Deloitte.

FICCI 100
100 YEARS OF BUILDING TOMORROW

Enhancing Competitiveness of Mining and Metals: Focus Area – Efficient Logistics

July 2026

Table of contents

Acknowledgement

FICCI would like to thank all the stakeholders involved with the report's development. We convey our special thanks to the Chair, Co-Chairs & members of the FICCI Committees on Mining, Steel, Non-Ferrous Metals, Coal and Cement for their leadership, guidance, and valuable inputs in conceptualising this report on Enhancing Competitiveness of Mining & Metals via Efficient Logistics.

The Deloitte team undertook extensive secondary research, analysed global and domestic best practices, and conducted comprehensive stakeholder interactions across the mining, metals, and logistics ecosystem. Their efforts in synthesising research findings with industry perspectives have significantly enriched the report, making it a comprehensive and insightful resource for policymakers, industry leaders, and other stakeholders working towards enhancing logistics efficiency across India's mining and metals value chains – encompassing logistics infrastructure, freight costs & building transport using Indian metals.

The report seeks to present an integrated view of trends, opportunities, challenges, and policy imperatives shaping India's logistics ecosystem for the mining and metals sector, highlighting pathways to strengthen multimodal connectivity, reduce logistics costs, and enhance the global competitiveness of India's mining and metals.

FICCI also expresses its appreciation to various organisations, associations and individual experts in the value chain for sharing their insights and contributing to the report. Their views have contributed immensely to finalising the report.

FICCI expresses its gratitude to everyone whose efforts were essential to the creation of this report.

Foreword by FICCI

India's aspiration to become a developed economy by 2047 will be underpinned by sustained growth in infrastructure, manufacturing, energy, and industrial development. At the core of this transformation lies mining and metals sector, which supplies essential raw materials required to power these growth engines.

As production and consumption of bulk commodities continue to rise, developing an efficient, integrated, and future-ready logistics ecosystem has become a strategic imperative for enhancing industrial competitiveness and reducing overall cost of operations. This is important not only to serve the domestic markets but also to capture the export opportunities.

Government has taken several significant initiatives in this direction through the PM GatiShakti, National Logistics Policy, Dedicated Freight Corridors, Multimodal Connectivity projects, and digital infrastructure planning. These reforms are creating a strong foundation for improving freight movement, strengthening supply chains, and enabling seamless connectivity across mines, industries, ports, and markets.

This report, developed by FICCI jointly with Deloitte, examines how logistics can be strengthened across mining and metals value chains. It takes stock of where India stands today, what needs to be done to cater to the growing requirements, and what global best practices offer by way of direction.

Beyond transportation connectivity and freight costs, the report also highlights the indispensable role of industrial materials such as steel, stainless steel, aluminium and other metals in developing modern logistics infrastructure. Greater adoption of advanced material solutions can improve asset longevity, reduce lifecycle costs, enhance cargo integrity, and contribute to building a sustainable, high-performance logistics ecosystem that supports India's mining, metals, manufacturing and infrastructure sectors.

We hope that you will find the report useful.

Jyoti Vij
Director General
FICCI

Foreword by Deloitte

India’s mining and metals sector stands at an inflection point. The country’s ambition to grow into a US$30–40 trillion economy by 2047 rests on a physical transformation: infrastructure, manufacturing and industrial capacity built at a scale and speed India has not attempted before. Coal, iron ore, cement and the emerging critical minerals segment will underwrite that transformation. However, resource abundance alone will not determine how much of this growth India captures. Increasingly, this will come down to logistics: how efficiently minerals and metals move from the mine to the plant to the port.

This is not a new observation, but it has not always received the level of attention commensurate with its strategic importance. On paper, India’s freight costs already compare favourably with those of Australia, Brazil, China and South Africa. In practice, the system loses value at every handoff. First-mile connectivity remains road-dependent even where trunk rail capacity exists. Ports still take days to turn cargo around, whereas the leading benchmark countries manage it in hours. And a policy landscape rich in ambition remains organised around individual modes of transport rather than around the mineral supply chains it is meant to serve. Coal has shown what focused reform can achieve, cutting evacuation times and easing bottlenecks that once seemed permanent. The task now is to bring that same discipline to iron ore, cement, bauxite and other minerals that will define India’s next industrial cycle.

This report draws on evidence from across the mining, metals, logistics, and infrastructure landscape to argue that logistics efficiency should be treated as a strategic capability rather than an operational afterthought. It examines where India’s logistics ecosystem can be further strengthened against global benchmarks, highlights international practices that may be adapted to the Indian context, and outlines how a more coordinated national approach could help unlock greater system-wide efficiency.

Deloitte is grateful to the stakeholders across government, industry and logistics who lent their perspective to this work. We hope this report provides policymakers, investors and industry leaders a clear, evidence-based agenda for closing the gap between India’s resource potential and its logistics reality and turning it into India’s next source of competitive advantage.

Rajib Maitra
Partner
Deloitte India

1. Executive summary

Somewhere between the mine and the market, India loses the advantage its geology gives it. The country holds the ore, the coal, the limestone, and increasingly the ambition: an economy on course to grow from US$4 trillion to US$30-40 trillion by 2047, with construction, manufacturing and mining already generating more than a quarter of national output. What it does not yet reliably hold is the ability to move what it produces at the speed and cost its rivals manage. That gap, more than any shortage of resources or capital, will decide how much of the coming industrial expansion India actually captures.

It is worth being precise about why this matters now. For bulk commodities, the price that determines whether an Indian steelmaker or cement producer wins or loses an order is rarely set at the mine gate. It is set by everything that happens afterwards. On paper, India's freight economics look competitive: its blended cost of roughly INR3.8 per tonne-kilometre undercuts those of Australia, China, Brazil and South Africa. But cheap transport and efficient transport are not the same thing. The country still depends on road for two-thirds of its bulk freight, its trains run shorter and slower than international peers, and its ports turn cargo around in days where Singapore counts hours. The headline number flatters a system that loses competitiveness at every handoff. As export ambitions in steel and cement sharpen and demand for critical minerals accelerates, this figure will decide competitiveness.

The evidence in this report points to a specific, correctable situation rather than a broad, structural one: India's primary logistics bottleneck sits in the first and last mile. Even though rail carries 42 percent of India's iron ore, inadequate first-mile connectivity forces substantial road movement (28 percent), eroding the cost advantage that greater rail integration could deliver. Cement, more exposed still, carries a logistics bill equal to nearly a third of its production cost, a single number that should reorder how the sector thinks about where its margin actually goes.

None of this reflects a shortage of ambition on the policy side. Initiatives such as PM GatiShakti, the National Logistics Policy, Sagarmala and the Dedicated Freight Corridors (DFCs) underscore the Government's commitment to strengthening mining logistics through integrated, multimodal freight infrastructure. The impact is already evident: although the commissioned DFCs account for just 4.1 percent of the Indian Railways network by route length, they carry 12.1 percent of railway freight - nearly three times their proportional share of the network.

Coal is the exception, and it is instructive. Its dedicated evacuation programme has roughly halved transit times compared with conventional lines, proving that focused, commodity-specific reform works when it is attempted. Iron ore, cement, aluminium and critical minerals now occupy the position coal held a decade ago: mature in demand, still waiting for the same discipline of reform.

The countries that have already solved this problem did not do it with more capital than India can deploy. They did it with fewer handoffs. Australia's Pilbara moves ore from pit to ship almost without friction because one company owns the entire chain. Brazil eliminated its first-mile road dependence through conveyor-fed, truckless mining that cut fuel use by 70 percent. South Africa built its rail network around specific commodities and specific ports rather than shared, general-purpose infrastructure.

What unites these examples is not technology or capital intensity but singleness of purpose across a fragmented set of actors, precisely the condition India has not yet engineered. India faces no meaningful geographic disadvantage against any of these peers, which means its position on global logistics rankings reflects a handoff issue, rather than a distance problem.

Realising these gains requires implementing the recommendations as a coherent reform programme rather than a set of standalone initiatives. In the near term, priorities include opening freight operations to greater competition, modernising the truck fleet, and integrating today's fragmented digital platforms into a unified logistics ecosystem.

In the medium term, it means requiring rail connectivity at the point where a plant is approved, not years afterwards, and scaling low-cost alternatives, such as slurry pipelines, wherever geography allows. In the long term, it means extending dedicated freight corridors into Odisha, Chhattisgarh, Jharkhand, and Karnataka, deepening ports to handle larger vessels, and taking the single highest-leverage move available: establishing a National Metals & Minerals Logistics Mission with the authority to plan across ministries that today do not plan together at all.

India will not run short of ore, coal or limestone in the coming decades. Whether it converts that abundance into industrial leadership, or watches competitors do it faster with less, will be decided in the space between the mine and the port.

2. Overview on Indian mining & metals sector

India's aspiration to become a developed economy under the Viksit Bharat 2047 vision is expected to trigger an unprecedented expansion of its industrial and infrastructure base. With the economy projected to grow from approximately US$4 trillion today to US$30–40 trillion by 2047,[1] sustaining this transformation will require large-scale investments across infrastructure, urban development, manufacturing, energy systems, and digital ecosystems.

India's economic trajectory over the past decade demonstrates the resilience and strength of its growth fundamentals. Despite disruptions such as the COVID-19 pandemic, the economy has sustained robust growth supported by public capital expenditure, increasing formalisation, rapid digital adoption, and strong domestic consumption. As India advances towards its long-term development objectives, the scale of industrial activity is expected to increase significantly, resulting in a corresponding rise in demand for minerals, metals, energy resources, and logistics services.

The next phase of India's growth will be fundamentally different from the previous decade. While the services sector will continue to remain an important contributor to economic growth, a significant share of future economic expansion will be driven by the country's physical economy, comprising manufacturing, construction, infrastructure, energy, and mining. These sectors are inherently material-intensive and depend on the efficient movement of large volumes of raw materials, intermediate products, and finished goods across geographically dispersed supply chains.

This industrial expansion will place substantial demands on the country's logistics ecosystem. The movement of iron ore, coal, limestone, steel, cement, aluminium, copper, and emerging critical minerals will increase considerably as infrastructure and manufacturing capacities expand. Consequently, logistics will no longer be merely an operational function but a strategic enabler that influences industrial competitiveness, investment attractiveness, export performance, and economic growth.

In this context, the efficiency, reliability, and sustainability of logistics infrastructure, including roads, railways, ports, inland waterways, warehousing, and multimodal networks, will play a critical role in determining India's ability to achieve its Viksit Bharat aspirations.

2.1 Industrial foundation of Viksit Bharat 2047

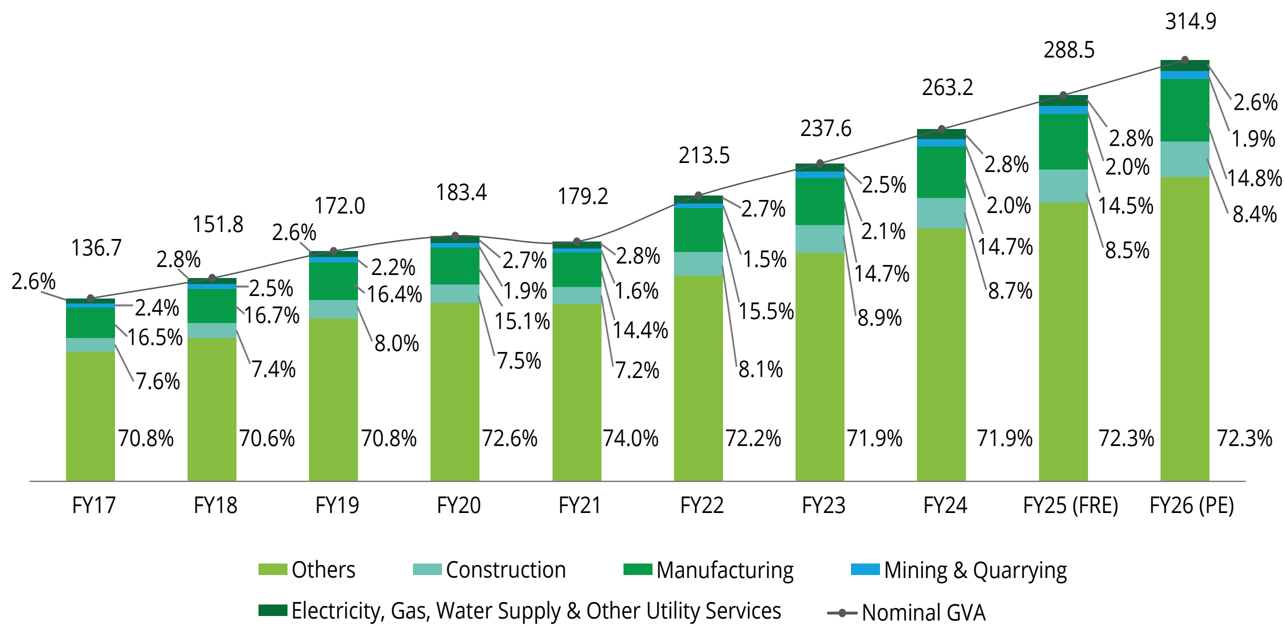
As India advances towards its Viksit Bharat 2047 aspirations, sustaining this growth momentum will require a significant expansion of the country's industrial and infrastructure base. Investments in transportation networks, urban infrastructure, manufacturing capacity, clean energy systems and strategic supply chains are expected to accelerate over the coming decades. This next phase of economic development will be increasingly dependent on the availability of key raw materials and industrial inputs, underscoring the importance of strengthening the foundational sectors.

Mining provides the minerals and metals that serve as essential inputs for manufacturing and infrastructure development, while the growth of construction, industrial production, transportation networks and energy infrastructure generates sustained demand for these resources.

Construction, mining & quarrying, manufacturing, and electricity, gas, water supply & other utilities account for approximately 27–29% of India's GVA, underscoring the direct contribution of the mining and metals value chain to economic activity. Considering extensive upstream and downstream linkages, its overall economic impact is considerably higher than indicated by direct contribution alone.

[1] https://viksitindia.com/

Figure 1: Contribution of the industrial and infrastructure-linked sectors to India's GDP[2]



*Nominal GDP in Rs. Lakh Cr.

2.2 Sectoral overview

The mining sector contributes around 2 percent of India's nominal GDP. In FY26, the mining sector (excluding coal, lignite and petroleum) accounted for INR1.71 lakh crore in mineral production, extracted from 1,206 operational mines, and supported the employment of nearly 1.25 crore people.[3]

Table 1: Indicative value of minerals produced in India[4]

Category	Indicative Value (INR crore)	Strategic Importance
Coal & Lignite	INR1.73 lakh crore[5] (FY25)	Energy security, power generation
Metallic Minerals	INR1.57 lakh crore (FY26)[6]	Steel, aluminium, manufacturing
Non-Metallic Minerals	INR14,045 crore (FY26)[7]	Cement, construction, chemicals
Critical & Strategic Minerals	Emerging segment	EVs, batteries, renewables, electronics

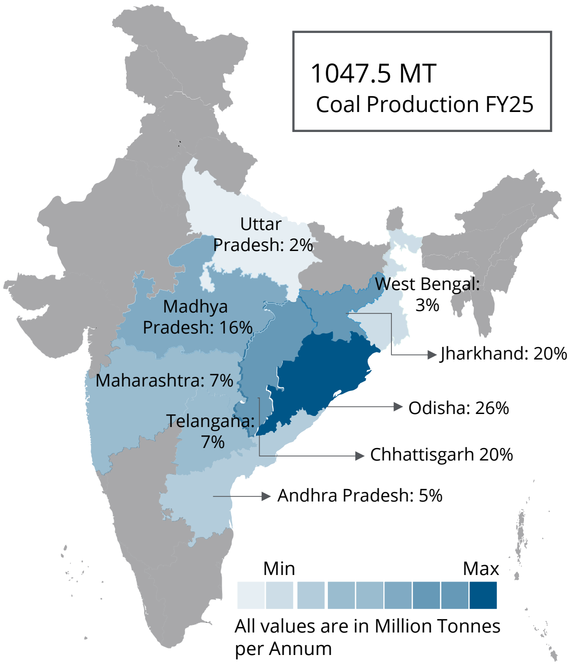
Among the broad spectrum of minerals produced in the country, coal, iron ore, and limestone are particularly significant, as they support India's power, steel, and cement industries. Together, these minerals account for a substantial share of the country's mineral production, industrial activity, and freight movement, making them indispensable to India's industrialisation.

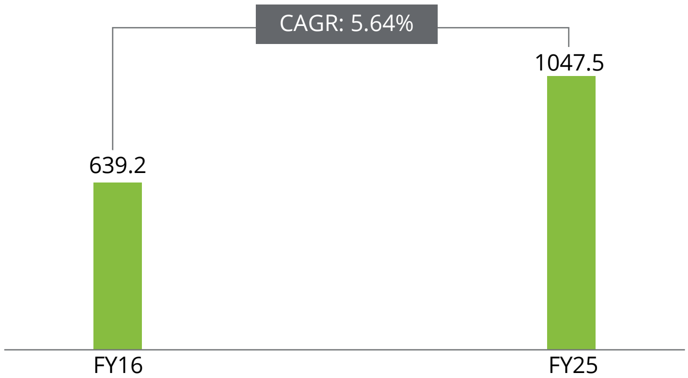
Coal and lignite mining

The growth of India's energy and industrial ecosystem is heavily dependent on coal and lignite for energy security. Despite the rapid growth of renewable energy, coal and lignite remain the single most important mineral commodities supporting India's growth and development. Coal contributes ~55 percent of India's primary energy requirements and fuels more than 74 percent of its electricity generation.[8]

[2] MoSPI
[3] https://mines.gov.in/admin/storage/ckeditor/2_1738040236.pdf?
[4] Ministry of Mines Annual report 2025-26, IBM Monthly Statistics March 2025
[5] Coal Controller (FY25)
[6] Ministry of Mines Annual Report
[7] Ministry of Mines Annual Report
[8] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2118788&lang=2&reg=3

Figure 2: State-wise and growth rate of coal production[9]





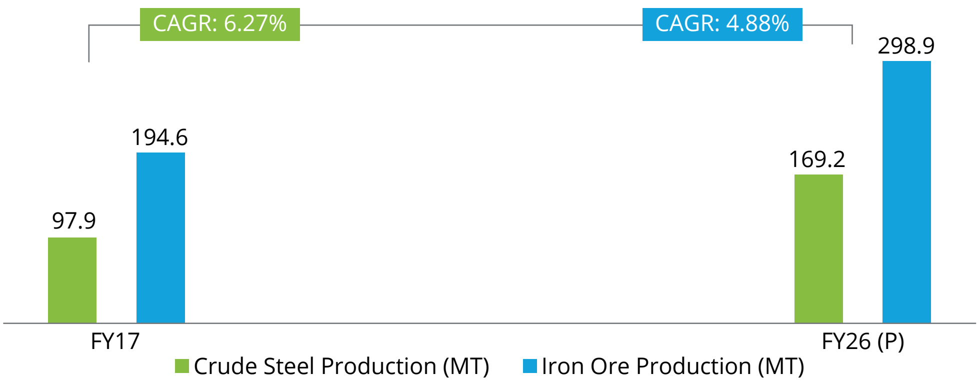
India is the second-largest producer and consumer of coal in the world. Coal production in India is concentrated in a few key states, such as Odisha, Jharkhand and Chhattisgarh, together contributing ~66 percent of total coal production in FY25. Lignite production is primarily concentrated in Gujarat, Tamil Nadu and Rajasthan, with total output reaching 45.13 million tonnes in FY25.

The power sector has a high multiplier effect because every unit of electricity generated enables economic activity in downstream sectors such as manufacturing, mining and metals, cement, construction, railways and metro systems, data centres and digital infrastructure, residential housing, commercial real estate and so on. As of FY25, India's per capita electricity consumption stood at ~28,300 MJ per person and continues to grow at an annual rate of around 2 percent.[10]

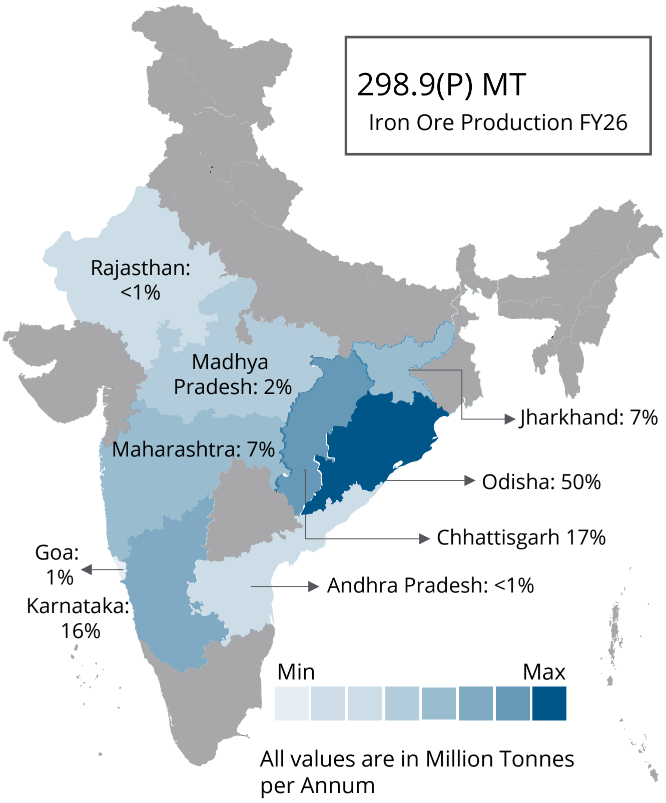
Iron ore and allied steel industry

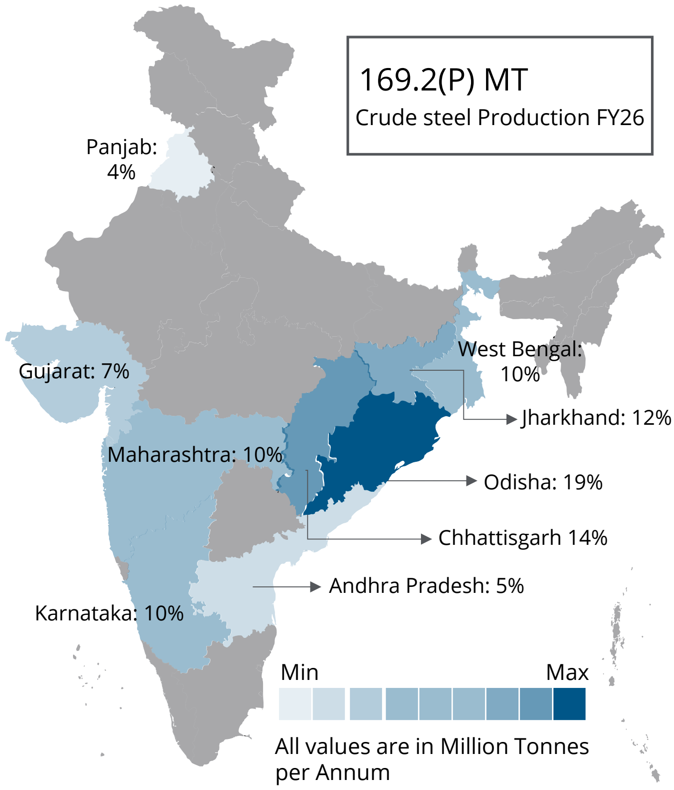
Iron ore mining is emerging as the most critical enabler of Viksit Bharat and industrial transformation. As the primary raw material for steel production, iron ore underpins infrastructure development, manufacturing expansion, urbanisation, transportation and the capital goods industry.

Figure 3: Growth rate of iron ore and steel production, state-wise iron ore production in FY26 and state-wise crude steel production in FY26[11]



[9] Ministry of Coal
[10] https://www.ibef.org/download/1780042362_Power-PPT-February-2026.pdf
[11] IBM monthly statistics Feb'26 and JPC





The iron and steel industry contributes around 2 percent to the national GDP and employs over 6 lakh direct jobs and 20 lakh indirect jobs.[12] The employment multiplier of steel is 6.8x, and the output multiplier is 1.4x. The sector is directly related to national development and initiatives such as the 'Make in India' campaign and is employed in housing, automobiles, power generation, petrochemicals and fertilisers.

India emerged as the world's second-largest crude steel producer, with per capita steel consumption increasing from 73.3 Kgs per person in FY17 to 115 Kgs per person in FY26, still, it is below the global average of 209[13] kgs, which shows the potential for the growth of the Indian steel industry.

Bauxite and allied aluminium industry

India is the 6th largest bauxite producer globally and is ~90% self-reliant in meeting its bauxite demand. Bauxite production reached 25.78 MT in FY26 (P), led by Odisha (75.13%), Gujarat (8.35%), and Jharkhand (7.94%).

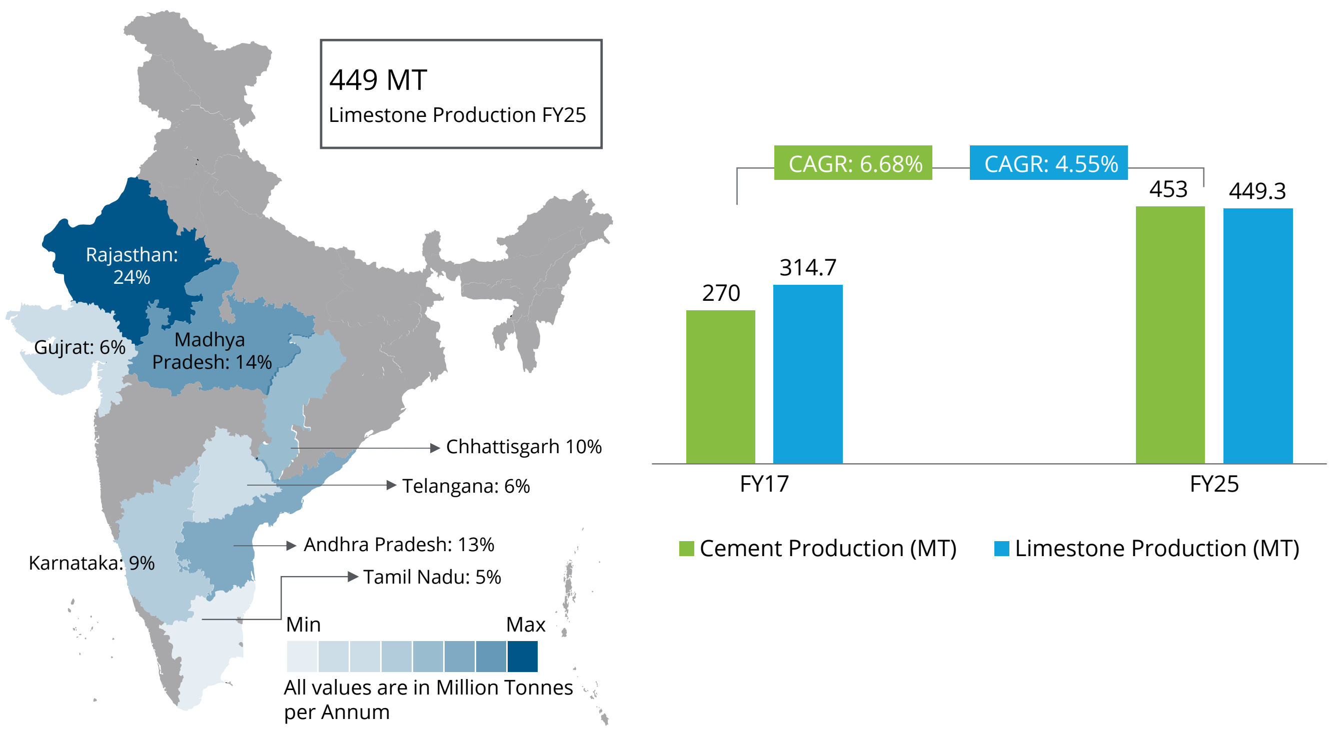
India is the 2nd largest producer of aluminium and produced nearly 4.1 million tonnes in FY26,[14] supported by abundant bauxite reserves, integrated producers, and expanding downstream manufacturing. India has an installed primary aluminium capacity of around 4 MTPA and is nearly 84%[15] self-reliant in meeting its present demand. The per capita consumption of aluminium in India is about 3.1 kg, compared to the world average of about 12 kg and China's 31.7 kg.[16] The domestic demand is being strongly driven by increasing urbanization and push for boosting domestic infrastructure, automotive, aviation, defence, and power sectors.

Limestone and cement industry

India possesses 19.0 billion tonnes of reserves and 208.6 billion tonnes of resources. Roughly 95–97 percent of India's limestone production is consumed by the cement industry.[17]

[12] https://www.ibef.org/blogs/how-government-policies-shape-the-steel-industry-in-india
[13] World steel association
[14] BigMint
[15] https://mines.gov.in/admin/download/69945dabea1821771330987.pdf
[16] https://www.ibef.org/download/1779171822_Metals-and-Mining-February-2026.pdf
[17] IBM Mineral yearbook 2022

Figure 4: State-wise production of limestone in FY25 and growth rate of limestone and cement production[18]



The Indian cement industry is a strategic enabler of economic growth in infrastructure, building & construction and industrial development, supported by strong limestone mining activity. The cement industry contributes ~11 percent of the input cost to the construction sector[19] and contributes nearly 1.2–1.3 percent of the national GDP.[20] The sector provides direct jobs to more than 1 million people. It creates additional indirect jobs across the country, as well as nearly 20,000 downstream jobs for every 1 million tonnes of cement produced.[21] The Indian cement industry has a GDP multiplier of 1.53x and an economic output multiplier of 4.14x.[22]

India's cement industry has an installed capacity of 720 MTPA. Despite being the world's second-largest cement producer, India's per capita cement consumption stands at around 290 kg, significantly below the global average of ~540 kg.[23] This substantial consumption gap highlights the significant headroom for growth in the country's infrastructure, housing and construction sectors.

Critical and strategic minerals: Emerging segment

India's critical minerals sector entered a transformative phase, driven by the rapid expansion of electric vehicles, renewable energy, battery manufacturing, semiconductors, electronics and defence industries. In FY25, India produced 63,380 tonnes of graphite and 1.67 million tonnes of phosphorite.[24] In CY25, production of Rare Earth Elements (REEs) and titanium-bearing minerals stood at ~1,700 tonnes and 300 tonnes, respectively.[25] However, the country remains heavily dependent on imports of lithium, cobalt, nickel and several processed rare-earth materials. While India's critical and strategic minerals sector is still nascent, it is expected to emerge as one of the most significant segments of the mining industry over the coming decades.

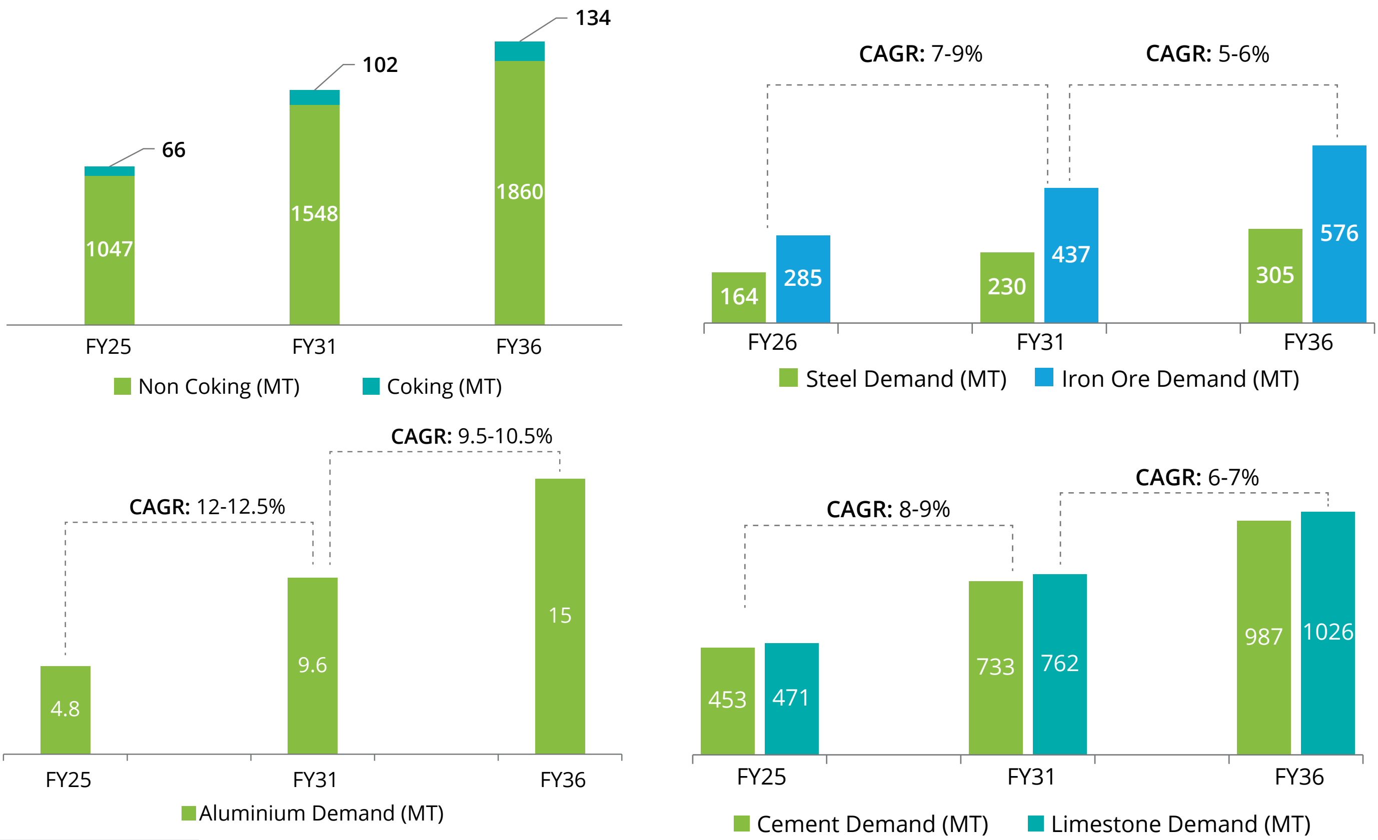
[18] IBM monthly statistics and IBEF cement manufacturing report Feb'2026
[19] https://www.wrightresearch.in/encyclopedia/chapter-report/chapter-1-overview-of-the-indian-cement-industry/
[20] https://www.reogma.com/industry-reports/cement-industry-profile-in-india/
[21] https://www.wrightresearch.in/encyclopedia/chapter-report/chapter-1-overview-of-the-indian-cement-industry/
[22] https://www.emis.com/php/store/reports/IN/India_Cement_Sector_Report_2025-2026_en_878641349.html
[23] Economic Survey 2025-26
[24] IBM Monthly Statistics March 2025
[25] USGS Mineral Commodity Summary 2026

2.3 Growth outlook of the mining and metals sector

The steel, cement, power and associated mineral sectors are expected to witness sustained growth over the coming decades, reflecting India's expanding industrial base and infrastructure development.

Volume of bulk commodities requiring logistics will continue to rise significantly, placing increasing pressure on India's freight network. This highlights the need to develop future-ready, multimodal logistics infrastructure with greater rail, coastal shipping and inland waterway capacity, improved first- and last-mile connectivity, and modern bulk-handling systems to efficiently support the long-term growth of the mining and metals sector.

Figure 5: Demand projections of coal, iron & steel, aluminium & bauxite, limestone and cement[26]



[26] Deloitte Analysis

Demand drivers for the mining and metals sector

The growth of coal, iron & steel, cement, and critical minerals is not driven solely by mining. Their demand is fundamentally linked to the expansion of downstream sectors, including infrastructure, manufacturing, urbanisation, energy transition, transportation, defence, and housing. India's ambition to become a developed economy by 2047, increase manufacturing's share in GDP to 25 percent, achieve net-zero by 2070, and build world-class infrastructure will significantly accelerate demand across these value chains, which will drive the major demand.

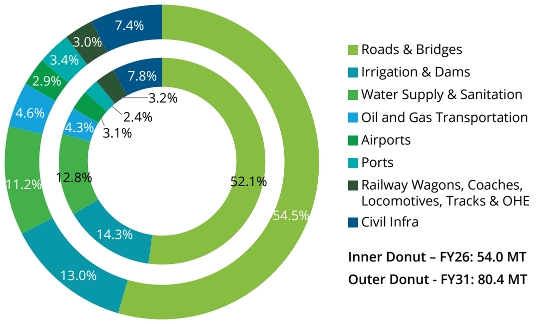
A. Infrastructure development

Infrastructure remains a major driver of demand for steel, cement and other industrial metals in India, accounting for ~33.5 percent of total steel demand in FY26 and is expected to grow up to 35 percent by FY31. 29 percent[27] of total cement demand is consumed by the infrastructure sector and is expected to remain the same by FY31. The infrastructure sector also drives a significant consumption of aluminium, copper, zinc and other allied materials. The Indian government has placed infrastructure at the core of its economic growth strategy through various initiatives, transforming the country's transport and logistics ecosystem.

Indian Railways is undergoing a massive modernisation program encompassing Dedicated Freight Corridors, Vande Bharat trains, station redevelopment, track expansion and metro rail systems. PM GatiShakti has already facilitated the planning of over 27,000 km of railway lines, supporting freight movement and industrial connectivity.[28]

India is undertaking one of the world's largest highway expansion programs through Bharatmala Pariyojana, Greenfield Expressways and PM GatiShakti. Bharatmala Phase-I targets the development of ~34,800 km of national highways and economic corridors, while new expressways are being developed to improve logistics efficiency. India's National Highways network expanded to 10,600 km in FY25.[29]

Figure 6: Steel demand in the infrastructure sector[30]

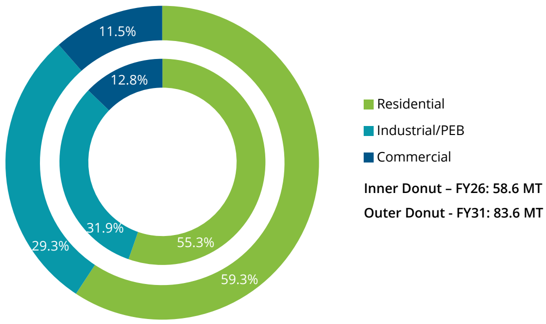


The primary forms of steel consumed in the sector include TMT rebars, structural steel and Hot-Rolled (HR) coils.

B. Building and Construction (B&C)

The building and construction sector accounts for the largest share of cement consumption in India and is one of the leading consumers of steel. Rapid urbanisation, rising incomes and housing demand are expected to sustain robust growth over the next two decades.

Figure 7: Steel demand in B&C Sector[25]



The B&C sector accounts for 58.6 million tonnes, representing 35.7 percent of total steel consumption, primarily in the form of TMT bars and rebars, HR coils, and coated and galvanised steel (GP/GC). Steel demand from the sector is projected to increase to 83.6 million tonnes by FY31, raising its share to 36.4 percent of the country's total steel demand.

---

[27] IBEF Cement Manufacturing Report Feb'26

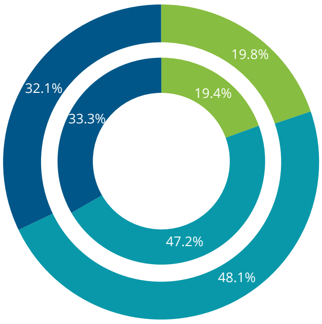
[28] https://www.pib.gov.in/PressNoteDetails.aspx?ModuleId=3&NoteId=153274&lang=1&reg=3

[29] https://www.business-standard.com/content/press-releases-ani/india-builds-10-660-km-of-highways-in-fy25-eyes-rs-3-trillion-push-road-minister-ajay-tamta-to-boost-road-reforms-at-rahsta-expo-2025-125081400017_1.html?

[30] Deloitte Analysis

[31] Deloitte Analysis

Figure 8: Cement demand in the B&C sector[25]



The Building & Construction sector accounts for 72 percent of total cement consumption, equivalent to ~326.2 million tonnes in FY25, driven by demand from rural and urban housing, as well as industrial and commercial construction. Cement demand from the sector is projected to increase to 545.6 million tonnes by FY31, while maintaining a share of overall cement consumption similar to that across these segments.

The B&C sector accounts for 11.4 percent of total aluminium consumption, mainly in the form of extrusions and FRPs, equivalent to nearly 0.64 million tonnes in FY26. Aluminium demand from the sector is projected to increase to 0.83 million tonnes by FY31.[31]

Residential housing

Housing demand is being supported by urban migration, demographic growth and government initiatives such as PM Awas Yojana. Affordable housing, middle-income housing and premium residential developments require significant volumes of cement, reinforcement steel, pipes, aluminium and electrical materials. India's urban housing deficit and continued urban expansion suggest that residential construction will remain a major consumer of minerals and construction materials.

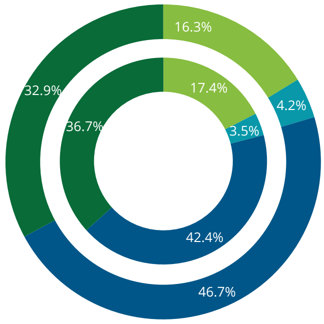
Commercial real estate

The growth of Global Capability Centres (GCCs), IT parks, commercial offices, retail developments and hospitality infrastructure is creating substantial demand for steel-intensive and cement-intensive construction. India's emergence as a global services and technology hub is expected to support continued investment in commercial real estate.

C. Automobile and allied sector

India is one of the world's largest automobile markets, producing ~31.03 million automobiles in FY25, and is rapidly strengthening its position as a global automotive manufacturing hub. The sector accounts for approximately 10.1 percent[32] of the total steel demand and nearly 22 percent of the total aluminium demand in FY26,[33] while also being a significant consumer of copper and zinc.

Figure 9: Steel demand in the automobile sector[27]



Electric mobility is emerging as a major driver of demand for critical minerals, supported by government initiatives such as FAME-II, FAME-III, PM E-DRIVE, PM-eBus Sewa, and the Electric Mobility Promotion Scheme 2024. Collectively, these programs have committed over INR42,000 crore to EV incentives, infrastructure and localisation, while supporting more than 3.7 lakh electric vehicles. With India projected to become the world's largest EV market by 2030 and attract over US$200 billion in investments over the next five years, demand for lithium, nickel, cobalt, graphite, copper, and rare earth elements is expected to grow substantially.[34]

D. Manufacturing

Manufacturing is expected to become one of the strongest drivers of mineral demand under the Viksit Bharat 2047 vision. The government aims to increase manufacturing's contribution to GDP to approximately 25 percent through Make in India and PLI schemes.[35]

- **Electronics and semiconductors:** Electronics manufacturing supported by Production Linked Incentive schemes, India Semiconductor Mission and Semiconductor Mission 2.0 is projected to exceed US$100 billion by 2030.[36]

[31] Deloitte Analysis
[32] Deloitte Analysis
[33] Deloitte Analysis
[34] https://www.ibef.org/industry/india-automobiles
[35] https://www.ibef.org/industry/manufacturing-sector-india
[36] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2115171&

- **Consumer durables:** India is projected to become the world's fourth-largest consumer durables market by FY27, with the sector growing at an 11 percent CAGR and expected to reach INR3 lakh crore by FY29, increasing demand for steel, copper, aluminium and speciality materials.[37]
- **Battery manufacturing:** Supported by the ACC Battery PLI scheme, domestic battery manufacturing is expected to emerge as one of the largest consumers of critical minerals, including lithium, nickel, cobalt, graphite and manganese.

E. Aerospace and defence

Defence and aerospace are emerging as strategic growth sectors under the Atmanirbhar Bharat initiative. India's defence production reached a record INR1.78 lakh crore in FY26, while defence exports crossed INR38,000 crore, supported by increasing participation from the private sector and defence start-ups.[38] The sector is emerging, currently accounting for ~0.5 percent of steel demand, with significant potential to drive future demand for strategic and critical minerals.

Strategic and critical minerals are essential for the aerospace and defence sectors due to their unique strength, heat resistance and magnetic properties. Titanium is used in aircraft structures and jet engines because of its high strength-to-weight ratio. Nickel and cobalt are used in superalloys for turbine blades that operate at extremely high temperatures; rare-earth elements such as neodymium, samarium and dysprosium are used in permanent magnets for missile guidance systems, radars and aircraft actuators; while tungsten is used in armour-piercing ammunition and high-temperature defence applications. These minerals are critical for ensuring the performance, reliability and strategic security of modern defence systems.[39]

2.4 Metals enabling logistics infrastructure development

Metals such as steel, stainless steel, aluminium, copper and zinc are not only the backbone of logistics infrastructure but are also among its largest freight commodities. These metals are extensively used in the development of railways, ports, roads, bridges, inland waterways, warehouses, freight terminals, container yards, conveyor belt structures, pipelines and material handling equipment, making them indispensable for building efficient multimodal logistics networks.

Table 2: Industrial Metals for Logistics Infrastructure Development

Industrial Metal	Logistics Infrastructure Applications	Typical Products/Components	Strategic Importance
Steel	Rail tracks, highways, port structures, airports, warehouses, logistics parks, inland waterway terminals	Structural beams, columns, plates, rebars, cranes, conveyor structures	Accounts for largest share of metal consumption in transportation and infrastructure projects.
Structural Steel	Pre-engineered warehouses, MMLPs, freight terminals, distribution centres	Steel frames, trusses, purlins, portal frames, mezzanine floors	Enables large column-free spans and lower lifecycle costs
High Strength Low Alloy (HSLA) Steel	Long-span bridges, heavy-duty trailers, cranes	Bridge girders, crane booms, trailer chassis	Reduces structural weight while maintaining high load carrying capacity.
Weathering Steel (COR-TEN)	Railway bridges, freight terminals, coastal infrastructure, port structures	Bridges, overhead gantries, retaining walls	Low maintenance, making it suitable for outdoor logistics assets with long life.

[37] IBEF
[38] https://manufacturing.economictimes.indiatimes.com/news/aerospace-defence/indias-defence-production-hits-record-1-78-lakh-crore-in-fy26/131787885
[39] https://mines.gov.in/admin/download/649d4212cceb01688027666.pdf?

Industrial Metal	Logistics Infrastructure Applications	Typical Products/Components	Strategic Importance
Stainless Steel (304/316)	Marine ports, inland waterways, warehouses and storage terminals	Storage tanks, pipelines, conveyors, silos, dock fittings, marine hardware	Essential in coastal and corrosive environments, significantly reducing maintenance costs and extending service life.
Aluminium	Truck trailers, freight containers, warehouse roofing, conveyor systems	Trailers, container bodies, roofing sheets, ladders, loading ramps	Reduces vehicle weight, improves payload capacity and fuel efficiency
Copper	Electrification, EV charging infrastructure, signalling, automation	Power cables, transformers, motors, charging systems	Essential for electrification, digital logistics, automation and reliable power distribution.

The ability to move growing volumes of metals in the future is directly linked to investments made today in logistics infrastructure. As metal production and consumption continue to rise, inadequate transport capacity can increase freight costs, transit time and supply chain bottlenecks, reducing industrial competitiveness.

Logistics infrastructure and the metals industry have a mutually reinforcing relationship, metals build logistics infrastructure, while efficient logistics is essential for transporting the larger volumes of metals required by future industrial and infrastructure growth.

3. Role of logistics as a strategic competitiveness lever

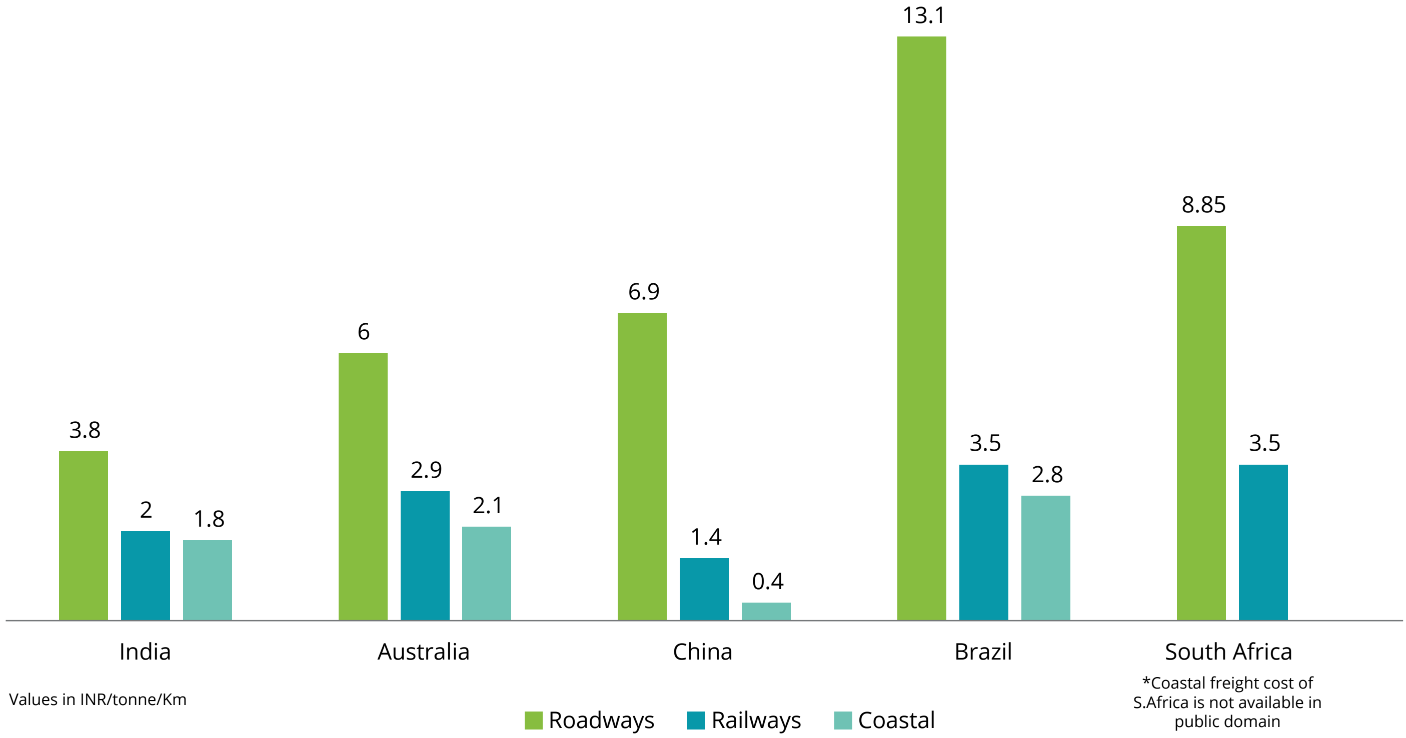
The anticipated growth across sectors will be largely driven by the minerals and metals sector, which provides the essential raw materials required for industrial development. Logistics will be a critical enabler of this growth, as minerals and metals are among the most freight-intensive sectors. However, India continues to face challenges related to multimodal connectivity, rail evacuation capacity, port infrastructure and first- and last-mile linkages, which increase logistics cost and reduce supply chain efficiency.

Despite this notable advancement, India continues to trail advanced and highly efficient logistics economies, including South Korea, Japan, the US, China, Australia and South Africa,[40] which continue to outperform India on key logistics parameters, including multimodal connectivity, customs efficiency, infrastructure quality, logistics service competence, shipment reliability and supply chain resilience. Sustained improvements in these areas will be critical for India to achieve its objective of becoming one of the world's top 25 logistics performers by FY30.[41]

3.1 Logistics cost benchmarking: India vs global peers

For bulk commodities such as iron ore, coal, limestone, cement, and finished steel, logistics costs are often the single-largest determinant of international competitiveness. Countries such as Australia, China, Brazil, and South Africa have built multimodal logistics corridors that significantly reduce transportation costs. India's logistics challenge is not the transportation tariff itself, but the efficiency, integration and modal mix of the freight ecosystem across mining clusters, processing clusters and consumption centres.

Figure 10: Freight cost analysis of major mineral producing countries[42]



[40] https://www.wipo.int/gii-ranking/en/indicators/322
[41] https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=155038&ModuleId=3&reg=3&lang=2
[42] DPIIT-Assessment of Logistics Cost in India & Deloitte Analysis

Major mining economies have achieved globally competitive logistics performance through sustained investments in dedicated freight infrastructure and multimodal integration.

- Australia has developed dedicated heavy-haul rail corridors connecting mining regions directly with ports. Mining companies operate integrated mine-to-port logistics systems.
- China has adopted a multimodal logistics model driven by extensive rail infrastructure, inland waterways and industrial clustering. Bulk commodities such as coal, iron ore and steel are transported primarily by rail and water.
- Brazil focused on dedicated mineral export corridors to achieve competitive end-to-end logistics performance through high asset utilisation, efficient port operations and seamless rail-port connectivity.
- South Africa has established a dedicated mineral evacuation corridor, such as an iron ore and coal corridor. These corridors enable the efficient movement of bulk commodities from mines to export terminals through heavy-haul rail systems, thereby minimising logistics inefficiencies.

Bulk commodities, including coal, iron ore, limestone, bauxite, manganese, cement and steel, primarily rely on railways, inland waterways and coastal shipping for long-haul transportation. At the same time, road transport continues to play a critical role in ensuring first- and last-mile connectivity to production facilities and end-use markets. The minor minerals are also highly dependent on roadways due to dispersed quarries, fragmented consumption centres and short-haul distances.

Figure 11: Modal share of bulk cargo in India and major mineral producing countries[37]

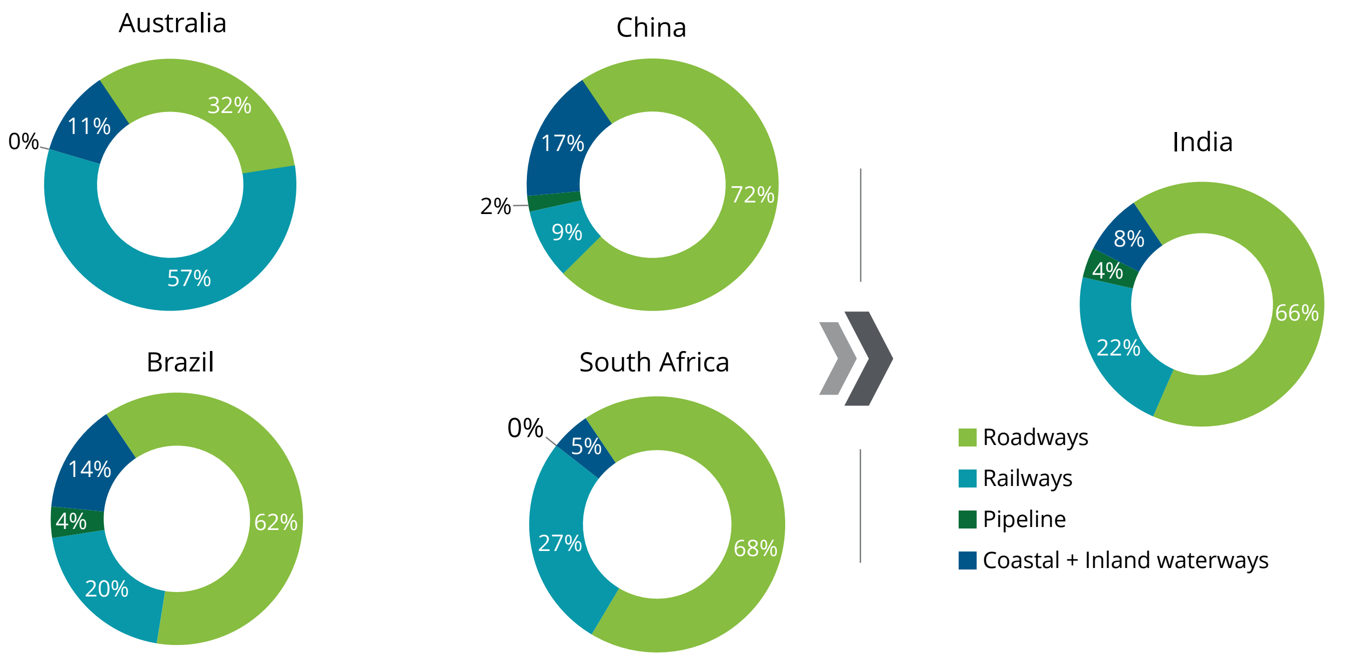


Table 3: Modal share of major bulk commodities in India[43]

Category	Road	Railways	Coastal	Others	Imperative
Iron Ore	28%	42%	29%	1%	Poor mine-to-rail connectivity, inadequate siding and loading infrastructure
Steel	59%	40%	1%	0%	Finished steel is primarily road transported due to fragmented demand and limited multimodal terminals
Cement	76%	22%	<0.5%	1.5%	Numerous cement plants rely on trucks for raw material transport from captive mines
Coal & Lignite	25%	65%	6%	4%	Heavy dependence on roads for first-mile movement to rail sidings and nearby consumers

Road transport continues to play a critical role in India's bulk logistics ecosystem by providing first-mile and last-mile connectivity to rail and coastal networks. Further strengthening integrated multimodal infrastructure can enhance seamless mine-to-market connectivity for bulk commodities.

3.2 Logistical inefficiencies in India

Fragmented multimodal logistics network

The bulk mineral logistics network in India continues to evolve, with mines often located far from rail sidings, opportunities to strengthen first-mile connectivity, enhance integration between rail terminals and ports, and expand dedicated freight corridors and multimodal logistics facilities serving industrial clusters. As a result, minerals such as coal, iron ore, limestone and steel undergo multiple loading, unloading and storage operations before reaching end users or export ports, increasing handling costs, transit time, cargo losses and supply chain inefficiencies while reducing the overall competitiveness of bulk freight transport.

In contrast, leading mining economies such as Australia, Brazil and South Africa have developed integrated mine-to-port logistics systems comprising dedicated heavy-haul rail corridors, private rail sidings, mechanised loading terminals and port-rail integration, enabling seamless movement of bulk commodities with minimal handling and significantly lower logistics costs.

Table 4: Use case of multimodal logistics across major mineral producing countries

Countries	Integrated logistics model	Impact on logistics
Australia	Darwin-Adelaide-Tarcoola multimodal logistics corridor integrating road, rail and port infrastructure for seamless movement of bulk minerals to domestic and export markets.	Reduces logistics costs and improves the efficiency of bulk mineral exports through integrated road–rail–port connectivity.
Brazil	892-km dedicated Carajás Railway linking mines to Ponta da Madeira Port	A leading miner's integrated corridor that eliminates intermediate handling, enabling one of the world's largest iron ore export systems with seamless mine-to-port connectivity.[44]
South Africa	Heavy-haul rail integrated with Richards Bay and Saldanha ports	Improved rail-port coordination and dedicated freight infrastructure are essential to lowering export costs and improving mineral competitiveness.[45]

[43] Deloitte Analysis
[44] https://ccsi.columbia.edu/wp-content/uploads/2022/12/CCSI-Shared-Use-Carajas-Corridor-Vale-Executive-Summary.pdf?
[45] https://openknowledge.worldbank.org/bitstreams/536c5740-64a5-5843-81a9-e62ec80bc673/download?

Rail freight capacity constraints

Limited rail capacity, congested freight corridors, inadequate last-mile rail connectivity to mines and industries, and insufficient sidings and terminals constrain India's bulk mineral logistics. These bottlenecks increase wagon turnaround time, rake availability, reduce freight speeds and force greater reliance on road transport, thereby resulting in higher logistics costs.

The National Rail Plan projects rail freight demand to grow from about 1.2 billion tonnes in FY26[46] to over 3.3 billion tonnes by 2050, highlighting the need for major investments in rail capacity and dedicated freight infrastructure.

Figure 12: Movement of freight benchmarking across major mineral producing countries and the US[47]

	Average train length	Average train speed	Gross Vehicle Weight Rating per wagon
USA	2000 meters	33 km/hr	130 tonnes
Brazil	3200 meters*	28-31 km/hr	120 tonnes
Australia	1800-2400 meters	35 km/hr	130 tonnes
South Africa	1800-2400 meters	33-34 km/hr	110 tonnes
India	700 meters	25 km/hr	80 tonnes

* - Brazil operates average 3200 m train on Serra dos Carajás (Parauapebas, Pará) to Ponta da Madeira Maritime Terminal (São Luís, Maranhão)

Port infrastructure and coastal Integration challenges

India's coastal transport remains underutilized, with opportunities to further strengthen rail-port connectivity, expand dedicated coastal cargo terminals, and enhance mechanised loading and unloading infrastructure. As a result, bulk commodities such as coal, iron ore, limestone, cement and steel are often transported by railways or roadways over long distances instead of being shifted to more economical coastal routes, increasing logistics costs, congestion and carbon emissions.

Coastal cargo handling infrastructure across Indian major ports remains inadequate, with limited mechanisation and wide variations in vessel turnaround times, lagging behind global best practices such as Japan (12–24 hours)[48] and Singapore (12 hours),[49] compared with a global average of approximately 65 hours.[50]

[46] https://economictimes.indiatimes.com/industry/transportation/railways/railways-reports-1-67-billion-tonne-freight-loading-in-fy26/articleshow/129947715.cms?utm
[47] Deloitte Analysis
[48] https://www.mdpi.com/2305-6290/10/2/51
[49] https://www.mpa.gov.sg/maritime-singapore/what-maritime-singapore-offers/global-hub-port
[50] https://unctad.org/system/files/official-document/rmt2025ch4_en.pdf

Table 5: Level of mechanisation and turnaround across major ports in India[51]

Port	Cargo volume (MT) FY25	Dedicated coastal berths	Mech. level at coastal berths	Average turnaround time (Hrs)[52]	
				Mechanised	Conventional
Paradip Port Authority	63.7	5	Mech.	42.93	70.12
Kamarajar Port Limited	19.7	2	Mech.	49.97	59.99
Cochin Port Authority	12.5	1	Mech.	38.04	131.09
Mumbai Port Authority	22.3	3	Non-Mech.	0	0
Visakhapatnam Port Authority	19.3	1	Non-mech.	48.83	104.54
Deendayal Port Authority	15.8	NIL	NA	-	-
V.O. Chidambaranar Port Authority	12	1	Non-Mech	82.32	97.68
New Mangalore Port Authority	8.7	2	Non-Mech.	43.48	74.42
Chennai Port Authority	6.2	1	Non-Mech.	0	93.29
Jawaharlal Nehru Port Authority	6	2	Non-Mech.	64.89	0
Syama Prasad Mookerjee Port Authority	5.1	3	1 Mech. (SMPA-H)	-	-
Mormugao Port Authority	4.4	NIL	NA	89.71	55.80

Limited cost competitiveness and connectivity of inland waterways

Inland waterways in India are used to transport bulk cargo, including coal, iron ore, limestone, cement, fly ash, and aggregates. However, most of these movements are short-haul, typically within 50 km, serving primarily as first- or last-mile links between mines, industrial plants, and ports rather than as long-distance multimodal transport corridors.

Several pilot projects undertaken by the metals industry to assess the viability of inland waterways for bulk cargo movement did not demonstrate commercially viable outcomes, limiting large-scale adoption.

Table 6: Pilot-scale projects undertaken to assess the viability of inland waterways[53]

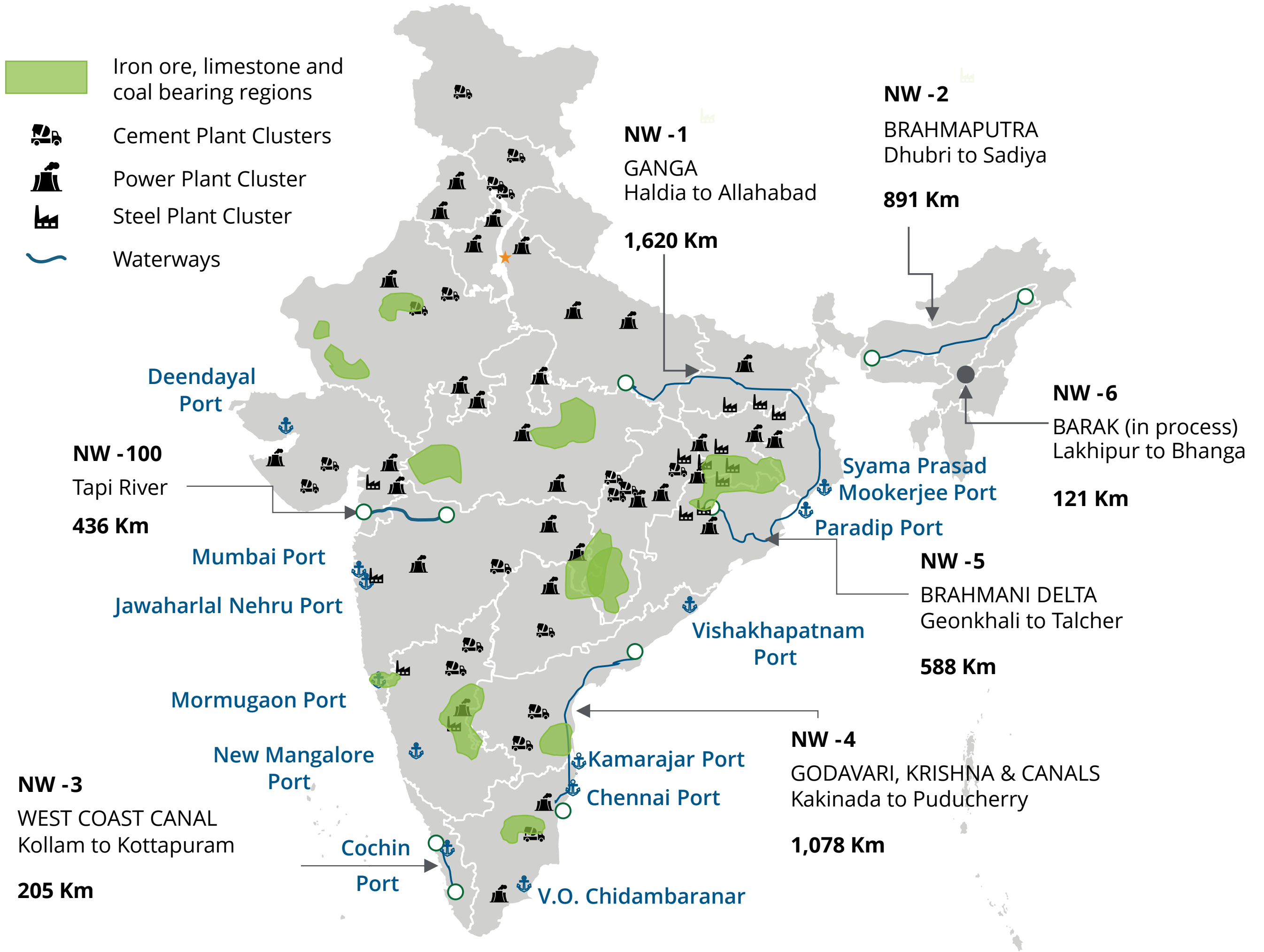
Plant location	Destination	Cargo type	Route use	Constraints
Durgapur	Bangladesh	18.5 kt Steel	NW-1 via IBP Route	Higher transit time increases inventory holding costs, while multiple handling leads to material deterioration and additional expenses. Operational challenges such as limited barge and berth availability during cargo readiness.
Bokaro	Guwahati	1.5 kT BF Slag	NW-2 via IBP	Limited availability of high-capacity barges, inadequate port-handling infrastructure, time-consuming documentation and clearance processes, and high warehousing costs.
Durgapur	Guwahati	0.3 kT TMT	NW-1 via IBP Route	Higher transit time due to regulatory clearances (up to ~3 months through Bangladesh) and constraints on barge and berth availability increase inventory holding costs.

kT – Kilo tonnes

[51] https://dgma.gov.in/download/1769691524_697b598415456_coastal-committee-report-final-jan2026.pdf
[52] Sagar Unnati
[53] Stakeholder Consultation

Bulk cargo movement through inland waterways in India costs around INR3.3 per tonne per km,[54] making it more expensive than rail and coastal shipping and nearly as costly as road transport. To address this, the Government launched the Jalvahak Scheme to promote multimodal transport, improve first- and last-mile connectivity, and increase the inland waterways freight share to 5 percent by 2030. However, the scheme is currently limited to three years ending in FY27[55] and is limited to NW-1, NW-2 and NW-16 via IBP route.

Figure 13: Important NWs for mining and metal clusters



Among all National Waterways, NW-1, NW-2 (via IBP route), and NW-5 have the highest potential for transporting bulk cargo for the mining and metals sector.

India's inland waterways are still in an immature stage and are not suited for long-haul movement of bulk cargo. Major mineral-bearing regions and consumption centres are located away from national waterways, creating multiple transit points, increasing handling and transhipment costs, and reducing the overall advantage of inland waterways. Moreover, the Jalvahak Scheme primarily covers NW-1, NW-2 and NW-16, offering limited support for cargo movement from major mineral-producing and industrial cluster states such as Odisha, Jharkhand, and Chhattisgarh, where connectivity to navigable waterways remains constrained.

[54] DPIIT-Assessment of Logistics Cost in India
[55] https://shipmin.gov.in/sites/default/files/Revised%20Jalvahak%20%20IWT%20cargo%20promotion%20Scheme%20%281%29%20%281%29.pdf

Logistics cost utilisation of inland waterways for long-distance haul via NW-1 vs Rail Road modal

Table 7: Use case of utilisation of NW-1 with and without JalVahak (JVK) Scheme vs Rail – Road Mode[56]

One tonne of steel movement from Durgapur to Patna via road & Rail		One tonne of steel movement from Durgapur to Patna via road and waterways		
Activities	**Cost**	**Activities**	**Cost (Without JVK)**	**Cost (With JVK)**
Material Loading at the Rail Siding at Durgapur	30	DSP to Kolkata Dock via Road	871	871
Rail Terminal Handling	40	Loading in Vessel at KDC	220	220
Rail Haul to Fatuah	782	Documentation Charges	200	0
Unloading to trucks	90	KDC to Gaighat (Patna)	2307	1500
Road Haul Fatuah to Patna	207	Unloading at Gaighat (Patna)	200	200
Total	**1149**	**Total**	**3798**	**2791**

IBP – India Bangladesh Protocol Route

India's inland waterways ecosystem is still at a nascent stage and requires significant structural and operational reforms to become a competitive mode for bulk cargo transportation over long hauls.

[56] Deloitte Analysis

3.3 First and Last-mile connectivity gaps in mining clusters and plant locations

Major iron ore and steel clusters

Nearly 99 percent of India's iron ore production is concentrated in Odisha, Karnataka, Chhattisgarh, Jharkhand and Goa, with Odisha alone accounting for more than half of the national production.[57] Despite this geographical concentration, many mines continue to depend on road transport to reach railway loading points because rail infrastructure has not expanded at the same pace as mining capacity.

Table 8: Major iron ore mining clusters and last-mile connectivity gaps[58]

Iron ore clusters	First- and last-mile connectivity gap	Impact on logistics and evacuation
Keonjhar–Barbil–Joda (Odisha)	• Many dispersed mines lack direct rail sidings • High dependence on roads for first-mile movement • Congestion on mining roads and limited mechanised loading infrastructure[59]	• Mech. High truck traffic • Multiple cargo handling • Longer rake loading time • Higher logistics costs and delays in evacuation during peak production
Kiriburu–Meghahatuburu–Noamundi (Jharkhand–Odisha)	• Several mines rely on roadways due to limited capacity at rail loading sidings and common-user infrastructure[60]	• Road congestion • Increased turnaround time • Inefficient rake utilisation, particularly during peak dispatch periods
Bonai–Koira Belt (Odisha)	• Missing feeder rail links and inadequate private sidings[61]	• Increased truck movement • Multiple handling operations • Higher first-mile logistics costs
Bailadila (Kirandul–Bacheli), Chhattisgarh	• Heavy dependence on the Kirandul–Kottavalasa (KK) rail line • Limited alternate evacuation corridors	• Rail congestion limits evacuation despite abundant reserves • Delays in rake availability affect the steel plant utilisation rate
Bellary–Hospet–Sandur (Karnataka)	• Mines depend on road transport to railheads and steel plants • Limited dedicated freight infrastructure for mine evacuation	• High road dependence increases freight cost • Road deterioration and loading delays
Donimalai (Karnataka)	• Capacity constraints at loading facilities • Limited rail expansion to accommodate increasing production	• Slower evacuation during periods of increased production • Dependence on scheduled rake availability

Major limestone and cement clusters

The Indian cement industry is highly location-specific: integrated cement plants are established close to limestone reserves, while grinding units are increasingly located near demand centres. This spatial separation creates substantial freight movements of limestone, clinker and cement between mines, integrated plants, grinding units and consumption centres, mainly those that are highly dependent on road transport.

[57] Deloitte Analysis, Ministry of Mines Annual Report 2025-26
[58] Deloitte Analysis
[59] https://mines.gov.in/admin/storage/ckeditor/DATED_170125_1737544769.pdf?
[60] https://rdso.indianrailways.gov.in/uploads/TFC-101-IronOre_Report.pdf?
[61] https://mines.gov.in/admin/storage/ckeditor/DATED_170125_1737544769.pdf?

Table 9: Major limestone mining clusters and last-mile connectivity gaps[62]

Limestone clusters	First and last-mile connectivity gap	Impact on logistics and evacuation
Chittorgarh–Nimbahera (Rajasthan)	• Limited dedicated rail sidings for several mines • Dependence on road haulage from captive mines to plants • Congestion on state highways during peak dispatch	• Higher first-mile transport cost • Increased truck traffic • Slower clinker/cement evacuation
Satna–Maihar–Katni (Madhya Pradesh)	• Several limestone mines require road transport before reaching plants or railway loading points • Limited multimodal freight infrastructure	• Multiple cargo handling stages, increased freight cost and longer turnaround time
Kadapa–Yerraguntla (Andhra Pradesh)	• Limited rail connectivity • Dependence on NH corridors for dispatch to southern markets	• Heavy road dependence increases logistics costs and road congestion
Baloda Bazar (Chhattisgarh)	• Inadequate last-mile road connectivity from mines to plants and rail terminals	• Slower evacuation of cement and clinker • Increased dependence on trucks
Ariyalur–Tiruchirappalli (Tamil Nadu)	• Limited multimodal integration between railheads, plants and ports • High dependence on road transport for regional distribution	• Higher logistics costs • Lower rail share despite suitable bulk cargo volumes.

Major coal and power plant clusters

Coal logistics are heavily dependent on efficient first- and last-mile connectivity between coal mines, railway sidings and thermal power plants. Despite rail carrying nearly 50 percent of Indian Railways' freight, many coalfields still rely on road transport from pitheads to loading points because of inadequate mechanised evacuation systems, railway sidings and feeder rail infrastructure. The Ministry of Coal has identified first-mile connectivity as one of the largest structural bottlenecks and has launched large-scale First Mile Connectivity (FMC) projects to eliminate truck-based evacuation.[63]

Table 10: Major coal mining clusters and last-mile connectivity gaps[64]

Coal clusters	First and last-mile connectivity gap	Impact on logistics and evacuation
Talcher Coalfield (Odisha)	• Several mines depend on truck movement to rapid loading systems or railway sidings • Additional FMC projects and rail infrastructure are under implementation	• Truck congestion, dust emissions, delayed rake loading and higher evacuation costs
Ib Valley Coalfield (Odisha)	• Limited mechanised coal handling plants and inadequate first-mile conveyor systems in expanding mines	• Higher dependence on diesel trucks, slower loading and increased logistics cost
Korba Coalfield (Chhattisgarh)	• Dependence on feeder rail infrastructure • limited loading capacity • Congestion on high-density rail corridors	• Longer wagon turnaround and delayed coal supplies to power stations
North Karanpura (Jharkhand)	• Several new mines require additional railway sidings and FMC systems	• Bottlenecks in coal evacuation despite production expansion
Singrauli Coalfield (MP–UP)	• Pithead plants benefit from MGR systems; coal dispatched outside the region still depends on congested rail infrastructure and limited loading capacity	• Rail congestion reduces flexibility for long-distance coal movement

[62] Deloitte Analysis
[63] https://www.pib.gov.in/Pressreleaseshare.aspx?PRID=1869543&utm_
[64] Deloitte Analysis

3.4 Tariff structures and their impact on sector competitiveness

While railways and coastal shipping are inherently more economical for long-distance bulk transport, their competitiveness is significantly affected by the prevailing tariff structure, terminal charges, first- and last-mile costs, time, procedural costs and multimodal handling requirements. Consequently, the total delivered logistics cost often exceeds the line-haul freight cost, resulting in increased reliance on road transport despite its higher operating cost per tonne-kilometre.

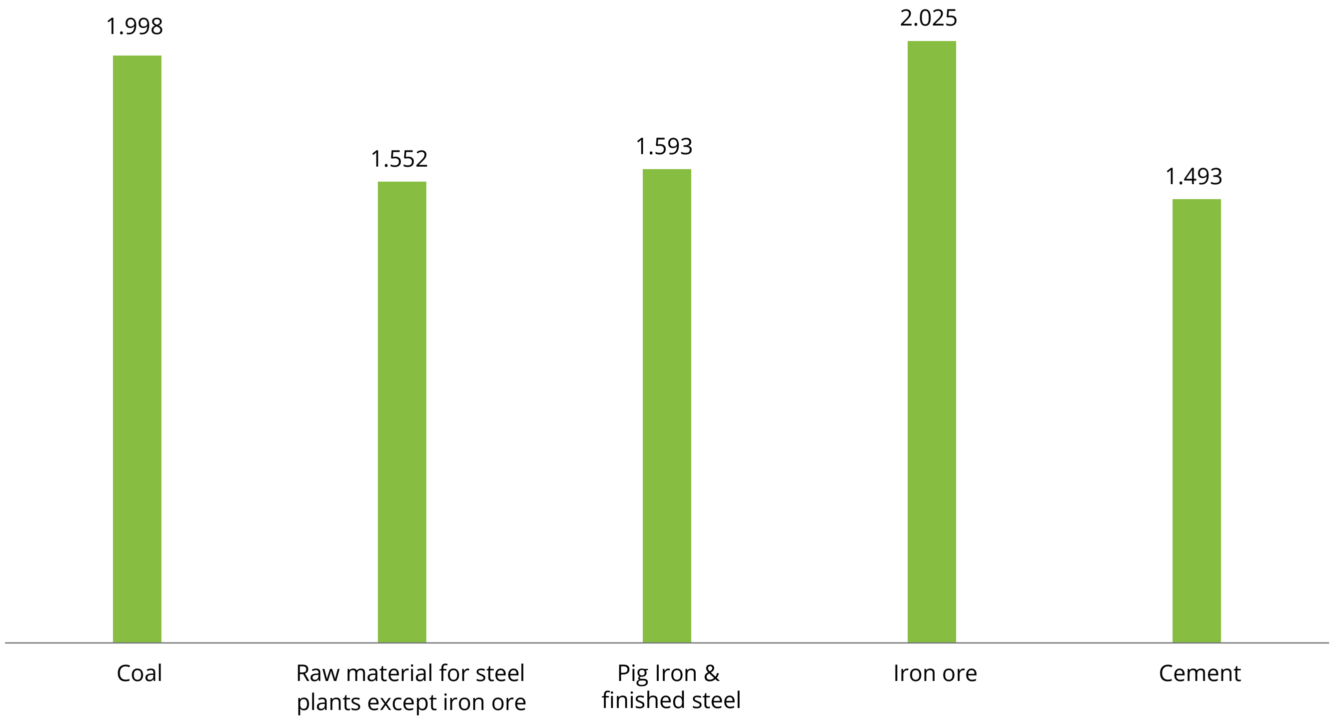
Road transport tariff structure

Road freight in India follows a market-driven door-to-door pricing model, wherein the freight rate generally includes factors such as vehicle hire, driver charges, fuel, tolls and direct delivery to the consignee. Unlike railways and coastal shipping, road transport does not require separate terminal handling, wagon placement, siding charges, port charges or cargo transshipment, thereby providing a single integrated end-to-end transportation service under a unified pricing structure.

Railway freight tariff structure

Rail freight operates under a commodity-based tariff system administered by Indian Railways, where freight rates vary according to commodity classification, distance slabs and axle loading. In addition to the basic freight charge, customers incur terminal handling charges, siding charges, wagon placement charges, demurrage, wharfage (where applicable), loading and unloading costs, and first- and last-mile transportation expenses. The wagon-based freight, basic freight accounts for only 79.3 percent of total logistics cost, while 10.5 percent comprises surcharges, with the remaining costs arising from terminal operations and ancillary logistics services.[65] Apart from this, cross-subsidisation further increases freight tariffs to offset passenger fare subsidies, thereby reducing rail transport's cost competitiveness.

Figure 14: Commodity-wise per tonne per km railway freight cost (FY24)



* - Values in INR / tonne/km

[65] DPIIT-NCAER

Coastal shipping tariff structure

Coastal shipping offers the lowest line-haul transportation costs for long-distance bulk cargo movement, but its tariff structure is fragmented across multiple service providers. In addition to ocean freight, cargo owners pay port handling charges, wharfage, pilotage, berth hire, documentation fees, vessel-related charges, storage charges and inland transportation costs at both origin and destination ports. Furthermore, cargo movement to and from ports generally requires separate road or rail transportation, resulting in additional first- and last-mile logistics costs.

Implications for the mining and metals industry

The present tariff framework inherently favours single-mode road or rail transportation over integrated multimodal logistics. While railways and coastal shipping offer significantly lower line-haul transport costs, the cumulative burden of terminal handling charges, siding costs, port charges, multiple cargo handling, first- and last-mile transportation, inventory carrying costs and detention charges substantially increases the delivered logistics cost. As a result, commodities such as coal, iron ore, limestone, steel and cement often continue to move by road even over distances where rail or coastal shipping would be operationally more efficient.

This fragmented tariff structure discourages the adoption of Rail-Sea-Rail (RSR) and other multimodal logistics models, leading to under-utilisation of Dedicated Freight Corridors, coastal shipping infrastructure and multimodal logistics parks. Consequently, India's mining and metals sector faces higher delivered raw material costs, increased logistics complexity, longer transit times and reduced international competitiveness. A shift towards integrated multimodal tariff structures, unified freight contracts and harmonised terminal and port charges is therefore essential to enable seamless modal integration and promote cost-effective bulk logistics.

Use case: Tarif structures across different distances

Table 11: Competitiveness of road, rail and coastal transport across different distances[66]

	150 kms			250 kms			500 kms		
Cost heads	**Road (INR/t)**	**Rail (INR/t)**	**Coastal Shipping (INR/t)**	**Road (INR/t)**	**Rail (INR/t)**	**Coastal Shipping (INR/t)**	**Road (INR/t)**	**Rail (INR/t)**	**Coastal Shipping (INR/t)**
First-mile movement (mine to terminal)	0	90		0	90		0	90	90
Loading at origin	40	50		40	30		40	30	35
Main haul	676.5	415.5		827.5	555		1655	1110	450
Terminal handling	-	40	Not Viable	-	40	Not Viable	-	40	80
Port charges	-	-		-	-		-	-	55
Last-mile movement	Included	90		Included	90		Included	-	55
Inventory & waiting cost	35	85		40	70		55	85	140
Total Delivered Cost	**751.5**	**770.5**		**907.5**	**875**		**1750**	**1445**	**940**
Per tonne per km Cost	**5.01**	**5.14**		**3.63**	**3.5**		**3.5**	**2.89**	**1.88**

The cost competitiveness of transport modes varies significantly with distance, driven by differences in freight rates and handling costs. At 150 km, road transport is the most cost-effective mode at approximately INR751.5/ tonne, as it enables direct point-to-point delivery without incurring terminal handling, port charges, or first- and last-mile transfer costs. At 250 km, rail transport becomes more economical at approximately INR907.5/tonne, benefiting from lower per-tonne-km freight costs despite additional handling and transfer expenses. At 500 km, coastal shipping emerges as the most cost-efficient mode at approximately INR940/tonne, as its significantly lower main-haul freight costs outweigh higher port handling and inventory-related costs. Overall, optimising logistics costs in India requires a strong focus on developing an efficient multimodal transportation network that leverages the cost advantages of each mode across different distance ranges, thereby minimising overall logistics cost per unit.

[66] Deloitte Analysis

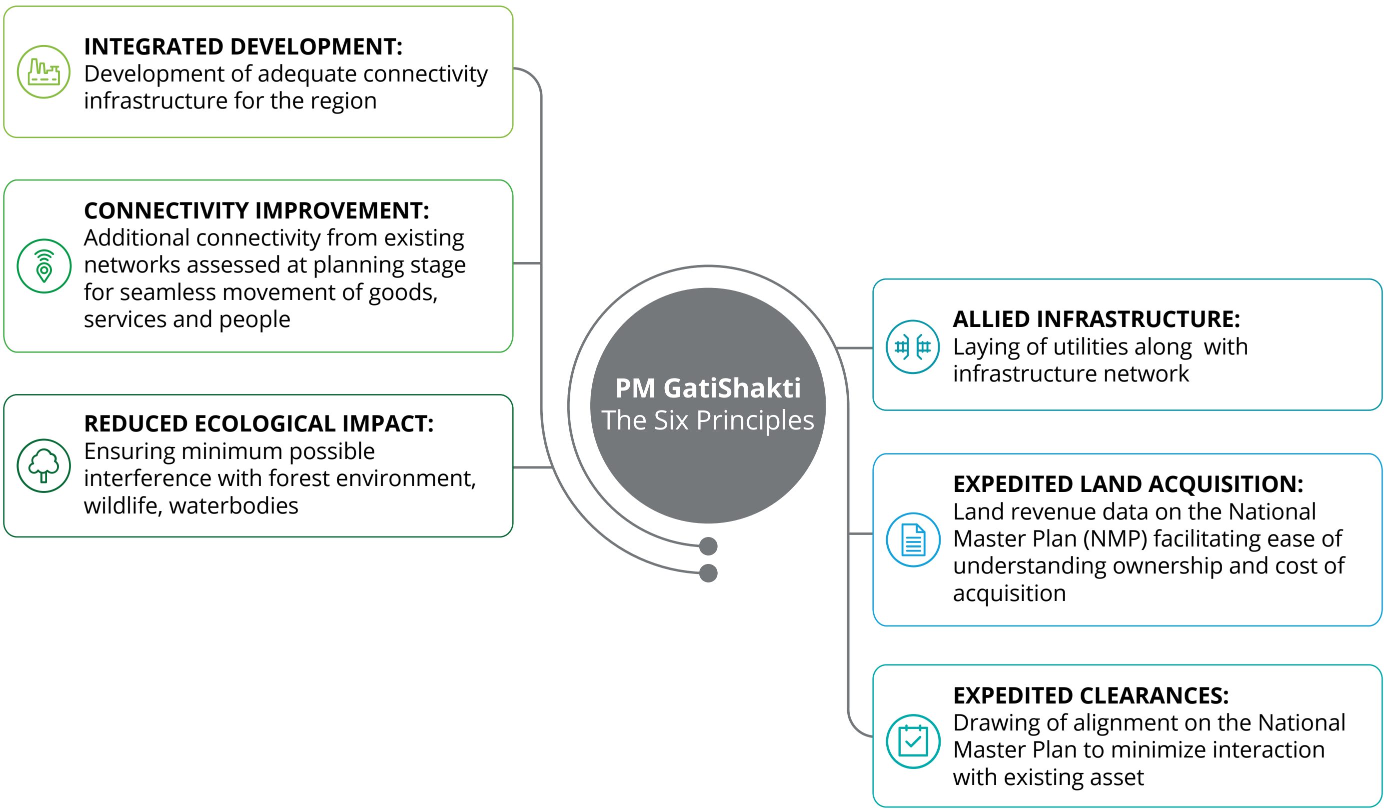
4. Policy and infrastructure landscape

India's logistics sector has emerged as one of the most critical pillars of the country's economic transformation and has undergone a structural shift over the last decade. The transformation combines hard infrastructure, such as rail corridors, port capacity, and waterway terminals, with soft infrastructure, such as digital interfaces, regulatory simplification, and skill development, to reduce India's logistics costs to global benchmarks by 2030 and improve India's ranking in the World Bank's Logistics Performance Index (LPI). To address this, the GOI has undertaken multiple logistics-specific initiatives, including the PM GatiShakti National Master Plan, the National Logistics Policy, Bharatmala, and Sagarmala.

4.1 PM GatiShakti National Master Plan

PM GatiShakti, launched in October 2021, aims to transform India's logistics by integrating planning for multimodal infrastructure connectivity. The Government of India plans to invest Rs. 100 lakh crores[67] to build a holistic infrastructure ecosystem through GatiShakti. The initiative is anchored on 2 levers: an indigenous Geographic Information System (GIS)-backed platform and a collaborative whole-of-government approach that brings together central ministries, states, and UTs for coordinated planning and execution across roads, railways, ports, waterways, airports and logistics infrastructure.

Figure 15: Six principles of PM GatiShakti[68]



[67] https://www.investindia.gov.in/team-india-blogs/pm-gati-shakti-master-plan
[68] https://pmgatishakti.gov.in/pmgatishakti/downloadfilenew/--srv--NMP_Files--1741588112582_PMGatiShakti_Compendium%20Vol-1.pdf

Figure 16: PM GatiShakti National Master Plan integration scorecard

58[70] Ministries and Departments Onboarded	**All**[71] States/Uts onboarded	**352**[72] Infrastructure projects evaluated by NPG	**3202**[73] Data Layers Integrated into NMP	**28**[74] Districts using the District Master Plan Module

For the iron ore and steel sector, PM GatiShakti is enabling data-driven infrastructure planning through the National Master Plan (NMP) portal. The Ministry of Steel has uploaded the geolocations of all CPSE steel plants, while the Indian Bureau of Mines (IBM) has digitised 3,154 operational and non-operational mining leases covering approximately 297,200 hectares.[69] The integrated geospatial platform enables planners to optimise the alignment of railway sidings, slurry pipelines, and multimodal links connecting mines, beneficiation plants, steel plants and ports. This reduces pre-feasibility and project planning timelines, improves mine evacuation planning and accelerates the development of logistics infrastructure for iron ore and steel.

GatiShakti Cargo Terminal (GCT)

The GatiShakti Cargo Terminal (GCT) policy strengthens first- and last-mile rail connectivity by promoting private investment in rail-linked logistics infrastructure through decentralised approvals, single-window clearances, and a liberal eligibility framework. It allows terminals to be developed on both Railway and private land, encouraging wider private participation. The policy also promotes multimodal logistics integration through warehousing, modern cargo handling facilities, and seamless road–rail connectivity.

For the metals and mining sector, GCTs strengthen evacuation infrastructure for coal, iron ore, limestone, and other bulk minerals by improving rail connectivity between mines, processing facilities, and metal manufacturing clusters. The strong industry response, reflected in the commissioning of around 128 GCTs,[75] demonstrates the policy's potential to develop a nationwide network of rail-linked logistics hubs and improve first- and last-mile connectivity for bulk freight.

PM GatiShakti Economic Corridor Programme

Complementing the GCT policy, the PM GatiShakti Economic Corridor Programme is significantly expanding rail infrastructure for bulk commodity movement. The programme comprises 434 railway projects with an investment of INR11.17 lakh crore,[76] including 192 Energy, Mineral and Cement (EMC) corridor projects, 200 High Traffic Density Routes projects (upgradation of High-Density Network and Highly Utilised Network of IR), and 42 Rail Sagar (port connectivity) projects. Within the EMC programme, 97 projects have been sanctioned, including 49 new railway lines specifically aimed at strengthening first- and last-mile connectivity for bulk industries.

Table 12: Connectivity to bulk industries[77]

Connectivity to	No of projects
Coal mines cluster	29
Iron ore mines cluster	9
Bauxite mines cluster	1
Limestone/other minerals	8
Other industrial nodes	2

[69] https://www.pib.gov.in/PressReleasePage.aspx?PRID=1852286
[70] https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=158902&ModuleId=3&reg=24&lang=15
[71] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2064378&reg=3&lang=2
[72] https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=2225805&reg=3&lang=2
[73] https://www.pib.gov.in/PressReleaseDetail.aspx?PRID=2270740&reg=6&lang=1
[74] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2178500
[75] https://sansad.in/getFile/loksabhaquestions/annex/187/AS526_b7Xlgn.pdf
[76] Deloitte Analysis
[77] Deloitte Analysis

Multi Modal Logistics Park (MMLP)

In addition, a network of 35 Multi Modal Logistics Parks (MMLPs)[78] is planned under the Bharatmala Pariyojana, with an estimated investment of INR46,000 crore. These facilities are designed as integrated hubs for freight aggregation, distribution, and multimodal transfer, combining warehousing, customs clearance, railway sidings, container depots, and specialised storage infrastructure such as cement silos within a single ecosystem. They are well-suited for handling containerised cargo, finished steel products, cement, and other manufactured goods requiring value-added logistics services.

Bharatmala Pariyojana

Bharatmala Pariyojana strengthens the logistics backbone of India's metals and mining sector by improving first- and last-mile road connectivity between mines, railheads, ports and industrial clusters. The programme enhances hinterland to port connectivity, with upgraded economic corridors expected to reduce truck transit times by 30–40 percent,[79] while higher-quality, access-controlled highways increase average vehicle speeds and are projected to reduce supply chain costs from around 18 percent to nearly 6 percent[80] on key freight routes. Collectively, these interventions improve coal evacuation, accelerate the movement of iron ore to steel plants and ports, lower cement distribution costs and enhance the overall efficiency and competitiveness of India's metals and mining supply chains.

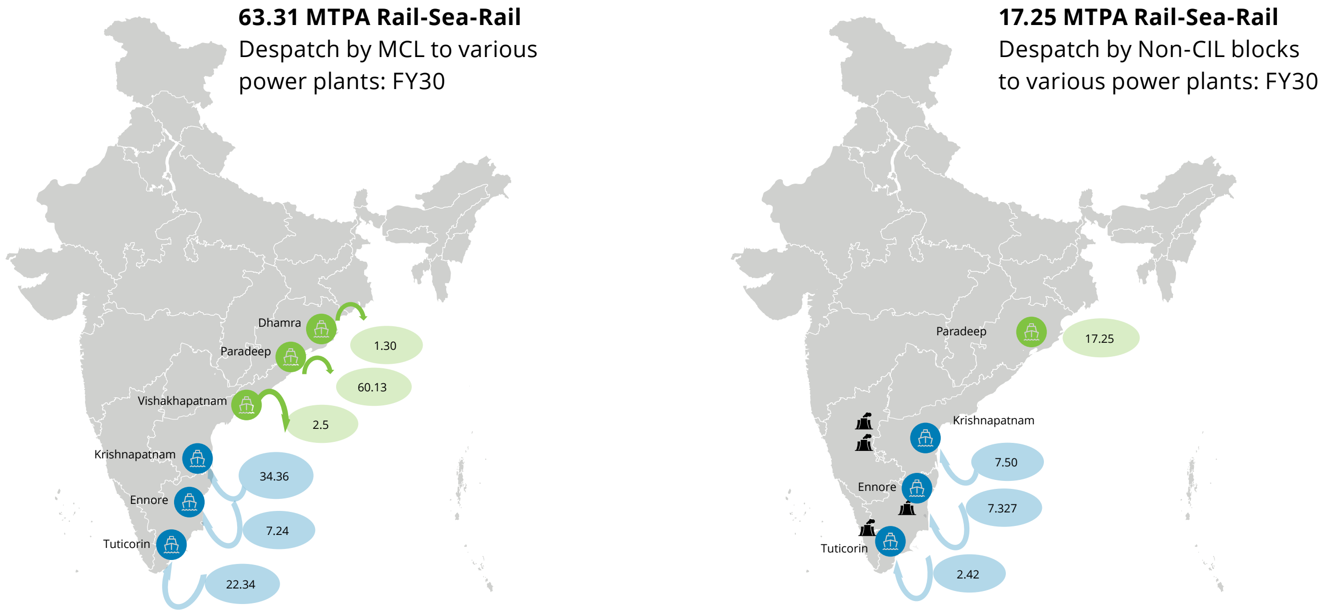
PM GatiShakti has improved integrated planning of mines, processing facilities and transport infrastructure through a GIS-based platform. Further enhancement should include production and consumption data, industrial capacity expansions and commodity-specific freight forecasting. This would enable proactive planning of rail links, freight terminals and multimodal infrastructure, ensuring synchronised industrial growth, reduced congestion and more efficient logistics investment.

Coal logistics policy

The integrated Coal Logistics Policy[81] indicates that coastal shipping has significant potential, with eastern ports collectively offering more than 120 MTPA of capacity. Based on power plant demand assessments and landed-cost economics, a realistic coastal shipping volume of 80–90 MTPA by FY30 is achievable. In FY30, an estimated 63.31 MTPA of coal from MCL and 17.25 MTPA from non-CIL blocks can be transported through rail–sea–rail routes to various power plants. Furthermore, around 30 MTPA of additional capacity can be utilised for exports to Bangladesh and Sri Lanka, ensuring no idle capacity. The study also factors in 20–25 MTPA (or 14–17 rakes per day) of coastal shipping demand from NRS assets in the steel and cement sectors. Beyond Paradip, ports such as Dhamra, Gopalpur, Vizag and Gangavaram should be actively explored and developed as key coastal shipping hubs.

[78] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2209837
[79] https://infra.tractorjunction.com/en/news/bharatmala-sagarmala-infrastructure-export-growth-india
[80] https://www.lexquest.in/bharat-mala-project-messiah-indian-roads/
[81] http://coal.nic.in/sites/default/files/2023-05/23-05-2023.pdf

Figure 17: Coastal shipping for coal



To strengthen rail-based evacuation, the policy prioritises 38 railway infrastructure projects under PM GatiShakti to improve mine-to-consumer connectivity and eliminate network bottlenecks. A major focus is on expanding First Mile Connectivity (FMC) by replacing truck-based coal transport with mechanised conveyor systems, rapid-loading silos and rail-linked coal-handling plants. As of FY26, 44 FMC projects with a mechanised handling capacity of 429.5 MTPA are operational, while 58 additional projects have been sanctioned, taking the total to 102 FMC projects with an envisaged capacity of 1,319 MTPA by FY30 and a planned investment of INR31,367 crore. These initiatives are expected to improve wagon turnaround, increase rail modal share, reduce diesel consumption and dust emissions, lower logistics costs, and enable faster, more efficient coal evacuation from mines to end-users.

4.2 National Logistics Policy (NLP)

The National Logistics Policy, launched in September 2022, complements the physical infrastructure framework of PM GatiShakti by providing the digital and regulatory architecture required to optimise the supply chain. The policy is anchored around four pillars: Integrated Digital Logistics Systems, Unified Logistics Interface Platform (ULIP), Ease of Logistics Services (E-Logs) and System Improvement Group (SIG). The policy sets a target to reduce logistics costs in India to global benchmarks by 2030 and to improve India's LPI ranking to among the top 25 countries (India improved to 38th in 2023).

Under the National Logistics Policy (NLP), ministries are mandated to prepare Sectoral Plans for Efficient

Table 13: Achievements of NLP[82]

Initiative	Achievement
Unified Logistics Interface Platform (ULIP)	Integrated 30+ digital systems through APIs; processed 160+ crore transactions (Aug 2025)
Logistics Data Bank (LDB)	Tracked 75+ million EXIM containers across 101 Inland Container Depots (ICDs)
E-Logs Portal and Service Improvement Group (SIG)	Resolved 100+ regulatory and operational issues raised by stakeholders
Logistics Skill Development	65,000+ professionals trained (2023–2025); 100+ institutions offering logistics-related courses
Logistics Ease Across Different States (LEADS) Index	Annual assessment covering all States and Union Territories

[82] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2167224&reg=3&lang=2

Logistics (SPEL) to identify infrastructure gaps, develop modal strategies and implement sector-specific logistics interventions. The Ministry of Steel's Draft SPEL maps over 2,100 steel units[83] and mineral assets, and identifies 22 priority infrastructure projects across rail, roads, ports, inland waterways and pipelines. These initiatives are expected to significantly benefit the metals and mining sector by reducing logistics costs and improving supply chain efficiency for bulk commodities such as coal, iron ore and cement. The impact is particularly significant for the cement industry, where logistics accounts for 30–35 percent of production costs.[84] A 10 percent reduction in logistics costs could lower overall production costs by approximately 3–3.5 percent. Similarly, improved multimodal connectivity and digital logistics planning are expected to reduce transportation costs for coal and iron ore, accelerate mine-to-plant and mine-to-port movement, and strengthen the logistics backbone required to support India's long-term industrial and steel production targets.

4.3 Dedicated Freight Corridors

To improve logistics efficiency, Indian Railways has developed Dedicated Freight Corridors (DFCs) to separate freight movement from passenger-heavy conventional railway routes by establishing exclusive, electrified, double-line corridors. The program currently comprises the Easter Dedicated Freight Corridor (EDFC) and the Western Dedicated Freight Corridor (WDFC), with plans for three additional corridors: the East Coast, North-South, and a newly announced 2,052 km East-West corridor linking Dankuni (West Bengal) to Surat (Gujarat).

Figure 18: Major Objective of DFC[85]

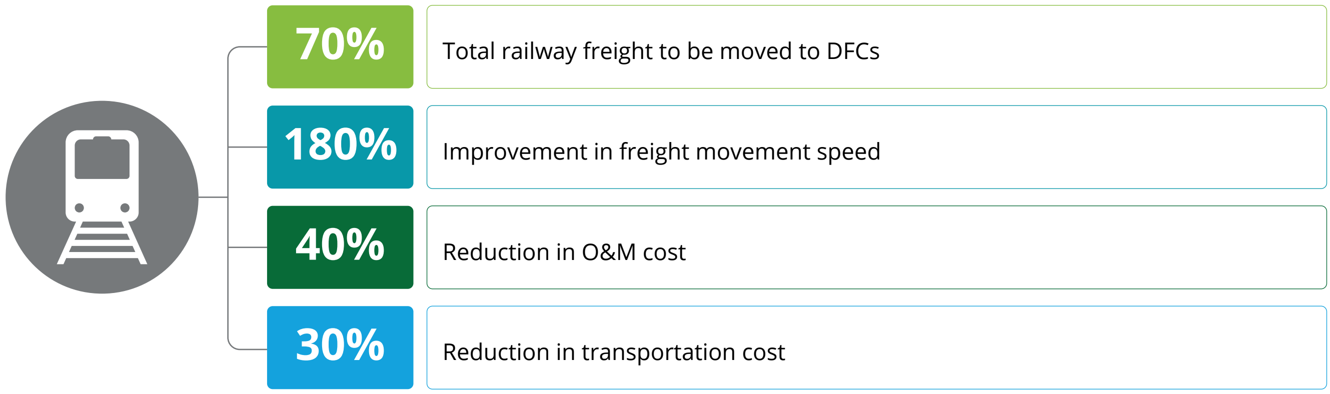


Table 14: Eastern and Western Dedicated Freight Corridor

Parameter	Eastern Dedicated Freight Corridor (EDFC)	Western Dedicated Freight Corridor (WDFC)
Route Length	1,337 km	1,506 km
Operational Status	Fully operational since **October 2023**	Fully operational since **March 2026**
Alignment	Ludhiana – Sonnagar	JNPT – Dadri
Primary Cargo	Thermal coal, iron & steel, fertilisers, food grains	Double-stack containers and other containerised freight
Freight Traffic (FY 2025–26)	**~214 freight trains/day**	**~191 freight trains/day**
Impact	Improves coal and iron ore evacuation from eastern mineral belts, releases capacity on the conventional railway network, including the Golden Quadrilateral, by separating freight from passenger traffic, enhances mineral loading and wagon turnaround, reduces transit time and inventory costs, and strengthens supply chain reliability for the power and steel sectors.	Enhances containerised freight movement through higher-capacity rail operations, increases rail-based port evacuation, reduces logistics costs and highway congestion, and improves export competitiveness and multimodal connectivity.

[83] https://steel.gov.in/sites/default/files/2025-04/Steel_English_AR_2024%20%281%29.pdf
[84] https://www.cmaindia.org/transitioning-towards-bulk-logistics
[85] http://investpunjab.gov.in/assets/docs/logistics.pdf

Figure 19: EDFC average trains per day

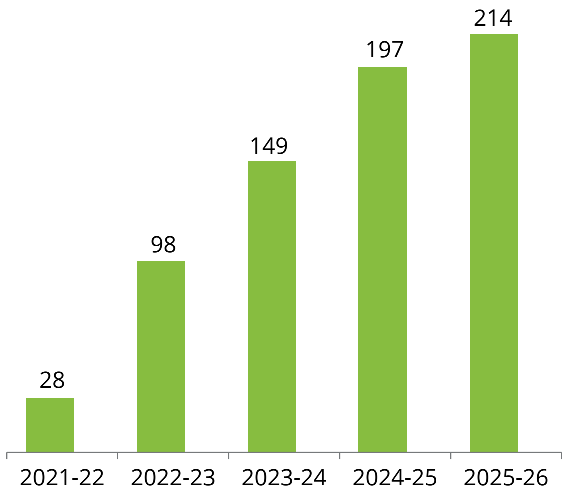


Figure 20: WDFC average trains per day

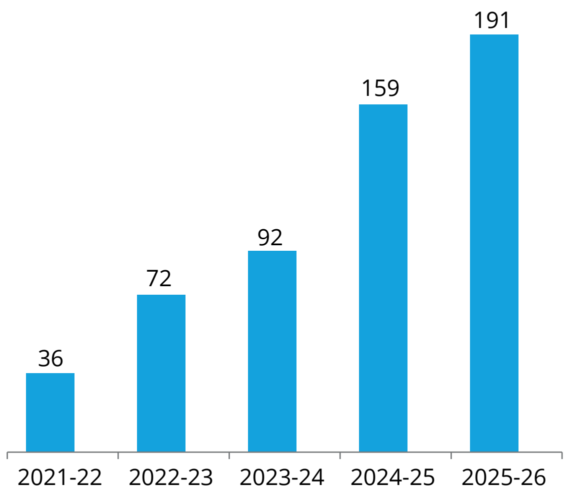


Figure 21: Dedicated Freight Corridor (DFC) network

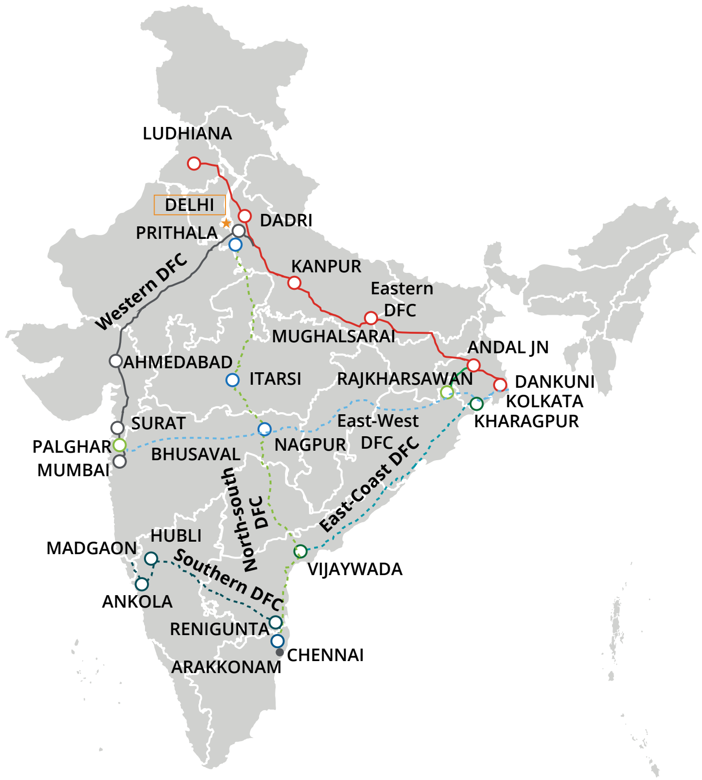
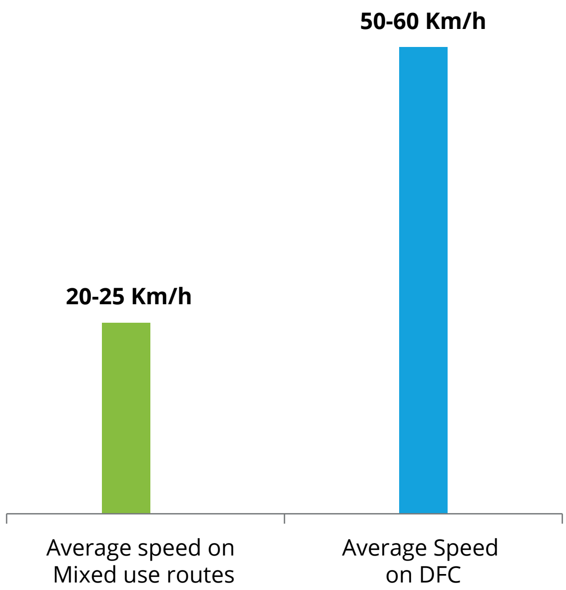


Figure 22: Average speed on freight trains[86]



[86] https://www.thehindubusinessline.com/economy/logistics/dedicated-freight-corridor-over-90-operational-138-km-to-be-added-by-april-end/article68026973.ece

Figure 23: Coal transit time per 100km: Conventional train vs DFC[87]

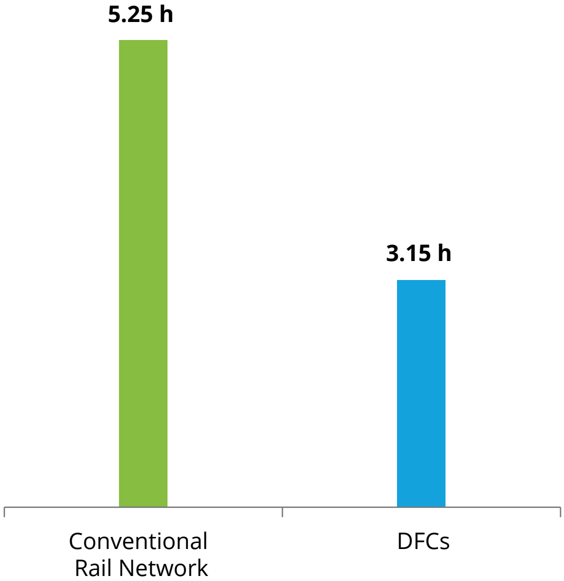
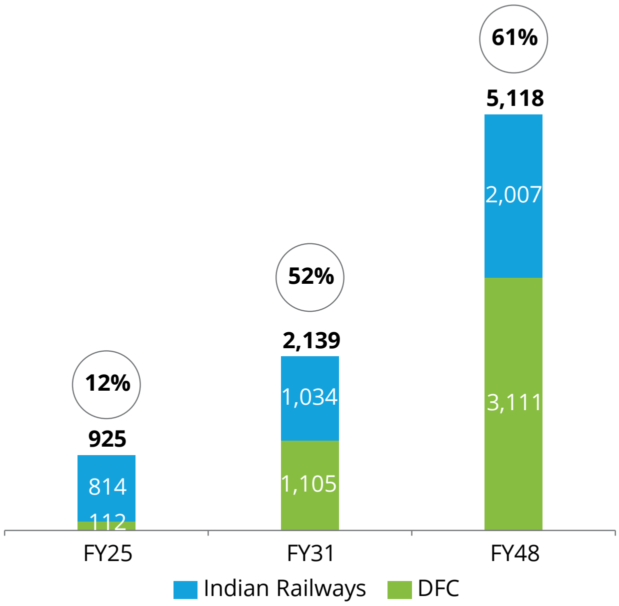


Figure 24: Future DFC share in India's railway freight traffic (Billion NTKMs)[89]



Despite accounting for only 4.1 percent of the Indian Railways network by route length (2,843 km of 69,439 km), the DFCs carried 12.1 percent[88] of the national rail freight traffic in FY25 (111,557 million NTKM of 925,236 million NTKM), demonstrating significantly higher freight intensity than the conventional network. The DFCs have substantially improved the movement of bulk commodities such as coal, iron ore, steel, cement, and power inputs by enabling longer, heavier trains, including double-stack container services and heavy-haul rakes.

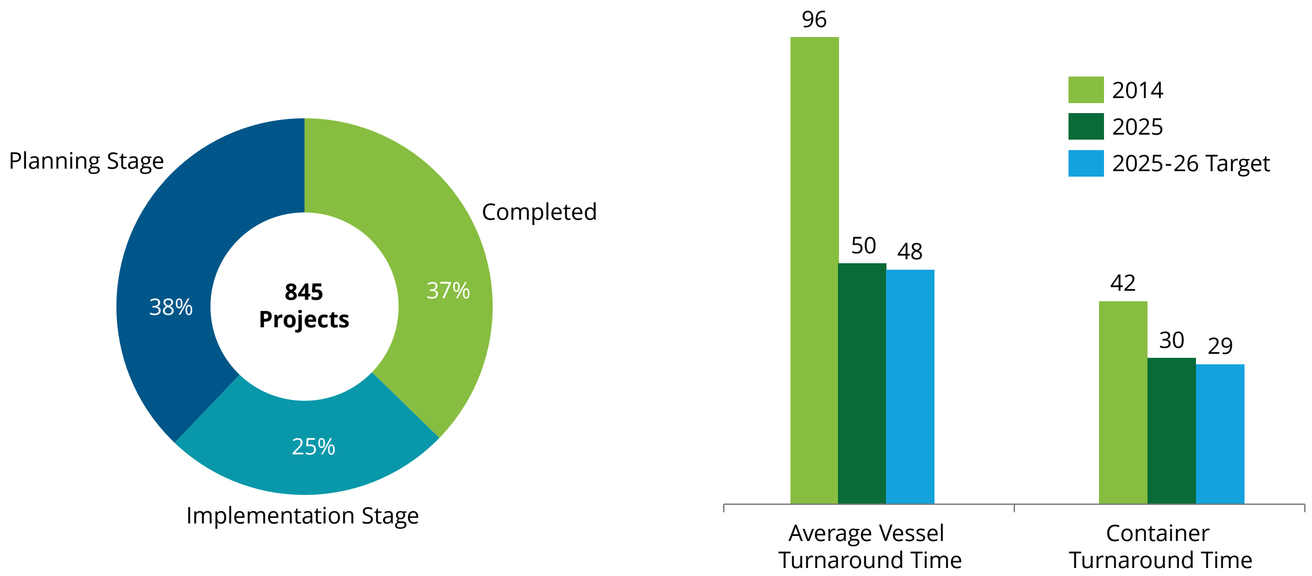
4.4 Sagarmala and port-led development

Given that ~95 percent[90] of India's trade by volume is handled through maritime routes, and robust port infrastructure forms a critical pillar of the country's global supply chain. To harness the potential of India's 11,099 Km coastline, the Ministry of Ports, Shipping and Waterways launched the Sagarmala Programme. The program comprises 845[91] identified projects with a cumulative estimated investment of INR6.06 lakh crore. As of March 2026, 315 projects[92] worth INR1.57 lakh crore have been completed, while an additional 210 projects are actively under implementation.

The cumulative cargo handling capacity of the major ports has expanded from 555 MTPA in FY 2013–14 to 1,681[93] MTPA in FY 2024–25. Operational efficiency at ports has also improved considerably.

[87] https://infra.economictimes.indiatimes.com/news/railways/indias-dedicated-freight-corridors-a-transformative-leap-towards-connectivity-and-growth/119113632
[88] Indian Railways
[89] Deloitte Analysis
[90] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2233239&reg=3&lang=1
[91] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2251071&reg=3&lang=1
[92] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2251071
[93] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2255798&reg=3&lang=1

Figure 25: Sagarmala project portfolio, with turnaround time (in hours) decline[94]



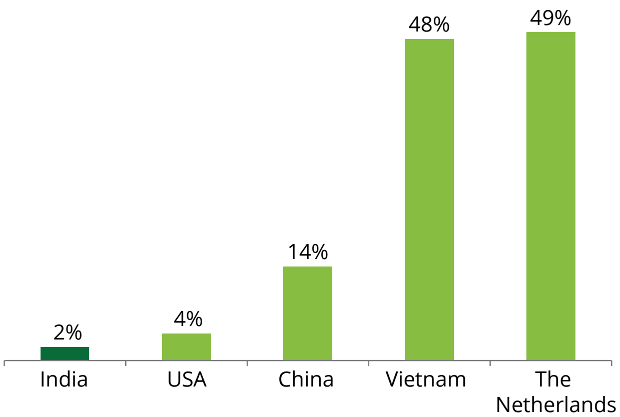
For the metals and mining sector, Sagarmala has facilitated the development and expansion of dry bulk handling infrastructure for iron ore exports, coking coal imports and the movement of limestone and gypsum used in cement manufacturing.

Coastal shipping and inland waterways

Historically, inland waterways have been one of the most underutilised components of India's transport network. Inland Water Transport (IWT) is widely recognised as one of the most environmentally sustainable and cost-efficient mechanisms for bulk freight. This underutilisation has historically been driven by inadequate terminal infrastructure and fragmented regulatory policies.

To address these challenges, the National Waterways Act of 2016[96] declared 111 rivers, canals, and estuaries as National Waterways (NWs), creating a navigable network of 20,187 kilometres spanning 23 States and 4 Union Territories. Of these, 32 NWs are operational, spanning ~5,155 km, and the number is proposed to increase to 52 in the next five years.

Figure 26: Modal share of waterways[95]



[94] https://www.maritimegateway.com/india-cuts-major-port-turnaround-time-to-49-47-hours-as-sagarmala-completes-315-projects-adding-400-mtpa-capacity/

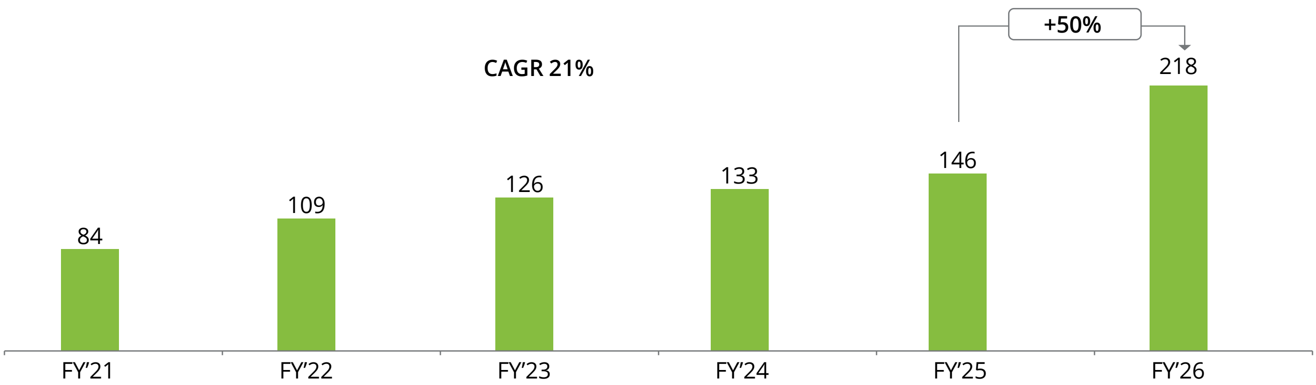
[95] https://prsindia.org/policy/report-summaries/development-and-expansion-of-existing-and-new-national-inland-waterways

[96] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2255798&reg=3&lang=1

Table 15: Cargo promotion scheme

Parameter	Details
Cargo Promotion Scheme (2024)	Introduced to accelerate the modal shift to waterways by reimbursing up to **35 percent of operational costs**[97] for the waterways leg of cargo movement, thereby offsetting the initial cost disadvantage for shippers
Targeted modal shift	**800 MT-km** of cargo to be shifted to waterways[98]
Supporting initiative	Union Budget 2026–27 proposes **operationalising 20 additional waterways** over the next five years
Cargo target (2030)	**200 million tonnes (MT)** of cargo movement through waterways
Long-term goal (2047)	Increase the combined **coastal and inland waterways modal share to 12 percent**
Expected impact	Reduces logistics costs, promotes multimodal transport and increases the movement of bulk commodities such as coal, iron ore, cement and other minerals through waterways.

Figure 27: Traffic on Major NW (in MT)[99]



[97] https://www.pib.gov.in/PressReleseDetailm.aspx?PRID=2217807
[98] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2116161
[99] https://iwaicargoportal.nic.in/web/home/dashboard

5. Stakeholder perspectives on logistics scenario

The metals and mining sector is among the most logistics-intensive industries, where the cost of transporting material is comparable to the cost of extracting it. The following section examines commodity-specific dynamics, infrastructure constraints, regulatory bottlenecks, technology gaps, and the persistent challenge of first and last-mile connectivity based on inputs and recommendations from key stakeholders across the steel, cement, iron ore, and non-ferrous metals industries.

5.1 Commodity-specific insights

Logistics intensity varies across the metals and mining value chain owing to differences in bulk density, lead distance, terrain and the availability and the maturity of dedicated handling infrastructure.

Coal/Lignite

Rail evacuation bottlenecks: Inadequate rail evacuation infrastructure, limited rake availability and continued dependence on road transport for mine-to-siding movement increase logistics costs despite rising coal production.

Supply chain disruptions: Non-pithead thermal power plants continue to face coal supply disruptions due to rail congestion, low freight train speeds and slow wagon turnaround, resulting in higher inventory and transportation costs.

Short-lead freight concession: Stakeholders have recommended reintroducing short-lead freight concessions for coal and coke movements up to 100 km to improve the viability of short-distance rail transport and encourage modal shift from road to rail.

Iron ore

Rail evacuation constraints: Iron ore evacuation remains concentrated in Chhattisgarh, Odisha, Karnataka and Jharkhand, where long mine-to-railhead distances and limited rail capacity increase dependence on road transport.

Rake availability: Continued moratorium on the induction of new rakes under the General Purpose Wagon Investment Scheme (GPWIS) and inadequate railway crew availability are delaying rake placement, disrupting plant inventory and operations.

Recommendation: Stakeholders have recommended lifting the GPWIS moratorium, increasing railway crew availability and ensuring timely rake placement to improve rail evacuation efficiency.

Road transport optimisation: The industry has also proposed increasing permissible axle load limits and promoting high-capacity multi-axle trucks to reduce per-tonne transport costs for bulk road movements.

Aluminium and non-ferrous metals

Rail freight classification: Indian Railways determines freight charges based on freight classes, where a higher class corresponds to a higher tariff per tonne-km, irrespective of commodity value. Stakeholders have recommended rationalising the freight classification of bauxite (Class 160 to 145), alumina (Class 180 to 170) and red mud (Class 110 to 100) to better reflect their economic value and bulk commodity characteristics. These revisions are expected to lower transportation costs, improve rail competitiveness, encourage a greater modal shift from road to rail and support circular-economy objectives in the aluminium value chain.

Over Dimensional Consignment (ODC) and permit management: A lack of a uniform pan-India regulatory framework for ODC movement, coupled with route disruptions and rigid permit systems, leads to delays and compliance issues. Stakeholders have recommended standardised approval mechanisms and automated route revision within mineral transport permit systems to enable seamless interstate movement.

Preferential traffic order: Aluminium and its raw materials are currently in Category D; upgrading them to Category C has been recommended to improve rake availability, reduce transit delays and ensure uninterrupted plant operations.

Steel industry

Rail evacuation bottlenecks: Inadequate railway rakes in mining regions delay the movement of iron ore and coking coal, affecting raw material availability, plant utilisation and productivity.

GPWIS moratorium: The continued moratorium on the induction of fresh rakes under the General Purpose Wagon Investment Scheme (GPWIS), extended until February 2027, restricts industries from augmenting wagon capacity to meet growing logistics requirements.

Stakeholder recommendation: Withdraw or temporarily relax the GPWIS moratorium to permit the induction of additional rakes for eligible industries, ensuring uninterrupted raw material movement and improving supply chain efficiency.

Cement industry

Road logistics improvements: Stakeholders have recommended dedicated mineral transport corridors, digitised dispatch through FASTag-based systems, simplification of the Ravanna process, rationalised toll charges, and development of bypasses and alternate routes to improve road freight efficiency.

Rail freight reforms: Indian Railways introduced a uniform bulk cement tariff of INR0.90[100] per tonne-km (November 2025), replacing the earlier slab-based freight structure. Stakeholders have further recommended reclassifying clinker from freight class 140A to 130A and reinstating the 25 percent Long Lead Traffic concession for clinker transported over 1,000 km.

Rail operational challenges: Inadequate rake availability, non-standard siding charges, poor condition of BOXN wagons, and infrastructure deficiencies at goods sheds and sidings increase logistics costs and disrupt dispatches. Modernisation of sidings, standardised charges, improved rake allocation, and 24×7 operations have been recommended.

Policy recommendations: Stakeholders have also proposed exempting the busy-season surcharge during the July–September lean-demand period to improve rail utilisation and lower logistics costs.

5.2 Infrastructure bottlenecks across the value chain

India's logistics infrastructure comprises a network of nodes such as ports, railway stations, and warehouses, interconnected through roads, railways, inland waterways, coastal shipping, air routes, and pipelines. The effective operation of this network depends on a skilled workforce and the integration of appropriate technologies and systems.

Railway

India's High Density Network (HDN) corridors comprise only ~16 percent of the railway network (≈11,050 km) but carry about 41 percent[101] of total rail traffic, resulting in severe capacity constraints and service delays. Bulk commodities such as coal and iron ore remain heavily dependent on these long-haul rail corridors, as road transport is uneconomical over long distances. Future rail capacity augmentation should therefore account for both infrastructure expansion and commodity-specific operational requirements to support a greater modal shift from road to rail.

[100] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2191294
[101] National Rail Plan

Figure 28: High-density railway network in India

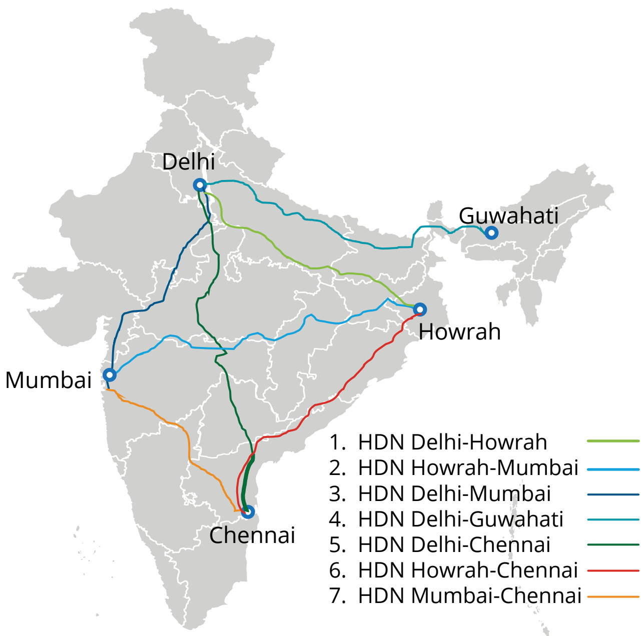
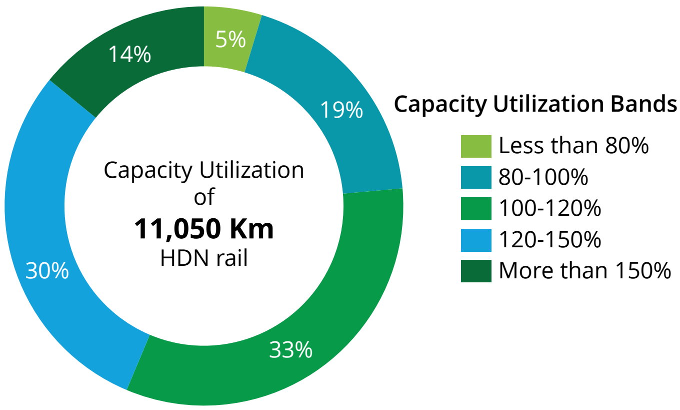


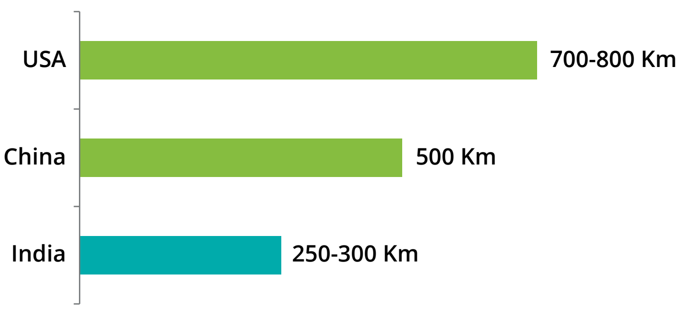
Figure 29: Capacity utilisation distribution of the HDNs[102]



Road

Road network, despite being the dominant mode of transport, also faces several structural challenges. Although India has more than 10 million trucks, fleet utilisation remains low. Furthermore, 25–30 percent of truck trips are empty return journeys, and trucks operating at utilisation levels below 15 percent are estimated to waste INR1.5–2 lakh crore[103] annually in logistics costs. Fleet ageing further compounds these inefficiencies, with more than 40 percent of trucks being over 10 years old, resulting in lower fuel efficiency and reduced reliability, particularly on long-haul mineral and clinker routes.

Figure 30: Average daily distance covered by trucks[104]



Ports

Port infrastructure has improved considerably in recent years; however, operational efficiency still lags global benchmarks. While ports such as Singapore achieve vessel turnaround times of 12 hours,[105] Indian ports continue to average around 1.5-2 days. Connectivity gaps between ports and their hinterlands, including congested rail crossings and crowded approach roads near major iron ore and coal-handling ports, further delay cargo movement. Sagarmala-led projects at ports such as Chennai, New Mangalore and Kamarajar aim to improve road and rail connections to ease congestion and facilitate smoother freight movement.

Warehousing

The warehousing sector remains fragmented, with only 35–40 percent[106] meeting the international Grade A standards. Land availability near metropolitan areas poses a significant constraint, forcing businesses to establish multiple smaller facilities rather than optimised distribution centres. This fragmentation increases inventory holding costs and reduces overall supply chain efficiency.

[102] https://indianrailways.gov.in/railwayboard/uploads/directorate/planning/High%20Density%20Network%20in%20Indian%20Railways.pdf
[103] https://www.businesstoday.in/union-budget/opinion/story/logistics-costs-to-gdp-can-budget-2026-finally-move-the-needle-513228-2026-01-28
[104] https://www.niti.gov.in/sites/default/files/2021-06/FreightReportNationalLevel.pdf
[105] https://www.mpa.gov.sg/maritime-singapore/what-maritime-singapore-offers/global-hub-port
[106] https://solwerindia.com/blog/2025/predictive-maintenance-equipment-management/

Skilled workers

India's logistics sector employs over 22 million people;[107] however, only 4.7 percent[108] of the workforce is formally skilled, highlighting a significant capability gap across transport, warehousing, ports and bulk cargo handling operations. The sector also faces an estimated 20 percent[109] shortage of truck drivers, with an immediate requirement for ~80,000[110] additional drivers, constraining fleet availability and increasing turnaround times for transportation. These workforce shortages adversely impact the efficient movement of bulk commodities such as iron ore, coal, limestone and steel, contributing to higher logistics costs and operational delays across the mining and metals value chain. The increasing deployment of digital technologies, automation, AI-enabled fleet management, and mechanised cargo handling further underscores the need for skilled operators, maintenance personnel, and logistics planners. Addressing these skill gaps through targeted workforce development and industry-led training programmes is critical to improving logistics efficiency and supporting the future growth of India's metals and mining sector.

Sustainable logistics

Looking ahead, decarbonising India's long-haul freight transport will require the development of a nationwide network of electric truck charging corridors supported by standardised charging connectors, communication protocols and interoperable payment systems. Such standardisation would eliminate infrastructure fragmentation, enable seamless interstate movement of electric heavy-duty vehicles and accelerate fleet electrification. Complementary policy measures, including fiscal incentives, green financing and carbon credit mechanisms, can further improve the commercial viability of low-emission freight transport, supporting a more sustainable, resilient and competitive logistics ecosystem for the metals and mining sector.

5.3 Regulatory, policy and procedural friction

The metals and mining logistics ecosystem continues to face regulatory and operational challenges arising from freight pricing, transport permits, railway wagon allocation, and port access, all administered by multiple authorities. Planning responsibilities are dispersed across several ministries, resulting in coordination gaps and delays in infrastructure development, as highlighted in the Aluminium Vision 2047 and Copper Vision 2047. Operationally, inadequate railway rake availability often forces bulk commodities such as iron ore and cement onto roads, even though rail is more economical for long-distance movement. In contrast, first-mile infrastructure projects, such as railway sidings, require multiple approvals from central and state governments, prolonging implementation. Stakeholders have recommended extending the First Mile Connectivity (FMC) model beyond coal to other bulk minerals to improve rail evacuation and reduce reliance on roads.

Road freight continues to face high logistics costs due to toll charges. Toll collections have nearly doubled from INR27,504 crore in FY2020 to INR55,882 crore in FY2024.[111] While toll rates are revised annually to account for inflation, this increases transportation costs for long-haul bulk commodities such as minerals, steel, and cement. Stakeholders have recommended rationalisation of toll charges for bulk freight vehicles, particularly where rail alternatives are unavailable, to improve logistics competitiveness.

Looking ahead, stakeholders have also emphasized the need for fiscal incentives, low-interest financing, toll exemptions, and carbon credit mechanisms to accelerate the adoption of LNG- and electric-powered freight vehicles, enabling a more efficient, coordinated and sustainable logistics ecosystem for the metals and mining sector.

5.4 Digital and technology adoption gaps

India's digital logistics ecosystem has advanced significantly through the Unified Logistics Interface Platform (ULIP), which integrates 30+ government systems across seven ministries through 100+ APIs, enabling real-time access to FASTag data from 800+ toll plazas, FOIS data covering 9,000+ commercial trains, and vehicle and driver verification databases. While these initiatives have improved shipment visibility and reduced detention and demurrage costs for large organised shippers, adoption remains uneven across the metals and mining sector, particularly among MSMEs, secondary steel producers, mini cement plants and scrap traders. The fragmented trucking industry,

[107] https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=155038&ModuleId=3&reg=3&lang=2
[108] https://www.peoplematters.in/article/employee-skilling/bridging-the-skill-gap-a-pathway-to-transforming-indias-logistics-sector-45702
[109] https://www.peoplematters.in/article/employee-skilling/bridging-the-skill-gap-a-pathway-to-transforming-indias-logistics-sector-45702
[110] https://www.peoplematters.in/article/employee-skilling/bridging-the-skill-gap-a-pathway-to-transforming-indias-logistics-sector-45702
[111] https://prsindia.org/budgets/parliament/demand-for-grants-2026-27-analysis-road-transport-and-highways

where nearly 80 percent[112] of trucks operate in the unorganised sector, limiting GPS integration, real-time tracking and digital freight management, constraining the potential 15–20 percent reduction in corridor travel times achievable through integrated digital systems. AI adoption in logistics across the metals and mining sector remains limited and largely confined to pilot projects and large enterprises, with limited penetration among MSMEs and fragmented transport operators. Although digital platforms such as Enterprise Business Systems (EBS) and e-Port Clearance have been implemented at major ports, wider adoption of common digital standards across ports, trucking operators, mines and industrial users remains essential to unlock end-to-end visibility and efficiency in bulk commodity logistics.

5.5 First- and last-mile connectivity challenges

First- and last-mile connectivity remain among the most persistent constraints on India's logistics performance despite substantial investments in highways, DFCs, ports and digital infrastructure. In the metals and mining sector, these bottlenecks are most pronounced in the movement of minerals from mines to railheads and the delivery of finished products to customers. The coal sector demonstrates the benefits of mechanised First Mile Connectivity (FMC) through enclosed conveyors, rapid loading systems, and integrated silos, which reduce truck dependence, dust emissions, quality losses and wagon turnaround time. However, similar mechanisation has not been widely adopted in the iron ore, cement and non-ferrous metals sectors, where dependence on road transport for mine-to-siding movement continues to increase logistics costs, transit times and weather-related disruptions.

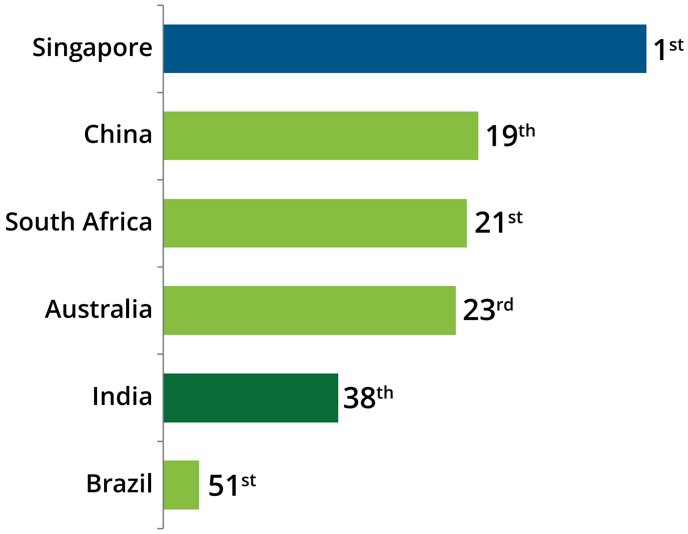
Mineral-rich regions in Odisha, Chhattisgarh and Jharkhand continue to lack all-weather road connectivity to railheads. At the same time, many secondary steel re-rolling mills and mini cement grinding units operate without dedicated rail sidings, relying almost entirely on road transport. Expanding mechanised FMC systems, improving road connectivity and developing additional rail sidings will be essential to reducing logistics costs and realising the full benefits of India's multimodal transport investments.

[112] https://tcifreight.in/wp-content/uploads/2025/06/a-joint-study-report-by-tci-iim-2009-10.pdf

6. Global best practices and learnings

India's metals and mining sector transported over 1 billion tonnes of bulk freight in FY25. As freight volumes continue to grow, logistics costs, modal mix, and first- and last-mile connectivity remain important determinants of the global competitiveness of its iron ore, steel and cement industries. Although India improved its ranking in the 2023 Logistics Performance Index (LPI) from 54th in 2014 to 38th out of 139 countries, reflecting significant investments in transport infrastructure and logistics reforms, further opportunities exist to strengthen logistics performance relative to leading mining economies such as Australia, China and South Africa, which benefit from integrated mine-to-port logistics corridors. Moreover, while Brazil and South Africa also face infrastructure constraints, their dedicated mineral freight corridors illustrate the benefits of efficient rail connectivity, multimodal integration and streamlined bulk commodity evacuation in enhancing logistics performance and industrial competitiveness.

Figure 31: Logistic Performance Index ranking of mineral-rich geographies (2023)[113]



6.1 Case studies from Australia, Brazil, South Africa and China on logistics optimisation in mining and metals

Australia: Pilbara Rail-Port Integration Model

Western Australia's Pilbara region is a fully vertically integrated, single-commodity logistics machine. Four mining companies, each of which owns and operates dedicated, standard-gauge heavy-haul railways running from their own mines directly to their own port terminals, with no shared third-party network in between for the two largest players.[114] The combined Pilbara rail network exceeds 3,800 km of private track and feeds the ports of Port Hedland, Dampier and Cape Lambert.

This single-owner, single-commodity model removes the coordination failures that affect multi-user freight networks. There is no slot allocation dispute between competing shippers, no tariff-setting conflict between an infrastructure manager and operating companies, and capital investment decisions are made by the same entity that captures the logistics benefit. It is this clean alignment of incentives, not just capital intensity, that has allowed Rio Tinto to automate its entire 1,700 km[115] network.

Brazil: Export-oriented logistics corridors

Brazil's iron ore logistics are organised around two long-haul, dedicated export railways operated under federal concession[116] by the world's largest iron ore producer. The Carajás logistical corridor in the northern state of Pará connects the Carajás mining complex with the maritime terminal through the Estrada de Ferro Carajás (EFC) railway network. and the Vitória-Minas railway (EFVM) in the southeast, linking the Iron Quadrangle mines of Minas Gerais to the Port of Tubarão in Espírito Santo.

[113] https://datacatalog.worldbank.org/infrastructure-data/search/dataset/0038649/logistics-performance-index
[114] https://rail.nridigital.com/future_rail_jul23/pilbara_western_australia_mining_rail_network
[115] https://www.wsp.com/en-au/projects/autohaul
[116] https://vale.com/w/vale-informs-on-the-renegotiation-of-railway-concession-contracts

Table 16: Brazil's logistics corridor

Corridor	Length	Port terminal	Concession expiry
Estrada de Ferro Carajás (EFC)	892 km	Ponta da Madeira (São Luís, MA)	2057
Vitória-Minas (EFVM)	905 km	Tubarão (Espírito Santo)	2057

Brazil has developed a highly efficient iron ore logistics system centred on the 892 km Estrada de Ferro Carajás (EFC), which enables the operation of 3.5 km-long heavy-haul trains comprising 330 wagons and carrying up to 40,000 tonnes of iron ore per trip, significantly reducing transport costs per tonne-kilometre. To address first- and last-mile connectivity, the S11D Eliezer Batista Complex[117] has adopted a truckless mining model, where shovels and mobile crushers feed ore directly onto a 30 km-long conveyor network connecting the mine to the processing plant and rail-loading facilities. With a production capacity of 90 MTPA, the system eliminates haul trucks, reduces fuel consumption by 70 percent, lowers emissions and maintenance waste and demonstrates how integrated conveyor–rail systems can substantially improve evacuation efficiency compared with conventional truck-based mine logistics.

South Africa: Freight corridor-based logistics strategy

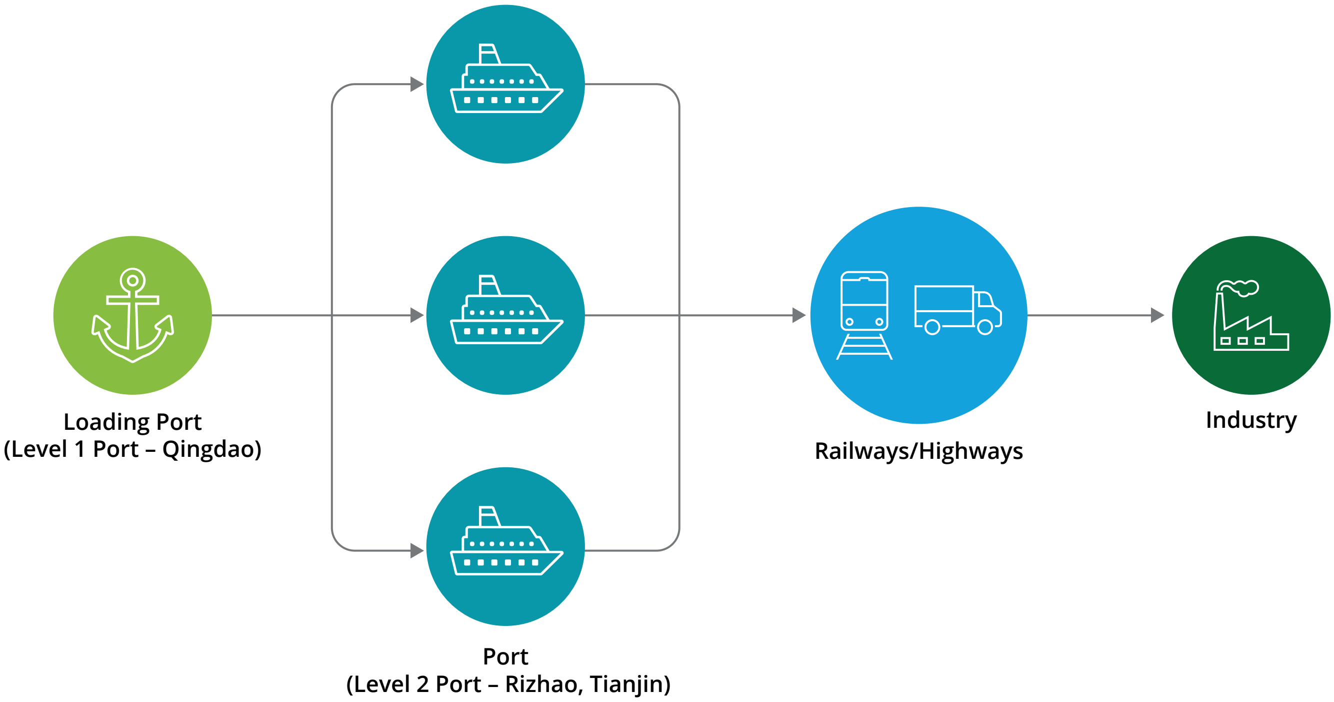
South Africa has adopted a freight corridor–based logistics strategy centred on dedicated heavy-haul mineral corridors operated by Transnet Freight Rail (TFR),[118] enabling efficient pit-to-port movement of bulk commodities. The 861 km Ore Corridor (OreCor) connects the iron ore mines at Sishen to the Port of Saldanha. It operates some of the world's heaviest and longest production trains, including 348-wagon iron ore trains and 375-wagon manganese trains stretching nearly 4 km and supported by 30-tonne axle loads, maximising throughput while reducing transport costs. Complementing OreCor are the North Corridor (coal) and Cape Corridor (manganese and general freight), which provide dedicated rail connectivity for bulk mineral exports. At the maritime end, the Port of Saldanha functions as an integrated heavy-haul export hub with an installed iron ore handling capacity of 57 MTPA, two deep-water berths capable of accommodating Capesize vessels, and an additional 8.5 MTPA multi-purpose terminal, enabling high-volume, seamless mine-to-port logistics. This integrated freight corridor model demonstrates how dedicated rail infrastructure, heavy-haul train operations and specialised export terminals can significantly improve the efficiency of bulk mineral evacuation, reduce logistics costs and enhance export competitiveness.

China: Integrated multimodal logistics ecosystem

China has adopted a state-led multimodal logistics strategy that integrates heavy-haul railways, inland waterways, ports and industrial clusters to optimise the movement of bulk commodities such as coal, iron ore and steel. The Yangtze River Economic Belt serves as the backbone of this system, with steel plants, ports, and manufacturing hubs strategically located to minimise transport distances and logistics costs. In parallel, China has promoted a nationwide road-to-rail policy[119] that shifts bulk freight from highways to rail and water transport.

[117] https://www.mining-technology.com/contractors/data//pressreleases/pressprojects11d-eliezer-batista/
[118] https://www.transnet.net/SubsiteRender.aspx?id=4444386
[119] https://www.tandfonline.com/doi/full/10.1080/17583004.2020.1840874#d1e201

Figure 32: China's transport network chain



China has also emerged as the global leader in smart port automation, with 52[120] automated container and bulk cargo terminals, either operational or under construction. At Qingdao Port, automation has increased container throughput by 15 percent, improved operational efficiency by 6 percent, and achieved an average crane productivity of 60.9 container moves per hour, setting multiple world records for automated terminal performance. Similarly, Yantai Port's fully automated ore terminal has improved bulk cargo loading and unloading efficiency by more than 20 percent through end-to-end automation. Supported by artificial intelligence, 5G communications, and integrated digital control systems, these smart ports have significantly enhanced cargo handling efficiency, reduced vessel turnaround times, and strengthened China's position as a global benchmark in bulk commodity logistics

6.2 Lessons for India: Transferable models and policy learnings

International experience demonstrates that high-performing mining economies have reduced logistics costs not merely through infrastructure expansion, but by integrating rail, ports, first-mile connectivity and digital systems into coordinated freight networks. While India's institutional and market structures differ from those of these countries, several practices can be adapted to improve mineral evacuation efficiency, strengthen multimodal connectivity and reduce logistics costs for bulk commodities.

Table 17: International best practices in mining and metals logistics value chains

Country	International best practice	Transferable lesson for India
Australia	Vertically integrated mine–rail–port logistics with dedicated heavy-haul rail networks and single-owner infrastructure.	Promote integrated logistics planning through mine–rail–port connectivity, encourage and align infrastructure investments with mining and port development to reduce coordination delays.
Brazil	Dedicated export rail corridors (EFC & EFVM), ultra-heavy haul trains (40,000 tonnes), and truckless mining using conveyor-based first-mile connectivity.	Develop dedicated export corridors and encourage conveyor-based mine evacuation to reduce reliance on roads, emissions and logistics costs.

[120] https://lmitac.com/news/automated-ports-china-leads-the-way

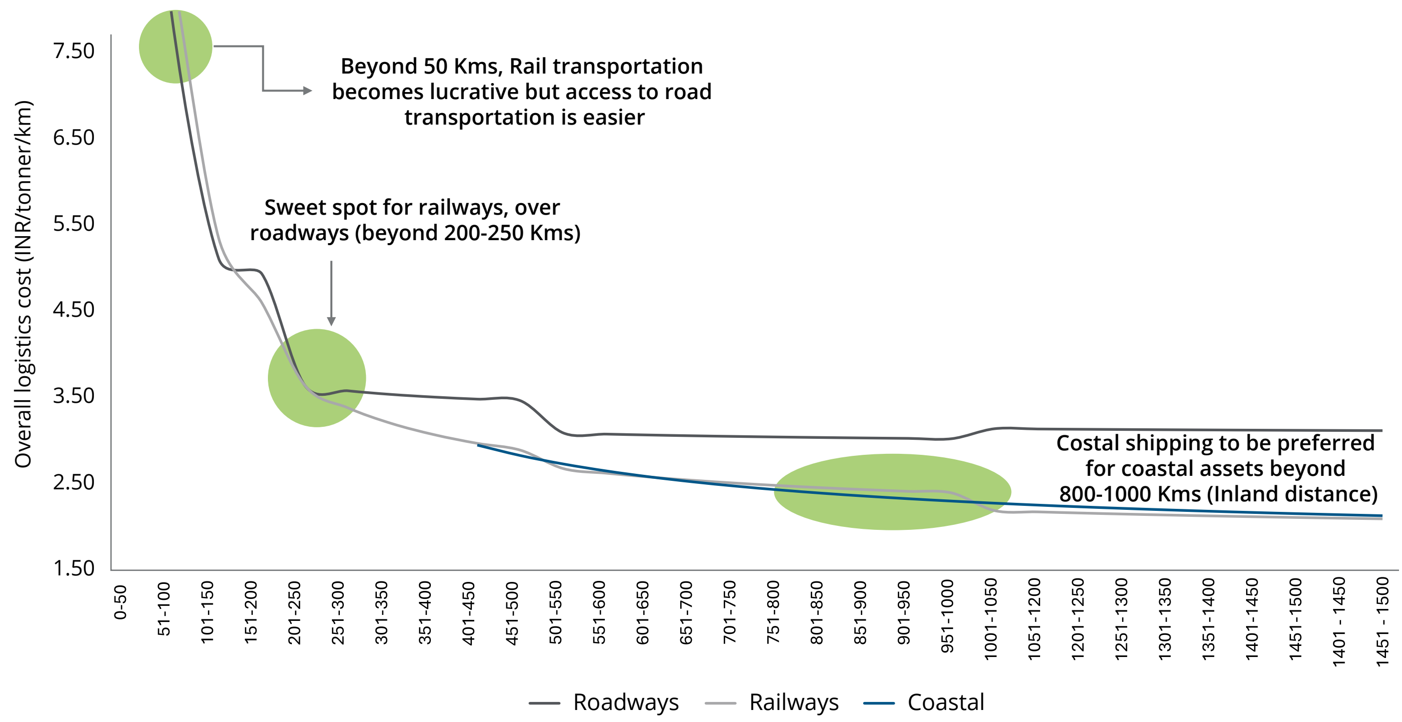
Country	International best practice	Transferable lesson for India
South Africa	Dedicated heavy-haul freight corridors integrated with specialised bulk export terminals.	Develop commodity-specific freight corridors connecting mineral belts to ports, strengthen heavy-haul rail operations and improve integration between rail infrastructure and bulk cargo terminals to enhance evacuation efficiency.
China	State-led multimodal logistics integrating rail, waterways, ports, industrial clusters, road-to-rail policy and smart port automation.	Accelerate multimodal logistics through rail–waterway integration, promote road-to-rail modal shift for bulk minerals, expand smart port automation and strengthen digital logistics platforms (ULIP, FOIS) for end-to-end supply chain visibility.

The international benchmarking highlights that successful mining economies treat logistics as an integrated value chain rather than as isolated investments in roads, railways, or ports. For India, the greatest opportunity lies in combining ongoing initiatives such as PM GatiShakti, Dedicated Freight Corridors, first- and last-mile connectivity, GatiShakti Cargo Terminals, and the National Logistics Policy (NLP) into a unified mineral logistics strategy. Such an approach can significantly reduce logistics costs, improve export competitiveness, and support India's long-term objectives under the National Steel Policy 2017 and Viksit Bharat 2047.

6.3 Logistics cost competitiveness

An integrated multimodal logistics framework that leverages railways, coastal shipping, inland waterways and roads based on their respective cost and operational advantages can significantly improve logistics cost competitiveness. India is increasingly adopting this approach through investments in Dedicated Freight Corridors, multimodal logistics parks, port connectivity and National Waterways, enabling greater integration across transport modes. As illustrated, while road transport remains critical for first- and last-mile connectivity, shifting bulk commodities such as coal, iron ore, steel, cement and fertilisers to rail beyond 200–250 km, where rail becomes more cost-effective, can further improve logistics efficiency. For long-haul movements exceeding 800–1,000 km, greater use of coastal shipping and inland waterways can provide lower transportation costs and carbon emissions per tonne-kilometre. Collectively, these measures can reduce logistics costs, improve freight reliability, alleviate road congestion and support India's decarbonisation objectives through greater use of energy-efficient rail and water-based transport.

Figure 33: Distance-based modal economics



7. Navigating the way forward

India's metals and mining sector is expected to experience significant growth, driven by rising demand for coal, iron ore, steel, cement and critical minerals. As freight volumes increase, logistics efficiency will become an increasingly important enabler of cost competitiveness and resilient supply chains. Continued strengthening of multimodal connectivity, rail evacuation infrastructure, first- and last-mile connectivity, rail modal share, inland waterways, rail capacity, fleet utilisation and digital integration can further enhance logistics performance across the mining and metals value chain.

Prioritizing the use of high-strength, durable materials in the construction and modernization of railway wagons, ports, bridges, warehouses and material handling infrastructure is essential as their adoption will improve structural reliability, extend asset life, reduce maintenance and lifecycle costs, enhance corrosion resistance, enhance operational efficiency, and support the development of resilient, sustainable and future-ready logistics networks.

Realising these opportunities will require a phased roadmap combining immediate operational improvements, medium-term regulatory and infrastructure interventions, and long-term investments in integrated multimodal logistics systems. The recommendations presented below are aligned with the key opportunities identified across the mining and metals logistics ecosystem.

7.1 Short-term interventions (0–2 years): quick wins for cost reduction

The short-term interventions focus on operational improvements, policy rationalisation and digital adoption that can deliver immediate reductions in logistics costs without requiring significant capital investment. The government should implement policy reforms, streamline regulatory approvals and improve coordination across transport modes. Industry should adopt digital platforms and optimise logistics operations. In contrast, logistics service providers should modernise fleets, enhance asset utilisation, improve service efficiency and leverage technology to deliver more reliable, cost-effective freight movement.

Table 18: Short-term recommendations

Areas	Recommendations
Rail logistics	• For movement of bulk minerals, allowing greater participation of private freight operators/ mining firms and promoting shared use of private railway sidings, resulting in higher rail modal share, improved asset utilisation and lower freight costs • Develop a National Steel Rail Freight Aggregation Platform under the Ministry of Steel in coordination with Indian Railways to aggregate freight demand from MSME clusters, enable shared rake booking and optimise rake planning, increasing rail-based dispatches from secondary units. • Undertake feasibility studies through the Research Designs and Standards Organisation (RDSO) to redesign wagon configurations and develop higher-capacity, modular wagon designs, including detachable cassette (frame) systems like those used in Europe, for transporting steel products (e.g., long products and coils) and bulk cargo. This would increase wagon load capacity, improve operational flexibility, asset utilisation, and lower overall rail logistics costs. • To facilitate streamlined logistics operations and ensure a reliable raw material supply chain, iron ore, aluminium and other critical raw materials should be reclassified from Category "D" to Category "C" in the Railway's Preferential Traffic Order. • Remove inflated railway mileage charges for mineral evacuation corridors after CAPEX recovery, by periodically reviewing rail links serving mines, steel plants and ports. This will reduce rail freight costs for iron ore, coal, limestone, steel and other bulk mineral commodities, improving the competitiveness of rail transport.
Road logistics	• Development of dedicated truck corridors or segregated freight lanes connecting industrial locations directly to the nearest national highways or major arterial roads to improve logistics efficiency.

Areas	Recommendations
Port logistics	• Modernise operations at major mineral-handling ports such as Paradip, Dhamra, Haldia and Gangavaram through digital gate management, AI-enabled berth planning, and 24×7 digital customs clearance, reducing vessel turnaround time, improving berth productivity, and accelerating the evacuation of iron ore, coal, steel and other bulk mineral cargo.
Policy and regulatory reforms	• Implement single-window digital approvals for logistics infrastructure projects by integrating environmental, railway, road and port clearances, resulting in faster project implementation and reduced regulatory delays. • Introduce auto-revision of mineral transport permits to automatically approve alternative routes during road closures, restrictions or diversions. • Launch a National Metals & Minerals Logistics Mission (NMMLM) to coordinate infrastructure planning, policy implementation and multimodal logistics development across the Ministries of Railways, Road Transport & Highways, Ports, Shipping & Waterways, Coal, Steel and Mines, resulting in integrated decision-making, faster project implementation and improved policy coordination.

7.2 Medium-term reforms (2–5 years): Structural and regulatory changes

Medium-term reforms require coordinated investments in logistics infrastructure, multimodal integration and regulatory changes to improve the efficiency of mineral transportation. The government should facilitate infrastructure development through supportive policies, public-private partnerships and regulatory reforms. Industry should invest in rail connectivity, mechanised handling systems, slurry pipelines, and multimodal logistics infrastructure, while logistics service providers should expand integrated logistics solutions, strengthen multimodal capabilities and deploy advanced digital systems to improve visibility, planning and operational efficiency.

Table 19: Medium-term recommendations

Areas	Recommendations
Rail logistics	• Promote rail evacuation infrastructure for all new integrated steel plants, beneficiation plants and large mining projects by making railway sidings and last-mile rail connectivity part of project approvals, resulting in lower dependence on road transport, reduced logistics costs and faster evacuation of bulk minerals. • Mechanise bulk cargo handling at railway terminals by deploying Rapid Wagon Loading Systems (RWLS) and rapid unloading systems for iron ore, coal, limestone, pellets and steel to reduce wagon turnaround time, improve asset utilisation and increase terminal throughput.
Road logistics	• For the mining and metals sector, accelerate replacement of ageing mineral haulage trucks with higher-payload, fuel-efficient vehicles through fleet modernization incentives, enabling more coal, iron ore, limestone and steel to be transported per trip, reducing the number of trips, transit time, fuel consumption and overall logistics costs.
Slurry pipelines and conveyor systems (first-mile connectivity)	• Promote slurry pipelines and conveyor-based first-mile connectivity for bulk mineral transport by encouraging adoption for high-volume bulk transport, and expanding mine-to-plant/rail/port networks and establishing a Slurry Pipeline Association of India to facilitate implementation, standardisation, regulatory reforms, and faster approvals. This will reduce road dependence, lower logistics costs, ease congestion and improve the environmental sustainability of mineral transportation.
Digital logistics integration	• Establish a bulk commodity Logistics Control Tower integrated with ULIP, FOIS, e-Way Bill and Port Community System (PCS) to enable end-to-end visibility, real-time tracking, multimodal coordination and optimised movement of minerals and metals across rail, road and ports.
Linkage rationalisation	• Replicate the successful coal Fuel Supply Agreements (FSAs) linkage rationalisation model for other bulk minerals by periodically rationalising long-term iron ore and limestone supply linkages based on plant proximity, transport mode and available infrastructure. This would reduce average haulage distances, optimise multimodal freight movement, ease rail congestion and lower overall logistics costs.

Areas	Recommendations
Private investment and financing	• Promote large-scale Public-Private Partnerships (PPPs) to develop heavy-haul rail corridors, railway sidings, freight terminals, Multi-Modal Logistics Parks (MMLPs), conveyor systems, slurry pipelines and port infrastructure, accelerating mineral evacuation while reducing public capital requirements.
Coastal shipping and inland waterways	• Expand inland water transport for mining and metals by operationalising National Waterway-5 (NW-5) connecting Odisha and West Bengal and developing dedicated bulk cargo terminals to link the mineral belts of Odisha, Jharkhand and Chhattisgarh with Paradip and Dhamra ports, reducing logistics costs and improving multimodal connectivity.
Multimodal logistics	• Develop integrated multimodal logistics hubs by establishing Multimodal Logistics Parks at Raipur, Raigarh and other mineral value chain clusters, for bulk commodities, creating port-based aggregation hubs, rail-linked stockyards near major consumption centres and specialised bulk commodity warehouses for iron ore, coal, limestone, bauxite, pellets and finished steel with mechanised loading and multimodal connectivity. This will support MSMEs through shared logistics infrastructure while reducing handling losses, inventory costs and overall logistics costs.

7.3 Long-term strategic priorities: Infrastructure investment, digital integration, multimodal hubs

Long-term priorities aim to transform the logistics ecosystem through large-scale infrastructure expansion, institutional reforms and sustainable freight transport. The government should lead the development of strategic national infrastructure, strengthen inter-ministerial coordination and create long-term policy frameworks that encourage private investment. Industry should adopt sustainable transport technologies and collaborate across the value chain to improve network efficiency. Logistics service providers should develop advanced multimodal capabilities, leverage digital technologies and support the transition towards integrated, low-carbon and globally competitive logistics networks.

Table 20: Long-term recommendations

Areas	Recommendations
Rail logistics	• Expand the DFC network for mining and metals by fast-tracking the East–West DFC and extending DFC connectivity to major mining regions in Odisha, Chhattisgarh, Jharkhand and Karnataka, linking mines with beneficiation plants, steel plants and ports to enable high-volume bulk freight movement, reduce logistics costs and decongest the rail network. • Upgrade high-density mining rail corridors through line doubling, electrification and higher axle load capability (32.5–35 tonnes) to increase freight capacity, improve train speeds and boost bulk commodity throughput.
Port logistics	• Upgrade major bulk mineral ports to handle Capesize and other large bulk carriers by deepening navigation channels, increasing berth drafts to 18–20 metres and developing dedicated mechanised mineral berths for iron ore, coal and limestone, thereby reducing ocean freight costs, increasing export capacity and improving the global competitiveness of India’s metals and mining sector. • Institutionalize year-round, data-driven dredging at key ports such as Kolkata, Paradip, Dhamra, Haldia, Gangavaram, etc. using predictive monitoring and modern dredging technologies to ensure reliable navigability. Support implementation through enhanced funding or PPP models and link dredging performance to measurable KPIs under Sagarmala and Maritime India Vision 2030 to improve efficiency and long-term sustainability.
Sustainable logistics	• Promote adoption of electric-powered freight vehicles for short- and medium-distance freight movement, supported by alternative fuel infrastructure (e.g. EV charging infrastructure), resulting in lower emissions and cleaner freight transport. • Develop green ports and carbon-neutral logistics parks incorporating renewable energy, water recycling, energy-efficient buildings and sustainable warehousing practices, resulting in environmentally sustainable logistics infrastructure aligned with India’s net-zero objectives. • Promote inland water transport for bulk logistics by integrating inland waterways with rail networks and developing efficient multimodal loading and unloading infrastructure to shift freight from road to waterways, reducing logistics costs, congestion and carbon emissions.

Connect with us

Deloitte Touche Tohmatsu India LLP

Ashwin Jacob
Partner
ashwinjacob@deloitte.com

Rajib Maitra
Partner
rajmaitra@deloitte.com

Anurag Gupta
Partner
anurgupta@deloitte.com

Tushar Chakraborty
Executive Director
tchakraborty@deloitte.com

FICCI

Abha Seth
Assistant Secretary General
abha.seth@ficci.com

Arpan Gupta
Director & Head
Mines, Metals, Cement, Power, Coal
Hydrocarbons and Renewable Energy
arpan.gupta@ficci.com

Namrata Sagar
Senior Assistant Director
namrata.sagar@ficci.com

Contributors

Deloitte Touche Tohmatsu India LLP

Yash Raj Singh
Rishi Mishra
Sumandeep Kaur
Kumar Sankalp
Ranmaya Roul
Avik Dutta
Harsh Garg

FICCI

Amitava Mukherjee
Satish Pai
Arun Misra
Sandeep Narade
Pankaj Satija

Jyoti Vij
Abha Seth
Arpan Gupta
Namrata Sagar
Siddhant Chandra

About FICCI

Established in 1927, the Federation of Indian Chambers of Commerce and Industry (FICCI) is the largest and oldest apex business organisation in India. Mahatma Gandhi addressed FICCI's fourth AGM in 1931. Our 98th AGM was held in November 2025. With our rich legacy, FICCI would play an even greater role as India emerges as the 3rd largest economy.

FICCI works with its key stakeholders to foster active engagement and dialogue with decision makers, to support steps that are good for commerce and industry.

As a member-led and member-driven organisation, FICCI represents over 2,50,000 companies across all segments of the economy, including public, private, and multinationals. The diverse membership base of FICCI across all Indian states includes both direct and indirect members through its 300 affiliated regional and state-level industry associations. FICCI has a large international presence via partner agreements with 250 national business associations in over 100 countries.

For information or permission to reprint, please contact FICCI at minesandmetals@ficci.com

Contact Us
Mines, Metals & Cement Division
Federation of Indian Chambers of Commerce and Industry
Tel: +91-11-23487536