

National Steel Policy: Vision 2047

Executive Summary

Steel has been a key driver of India's industrial and economic development, supporting infrastructure, manufacturing, transportation, urbanisation and downstream industries. National Steel Policy – Vision 2047 (NSP – Vision 2047) provides long-term policy framework to build a globally competitive, technologically advanced, environmentally sustainable and resource-efficient steel sector aligned with the vision of Viksit Bharat @2047. India's crude steel production has increased from about 89 million tonne (MT) in 2014-15 to 170 MT in 2025-26, while finished steel consumption has risen from 77 MT to 164 MT. India's share of global crude steel production has also grown from 5.2% in 2014 to about 8.9% in 2025, supported by an installed capacity of 220 million tonnes per annum (MTPA). The Policy aims to meet the country's growing steel requirements, while strengthening India's position in the global steel industry.

Manufacturing and infrastructure will remain the primary drivers of steel demand, Construction and infrastructure currently account for about 67% of steel consumption, while automobiles, engineering goods, appliances and packaging contribute another 28%. Demand will also be driven by rapid urbanization, expansion of renewable energy, clean mobility, digital infrastructure and emerging technologies. The Policy projects finished steel demand of 505 MT by 2047, requiring crude steel capacity of 604 MT, per capita consumption of 302 kg and steel exports of 45 MT.

Raw materials account for around 65-70% of steelmaking costs. While India is largely self-sufficient in iron ore, it imports nearly 92% of its coking coal requirement. The Policy seeks to reduce import dependence through domestic mining, washery expansion, asset acquisition, long-term supply arrangements, and AI-based optimization of coal blends. Other raw materials important for steel sector like Manganese, Limestone etc. will also remain in policy focus to ensure long-term resource sustainability. The secondary steel sector, comprising around 2,550 units and nearly 47% of crude steel production capacity, will receive support for improved raw material access, technology improvement, skill development and safety.

Decarbonization is one of the key pillars of the Policy. The steel sector contributes about 10-12% of India's CO₂ emissions, with an average emission intensity of 2.54 tonnes of CO₂ per tonne of crude steel (tCO₂/tcs), significantly above the global average of 1.92 tCO₂/tcs. NSP – Vision 2047 outlines a phased transition towards Net Zero by 2070 through improved energy efficiency, renewable electricity, greater scrap utilization and use of hydrogen.

The Policy also focuses on value-added steel such as stainless steel and specialty steel, addressing their dependence on imported raw materials and technology. It proposes diversification of raw material sourcing, development of a domestic scrap ecosystem, promotion of downstream manufacturing clusters, indigenous technology development, Centres of Excellence and demand aggregation. Steel quality will be strengthened through revised Indian Standards and conformity assessment mechanisms.

Digital transformation is identified as an emerging priority. This includes focus on digital infrastructure, common data standards and Industry 4.0 adoption, migrating latter to Industry 5.0 ecosystem driven by trusted AI and autonomous production systems. Measures to discourage import of sub-standard low-quality steel will continue to be taken including AI supported import monitoring and other trade remedial measures. Export of good quality steel will also be encouraged.

International cooperation in steel sector will become priority area in coming years especially for raw material diversification, steel trade and technology collaboration. India, being the second largest producer and consumer of steel in the world, will collaborate with other countries to take steel sector forward in the right direction.

Recognizing the need for a larger and more skilled workforce, the Policy outlines measures including a Steel Skill Development Working Group, periodic skill-gap assessments and upgrading training institutions into Centres of Excellence. Safety initiatives include establishing a Steel Industry Safety Council and Safety Directorate to standardize audits, reporting, disaster preparedness and digital safety systems, with the objective of achieving zero tolerance for safety violations. Research and innovation will be supported through the Ministry's R&D programmes and SRTMI's challenge and start-up initiatives.

In summary, this policy is a roadmap for Indian steel sector's journey upto Viksit Bharat@2047. The policy covers all important aspects for steel sector and gives concrete action plan to address the challenges and explore the opportunities. It is expected that this policy will become a guiding document for Indian steel sector's phenomenal growth in coming two decades.



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Chapter 1: Strategic Framework

1.1. India has made significant progress in expanding its steelmaking capacity, improving technological capabilities and increasing domestic steel consumption over the past decade. Crude steel production has increased from about 89 MT in 2014-15 to 170 MT in 2025-26, while finished steel consumption has more than doubled from 77 MT to 164 MT during the same period. Figure 1.1 shows India's crude steel capacity, production and consumption since 1992. The country's steelmaking capacity has expanded to 220 MTPA, supported by sustained investments by both public and private sector enterprises. India's share in global crude steel production has also increased from 5.2 per cent in 2014 to about 8.9 per cent in 2025.

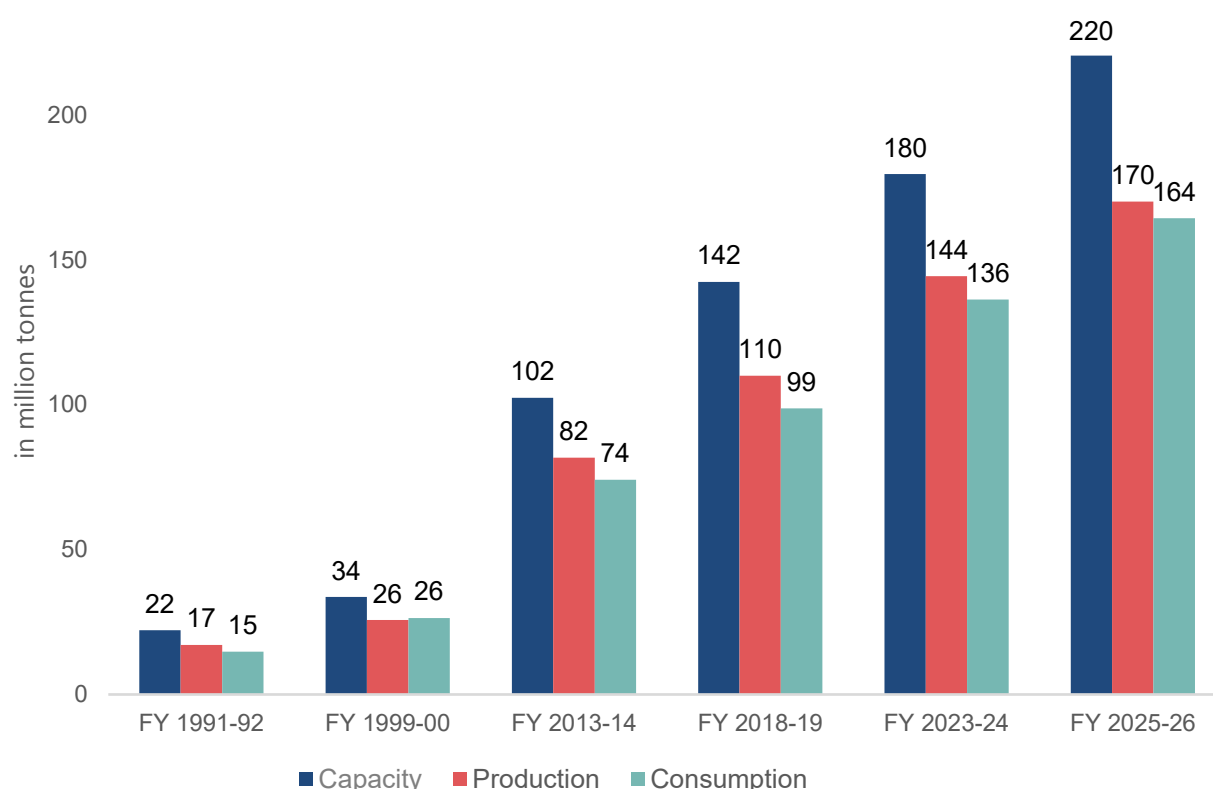


FIGURE 1.1 INDIA'S CRUDE STEEL CAPACITY, PRODUCTION AND CONSUMPTION SINCE 1992

- 1.2.** The coming decades present significant opportunities and challenges for the sector. India's aspiration to become a *Viksit* (developed) nation by 2047, sustained economic growth and rapid urbanisation are expected to substantially increase domestic steel demand.
- 1.3.** A defining feature of India's growth strategy over the last five years has been the significant increase in public capital expenditure. Union Government's capital expenditure has increased by more than three times since FY 2019-20, with sustained investments in transport infrastructure, railways, highways, ports, airports, urban infrastructure, energy systems and logistics. This shift towards asset creation has not only directly increased steel consumption but has also catalysed private investment by improving connectivity, reducing logistics costs and enhancing industrial

competitiveness. Continued emphasis on infrastructure-led growth is expected to remain a key driver of steel demand over the medium and long term.

- 1.4.** Demographic trends further reinforce India's long-term growth potential. India's population is projected to increase from around 1.42 billion in 2025 to about 1.67 billion by 2047, while the urban population is expected to increase from approximately 0.54 billion to 0.84 billion during the same period. This urban transition, involving nearly 300 million additional urban residents, will require substantial investments in affordable housing, commercial buildings, industrial parks, metro rail systems, airports, water supply, sanitation, power transmission and other urban infrastructure. The resulting increase in steel-intensive construction and infrastructure activities is expected to provide a strong structural foundation for sustained growth in domestic steel demand.
- 1.5.** Beyond the expansion of domestic demand, the Indian steel sector is entering a period of structural transformation. The industry will need to balance the objectives of rapid capacity expansion and affordable steel availability with the imperatives of competitiveness, resource efficiency, energy security and environmental sustainability. At the same time, changing global trade dynamics, evolving technologies, supply-chain vulnerabilities and increasing competition for critical raw materials are reshaping the global steel landscape. These developments necessitate a coordinated and forward-looking approach to strengthen the resilience and competitiveness of the Indian steel industry.
- 1.6.** The next two decades will therefore require the steel sector to move beyond capacity-led growth towards value creation, technological advancement and integration across the steel value chain. Greater emphasis will be required on technology adoption and innovation, efficient utilisation of raw materials and energy, development of high-value and specialty steel, circularity and decarbonisation, digitalisation and advanced manufacturing. Strengthening linkages with downstream industries, promoting domestic manufacturing of critical inputs and equipment, and enhancing India's participation in global steel value chains will be equally important to realise the sector's long-term potential.
- 1.7.** With the rapid expansion of the steel sector, India must also focus on indigenisation of technology and capital goods for steelmaking, while building domestic capabilities in specialty steel manufacturing to enhance global competitiveness.
- 1.8.** The National Steel Policy-Vision 2047 has been conceived in view of India's emergence as the world's second-largest steel producer, rapid domestic growth and emerging priority areas such as carbon emission reduction, capacity expansion, technology upgradation and adoption of Artificial Intelligence (AI) and Machine Learning (ML).
- 1.9.** NSP – Vision 2047 provides a comprehensive framework to guide the long-term development of the Indian steel sector. Through coordinated efforts of the Central and State Governments, industry and other stakeholders, it aims to position the industry as globally competitive, resilient and environmentally sustainable, contributing to Viksit Bharat @ 2047.

1.10. Objectives: NSP – Vision 2047 aims at achieving the following objectives:

- i. Increase per capita steel consumption to 302 kg by 2047.
- ii. Build a globally competitive industry and reach a crude steel capacity of 604 MT by 2047.
- iii. Promote greater use of steel in infrastructure, housing, transportation, renewable energy, and emerging manufacturing sectors.
- iv. Prevent sub-standard and inferior quality steel imports and support indigenization of critical grades and processes.
- v. Promote modernization of secondary steel industries, steel service centres, fabrication facilities and MSMEs to enhance domestic value addition and employment generation.
- vi. Increase steel exports from India to 45 MT by 2047.
- vii. Ensure the availability of raw materials at competitive prices to the domestic steel industry, promote beneficiation and value addition of domestic resources.
- viii. Increase the availability of washed coking coal at competitive prices and reduce import dependence on coking coal.
- ix. Secure adequate availability of fluxes like limestone and dolomite, essential in steelmaking.
- x. Strengthen domestic steel scrap collection, processing and recycling ecosystems.
- xi. Encourage industry to be a world leader in energy-efficient steel production.
- xii. Encourage development and deployment of breakthrough low-carbon technologies including hydrogen-based steelmaking, CCUS and circular economy practices.
- xiii. Substantially reduce the carbon footprint of the steel industry by reducing the average emissions intensity to 1.54 tCO₂/tcs steel by 2047.
- xiv. Promote domestic manufacturing of high-value steel products required for automotive, electric mobility, renewable energy and strategic sectors.
- xv. Promote indigenization of steelmaking technologies, equipment and manufacturing capabilities.
- xvi. Promote adoption of digital technologies, artificial intelligence and automation to improve productivity, quality, safety and resource efficiency.
- xvii. Strengthen domestic research, innovation and collaboration between industry, academia and research institutions for next-generation steel technologies.
- xviii. Attain global standards in industrial safety.
- xix. Forge strategic partnerships with emerging economies in steel value chain to secure critical raw materials, accelerate technology and capability transfers, and expand India's global steel value-chain footprint.
- xx. Develop a globally competitive, future-ready workforce to support the transition towards sustainable, low-carbon steel manufacturing.

Chapter 2: Steel Demand, Capacity and Quality

2.1 Steel Demand:

Steel is a foundational material for economic development and will play a pivotal role in India's transition towards a Viksit Bharat by 2047. Historically, the growth of the steel sector has mirrored industrial transformation in developed economies. India's per capita steel consumption remains low at 116 kg in FY26, compared to the global average of 209 kg, indicating significant headroom for growth as infrastructure and manufacturing expand.

2.1.1 Construction and infrastructure are the largest consumers of steel accounting for nearly 67% of the country's total steel consumption. The building and construction sector alone accounts for around 37% of domestic steel consumption, driven by residential housing, commercial buildings, industrial structures and urban development. Infrastructure, including roads, railways, metro systems, bridges, ports, airports, pipelines and power projects, contributes another 30% of steel demand, as shown in Figure 2.1.

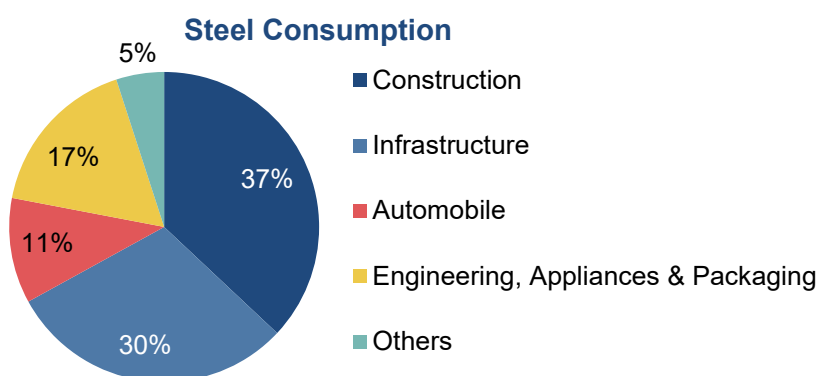


FIGURE 2.1 SECTOR-WISE DISTRIBUTION OF STEEL CONSUMPTION IN INDIA

2.1.2 Manufacturing-led growth is expected to emerge as an increasingly important contributor to steel demand. India's objective of increasing the share of manufacturing in the economy, supported by initiatives such as Make in India, the Production Linked Incentive (PLI) Scheme, semiconductor manufacturing, defence indigenisation and the development of industrial corridors, is expected to significantly expand steel consumption in sectors such as automotive, engineering goods, capital goods, machinery, shipbuilding, renewable energy equipment and defence production.

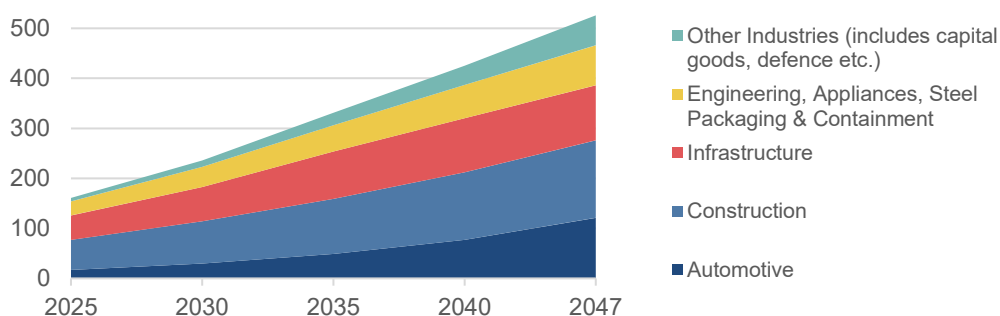


FIGURE 2.2 KEY MANUFACTURING SECTORS DRIVING FUTURE STEEL DEMAND

- 2.1.3** Various studies indicate that finished steel consumption growth begins to flatten once per capita GDP reaches around USD 10,000. India is expected to achieve this per capita GDP by 2040-41 to 2042-43. Accordingly, India's per capita steel consumption is estimated to enter a stabilisation phase between 2040-41 to 2042-43 and expected to stabilize by 2047-48.
- 2.1.4** The transition towards a low-carbon economy is expected to create new avenues for steel demand. Expansion of renewable energy capacity, transmission networks, green hydrogen infrastructure, electric mobility, battery manufacturing and associated industrial ecosystems will require substantial quantities of steel. Ministry of Steel will encourage the use of recycled steel in construction sector.
- 2.1.5** The Ministry of Steel will undertake the following initiatives towards sustaining demand and creating domestic capacity:
- i. **Promotion of steel-based construction:** Promote awareness for adopting steel-intensive design practices and construction that lower lifecycle costs thereby ensuring durability and sustainability.
 - ii. **Steel usage in key sectors:** Work with stakeholders to promote steel-intensive designs in sectors such as bridges, affordable housing, railway infrastructure, transmission towers, renewable energy structures and public infrastructure.
 - iii. **Life Cycle Cost (LCC) Integration:** Efforts will be made to prioritise LCC computation – positioning steel as the material of choice – in government procurement.
 - iv. **Prioritise steel-intensive building designs:** Prioritize steel-intensive design standards for buildings in higher seismic zones, flood prone areas and coastal regions, through Indian standards and Special Publication in consultation with the Bureau of Indian Standards.
 - v. **Capacity creation through an enabling ecosystem:** Facilitate timely capacity expansion by working with relevant Ministries and State Governments to improve availability of raw materials, logistics infrastructure, utilities, land, environmental clearances and other enabling infrastructure required for steel projects.

2.2 Steel Capacity:

By 2047, India's finished steel demand is projected to reach 505 MT, and per capita consumption is expected to rise to 302 kg. To meet the projected domestic demand, the required domestic crude steel capacity is envisaged to reach 604 MT by 2047, as shown in Figure 2.3., necessitating extensive investment in resources, infrastructure, manpower, and technology.

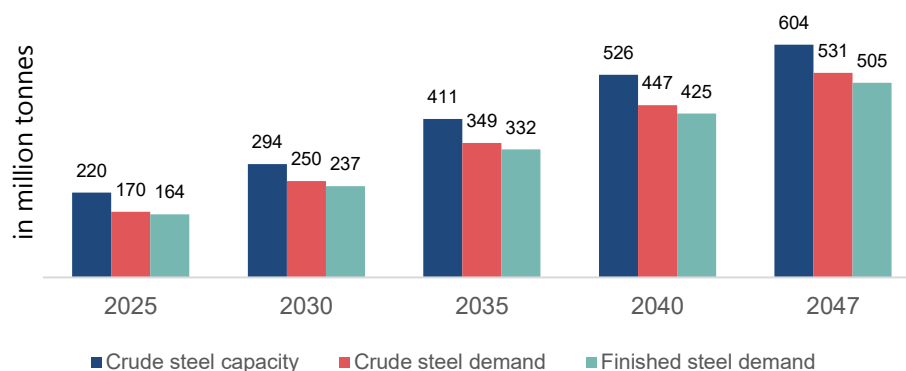


FIGURE 2.3 PROJECTED GROWTH IN INDIA'S FINISHED STEEL DEMAND, PER CAPITA STEEL CONSUMPTION AND DOMESTIC CRUDE STEEL CAPACITY BY 2047

2.2.1 India's crude steel production is currently distributed between BOF route about 43%, EAF route about 19% and IF route about 38%. By 2047, the share of the BOF route is likely to increase above 50%. The share of the EAF route is also likely to increase, driven by technology upgrades and energy efficiency measures while the contribution from IF route is expected to decrease.

2.3 Steel Quality

- 2.3.1** Increasing adoption of value-added steel is expected to improve the quality and intensity of steel consumption. This transition will require a robust quality ecosystem comprising updated standards, conformity assessment and reliable certification mechanisms.
- 2.3.2** As manufacturing becomes more technology-intensive and integrated into global value chains, demand for high-quality and specialty steel is also expected to increase. Consistent adherence to Indian Standards and internationally accepted quality requirements will therefore become increasingly important to support advanced manufacturing, exports and critical infrastructure.
- 2.3.3** Stricter environmental and pollution-control norms, together with demand for higher quality and faster delivery, will accelerate the shift towards steel-intensive, workshop-fabricated construction, which offers better quality control, lower waste and faster execution.
- 2.3.4** The Ministry will undertake the following initiatives to curb sub-standard and inferior imports and to support indigenization of critical grades and processes:
- Strengthen the Ministry's standardization cell with industry members in consultation with BIS for formulation, revision, and amendment of Indian Standards, including identification of imported grades for inclusion.
 - Leverage existing product certification schemes, which offer flexibility and regulatory discretion to address diverse product categories effectively.
 - Enhance stakeholder awareness of Indian Standards and QCOs through targeted communication and outreach.
 - Facilitate creation of an MSME support wing to guide MSMEs for better steel quality.

Chapter 3: Secondary Steel Industries (SSIs)

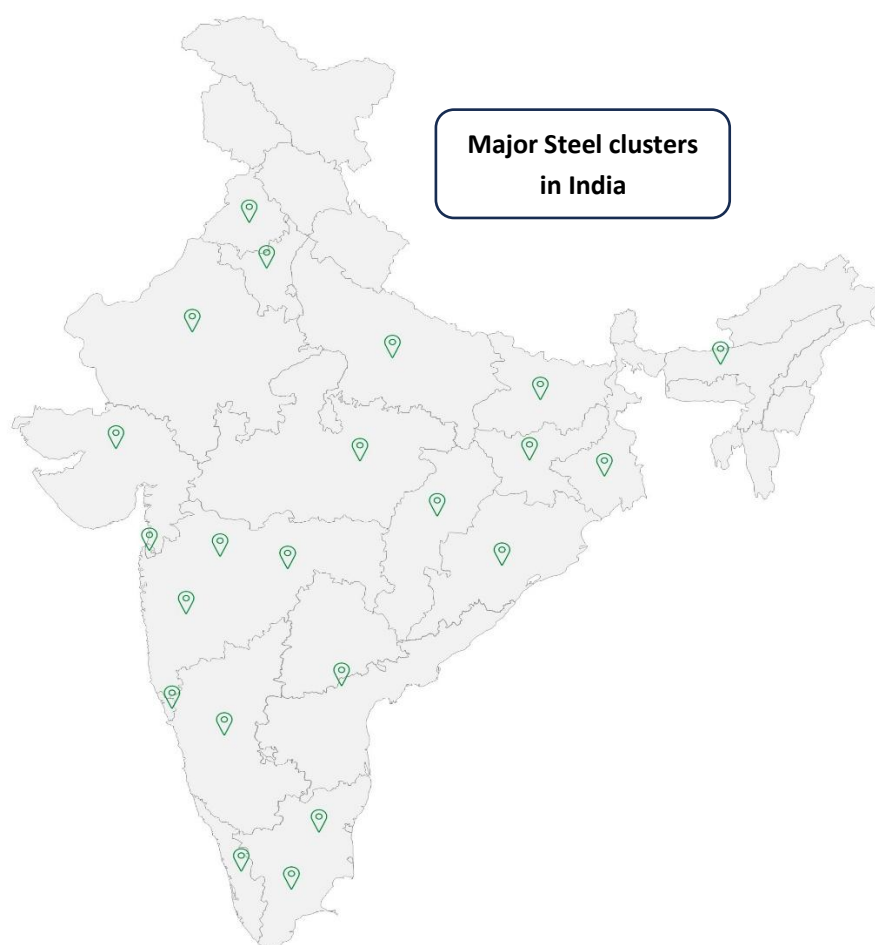


FIGURE 3.1 SECONDARY STEEL CLUSTERS IN INDIA

- 3.1.** India's Secondary Steel Industries (SSIs) form a cornerstone of the national steel sector, encompassing around 2,550 units and accounting for approximately 47% of crude steel production capacity in FY 2025-26. This sector includes Direct Reduced Iron (DRI) units, producers operating on Electric Arc Furnace (EAF) and Induction Furnace (IF) routes, as well as numerous re-rolling mills. The role of SSIs will be crucial towards making India Atmanirbhar in value-added steel and steel fabrication segments.
- 3.2.** Compared to the seven large producers, the secondary steel sector accounts for 73% of EAF units, 100% of induction furnace units, 97% of sponge iron units and 95% of wire drawing units, demonstrating its extensive presence across the steel manufacturing sector and its major contribution to domestic steel production.
- 3.3.** MSMEs constitute the majority of establishments in the secondary steel sector, accounting for over 70% of units in key segments such as induction furnaces (71%), re-rolling mills (70%), pipes (72%), and wire drawing (75%). Although MSMEs operate with relatively smaller capacities, they contribute significantly to production, including 33% of induction furnace steel, 31% of re-rolled products, 31% of pipes, and 54% of wire drawing output, underscoring their critical role in India's decentralized steel manufacturing ecosystem.

SSI	Metallic input	Units
Blast Furnace - Basic Oxygen Furnace	Hot Metal + Scrap (~<10%)	4
Electric Arc Furnace	Hot Metal + Pig Iron + DRI + Scrap (~12%)	30
Induction Furnace	DRI + Pig Iron + Scrap (~38%)	1,112
Re-Rolling Mills		1,254
Ferro Alloy Units		150
Total		2,550

TABLE 3.1 ROUTE-WISE DISTRIBUTION OF SECONDARY STEEL INDUSTRY

- 3.4.** India's secondary steel sector is distributed among approximately 22 major clusters spanning across entire country. These secondary steel industries are present mainly in re-rolling facilities, induction furnaces and sponge iron units.
- 3.5.** They face challenges due to constraints in raw material access, old technology, low digital technology adoption, limited resources for capacity expansion and modernization, non-compliance to safety standards and unskilled workforce.
- 3.6.** The Ministry of Steel will drive SSI modernization and growth through the following initiatives:
- 3.6.1** Increase iron ore availability: Facilitate the early ramp-up of production from auctioned mines, enhance iron ore output by CPSEs, and enable the sale of iron ore over and above captive requirements.
 - 3.6.2** Modernization and technological upgradation: Facilitate the adoption and upgradation of advanced technologies to improve energy efficiency, process efficiency, product quality, and overall competitiveness. The Policy will also support the industry's smooth transition to next-generation low-carbon production processes, including the use of other emerging clean technologies and use of renewable energy as they become commercially viable.
 - 3.6.3** Skill Development: Capacity building via NISST, BPNSI, ITIs and institutes of CPSEs on digital tools, safety, and value-added steel.
 - 3.6.4** Collaboration & Knowledge Exchange: Establish forums linking secondary producers with technology providers, academia, and research bodies.
 - 3.6.5** Safety Culture: Mechanism to support safety and train manpower in safety aspects.
 - 3.6.6** Promotion of downstream steel industries: Promote establishment of downstream steel clusters, steel service centres, fabrication facilities and MSMEs to enhance domestic value addition, employment generation and steel consumption.

Chapter 4: Steel Trade

4.1 India's steel trade is undergoing a structural transition. While domestic demand is expected to increase, India must simultaneously strengthen its position as a reliable global supplier of high-quality steel. The evolving global trade landscape, characterised by overcapacity in some regions, increasing protectionism, carbon-related trade measures, and supply chain diversification, presents both challenges and opportunities for the Indian steel industry.

4.2 India, the world's second-largest steel producer, has become a net exporter of finished steel during the fiscal year 2025-26. During this year, imports of finished steel declined by ~32% to 6.5 million tonnes, while exports increased by ~36% to 6.6 million tonnes.

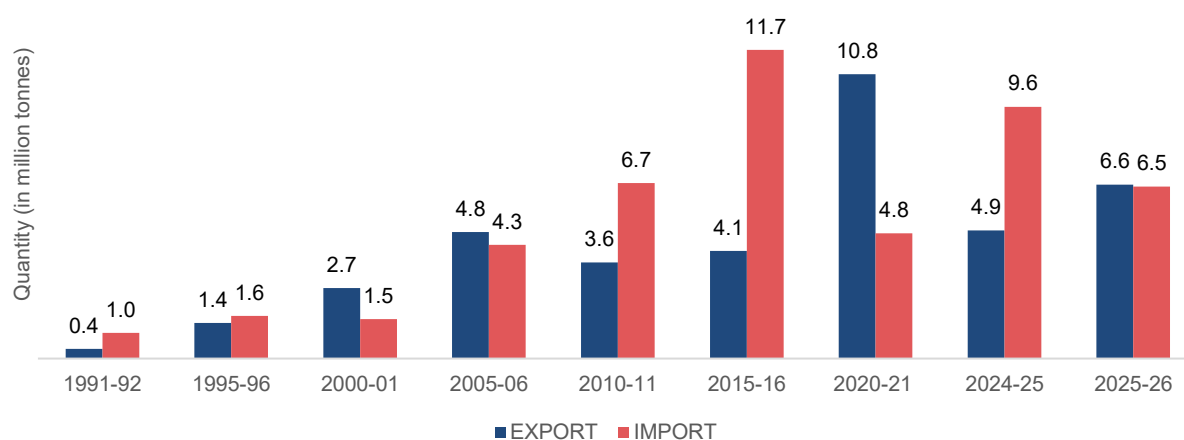


FIGURE 4.1 FINISHED STEEL IMPORT – EXPORT TREND

4.3 Steel Imports

4.3.1 More than 60% of India's steel imports originate from countries with which India has Free Trade Agreements (FTAs). The global steel sector is witnessing increasing protectionism, with many countries adopting measures to safeguard their domestic industries against low-cost imports, unfair trade practices and supply chain disruptions arising from geopolitical developments.

4.3.2 Imports of sub-standard or non-conforming steel, sudden import surges and possible circumvention of trade measures pose significant challenges for domestic producers. These concerns require a robust import governance framework based on testing, certification, traceability and real-time import monitoring supported by advanced analytics for early detection of abnormal import trends.

4.3.3 Where unfair trade practices are established, timely and evidence-based anti-dumping, countervailing and safeguard measures should be pursued, in coordination with the Directorate General of Trade Remedies (DGTR), Department of Commerce and other stakeholders. Such interventions should remain targeted and proportionate so that downstream industries continue to have access to essential inputs at affordable prices.

- 4.3.4** While protecting domestic industry from unfair imports, import policy should also ensure the availability of specialised and value-added steel grades that are not adequately produced within the country. Reducing dependence on such imports requires sustained investment in advanced metallurgical technologies, automation, research and development, quality systems, productivity enhancement, energy efficiency, raw material security and logistics infrastructure.
- 4.3.5** A three-pronged strategy centred around Quality Assurance, Fair Trade and Domestic Capability should therefore be adopted to reduce avoidable import dependence, strengthen India's steel ecosystem and enhance the competitiveness, resilience and long-term growth of both the steel industry and downstream manufacturing sectors.

4.4 Steel Exports

- 4.4.1** As India expands its steelmaking capacity, exports will remain an important component of a globally competitive and resilient steel industry. The export strategy is expected to progressively shift from volume-driven exports towards diversified, value-added and sustainable products, with greater emphasis on automotive steel, coated steel, electrical steel, stainless steel and other advanced steel grades that support India's manufacturing ambitions.
- 4.4.2** Indian steel exports face intense global competition arising from global overcapacity, lower production costs and government support in competing economies. Trade barriers, including anti-dumping and countervailing measures, safeguards and quotas, along with price volatility and geopolitical developments, can constrain market access.
- 4.4.3** Export opportunities are also constrained by limited domestic capacity in specialised and value-added steel grades required by sectors such as automotive, electrical, engineering, defence, aerospace and energy. At the same time, global markets are placing greater emphasis on quality, certification, traceability and low-carbon production. Strengthening domestic capabilities in these areas would therefore be essential for expanding India's presence in higher-value segments of the global steel market.
- 4.4.4** Policy measures shall focus on improving cost competitiveness across production, energy and logistics; strengthening export infrastructure and trade facilitation; expanding testing, certification and traceability capabilities; and accelerating the adoption of energy-efficient and low-carbon steelmaking technologies. Greater emphasis should also be placed on developing domestic capacity for specialty and advanced steel grades to support both export diversification and value addition.
- 4.4.5** Market diversification shall be pursued through bilateral and regional trade agreements and sustained trade engagement, with greater focus on high-growth markets in Africa, the Middle East, ASEAN and Latin America. At the same time, India's presence in developed markets should be consolidated through compliance with international quality, environmental and sustainability

standards, including emerging requirements such as the European Union's Carbon Border Adjustment Mechanism (CBAM).

- 4.4.6** The overall policy objective is to establish India as a reliable and competitive global steel supply hub by pursuing a three-pronged strategy centred on Cost Competitiveness, Market Access, and Value Addition & Green Steel. This approach would enable greater export diversification, strengthen India's resilience to global market and policy shifts, and enhance the long-term competitiveness of Indian steel in international markets.



FIGURE 4.2 KEY EXPORT DESTINATIONS AND TARGET MARKETS FOR INDIAN STEEL

4.5 The Ministry will take efforts towards:

- 4.5.1** Achieving increased market access through bilateral and multilateral trade agreements and periodic review of existing agreements.
- 4.5.2** Import monitoring by introduction of advanced analytics through artificial intelligence for policy interventions against import surges and circumvention.
- 4.5.3** Facilitating export competitiveness through remission benefits, improved market access, quality certification, CBAM compliance, green modernization, adoption of low-carbon technologies and other export facilitation measures.
- 4.5.4** Promoting fair and transparent trade practices through the implementation of appropriate trade remedial measures.

Chapter 5: Raw Material Security

5.1 The major raw materials essential for steel production include iron ore, coking coal, PCI coal, thermal coal, limestone, dolomite, and manganese ore. Raw materials account for nearly 65-70% of the total cost of steelmaking, underscoring their critical importance in ensuring the industry's competitiveness, sustainability, and long-term growth, as shown in Figure 5.1.

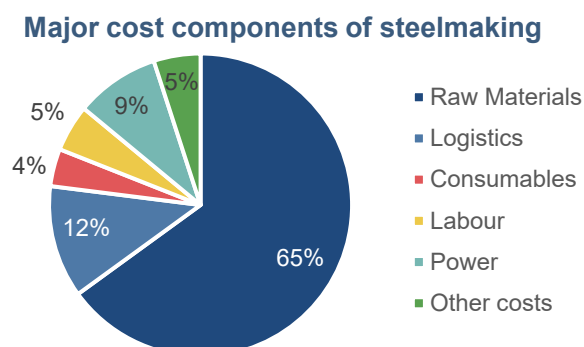


FIGURE 5.1 MAJOR COST COMPONENTS OF STEELMAKING

5.2 Iron ore

5.2.1 Iron ore is the primary raw material for steel making, which is typically processed into iron using blast furnaces or direct reduced iron methods. India is self-sufficient in iron ore.

5.2.2 The major challenges include: (i) rising production of iron ore fines and declining iron content in available ores, (ii) underutilization of beneficiation and pelletization capacity, (iii) delayed operationalization/squatting of allocated mines leading to underutilization of resources, (iv) extended timelines in obtaining statutory approvals.

5.2.3 The iron ore demand is projected as 772 MT by 2047, as shown in Figure 5.2.

5.2.4 Ministry of Steel will make efforts towards the following:

- i. Expansion of existing mines, exploration of new deposits, and adoption of modern mining technologies.
- ii. Increase utilization of low-grade iron ore through beneficiation and pelletization processes and ensure maximum low-grade iron ore to be consumed within the country by doing value addition.
- iii. Pursue foreign asset acquisition and joint ventures (JVs) to secure access to high-grade iron ore reserves.
- iv. Reservation of mineral blocks for CPSEs, allow shared infrastructure, raise lease limits, and rationalization of statutory levies.

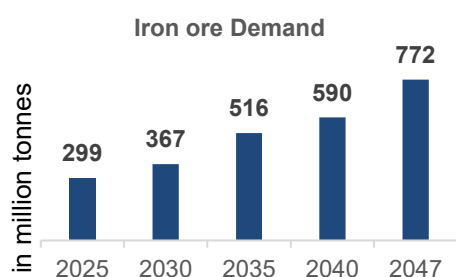


FIGURE 5.2 PROJECTED IRON ORE PRODUCTION BY 2047

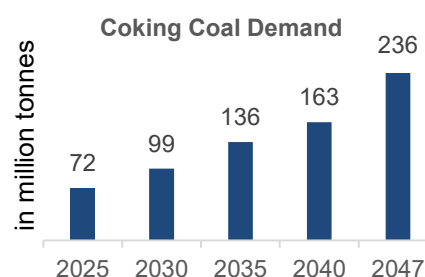


FIGURE 5.3 PROJECTED COKING COAL DEMAND BY 2047

5.3 Coking Coal

- 5.3.1** Coking coal is the primary reducing agent in the BF iron making route, with an average consumption of 670 - 700 kgs per tonne of hot metal production in blast furnace. About 92% of India's coking coal requirements is met through imports, mainly from Australia, USA, and Russia.
- 5.3.2** Coking coal grades available in India range from Steel grade I&II to Washery grade I-VI, however coking coal till Washery grade III and partially washery grade IV are considered suitable for metallurgical applications.
- 5.3.3** The average yield of washed coal remains limited to 30–40%, limiting the overall supply of metallurgical-grade coking coal to the steel sector.
- 5.3.4** India's existing operational coking coal washing capacity stands at around 39 MTPA, however, the actual operational output is only around 6 MT against a feed of around 17 MT, due to low yield and significant idle capacity.
- 5.3.5** Under Phase-II of sustainable technological transformation (2030 to 2035) as mentioned in section 6.4.1, coal gasification may support transition toward the DRI–EAF steelmaking route, while also enabling a significant reduction in coking coal consumption.
- 5.3.6** The demand for coking coal is expected to reach 236 MT by 2047, as shown in Figure 5.3.
- 5.3.7** Ministry of Steel will make efforts towards the following:
- Pursue strategic global outreach for diversification of sourcing, acquisition of foreign assets, strengthening supply security.
 - Promote setting up coal washeries.
 - Optimize coal blends to increase the use of domestic coking coal.
 - Conduct strategic mapping of appropriate grades of coking coal mines to steel plants to optimize supply chains, reduce transportation bottlenecks, and align production with demand.

5.4 Pulverized Coal Injection (PCI)

- 5.4.1** PCI is used in BF to partially replace coke and improve fuel efficiency, with a typical consumption of 130–160 kg/t of hot metal production. India's PCI consumption is largely met through imports from Russia and Australia.

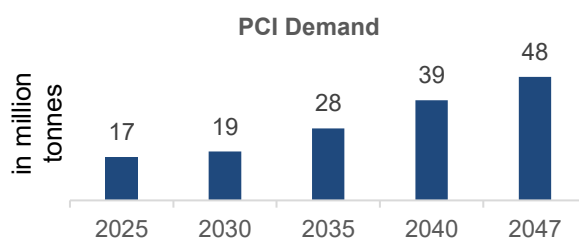


FIGURE 5.4 PROJECTED PCI DEMAND BY 2047

- 5.4.2** The high ash content and volatile matter in Indian coal significantly restrict PCI substitution rates, while the absence of dedicated PCI-grade washing facilities and inconsistent coal quality further impede wider adoption of PCI technology in the steel sector.
- 5.4.3** NSP Vision 2047 seeks to expand exploration and washing to increase the domestic availability of PCI-grade coal. It will encourage greater use of PCI to

reduce coking coal consumption in steelmaking and develop domestic supply to meet the projected PCI coal requirement of 48 MT by 2047 while reducing import dependence, as shown in Figure 5.4.

5.5 Other raw materials used in steel making process

5.5.1 Limestone & Dolomite:

- Limestone and dolomite are essential fluxing agents in steelmaking, with specific consumption of 0.3–0.4 tonnes per tonne of hot metal.
- In FY 2025-26, India consumed 24.3 MT of limestone, producing 8.1 MT domestically and importing 16.2 MT mainly from UAE and Oman.
- Dolomite consumption was 9.2 MT in FY 2025-26, with 2.7 MT produced domestically. India imported 6.5 MT of dolomite primarily from Bhutan, UAE, and Oman.
- Limestone demand is estimated to reach 77 MT, and dolomite demand is estimated to reach 51 MT by 2047, as shown in Figure 5.5 & 5.6.

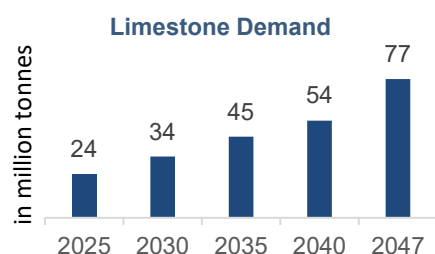


FIGURE 5.5 PROJECTED LIMESTONE DEMAND BY 2047

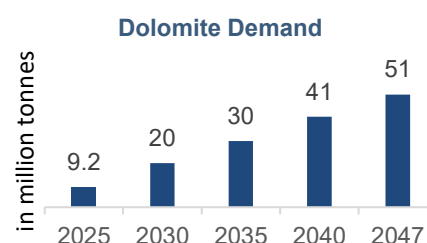


FIGURE 5.6 PROJECTED DOLomite DEMAND BY 2047

- The Ministry will make efforts to enhance domestic production capacity through expansion of existing mines and exploration of new mines. Diversifying limestone and dolomite sourcing through strategic global partnerships is another major objective.

5.5.2 Manganese Ore

- Manganese is a vital alloying agent that enhances the hardness, strength, and durability of steel. In FY 2025–26, the sector consumed 10.8 MT of manganese ore, with domestic production of 3.9 MT and import of 6.9 MT, primarily sourced from South Africa, Gabon, UAE, and Singapore, indicating significant import dependence.
- The Ministry will make efforts to enhance domestic production capacity through expansion of existing mines and exploration of new mines and diversification of sourcing by exploring strategic global partnerships for strengthening manganese supply to meet the projected manganese ore requirement of 34 MT by 2047, as shown in Figure 5.7.

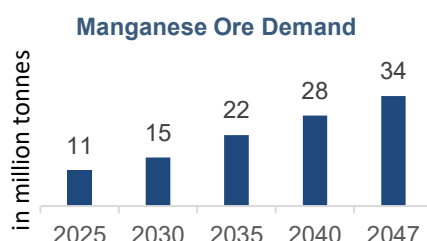


FIGURE 5.7 PROJECTED MANGANESE ORE DEMAND BY 2047

5.5.3 Steel Scrap

- i. Scrap is a key secondary raw material that reduces raw material requirement logistics costs and supports decarbonization in the steel sector. It contributed ~21% to India's crude steel output. In FY 2025-26 total 36 MT of scrap was used out of which 28 MT was generated domestically and 8 MT was imported.
- ii. By 2047, ferrous scrap consumption is projected to reach 123 MT, contributing around 21% of crude steel production, as shown in Figure 5.10.

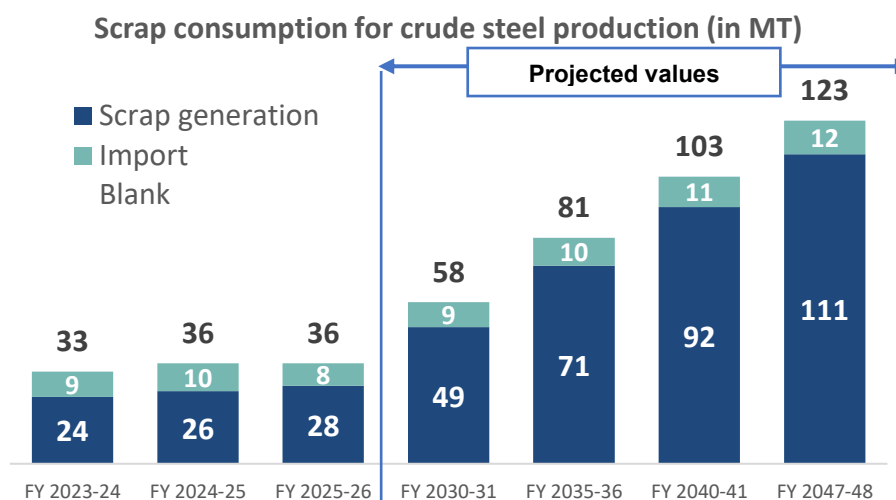


FIGURE 5.8 PROJECTED FERROUS SCRAP DEMAND BY 2047

- iii. NSP Vision 2047 aims to maintain the current 21% scrap share in steel production through policy measures that increase domestic scrap availability and strengthen recycling.
- iv. Key initiatives include the Vehicle Scrapping Policy, modernising and expanding ship recycling facilities, and implementing Extended Producer Responsibility (EPR) for end-of-life vehicles, construction waste, and consumer durables, supporting a circular, resource-efficient, and low-carbon steel sector.
- v. A sizeable volume of ferrous scrap remains untapped across households, obsolete items, construction and demolition waste, disputed industrial assets and end-of-life vehicles. A mission-mode drive on the lines of Swachhata Abhiyan will be launched to channelise such scrap into the formal recycling ecosystem, enhancing domestic scrap availability and promoting sustainable steel production.
- vi. India recycles approximately one-third of the world's end-of-life shipping tonnage and is the largest ship recycling nation globally. However, access to EU-flagged vessels remains constrained as Indian yards must be included in the European Union List under the EU Ship Recycling Regulation (EU-SRR). Efforts will be made for upgrading Indian yards to EU-SRR requirements through technical cooperation and capacity building with the EU and mutual recognition memorandum with the European Commission's Directorate-General for Environment (DG ENV), under which any yard certified by India's Ship Recycling Board would automatically be recognized as eligible to recycle EU-flagged vessels.

- vii. Other policy initiatives, such as the Carbon Credit Trading Scheme (CCTS), are also expected to incentivise greater utilisation of ferrous scrap by recognising its lower carbon footprint relative to primary steel production.

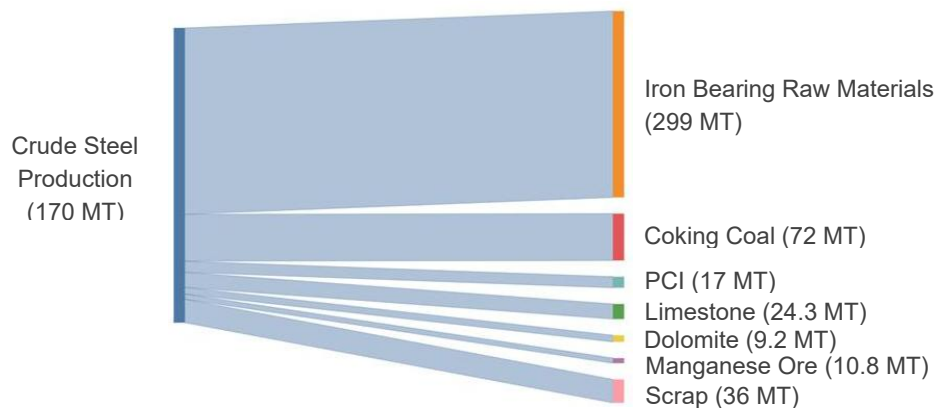


FIGURE 5.9 MAJOR RAW MATERIAL DEMAND IN 2026

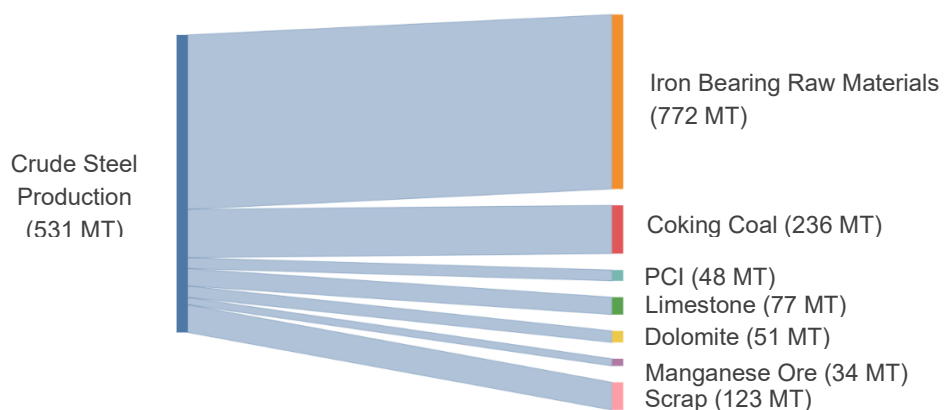


FIGURE 5.10 MAJOR RAW MATERIAL DEMAND IN 2047

5.6 Logistics

- 5.6.1** This policy promotes the development of robust last-mile connectivity between mines, steel plants, railway sidings, ports, and multimodal logistics hubs through dedicated infrastructure investments. Priority would be accorded to road, rail, and conveyor connectivity projects to reduce logistics costs, improve supply chain efficiency, and enhance the competitiveness of the domestic steel industry.
- 5.6.2** PM Gatishakti will be actively leveraged to map raw material availability, including iron ore, coal, manganese ore and other key inputs, against existing and potential steel consumption centres to identify optimal locations for new steel plants and capacity expansion, while minimising inbound and outbound logistics.
- 5.6.3 Logistics for raw materials**
- i. Current iron ore transport modal share is around 42% by railways, 28% by roadways, 29% through coastal shipping & other modes and 1% through direct slurry pipeline.

ii. **Railways and roadways:**

- a. Limited railway connectivity at mining locations necessitates the use of roadways for first-mile evacuation to processing and marketing centres.
- b. Overdependence on roadways leads to congestion and increases logistical inefficiencies and delays.
- c. The Ministry of Steel aims towards promoting efficient logistics systems, including conveyor belts, slurry pipelines, and other alternative modes.
- d. By 2047, railways are projected to carry around 49% and roadways around 9% of iron ore.

iii. **Coastal shipping and inland waterways:**

- a. Most iron ore mines are located in hinterland regions, future mechanisation and enhanced first-mile multimodal connectivity can enable greater integration with coastal and inland waterway logistics which shall remove logistical inefficiencies.

iv. **Slurry pipelines:**

- a. Slurry pipelines provide a cost-effective, reliable, and sustainable solution for transporting the growing volumes of iron ore as well as for coal.
- b. Currently, only around 18 MTPA of iron ore is transported through slurry pipelines, while most movement relies on rail and road. The expansion is constrained by multiple regulatory clearances, land acquisition issues, local opposition, and the absence of a dedicated regulatory framework.
- c. Slurry pipelines require significant water and face environmental concerns. NSP Vision 2047 envisions to expand slurry pipeline capacity to over 299 MTPA by 2047.

5.6.4 Logistics for finished goods

- i. Current transport modal share in finished steel is around 40% by railways, 59% by roadways, and 1% by coastal shipping.

ii. **Railways and roadways:**

- a. Inadequate rail infrastructure, including limited rake availability, network congestion, and insufficient rail-connected stockyards, leads to higher transit times and increased logistics costs for finished steel movement.
- b. Heavy dependence on road transport for first- and last-mile connectivity, coupled with high trucking costs, road congestion, and axle load restrictions, reduces the efficiency and cost competitiveness of finished steel logistics.
- c. By 2047, railways is projected to carry 62% of finished steel, while roadways share is expected to carry 35% of finished steel.

iii. **Coastal shipping and inland waterways:**

- a. Steel production and consumption centres are often located away from ports and navigable waterways, requiring multimodal connectivity through rail or road for first- and last-mile transportation, which increases logistics costs and transit time.
- b. Expansion needed for dedicated steel-handling infrastructure, improve service frequency, and strengthen multimodal integration to enhance coastal and inland waterway transport for finished steel.

- c. The objective is to enhance share of coastal shipping for finished steel to about 3% by 2047.

5.7 Ministry of Steel will make efforts in collaboration with other Ministries and departments towards the following:

5.7.1 Railways and roadways:

- i. Improve rake availability, introduce mini-rake bookings, fast-track rail projects, and upgrade rail sidings and terminals.
- ii. Develop shared-use rail sidings and dynamic wagon-sharing mechanisms.
- iii. Promote dedicated freight corridors and multimodal logistics parks with strong road-rail connectivity.
- iv. Encourage investment in specialised wagons and private rake maintenance to improve efficiency.
- v. Upgrade road infrastructure, including key corridors and last-mile connectivity to steel hubs.
- vi. Establish a mechanism to monitor and expedite priority rail projects.

5.7.2 Slurry pipeline:

- i. Introduce a single-window clearance system through NSWS with integrated approvals and defined timelines.
- ii. Promote water recycling through return water pipelines and desalination plants at coastal steel units.
- iii. Encourage shared slurry pipelines and common carrier models to improve viability and speed up implementation.
- iv. Introduce a Viability Gap Funding (VGF) scheme for iron ore and coking coal slurry pipelines, on the lines of strategic energy infrastructure, to promote cost-effective, low-carbon bulk mineral transportation.

5.7.3 Coastal shipping and inland waterways:

- i. Develop multimodal terminals, strengthen last-mile connectivity, and promote digital platforms to improve freight efficiency.
- ii. Inter Ministerial collaboration to promote port modernization, mechanized cargo handling, rationalized port charges, fiscal support for coastal shipping, and streamlined regulatory approvals.
- iii. Encourage private participation in developing multi modal logistics hubs in the major consumption centres of the country for unloading steel consignment which currently suffers from capacity crunch.
- iv. Identify projects of importance for steel sector and develop a monitoring mechanism at appropriate level for their execution.

Chapter 6: Sustainable Steel

- 6.1** The Indian steel sector is among the largest industrial sources of greenhouse gas emissions. Steel production accounts for an estimated 10–12% of India's total carbon dioxide emissions, primarily due to its heavy dependence on coal. Approximately 42% of India's crude steel is produced through the BF-BOF route, which relies on coking coal. In addition, nearly 27% crude steel production is through coal based DRI. Consequently, the average emission intensity of the Indian steel sector is estimated at 2.54 tCO₂/tcs, significantly higher than the global average of about 1.92 tCO₂/tcs. (As per latest WSA report)
- 6.2** India's transition towards low-carbon steelmaking is constrained by several structural challenges. Secondary Steel Industries (SSIs), which account for nearly 47% of the country's crude steel production capacity, continue to operate with ageing and relatively inefficient technologies, constrained financial resources, and limited access to modern equipment and clean technologies. The sector also faces inadequate domestic availability of quality ferrous scrap, natural gas, renewable energy, and other low-carbon inputs required for cleaner steel production.
- 6.3** Institutional challenges, including limited availability of accredited auditors and verification agencies, inadequate systems for measurement, reporting and verification (MRV), and gaps in technical capacity and awareness, further impede the pace of decarbonization.
- 6.4** Recognizing these challenges, the NSP – Vision 2047 envisages a phased transition towards a cleaner, technology-driven and globally competitive steel industry by 2047, while laying the foundation for achieving Net Zero emissions by 2070.
- 6.4.1** The transformation is structured across four overlapping phases. Each phase is anchored by a lead lever but carries forward and intensifies the interventions of preceding phases. The overlap is intentional: energy efficiency (EE) and renewable energy (RE) deployment initiated in Phase I continue to scale throughout the entire period; scrap utilization deepens continuously; and the coal gasification bridge established in Phase II persists as a transitional fuel even as green hydrogen and CCUS assume the primary abatement burden in the final phases, as shown in Table 1 and Figure 6.1.

Phase	Indicative Period	Lead Lever	Continuing / Overlapping Levers
Phase I	2026 – 2030	Energy efficiency, renewable energy, increased ferrous scrap	Foundation levers; continue and deepen across all subsequent phases
Phase II	2030 – 2035	Best Available Technologies (BAT) , Coal gasification + RE	EE, RE and scrap scale in parallel; Gasified coal established as transition fuel
Phase III	2035 – 2040	Green-hydrogen-based (H ₂ -DRI) production + CCUS	RE, scrap; Gasified coal, H ₂ blending ramps to 100%

Phase	Indicative Period	Lead Lever	Continuing / Overlapping Levers
Phase IV	2040 - 2047	CCUS for inherent process & residual emissions	All prior levers operating at scale; CCUS abates the residual

TABLE 6.1 ROUTE-WISE DISTRIBUTION OF SECONDARY STEEL INDUSTRY

- 6.5** The phases are complementary/synergistic rather than substitutive. By 2047, a modern integrated Indian steel plant is likely to combine renewable-powered electric arc furnaces with high scrap utilization, or hydrogen-based DRI for virgin iron production, biochar and gasified coal substitution in residual coal-based processes, and CCUS for capturing the remaining process emissions that cannot be electrified or replaced by hydrogen. Similar evolution in BF+BOF route is also envisaged with reduced use of coal and CCUS playing important role.

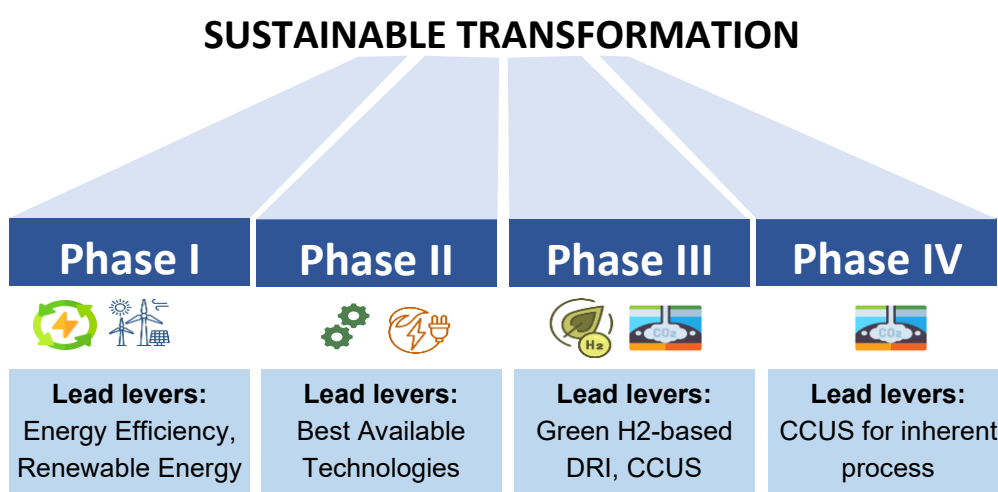


FIGURE 6.1 PHASE WISE LEAD LEVERS BY 2047

- 6.6** Continued investment in research, development and innovation (R&D & I), pilot-scale demonstrations, and industry–academia collaboration will accelerate technology validation and large-scale deployment, strengthening the long-term competitiveness and resilience of the Indian steel industry.
- 6.7** Policy instruments such as Carbon Credit Trading Scheme (CCTS), Renewable Consumption Obligations (RCOs), Green Steel certification and other market-based mechanisms will incentivise emission reduction and investment in cleaner technologies. Government initiatives, including the National Green Hydrogen Mission, CCUS Mission, Coal Gasification Scheme and research programmes, will support the commercialisation of transformative technologies.
- 6.8** Through these interventions, the Ministry of Steel aims to reduce the sector's average carbon emission intensity from 2.54 tCO₂/tcs to approximately 1.54 tCO₂/tcs by 2047, while ensuring economic viability and global competitiveness, thereby supporting India's Net Zero target by 2070.

Chapter 7: Value added steel

7.1 Value-added steel, including specialty and stainless steel, is essential for achieving Viksit Bharat@2047 and building an advanced manufacturing economy. It supports key sectors such as automotive, defence, aerospace, railways, renewable energy, shipbuilding, oil & gas, capital goods and industrial machinery, while strengthening self-reliance, supply-chain resilience, domestic value addition and global competitiveness.

7.2 Specialty Steel

7.2.2 Developing indigenous capability in specialty steel is essential for technological self-reliance and global competitiveness. However, the sector faces several challenges in scaling up domestic production.

7.2.3 Indian producers face 5–10% higher production costs due to limited access to advanced technology and finance, logistics inefficiencies and high power costs. Production of several high-end grades also depends on imported process equipment, advanced manufacturing technologies and foreign technical expertise, constraining the development of indigenous capabilities.

7.2.4 Imports are concentrated in high-end and strategic applications in sectors such as automotive, defence, space and power, with some grades unavailable domestically due to technical or capacity constraints. Addressing these gaps presents an opportunity to reduce import dependence and expand India's specialty steel portfolio.

7.2.5 Domestic demand for specialty steel is fragmented across multiple end-use sectors, limiting economies of scale and investment confidence. Long product qualification and approval cycles with Original Equipment Manufacturers (OEMs), along with limited domestic testing and certification infrastructure, further delay the commercialisation of indigenous products.

7.3 Stainless Steel

7.3.1 Stainless steel is used across a wide range of downstream industries, including kitchenware/utensils, process industries, tubes and pipes, architectural and structural applications, transportation, automotive components and industrial machinery. Its aesthetics, durability and corrosion resistance make it particularly suitable for infrastructure and applications in coastal regions.

7.3.2 India's stainless-steel industry has an installed capacity of around 7.7 MT, comprising about 6.1 MT of flat products and 1.7 MT of long products. Nearly 60% of the flat product capacity is contributed by MSMEs, making the sector an important source of employment and value addition.

7.3.3 Per capita stainless-steel consumption in India is around 3.4 kg, compared with the world average of over 6 kg, indicating significant potential for growth in domestic consumption.

7.3.4 Stainless-steel production depends on nickel-bearing raw materials and stainless-steel scrap. High import dependence for these inputs exposes the

sector to supply-chain disruptions and raw-material price volatility.

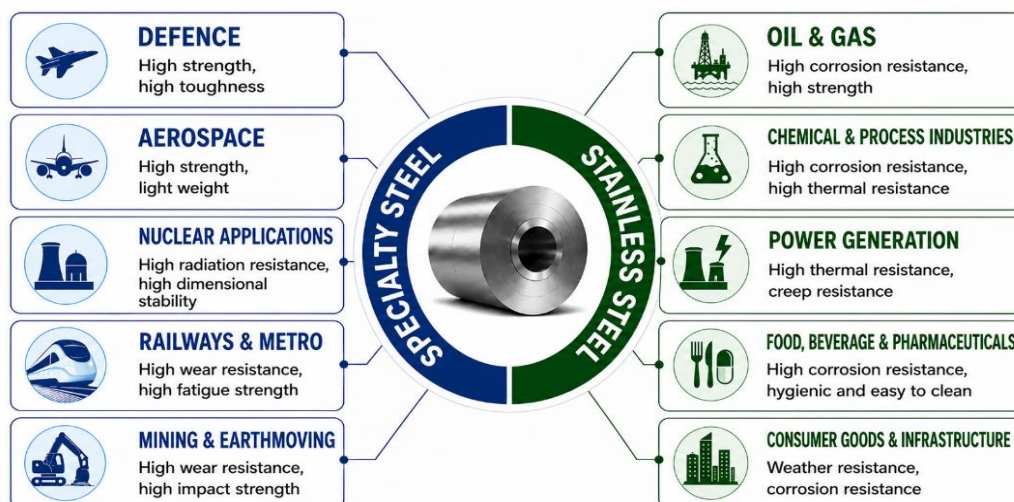


FIGURE 7.1 VALUE ADDED STEEL (SPECIALTY STEEL AND STAINLESS STEEL)

7.4 Policy Interventions:

The Ministry of Steel will support the growth of the value-added steel segment through the following policy interventions:

- 7.4.2** Aggregate specialty steel demand across end-use sectors to reduce demand uncertainty and facilitate investment and capacity creation.
- 7.4.3** Remove entry barriers and promote indigenous design and manufacture of equipment, automation systems and process technologies for high-value steel production.
- 7.4.4** Discourage cheaper and sub-standard imports while promoting domestic production of quality-compliant value-added steel.
- 7.4.5** Support capacity expansion and technology upgradation, particularly for MSMEs and small producers, including common processing and testing facilities and digital manufacturing.
- 7.4.6** Promote exports of value-added steel across grades and end-use sectors.
- 7.4.7** Establish Centres of Excellence in collaboration with academia, research institutions and industry for research, technology development and indigenous capability building.
- 7.4.8** Strengthen domestic testing, certification and product qualification infrastructure to accelerate commercialisation of indigenous high-value steel.
- 7.4.9** Facilitate G2G and B2B partnerships, overseas asset acquisition and long-term commercial arrangements to secure nickel, ferronickel, stainless-steel slabs and stainless-steel scrap.
- 7.4.10** Develop an integrated stainless-steel scrap ecosystem covering collection, segregation, processing, certification, traceability and organised recycling, including identification of scrap-generating clusters and establishment of processing units.
- 7.4.11** Promote domestic use of stainless steel through awareness of life-cycle costing and its long-term benefits, particularly in suitable infrastructure and other applications.
- 7.4.12** Promote downstream manufacturing clusters for products using stainless steel as a key input.

Chapter 8: Innovation

8.1 Introduction: NSP aims to promote innovation across the steel value chain, focusing on solutions that address industry constraints, strengthen domestic technological capability, accelerate digitalisation, improve resource efficiency, and demonstrate potential for commercialisation and wider adoption.

INNOVATION ECOSYSTEM: FROM IDEA TO INDUSTRIAL ADOPTION

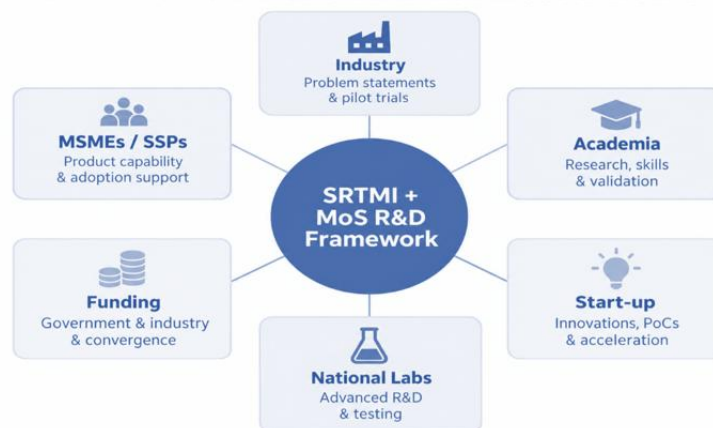


FIGURE 8.1 INNOVATION ECOSYSTEM

8.2 Innovation Priorities Across the Steel Value Chain: The focus will be on innovation that improves resource utilisation, value addition, import reduction, strategic capabilities, competitiveness and low-carbon steelmaking. Innovation requirements will broadly cover two interlinked areas:

- 8.2.1** Product and Technology Innovation: Development of advanced, specialty and strategic steel products with higher value addition and greater domestic capability. Such innovation will support import substitution, strategic self-reliance and export competitiveness.
- 8.2.2** Process, Resource and Sustainability Innovation: Development and adoption of technologies for resource efficiency, circularity and decarbonisation across steel production, including greater use of scrap; recovery of iron and other valuable materials from residues; utilisation of slag, mill scale and other by-products; refractory recovery; energy efficiency; and low-carbon and alternative reduction technologies.

In order to realise these priorities NSP-2047 proposes interventions relating to research and development, digital transformation, technology demonstration, commercialisation and scale-up.

8.3 Innovation through Digital Transformation:

- 8.3.1** Rapid advances in AI, ML, IIoT, Digital Twins, robotics and automation are transforming steelmaking. NSP 2047 aims to accelerate digitalisation by addressing old systems, fragmented platforms and dispersed operational data.
- 8.3.2** Secondary Steel Producers (SSPs) face greater challenges due to limited digital infrastructure, awareness, skilled manpower and financial resources,

resulting in fragmented adoption of digital technologies and limited use of integrated planning, predictive maintenance and digital quality systems.

8.3.3 The NSP 2047 aims for short terms and long term set goals. In first phase it will focus to develop digital infrastructure, common standards, interoperable data platforms, and integrated digital systems, with special support for Secondary Steel Producers through shared infrastructure, capacity building, and technology assistance.

8.3.4 Building on this foundation, the next phase will focus on Industry 5.0, including trusted AI, autonomous operations, human-centric manufacturing and intelligent decision-support systems, enabling self-optimising and adaptive production through continuous innovation and indigenous technology development.

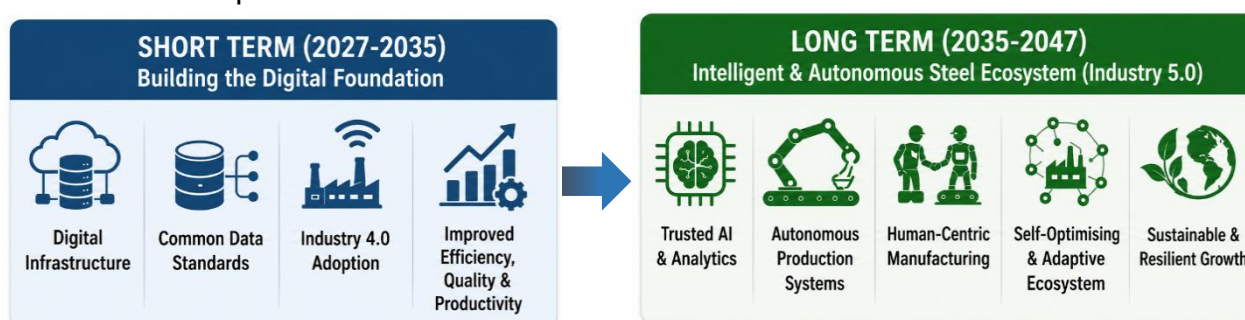


FIGURE 8.2 TRANSITION PHASES TOWARDS INDUSTRY 5.0

8.4 Innovation through Research and Development

8.4.1 NSP envisages R&D through focused measures to attract industry, academia and start-ups, link research with plants for trials and adoption, and build capabilities. Targeted initiatives are:

- Encourage research outputs that are linked to industrial needs.
- Promote targeted R&D, pilot demonstrations and technology validation for emerging low-carbon pathways.
- Work with DST to leverage funds available under Anusandhan National Research Foundation (ANRF) and Research Development and Innovation Fund (RDIF) etc. to commission R&D projects relevant for the steel sector.
- Use awards, formal recognition and official repositories/compendiums to broaden participation by researchers and start-ups.

8.4.2 Institutional Framework

Ministry of Steel's "Promotion of Research & Development in Iron and Steel Sector" scheme and Steel Research and Technology Mission of India (SRTMI) will play key roles to promote R&D in the sector. These institutions will work as a driver for development of indigenous steel making technologies.

- Under SRTMI, innovators, academic institutions, research institutions will be encouraged to bring up breakthrough ideas which can have a long-term impact.
- A Steel Digital Centre of Innovation (SDCoI) will be established within the Steel Research and Technology Mission of India (SRTMI) which will aim to:

- a. Develop the National Steel Data Platform comprising standardised repositories for production, quality, energy, emissions, logistics and raw material data;
- b. Establish interoperability standards, common data governance principles and secure data-sharing frameworks;
- c. Undertake Digital Maturity Assessments and sector-wide benchmarking;
- d. Maintain a national repository of validated AI, Industry 4.0 and digital manufacturing use cases;
- e. Facilitate technology transfer, pilot demonstrations and dissemination of best practices;
- f. Support collaborative R&D in digital manufacturing technologies;
- g. Develop sector-specific industrial cybersecurity standards and incident response mechanisms.

8.5 Commercializing different aspects of Innovation:

NSP–Vision 2047 will focus on industry-led, outcome-oriented innovation, with active participation from academia, R&D institutions and Government. Support will address the gap between research and commercial deployment through the technology pathway.

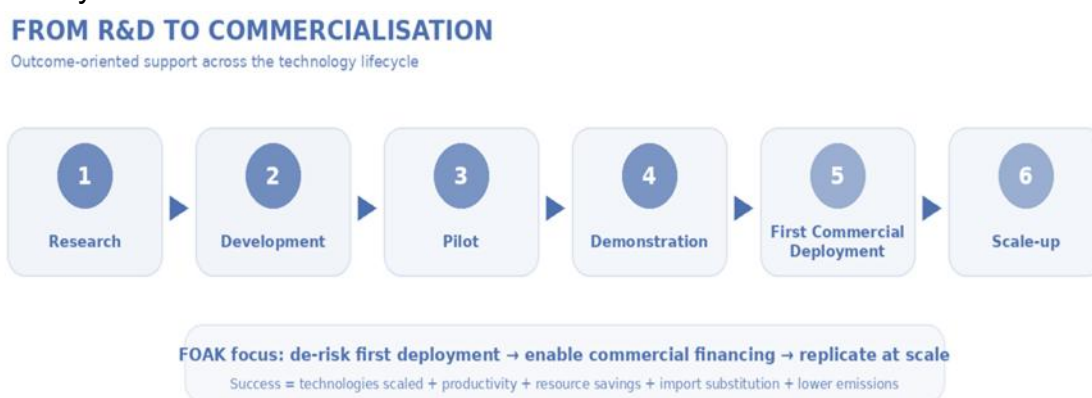


FIGURE 8.3 TRANSITION FROM R&D TO COMMERCIALISATION

Support will be aligned with technology maturity and strategic importance, particularly for First-of-a-Kind (FOAK) projects, to reduce initial technology and commercial risks and enable subsequent scale-up.

8.6 Outcomes and Performance Indicators

Technologies Commercialised & scaled Strategic capability Import substitution Digitalisation Wider adoption	Productivity Operational efficiency Value addition Advanced steel products Competitiveness Global position	Resources Energy & material savings Climate Emissions reduction Skills Innovation-ready workforce
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Chapter 9: Safety

- 9.1** The iron and steel industry combines complex processes with large-scale operations that are inherently hazardous, exposing its workforce to significant occupational hazards. In iron & steel making value chain, various hazards like exposure to toxic gases, high temperature, work at height, heavy machinery, work in confined spaces, materials falling from height, and electrical hazard.
- 9.2** Presently, industry engages contractual workforce for their operation which is leading to higher safety risks owing to insufficient training, limited skills, and poor awareness of site-specific hazards. Strengthening safety standards, building technical capacity, and embedding preventive practices are therefore essential to close these gaps.
- 9.3** The Ministry of Steel issued 25 Safety Guidelines in 2020 and 16 process-based guidelines in 2024, covering both workplace and process safety. The industry complies to regulations and adopts various measures to reduce the occurrence of incident. Despite these efforts, incidents continue to occur due to gaps in implementation and monitoring of safety protocols at various level. This underscores the need for concerted action by all stakeholders to ensure a safe working environment and to prevent and, ultimately, eliminate accidents.



FIGURE 9.1 FOCUS AREAS OF SAFETY MANAGEMENT ACROSS STEEL SECTOR

- 9.4** The major objectives for strengthening safety in Indian steel sector are outlined below:
- 9.4.1** Zero tolerance for safety violations and reduction in Lost Time Injury (LTI) and Total Recordable Injury Frequency Rate (TRIFR).
- 9.4.2** Integrate proactive risk management, advanced safety technologies, and continuous workforce engagement.

- 9.4.3** Encourage use of digital safety systems including electronic Permit-to-Work (e-PTW), gas detection, wearables, and real-time alerts with feedback and learning loops.
- 9.4.4** Align with global benchmarks through conformance to recognized practices and independent checks.
- 9.5** The Ministry of Steel will support safety through focused measures to strengthen governance, reporting, and capability. Key initiatives are:
- 9.5.1** Creation of Steel Industry Safety Council (SISC) as the apex institutional body to promote safety, occupational health, process safety, disaster management, and implementation of uniform safety standards across the steel sector through a collaborative framework involving Government agencies, industry, and technical institutions.
- 9.5.2** The Steel Industry Safety Council shall be supported by a dedicated Steel Industry Safety Directorate (SISD) comprising domain experts from the steel industry to provide technical support in safety audits, process safety, industrial hygiene, accident investigation, capacity building, and implementation of best safety practices across the steel value chain. The SISD shall have jurisdiction over all iron and steel producers in the country, as well as mines of Central Public Sector Enterprises (CPSEs) under the administrative control of the Ministry of Steel. The functions and responsibilities of the Directorate are as follows:
- i. Oversee implementation of all decisions of the Council
 - ii. Keep abreast of international developments and develop standards suitable for Indian conditions
 - iii. Carry out periodic safety audits and reviews
 - iv. Collect and disseminate accident and near-miss information
 - v. Review disaster management and emergency preparedness
 - vi. Develop standards for safe construction, commissioning, operation and maintenance
 - vii. Promote digital safety systems, AI and predictive maintenance
 - viii. Issue Steel Industry Safety Standards, Recommended Practices and Guidelines
 - ix. Link safety performance with Memorandum of Understanding (MoU) scorecards for PSUs

Chapter 10: International Cooperation

10.1 The Indian steel industry faces several structural challenges, including raw material shortages, dependence on foreign technologies, inadequate investments in modernization, and limited access to global export markets. Addressing these challenges is essential to reach 604 MT of crude steel capacity by 2047. Strengthening international cooperation will play a key role in ensuring raw material security, facilitating technology transfer, attracting investments, and expanding global market access. This will help build a stronger and more resilient steel value chain while enhancing the competitiveness and sustainable growth of India's steel industry.



FIGURE 10.1 FOUR PILLARS OF INTERNATIONAL COOPERATION

10.2 Raw material security is critical, as India depends heavily on imports for coking coal, limestone, dolomite, nickel, manganese, and magnesite. Although India's total iron ore reserves are adequate, the share of high-grade iron ore has dropped from 70% in FY19 to 46% in FY22, with medium-grade iron ore now dominating reserves. A well-diversified import strategy and consistent consolidation in domestic production is therefore of utmost significance. At present, India imports 90% of its coking coal, 97% of SMS-grade limestone and nearly all its steel-grade dolomite and nickel. Manganese and magnesite imports are also highly concentrated, with few countries dominating global supply, underscoring the need to broaden the sourcing base. Strategic partnerships with resource-rich countries offering reliable long-term supplies, political stability, strong trade relations, efficient logistics, competitive pricing, and ease-of-doing business will be critical to diversifying the sourcing of key raw materials, reducing import concentration risks, and ensuring long-term raw material security for India's steel sector.

10.3 Technological collaboration is critical to bridging the technology gap in India's steel sector. Indian steel producers remain dependent on imported technologies and

capital goods, while global peers are advancing in sustainable steel production, development of breakthrough technologies and adoption of digital technologies. Heavy equipment manufacturing centres will be identified to promote domestic manufacturing, accelerate indigenization of critical heavy equipment, and reduce import dependence. These centres will also be developed with an export-oriented focus to cater to the growing mining equipment demand in African and South Asian markets. Further possibility of G2G engagements to get market for heavy equipment exports will be explored. Collaboration on these emerging areas and developing indigenous technologies is critical for India to stay competitive. Targeted partnerships with technologically advanced countries will be critical to accelerating the adoption of advanced steelmaking technologies, fostering indigenous innovation, and enhancing the global competitiveness of India's steel industry.

- 10.4** Strategic investments are vital for enhancing India's steel sector competitiveness — this includes outbound investments in foreign mining assets to secure raw material supply, and inbound investments through partnerships with global technology leaders to reduce import dependence on high-tech equipment and strengthen domestic manufacturing.
- 10.5** The steel exports have witnessed a significant decline from 10.78 MT in FY'21 to 6.60 MT in FY'26. Strengthening global presence in steel exports will demand international trade collaborations, improved production efficiency, and supportive export policies to restore India's competitiveness in global steel trade. Exploring strategic trade partnerships with high-potential export markets will be critical to securing enhanced market access, expanding exports of value-added steel products, and restoring India's global competitiveness
- 10.6** Collaborative initiatives are already being undertaken by leading Indian integrated steel players through joint ventures, technology licensing agreements and overseas raw material asset acquisitions. However, these efforts remain fragmented and concentrated among large players, while the broader industry has limited access to structured global partnerships.
- 10.7** NSP Vision 2047 envisions the creation of a structured framework for international collaboration which will facilitate G2G and B2B partnerships, support outbound and inbound investments and strengthen India's integration with global value chains.
- 10.8** Countries have already been identified for collaboration, categorized by opportunity levels, with targeted initiatives planned across multiple opportunities. Institutional mechanisms in the form of MoUs/MoC are already in place with Russia, Japan, Republic of Korea, Brazil and Indonesia. The NSP also aims to continuously assess countries with emerging potential in the steel value chain to facilitate timely and strategic international engagement. Collaboration will be explored across different partnership mechanisms including but not limited to long-term offtake agreements, acquisition of mining assets, value addition in the source countries including beneficiation plants and strategic joint ventures.

Chapter 11: Capacity Building

- 11.1** The Indian Steel sector currently provides direct employment to around 6 lakh persons and supports nearly 20 lakh indirect jobs across mining, logistics, fabrication and allied industries.
- 11.2** In line with the national vision, the sector will require a highly skilled, future-ready, and globally competitive workforce capable of supporting technological innovation, digital transformation, advanced manufacturing, and sustainable steel production. Accordingly, the strategic interventions required are outlined below.



FIGURE 11.1 MSDE SCHEMES AND SIDH AS THE CONNECTING PLATFORM

- 11.3** The industry needs to address following skilling requirements:
- 11.3.1** The existing workforce has substantial experience in conventional steelmaking processes, with opportunities to further strengthen competencies in advanced manufacturing systems such as industrial automation, SCADA, IoT-enabled predictive maintenance, robotics, digital process control and AI-assisted operations.
- 11.3.2** Existing curricula in ITIs, polytechnics and other technical institutions need to be better aligned with evolving industry requirements. In addition, many institutions continue to rely on conventional training methodologies and lack modern equipment for hands-on learning.
- 11.3.3** Rapid technological advancements, including Industry 4.0, AI, automation, digital manufacturing and green steel technologies, call for continuous updating of curricula, training infrastructure and workforce capabilities to keep pace with emerging industry requirements.
- 11.3.4** Structured skilling initiatives can be further expanded across the secondary steel sector, including MSMEs, with greater opportunities for formal training, Recognition of Prior Learning (RPL) and recognised certification for the existing workforce.
- 11.4** The overarching objectives of skill development in NSP – Vision 2047 are to:
- 11.4.1** Position India as a globally recognised centre of excellence for steel-sector skilling and a preferred source of skilled manpower and technical expertise for the global steel industry.

- 11.4.2** Ensure the availability of industry-ready skilled manpower by bridging skill gaps through sector-specific competency frameworks, modern training pathways, and Recognition of Prior Learning (RPL).
- 11.4.3** Promote an inclusive steel skilling ecosystem by expanding access to quality training opportunities, including for women.
- 11.5** The Ministry of Steel shall pursue the following strategic interventions:
- 11.5.1** Establish a Steel Skill Development Working Group (SSDWG) comprising representatives from Government, industry, academia, Sector Skill Councils, research institutions, and CPSEs to guide workforce planning, competency standards, curriculum development, certification, and industry partnerships.
- 11.5.2** Undertaking periodic national skill-gap assessments, forecasting workforce requirements, and regularly updating occupational standards and curricula in collaboration with industry and the Ministry of Skill Development & Entrepreneurship (MSDE).
- 11.5.3** Strengthen institutional capacity by upgrading ITIs, Polytechnics, CPSE training institutes, NISST, BPNSI, and other accredited institutions into Centres of Excellence, while developing cluster-based skilling ecosystems and conducting skill development programmes in steel manufacturing regions, particularly for MSMEs, in collaboration with MSME Technology Centres.
- 11.5.4** Expand industry-integrated skilling through apprenticeships, the Dual System of Training (DST), internships, and Recognition of Prior Learning (RPL) by leveraging Government initiatives such as the National Apprenticeship Promotion Scheme (NAPS), the National Apprenticeship Training Scheme (NATS), PM SETU, and other programmes to create industry-ready manpower.
- 11.5.5** Develop a network of CoEs for steel-sector skilling and strengthen the capacity of trainers through Training of Trainers (ToT) programmes in collaboration with CPSEs, industry, academic institutions. The training programmes shall incorporate industry 4.0 technologies, AI, automation, digital manufacturing and green steel technologies, aligning with national initiatives such as PM SETU and the National Green Hydrogen Mission.
- 11.5.6** Promote partnerships with leading steel companies, technology providers, academia, research institutions and advanced steel-producing countries for faculty development, curriculum benchmarking, joint certification, technology transfer and knowledge exchange in advanced and green steel technologies.
- 11.6** Steel-sector skilling initiatives shall align with Ministry of Skill Development and Entrepreneurship MSDE schemes such as PMKVY, NAPS, NATS and PM SETU. Steel companies shall support training infrastructure, workforce upskilling and reskilling, including through CSR. The Skill India Digital Hub (SIDH) shall be the primary platform for enrolment, training, certification and apprenticeships.

Chapter 12: Future Outlook

- 12.1** The demand projections presented in this Policy are based on the demographic trends, macroeconomic growth, infrastructure development, urbanisation, manufacturing expansion and sector-wise steel consumption. While these provide a robust basis for long-term planning, the steel sector is expected to witness significant technological changes over the next two decades.
- 12.2** The pace of technological innovation has accelerated considerably in recent years. Artificial Intelligence (AI), advanced manufacturing, new materials, robotics, digital engineering, clean energy technologies and circular economy practices are expected to transform industrial production and usage globally. Some of these developments are likely to create significant new demand for steel, while others may improve material efficiency, reduce steel intensity or substitute steel in certain applications. The extent and timing of these changes remain uncertain and will depend upon technological maturity, commercial viability, consumer acceptance, regulatory developments and global market conditions.
- 12.3** Rapid advances in Artificial Intelligence, digital twins, machine learning and advanced engineering design are expected to significantly improve the efficiency with which steel is designed, manufactured and utilised across multiple sectors. AI-assisted design and digital simulation can enable engineers to optimise structures, reduce material requirements and achieve equivalent or superior performance with lower steel intensity.
- 12.4** While these technologies may reduce the quantity of steel required for individual components or projects, their broader impact is likely to be more nuanced. By improving design efficiency, reducing development cycles, enhancing manufacturing productivity and enabling faster and more cost-effective construction, these technologies could stimulate the expansion of end-use markets and accelerate the deployment of steel-intensive infrastructure and industrial projects. Consequently, efficiency gains at the individual project level may be offset, and potentially more than offset, by higher overall activity and increased steel consumption. In addition, the growing adoption of advanced engineering is expected to create demand for higher-performance and more specialised steel grades capable of meeting increasingly demanding design, weight, durability and efficiency requirements. AI and advanced digital engineering are therefore expected to reshape the composition and efficiency of steel demand.
- 12.5** Aluminium alloys, carbon-fibre composites, engineered timber, high-performance concrete, polymers and other lightweight and advanced materials are increasingly being adopted in selected applications across automobiles, aerospace, construction and consumer products. Their growing use is likely to result in greater material substitution and, increasingly, the emergence of hybrid material systems in which these materials complement steel. While certain applications may see partial substitution of steel, advances in steel technology – including the development of new grades and tailored performance characteristics – are expected to enable steel to retain and expand its role in emerging applications.

- 12.6** Steel is expected to remain the material of choice across most infrastructure and heavy-engineering applications, underpinned by its superior combination of strength, durability, versatility, recyclability and cost competitiveness. Innovation is expected to accelerate within the steel industry, driving demand for advanced high-strength steels, electrical steels and other high-performance, value-added products. The future steel market is therefore likely to be shaped not only by overall volume growth, but increasingly by a shift towards higher-value, application-specific grades capable of meeting evolving performance, weight, sustainability and efficiency requirements.
- 12.7** The global transition towards clean energy is expected to create substantial new opportunities for the steel sector. Expansion of renewable energy, transmission infrastructure, battery manufacturing, green hydrogen, electric mobility, nuclear energy and carbon capture infrastructure will require significant quantities of high-quality steel. Wind turbines, transmission towers, hydrogen pipelines, electrolyzers, pressure vessels, storage systems, battery manufacturing facilities, semiconductor plants and data centres are expected to emerge as important sources of future steel demand. The growing emphasis on resilient supply chains and strategic manufacturing is also expected to increase domestic demand for specialty steel in defence, aerospace, railways and advanced engineering applications.
- 12.8** Circular economy practices are expected to play an increasingly important role in the steel sector beyond 2035. As infrastructure, buildings, vehicles and industrial equipment constructed during the past three decades reach the end of their useful life, domestic availability of steel scrap is expected to increase significantly. Greater utilisation of ferrous scrap, supported by an efficient recycling ecosystem and improved collection systems, will enhance resource efficiency, reduce dependence on virgin raw materials and contribute to decarbonisation. While this transition may alter the mix of steelmaking routes, it is not expected to diminish the long-term importance of established steel making routes in India's industrial development.
- 12.9** Emerging technologies are also expected to reshape global manufacturing and trade. Additive manufacturing (3D printing), autonomous manufacturing systems, industrial robotics, quantum computing, biotechnology, nanotechnology and advanced materials research have the potential to transform industrial processes over the next two decades. Although the long-term impact of many of these technologies remains uncertain, they are expected to influence manufacturing productivity, product design, resource efficiency and global competitiveness. The Indian steel industry must therefore remain agile and continuously adapt to technological developments through sustained investments in research, innovation and technology adoption.
- 12.10** Considering the long-term nature of this Policy, the Ministry of Steel shall periodically review the demand projections and capacity requirements in light of emerging technological developments, evolving consumption patterns, changing trade dynamics, climate policies and global economic conditions. Such reviews shall be undertaken at appropriate intervals, preferably every five years, to ensure that the Policy remains relevant and responsive to technological and structural changes affecting the steel sector.

Annexure-II-A (Ref: Para 3.3, Page 4 and Page 8)

Outcome Indicators: Indicative Steel Demand, Production and Capacity Requirements up to 2047

(in million tonnes)

Parameter	Present status	Projections				
		2025	2030	2035	2040	2047
1 Crude steel capacity	220	294	411	526	604	
2 Crude steel production	170	250	349	447	531	
3 Finished steel consumption	164	237	332	425	505	
4 Sponge iron/DRI demand	60	83	112	125	143	
5 Per Capita Consumption (in kg per person)	116	158	220	262	302	

(The numbers for 2025 in the above table correspond to 2025-26 and so on.)

Assumptions:

- i. Demand projections are based on sector-wise assessment of steel-consuming industries and validated through macroeconomic indicators.
- ii. GDP growth of approximately **7% per annum** has been assumed over the long term.
- iii. Population projections are based on **UN World Population Prospects (2024 Revision)** and **World Urbanization Prospects (2025 Revision)**. **(For clarity we can mention the projected population figures.)**
- iv. Per capita steel consumption has been derived using projected population.
- v. Crude steel production has been estimated assuming **95% conversion** from crude steel to finished steel.
- vi. Installed crude steel capacity has been estimated assuming **88% average capacity utilisation**.

Outcome Indicators: Indicative Raw material Demand by 2047

(in million tonnes)

Raw Material		Present status	Projections			
		2025	2030	2035	2040	2047
1	Iron ore	299	367	516	590	772
2	Coking Coal	72	99	136	163	236
3	Non-coking Coal for PCI	17	19	28	39	48
4	Non-coking Coal for DRI	68	105	133	150	167
5	Manganese Ore	11	15	22	28	34
6	Limestone & Dolomite	34	54	75	95	128
7	Scrap	36	58	81	103	123

Assumptions:

1. BOF route: 55%; EAF route: 30% and IF route 15%
2. % Scrap in Charge mix of BOF: 10%
3. EAF charge mix considered: 50% DRI, 30% Hot Metal & 20% Scrap
4. IF charge mix considered: 54% DRI, 46% Scrap
5. Coke required in BF: 460 kg / thm
6. Avg. PCI Injection in BF considered: 160 kg / thm
7. Ferrous burden required /t of Hot metal in BF: 1.65 t
8. Ferrous burden required /t of solid charge in DR plant: 1.77 t
9. Specific raw material consumption:

Sr. No.	Raw material	Specific Consumption
1	Iron Ore Consumption (BF) (tonnes/ tonne hot metal production)	1.65
2	Iron Ore Consumption (DRI) (tonnes/ tonne hot metal production)	1.77
3	Coking coal (tonnes/ tonne hot metal production)	0.700
4	Non-coking coal for PCI (tonnes/ tonne hot metal production)	0.160
5	Non-coking coal for DRI (tonnes/ tonne DRI production)	1.200
6	Manganese ore (tonnes/tonnes of crude steel production)	0.06
7	Limestone & Dolomite (tonnes/ tonne hot metal production)	0.400

Glossary

Abbreviation	Description
%	Percent
~	Approximately
AI	Artificial Intelligence
B2B	Business to Business
BEE	Bureau of Energy Efficiency
BF-BOF	Blast Furnace-Basic Oxygen Furnace
BIS	Bureau of Indian Standards
BOF	Basic Oxygen Furnaces
BPNSI	Biju Patnaik National Steel Institute
BT	Billion Tonnes
CAGR	Compound Annual Growth Rate
CBAM	Carbon Border Adjustment Mechanism
CCTS	Carbon Credit Trading Scheme
CCS	Carbon Capture and Storage
CCUS	Carbon Capture, Utilisation and Storage
CPSE	Central Public Sector Enterprises
DRI	Direct Reduced Iron
EAF	Electric Arc Furnaces
ESG	Environmental, Social and Governance
ETS	Emission Trading Scheme
EU	European union
FTA	Free Trade Agreement
FY	Financial Year
GDP	Gross domestic product
G2G	Government to Government
IBRM	Iron Bearing Raw Materials
IoT	Internet of Things
LCC	Life Cycle Cost
MMSCMD	Million Metric Standard Cubic Meters per Day
MoEFCC	Ministry of Environment, Forest, and Climate Change
MoPNG	Ministry of Petroleum & Natural Gas
MoR	Ministry of Railways
MoRTH	Ministry of Road, Transport and Highways
MSME	Micro, Small and Medium Enterprises
MT	Million Tonnes
NIP	National Infrastructure Pipeline
NISST	National Institute of Secondary Steel Technology
NSDC	National Skill Development Corporation
PCI	Pulverized Coal Injection
R&D	Research and development
SIMA	Sponge Iron Manufacturer's Association
SSI	Secondary Steel Industries
TCS	Tonnes of Crude Steel
UAE	United Arab Emirates