Indian Steel Industry: Trends and Insights

Occasional Paper No.: 224

Export-Import Bank of India

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Executive Summary

Steel plays a significant role in human life, especially in every aspect of engineering. It is used in manufacturing, including cars, building supplies, washing machines, cargo ships, surgical scalpels, and many other products that have growing importance among consumers. Steel is an alloy of iron and carbon containing less than 2% carbon and at times 1% manganese and small amounts of silicon, phosphorus, sulphur, and oxygen.

Global Production Trends

Crude Steel: The global crude steel production stood at 1892 MT in 2023, a marginal increase from 2022. Several nations saw fall in production in 2023 due to global slowdown and recessionary pressures, impacting demand as well as production. In India, the demand held steady, driven by an infrastructure boom, and supported by allied sectors, such as housing, auto and consumer durables.

China was the largest producer of crude steel globally, with production of 1019 MT crude steel in 2023, same as in 2022. India, with a production of 140.8 MT crude steel was the second largest crude steel producer in 2023, followed by Japan (87.0 MT), the US (81.4 MT), and Russia (76.0 MT).

Iron Ore: The world's crude iron ore reserves have fluctuated between 170 and 190 billion metric tonne (BT) over the past decade. As per the latest data from United States Geological Survey (USGS), crude ore reserves are at 190 BT. Australia has the highest crude-ore reserves in the world. In 2023, Australia accounted for over 30% of the global crude iron ore reserves, followed by Brazil (17.8%), and Russia (15.2%). In 2023, the global iron ore

production stood at 2436 MT, up 2.3% on-year. Australia, Brazil, China and India were among the world's largest iron ore mine producers and accounted for 80% of the global iron ore in 2023.

Metallurgical Coal: Metallurgical coal production rose to 1113 MT in 2023 from 940 MT in 2010 on rising demand from the global steel industry. China accounted for about 58% of global coking coal production, at 649 MT in 2023, an increase of 8.5% on-year. The other top producing countries in 2023 were India, Australia and the USA.

Global Trade Trends

Iron Ore: In 2022, global iron ore exports declined 4.3% on-year to 1587 MT due to low exports from India amid implication of duty across steel products in the country. Over 2012-2022, exports rose at a CAGR of 3%. Australia is the largest exporter of iron ore in the world and accounted for around 57% of the global iron ore market. The other leading exporters of iron ore are Brazil, Africa, and India. China and Japan are the major iron ore importers. China accounted for 70.9% of iron ore imports in 2022.

Steel and Steel Products: Steel is a major commodity traded globally. Global steel exports (including both semi-finished and finished steel) stood at about 434.7 MT in 2023. Hot-rolled (HR) sheets and coils were the most exported steel products globally during 2014-2023. They accounted for about 19% of the exports in 2023, followed by ingots and semi-finished steel, galvanised sheets, steel tubes and fittings, plates etc.

The five major exporters of steel products in 2023 were China with a share of about 21.7% in global exports, Japan (7.4%), the European Union (27) (6.2%), South Korea (6.2%), and Germany (5.2%). The European Union remained the top importer of steel in 2023, with a share of 9%. The EU both imports and exports steel products but is a net importer. Other key importers are the United States (6.1%), Germany (4.3%), Italy (4.3%), Turkey (4.1%) and Mexico (4%).

India's Steel Industry

India is the second largest steel producer globally, after China. Being one of the core industries, steel contributes slightly more than 2% of India's GDP. Given the low per capita steel consumption in the country, there is considerable scope for the sector to grow.

Production Trends

Iron Ore: The production of iron ore in FY 2024 has picked up, growing by 7.7% year on year to 277 MT. Odisha remains the largest producer of iron ore in India with a share of over 56% as of FY 2023, followed by Chhattisgarh (16%) and Karnataka (14%).

Crude Steel: In FY 2024, India produced 144 MT of crude steel, compared with 89 MT a decade ago. The steel industry has logged an impressive average growth of 4.8% every year between FY 2015 and FY 2024.

Finished Steel: In FY 2024, finished steel production stood at 138.8 MT, up 9.1% from the previous year. During FY 2015-24, the production grew at an AAGR of 5.2%. Consumption of finished steel in FY 2024 was recorded at 136.3 MT, up 13.6% on-year driven by the housing and infrastructure segments.

India's Trade Trends

Iron Ore: In 2022, India's iron ore exports stood at 16 MT, with China being the major destination. India exported 6% of the ore produced in the country.

Coking Coal: The steel sector requires high-quality coking coal for the manufacturing process. Despite having substantial coal reserves, India is unable to produce steel grade coking coal and largely depends on global markets for its coal requirements in the steel sector. India's imports of coking coal rose to 60.5 MT in FY 2024, up by 4.2% from 58.1 MT in FY 2023. Historically India was dependent on Australia for majority of its coking coal imports. However, in the recent years, Australia' share in India's imports of coking coal has reduced from 85% in FY 2017 to 49% in FY 2024.

Finished and Semi-finished Steel: In FY 2024, India's exports of steel stood at about 8.5 MT of which exports of finished steel were 7.5 MT and exports of non-finished steel were over 1 MT. The exports of finished steel products after exhibiting a contraction of 50.2% in FY 2023, registered a growth of 11.5% in FY 2024. India's most exported products in the finished steel category include bars/ rods and HR coils/ sheets, plates, galvanised sheets/ plates and cold-rolled coils/ sheets. The imports of steel during FY 2024 stood at 9.7 MT, leading to a trade deficit of -1.1 MT. Notably, this marks a deviation from India's trend of registering a trade surplus in steel since FY 2017.

In FY 2024, flat products formed 78.1% of India's total steel exports (6.7 MT), up from 71% in FY 2023. The share of non-flat products has fallen marginally from 10.1% in FY 2023 to 9.7% in FY 2024 (0.81 MT). The remaining 12.4% was the share of semi-finished products in exports.

Italy was a key importer of finished steel products from India in FY 2024 with a share of 19% in India's exports (1.8 MT), followed by Belgium with exports of 0.9 MT, Spain (0.7 MT), the UAE (0.6 MT), and the USA (0.2 MT).

Impact of FTAs on Indian Steel Sector

ASEAN, Japan and South Korea

In terms of the Indian steel sector, Japan and South Korea are the key competitors. Both countries have large surplus capacities in steel making and a significantly high exports to production ratio. South Korea continues to account for the largest share in Indian steel import basket. High value-added steel products like electrical steel are helping South Korea in expanding the market share. However, Japan's share in imports has declined as more competitive imports from China and ASEAN have gained market share.

The UAE

With the signing of the India-UAE CEPA, the import duty on Indian steel products in the UAE is planned to phase out in a span of 10 years. In 2022, the import duty on majority of steel products was 5%. The plan is to reduce

import duty by 0.5% every year and reach 0% in a span of 10 years. This will result in lesser import cost for UAE consumers, thereby making Indian exports more competitive in the world steel sector.

Australia

Under the India-Australia ECTA, import duty on coking coal was reduced to 0% from 2.5%, which is conducive for Indian steel industry as India is heavily dependent on Australia for its coking coal needs.

Implications of Tariffs on India's Steel Exports

EU

The EU accounts for a major share (36%) of Indian finished steel exports. The EU has imposed a quota on steel imports to safeguard domestic industries, thereby impacting trade. In the medium term, exports from India to the EU would depend on the safeguard measures that come into play and on the impact of Carbon Border Adjustment Mechanism (CBAM). The tariffs under CBAM will be introduced gradually from 2026 and 100% of the emission will be taxed in 2034.

To mitigate the price increase for exports to Europe, major steel mills in India have announced plans to commission low carbon products with increased usage of steel scrap and green electricity. With a typical gestation period of 4-5 years for new steel mills, low emission steel production in India is expected to start by the end of the decade.

UK

After the adoption of the UK Steel Safeguard Policy, India and the UK started talks on FTA to reduce the impact of the policy on steel exports from India. India and the UK launched talks for an FTA in January 2022 and the negations are going on. The signing of an FTA is expected to provide an impetus to India's steel exports the UK.

Decarbonisation of Steel Sector

The steel industry plays a significant role in global emissions, roughly accounting for 9-10% of total global carbon emissions. The average carbon emissions increased from 1.8 tonne CO_2 per tonne crude steel cast in 2007 to 1.91 tonne CO_2 per tonne in 2022. Steel produced through the Blast Furnace-Basic Oxygen Furnace (BF-BOF) route consumed on an average 23.98 gigajoule (GJ) per tonne of crude steel produced, steel produced through the scrap- electric arc furnace (EAF) consumed 10.20 GJ per tonne of crude steel produced, and the Direct Reduced Iron (DRI)-EAF consumed 22.37 GJ per tonne of crude steel produced in 2022. As the world moves towards reducing the carbon emissions in steelmaking, the new capacities are expected to come up in the scrap-EAF space.

The steel industry in India accounts for about 13% of India's energy-related emissions as per the IEA India Energy Outlook 2021, higher than the global standard of 7-8%, and over a third of total industrial energy related emissions. Despite improvements in recent years, average emissions at about 2.5 tonne of CO_2/tonne of crude steel as of 2021 remain well above the global benchmarks.

In India, 36% (45 MT) of crude steel was manufactured through the blast oxygen route in FY 2023. The EAF route accounted for 32% (40.6 MT). About 80% of production through the EAF method was coal-based, using coking coal as a reductant in the production process; the other 20% was natural gas-based. The induction furnace route accounted for the remaining 22% of steel production.

Being the second-largest producer of crude steel and the second-largest emitter of CO_2, Ministry of Steel is focusing on decarbonising the steel industry quickly to achieve carbon neutrality by 2070. Most integrated steel producers are taking efforts to adopt the best available technologies, in line with India's Net-zero target and the Steel Ministry's vision of reducing emission intensity by 20% by 2030.

Strategies for Strengthening the Steel Industry

The industry is witnessing a paradigm shift. While on the one hand, the National Steel Policy has a vision to achieve a production target of 300 MT per annum by 2030, on the other hand, India has committed emission reductions under COP 26 which makes furthering sustainability in the steel sector a key priority.

Securing Coking Coal Supply

India is dependent on the import of coking coal for its needs. India's coking coal imports have increased from 44.8 BT in FY 2015 to 60.5 BT in FY 2024, recording an AAGR of 3.6%. India is expected to remain a key importer of coking coal until the end of the decade, as the Indian coking coal has high ash content and lower coke strength.

Around 49% of India's coking coal imports in FY 2024 were from Australia. To diversify its import sources, India needs to target Russia, Canada, and the US. Besides diversification, India may focus more on mining and washing technology to make India's coking coal more useful. Further, mining and exploration may also be helpful in finding more coking coal reserves, which could be low in ash content. Investing in technology would play a crucial role in reducing India's import dependence for coking coal.

Boosting Steel Exports

India's steel export potential remains underutilised, primarily exporting lower-value commodities such as hot rolled coils. Out of the total exports of finished and non-finished steel in FY 2024, about 88% of the exports were of non-alloys and only 12% of alloys. As a result, the export realisation in terms of value is lesser vis-à-vis products at the higher end of the steel value chain such as specialty steel products which involve the processing of normal finished steel by way of coating, plating, and heat treatment to convert it into high value-added steel, for use in applications such as defence, space, power, automobile, capital goods, etc.

For instance, India was the top importer of stainless steel in ingots or other primary forms (HS 7218) globally, with a trade deficit of US$ 1.4 billion in 2023. India's exports of stainless steel in ingots comprised a mere share of 0.7% in global exports in 2023 as against an import share of 26.8% globally. Similarly, India runs trade deficit in flat rolled products of stainless steel. While India had a trade surplus in stainless steel bars and rods in 2023, its contribution in global exports of 7% has huge scope of improvement given that the top exporting countries, Taiwan, Italy and Japan had a share of 19.4%, 13.8% and 10.5%, respectively, in world exports of stainless-steel bars and rods in 2023.

To enhance export performance, India needs to shift focus towards high-value steel products, such as specialty steels used in defence, space, and automotive industries, which command higher prices. Addressing cost competitiveness, particularly for high-grade steel, is crucial. This involves removing non-GST taxes that increase export costs and including steel in the Remission of Duties and Taxes on Exported Products (RoDTEP) scheme. Additionally, maintaining a stable policy environment, free from sudden export duties, and identifying competitive markets through targeted free trade agreements can significantly boost India's steel exports.

Addressing Logistical Challenges

In case of India, although the steel plants are at close distance to raw materials sources, most of them are far from the ports. The logistics costs thus become costly with high rail freight charges due to cross-subsidisation of passenger traffic.

To mitigate the costs, it is critical that India creates state of the art last mile connectivity to the ports. Currently, both iron and steel and iron ore are under class 165 while coal is under class 145. Higher the freight class, higher is the freight cost. Bringing down both iron and steel and ore under class 145 could give a major push to the competitiveness of the Indian Steel industry. Developing ports, dedicated railways, and expressways would enhance connectivity and efficiency. Addressing container shortages by manufacturing

them domestically, despite initial import dependencies for specific steel grades, would reduce long-term logistics costs and stimulate demand within the steel sector. These measures are crucial as India aims to reach a crude steel production target of 300 MT by 2030-31.

Integrating Industry 4.0 and Steel Industry

Adopting Industry 4.0 technologies can revolutionise steel manufacturing by enhancing productivity and reducing costs. IoT sensors may be used in the plants to collect the data pertaining to temperature, air pressure etc. and analyse using AI. Further, as steel plants are tough environments to work in with possibilities of accidents and injuries, monitoring of the machines in real time may be enabled.

Besides, as steel plants use humungous amounts of energy, smart meters and IoT may work together to reduce the wasted energy by assessing the amount of energy required as per the steel products being manufactured, thereby rationalising the energy consumption. Further, efficient utilisation of materials is another benefit of Industry 4.0 through the usage of AI. For instance, which product requires how much thickness and coating could be evaluated by AI through regular feeding of data, leading to better-quality products. Braincube is one such company which has been providing AI and data driven solutions to a host of steel manufacturing companies including ArcelorMittal, Aubert & Duval, Eramet etc. Going forward, inclusion of Industry 4.0 technologies may be incorporated in the production models either through in house resources or through outsourcing.

Moving Towards Greener Steel

India's position as the second-largest crude steel producer globally, necessitates a focus on reducing carbon emissions to meet its net-zero commitment by 2070. The International Energy Agency (IEA) roadmap suggests phased decarbonisation: short-term improvements in process and energy efficiency, medium-term adoption of hydrogen-based technologies and carbon capture, and other interventions post 2050.

In line with targets set by Indian government for net zero emission in steel industry, for reducing emissions in the short term, India may focus on using more scrap in the steel-making process, improving efficiency, and in turn, reducing energy and carbon intensity. Several Indian companies have announced plans to increase the use of scrap. For instance, JSW Steel plans to establish steel scrap processing centres across the country, Tata Steel is setting up electric arc furnace-based recycling plants and AM/NS India aims at increasing scrap use to around 10% by 2030 from 3-5% currently.

In the medium term, uptake of green hydrogen and CCUS technologies may be prioritised to reduce carbon emissions. Indian steel companies are working on improving process efficiencies and are working on new technologies to reduce the emissions from steel production. Notably, Jindal Stainless Limited has recently begun using green hydrogen for manufacturing stainless steel at its plant in Haryana. JSW Energy is also in the process of setting up a green hydrogen project in Karnataka for JSW Steel limited to manufacture green steel. Besides, Tata Steel has set up a carbon capture plant at Jamshedpur for making captured carbon available for onsite reuse.

Transitioning to a Circular Economy

As a permanent material which can be recycled repeatedly without losing its properties, steel is fundamental to a circular economy. The circular economy in the steel sector revolves around steel scrap recycling, improvement of material and process efficiency, and renewable or hydrogen-based steel production.

There is not enough scrap available to meet demand for new steel products. Going forward, for handling steel scrap, formal and scientific collection, dismantling, and processing of steel products may be promoted in an organised, safe, and environmentally sound manner. Production of high-quality steel scrap for steel production may be prioritised to minimise dependence on imports. Further, end-of-life vehicles from Indian cities may be eliminated and recycled into scrap steel and mechanisms may be established to treat waste streams and residues from demolition and shredding plants.

1. Global Steel Industry

Steel has become one of the most widely used materials across industries, globally. It is an alloy of iron and carbon containing less than 2% carbon and 1% manganese and small amounts of silicon, phosphorus, sulphur, and oxygen. It is made from iron ore which is mined in about 50 countries and almost 98% of global iron ore is used in steelmaking. Today, steel is the most important material used in engineering and building worldwide.

Global Steel Industry

Production Trends

The growth in global steel demand is estimated to be muted at 1-2%[1] in 2024. Europe witnessed contraction in steel demand by about 4.7% in 2023 because of the impact of geopolitical uncertainty, inflationary pressures, and above-average energy prices on end-user segments[2]. The developed world, overall, is expected to show a strengthening recovery in steel demand, estimated at 1.3% in 2024. Demand in China, which has a major share in global steel demand, was less than expected because of the country's ailing property sector given that the under-construction projects slumped 21% on year in 2023[3].

According to the World Steel Association, global steel demand is expected to see a 1.7% rebound to reach 1793 million tonnes (MT) in 2024 and growth of 1.2% in 2025 to reach 1815 MT.

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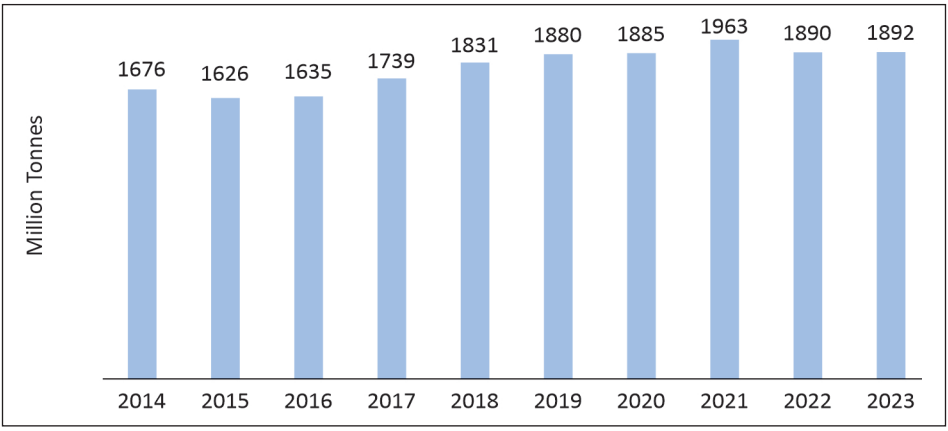
[1] World Steel Association

[2] The European Steel Association

[3] World Steel Association

The global crude steel production stood at 1892 MT in 2023, a marginal increase from 1890 MT in 2022 (Chart 1). Several nations saw fall in production due to slowdown and recessionary pressures, impacting demand as well as production. In India, however, demand held steady, driven by an infrastructure boom and supported by allied sectors, such as housing, auto and consumer durables.

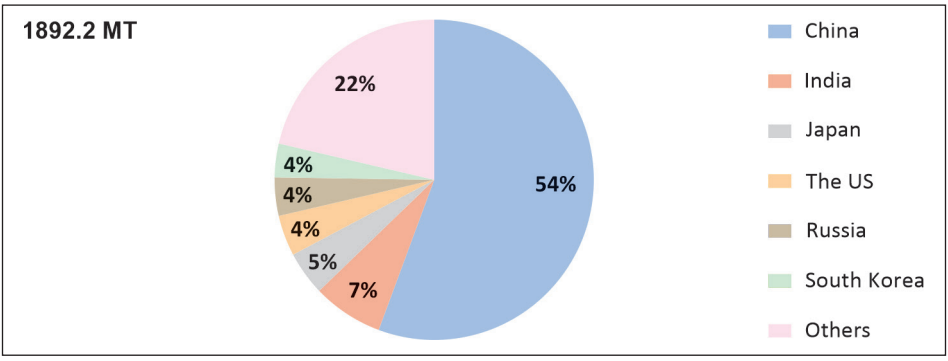
Chart 1: Global Crude Steel Production



Source: World Steel Association

China was the largest producer of crude steel globally, with production of 1019 MT crude steel in 2023. India, with a production of 140.8 MT crude steel was the second largest crude steel producer in 2023, followed by Japan (87.0 MT), the US (81.4 MT), and Russia (76 MT) (Chart 2).

Chart 2: Top Crude Steel-producing Countries: 2023



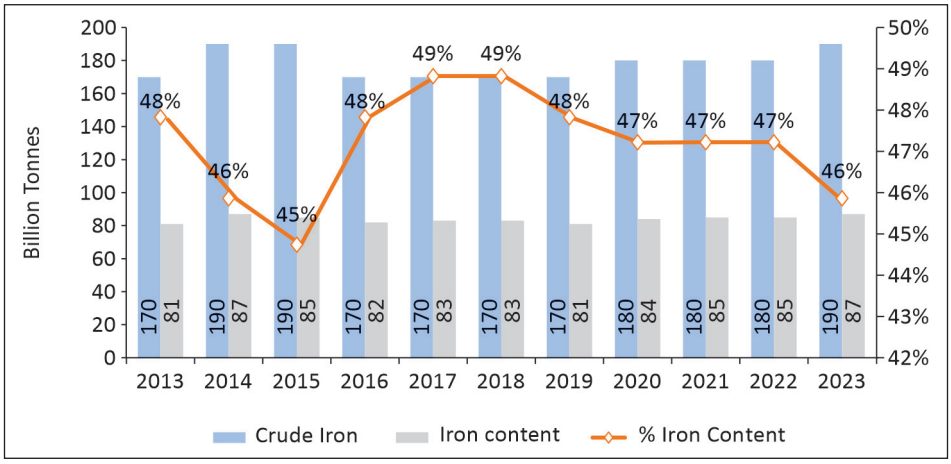
Source: World steel Association; India Exim Bank Research

Iron ore

Iron ore is the main raw material in steel making. Manufacturing a tonne of steel requires 1.5-1.7 tonnes of iron ore, apart from other raw materials, such as coking coal, thermal coal and ferro alloys. With steel heavily connected to the global value chain, its basic raw material, iron ore, assumes a major importance. Almost 98% iron ore is used in steelmaking, and it is mined in about 50 countries. The production of iron ore depends on the geological presence of reserves in a particular region and the feasibility and technologies available.

The world's crude iron ore reserves have fluctuated between 170 and 190 billion metric tonne (BT) over the past decade. As per the latest data from United States Geological Survey (USGS), crude ore reserves are at 190 BT. The average iron content of the total iron ore reserves in the world has been in the range of 47-49%, indicating an iron content of 80-87 BT by weight.

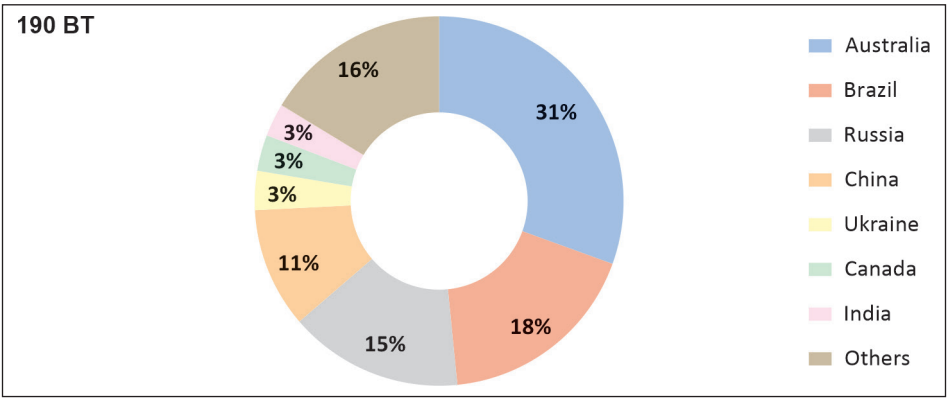
Chart 3: Global Crude Iron Ore Reserves with Iron Content



Source: United States Geological Survey (USGS); India Exim Bank Research

Australia has the highest crude-ore reserves in the world. In 2023, Australia accounted for over 30% of the global crude iron ore reserves, followed by Brazil (17.8%), and Russia (15.2%). India's reserves of crude iron ore are around 5.5 BT with a global share of 3.1%, the seventh highest in the world (Chart 4).

Chart 4: Crude Iron Ore Reserves by Country: 2023

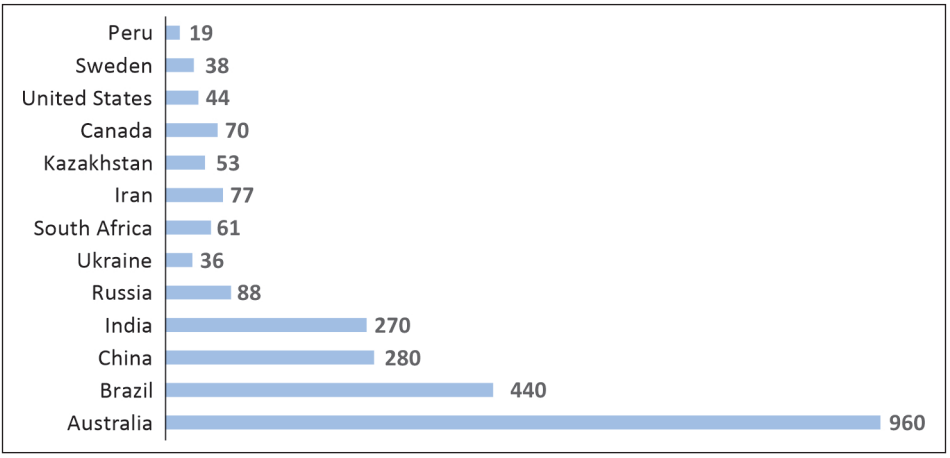


Source: USGS; India Exim Bank Research

Even though there are many iron ore deposits globally, only a few are physically and economically suitable for undertaking mining operations. As per the USGS, while the global iron ore reserves are around 190 BT, the global resources are estimated to be greater than 800 BT of crude iron ore containing more than 230 BT of iron.

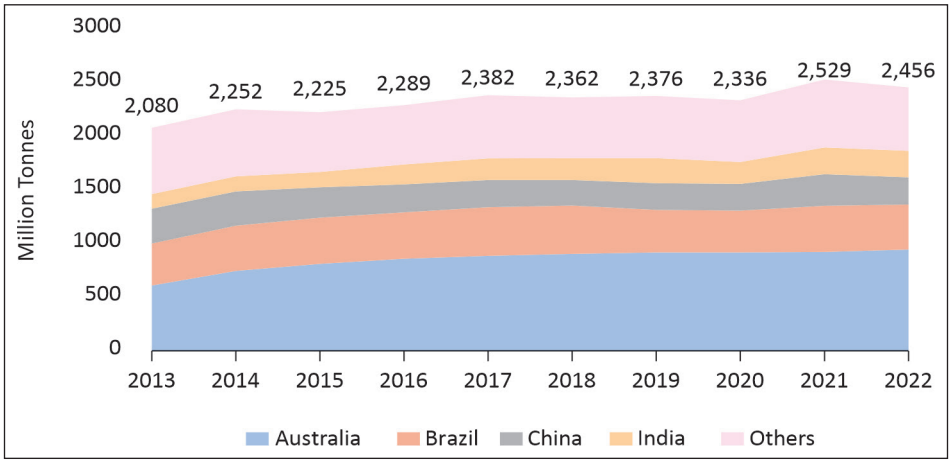
In 2023, the global iron ore production stood at 2436 MT, up 2.3% on-year (Chart 5). Australia and Brazil were among the world's largest iron ore mine producers, producing 960 MT and 440 MT, respectively, in 2023.

Chart 5: Global Iron Ore Production: 2023



Source: US Geological Survey

Chart 6: Top Iron Ore Producers



Source: World Steel Association

Australia is the leading producer of iron ore and accounted for 38% of the global output in 2022.The other major iron ore producers are Brazil, China, and India. These four countries produced 70-75% of the global iron-ore output during 2013-2022.

Metallurgical Coal

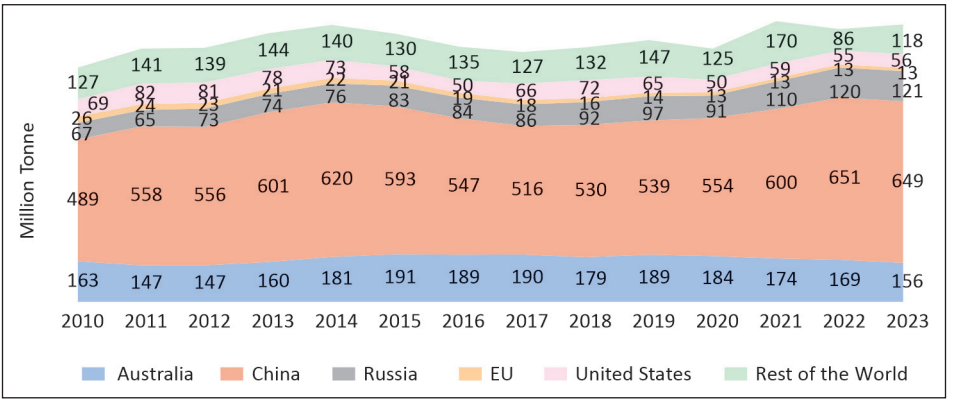
Metallurgical coal or met coal refers to coking coal and pulverised injection coal. It is primarily used in blast furnace operations at the iron making stage in the steel manufacturing process. In a coke oven plant, coking coal is converted into coke at high temperature in the absence of oxygen and then reacted with oxygen in blast furnace to form carbon monoxide to reduce iron oxide to iron.

Coking coal occurs naturally in sedimentary rock within the earth's crust. It has low ash, sulphur and phosphorus content, and high carbon content compared to thermal coal. It is porous, hard and bituminous in nature. The quality of coking coal is primarily measured by the hardness and reactivity of coke produced from coking coal. The coke reactivity index and coke strength after reaction are critical parameters for the efficient operation of a blast furnace. Based on this property, coking coal can be classified as weak, semi-soft, semi-hard, and hard coking coal.

Global Production of Metallurgical Coal

Met coal production rose to 1113 MT in 2023 from 940 MT in 2010 on rising demand from the global steel industry.

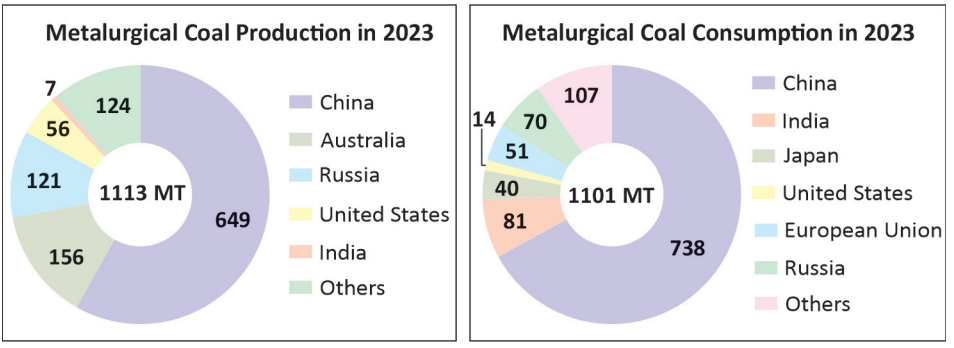
Chart 7: Global Metallurgical Coal Production



Source: IEA; India Exim Bank Research

The largest steel producing nations are the major markets for the coking coal sector. China is the largest producer of steel and consumer of coking coal in the world. Other major markets include India, Japan, Russia and the European Union. The global met coal demand has been increasing significantly from 881 MT in 2010 to 1101 MT in 2023.

Chart 8: Top Global Producers and Consumers of Metallurgical Coal



Source: CRISIL MI&A, IEA; India Exim Bank Research

- **China:** China accounted for about 58% of global coking coal production, at 649 MT in 2023. This was an increase of 8.5% on-year. In line with the sharp rise in steel production in China, which quickly overtook the United States to become the world's largest steel manufacturer in the early 2000s, demand for metallurgical coal has also expanded significantly. As China consumes almost 65% of global coking coal (738 MT in 2023), the global coal sector and its trade dynamics heavily depends on the political, economic and environmental situation in the country.
- **Australia:** Australia, with a production of 156 MT, accounted for 14% share of global coking coal production in 2023. However, the country's output declined 2.8% on-year in 2023, impacted by lower investments in coal mining activity. 95% of the country's production is exported and comprises 70% share in global exports.
- **Russia:** Russia is the third-largest coking coal producing country, with a production of 121 MT (11% share in global coking coal production) in 2023.

Coking coal demand is driven by China and India as the countries are major producers as well as consumers of crude steel. While India too has coking coal reserves, it has not been able to produce the required quality of washed low ash coking coal needed for the steel industry. Majority of mined coking coal is utilised in thermal power plants due to higher ash content. Hence, 85% of the coking coal requirement is met via imports. To bridge the gap, the Ministry of Coal has launched Mission Coking Coal to address the issue of demand supply imbalance and heavy import requirement in the Indian coking coal industry.

Global Trade Trends

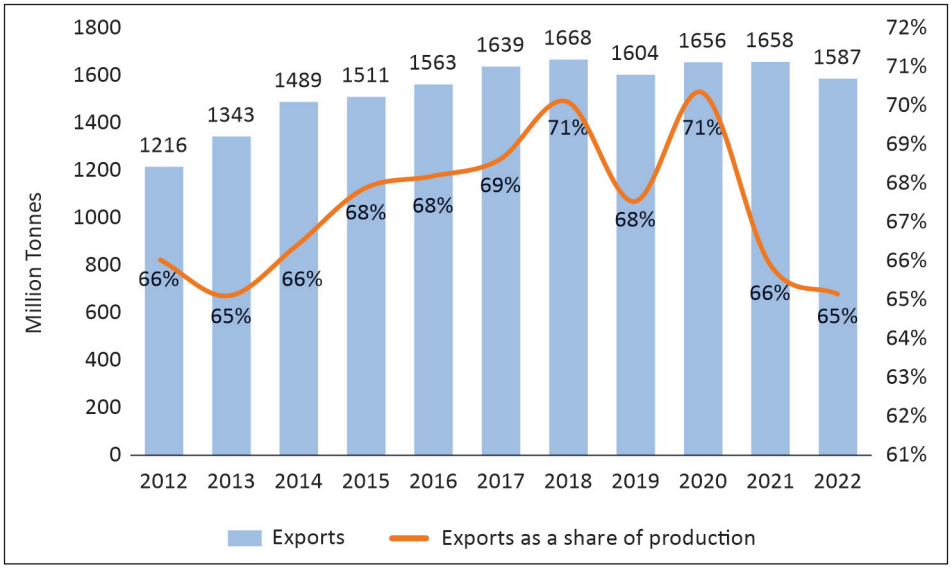
Steel is one of the most traded commodities in the world. In 2023, steel exports were equivalent to 434.7 MT. Steel-exporting regions typically have access to raw material, such as iron ore and coking coal, economic conditions that support industrial activity, and enough supply to trade in the global markets.

Iron Ore Trade

Iron-ore demand is driven by steel demand across geographies. The main iron-ore exporting countries are not major steel producers. Hence, their domestic ore consumption is less, thus resulting in a surplus that is exported. Also, there are other factors, such as unavailability of the required iron ore grade and cheaper prices in the global markets, which prompt some countries to import. Global iron ore exports over 2012-2022[4] are given below.

In 2022, global iron ore exports declined 4.3% on-year to 1,587 MT, due to low exports from India amid implication of duty across steel products in the country. Over 2012-2022, exports rose at a CAGR of 3%). Almost every year, 65-75% of iron ore produced was exported (Chart 9).

Chart 9: Global Iron Ore Exports



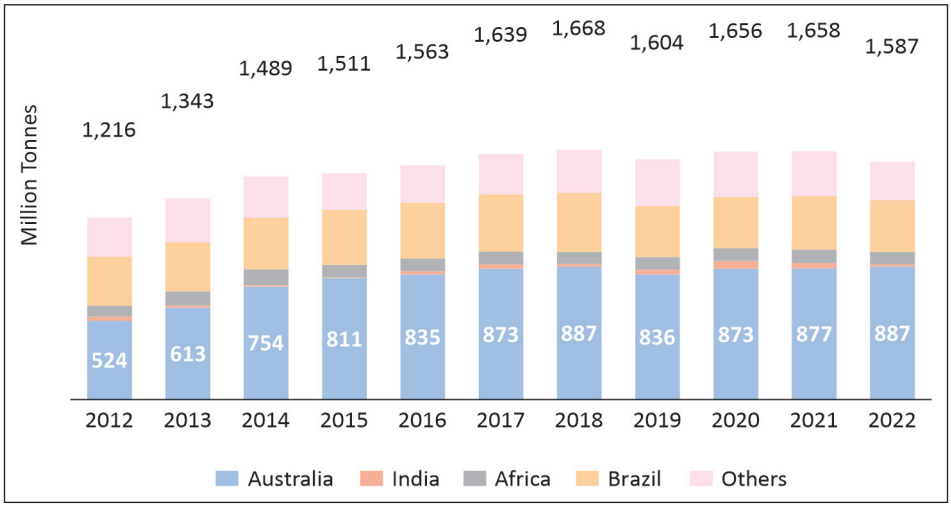
Source: World Steel Association; India Exim Bank Research

Australia is the largest exporter of iron ore in the world. In 2022, the country exported nearly 887 MT, accounting for around 57% of the global iron ore market. While the country has huge iron ore reserves, its crude steel

[4] Latest data available for 2022

production is minimal, making it a major ore exporter. In 2022, Australia exported 95% of its production. The other leading exporters of iron ore are Brazil (22% global market share), Africa (5%)[5] and India (1%) (Chart 10).

Chart 10: Top Iron Ore Exporters

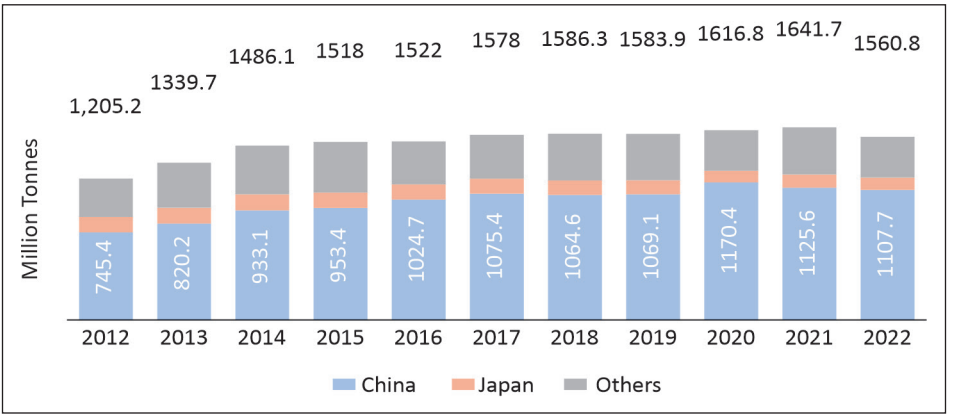


Source: World steel Association

China and Japan are the major iron ore importers. China topped with a 70.9% share in global ore imports as of 2022. The country is the top crude steel producer, accounting for 50-55% of the global production. In 2022, the country's iron ore production (feasible grade for production) was 21% of its apparent ore consumption, making it a net importer. Over 2019-2022, its ore imports were 4-5 times its domestic production as demand outstripped domestic supply by a huge margin. Japan had a 7% share in the imports market as of 2022. It was the third largest steel producer as of 2023. The country is fully reliant on other nations for iron ore as its domestic production is almost zero (Chart 11).

[5] South Africa, Mauritania and Sierra Lione account for 71%, 14% and 7% iron ore exports from Africa respectively. Going forward, in 3 to 5 years, Gunia (Conakry) is expected to become the largest exporter of iron ore from Africa.

Chart 11: Country-wise Iron Ore Imports

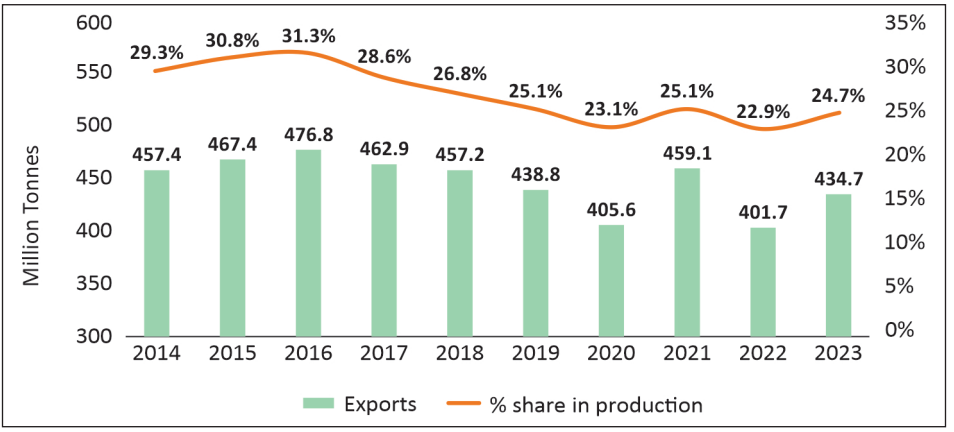


Source: World Steel Association

Steel and Steel Products

Steel is a major commodity traded globally. Global steel exports (including both semi-finished and finished steel) stood at about 434.7 MT in 2023 (Chart 12).

Chart 12: Global Finished and Semi-Finished Steel Exports

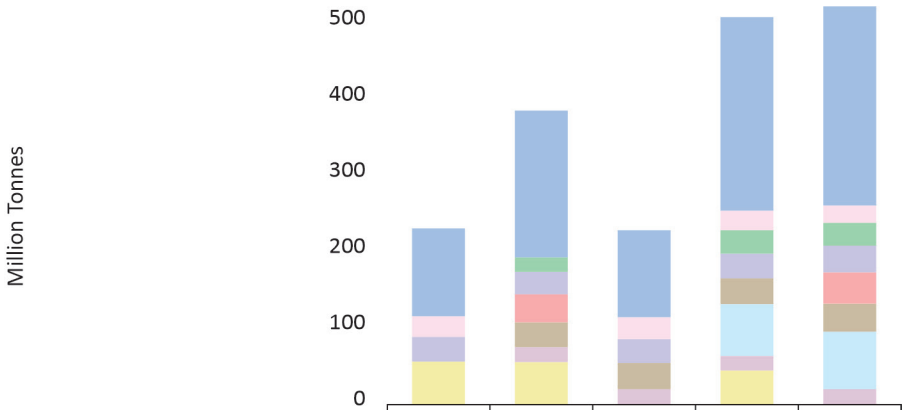


Source: World Steel Association; India Exim Bank Research

Hot-rolled (HR) sheets and coils were the most exported steel products globally during 2014-2023. They accounted for about 19% of the exports

in 2023. They are used in construction projects and railway tracks. With a share of 13%, ingots and semi-finished steel are the second most exported products, followed by galvanised sheets, steel tubes and fittings, plates etc.

Chart 13: Categories of Steel Product Exports



	2019	2020	2021	2022	2023
Others	115.7	193.0	114.5	254.3	261.3
Wire rod	26.8	0.0	29.0	25.5	22.6
Cold-rolled sheets and coils	0.0	19.0	0.0	30.8	30.3
Plates	32.8	29.4	30.9	32.2	35.2
Galvanised sheet	0.0	37.0	0.0	0.0	41.0
Steel tubes and fittings	0.0	32.3	34.3	34.2	36.5
Hot-rolled sheets and coils	0.0	0.0	0.0	68.0	75.6
Angles, shapes and sections	0.0	19.6	20.3	19.0	20.1
Ingots and semi-finished material	56.1	55.7	0.0	44.6	0.0

Source: World Steel Association

Top Exporters

In 2023, global exports of finished and semi-finished steel increased by about 7.9% on-year. The five major exporters of steel products were China with a share of about 21.7% in global exports, Japan (7.4%, the European Union (27) (6.2%), South Korea (6.2%), and Germany (5.2%).

Table 1: Major Exporters of Steel: 2023

Exporter	Exports (in MT)	Share in Global Exports
China	94.3	21.7%
Japan	32.2	7.4%
South Korea	27.0	6.2%
European Union (27)	26.0	6.0%
Germany	22.5	5.2%
Italy	16.1	3.7%
Belgium	14.6	3.4%
Russia	13.9	3.2%
Türkiye	12.7	2.9%
Brazil	12.3	2.8%
Iran	11.9	2.7%
Netherlands	11.8	2.7%
France	9.9	2.3%
India	9.9	2.3%
Indonesia	9.6	2.2%

Source: World steel Association; India Exim Bank Research

The European Union remained the top importer of steel in 2023, with a share of 9%. The EU both imports and exports steel products but is a net importer. Other key importers are the United States (6.1%), Germany (4.3%), Italy (4.3%), Turkey (4.1%) and Mexico (4%) (Table 2).

Table 2: Major Importers of Steel: 2023

Country	Imports (in MT)	Share in Imports
European Union (27)	39.2	9.0%
United States	26.4	6.1%
Germany	18.7	4.3%
Italy	18.7	4.3%
Türkiye	18.0	4.1%
Mexico	17.5	4.0%
South Korea	15.0	3.5%

Country	Imports (in MT)	Share in Imports
Viet Nam	14.0	3.2%
Thailand	13.7	3.2%
Indonesia	12.4	2.9%
France	11.8	2.7%
Belgium	11.6	2.7%
Poland	11.6	2.7%
China	11.0	2.5%
Spain	10.2	2.3%
India	9.8	2.3%

Source: World steel Association; India Exim Bank Research

During 2024 and 2025, according to the World Steel Association, the global demand is expected to exhibit a broad-based growth. India, particularly is expected to witness strong growth in steel demand owing to its growing infrastructure investments. Other emerging parts of the world such as the Middle East and North Africa and the ASEAN nations are also expected to witness acceleration in steel demand growth. However, steel demand in the EU, UK and China is expected to lag.

2. India's Steel Industry

India has a highly developed steel manufacturing sector, capable of manufacturing crude steel and value-added steel products. In 2018, the country surpassed Japan as the second largest producer of crude steel in the world and continues to hold the position. Being one of the core industries, steel contributes slightly more than 2% of India's GDP. Domestic iron ore availability is a major reason for the establishment of a steel industry in India. Given the low per capita steel consumption in the country, there is considerable scope for the sector to grow. Steel consumption is expected to increase owing to the government thrust on infrastructure construction and a thriving automobile and railways sectors.

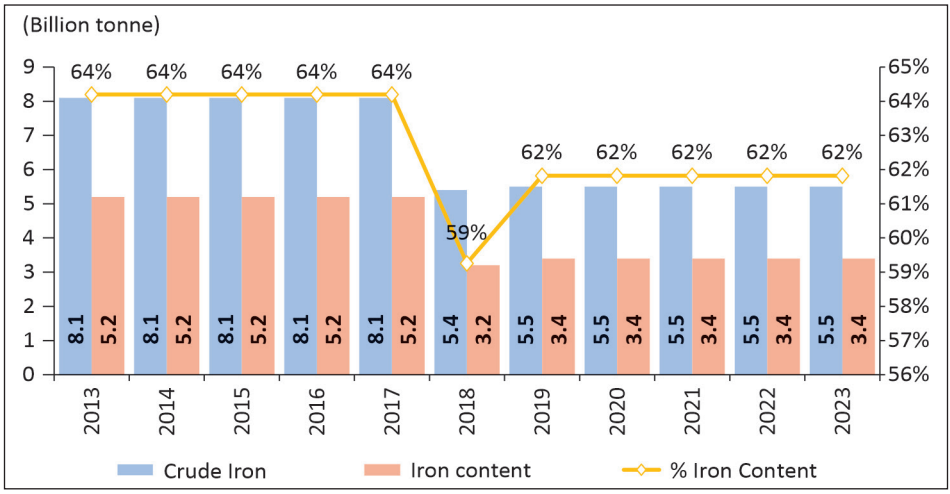
Reserves and Iron Ore Classification

India's crude iron ore reserves have shrunk during 2013-2023. In 2013, the reserves stood at 8.1 BT after the Supreme Court lifted the moratorium on several mines in Karnataka, Goa, and Odisha. However, in 2018, the Supreme Court banned mining in Goa to combat illegal mining, which reduced the reserves to 5.4 BT.

According to the Indian Bureau of Mines' Minerals Yearbook 2021, the total crude iron ore resources in India stood at 33.3 BT. Of this, 22.5 BT is iron ore haematite and the balance iron ore magnetite. It may be noted that about 79% of the haematite resources are found in the eastern India, including states such as Assam, Bihar, Chhattisgarh, Jharkhand, Odisha and Uttar Pradesh while 93% of magnetite resources are found in southern states such as Andhra Pradesh, Goa, Karnataka, Tamil Nadu and Kerala.[6]

[6] A resource is that amount of a geologic commodity that exists in both discovered and undiscovered deposits. On the other hand, reserves are that subgroup of a resource that have been discovered, have a known size and can be extracted at a profit.

Chart 14: Crude Iron Ore Reserves with Iron Content in India



Source: USGS; India Exim Bank Research

Table 3: Classification of India's Resources and Reserves of Iron Ore (in BT)

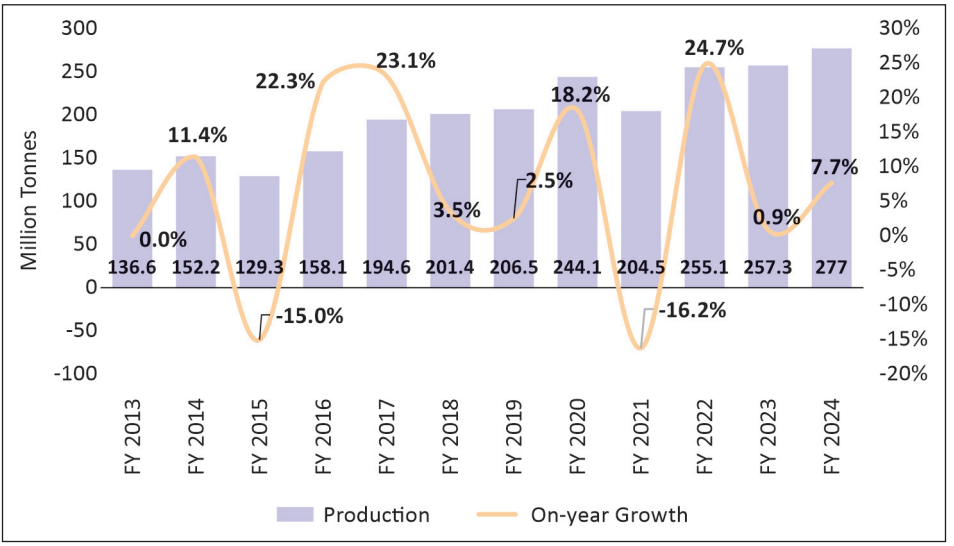
	Haematite	Magnetite
Total resources	22.5	10.80
Reserves	5.5	0.05

Source: Indian Bureau of Mines (IBM)

Haematite is considered to be of superior quality because of its higher grade. Almost the entire iron ore reserves of the country is haematite (magnetite is negligible).

The production trends in iron ore have been erratic owing to various reasons. In FY 2013, the production fell 19% after the Supreme Court cancelled mine leases in Goa. However, it increased from FY 2016 after the mines in Goa were reauctioned and mines in Odisha and Karnataka were auctioned. The mines have also started operating more efficiently with large steelmakers taking over, leading to a pick-up in production. In FY 2021, the production dropped owing to weak demand amid the COVID-19 pandemic. The production of iron ore in FY 2024 has picked up, growing by 7.7% year on year to 277 MT (Chart 15).

Chart 15: India's Iron Ore Production and Share by Type



Source: IBM; CRISIL; India Exim Bank Research

Lumps, fines and concentrates are the three main types of iron ore produced. Iron ore is processed to create concentrates. Steelmakers prefer lumps over fines because the former can be used immediately in the blast furnace while the latter must be sintered and/or pelletized before use. Further, it may be noted that there are different grades of iron such as below 55% Fe, 55% to below 58% Fe, >58% to <62% Fe, >62% to 65% Fe, 65% and above Fe, etc. The higher-grade iron ore is easy to process since it does not need to undergo the beneficiation process to produce steel. Lower grade iron ore, especially <58% Fe and below, must be beneficiated or blended with the high variety to be used in the furnace. Also, as fines come in the form of dust, steelmakers prefer lumps over fines of the same grade.

The iron ore demand in India is expected to continue to grow in the medium term, ensuring a higher value addition in the steel supply chain.

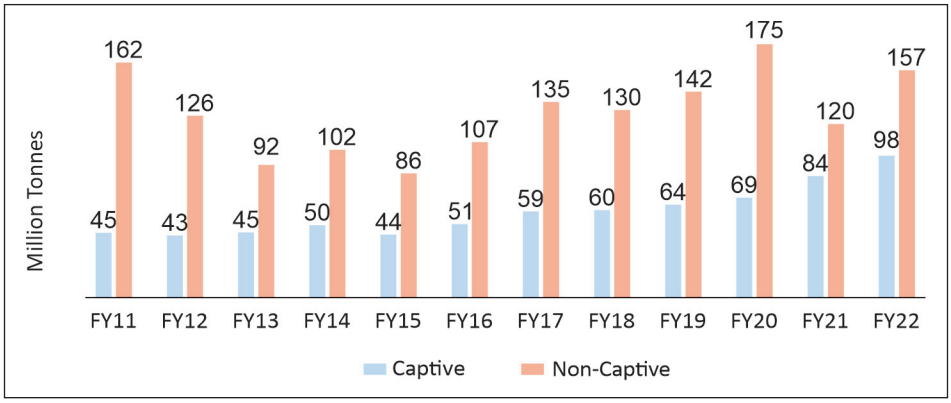
Captive and Non-captive Production

Iron ore mines in India are either captive (owned by steel mills such as SAIL, Tata Steel and JSW Steel) or non-captive/merchant (owned by miners such

as National Mineral Development Corporation, or NMDC, and Odisha Mining Corporation, or OMC, which sell merchant iron ore to steel makers).

The share of captive iron ore production has increased from 22% in FY 2011 to 38% in FY 2022. Over the last decade, production from captive iron mines logged a CAGR of 7% compared with the flattish growth of non-captive mines (Chart 16).

Chart 16: India's Captive and Non-Captive Iron Ore Production



Source: IBM

The increase in captive iron ore output is attributable to steel companies' aggressive bids for iron ore mines following the passage of the Mines and Minerals (Development and Regulation) Act 2015[7]. After the government amended the rules to allow steel producers to bid for iron ore mines, large steel players started acquiring iron ore mines to decrease their reliance on merchants for raw materials and check input costs.

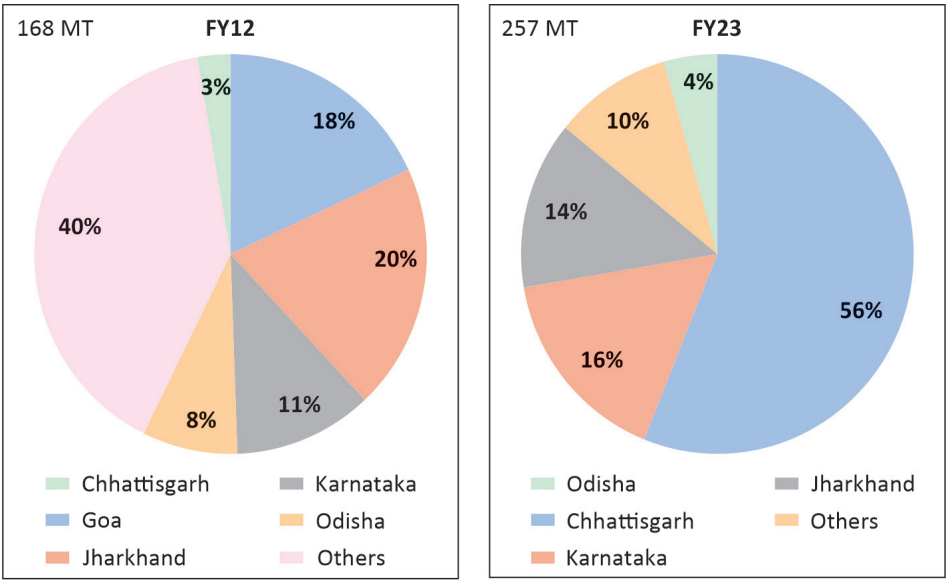
State-wise Production

Odisha remains the largest producer of iron ore in India with a share of over 56% as of FY 2023, followed by Chhattisgarh (16%) and Karnataka (14%). The share of Odisha increased from 40% in FY 2012 to 56% in FY 2023. The state's

[7] The Act provides that captive mines (other than atomic minerals) may sell up to 50% of their annual mineral production in the open market after meeting their own needs.

ore production logged a CAGR of 7% during FY 2012-2023. Chhattisgarh registered a production CAGR of 2.9%, lower than the country's overall production CAGR of 4.2%. In FY 2013, Goa was among the top producers of the ore with a share of almost 8% in the country's overall production. However, the mines in the state were closed in 2012 leading to a fall in the state's share in the subsequent years (Chart 17).

Chart 17: State-wise Iron Ore Production



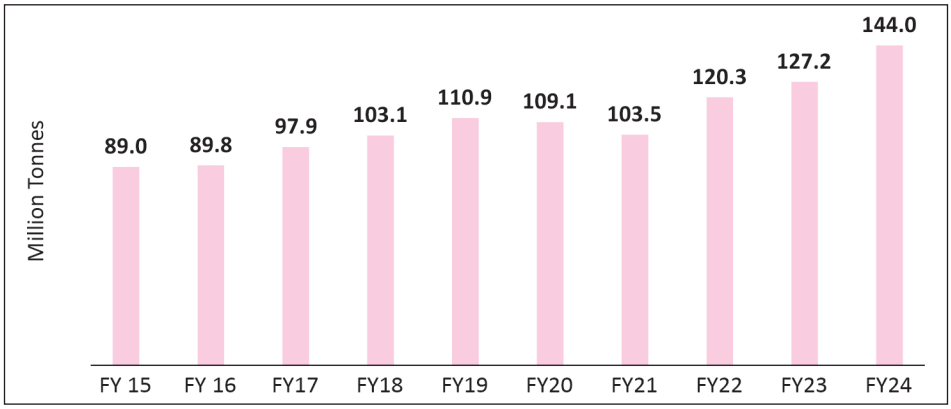
Source: IBM; India Exim Bank Research

Trends in Steel Industry

Crude Steel

In FY 2024, India produced 144 MT of crude steel, compared with 89 MT a decade ago. The steel industry has logged an impressive average growth of 4.8% between FY 2015 and 2024.

Chart 18: Crude Steel Production in India

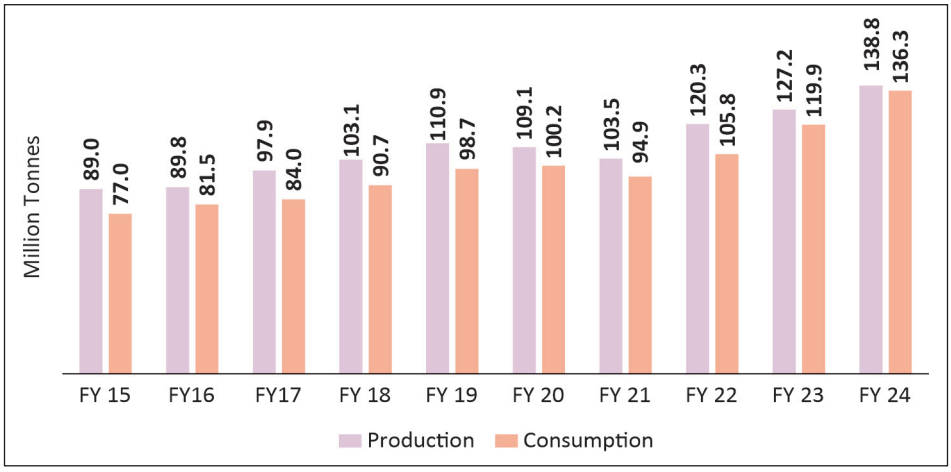


Source: Joint Plant Committee (JPC) under the Ministry of Steel

Finished Steel

In FY 2024, finished steel production stood at 138.8 MT, up 9.1% from the previous year. During FY 2015-24, the production grew at an AAGR of 5.2%. Consumption of finished steel in FY 2024, was recorded at 136.3 MT, up 13.6% on-year driven by the housing and infrastructure segments (Chart 19).

Chart 19: Production and Consumption of Finished Steel in India



Source: JPC, CMIE Industry Outlook; India Exim Bank Research

Notably, India has seen double-digit growth in production due to the fast-growing infrastructure and construction segments. The government's infrastructure spend increased 15% on-year in FY 2024 as per the interim budget fiscal 2025.

India's Trade Trends

Iron Ore

In 2022, India's iron ore exports stood at 16 MT, with China being the major destination, according to the World Steel Association. India exported 6% of the ore produced in the country. In 2022, Indian iron-ore exports dropped on-year, due to the implication of export duty in May 2022. However, the duty was removed in November 2022. India's iron ore exports are expected to continue to grow in the medium term.

Metallurgical Coal

Along with the rapid expansion of its domestic steel industry, India's need for metallurgical coal has grown significantly in the last few years. However, owing to the country's limited domestic high quality metallurgical coal deposits, demand has been satisfied by imports. With India's crude steel production of 127 MT in FY 2023, met coal demand touched 81 MT (7% of global coal demand) both from steel-coke ovens and blast furnaces as per IEA's statistics. Though India was the second-largest producer of crude steel in the world in 2023, the production gap between China and India was huge. That said, the country is a major market for the global coking coal sector because of low domestic availability of coking coal in India.

The steel sector requires high-quality coking coal for the manufacturing process. China, which is the largest crude steel producer, is also the largest consumer and producer of coking coal. On the other hand, despite having substantial coal reserves, India is unable to produce steel grade coking coal and largely depends on global markets for its coal requirements in the steel sector. India's imports of coking coal rose to 60.5 MT in FY 2024, up by 4.2% from 58.1 MT in FY 2023.

Table 4: India's Trade in Coking Coal (in thousand tonnes)

Year	Exports	Imports
2014-15	45.2	44,752.0
2015-16	64.6	45,701.0
2016-17	29.2	42,953.2
2017-18	72.8	48,622.3
2018-19	66.8	53,665.0
2019-20	17.4	53,647.8
2020-21	4.5	53,160.1
2021-22	3.5	59,460.6
2022-23	34.3	58,069.6
2023-24	105.3	60,526.0

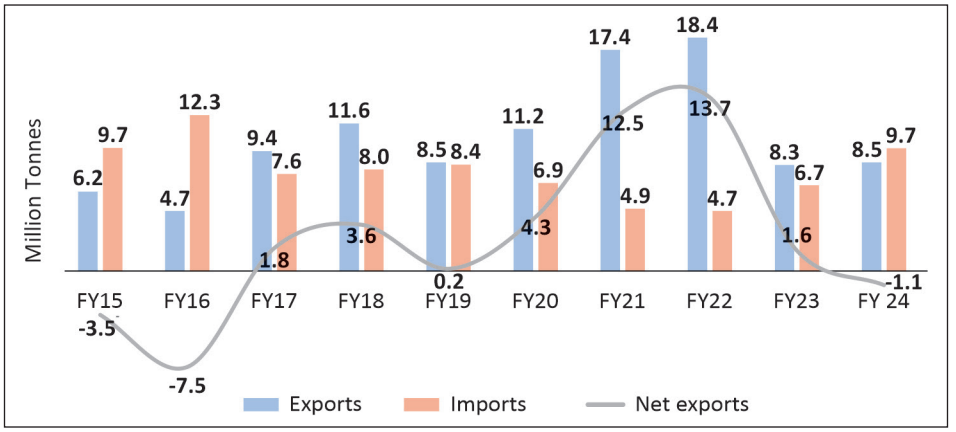
Source: CMIE Industry Outlook; India Exim Bank Research

Historically India was dependent on Australia for majority of its coking coal imports. However, in the recent years, Australia's share in India's imports of coking coal has reduced from 85% in FY 2017 to 49% in FY 2024. This diversification in import basket helps in reduced vulnerability due to environmental, tariff and geopolitical disruptions. With the change in import basket, the USA (14%), Russia (8%) and Singapore (9.3%) emerged as major coking coal suppliers to India in FY 2024.

Finished and Semi-finished Steel

India trades in finished and semi-finished steel products. Finished steel products are flat and long products and semi-finished steel products include pig/sponge iron, scrap etc. In FY 2024, India's exports of steel stood at 8.5 MT and the imports stood at 9.7 MT, leading to a trade deficit of -1.1 MT. Notably, this marks a deviation from India's trend of registering a trade surplus in steel since FY 2017.

Chart 20: India's Steel Trade



Source: JPC; India Exim Bank Research

In FY 2024, India's finished and semi-finished steel exports stood at 7.5 MT and 1.1 MT, respectively. The exports of finished steel products after exhibiting a contraction of 50.2% in FY 2023, registered a growth of 11.5% in FY 2024. India's most exported products in the finished steel category include bars/ rods and HR coils/ sheets, plates, galvanised sheets/ plates and cold-rolled coils/ sheets. The imports of finished and semi-finished steel during FY 2024 were to the tune of 8.3 MT and 1.3 MT, respectively.

Table 5: India's Trade in Finished and Semi-finished Steel

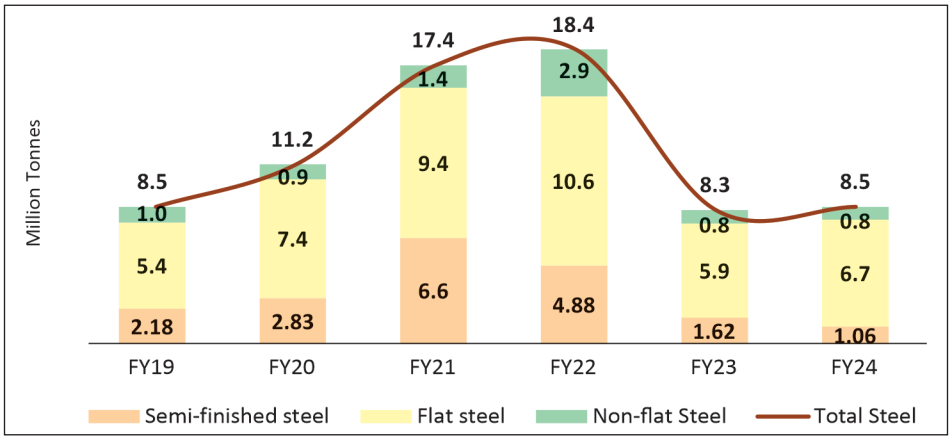
Category	FY19	FY20	FY21	FY22	FY23	FY24
	Exports					
Semi-finished steel	2.2	2.8	6.6	4.9	1.6	1.1
Total finished steel	6.4	8.4	10.8	13.5	6.7	7.5
Total Steel	8.5	11.2	17.4	18.4	8.3	8.5
	Imports					
Semi-finished steel	0.5	0.2	0.2	0.1	0.7	1.3
Finished steel	7.8	6.8	4.8	4.7	6.0	8.3
Total Steel	8.4	6.9	4.9	4.7	6.7	9.7

Source: JPC; India Exim Bank Research

In FY 2024, flat products formed 78.1% of India's total steel exports (6.7 MT), up from 71% in FY 2023. The share of non-flat products has fallen marginally from 10.1% in FY 2023 to 9.7% in FY 2024 (0.81 MT). The remaining 12.4% was

the share of semi-finished products in exports. Semi-finished steel product exports declined 66.7% in FY 2023 and 34.6% in FY 2024 owing to weaker demand in Chinese and EU markets. In FY 2021, semi-finished steel product exports had hit a record high because of strong global demand (Chart 21).

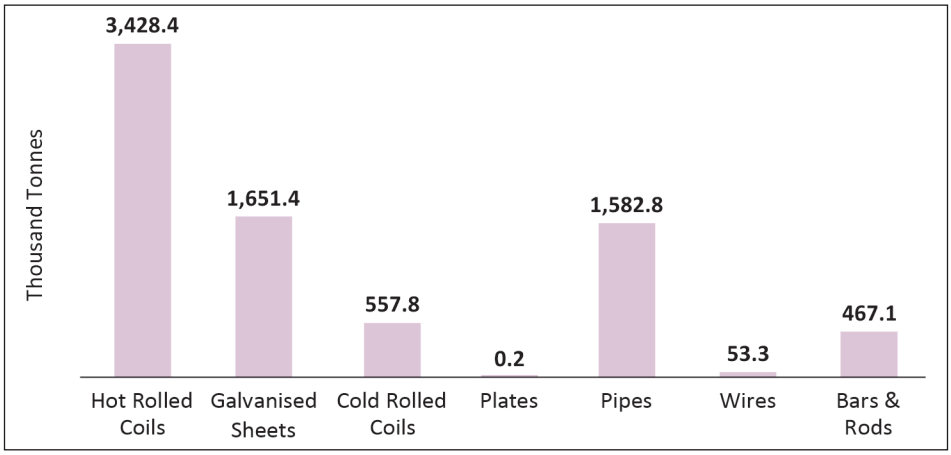
Chart 21: India's Exports of Finished Steel Products: By Type



Source: JPC; India Exim Bank Research

As regards imports, flat steel products, with an import value of 7.9 MT in FY 2024 accounted for 81.7% of India's total steel imports, down from 82.9% on FY 2023. The imports of non-flat products, at US$ 0.4 MT, accounted for 4.6% of steel imports in FY 2023, down from 6.4% in FY 2023.

Chart 22: India's Exports of Select Steel Products



Source: JPC; India Exim Bank Research

Trends in India's Steel Sector Prices

Flat and long steel prices in India are majorly a function of key raw material such as iron-ore, coal and ferro-alloys. Additionally, flat steel prices are impacted by global prices as it is the most imported/exported sub-segment in the Indian steel market.

Iron Ore

Although India has abundant reserves of ore, iron ore lumps are imported because of their competitive pricing in the global market. The price of Indian iron ore lumps touched ₹6,614, an all-time high in FY 2022. Average iron ore prices rose 95% on-year in FY 2022, owing to its increased exports and high steel prices. Domestic iron ore prices have been soaring since the second quarter of FY 2021, on account of limited supply in the market.

In FY 2023, prices softened, owing to the temporary implication of export duty on iron ore between May and November 2022 and average prices slumped to ₹4,062. In FY 2024, iron ore prices are expected to have touched ₹4,400 per tonne, up 8% on-year. After the removal of export duty, iron ore prices started rising. However, it began to drop since May 2023, due to falling global iron ore prices and weak steel market. Prices picked up in H2FY24 with strong domestic and export demand.

In FY 2025, iron ore prices are expected to stabilise to ₹4,100-4,400 per tonne amid a moderate growth in steel demand and increase in the global and domestic iron ore output as new mines are in progress.

Coking Coal

India is dependent on the import of coking coal for its needs. In FY 2023, coal prices saw a mixed trend. Prices declined to below US$ 250 per tonne in July and August 2022 from US$ 500 per tonne in May, due to weak global steel demand associated with the Covid-19 pandemic-led lockdowns in China and inflation in the EU. The prices started rising late December 2022, owing to the wet weather in Australia causing supply chain issues. Additionally, improved

global demand since January 2023 supported price rises. The average price in fiscal 2023 was US$ 330 per tonne, up 5% on-year.

Prices are estimated to have corrected 14% on a high base in FY 2024 and estimated to have reached US$ 285 per tonne since incremental coal production by Australia outpaced demand growth. In addition, high coal prices in April and May 2023 led to high average price in FY 2023 amid the Russia-Ukraine conflict and supply constraints. Australian coal prices saw a mixed trend in FY 2024. Prices were below US$ 300 per tonne in the first half of fiscal 2024 and inched above US$ 300 per tonne in H2FY24 amid supply constraints and improved demand from Asian countries. In FY 2025, prices are expected to drop to US$ 240-290 per tonne, on the back of improved supply from Australia's drier conditions and moderate demand from Asian countries.

Thermal Coal

In FY 2023, e-auction prices for non-coking coal surged 62% on-year to ₹6,707 as premiums increased in response to high demand from the power and non-power sectors. Additionally, 80% of thermal coal requirement to produce sponge iron is procured domestically. In the second quarter of FY 2023, a crunch in the thermal coal supply led to high prices, impacting sponge iron players. Though thermal coal prices rallied in the first half of FY 2024, prices dropped in the second half, owing to improved supply.

In FY 2024, prices declined 36% on-year to ₹4,400 per tonne as supply rose. Additionally, drop in global coal prices amid moderate demand supported price corrections. In FY 2025, prices are expected to remain rangebound as supply is likely to improve with moderate growth in steel demand.

Domestic Flat Steel (HRC)

The geopolitical impact of the Russia-Ukraine conflict sent the commodities market into a frenzy, as regions that sourced materials from these countries went into a panic mode, with a surge in input costs and finished product prices. The increase in export realisations sent domestic prices on a rally as well, affecting demand at home.

As a measure to reign in runaway prices, the government imposed export duties effective May to Nov 2022 on iron ore, steel and pig iron, and removed import duties on coking coal. This caused prices to promptly correct from ₹76,000 per tonne to ₹56,000, down 26%. Overall average prices corrected 9% on-year, while flat price averaged at ₹60,958 per tonne in FY 2023.

In FY 2024, flat steel prices corrected with the pressure from cheaper imports, muted and competitive global market, while average prices are estimated to have touched ₹57,750 per tonne. Domestic steel prices are expected to reduce in the first half of FY 2025, with moderate growth in demand, due to the impact of monsoon and labour shortages.

Global Flat Steel (HRC China FOB)

By far, China remains one of the key players influencing the global iron and steel industry. More than 50% of the global crude steel is produced in China. In 2022, its global production dropped 4%, with China's production falling ~2%. The Russia-Ukraine conflict and Covid-19 induced lockdowns in China remained major headwinds in 2022, significantly hitting the global economy. With tumultuous supply and demand, global prices remained volatile in 2022 to average at US$ 708 per tonne.

In 2023, positive sentiments got stumped with a reality check in China. Prices corrected with flattish domestic demand offtake. However, it is observed that the crude steel production in China remained flat on- year. Surplus was diverted to the export market. Overall, prices corrected ~16% on-year averaging ~US$ 591 per tonne.

Despite the upward growth rates in major steel consuming nations, global demand is estimated to increase 1-2%, with a sluggish demand in China, keeping the prices in check in 2024, which are expected to reach US$ 575-625 per tonne.

Long Steel

Long steel is dependent on the domestic market, unlike flat steel and is dominated by secondary players and relies on thermal coal for production. With increase in the thermal coal output and softening prices, long steel prices will vary depending on the price delta between scrap and pig iron prices. Its price averaged to ₹59,146 per tonne in FY 2023.

In FY 2024, corrected prices are estimated to have touched ₹53,750 per tonne, on account of fall in input costs. In FY 2025, prices are expected to remain range bound between ₹52,000 and ₹54,000 amid moderate demand growth in long steel.

3. India's Steel Trade Outlook with its Major Trade Partners

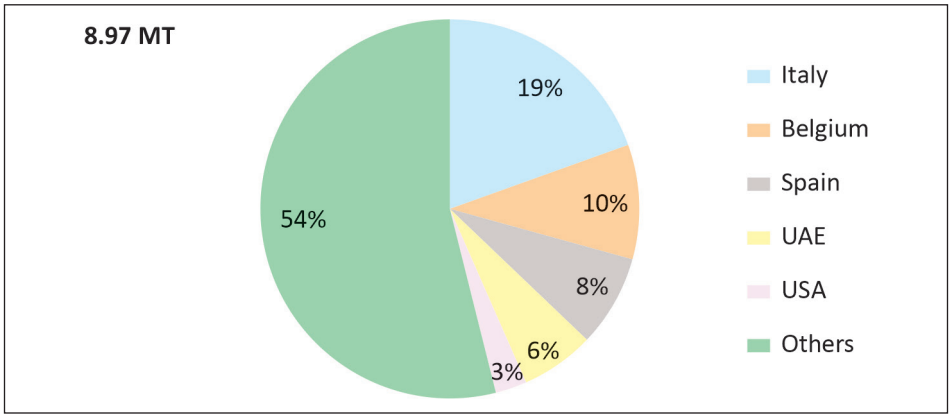
With India emerging as the strongest driver of steel demand growth since 2021, the steel demand is expected to continue to charge ahead with 8% growth over 2024 and 2025, according to the World Steel Association. In 2025, steel demand in India is projected to be almost 70 million tonnes higher than in 2020.

The global steel demand is expected to rise by about 4% in 2024, according to the estimates of OECD with highest on-year growth of about 6.7% anticipated in developing Asia (other than China). The other regions with high expected steel demand are the EU, the UK, Africa, and the Middle East.

The high external steel demand poses opportunities for India to increase its steel exports, particularly to high demand regions. For instance, domestic players may tap the African market provided their prices are cheaper than Chinese products. Exporting to African countries is currently costlier for Indian players than Chinese players despite India's proximity to Africa because of lower economies of scale.

Italy was a key importer of finished steel products from India in FY 2024. It imported 19% (1.8 MT) of the finished steel products exported by India, an on-year growth of 59%. Other important export markets for India in FY 2024 were Belgium with exports of 0.9 MT, Spain (0.7 MT), the UAE (0.6 MT), and the USA (0.2 MT).

Chart 23: India's Major Export Markets for Finished Steel: FY 2024

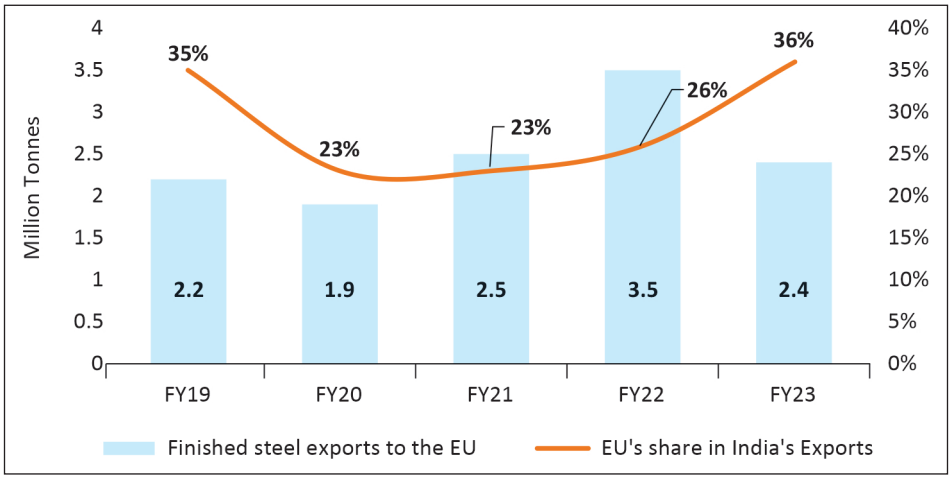


Source: CMIE Outlook; India Exim Bank Research

Implications of Tariffs on India's Steel Exports

The EU accounts for a major share (36%) of Indian finished steel exports. In FY 2023, India's steel exports to the EU stood at 2.4 MT. In fact, the figure has always stayed in the 2-4 MT range. Also, the EU has imposed a quota on steel imports to safeguard domestic industries, thereby impacting trade between the two nations.

Chart 24: India's Steel Exports to the EU



Source: JPC; ; India Exim Bank Research ;until fiscal 2021, the UK was part of the EU and the figures are based on that. fiscal 2019: 0.083 MT; fiscal 2020: 0.083; and fiscal 2021: 0.086 MT

EU Steel Safeguard Policy

In 2018, the EU imposed provisional safeguard measures on certain steel imports in response to the US's import tariffs on steel and aluminium. These safeguards were a result of the concerns that US restrictions on steel exports will divert more imports into the EU, destabilising the region's steel market. On January 31, 2019, the EU adopted definitive safeguard measures on steel imports, which consist of tariff-rate quotas. Initially, they were applied for the period between February 2, 2019, to June 30, 2021. These safeguards were imposed on 26 steel product categories.

On June 24, 2021, the safeguard measures on imports of certain steel products were extended for three years until June 30, 2024. The European Commission again revised the safeguard measures on certain steel imports on June 23, 2022. The safeguard measures are implemented in the form of country-specific tariff quotas per product category. An additional duty of 25% is due on imports that exceed the quotas. The tariff is also applicable to the United Kingdom as it is no longer a part of the EU.

Impact of the Policy

The US used to be the top importing region of steel followed by the EU till 2018. However, from 2019 their positions were reversed. This happened after a 25% duty was imposed on imports by the US. Consequently, the EU became the world's largest steel importing country in 2022, followed by the US. That being said, volumes to the EU started declining with the imposition of the safeguard duties.

Table 6: Tariff Rate Quota Imposed by EU on Indian Steel Products for FY 2024

Product Category	Exemption Quota (MT)
Non-alloy and other alloy hot rolled sheets and strips	1.15
Non-alloy and other alloy cold rolled sheets	0.64
Metallic coated sheets	0.2
Organic coated sheets	0.31
Stainless cold rolled sheets and strips	0.11
Stainless hot rolled quarto plates	0.008
Stainless bars and light sections	0.12
Stainless wire rod	0.03
Gas pipes	0.74
Seamless stainless tubes and pipes	0.02
Others	0.29

Source: Directorate-General for Trade, European Union

Once the quota is exceeded, a 25% tariff is applied to the imported products, The quotas of the products exempted from additional duty are revised every year based on EU demand and the steel market conditions. Also, the quotas differ across countries. In fiscal 2024, 3.4 MT of steel was allowed to be exported to the EU region without any additional tariffs.

In the medium term, exports from India to the EU would depend on the safeguard measures that come into play and on the impact of CBAM[8]. The tariffs under CBAM will be introduced gradually from 2026 and 100% of the emission will be taxed in 2034. With an estimated pricing of CBAM emission certificates at around EUR100 per tonne of CO_2 emissions, Indian prices are expected to become dearer by around EUR 60-80 in European market by 2034[9]. However, in order to mitigate the price increase for exports to Europe, major steel mills in India have announced plans to commission low carbon

[8] The CBAM is a carbon tariff that is paid by the producer for producing high-carbon steel. The actual carbon content of products imported into the EU is determined by the Emission Trading Systems formula

[9] CRISIL Research

products with increased usage of steel scrap and green electricity. With a typical gestation period of 4-5 years for new steel mills, low emission steel production in India is expected to start by the end of the decade.

UK Steel Safeguards

At the end of the transition period of exiting from the EU, the UK government adopted a steel safeguard measure covering 19 of the 26 steel product categories that were under the EU's steel safeguard policy. This measure expired on June 30, 2021. On June 11, 2021, the UK's Trade Remedies Authority (TRA)[10] published its final recommendations on the steel safeguards. It recommended that the safeguards be extended across 10 product categories for three more years[11] and 9 product categories were exempted. The government passed its legislation on the same. However, the safeguards were extended for five of the remaining nine products for one year until June 30, 2022. On June 29, 2022, the safeguards were extended for two more years on these five products after the TRA's reconsideration report[12]. The main intention of the UK's safeguard policy is to protect its domestic steel producers' interests and stabilise the UK steel markets.

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[10] The UK Trade Remedies Authority (TRA) investigates if a trade remedy is needed to prevent injury to UK industries from unfair trading practices or unforeseen import surges.

[11] Initial 10 product categories

1. Non-alloy and other alloy hot-rolled sheets and strips
2. Non-alloy and other alloy cold-rolled sheets
3. Metallic coated sheets
4. Organic coated sheets
5. Rebars
6. Railway materials
7. Gas pipes
8. Hollow sections
9. Large welded tubes
10. Other welded tubes

[12] Other five categories

1. Tin mill products
2. Non-alloy and other alloy quarto plates
3. Alloy and non-alloy merchant bar and light sections
4. Non-alloy and other alloy bar rods
5. Angles, shapes and sections of iron or non-alloy steel

Import quotas are set by product category and distributed among countries whose import market share exceeded 5% between 2017 and 2019 (i.e. country-specific quotas). These include the EU, Turkey, China, South Korea, India, Japan, and several other countries. All other countries have remaining quotas available for the initial 10 products.

The Government of India had expressed concern that the tariff on steel exports will result in decline in exports to the UK. Although talks were held between the two governments at the WTO in August 2022, India was not exempted from the above policy.

Impact of FTAs on Indian Steel Sector

Benefits of FTAs

FTAs entail benefits including the removal of tariffs/taxes on a variety of goods and addresses the behind-the-border barriers that impede flow of goods or services.

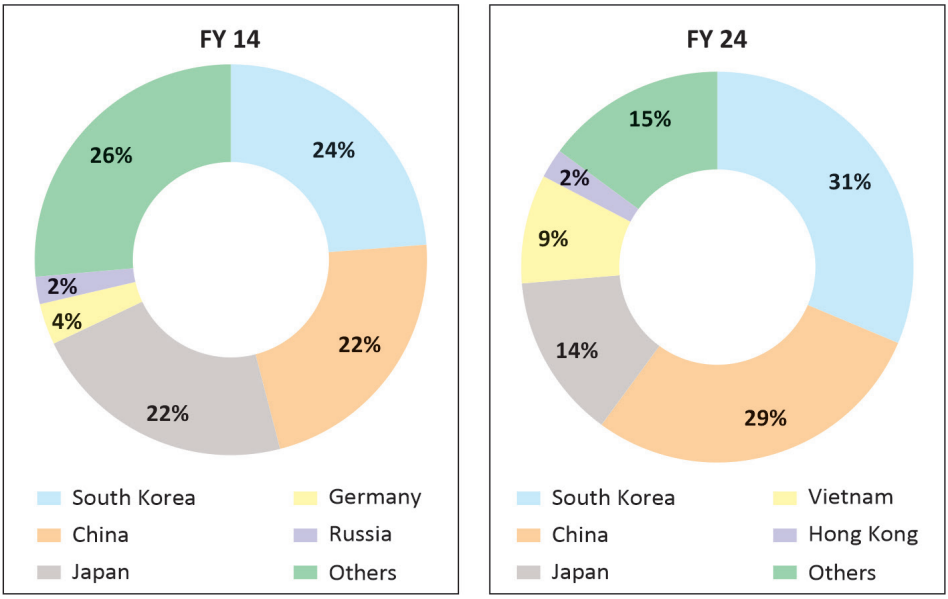
- FTAs allow for regional or geographical economic co-operation resulting in improved bilateral trade between the two countries in the areas agreed between the parties
- They help in providing customers with a wide range of products that are competitively priced
- Augmented inflow of foreign investments in accordance with the provisions of the pact

India's Steel Trade after Agreement with the ASEAN, Japan and South Korea

In terms of the Indian steel sector, Japan and South Korea are the key competitors. Both countries have large surplus capacities in steel making and a significantly high exports to production ratio. On the opposite side, the scope for other countries to export steel products to Japan and South Korea is very limited, as these countries have witnessed demand saturation, where the demand for steel products is expected to decline in both the medium and long run.

South Korea continues to account for the largest share in Indian steel import basket. High value added steel products like electrical steel are helping South Korea in expanding the market share. However, Japan's share in imports has declined as more competitive imports from China and ASEAN have gained market share.

Chart 25: Import of Steel Products by India from Major Countries in FY 2014 and 2024 by Quantity



Source: CMIE Industry Outlook; India Exim Bank Research

Due to implementation of capacity swap program in Chinese steel industry to reduce overcapacity and curb pollution, many Chinese companies have invested in new steel making capacities in ASEAN countries. This has resulted in substantial increase in imports from ASEAN to India since 2020. In order to keep the imports in check, steel mills have suggested increasing the "Country of Origin' restrictions and Quality checks on imports. With the gradual implementation of Quality control order[13] on steel products, import of steel products is being kept in check.

[13] Quality control regime for 145 steel products is introduced by the ministry of steel, which ensures that only BIS certified steel products are sold in India.

India's Trade Agreement with the UAE

India and the UAE signed a Comprehensive Economic Partnership Agreement (CEPA) on February 18, 2022. The agreement covers almost 11,908 tariff lines dealt in by India and 7,581 tariff lines by the UAE. The agreement came into effect from May 1, 2022. By entering into the agreement, India got preferential access for 97% of its tariff lines which constitute 99% of Indian exports to the UAE. The two countries have set a target to increase the total value of non-petroleum bilateral trade in goods to over US$ 100 billion by 2030.

Total trade between India and the UAE stood at US$ 83.6 billion in FY 2024, constituting a share of about 7.5% in India's overall trade, making the UAE India's third-largest trade partner for India. Further, exports to the UAE were valued at US$ 35.6 billion and imports from the UAE stood at US$ 48.0 billion in FY 2024.

The share of iron and steel exports in India's exports to the UAE was only about 0.6% during FY 2024 while the share of iron and steel in imports from the UAE was 0.7%.

With the signing of CEPA, the import duty on Indian steel products in the UAE is planned to phase out in a span of 10 years. In 2022, the import duty on majority of steel products was 5%. The plan is to reduce import duty by 0.5% every year and reach 0% in a span of 10 years. This will result in lesser import cost for UAE consumers, thereby making Indian exports more competitive in the world steel sector.

India–Australia Economic Co-operation and Trade Agreement

India-Australia Economic Cooperation and Trade Agreement (ECTA) came into force on December 29, 2022, making over 85% of Australian product exports to India by value, tariff free. This will rise to 90% by January 1, 2026. In addition, 96% of imports from India are now tariff-free for Australia, which will increase to 100% by January 1, 2026.

India's merchandise trade with Australia equalled US$ 24.1 billion in FY 2024, with India's exports to Australia at US$ 7.9 billion and imports from Australia at US$ 16.2 billion. India's exports to Australia are dominated by mineral fuels. India also mainly imports mineral fuels from Australia.

In FY 2024, 60.5 MT of coking coal was imported to India from other nations. Australia had the highest share of 48%, signifying the importance of the FTA agreement with Australia in the sector.

Under the agreement, import duty on coking coal was reduced to 0% from 2.5%, supports the Indian steel industry. As noted earlier, although India has coal reserves, it is import dependent for coking coal because the coking coal available in India is of low grade, making it unfeasible for use in steel manufacturing. Coking coal imports from Australia are given below to understand the significance of this agreement.

Table 7: India's Coking Coal Imports from Australia

Year	Australian coal exports	% share of India
2012	142.3	17.1%
2013	154.1	19.5%
2014	180.4	20.8%
2015	187.6	20.2%
2016	187.9	19.4%
2017	177.1	20.1%
2018	179.2	20.6%
2019	182.0	19.7%
2020	176.0	21.0%
2021	171.0	24.0%

Source: CIL, IEA; India Exim Bank Research

Potential Trade Agreement with the UK

India and UK's bilateral trade stood at US$ 20.3 billion, making it the sixth-largest trade partner for India in FY 2023. UK had a share of 2% in India's

trade. Exports to the UK stood at US$ 11.4 billion and imports from the UK stood at US$ 9 billion, making India a net exporter to the UK.

The main products exported to the UK are electrical machinery and nuclear reactors with a share of 12% and 10%, respectively. In India's export and import portfolio, iron and steel has a share of 2% and 9%, respectively,

After the adoption of the UK Steel Safeguard Policy, India and the UK started talks on FTA to reduce the impact of the policy on steel exports from India. India and the UK launched talks for an FTA in January 2022. The 14th round of talks began in January 2024 and concluded in mid-March without any deal. The next round of talks is expected to start post Indian general elections.

4. Decarbonisation of Steel Sector

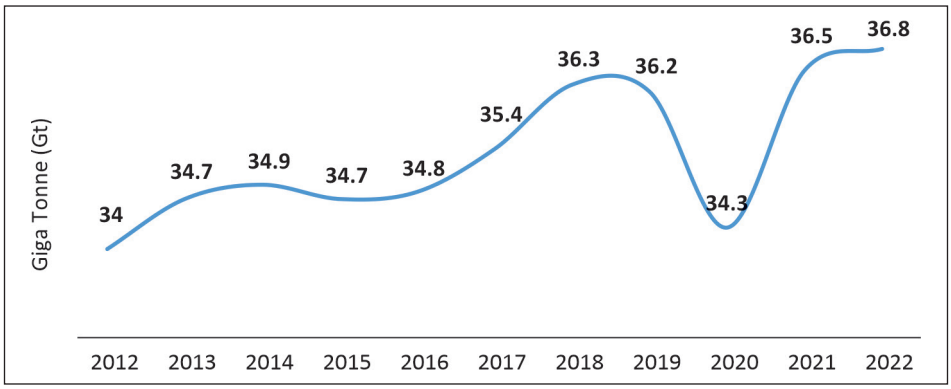
From rising sea levels that increase the risk of ruinous flooding to consistently rising temperatures that threaten the survival of all living beings, the impact of climate change that we see today is unprecedented in scale. The earth's temperature has risen by 1.1 degrees Celsius relative to the levels that prevailed during 1850-1900. According to the World Meteorological Organisation, 2023 was the warmest year in its 174-year observational record.

To curb rise in global temperature, 196 countries signed the Paris Agreement on December 15, 2015. Since then, every nation has been aggressively acting on reducing carbon dioxide (CO_2) emissions. Also, in May 2022, the G7 committed to focus on accelerating the pace of decarbonisation in heavy industries to keep the limit of 1.5°C temperature rise within reach.

Global carbon emissions touched 36.8 giga tonne (GT) in 2022, a rise of 0.9% on-year. The rise is less than the 2021 rebound which was 6% after the pandemic. Using cleaner energies resulted in lesser-than-anticipated emissions growth despite switching to coal from gas due to inflationary pressures and supply chain concerns owing to geopolitical conflicts. However, carbon emissions touched an all-time high in 2022.

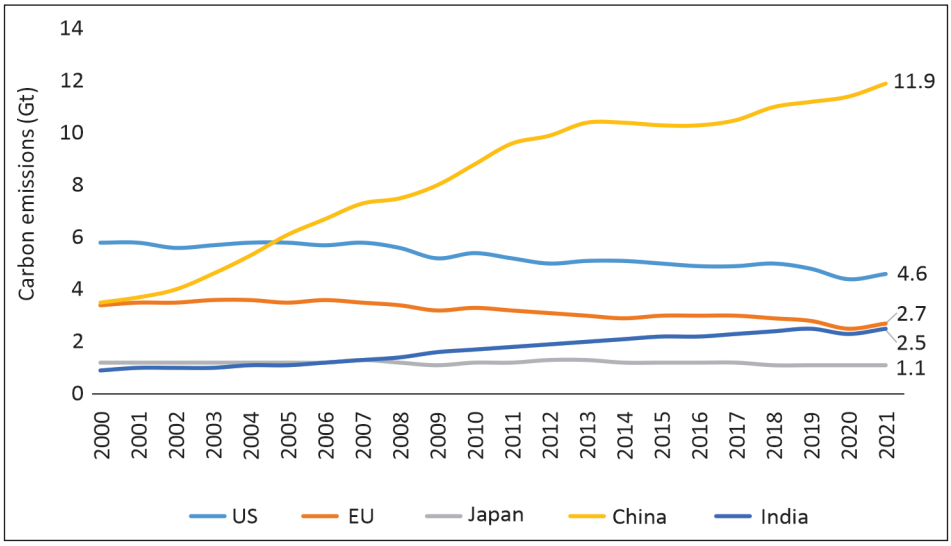
As is evident from Chart 27, China, which emitted around 11.9 GT of GHG in 2021, leads in CO_2 emissions due to its massive industries. Its energy-intensive industrial operations are environmentally concerning. China's emissions increased by more than three times, in the last two decades.

Chart 26: World Carbon Emissions from Energy Combustion and Industrial Activity



Source :IEA

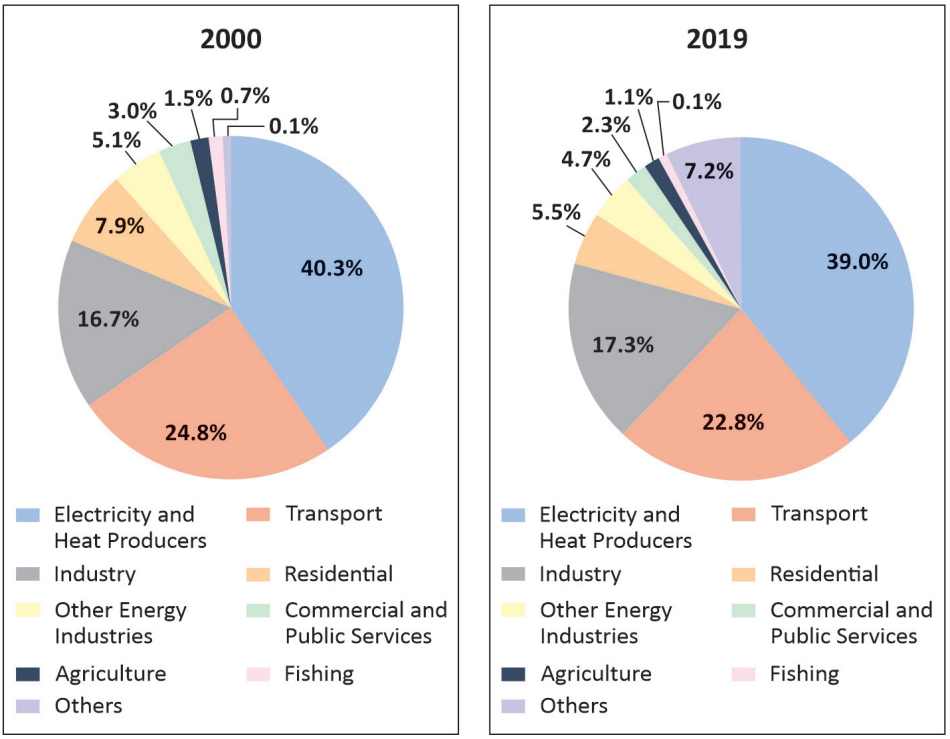
Chart 27: Carbon Emissions across Geographies



Source: IEA

It may be noted that the steel industry plays a significant role in global emissions. While a couple of decades ago, the industry accounted for 16.7% in the total CO_2 emissions of the globe, today, its share has crossed the 17% mark. The 'electricity and heat producers' segment remains the biggest contributor to global carbon emissions, with 39% contribution coming from this segment (Chart 28).

Chart 28: Sector-wise CO_2 Emissions



Source: IEA

Resource Consumption in the Iron and Steel Industry

Steelmaking is a multi-stage process. It includes iron making, primary and secondary steel making, casting (steel is cast into semi-finished shapes), and finally, hot rolling and cold rolling to deliver the desired end-products for various industries.

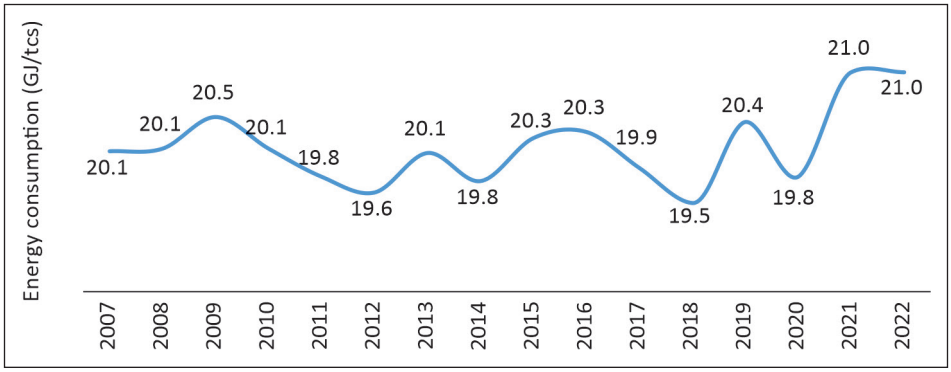
The key raw materials used for producing steel are iron ore, limestone, coal, natural gas, biomass, and charcoal. The inputs change based on the production technique employed. The three types of production techniques that are typically used are: Blast Furnace-Basic Oxygen Furnace (BF-BOF), direct reduced iron (DRI)-electric arc furnace (EAF), and induction furnace.

Table 8: Key Energy Resources Required in Steel Production

Resource	Used in	Application as Energy and Reducing Agent
Coal	Sinter and coking plants, blast furnace	Coke production, BF injections
Oil	Steam production	BF injection
Natural gas	Furnaces, power generators	BF injection, DRI production
Electricity	Electric arc furnace, rolling mills and motors	-

Source: WSA

Chart 29: Energy Intensity per Tonne of Crude Steel



Source: WSA

Steel produced through the BF-BOF route consumed on an average 23.98 gigajoule (GJ) per tonne of crude steel produced, steel produced through the scrap EAF consumed 10.20 GJ per tonne of crude steel produced, and the DRI-EAF consumed 22.37 GJ per tonne of crude steel produced in 2022 (WSA). The blast furnace and DRI processes consume higher energy due to the combustion of fossil fuels. All these are carbon-based. However, as part of its climate change mitigation efforts, the industry is gradually shifting to hydrogen-based production process, which has its own set of challenges.

China accounts for 50% of global steel production and 90% of its output is produced through the BF-BOF route. Energy consumption increased from 19.51 GJ in 2018 to 21.02 GJ in 2021 due to increased adoption of the BF-BOF

method. However, in 2022, the energy consumption per tonne of crude steel dropped due to increased importance for low carbon steel.

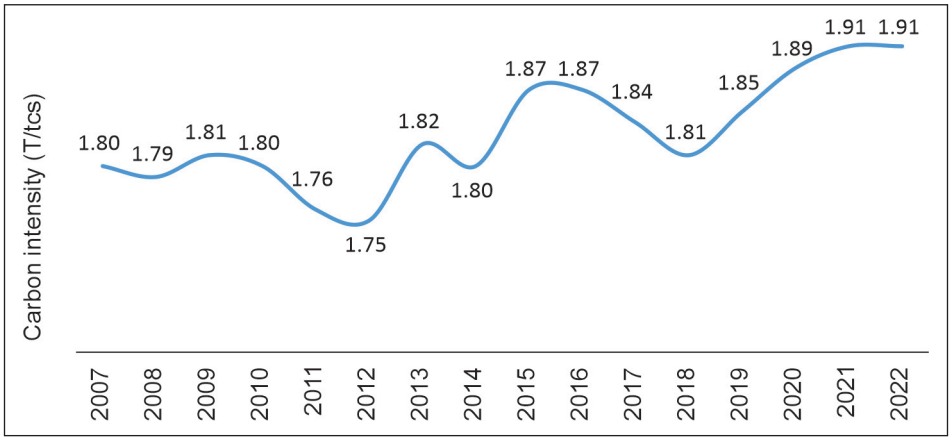
Table 9: Crude Steel Production by Process in 2022

Country	Oxygen (BF-BOF) %	Electric (EAF) %	Other %
World	71.6	27.9	0.5
China	90.5	9.5	-
India	44.8	55.2	-
Japan	74.7	25.3	-
The US	30.9	69.1	
Russia	59.8	38.2	2.0
South Korea	68.2	31.8	-
Turkey	28.4	71.6	-
Germany	70.0	30.0	-
Brazil	75.6	23.2	1.2
Iran	10.2	89.8	-

Source: WSA

As mentioned earlier, the industry segment contributes to over 17% of global carbon emissions. Within the industry, the iron and steel segment is a major contributor and roughly accounts for 9-10% of total global carbon emissions. The average carbon emissions increased from 1.8 tonne CO_2 per tonne crude steel cast in 2007 to 1.91 tonne CO_2 per tonne in 2022.

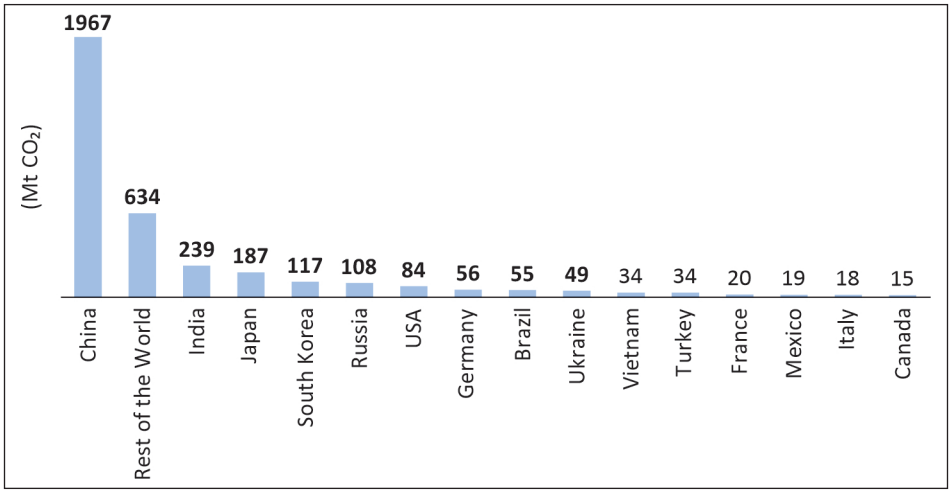
Chart 30: Average Carbon Emission Intensity per Tonne of Crude Steel (t/tcs)



Source : WSA

As per Global Efficiency Intelligence, carbon emissions from the steel sector were over 3,600 MT CO_2 in 2019 with China alone accounting for over 54% of these emissions followed by India (6.6%). As the highest producer of steel, with almost 90% of its crude steel production through the blast furnace-basic oxygen furnace (BF-BOF) method, China was the highest emitter of carbon emissions.

Chart 31: Total CO_2 Emissions from Steel Production in 2019: by Country



Source: Global Efficiency Intelligence

Scrap in Steelmaking

Recycled scrap can be used as a raw material for steel production. Scrap-based steel making has the lowest emission intensity. Scrap generated inside steel plants or from end-of-life products can be reprocessed and reused. Instead of entirely using new raw materials, reusing scrap results in lower energy intensity.

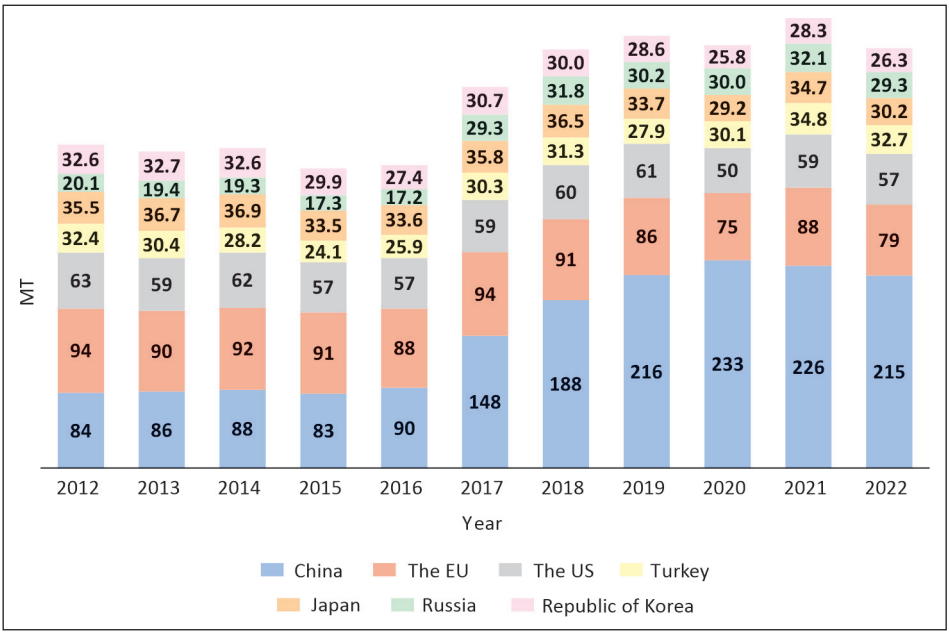
There are around 20 grades of scrap, and their age varies from one day to 100 years. Scrap generated from different sources can be recycled and used in the steel manufacturing process in two ways:

1. In EAF, scrap is melted using electricity to produce crude steel. This method of producing steel is called scrap based EAF

2. In BF-BOF, scrap is added to a mix of molten iron and other materials in the BOF to control heat in the production process.

As the world moves towards reducing the carbon emissions in steelmaking, the new capacities are expected to come up in the EAF space. Steel scrap is majorly generated by China, the EU, the US, Turkey, Japan, Russia, and the Republic of Korea.

Chart 32: Global Steel Scrap Consumption Trends



Source: CAMU, EUROFER, ISRI calculations, TCUD, Japan Ministry of Economy, RUSMET, KOSA, CARI, WSA, CRISIL MI&A

China is a key player among major scrap-generating countries. Its steel scrap consumption increased to 215 MT in 2022 from 84 MT in 2012, as crude steel production rose to 1,018 MT from 739 MT. Steel scrap consumption for the EU and Japan fell 16% and 15%, respectively, in 2022, in line with the decrease in their crude steel production.

Table 10: Steel Scrap Consumption and Crude Steel Production in Key Regions (MT)

Region	Steel Scrap Consumption			Crude Steel Production		
	2022	2012	% Change	2022	2012	% change
China	215	84	156%	1018	731	39%
EU-27	79	94	-16%	136	169	-19%
The US	57	63	-10%	81	89	-9%
Turkey	33	32	1%	89	36	148%
Japan	30	36	-15%	35	107	-67%
Russia	29	20	46%	71	70	2%
Republic of Korea	26	33	-19%	66	69	-5%
India[14]	24	19	26%	120	74	62%

Source: CAMU, EUROFER, ISRI calculations, TCUD, Japan Ministry of Economy, RUSMET, KOSA, CARI, WSA, CRISIL MI&A

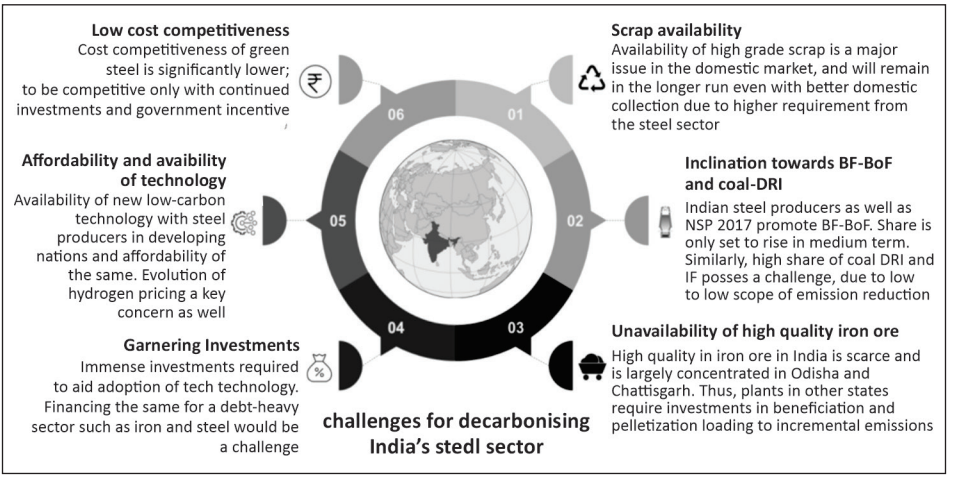
Major Challenges to Decarbonisation of Steel industry in India

The steel industry accounts for about 13% of India's energy-related emissions as per the IEA India Energy Outlook 2021, higher than the global standard of 7-8%, and over a third of total industrial energy related emissions. Despite improvements in recent years, average emissions at ~2.5 tonne of CO_2/tonne of crude steel as of 2021 remain well above the global benchmarks.

Being the second-largest producer of crude steel and the second-largest emitter of CO_2, Ministry of Steel is focusing on decarbonising the steel industry quickly to achieve carbon neutrality by 2070. Most integrated steel producers are taking efforts to adopt the best available technologies, in line with India's net-zero target and the steel ministry's vision of reducing emission intensity by 20% by 2030.

[14] FY 2013 and FY 2023 values are used for India

Chart 33: Key Challenges Facing the Indian Iron and Steel Industry

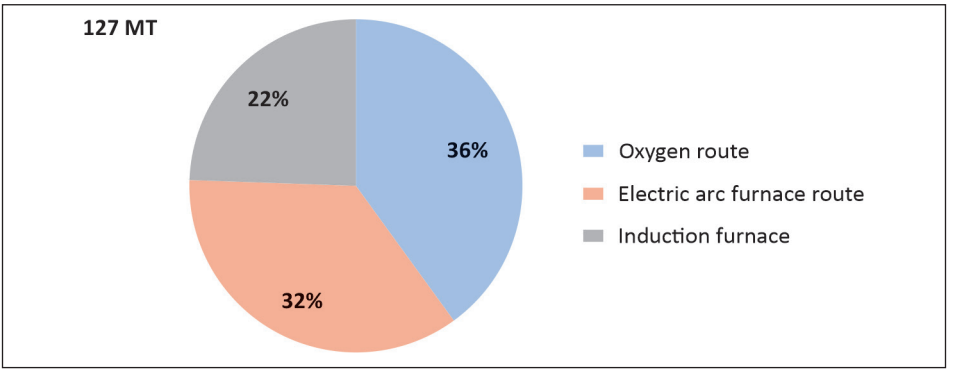


Source: CRISIL MI&A; India Exim Bank Research

India's Steel Production by Route

In India, 36% (45 MT) of crude steel was manufactured through the blast oxygen route in FY 2023. The EAF route accounted for 32% (40.6 MT) – 80% of production through the EAF method was coal-based, using coking coal as a reductant in the production process; the other 20% was natural gas-based. The induction furnace route accounted for the remaining 22% of steel production.

Chart 34: Steel Production by Route in India in FY 2023



Source: JPC; India Exim Bank Research

At 2.5-4 tonnes, carbon emissions are the highest in the coal based EAF route due to use of a huge quantity of coal, followed by the oxygen furnace route (2.4 tonnes). Scrap-based EAF releases the least amount of carbon emissions (0.4 tonne). The EAF-DRI route of steel production using natural gas releases around 1.5 tonne of CO_2.

As a majority of Indian steel is produced through the oxygen furnace and coal based EAF routes, the domestic steel sector's carbon intensity is higher than the global average. To minimise emissions, India should use deep decarbonisation techniques.

On a positive note, for Indian steel producers, considering that the BF-BoF accounted for 55-60% of Europe's crude steel production over the last five years, its complete phasing out by 2030 is unlikely, leaving enough room for competitive exports from India and developing countries. Furthermore, it may be a while before the EU can start aggressively reducing emissions for sectors such as steel, considering only 50-70 MT of new capacity in pathbreaking technology is likely to be added by 2030 against current capacity of 200-220 million tonne. This would ensure the BF-BoF capacity continues beyond 2030, providing an extended window for competitive exports. In the longer run, steel prices will guide the export trajectory. While flat steel (hot-rolled coil) prices in India were lower by ~€100/ tonne than those of West Europe over the last five years, players may lose incremental realisations through exports to Europe after 2026, when purchase of carbon credits becomes mandatory.

Impact of the Changing Global Policy Environment on Indian Steel

The recent emphasis on climate change and its effects on mankind have led to changes in environmental policies and calls for ambitious net-zero emission goals across geographies. Major steel-making countries globally, including China, the US and the EU, have set targets to become net carbon neutral to mitigate the impact of carbon emissions.

The EU

In 2022, carbon emissions from the EU stood at 2.7 billion tonnes, i.e., 7.2% of global carbon emissions. To lower emissions, the EU has set an ambitious climate goal of making Europe the first carbon-neutral continent. As part of the European Green Deal in December 2019, the EU is targeting to reduce its GHG emissions by 55% by 2030 from the base level of 1990 and become carbon-neutral by 2050.

Policy Changes across the EU

Carbon Border Adjustment Mechanism (CBAM): The CBAM is a carbon tariff that is paid by the producer for producing high-carbon steel. The actual carbon content of products imported into the EU is determined by the Emission Trading Systems formula[15]. Importers, therefore, need CBAM certificates that correspond to the price of carbon emissions that would have been charged if the goods had been manufactured in accordance with EU legislation on carbon pricing. However, there are deadlines for the payment of carbon tax. The difference in carbon content is due to variations in steel manufacturing techniques across geographies, resulting in carbon leakage.

Table 11: Carbon Intensity per Tonne of Crude Steel across Geographies

Country	tCO_2/ tcs
The EU	1.4
Japan	1.4
China	1.8
India	2.5
Russia	2.2
The US	1.1

Source: CRISIL MI&A Research; India Exim Bank Research

[15] Standard emissions to be considered in the absence of audited source emissions, as per IPCC 2019 report

- Iron ore mining- 0.013 tCO_2/ t iron ore
- Coke making- 0.30 tCO_2/ t coke
- Sinter making- 0.21 tCO_2/ t sinter
- Pig iron- 1.43 tCO_2/ t hot metal
- DRI (natural gas) production- 0.7 tCO_2/ t DRI

Time period: The CBAM will be phased in gradually.

- Transition period: The reporting system will be from October 1, 2023, to December 31, 2025. During this period, importers must report the quantity of goods and total emissions embedded in imported products without having to pay for financial adjustments. This will allow time for the final system to be implemented. No CBAM certificates will be provided during the transition period.
- Full and formal adoption of CBAM: The gradual phasing-in of CBAM between 2026 and 2034 will allow for an adequate transition period for EU and non-EU businesses. In 2026, importers will begin to pay CBAM financial adjustment. Free allowances as per the ETS system will cease for CBAM-covered sectors in 2026.
- Impact: The impact of this steel policy on India is high, as about 6% of Indian steel is exported to the EU. This increases the cost to Indian producers. However, the country is also planning to shift towards low-carbon steel manufacturing technologies.
- Revision of Renewable Energy Directive: The share of renewable energy sources in total energy consumption is targeted to increase from 32% over to 40% by 2030. When renewable energy sources replace fossil fuels in the steel production process, CO_2 emissions would decline.
- EU Hydrogen Strategy: Compared with BF-BOF production, hydrogen-based green steel production will help limit CO_2 emissions. Since green hydrogen is a potential replacement for fossil fuels such as coal or natural gas in the steel production process through the DRI-EAF route, the EU aims to manufacture electrolysers of 40 GW, which have the capacity of producing 10 MT of green hydrogen.

Though there is no direct impact of this policy change on the India steel export market, the increased usage of renewable energy sources would result in lower carbon intensity for steel in the EU, helping CBAM timelines.

China

- In 2022, carbon emissions from China stood at 11.4 billion tonnes, i.e., a massive 30.7% share of global emissions. To lower emissions, China has set a goal of becoming carbon neutral by 2060. Chinese President Xi Jinping announced in 2020 that the country would aggressively aim to achieve peak carbon emissions by 2030 and net-zero emissions before 2060. The crude steel production in 2023 was stagnant at 1,019 MT. As China is the largest producer of crude steel and 90% of steel production is through BF-BOF, carbon intensity from the steel sector is higher in China.
- Capacity swap programme: The Chinese government put in place a new capacity swap programme with effect from June 1, 2021. Based on the programme's framework, steel producers in certain regions are not allowed to increase production capacity. Also, in several other regions, the replacement ratio has been changed from 1.25:1.00 (as per the old capacity swap programme) to 1.5:1.0, implying that to expand crude steel production by 1.0 MT, manufacturers need to eliminate 1.5 MT of crude steel capacity.
- Overall, the Chinese government has been focusing on limiting steel production on-year as well as curbing further CO_2 emissions.

India's Policy Initiatives for Decarbonisation

India is committed to decarbonise the steel sector in India and various focus areas have been identified by the ministry in this regard.

- The Lok Sabha passed the Energy Conservation (Amendment) Bill, 2022, to establish a carbon credit market to incentivise players making less carbon-intensive steel. Additionally, initiatives such as Perform, Achieve and Trade (PAT) and renewable energy certificates (RECs) promote energy efficiency and increased use of renewable energy sources across sectors. The carbon market helps provide the necessary market support mechanism where carbon credits are sold and bought.
- The Government of India has also come out with guidelines for undertaking pilot projects for using green hydrogen in the steel sector.

The guidelines, named "Scheme Guidelines for implementation of Pilot projects for use of Green Hydrogen in the Steel Sector under the National Green Hydrogen Mission", have been issued by the Ministry of New & Renewable Energy (MNRE).

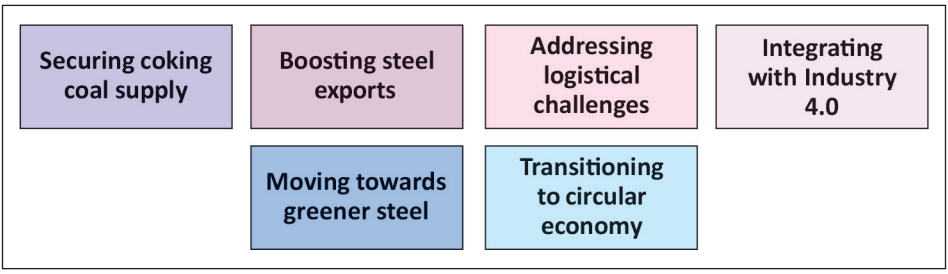
- Three areas have been identified as thrust areas for the pilot projects in the steel sector. These are use of Hydrogen in Direct Reduced Ironmaking process; use of Hydrogen in Blast Furnace; and substitution of fossil fuels with Green Hydrogen in a gradual manner. The scheme would also support pilot projects involving other innovative use of hydrogen for reducing carbon emissions in iron and steel production.
- The scheme envisages that considering the higher costs of green hydrogen at present, steel plants could begin by blending a small percentage of green hydrogen in their processes, and increase the blending proportion progressively, with improvement in cost-economics and advancement of technology.

- To ensure better availability of domestic steel scrap and gradual shift to less carbon-intensive forms of steel, the steel ministry issued a Steel Scrap Recycling Policy in 2019. The objective of the policy is to promote a formal and scientific collection, dismantling and processing activities for end-of-life products that are sources of recyclable (ferrous, non-ferrous, and other non-metallic) scraps which will lead to resource conservation and energy savings and setting up of an environmentally sound management system for handling ferrous scrap. The goal of the Ministry of Steel is to develop a globally competitive steel industry using the latest environmentally friendly technology. Since steel scrap is the main raw material for EAF/IF-based steel production, this policy provides a framework to promote and facilitate the establishment of metal scrap centres in India, ensuring the scientific processing and recycling of steel scrap from different sources and different products.

5. Strategies for Strengthening the Steel Industry in India

The Indian steel industry is at an important junction. The industry is witnessing a paradigm shift. While on the one hand, the National Steel Policy has a vision to achieve a production target of 300 MT per annum by 2030-31, on the other hand, India has committed emission reductions under COP 26 which makes furthering sustainability in the steel sector a key priority. The chapter lists a few strategies that may be adopted for accelerating the growth of the industry.

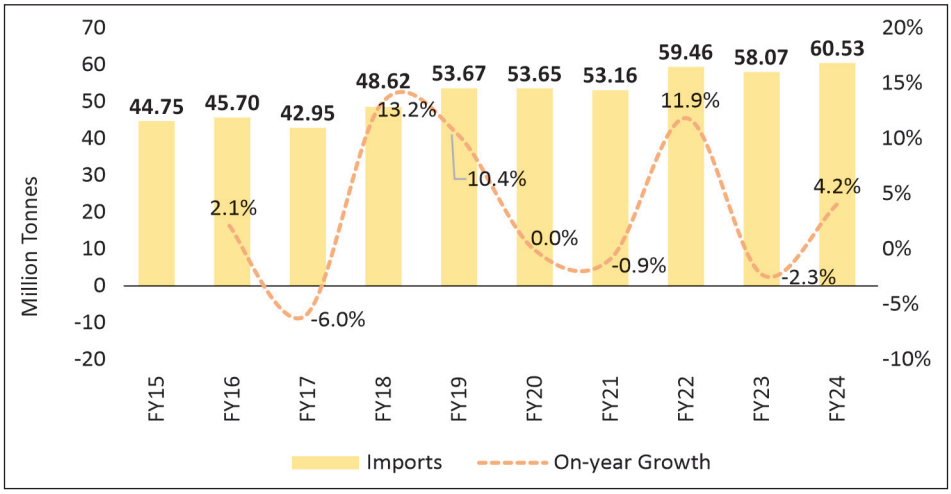
Chart 35: Select Strategies for Indian Iron & Steel Industry



1. Securing Coking Coal Supply

Coking coal, a vital component in the production of steel, contributes around 40-45% of the steel production cost. India is dependent on the import of coking coal for its needs. India's coking coal imports have increased from 44.8 MT in FY 2015 to 60.5 MT in FY 2024, recording an AAGR of 3.6%. Around 49% of India's coking coal imports in FY 2024 were from Australia. Other important sources included the USA, Russia, Singapore, and Canada.

Chart 36: Coking Coal Imports by India



Source: Ministry of Coal; CMIE Industry Outlook; India Exim Bank Research

India is expected to remain a key importer of coking coal until the end of the decade as the current production capacities and cost economics in steel production support blast furnace-based operations. Blending of domestic coking coal is expected to improve from the current 15% to about 30% in a decade, with an increase in the focus on beneficiation of coking coal, owing to 'Mission Coking Coal'. However, the quality of Indian coking coal- high ash content and lower coke strength - are the key factors inhibiting wider scale usage.

It may be noted that India's import dependence for coking coal is around 85% and India targets to get reduce this to 65% by FY 2031. Given that India intends to achieve crude steel production target of 300 MTPA by 2030-31, securing coking coal supply becomes even more important.

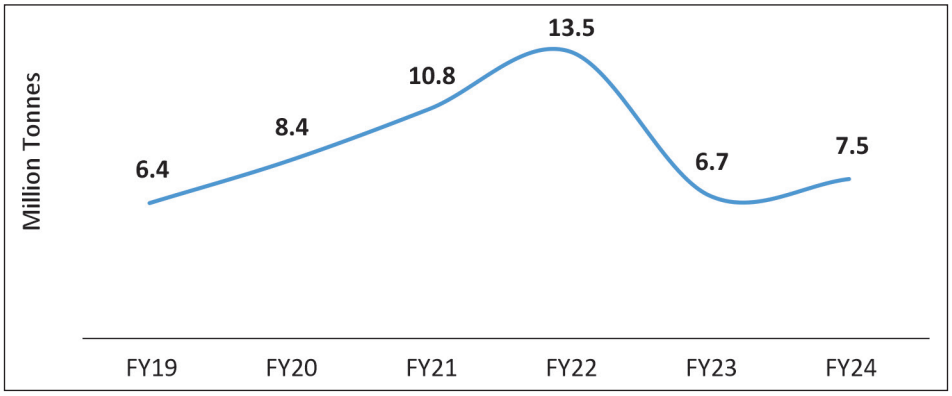
The first step to secure the raw materials such as coking coal would be to diversify the import sources. Currently, India is heavily dependent on Australia, with almost half of India's coking coal imports coming from Australia. India is already targeting Russia for increased coking coal imports in the coming years. Other than this, Canada, and the US can also be important destinations to explore.

However, the diversification would not actually reduce the import dependence of Indian steel players. Therefore, India should focus more on the mining and the washing technology to reduce the import dependence. Currently, most of the domestic coking coal is being used by the power industry due to its high ash content (18%-49%). To make it useful for the iron and steel industry, coking coal has to be washed to reduce the ash content, which can then be blended with the low ash content imported coking coal. Further, mining exploration can also be helpful in finding more coking coal reserves, which could be low in ash content. Investing in technology would play a crucial role in reducing India's import dependence for coking coal.

2. Boosting Steel Exports

India's exports of finished steel were recorded at about 7.5 MT in FY 2024. Although the exports are higher than in FY 2023, they are lower than the exports in preceding few years (Chart 37). Although, the fall is majorly attributed to the imposition of export duty on all steel products, based on a business-as-usual scenario as well, India's steel exports have the potential to perform better.

Chart 37: India's Finished Steel Exports



Source: JPC; India Exim Bank Research

Notably, out of the total exports of finished and non-finished steel in FY 2024, about 88% of the exports were of non-alloys and only 12% of alloys in FY 2024. India majorly exports commodities such as hot rolled coils (3.4 MT

in FY 24) which lie at the lower end of the value chains. As a result, the export realisation in terms of value is lesser vis-à-vis products at the higher end of the steel value chain such as specialty steel products which involve the processing of normal finished steel by way of coating, plating, and heat treatment to convert it into high value-added steel, for use in applications such as defence, space, power, automobile, capital goods, etc.

For instance, India was the top importer of stainless steel in ingots or other primary forms (HS 7218) globally, with a trade deficit of US$ 1.4 billion in 2023. India's exports of stainless steel in ingots comprised a mere share of 0.7% in global exports in 2023 as against an import share of 26.8% globally. Similarly, India runs trade deficit in flat rolled products of stainless steel. While India had a trade surplus in stainless steel bars and rods in 2023, its contribution in global exports of 7% has huge scope of improvement given that the top exporting countries, Taiwan, Italy and Japan had a share of 19.4%, 13.8% and 10.5%, respectively, in world exports of stainless-steel bars and rods in 2023.

Table 12: India's Trade in Stainless Steel

HS Code	Commodity	India's Exports in 2023 (US$ mn)	India's Share in Global Exports	India's Imports in 2023 (US$ mn)	India's Share in Global Imports
7218	Stainless steel in ingots or other primary forms; semi-finished products of stainless steel	37.1	0.7%	1423.5	26.8%
7219	Flat-rolled products of stainless steel, of a width of >= 600 mm, hot-rolled or cold-rolled "cold-reduced"	718.3	2.1%	1632.5	4.8%
7220	Flat-rolled products of stainless steel, of a width of < 600 mm, hot-rolled or cold-rolled "cold-reduced"	179.5	3.2%	231.6	4.2%
7221	Bars and rods of stainless steel, hot-rolled, in irregularly wound coils	122.9	7.0%	38.8	2.1%

Source: ITC Trade Map; India Exim Bank Research

Besides, Grain Oriented Electrical Steel (GOES), is another sought-after commodity, globally. It is a crucial component in electrical transformers, which remain vital for the effective conversion, transfer, and utilisation of electricity. Thus, focus needs to be laid in strengthening export capabilities in high value and high demand steel categories.

Further, the cost competitiveness of the steel sector also needs to be addressed. While domestically, the steel produced might be cost effective, steel for exports, especially high-grade steel or special steel is not very export competitive. This is because this kind of steel requires economies of scale to become competitive. In the present scenario, various taxes which are not a part of GST can be counter-beneficial for these products. For instance, VAT on diesel for transportation, electricity duty etc. are levied on the steel industry and are not refunded. While the GOI has introduced the Remission of Duties and Taxes on Exported Products (RoDTEP) scheme for various sectors, steel is not a part of this scheme.

Finally, a stable policy environment could be one of the most important factors in determining the direction of the exports. Policy decisions such as export duty on steel could negatively impact the steel exports. For instance, in May 2022, duty on exports of iron ore was hiked by up to 50% and for a few steel intermediaries to 15% as the steel manufacturers increased their exports owing to increased steel prices during March 2020 to April 2022. The duty was withdrawn in November 2022.

Overall, laying down a well-defined export strategy could be helpful for the industry. Competitive products and markets may be identified for the various steel products. At the same time, engaging in FTA negotiations with countries and regions where Indian steel is competitive could be one of the solutions. Additionally, the negotiations should be regular to cover steel under the RoDTEP scheme. This would help the steel industry in becoming more competitive.

3. Addressing Logistical Challenges

Logistics plays an extremely crucial role in the iron and steel industry. The imported iron ore and coking coal which transported from ports to the plants and the finished steel transported from the unit to the port for exports, both are bulk materials. As a result, logistics, especially the transportation cost component, plays an important role in the steel industry.

In case of India, although the steel plants are at close distance to raw materials sources, most of them are far from the ports. Given the high distances between the plants and the ports, railways are usually the preferred mode of freight and over 80% of steel industry's logistics requirement is met through railways. However, freight cost of railways in India is on the higher side. This is because railways in India is hugely dependent on freight for the revenue and in turn, cross subsidises the passenger traffic. As per Niti Aayog, freight cost from Jamshedpur to Mumbai can be as high as US$ 50/ton, in comparison with US$ 34/ton from Rotterdam to Mumbai.

To address these issues, it is critical that India creates state of the art last mile connectivity to the ports. It may be noted that for every tonne of steel produced, roughly 3 tonnes of raw material need to be transported. With high targets set by India to reach 300 MT of crude steel production by 2030-31, the logistics demand is going to increase exponentially. Therefore, long-terms solutions are important to address this challenge.

First solution could be to revise the freight class under railways for iron ore. In railways, higher the freight class, higher is the fare. Currently, both iron and steel and iron ore are under class 165. However, coal is under the class 145. Bringing down both the iron and steel and ore under class 145 could give a major push to the competitiveness of the Indian Steel industry. Further, consistent investing in new logistics infrastructure will be an important step. This could involve strengthening and development of new ports, dedicated railway connectivity between ports and plants and upgrading railways to increase the average speed, building new expressways, etc. Further, container shortages were seen across the globe, in the post-pandemic period. Investing

in new infrastructure could also involve manufacturing the containers domestically, although a specific grade of steel might be required for the same and in the initial time frame, import dependence may go up. However, in the long run, this would help in decreasing the logistics cost, as well as creating steel demand from the logistics sector.

4. Integrating Industry 4.0 and Steel Industry

Industry 4.0, also known as smart manufacturing is the realisation of the digital transformation of the field, delivering real-time decision making, enhanced productivity, flexibility, and agility. Technologies such as IoT, cloud computing, AI and ML, among others, are being integrated in the manufacturing processes.

Integrating Industry 4.0 practices in the steel manufacturing is important because this has the capability to create efficient steel plants and reduce the cost of production. IoT sensors can be used in the plants to collect the data and feeds in the data to the AI. For instance, sensors can be installed on the steel slab which go to the furnace. Accordingly, data may be collected by the sensors regarding the temperature, air pressure etc. This would allow the AI to adjust the temperature or air pressure on its own, after sufficient data has been generated. This would not only improve the quality of production, but the AI will also be helpful in predicting the factors such as maintenance requirements which could save significant costs for the plants.

Further, steel plants are tough environments to work in. There could be accidents and injuries which could lead to loss of human lives and at the same time, could lead fall in productivity. This is because huge blast furnaces can generate lot of heat and gases. By monitoring the machines in real time, the AI technology can help reduce the human errors which will prevent the injuries from happening, and consequently, will increase productivity.

Finally, steel plants use humungous amounts of energy. With Industry 4.0, smart meters and IoT work together and can reduce the wasted energy. AI can assess the amount of energy required as per the steel products being

manufactured, thereby rationalising the energy consumption. Further, efficient utilisation of materials is another benefit of Industry 4.0 through the usage of AI. For instance, which product requires how much thickness and coating, once AI can evaluate this through regular feeding of data, the processes could be streamlined, and the end result will be a better-quality product.

Braincube is one such company which has been providing AI and data driven solutions to a host of steel manufacturing companies including ArcelorMittal, Aubert & Duval, Eramet etc. The solutions provided include use of IIoT tools to consolidate and contextualize data from disparate sources across the entire metal manufacturing process; identifying issues early and minimising downstream quality defects; access to live monitoring of production, and visualisation, contextualization, and analysis of data, among others. Going forward, inclusion of Industry 4.0 technologies may be incorporated in the production models either through in house resources or through outsourcing.

5. Moving towards Greener Steel

In 2023, India was the second-largest crude steel producer globally, behind China. Indian crude steel production stood at 140 MT in 2023, up 11% on-year and accounted for 7.5% of global steel production. Looking at the growth trajectory, Indian steel production is expected to reach 182-188 MT over the next four years. As of now, India's average carbon emissions per tonne of steel production is 2.5 tonne CO_2 per tonne of crude steel (T/tcs), down from 3.1 T/tcs in 2005. As production rises, carbon emissions will jump, unless Indian producers use green technologies. Also, to achieve India's Net-Zero commitment by 2070, it is imperative to shift towards hydrogen-based technologies.

Though the top six players (JSW Group, TSL Group, SAIL, AM/NS, RINL and JSPL) jointly hold a steel market share of 63%, the sector is diversified with the presence of various technologies and a significant number of secondary players. The type of technology used determines steel carbon intensity.

Box 1: Decarbonisation Targets of Top Indian Steel Companies

The major targets for decarbonisation set by Indian steel mills are in line or more aggressive than the government's target of net zero by 2070.

- Tata steel group has targeted below 2 tCO_2/tcs target by 2025, as against current emission of around 2.2 tCO_2/tcs with a net zero target for the year 2045. The aggressive target is in line with groups global operations with net zero by 2050 targeted by EU-27.
- JSW group has targeted below 1.95 tCO_2/tcs target by 2030, as against current emission of around 2.4 tCO_2/tcs with a net zero target for the year 2050.
- SAIL has targeted below 2.3 tCO_2/tcs target by 2030, as against current emission of around 2.5 tCO_2/tcs with a net zero target for the year 2070 in line with the government's target.
- JSPL has targeted below 2.0 tCO_2/tcs target by 2030, as against current emission of around 2.7 tCO_2/tcs with a net zero target for the year 2047.

Source: CRISIL Research, India Exim Bank

The IEA has released a roadmap for the iron and steel industry that highlights new technologies to produce low-carbon steel and improve energy efficiency in the steel-making process. According to the roadmap, decarbonisation of the steel sector should be carried out in phases, as hydrogen-based technologies and carbon capture and storage (CCS) technologies are not yet technically/ commercially viable. As per IEA's estimates in 2023, as against conventional steel making cost of 350-700 US$/tonne, the cost of steel production via electrolytic green hydrogen ranged between 900-1,500 US$/tonne varying across geographies.

Various approaches, such as improving process and energy efficiency, switching to renewable energy sources, and using alternative fuel sources, are available. Use of better-quality raw materials like 64%+ Fe iron ores, high CSR coking coal and processed scrap and improving material circularity in the

near and medium term would help lower the steel sector's carbon intensity. The three phases in decarbonisation of the steel sector are as follows:

Phase 1: This phase from 2022 to 2030 aims to reduce emissions in the short term.

Phase 2: This phase from 2031 to 2030 uses deep decarbonisation technologies in the medium to long term.

Phase 3: This phase from 2051 to 2070 uses other interventions post 2050 towards the goal of Net-Zero by 2070.

In line with targets taken by Indian government for net zero emission in steel industry, for reducing emissions in the short term, India may focus on using more scrap in the steel-making process, improving efficiency and, in turn, reducing energy and carbon intensity. Several Indian companies have announced plans to increase the use of scrap. For instance, JSW Steel plans to establish steel scrap processing centres across the country, Tata Steel is setting up electric arc furnace-based recycling plants and AM/NS India aims at increasing scrap use to around 10% by 2030 from 3-5% currently.

In the medium term, uptake of green hydrogen and CCLCS technologies may be prioritised to reduce carbon emissions. Notably, Jindal Stainless Limited has recently begun using green hydrogen for manufacturing stainless steel at its plant in Haryana. The facility is being operated under the BuildOwn-Operate by Hygenco and is being controlled by an advanced energy management and control system. This marks India's first green hydrogen plant in the stainless-steel sector. JSW Energy is also in the process of setting up a green hydrogen project in Karnataka for JSW Seel limited to manufacture green steel. Besides, Tata Steel has set up a carbon capture plant at Jamshedpur. The plant uses amine-based technology to make the captured carbon available for onsite reuse.

Indian Steel companies are working on improving process efficiencies and are working on new technologies to reduce the emissions from steel production.

Box 2: Technologies and Techniques to Improve Energy Efficiency

- **Pulverised coal injection (PCI)**: PCI usually involves large volumes of coal being injected in the blast furnace route. This injection is a substitute for metallurgical coal at the iron-making stage for production of hot metal. The use of PCI lowers usage of coke and, hence, reduces carbon emissions. This process not only reduces carbon intensity but also helps cut costs and improve energy efficiency all modern blast furnaces in India are now equipped with PCI systems.

- **Coal bed methane (CBM)**: To transform iron ore into iron in the blast furnace, metallurgical coke is used to produce most of the energy required for the process. It mainly consists of CH4 and is found in coal rocks. CBM is a more environmentally friendly energy source compared with direct coke and uses the gas deposited in coal seams or coal underbeds. CBM injection into the blast furnace will reduce the quantity of coke required by 10 kg/tonne of hot metal (thm). It helps reduce 33 gm of CO_2 per tonne of steel. India is still in the nascent stage of utilisation of CBM in steel making, the nearest comparative technology used in India is JSPL's use of syngas produced by coal gasification for iron making via gas based DRI units.

- **Top pressure recovery turbine (TRT)**: This is an energy-saving technique employed at the iron-making stage. In blast furnaces, gases leave at high pressure and temperature. Usually, they are purified and used for heating. But high pressure and energy are lost in the entire process. TRT uses high pressure to generate electric power by driving the turbine and controlling top pressure of the blast furnace. High-capacity blast furnaces above 3000 m^3 volume in India are usually fitted with TRT technology.

- **Oxygen convertor gas treatment systems**: During the steel-making process, blast oxygen furnaces release gaseous waste, which contains a large amount of CO at extremely high temperatures. Convertor systems can recycle the blast furnace gas released into fuel, thereby bringing down CO combustion as much as possible and using cooling systems.

- **Natural gas-EAF method**: Usually coal or natural gas is used as a reductant in the DRI-EAF method. Coal as a reducing agent releases a large amount of CO_2 emissions compared with natural gas. Instead of coal, if natural gas is used as a reducing agent, the process is called natural gas-EAF method. If scrap is used, the process is called scrap–DRI method, which has the lowest emissions. The natural gas- and scrap-based DRI methods are more energy-efficient and less carbon-intensive.

Deep decarbonisation techniques

- **Carbon capture and storage (CCS)**: This is one way to reduce carbon emissions. The main steps in this process are capturing carbon released during the steel manufacturing process and then transporting it to storage spaces through a pipe or ship. After that, the transported gas is stored in geological formations such as caverns so that it is not leaked into the atmosphere. However, the technology faces challenges during transportation and storage

- **Carbon capture and utilisation (CCU)**: This process is similar to CCS, except that CO_2 is not stored underground. It is used for other purposes such as production of methanol, polymers, ammonia and higher alcohols. Few pilot projects are commissioned in India like JSW's pilot project of 100 TPD at salav plant.

- **Hydrogen-based DRI**: If hydrogen is used as a reductant in the DRI-EAF route, the process is called hydrogen-based DRI. The intensity of emissions depends on the type of hydrogen used. There are three major types of hydrogen, and the one obtained from cleaner sources is called green hydrogen. Thought the technology is in nascent stage, Indian steel mills are running trials to blend hydrogen in blast furnaces to reduce emissions.

Source: CRISIL Research, India Exim Bank

Transitioning to a Circular Economy

In a linear economy, products are usually produced, sold, used, and discarded. A circular economy works quite differently. It forms a circular loop of producing, selling, using, and again reproducing by recycling, refurbishing and other techniques and then reusing. This results in lower waste and damage to ecosystems. In a circular economy, the basic principle is to extend the lifetime of products. As a permanent material which can be recycled repeatedly without losing its properties, steel is fundamental to a circular economy.

The circular economy in the steel sector revolves around steel scrap recycling, improvement of material and process efficiency, and renewable or hydrogen-based steel production. Reduce, reuse, redesign, remanufacture and resell are the basic principles of a circular economy, resulting in lower carbon emissions.

There is not enough scrap available to meet demand for new steel products. Going forward, the following measures may be adopted for a rapid transition to circular economy in steel.

- Promoting the formal and scientific collection, dismantling, and processing activities of used products and establish an organised, safe, and environmentally sound management system for handling steel scrap.
- Developing a responsive ecosystem that involves all stakeholders.
- Producing high-quality steel scrap for high-quality steel production and minimise dependence on imports.
- Eliminating end-of-life vehicles from Indian cities and recycle scrap metal. Establish mechanisms to treat waste streams and residues from demolition and shredding plants.
- Promoting the 6R principles of “Reduce, Reuse, Recycle, Repair, Redesign, and Remanufacture”.

Summing up

India's prowess in steelmaking in rapidly increasing. Going forward, the focus needs to be on boosting India's exports in high value steel. Reducing carbon emissions in the sector is also critical for India's steel exports to comply with the decarbonisation acts and policies set by different countries. With policy support and active private participation, India needs to take significant strides in adopting circular economy practices and cutting-edge technologies in the steel sector.

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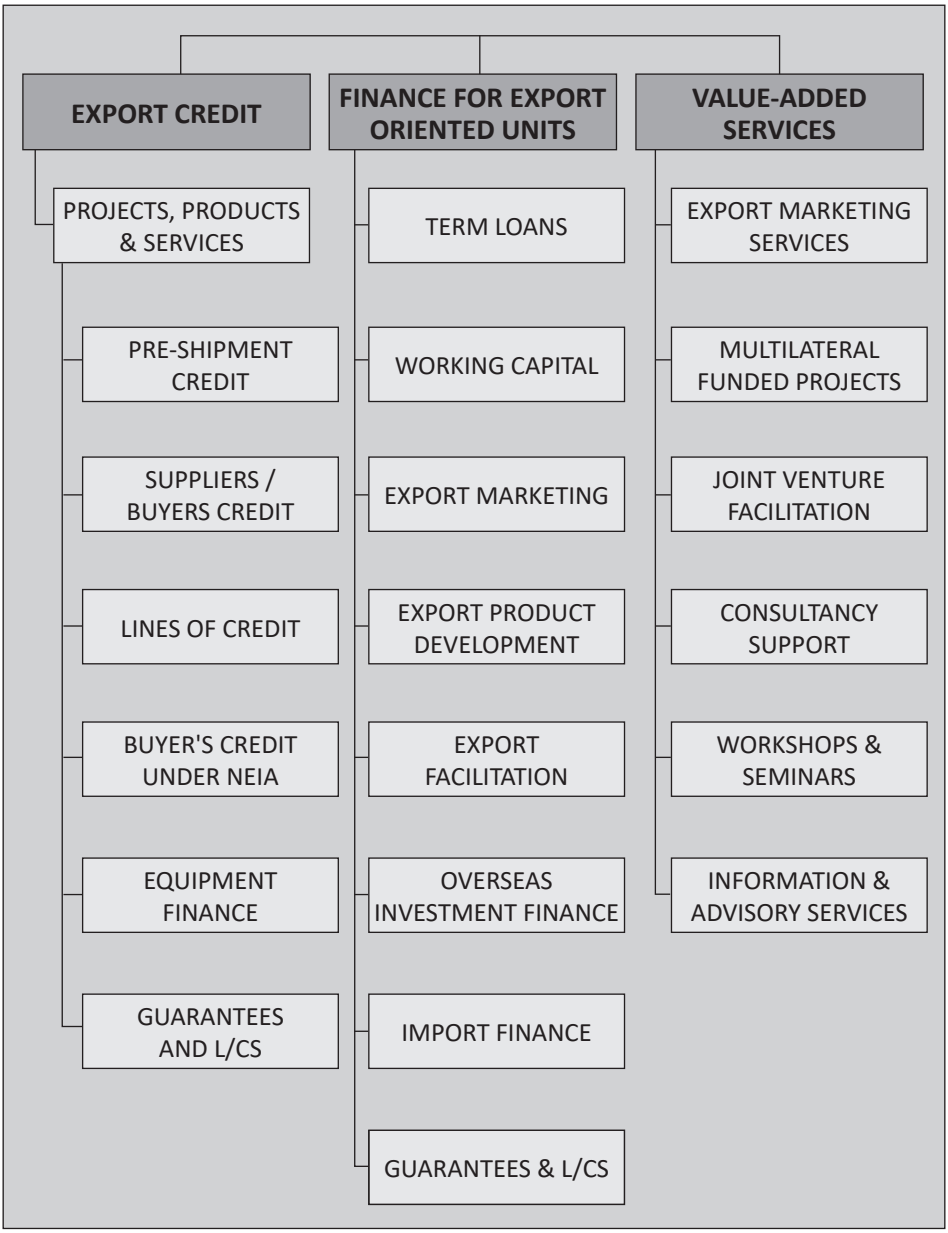

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