रीय खनिज विकास निगम
एनपीए	नॉन-परफॉर्मिंग एसेट्स
पीसीआई	पुल्वेराइज्ड कोल इंजेक्शन
पीपीपी	सार्वजनिक निजी भागीदारी
आर एंड डी	अनुसंधान और विकास
आरईसी	नवीकरणीय ऊर्जा प्रमाणपत्र
आर-एलएनजी	रीगैसिफाइड लिक्विफाइड नेचुरल गैस
यूएचपी	अल्ट्रा हाई पावर
यूएनडीपी	संयुक्त राष्ट्र विकास कार्यक्रम
वीएटी	मूल्य वर्धित कर
डब्ल्यू टीओ	विश्व व्यापार संगठन

MINISTRY OF STEEL

(ESTABLISHMENT DIVISION)

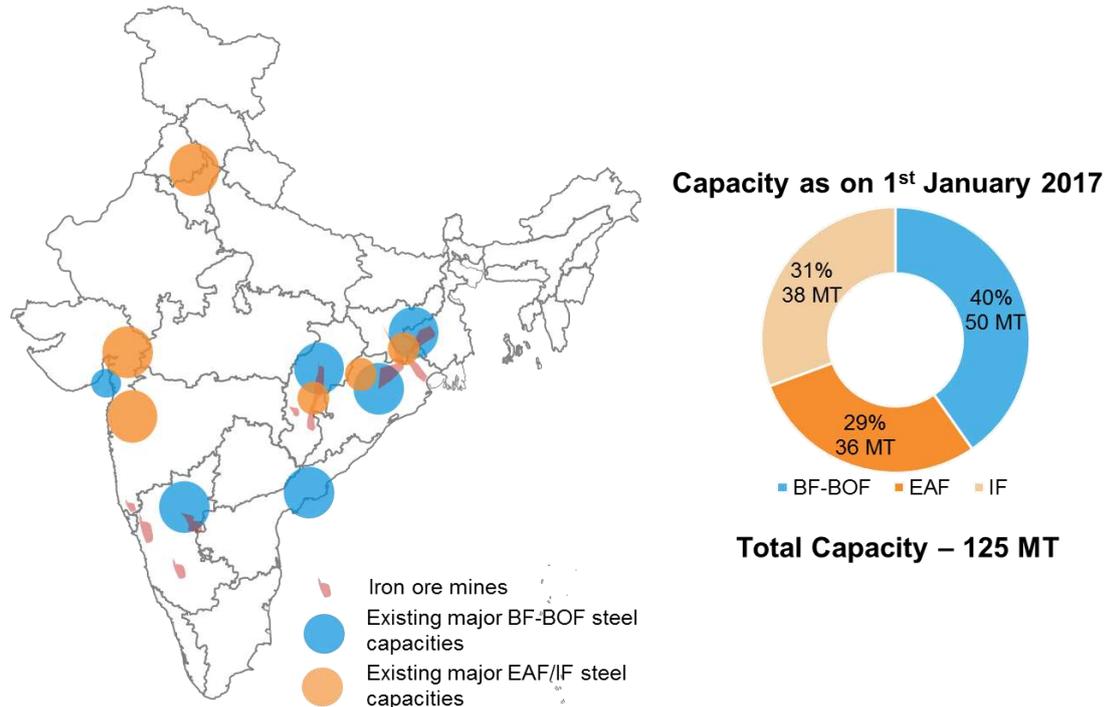
NOTIFICATION

New Delhi, the 8th May, 2017

G.S.R. 452 (E).—The National Steel Policy 2017 is hereby published for general information.—**NATIONAL STEEL POLICY 2017****1. Introduction**

- 1.1.** Steel is a product of large and technologically complex industry having strong forward and backward linkages in terms of material flows and income generation. It is also one of the most important products of the modern world and of strategic importance to any industrial nation. From construction, industrial machinery to consumer products, steel finds its way into a wide variety of applications. It is also an industry with diverse technologies based on the nature and extent of raw materials used. In India, steel has an output multiplier effect of nearly 1.4X on GDP and employment multiplier factor of 6.8X.
- 1.2.** A vibrant Steel industry has historically been the foundation of a nation's rapid Industrial Development. On account of rapid industrial development, from a small capacity of 22 MT in FY 1991-92 prior to deregulation, India has become the 3rd largest steel producer in the world with a production of 90 MT and a capacity of 122 MT in FY 2015-16. Today, the Indian steel industry contributes approximately 2% to the country's GDP and employs about 5 lakh people directly and about 20 lakh people indirectly¹. The National Steel Policy 2017 (NSP 2017) is an effort to steer the industry to achieve its full potential, enhance steel production with focus on high end value added steel while being globally competitive.
- 1.3.** The National Steel Policy 2005 (NSP 2005) sought to indicate ways and means of consolidating the gains flowing out of the then economic order and charted out a road map for sustained and efficient growth of the Indian steel industry. However, the unfolded developments in India as also worldwide, both on the demand and supply sides of the steel market, have warranted a relook at the different elements of the NSP 2005.
- 1.4.** India's competitive advantage in steel production is driven, to a large extent, from the indigenous availability of high grade iron ore and non-coking coal – the two critical inputs of steel production. In addition, it also has a vast and rapidly growing market for steel, strong MSME sector and a relatively young work force with competitive labour costs.
- 1.5.** Driven by the positive demand outlook and prevailing high prices of steel in the period post 2004, the Indian steel sector witnessed a wave of investments in the states of Odisha, Jharkhand, Karnataka and Chhattisgarh. Substantial new capacity was created and existing plants were modernized. A significant portion of these investments were funded by banks and other forms of borrowings.
- 1.6.** India became the 3rd largest producer of steel in 2015 and is now well on track to emerge as the 2nd largest producer after China. There is significant potential for growth given the low per capita steel consumption of 61 Kg in India, as compared to world average of 208 Kg. Indian economy is rapidly growing with enormous focus on infrastructure and construction sector. Several initiatives mainly, affordable housing, expansion of railway networks, development of domestic shipbuilding industry, opening up of defence sector for private participation, and the anticipated growth in the automobile sector, are expected to create significant demand for steel in the country. Further, while the main focus of the industry is on the domestic market, being in close vicinity of the developed west and developing east, provides it a strategic location that augurs well for the industry seeking opportunities for exports of finished goods and imports of some scarcely available raw materials.
- 1.7.** The Indian steel industry is structured in between three broad categories based on route wise production viz. BF-BOF, EAF and IF. BF-BOF route producers have large integrated steel making facilities which utilize iron ore and coking coal for production of steel. Unlike other large steel producers, the Indian steel industry is also characterized by the presence of a large number of small steel producers who utilize sponge iron, melting scrap and non-coking coal (EAF/IF route) for steelmaking. As on March 2016, there were 308 sponge iron producers that use iron ore/ pellets and non-coking coal/gas providing feedstock for steel production; 47 electric arc furnaces & 1128 induction furnaces that use sponge iron and/or melting scrap to produce semi-finished steel and 1392 re-rollers that rolls out semi-finished steel into finished steel products for consumer end use.

¹ As per the MECON Estimates

Figure 1: Current steel footprint in India

Source: Ministry of Steel, JPC

- 1.8.** Over the past two decades, the Indian steel industry has developed capabilities of producing a wide range of value added steel at par with global best practices addressing diverse needs of the end user industries. However, India still needs to make a special effort to domestically produce number of value added products like automotive steel for high end applications, electrical steel (CRGO), special steel and alloys for Power equipment, Aerospace, Defense and Nuclear applications.
- 1.9.** However, the Indian steel sector is disadvantaged due to limited availability of some of the essential raw material such as high grade lumpy Manganese ore & Chromite, coking coal, steel grade limestone, refractory raw material, Nickel, Ferrous Scrap etc. Due to shortage of domestic coking coal, both in terms of quantity and quality, pig iron producers/ BF operators in India have to significantly depend on import of coking coal.
- 1.10.** In the recent past, multiple issues have also adversely impacted the steel sector, viz. cancellations of iron ore and coal mine allocations, delays in land acquisition, environmental clearances, which led to many of the projects facing significant cost and time overruns. Additionally, companies also faced substantially increased operating costs on account of increased logistics & raw material costs and other charges.
- 1.11.** Post 2011, global prices of steel began to decline, marking the beginning of a down turn in the global steel industry triggered by slowdown in global demand and over capacities in a number of countries including China. By July 2015, prices had fallen by 50% compared to January 2011 - their lowest in decades, as cheap imports flooded world steel markets. This significant structural asymmetry between demand and supply also affected large number of Indian companies leading to surge in imports resulting in weak pricing conditions, low profitability, lower capacity utilization and even closure of capacities in some cases.
- 1.12.** In the new environment, the industry has to be steered with appropriate policy support to ensure that production of steel matches the anticipated pace of growth in consumption. Special emphasis is needed to ensure that the industry follows a sustainable path of development in respect of environmental friendliness, mineral conservation, quality of steel products, use of technology and indigenous R&D efforts to ensure that the country can, over time, reach global efficiency benchmarks to become a world leader in steel production technology, as well as in production of high end steel.

2. NSP 2017 – Vision, Mission & Objectives

- a) **Vision:** To create a technologically advanced and globally competitive steel industry that promotes economic growth.
- b) **Mission:** Provide environment for attaining –
- i. Self-sufficiency in steel production by providing policy support & guidance to private manufacturers, MSME steel producers, CPSEs & encourage adequate capacity additions.
 - ii. Development of globally competitive steel manufacturing capabilities
 - iii. Cost-efficient production and domestic availability of iron ore, coking coal and natural gas
 - iv. Facilitate investment in overseas asset acquisitions of raw materials.
 - v. Enhance domestic steel demand.
- c) **Objectives:** The National Steel Policy aims at achieving the following objectives –
- i. Build a globally competitive industry
 - ii. Increase per Capita Steel Consumption to 160 Kgs by 2030-31
 - iii. To domestically meet entire demand of high grade automotive steel, electrical steel, special steels and alloys for strategic applications by 2030-31
 - iv. Increase domestic availability of washed coking coal so as to reduce import dependence on coking coal from ~85% to ~65% by 2030-31
 - v. To have a wider presence globally in value added/ high grade steel
 - vi. Encourage industry to be a world leader in energy efficient steel production in an environmentally sustainable manner.
 - vii. Establish domestic industry as a cost-effective and quality steel producer
 - viii. Attain global standards in Industrial Safety and Health
 - ix. To substantially reduce the carbon foot-print of the steel industry

3. The current context and the long term perspectives on growth

- 3.1. The domestic demand backed growth of the Indian economy and consequently the steel consuming sectors has been a key trait of Indian steel industry. The decade before the liberalization of the Indian steel industry in 1991 witnessed growth in crude steel production at a CAGR of 5.2%. Post liberalization, witnessed a decadal CAGR of 6.1% which accelerated to 8.3% during 2000-01 to 2015-16.
- 3.2. However, today the steel industry in India faces challenging external conditions manifest in slow economic growth and idle steel capacity globally. With weak global economic prospects, the Indian steel industry will have to strongly depend on the growth of domestic consumption for its future.

4. The Policy

NSP 2017 covers the following policy areas –

- a. Steel Demand
- b. Steel Capacity
- c. Raw Materials
- d. Land, Water and Power
- e. Infrastructure & Logistics
- f. Product Quality
- g. Technological Efficiency
- h. MSME Sector
- i. Value Addition in Stainless Steel
- j. Value Addition in Alloy & Special Steel
- k. Environment Management
- l. Safety
- m. Trade
- n. Financial Risks
- o. Role of CPSEs & Way Forward
- p. Focus on High-End Research: Steel Research & Technology Mission of India

4.1. Steel Demand

- 4.1.1. In 2015, India was the only large economy in the world where steel demand continued to demonstrate positive growth at 5.3 %, as against negative growth in China -5.4%, and Japan -7.0%. India's growing urban infrastructure and manufacturing sectors indicate that demand is likely to remain robust in the years ahead. If India is to achieve the goal of being a "developed nation", the steel industry must play a crucial role as has been the case with all the major developed countries and East Asian countries like Japan, South Korea and China.
- 4.1.2. Notwithstanding the current challenges, Indian steel industry still has significant potential for growth, underscored by the fact that the per capita steel consumption in the country at 61 kg (incl. rural consumption at 10 kg) is much lower than the global average of 208 kg. Going forward, the accelerated spend in infrastructure sector, expansion of railways network, development of domestic shipbuilding industry, opening up of defence sector for private participation, anticipated growth in automobile and capital goods industry and the construction in urban & rural areas, are expected to create significant demand for steel in the country.
- 4.1.3. Growth in steel consumption in a country is typically linked to the economic growth and steel intensity. While growth in GDP is a crucial determinant of growth in overall consumption, steel intensity is the definitive parameter for an economy and determines the growth rate of steel demand vis-à-vis consumption over time.
- 4.1.4. It is expected that at the current rate of GDP growth, the steel demand will grow threefold in next 15 years to reach a demand of 230 MT by 2030-31 as illustrated in **Annexure I**. However, even with this demand of finished steel by 2030-31, India's per capita consumption would reach only to 158 Kgs, lower than the current global average of 208 kg (**Annexure II**).
- 4.1.5. Creation of steel demand in the country is one of the major task to be undertaken in this direction. To drive steel demand, Ministry has identified construction and manufacturing sectors like Rural development, Urban infrastructure, Roads & Highways, Railways etc. to be the key focus areas and will take necessary steps to achieve the same through following –
- 4.1.5.1. Steel structures are highly cost effective and have shorter lead time for erection and have greater durability with high design comfort. Hence usage of steel needs to be encouraged in all buildings and structures. Efforts will be made to emphasize the lower lifecycle costing while evaluating projects rather than looking at just the upfront cost in isolation, which would encourage greater usage of steel in Government as well as the private sector.
- 4.1.5.2. The Government has chalked out an extremely ambitious plan of Housing for all by 2022 as well as schemes such as Pradhan Mantri Awas Yojna, Saansad Adarsh Gram Yojna etc. These provide a huge opportunity for use of steel intensive structures and designs, usage of pre-fabricated and precast steel structures, etc. Hence, Ministry will take all necessary measures to promote the increased usage of steel intensive structures/designs under these schemes.
- 4.1.5.3. Commercial, Residential buildings and flyovers also provides immense opportunities. Necessary efforts will be made in conjunction with Ministry of Road, Transport & Highways to evaluate the replacement benefits of the existing bridges, pavements and crash barriers used in Roads & Highways and consider for projects in steel bridges, steel reinforced pavements and steel crash barriers respectively.
- 4.1.5.4. Usage of steel in railways is limited to laying of railway tracks, rolling stocks, wagons, platforms and coaches. Efforts will be made to increase the steel usage in making railway station, foot over bridges, rail coaches, construction of steel based railway colony buildings especially in seismic prone areas, construction of dedicated freight corridors & superfast rail corridors and construction of more steel bridges for saving time & capital expenditure.
- 4.1.6. The "Make in India" initiative is expected to witness significant investments in Construction, Infrastructure, Automobile, Shipbuilding and Power sectors, which will stimulate steel demand. Hence, efforts will be made to pass on such benefit to the domestic steel producers. Use of cost efficient and competitive 'Indian Made steel' will pave the way for infrastructure development and construction activities in the country.

4.2. Steel Capacity

- 4.2.1. It is anticipated that a crude steel capacity of 300 MT will be required by 2030-31, based on the demand projections as mentioned above. However, achieving crude steel capacity up to 300 MT will require extensive mobilization of natural resources, finances, manpower and infrastructure including land.

- 4.2.2. Considering the competitive advantage of steel production in India, the country also has the potential to export sufficient quantities of steel and become a major player in the global market, thus mitigating the foreign exchange risk emanating out of the exposure of the industry to the global raw materials market especially for coking coal.
- 4.2.3. BF-BOF route is expected to contribute about 60 - 65% of the crude steel capacity & production with remaining 35 - 40% by EAF & IF route in 2030-31.
- 4.2.4. Demand for pig iron for merchant use, such as for castings and supplementary metallic in the electric arc or induction furnaces, is projected to increase to 17 MT by 2030-31. Similarly, demand for sponge iron is projected to increase to 80 MT by 2030-31 as illustrated in Annexure I. It is projected that the sponge iron capacity may increase to 114 MT² by 2030-31 with around 30% share of gas based capacities under increased environmental considerations and long term availability of gas.
- 4.2.5. Creation of additional capacity for fulfilling the anticipated demand will require significant capital investment of about Rs. 10 lakh Crore by 2030-31 and will also generate significant employment in the range of 36 Lakhs by 2030-31 from the current level of 25 Lakhs depending on degree of automation resulting from adoption of different technologies.
- 4.2.6. In order to ensure optimal growth of the industry and to avoid situations of over or under capacity, the Ministry will work with all the stakeholders to monitor investments in the steel industry on a continuous basis and will also facilitate setting up of SPVs in mineral rich states of Odisha, Chhattisgarh, Jharkhand and Karnataka.
- 4.2.7. Establishment of steel plants along the coast under the aegis of Sagarmala project will be undertaken. Such plants would be based on the idea of importing scarce raw materials and exporting steel products. The Ministry will also promote cluster based approach particularly in MSME steel sector with common infrastructure on consortium approach for optimum land use, easy availability of raw materials and economies of scale.
- 4.2.8. Necessary policy environment will also be provided to promote gas based steel plants, electric steelmaking, auxiliary fuel injection in blast furnace and other technologies which will bring down usage of coking coal in steel production. Efforts will also be made to facilitate alternate route for steelmaking using indigenous coal with increased focus on improving energy efficiency and reducing GHG emissions.
- 4.2.9. Induction Furnace route of steelmaking has a number of advantages for India, namely, no requirement of coking coal, lower capital cost and smaller land requirement. This route of steelmaking is however hampered in terms of its refining capabilities. Hence, appropriate efforts will be made to promote development of consistent & cost-effective refining methods in order to produce high quality steel.

4.3. Raw Materials

Availability of raw materials at competitive rates is imperative for the growth of the steel industry. Details of the estimated raw material requirement by 2030-31 for the steel industry have been provided in **Annexure III**.

4.3.1. Iron Ore

- 4.3.1.1. The government has already come up with Mines and Minerals (Development and Regulation) Amendment Act, 2015 which gives greater emphasis on time bound mine development and increased stress on mineral exploration and sustainable mining operations. The Act has brought clarity on mine allocation process (through auction) and procedure for mining lease renewal and provides for reservation of any particular mine for a particular end use and put conditions permitting auction among such eligible end users.
- 4.3.1.2. As and when mining leases expires, suitable efforts will be made in conjunction with Ministry of Mines to facilitate auction of mineral blocks in a regular manner. Ministry will also facilitate to develop robust plans to guide future leases for start of mineral production in time bound manner in order to ensure adequate availability of iron ore.
- 4.3.1.3. Utilization of low grade fines lying at mine sites of captive iron ore miners will be promoted and any regulatory changes that may be required will be evaluated in conjunction with concerned ministries. Beneficiation and agglomeration industries would be strengthened through suitable support.
- 4.3.1.4. Transportation of iron ore fines to pelletisation units will be targeted through **slurry pipelines and conveyors** as it will reduce pollution and de-congest transportation infrastructure in mining areas. To encourage this

² Projection of Sponge Iron Capacity represent the mean value based on the premise that 60-65 % of steel production in 2030-31 shall be coming through BF-BOF route and rest through EAF/IF route.

environment friendly transportation, Ministry of Steel will pursue timely completion of on-going **slurry pipeline** projects and their further expansion in the coming years.

- 4.3.1.5. To ensure long term supply of iron ore, intensive & deeper exploration would be promoted to augment resource base. Eco-friendly viable underground mining technique for optimal utilization of magnetite ore deposits locked in Western Ghats would also be explored in conjunction with mining research institutes.
- 4.3.1.6. In order to develop a strategic footprint in the global natural resource industry, acquisition of mineral assets overseas will also be facilitated through bilateral talks with the prospective nations. Steel sector players will be encouraged to acquire and develop global projects individually or on partnership basis.
- 4.3.1.7. Ministry of Steel in conjunction with Ministry of Mines, will facilitate creation of a uniform country-wide sales platform for bringing transparency and predictability in the process of sale of iron ore.

4.3.2. **Iron Ore Pellets**

- 4.3.2.1. During mechanized mining, 60 to 70% output is generated as fines below 10 mm size. Fines are also generated during transportation and handling. To economically utilize these fines, suitable agglomeration process is necessary for converting them into sinters or pellets.
- 4.3.2.2. Till the recent past, domestic steel industry was mainly using higher grades of iron ore and a higher proportion of lumps due to their easy accessibility and availability. However, there is a pressing need to utilize low grade iron ores including slimes and dump fines which are stockpiled at different mine heads. Hence, optimal use of existing low grade iron ore resources with special emphasis on conservation of high grade ores will be encouraged. As of 2015-16, there exists pelletisation capacity of about 85 MT with a capacity utilization 32.5%. Impetus will be given to **Pellet industry** as it helps in mineral conservation by acting as direct feedstock in Blast Furnace in place of high grade iron ore.

4.3.3. **Coking Coal & Non-Coking Coal**

- 4.3.3.1. About 85% of the coking coal requirement of the domestic steel industry is presently being met through imports. Ministry of Steel will coordinate with Ministry of Coal to increase availability of coking coal through **overseas asset acquisition** and will also ensure that **sufficient number of modern coking coal Washeries get established**. Suitable fiscal measures will also be taken to support the rising requirement in the steel sector.
- 4.3.3.2. Furthermore, deliberations will be held with Ministry of Coal to persuade CIL to create special coal linkage e-auction window for steel players to ensure supply of coal to steel sector. Ministry of Steel will also facilitate periodic auction of coking coal blocks as it will encourage the steel industry to develop its own dedicated coking coal mines.
- 4.3.3.3. Efforts will also be made to facilitate allocation of indigenous coking coal reserves in the country exclusively to steel sector with no diversion of such coal to any other sector.
- 4.3.3.4. To ensure long term availability of coking coal, Ministry of Steel in conjunction with Ministry of Coal will facilitate exploration & optimal utilization of deep seated coking coal reserves. Efforts will also be made to expeditiously implement Jharia Action Plan to improve the domestic availability of coking coal.
- 4.3.3.5. Integrated steel plants will also be pursued to reduce their coking coal consumption at par with global best practices by resorting to auxiliary fuel injection technologies like Pulverized Coal Injections (PCI)/ Cold Dust Injection (CDI) or natural gas/ syngas injection along with PCI/ CDI.

4.3.4. **Natural Gas**

- 4.3.4.1. Under the Paris Treaty (COP 21), India intends to reduce the emission intensity of its GDP by 33-35% by 2030 from 2005 levels. In order to achieve this target, India needs to find energy efficient resources that are affordable and also available. Natural Gas is one such greener alternatives available.
- 4.3.4.2. Given the future potential of gas based technology, in terms of up-gradation of coal based DRI capacities in the MSME sector to gas based route, need for captive gas based power plants for the sector and the alternative of injecting natural gas in blast furnace to reduce dependence on imported metallurgical coal (both coking and PCI), ensuring firm supply of natural gas is imperative to boost the confidence and investment in the gas based steelmaking technology.

- 4.3.4.3. In case of gas based steel plants which have been stranded due to lack of supply of natural gas from domestic sources, options will be evaluated in coordination with Ministry of Petroleum and Natural Gas for restoration of domestic gas supply to steel sector. Efforts will also be made to remove the cascading effect of anomalies in the tax structure.
- 4.3.4.4. To ensure long term availability of natural gas, Ministry of Petroleum & Natural Gas will be approached to explore new reserves of natural gas. The technology of coal gasification to produce syngas for subsequent usage in DRI plants would also be encouraged.
- 4.3.5. **Limestone, Manganese Ore and Chromite Ore**
- 4.3.5.1. Ministry will suitably facilitate the increased exploration efforts to raise resources of limestone, manganese and chromite ore in the country. In the case of steel grade limestone, high grade low phosphorus manganese ore and high grade chromite lumpy ore, the steel industry is likely to remain dependent on imports. Suitable measures will be taken to encourage imports of these materials since they are available in limited quantities. Ministry will also facilitate in exploring the possibility of optimally utilizing the high grade limestone available in Himachal Pradesh and Rajasthan in an environmentally sustainable manner. The industry will also be encouraged to acquire such assets globally to maintain a steady supply of these materials to the growing industry. Necessary efforts will be made for greater exploration of manganese and chromite ore.
- 4.3.6. **Ferro-Alloys**
- 4.3.6.1. Ferro-alloy is a power intensive industry. Hence, captive power generation in the ferro-alloys plants will be extensively supported. Since the demand for ferro-alloys is likely to grow along with steel production in the country, the industry may be encouraged to set up larger units to achieve adequate economies of scale. Efforts will be made to provide necessary raw materials linkages and stable supply of power to grow Ferro-alloys units on priority.
- 4.3.7. **Refractory Raw Material**
- 4.3.7.1. India is not endowed with high quality reserves of key refractory raw materials viz. bauxite (refractory grade) and magnesite and is largely dependent on imports. Suitable measures and procedural simplifications will be done to support the rising requirement of refractories in the steel sector.
- 4.3.7.2. Geologically, fire clay, an important raw material for making refractories, exists concurrently with coal deposits. However, there have been difficulties in full utilization of the domestic resources found alongside coal deposits. The potential of fire clay extraction will be examined in order to raise supplies of the same to the domestic industries.
- 4.3.8. **Nickel**
- 4.3.8.1. Nickel has been under constant demand from the ferro-alloys and alloy / stainless steel industry. Nickel is practically unavailable in the country and the entire quantity of unwrought and other forms of the nickel needs to be imported. Hence, the industry may be encouraged to acquire such assets globally to maintain a steady supply to the industry. Simultaneously, R&D will be pursued to extract Nickel from the lateritic ore overburden available in Sukinda Valley, Orissa.
- 4.3.9. **Ferrous Scrap**
- 4.3.9.1. In order to promote use of scrap based steelmaking technologies inter-alia to reduce GHG emission intensity in the country, actions will be initiated to increase availability of ferrous scrap. Options will also be evaluated in coordination with other concerned ministries to develop a scrap segregation (quality-wise), collection, processing and recycling policy.
- 4.3.9.2. In order to ensure availability of sufficient quantities of good quality scrap, establishment of an organized and environment friendly steel scrap processing units within the country will be facilitated by promoting modern steel shredding plants.
- 4.3.9.3. In order to promote increased use of scrap based steel-making in the country, efforts will be made in coordination with Ministry of Power to ensure availability of electricity to the sector.
- 4.4. **Land, Water & Power**
- 4.4.1. The growth plans of the Indian steel industry have also been hindered by difficulties in land acquisition. Many projects have stuck due to delays in acquisition of adequate land at the preferred locations due to policy and procedural issues. In order to reach crude steel capacity of about 300 MT, additional land requirement is

estimated to be ~91,000 acres considering green field expansion. To help in early implementation of projects, Ministry will coordinate with respective State Governments to ensure timely availability of litigation-free lands to the industries.

- 4.4.2. The formation of steel clusters (especially for MSME steel units), service centers and steel processing centers will be facilitated. Creation of related common infrastructure on partnership basis will be promoted to optimize land use. Small and medium steel enterprises, including FDI projects, will be encouraged to be set up in industrial corridors and in clusters under PPP (Public Private Partnership) to ease land acquisition.
- 4.4.3. It has been observed that the water allocation for steel industry is generally accorded low priority. But it is forecast that by 2030-31, the steel industry will annually require approximately 1500 million cu. meter of water. Keeping this in view, the Ministry will coordinate with respective State governments to allocate water to steel projects on priority basis. Water conservation at all levels will be encouraged and the industry's efforts will be supported.
- 4.4.4. Considering the importance of water as a scarce resource, there has been a major thrust by the Government on reduction of discharge from the steel plants which will require innovative solutions and techniques to effectively recycle treated waste water. Hence, the steel industry will be encouraged to pursue plans and strategies to reduce specific water consumption per tonne of steel produced.
- 4.4.5. Since steel is an energy intensive industry, Ministry will focus on availability of power to steel making facilities. The power required by the industry is estimated to increase to 27,717 MW by 2030-31. Post de-allocation of coal blocks, various units in steel sector, especially the sponge iron plants, have been procuring power at high cost. Ministry of Steel will deliberate with Ministry of Power to make power available to such units through open access.
- 4.4.6. Ministry of Steel will facilitate the use of waste heat recovery in Steel plants in consultation with other ministries. Efforts will also be made to facilitate usage of captive power for MSME sector and remove the cascading effect of anomalies in the tax structure.
- 4.4.7. In view of impending growth scenario in steel sector, Ministry of Steel will facilitate mechanism of Special Purpose Vehicles (SPVs) for Greenfield capacity additions. Steel SPV would acquire the land, get the necessary statutory approvals, water linkage and iron ore linkage and develop the minimum necessary infrastructure for setting up of steel plants. The Steel SPV would thereafter be put to open bidding in a transparent manner for setting up of the steel plant by interested parties. Similarly, the mining SPV will provide long term iron ore linkage to the Steel SPV.

4.5. Infrastructure & Logistics

- 4.5.1. Since bulk of the capacity additions are likely to come up in the three eastern states of Odisha, Chhattisgarh and Jharkhand, Ministry of Steel will pursue for the adequate and timely infrastructure growth in these regions to address the increased industry requirement in areas such as **railways, roadways, power generation and distribution etc.**
- 4.5.2. With the increase in steel demand and production, the requirement of adequate infrastructure will further increase. Government will need to invest heavily in development of **evacuation infrastructure** to minimize turn-around-time as well as to build the necessary linkages to reduce the length of haulage. Ministry of Steel will also encourage steel players to **promote better plant layout design, engineering, technologies and optimum use of economic capacity.**
- 4.5.3. With plans to have large number of blast furnaces in future, the use of pellets shall also increase, requiring grinding of ores/fines to ultra-fine size, hence **increased investment in slurry pipelines.** This will be encouraged through suitable policy support from the government.
- 4.5.4. Alternative modes for transportation of raw materials such as **slurry pipelines and conveyors** will go a long way in reducing the problems of pollution and congested transportation network in the mining areas. To encourage environment friendly transportation of raw material, efforts will be made to accord all the benefits available to the infrastructure industries, to slurry pipelines also.
- 4.5.5. Transportation of raw materials and finished goods through **inland waterways and coastal shipping** will also be promoted. Necessary efforts will be made in conjunction with Inland Waterways Authority of India along with other concerned ministries to facilitate debottlenecking of inland waterways transportation through dredging, modernization of jetties, simplifying the approval process for environmental clearances & coastal regulation zone (CRZ) clearances, improved connectivity with road through dedicated corridors and rail etc.

4.5.6. To encourage export opportunities and be competitive, the Government of India is contemplating **port-led development of steel clusters under the aegis of Sagarmala program**. Establishment of coast based steel plants will suitably be undertaken in conjunction with Ministry of Shipping.

4.5.7. Given the expected growth in demand in steel production and the corresponding requirement for raw materials, the port infrastructure in the country, especially at coking coal importing ports needs to be significantly strengthened. Such ports will be identified in conjunction with the steel industry and would be taken up with Ministry of Shipping to ensure uninterrupted supply of coking coal to steel industry.

4.6. Product Quality

4.6.1. Bureau of Indian Standards (BIS), has formulated a large number of Indian Standards for most of the iron and steel products produced in the country. Actual implementation of these standards by the industry is however limited, resulting in large scale production, imports and use of sub-standard material, putting infrastructure and public safety at risk.

4.6.2. **Quality Control Order:** Adoption of the standards by producers and users will be facilitated and mandatory quality certification will be ensured. Recently the Steel and Steel Products (Quality Control) Order and Stainless Steel (Quality Control) Order that mandates Bureau of Indian Standards certification for certain products was introduced. The implementation of this order will be closely monitored in conjunction with Bureau of Indian Standards. Thirty Three (33) steel products have already been notified under the mandatory quality certification mark scheme of BIS. Efforts will be made to bring in additional steel products, which are used in critical end-use applications, under the mandatory scheme to ensure protection of human health, environment, and safety.

4.6.3. MSME sector units, particularly the small re-rolling mills and Induction Furnace Units lack in-house quality testing facilities. Quality testing facilities would be set up in steel hubs and already established facilities would be further strengthened to cater to possible rise in demand.

4.6.4. Apart from the adherence to conditions under Steel and Steel Products (Quality Control) Order, Ministry of Steel is also facilitating the production of quality steel, particularly in MSME sector by carrying out R&D and technological interventions and providing financial assistance. More steps in this direction will be encouraged.

4.7. Technological Efficiency

4.7.1. Though the choice of technology will be determined by entrepreneurs based on techno-economic considerations, Ministry of Steel would encourage adoption of technologies, which:

4.7.1.1. Are conducive to effective & efficient utilization of domestic resources with minimum damage to environment and production of high-end and special steel required for sophisticated industrial and scientific applications.

4.7.1.2. Minimize environmental damage at various stages of steel making.

4.7.1.3. Optimize resource utilization and facilitate modernization of the steel industry so as to achieve global standards of productivity and efficiency.

4.7.1.4. Led to the development of front end and strategic steel based materials.

4.7.2. Improving the techno-economic performance of steel units is crucial to improving competitiveness of the industry. Details of the estimated techno-economic performance parameters by 2030-31 for the steel industry have been provided in **Annexure IV**. Ministry of Steel, in association with suitable agency, will constantly monitor techno-economic performance of all the steel plants within the country vis-à-vis the global best practices. Furthermore, increased use of prepared burden in charge mix and greater use of PCI in blast furnaces will also be promoted.

4.7.3. Steel companies will be encouraged to have strategic joint ventures for production and development of technologically more advanced products. Transfer of technology for production of Automotive Steel and other special steels including Product Development/ Acquisition of Technology for Boiler Quality Plates and Alloy Steel Tube Material, Electrical Steel will be facilitated.

4.7.4. Ministry will encourage the research institutes within the country to develop less resource intensive and less energy intensive steelmaking technologies as well as new products.

4.8. MSME Steel Sector

- 4.8.1. India over the years has developed a strong MSME sector (comprising of DRI-EAF/IF route based steel producers and rolling mills) which is unique to India. It embodies the entrepreneurial and innovative strengths of Indian steel industry which turned the unavailability of coking coal – a key input for BF-BOF route into an opportunity.
- 4.8.2. However, there exists large variations amongst various units in terms of scale of operations, product-mix and technology. The MSME sector, including sponge iron industry, plays an important role in providing employment, meeting demand of some special products required in small volumes and local demand of steel in hinterlands. Apart from this, the sector is also highly export oriented which helps in earning foreign exchange for the country.
- 4.8.3. Various measures as mentioned below will be taken to improve the performance of MSME steel sector and sponge iron industry-
- 4.8.3.1. Availability of raw materials will be ensured by facilitating auction of non-coking coal exclusively for steel/sponge iron sector and increasing the iron ore availability in the domestic market.
- 4.8.3.2. Adoption of energy efficient technologies in the MSME steel sector will be encouraged to improve the overall productivity & reduce energy intensity.
- 4.8.3.3. Small and medium iron and steel making units will be encouraged to be set up in the proposed industrial corridors and clusters for optimal utilization of land and reach economies of scale.

4.9. Value addition in Stainless Steel

- 4.9.1. Though India is 3rd largest producer of steel globally, it is still a net importer of stainless steel used in high-end applications. With increased demand of steel and need to build 200 MTPA additional capacity by 2030-31, considerable capacity addition of stainless will also be required. Like most segments of the Indian steel sector, stainless steel industry has also been facing difficulty over the last 3-4 years. Today, the domestic stainless steel industry has a low capacity utilization of around 50% due to the surge in low priced imports and fall in prices. Hence, necessary efforts will be made to protect the existing & upcoming stainless steel facilities from unfair trade practices through suitable trade remedial measures.
- 4.9.2. Besides, price consideration, import of stainless steel takes place on quality considerations. Country is dependent on import of most of the super duplex, super austenitic and high alloyed varieties of stainless steel for stringent end use applications. Ministry will encourage steel producers to have strategic ventures in production and development of technologically more complex products including high end varieties of stainless steel.
- 4.9.3. To counter threats from competing materials, promotion of stainless steel through mass campaigns, particularly in rural areas will be encouraged. Greater use of stainless steel in residential or commercial constructions in coastal and earthquake prone areas of the country will also be promoted. Use of high quality stainless steel in drinking water pipelines, water storage, packaging of food grains etc. will be promoted to prevent intake of hazardous impurities.

4.10. Value addition in Alloy & Special Steel

- 4.10.1. While large varieties of value added steel products are now being produced indigenously but the country is still dependent on import of several high performance & value added steel products like electrical steel, automotive grade steel and steels for specialized use in defence, space and nuclear applications.
- 4.10.2. With better demand prospects and mega expansion plans in the pipeline, there is a need to sharpen the focus on alloy & special steels as it guarantees better premium to both steel makers and consumers. These products are mainly finished steel and are termed so depending on their treatment or their end use in automobile and consumer durable sectors. Hence, necessary efforts will be made to collaborate with foreign players for technical and strategic cooperation for this purpose.
- 4.10.3. For the past couple of years, demand for alloy & special steel, or value-added steel, with superior quality to meet stringent application norms of various market segments, has been growing. Future growth of Indian steel makers will also be driven by these value-added products. Production of these premium grade products will not only help them improve realizations but will also add to the topline growth of steelmakers. Hence,

Ministry will encourage steel producers to have strategic ventures in production and development of these technologically more complex products including high end varieties of alloy steel and electrical steel.

4.11. Environment Management

- 4.11.1. While steel companies are themselves addressing the energy & environment issues in the plants through technological upgradation/ modernisation, and/or diffusion of energy efficient & environment friendly technologies in the plants, Ministry will facilitate improvement in the energy & environment scenario of steel plants through various forums/ mechanisms.
- 4.11.2. Ministry will facilitate the formation of a forum to chalk out best practices and promote policies and programs that encourage and expedite the transition to a clean energy economy. Apart from the adherence to these stringent energy efficiency parameters, steel companies will also be encouraged to adopt best available technologies & practices to provide clean & green environment.
- 4.11.3. Energy & Environment management is an on-going process and is directly related to the technologies adopted by the iron & steel plants. So far, Ministry has successfully implemented certain mechanisms such as NEDO model projects in CPSEs and UNDP-AUSAID-MOS steel project in steel re-rolling mills to facilitate improvement in energy efficiency. Efforts will further be made to scale up these mechanisms with enlarged coverage in steel re-rolling mills and induction furnace units.
- 4.11.4. Considering all waste materials as an economic asset, Ministry will encourage the steel companies to develop a Waste Management Plan for additional impetus on zero-waste or complete waste recycling. Concrete efforts will further be made by Ministry to promote use of iron & steel slag in alternate uses like road making, rail ballast, construction material, soil conditioner etc. Simultaneously, steel plants will be pursued to set up SMS slag weathering/ steam ageing plants to enable them to supply processed/ sized SMS slag for road making, rail ballast etc.
- 4.11.5. Ministry of Steel will also facilitate the formulation and adoption of standards at par with global best practices with regard to particulate matter emissions, SO_x & NO_x, water consumption and zero or near zero liquid discharge.
- 4.11.6. India has recently signed Paris Declaration (COP 21) under which intends to reduce the emission intensity of its GDP by 33-35% by 2030 from 2005 levels. Towards this end, Ministry of Steel has already submitted the Intended Nationally Determined Contributions (INDC) for reducing GHG emissions in iron & steel sector which inter-alia projects CO₂ emission of 2.2 – 2.4 tonnes per tonne of crude steel in BF-BOF route and 2.6 – 2.7 tonnes per tonne of crude steel in DRI-EAF route by the terminal year of 2030. Ministry will find ways and means in consultations with industry to achieve aforesaid standards at par with the global best practices to the extent possible.
- 4.11.7. Capacity additions through coal based routes will have far reaching implications for India in terms of environmental degradation. Hence, necessary efforts will be made to have a judicious mix of production routes to reduce the carbon footprint of steel sector in line with the INDC targets.

4.12. Safety

- 4.12.1. Ministry of Steel will continuously monitor the safety performance of all its steel companies including those in private sector through periodic reviews. Necessary efforts will be made to encourage the development of clearly defined safety standards and goals to become a zero accident workplace.
- 4.12.2. Ministry of Steel will coordinate with steel companies to ensure that on the job trainings on maintaining a safe workplace are provided to employees of the steel companies. Small sized units which cannot afford to conduct such trainings on their own will be facilitated by Steel Research and Technology Mission of India (SRTMI) for organizing the same

4.13. Trade

- 4.13.1. India was a net exporter of steel in 2013-14. However, due to global downturn in steel demand and excess capacities in major steelmaking countries such as China and Japan, India witnessed a significant surge in imports in 2014-15, which continued in 2015-16 as well. Production, consumption, imports and exports of finished steel since 2013-14 are provided in **Annexure V**.

- 4.13.2. Given the cyclical nature of steel industry, there would be situations of unfair trade practices in the future also. To prevent occurrence of the same, Government will continue to be vigilant and will intervene in the market as and when required with suitable trade remedial measures in line with WTO guidelines and/or India's Foreign Trade Policy to protect the interests of the domestic producers.
- 4.13.3. Steel industry will be encouraged to be competitive and to develop a global presence, not just in base grades of steel, but also in high quality steel, which are currently produced by selected few international steel companies. Ministry of Steel will also deliberate with Ministry of Commerce to ensure that export production is zero rated with regard to various central & state taxes and levies.
- 4.13.4. In addition, certain trade restrictions have been imposed on Indian steel products by other countries. Hence, domestic steel industry will be encouraged to convey their grievances during trade remedial proceedings with those countries.
- 4.13.5. Considering the importance of information in today's world, the existing institutions such as Joint Plant Committee (JPC) and the Economic Research Unit (ERU) will be further strengthened to meet the requirement of industry and market information related to steel and its raw materials. Continuous strategic research in the steel and related areas, constant tracking of developments in global trade, global investment in the steel industry, emerging technologies in steel & its related areas and data on new mining assets in iron ore, coal, etc. in foreign countries will also be supported. Continuous research on international and domestic steel demand will also be encouraged and risks of investments in foreign countries in steel and related industries will be continuously assessed.

4.14. Financial Risks

- 4.14.1. Given the enormity of requirement of financial resources to add the required steel capacity and the current conditions of steel industry, mobilizing adequate capital for the industry will be a challenging task in future. Hence, the steel industry will be encouraged to reduce capital costs and remain innovative in developing appropriate structure of the capital to minimize debt and service equity.
- 4.14.2. Ministry of Steel will also make necessary efforts to identify bad debts in the steel sector. Such companies will be encouraged to lower their Debt/EBITDA ratio by adopting appropriate debt restructuring in consultation with banks as per the RBI guidelines.

4.15. Role of CPSEs and Way Forward

- 4.15.1. The Companies Act, 2013 was enacted on 29th August 2013 replacing the Companies Act, 1956. In addition, the Ministry of Corporate Affairs has also notified Companies Rules 2014 on Management and Administration (March 2015), Appointment and Qualification of Directors (January 2015), Meeting of Board and its powers (March 2015) and Accounts (October 2014). The Companies Act 2013 together with the Companies Rules provide a robust framework for corporate governance. These statutory provisions are also applicable to CPSEs.
- 4.15.2. In the current scenario, steelmaking CPSEs need to not only compete with private integrated steel players and cater to the requirements of the MSME steel sector but are also required to be globally competitive. In order to provide economies of scale, CPSEs will be encouraged to increase focus on their core competencies and divest their non-core assets through mergers and restructuring.
- 4.15.3. As of now, CPSEs have primarily focused and invested more in brown-field expansion of similar steel capacity with limited value addition in terms of high end product development. Ministry will encourage the CPSEs to develop a policy for future investment, so that impetus could be given for development of value added steel capacity and adoption of latest technologies at par with global best practices.
- 4.15.4. Besides, the CPSEs will also be encouraged to take leadership role in development of steel industry & the community, adopt a more inclusive business model, increase their CSR spends, invest in R&D for indigenous design & engineering and product development for replacement of import. Further, CPSEs will also be encouraged to take lead in promoting steel usage through developing steel intensive structural designs for roads, railways, bridges, crash barriers etc. with proper technical consultations and setting up of service centers for more customized and de-centralized product delivery.
- 4.15.5. Further to encourage synergy across similar CPSEs, efforts will be made to ensure appointment of independent directors across similar / independent CPSEs.

4.16. Focus on High - End Research: Steel Research & Technology Mission of India (SRTMI)

- 4.16.1. In India, substantial R&D in Iron and Steel sector is currently being carried out by the leading steel companies like SAIL, Tata Steel, JSW Steel, etc. who have accomplished some significant work in the areas of raw material beneficiation, agglomeration and product development. However, in general, major focus of R&D is limited to day to day operations and hence, lacks disruptive innovation.
- 4.16.2. India's R&D investment in steel sector is limited not only in absolute terms but also as percentage of turnover which is 0.05 – 0.5% as against 1% in leading steel companies abroad. The Indian steel companies need to evolve a time bound action plan to enhance their R&D expenditure to at least 1% of the turnover.
- 4.16.3. Efforts will be made through joint collaborative R&D programmes to create manufacturing capabilities for development of process and products in synergy with natural resources of the country with an aim to minimize damage to the environment.
- 4.16.4. Ministry of Steel has taken full cognizance of the technological scenario in Indian Steel Industry and has initiated a fresh move for preparation of a comprehensive blue print for promotion of R&D in Iron & steel Sector. To bring in all the stake-holders into one platform and promote steel research on themes of critical and vital national importance, an institutional platform called “**Steel Research and Technology Mission of India**” has been established with an objective to spearhead R&D of national importance in iron & steel, creating state-of-art facilities to conduct cutting-edge research, develop expertise & skill development, manage human resources and bolster a tripartite synergy amongst industry, national R&D laboratories and academic institutes.
- 4.16.5. In order to boost innovation in the steel sector (future technologies), a time bound action plan will be evolved under the aegis of SRTMI to enhance the R&D expenditure of Indian steel CPSEs. The Ministry through SRTMI will also encourage corporates in steel sector, private and public sector alike, to direct certain sums from their profits towards continuous industry collaborative research. Apart, they would also be encouraged to set up their own steel technology centres and steel sector oriented research and education wings at universities in order to focus on technology based solutions for development of high quality, low cost steel products and to build greater interface between academia, R&D institutions and industry.
- 4.16.6. Product development is yet another challenge faced by the Indian steel industry which has given rise to import of most of the value added products like automotive steel for high end applications, electrical steel like CRGO & amorphous steel as well as special steel and alloys for the Power Equipment, Aerospace, Defense and Nuclear applications. Production of these value added, front end, and strategic products will be facilitated through acquisition of foreign technology by setting up of joint ventures, or subsidiaries of foreign companies or by indigenous development. Measures will also be taken to ensure development of all such special steel and alloys to minimize import dependence.
- 4.16.7. Indian steel industry is currently importing technology & critical equipment and systems for steel plants. Hence, necessary efforts will be made under the aegis of SRTMI to raise the level of R&D and acquire best in class manufacturing capabilities to develop all these equipment and systems.
- 4.16.8. CPSEs will be encouraged to reduce manpower and overhead expenses based on domestic and peer group benchmarking. Besides, the CPSEs will also be encouraged to right size their manpower over time through Superannuation/ Separation/ intakes in conformance with technological advances and suitably exercise the option of Voluntary Retirement Scheme (VRS) to improve labour productivity.
- 4.16.9. As a part of skill development initiative, the Ministry will coordinate with the technical institutes under its aegis and INSDAG to re-align the education system to attract, facilitate and generate steel domain experts.

5. Power to amend the Policy

- 5.1. Notwithstanding anything contained in the foregoing paras, the Ministry of Steel, with the approval of Competent Authority, may amend various aspects of this Policy from time to time depending upon the experience gained during implementation, market dynamics, end user interest etc.

[F. No. 18 (2)/2016-IDD]

SYEDAIN ABBASI, Jt. Secy.

Annexure I: Forecast of iron and steel demand and production by 2030-31
(All values in MT unless stated)

Sr. No.	Parameters	Projections (2030 – 31)
1	Total crude steel capacity	300
2	Total crude steel demand/production	255
3	Total finished steel demand/production	230
6	Sponge iron demand/production ³	80
7	Pig iron demand/ production	17
8	Per Capita Finished Steel Consumption in Kgs	158

Source: Ministry of Steel, INSDAG, MECON

Projections of Pig Iron & Sponge Iron represent the mean value based on the premise that 60-65 % of steel production in 2030-31 shall be coming through BF-BOF route and rest through EAF/IF route.

Assumptions:

- i. GDP growth rate assumed at 7.5%⁴ y-o-y
- ii. Elasticity of steel demand with GDP = 0.8 till FY 20 and 1.0 from FY 20 onwards
- iii. Steelmaking capacity to reach 300 MT by 2030-31

Annexure II: Sector wise steel consumption in India in MT (unless stated)

Sr. No.	Item	Current demand 2015-16	Projected demand in 2030-31
1	Construction & Infrastructure (Projects - Steel, Oil, Highways, Bridges, Airports, Ports, Urban Infrastructure, Water Transportation, Pre-fabricated Buildings, Power Projects including Transmission, Oil & Gas Pipelines Real Estate – Residential & Industrial)	50.5	138
2	Engineering & Fabrication (Capital Goods, Consumer Durable, Electrical Goods, General Engineering, Tube Making, Cold Reducing, Wire Drawings, Industrial Bodies & Pressure Vessels, General Fabrication, Defence Equipment)	18	50
3	Automotive	8.2	28
4	Other Transport (Rail lines, Wagons Coaches, Ship Building, Coastal)	2.4	8
5	Packaging & Others (not included above) (Petroleum, non-petroleum, LPG Gas Cylinders)	2.4	6
Total Finished Steel Consumption in MT		81.5	230
Per Capita Finished Steel Consumption in Kgs		61	158

Source: Ministry of Steel, MECON

Annexure III: Forecast of major raw material requirement by 2030-31
(All Values in MT unless stated)

Sl. No.	Raw materials	Projections (2030-31)
1	Iron ore requirement	437
2	Coking coal requirement	161
3	Non-coking coal requirement for PCI	31
4	Non-coking coal requirement for DRI	105

³ DRI made through coal based route : 70% {Balance through gas based route}

⁴ Average GDP growth rate of India was 7.5% during 2010 – 2015 (World Bank)

5	Natural Gas (in MMSCMD ⁵)	20
6	Manganese ore requirement	11
7	Chromite ore requirement	5
8	Limestone & Dolomite requirement	86
9	Ferro-alloys	4
10	Refractories	3
11	Scrap	16

Source: Ministry of Steel, MECON

Projections represent the mean value based on the premise that 60-65 % of steel production in 2030-31 shall be coming through BF-BOF route and rest through EAF/IF route.

Assumptions:

BF-BOF route: 60-65%; EAF/IF route: 35-40% (2030-31)

% Scrap in Charge mix of BOF : 15

DR-EAF charge mix considered : 63% DRI, 35% Hot Metal & 2 % Scrap

DR-IF charge mix considered : 80% DRI & 20% Scrap

Charge mix in BF considered : 60% Sinter, 25% Pellet & 15% Lump ore

Charge mix in gas based DR plant considered : 30% Lump ore & 70% Pellet

Charge mix in Coal based DR plant [50% kilns running on pellet & 50% on lump ore]

DRI made through coal based route : 70% {Balance through gas based route }

Skip Coke required in BF : 450 kg/thm

Avg. PCI Injection in BF considered : 150 kg/thm

Iron Ore required /t of Hot metal in BF : 1.65 t

Iron ore required /t of solid charge in DR plant : 1.55 t

Natural gas required /t of DRI production : 280 SM³

Annexure IV: Targets for techno-economic performance

Parameter	Units	International Best Practices	Current Value	Target for 2030-31
Coke Rate	Kg/thm	275 - 350	400 - 600	300 - 350
CDI Rate	Kg/thm	200 - 225	50 - 200	180 - 200
BF Productivity	tonnes/m ³ /day	2.5 - 3.5	1.3 - 2.2	2.5 - 3.0
Specific Energy Consumption	Gcal/tcs	4.5 - 5.0	6.2 - 6.7	5.0 - 5.5

Source: Ministry of Steel

Annexure V: Production, consumption, imports and exports of finished steel (in MT)

Period	Production for sale	Import	Export	Consumption
Apr 2016 – Jan 2017	82.9	6.1	5.9	68.9
2015-16	91	11.7	4.1	81.5
2014-15	91.5	9.3	5.6	77
2013-14	87.7	5.5	6	74

Source: Ministry of Steel, JPC

⁵ Million Metric Standard Cubic Meter Per Day

(Assumed that 100 % DRI through gas based route would be produced using natural gas. In case DRI is produced using other gases such as syngas, coke oven gas, Corex gas, etc., the natural gas demand shall accordingly reduce)

Annexure VI: Indian Steel sector – Industry Analysis

Suppliers' power	Threat of new entrants	Buyers' power
<ul style="list-style-type: none"> + Iron ore- dependent on NMDC, OMC and Odisha miners + Coking coal/ Natural Gas- dependent on imports + Thermal Coal- CIL/ SCCL + Natural Gas- Government allocation, R-LNG contracts + Huge dependency on major suppliers + High switching cost for steelmakers + Very few steelmakers have captive mines and are not dependent on the vagaries of the market + High cost of raw material relative to total purchases in industry — Fragmented coke suppliers — Low threat of forward integration by major suppliers 	<ul style="list-style-type: none"> + 100% FDI in Steel sector + Government facilitating investment + Very few players have economies of scale + Easier access to key inputs (Auction) + Low brand identity (commodity) and low switching cost + Fewer proprietary products and low chances of retaliation — High capital costs and entry barriers — High psychological costs for switching suppliers — Raw material security & high logistics cost issues — Steel sector recognised as stressed by the banks — Time consuming land and environmental approvals — Highly capital & technology intensive industry 	<ul style="list-style-type: none"> + Increasing demand at 5-6% CAGR + E-Platform – MSTC Metal Mundi launched to facilitate transparent sale of finished & semi-finished steel products + Steel used in automobile & engineering goods market are dominated by private players — Unregulated sector, but Govt. may take trade remedial measures that indirectly influences the domestic retail prices — Steel used in construction & Infra sector mainly procured by Govt. entities — Fragmented MSME steel players
Industry rivalry		
<ul style="list-style-type: none"> + Industry is divided among few integrated steel manufacturers and fragmented MSME steel players + Competition among domestic producers + Competition from foreign players, esp. China + Disinvestment & capacity expansions by CPSEs 		
Threat of substitutes		
<ul style="list-style-type: none"> + Limited substitutes- Aluminium, plastic and carbon fibre — High switching cost and high performance tradeoff of substitutes — Low buyer inclination to substitute 		

	High
	Medium
	Low

Appendix I: List of Abbreviations

BF-BOF	Blast Furnace – Blast Oxygen Furnace
CAGR	Compounded Annual Growth Rate
CDI	Coal Dust Injection
CDR	Corporate Debt Restructuring
CIL	Coal India Limited
CIS	Commonwealth of Independent States
COP	Conference of the Parties
CPSE	Central Public Sector Enterprises
CRZ	Coastal Regulation Zone
CRGO	Cold Rolled Grain Oriented
DPE	Department of Public Enterprises
DRI	Direct Reduced Iron
EAF	Electric Arc Furnace
EBT	Eccentric Bottom Tap
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GST	Goods and Services Tax
IF	Induction Furnace
INDC	Intended Nationally Determined Contribution
MMSCMD	Million Metric Standard Cubic Meter Per Day
MoPNG	Ministry of Petroleum & Natural Gas
MoS	Ministry of Steel
MTPA	Million Tonnes Per Annum
NMDC	National Mineral Development Corporation
NPA	Non-Performing Assets
PCI	Pulverized Coal Injection
PPP	Public Private Partnership
R&D	Research and Development
REC	Renewable Energy Certificates
R-LNG	Regasified Liquefied Natural Gas
UHP	Ultra High Power
UNDP	United Nations Development Programme
VAT	Value Added Tax
WTO	World Trade Organization

REVISED ORDER
CORRECTED 31.08.2018

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

Original Application No. 593/2017
(W.P. (Civil) No. 375/2012)

In the matter of:

Paryavaran Suraksha Samiti & Anr.
Vs.
Union of India & Ors.

CORAM : HON'BLE MR. JUSTICE ADARSH KUMAR GOEL, CHAIRPERSON
HON'BLE DR. JUSTICE JAWAD RAHIM, JUDICIAL MEMBER
HON'BLE MR. JUSTICE S.P. WANGDI, JUDICIAL MEMBER
HON'BLE DR. NAGIN NANDA, EXPERT MEMBER

Present:

<p>Applicant: Amicus Curiae: Respondent Nos.</p>	<p>Mr. Rohit Prajapati, Applicant in person Mr. Jai A. Dehadrai, Adv. Mr. Nishe Rajan Shonker, Adv. for State of Kerala Mr. Tarunvir Singh Khehar, Ms. Guneet Khehar Mr. Sandeep Mishra Advs. for GNCTD Mr. Anil Shrivastava Mr Rituraj Bswas and Ms. Sujaya Bardhan, Advs. for State of Arunachal Pradesh Mr. Jogy Scaria, Ms. Beena Victor, Advs. for Kerala State Pollution Control Board Mr. Avijit Roy, Adv. for Assam Pollution Control Board Mr. Leishangthem Roshmani Kh, Ms. Maibam Babina, Advs. for State of Manipur Mr. Nikhil Nayyar, Mr. Dhananjay Bajjal, Advs. for APPCB and TSPCB Mr. Mukesh Verma, Adv. Mr. Tarunvir Singh Khehar, Adv., Mr. Sandeep Mishra and Ms. Guneet Khehar, Adv. Mr. Dinesh Jindal, LO for DPCC Ms. Aruna Mathur, Mr. Avneesh Arputham, Ms. Simraj Jeet and Ms. Anuradha Arputham, Advs. for State of Sikkim Mr. Raja Chatterjee, Mr. Piyush Sachdev, Ms. Abhinandini Yadav, Advs. and Advs. for State of WB Mr. Edward Belho, AAG, Mr. K. Luikang Michael and Ms. Hoineithiam, Advs. for State of Nagaland Ms. Enatoli Sema, Adv. for State of Nagaland and Pollution Control Board Mr. M. Paikaray and Mr. A.K. Panda, Advs. for SPCB, Odisha Mr. Dhruv Pal, Adv. for State of Gujarat Mr. V.K. Shukla, Adv. for State of MP Mr. Jayesh Gaurav, Adv. for R-47 Mr. Tayenjam Momo Singh, Adv. for Meghalaya Pollution Control Board Mr. Shlok Chandra and Mr. Ritesh Kumar Sharma, Advs. Mr. Gautam Singh and Mr. Shoeab Alam, Advs. for State of Bihar Ms. Aprajita Mukherjee, Adv. Ms. G. Indira, Adv. for UT of Andaman & Nicobar Mr. Balendu Shekhar, Mr. Sriansh Prakash and Mr. Rajkumar Maurya, Advs. for Ministry of Environment, Forest and Climate Change Ms. Puja Kalra, Adv. for SDMC & NDMC</p>
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Mr. Anil Grover, AAG, Mr. Rahul Khurana and Mr. Mishal Vij, Adv. for State of Haryana and HSPCB

Ms. Yogmaya Agnihotri, Adv. and Ms. Prity, Adv. for CECB

Ms. Sakshi Popli, Adv. for Ministry of Environment, Forest and Climate Change

Mr. Shuvodeep Roy, Adv. and Mr. Rituraj Biswas, Adv. for State of Tripura & Tripura Pollution Control Board

Mr. Shashank Bajpai and Mr. Shakun S. Shukla, Adv. for State of Odisha

Ms. Asha Nayar Basu and Ms. Aradhita Ghosh Mandal, Adv.

Ms. Priyanka Sinha, Adv. for State of Jharkhand Mr. Rajul Shrivastav, Adv. for MPPCB

Mr. Pradeep Misra and Mr. Daleep Dhyani Adv. for UPPCB

Mr. R. Rakesh Sharma and Mr. V. Mowli, Adv. for State of TN & TNPCB

Mr. Shubham Bhalla, Adv.

Mr. Shiv Mangal Sharma, AAG, Mr. Saurabh Rajpal, Mr. Adhiraj Singh, Ms. Shikha Sandhu and Mr. Vikrmjeet Singh, Adv. for State of Rajasthan and Pollution Control Board

Mr. G. M. Kawoosa, Adv. for State of J & K

Mr. Divya Prakash Pande, Adv. For HPSPCB

Mr. Manish Kumar, Adv.

	<p>Item No. 12</p> <p>August 03, 2018</p> <p>A</p>	<p>1. This matter was taken by this Tribunal in furtherance to the orders of the Hon'ble Supreme Court dated 22.02.2017 <i>Paryavaran Suraksha Samiti Vs. Union of India</i> (2017) 5 SCC 326, establishment and functioning of ETPs/CETP/STPs.</p> <p>2. Vide order dated 25.05.2017, Notice was issued to Central Pollution Control Board and all the States Pollution Control Boards/Committees and the Ministry of Environment, Forest and Climate Change. They were directed to file status-cum-compliance report in terms of the orders of the Hon'ble Supreme Court. Accordingly, various status reports have been filed. An affidavit has been filed by the Ministry of Environment, Forest and Climate Change dated 04th July, 2017 stating as follows:</p> <p style="padding-left: 40px;"><i>"4. That the answering Respondent is engaged in policy formulation, prescribing standards and its implementation through the Central Pollution Control Board (CPCB), State Pollution Control Boards (SPCBs) and Pollution Control Committees (PCCs) for UTs. This Ministry has written to all</i></p>

	<p>Item No. 12</p> <p>August 03, 2018 A</p>	<p>SPCBs and PCCs as well as to CPCB to ensure compliance of the judgment of the Hon'ble Supreme Court and to submit detailed compliance report.</p> <p>5. That the CPCB has also followed up with all SPCBs and PCCs through letters and review meetings to ensure compliance of the aforementioned judgment and that the matter was also discussed in the 62nd Conference of the Chairmen and Member Secretaries of SPCBs and PCCs held on 27.06.2017. That 26 SPCBs/PCCs have submitted the compliance report, which has been summarized at Annexure-I.</p> <p>6. That the CPCB has also carried out inspections of 17 categories of industries to verify compliance with its directions issued on online effluent/emission monitoring system and to cross-verify online results with manual sampling. During February-June, 2017, 64 industries were inspected and directions under section 5 of the Environment (Protection) Act, 1986 have been issued to 24 non-complying industries; 18 industries were complying; 8 were found closed and inspection reports of 14 industries are under process.</p> <p>7. That the CPCB and NMCG through 11 technical institutions, inspected 751 industries located in the River Ganga main stem during March-April, 2017 to verify the status of installation and connectivity of industries discharging effluents as well as their compliance with the standards. Closure directions have been issued to 154 industries; show cause notices issue to 36 industries; 149 industries were found complying and direction issued to 91 self-closed Grossly Polluting Industries (GPI) to remain closed; 93 GPI units were found closed as per directions; 38 GPI units found operational in violation of closure directions and inspection reports of 190 industries are under process”.</p> <p>3. We have heard learned Amicus Curiae Sh. Jai A. Dehadrai and the learned counsel for Ministry of Environment, Forest and Climate Change, Central Pollution Control Board, various State Pollution Control Boards and the Pollution Control Committees.</p> <p>4. Learned Amicus Curiae has drawn our attention to orders dated 04.07.2017, 18.09.2017 and 11.10.2017 of the Tribunal directing the State Pollution Control Boards to file a statement as to how many Industrial Units discharging trade effluents or causing emissions exist in</p>
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	<p>Item No. 12</p> <p>August 03, 2018</p> <p>A</p>	<p>the State, how many are having their own STPs, ETPs and/or connected to Common Effluent Treatment Plant (CETP), whether any such CETP or ETP or STP is properly functioning and treating the effluents as per prescribed limits or not.</p> <p>5. Learned Amicus Curiae submitted that contamination of water due to industrial effluents can lead to various diseases and adverse consequences on the aquatic organism due to decreased level of oxygen. The use of technology can help reduction of adverse consequences. However, the best solution is to prevent pollution by soil conservation and proper disposal of toxics and chemicals which may include chemical recycling.</p> <p>6. Having monitored the matter for the last more than one year on several dates, we are of the view that the matter requires continuous monitoring by statutory authorities as per directions which we proceed to issue today.</p> <p>(i) We direct the Central Pollution Control Board (CPCB) to forthwith prepare an action plan after looking into all the status reports. The action plans must have mechanism to ensure compliance or all the directions in the order of the Hon'ble Supreme Court. To enable this to be done, a Nodal officer must be identified to deal with the issue of CETPs/ETPs/STPs.</p> <p>(ii) A representative of the Ministry of Environment, Forest and Climate Change may be associated with the Nodal Officer of the CETP for monitoring. The Monitoring by the said two officers- the representative of the MoEF and the Nodal Officer of the CPCB must be held atleast once in a</p>
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	<p>Item No. 12</p> <p>August 03, 2018</p> <p>A</p>	<p>month and on the basis of such meeting and the feedback taken further follow up action must be taken and appropriate directions issued. This process may be a continuous process.</p> <p>(iii) It must be ensured that STPs, CETPs and ETPs are functional and meet the requisite standards.</p> <p>(iv) There is already a direction in the above judgment under which 50% of the funds for the purpose are to be provided by the Central Government, 25% by the States and remaining 25% to be arranged by way of loans which is to be re-paid by the user industries. Local bodies and the States have duties as clearly stipulated in the judgment. There has to be online monitoring system by each State to display emission levels in public domain in terms of paragraph 17 of the order of the Hon'ble Supreme Court.</p> <p>(v) A report of the steps taken may be placed on the website of the Central Pollution Control Board atleast once in three months. Deficiencies if any may also be so displayed.</p> <p>(vi) The Central Pollution Control Board may take penal action for failure, if any, against those accountable for setting up and maintaining STPs, CETPs and ETPs Central Pollution Control Board may also assess and recover compensation for damage to the environment and the said fund be kept in a separate account and utilized in terms of an action plan for protection of the environment. Such action plan may be prepared by the Central Pollution Control Board within three months from today.</p> <p>(vii) A compliance report in terms of the above order may</p>
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	<p>Item No. 12</p> <p>August 03, 2018</p> <p>A</p>	<p>be furnished to this Tribunal within four months from today by e-mail at filing.ngt@gmail.com.</p> <p>(7) Proceedings are disposed of.</p> <p>However, the report received from the Central Pollution Control Board may be placed for consideration before this Tribunal on 3.2.2019.</p> <p>We place on record our appreciation for the services rendered by the learned Amicus Curiae.</p> <p>....., CP (Adarsh Kumar Goel)</p> <p>....., JM (Dr. Jawad Rahim)</p> <p>....., JM (S.P. Wangdi)</p> <p>....., EM (Dr. Nagin Nanda)</p> <p style="text-align: right;">03.08.2018</p>
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