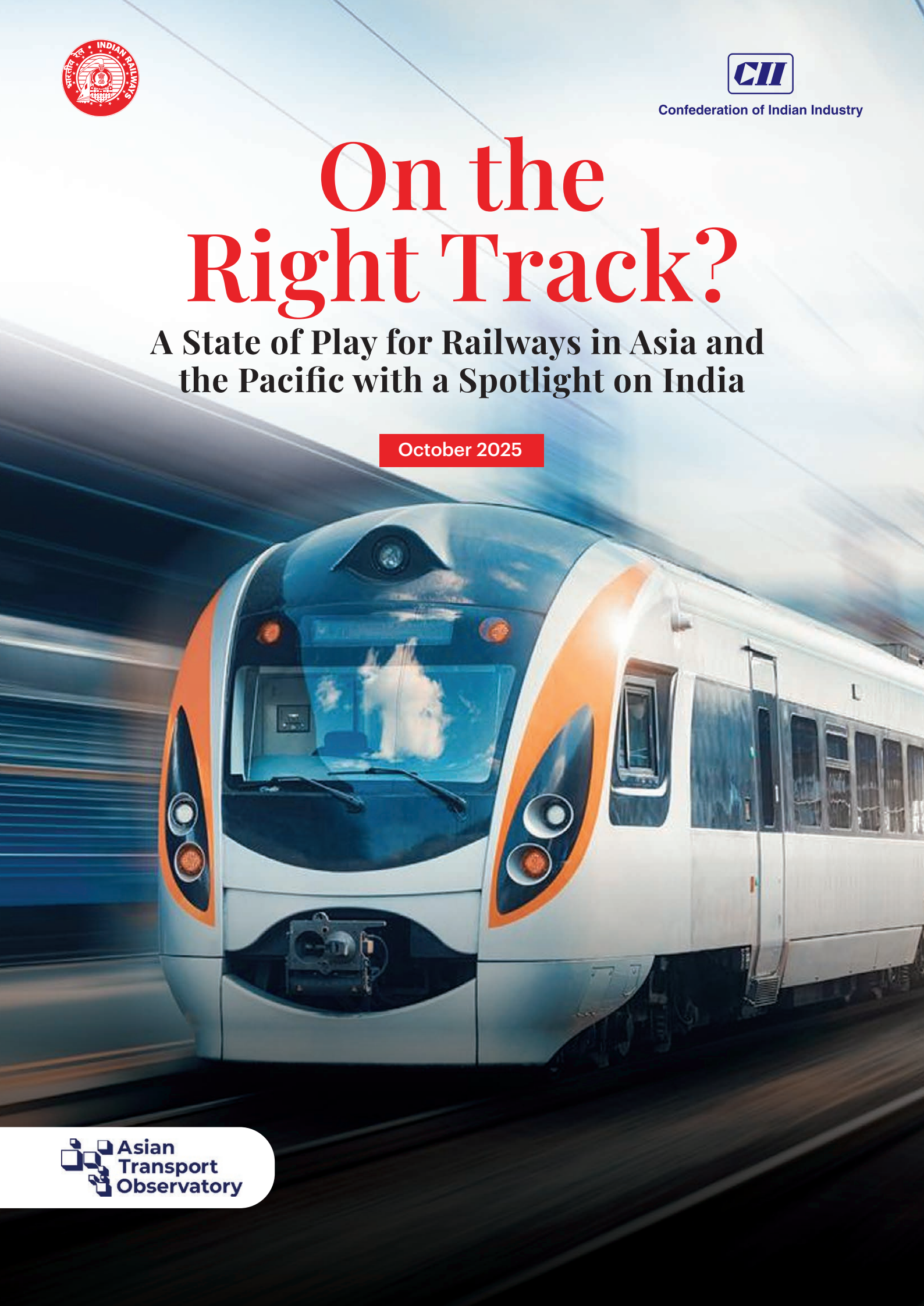
Confederation of Indian Industry

On the Right Track?

A State of Play for Railways in Asia and the Pacific with a Spotlight on India

October 2025



Asian Transport Observatory

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Chandrajit Banerjee

Director General
Confederation of Indian Industry (CII)

Foreword

Asia today stands at a pivotal moment in its development journey. The region's rapid economic growth and expanding mobility needs have reshaped global trade and production networks. Yet, rising emissions and widening connectivity gaps underscore the urgent need for a transition toward sustainable and resilient transport systems. For a continent defined by its scale and diversity, reimagining mobility is both an economic and environmental imperative.

In this context, the report "A State of Play for Railways in Asia and the Pacific" provides evidence-based insights into the state of regional rail infrastructure. It offers a comprehensive and data-driven understanding of trends in investment, energy efficiency, and climate action across the transport sector.

The report draws particular attention to India, highlighting both its progress and its challenges. Indian Railways continues to demonstrate exceptional operational performance and strong decarbonization outcomes. With two-thirds of the locomotive fleet now electrified, India operates one of the most energy-efficient railway systems in the Asia-Pacific.

Landmark initiatives such as the Dedicated Freight Corridors (DFCs) and expanding metro systems are transforming logistics and urban mobility. These efforts signal India's determination to build a modern, competitive, and low-carbon transport ecosystem capable of supporting sustained economic growth.

This publication provides a railway roadmap for the future. It presents actionable insights to guide policy, shape investment decisions, and strengthen partnerships among governments, industry, and development institutions.

CII extends its appreciation to the Asian Transport Observatory (ATO) and all other stakeholders whose collaboration and expertise have been instrumental in developing this important report.

The report will serve as a valuable resource for all stakeholders working to advance sustainable connectivity and economic integration across Asia and the Pacific.

Background

Asia's transport sector is failing its commitments. Progress towards the 2030 Agenda for Sustainable Development and the Paris Agreement has stalled. In Asia and the Pacific, domestic transport emissions hit a record 2.8 gigatons of CO_2 in 2024 (European Commission. Joint Research Centre., 2025). Since the Paris Agreement, Asia's domestic transport emissions have grown at about twice the global average, accounting for over 80% of the global increase. The increase in transport demand has not delivered universal access and connectivity. Far from it. Close to 1.8 billion people, forty percent of Asia's population, remain disconnected, stranded from the opportunities that mobility provides (Center for International Earth Science Information Network, 2023a, 2023b). A silent epidemic from polluted air and unsafe roads claims close to one million lives annually. The current trajectory is unsustainable.

There is another path. Rail is an anomaly of efficiency in the transport sector. It accounts for a just 1% of transport carbon emissions while shouldering 8% of motorized passenger travel and 12% of freight demand (European Commission. Joint Research Centre., 2025; Tjandra et al., 2024). According to the International Energy Agency, the greenhouse gas emissions per passenger-kilometer (GHG/PKM) for rail is, on average, less than one-sixth those of cars, and a fifth of those for air travel. Strategic rail development is a powerful lever for enhancing economic vitality, ensuring energy security, and promoting human well-being.

Without a fundamental realignment of investments and reform, the region's development and climate goals will remain unattainable. Railways are critical to this. For a continent of vast distances and landlocked nations, they are the backbone of economic integration and trade.

To ground these discussions in evidence, the Asian Transport Observatory (ATO)-an initiative of the Asian Development Bank (ADB) and the Asian Infrastructure Investment Bank (AIIB)-has prepared this foundational analysis in collaboration with the CII Infrastructure team. The concise background paper provides an overview of the state of railways in the Asia-Pacific region, with a particular focus on India. It dissects infrastructure, demand, and operational trends. It quantifies energy intensity, electrification progress, and the current state of emissions. The analysis traces investment flows and the urgent work of building climate resilience.

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Rail Infrastructure Development

In the Asian railway industry, growth has been the only constant. Between 2000 and 2023, the Asian network expanded by 234,000 kilometers. This corresponds to a strong annual growth rate of 2.1%, slightly below the 2.2% growth in road network expansion (ATO, 2025). The system's structure shows its priorities: heavy railways make up the traditional core at 86%, while high-speed lines (10%) and urban rail (4%) reflect strategic choices shift (ITDP, n.d.; UIC, 2024).

India's trajectory, however, reveals a deep modal bias. Its rail network grew by just 6,000 kilometers (in route length) over the same period, an annual rate of just 0.4%. This stands in contrast to road development, which expanded eight times faster at 3.2%. The scale of this disparity becomes acute when benchmarked against the broader Asian context. India, a nation representing nearly one-third of the continent's demographic and economic weight, operates with a rail system that is fundamentally out of scale with its stature. In terms of total transport infrastructure, its share of rail capacity rests at just 1.1% even with the inclusion of the Mumbai-Ahmedabad project, which is currently under construction.

Urban rail systems fare only marginally better, at 9%. Such figures illustrate a critical and widening railway deficit (IRJ, 2024; ITDP, n.d.; UIC, 2024).

The railway network's physical footprint offers another lens. In 2024, India's rail density reached 24 kilometers per thousand square kilometers, exceeding the Asia-Pacific mean of 12 and the 2021 OECD benchmark of 14. Yet, this metric is deceptive as population density and economic ambition need to be considered. Overall, the numbers point to a critical and widening railway deficit.

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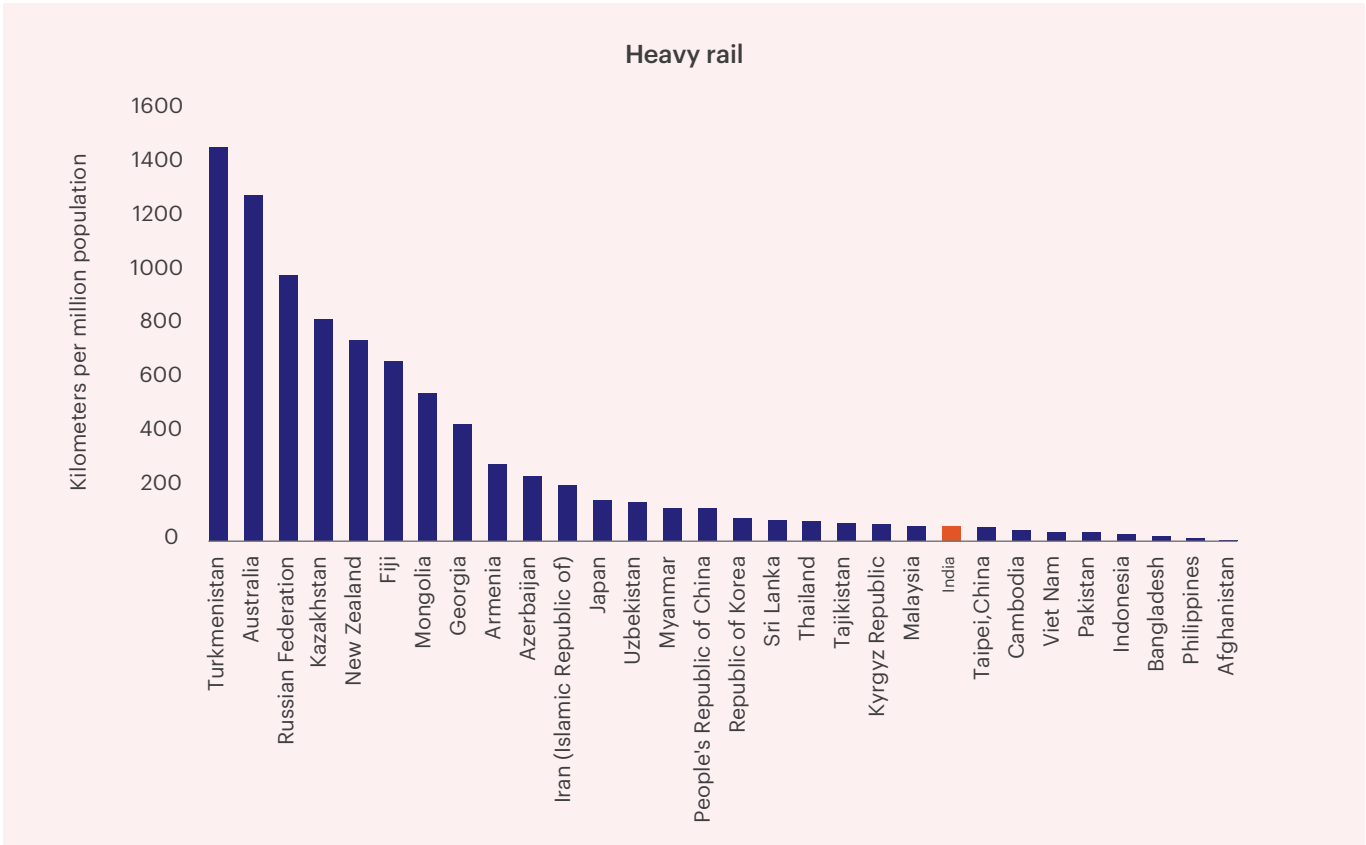
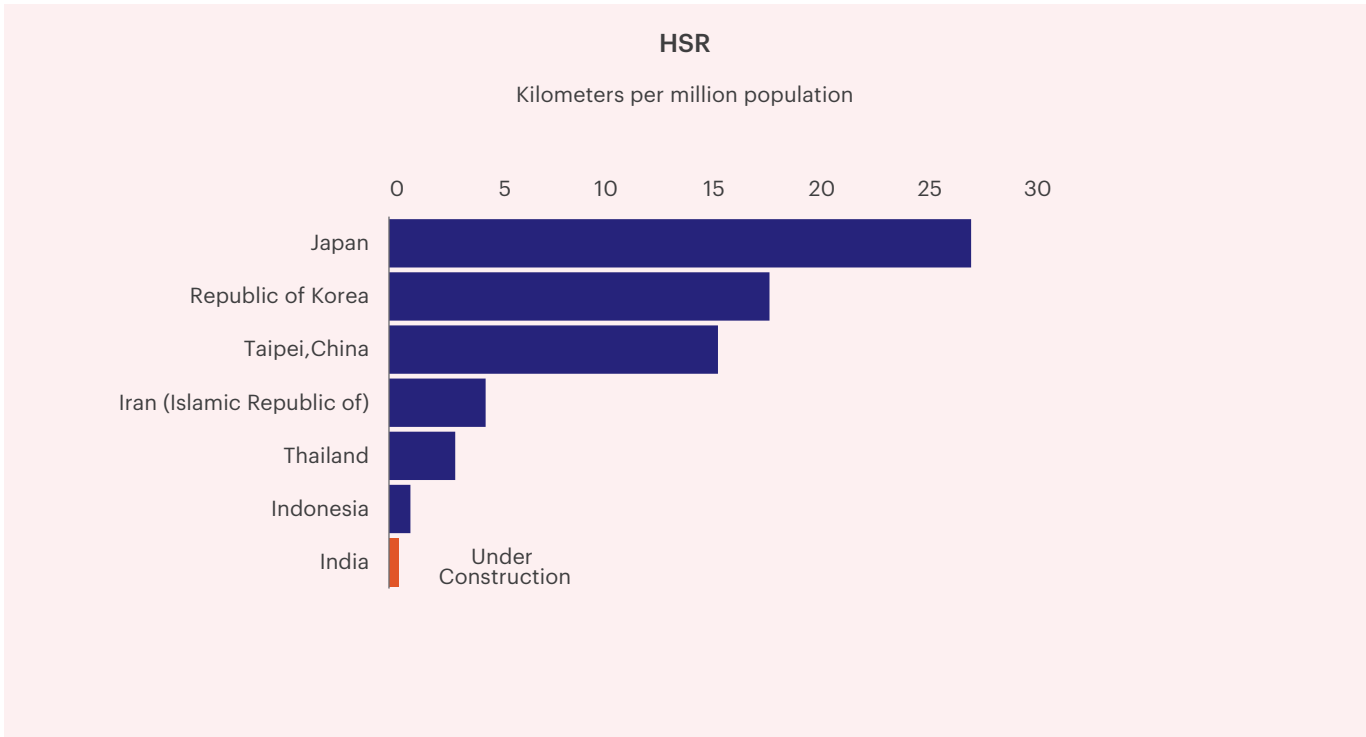

Heavy rail
Kilometers per million population
1600
1400
1200
1000
800
600
400
200
0
Turkmenistan
Australia
Russian Federation
Kazakhstan
New Zealand
Fiji
Mongolia
Georgia
Armenia
Azerbaijan
Iran (Islamic Republic of)
Japan
Uzbekistan
Myanmar
People's Republic of China
Republic of Korea
Sri Lanka
Thailand
Tajikistan
Kyrgyz Republic
Malaysia
India
Taipei,China
Cambodia
Viet Nam
Pakistan
Indonesia
Bangladesh
Philippines
Afghanistan


HSR
Kilometers per million population
0
5
10
15
20
25
30
Japan
Republic of Korea
Taipei,China
Iran (Islamic Republic of)
Thailand
Indonesia
India
Under Construction

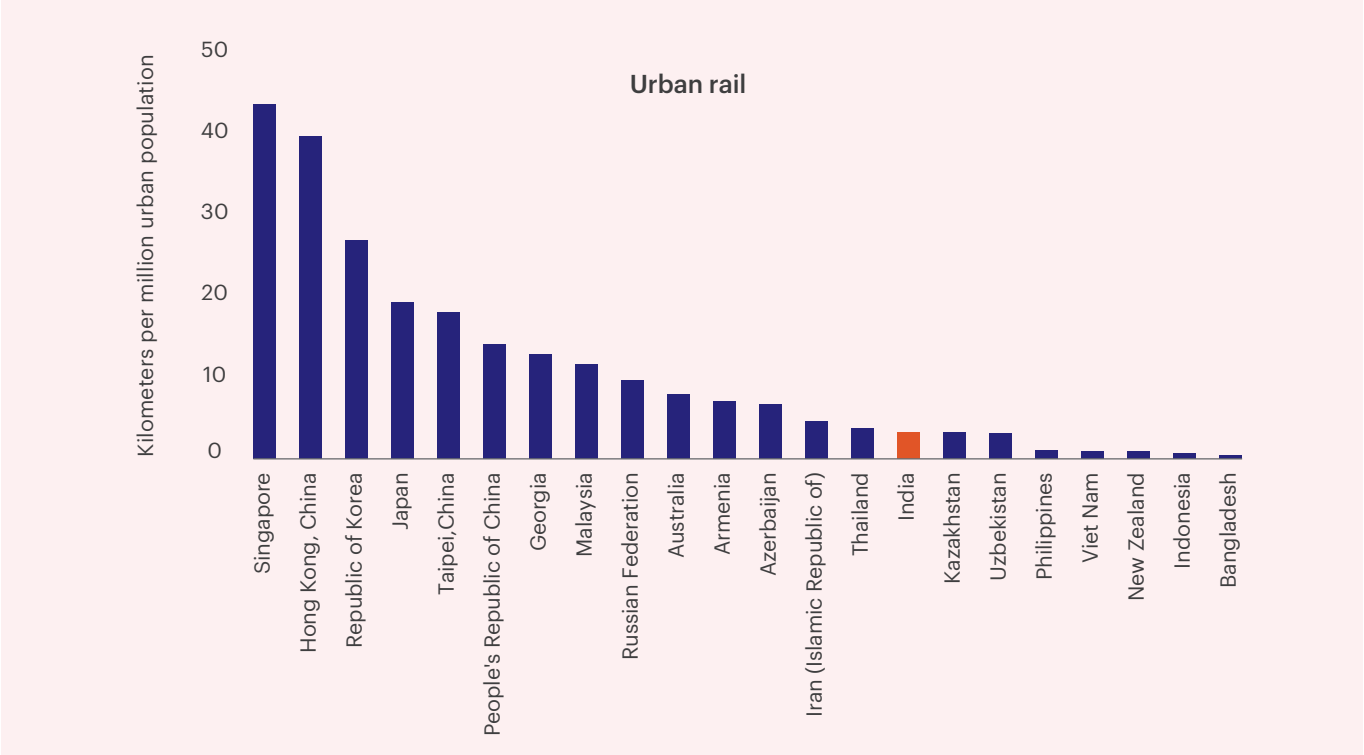


Figure 1: Rail infrastructure availability

Source: (ITDP, n.d.; UIC, 2024)

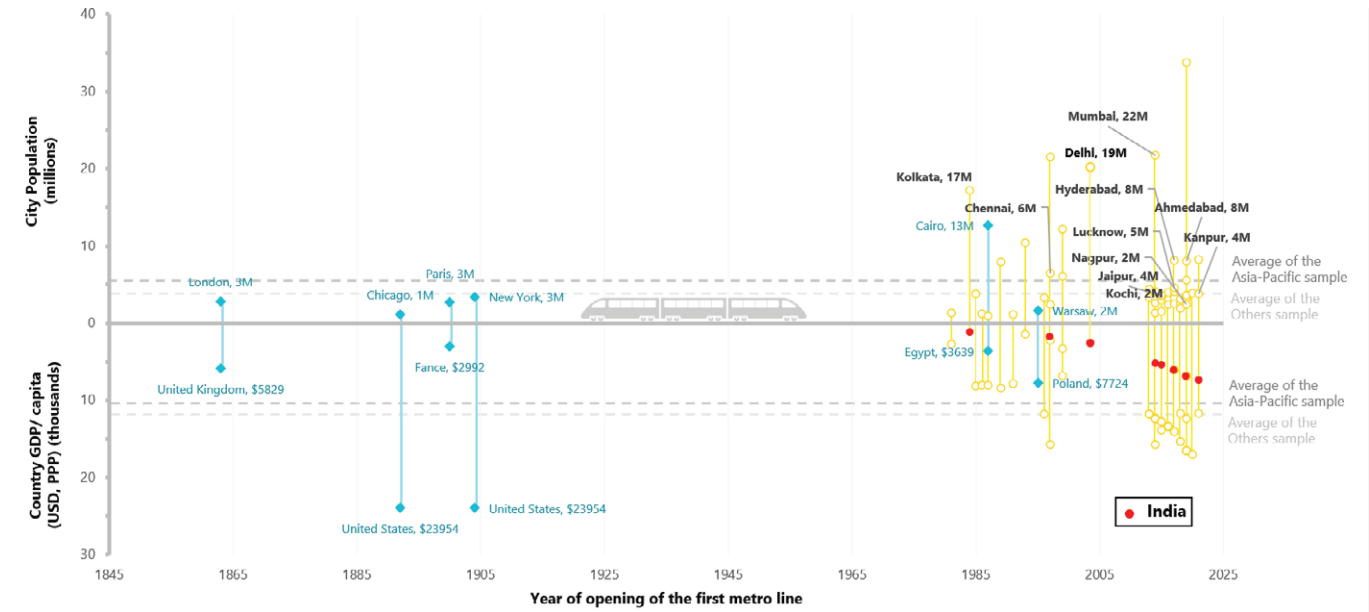


Figure 2: Metro rail opening vs. City population and Country GDP/ capita levels

Source: ATO visualization based on data from ITDP, GHS and World Bank

India is upgrading its railway system to handle more capacity. The government is doing this by creating dedicated freight corridors (DFCs), building the country's first high-speed train, and adding metro systems to major cities. Although India was slow to initiate the development of metro systems, it is now catching up quickly. Kolkata opened the first metro in 1984, followed by New Delhi in 2002. The success of the Delhi Metro has served as a blueprint, encouraging other cities across the country to develop their own metro networks.

Demand, Utilization, and Efficiency

Tracks do not guarantee traffic. In terms of land transport demand, road transport remains a more competitive mode to move people and goods. Where comparable data and railway infrastructure are available, evidence shows that the share of rail in total land passenger and total land freight demand varies significantly among economies. The link between heavy rail infrastructure and its use is a vital indicator of a nation's railway system's effectiveness and efficiency. Ideally, as infrastructure grows, there should be a proportional increase in utilization, measured by passenger and freight traffic per kilometer of rail, ensuring that investments are both productive and sustainable.

Figure 3: Share of rail in land transport activity

Source: (Tjandra et al., 2024)

In India's case, Indian Railways operates 13,523 passenger trains and 9,146 freight trains daily on its extensive railway network, with passenger trains averaging a speed of 50.6 kmph and freight trains at 24 kmph. In terms of mode share, it has been estimated to be approximately 13% for passengers and 27% in both tonnage and ton-mile terms, according to the National Rail Plan. The International Union of Railways estimates that the modal share of rail freight in India has decreased substantially over the past 15 years, from 36% in 2007 to 21% in 2021 (UIC, 2023).

From 2000 to 2020, Asian nations exhibited diverse trends in heavy rail infrastructure development and usage. Kazakhstan and Uzbekistan expanded their networks and saw significant increases in utilization, reflecting successful alignment with demand. Conversely, Turkmenistan experienced a substantial increase in network length but a decline in usage, suggesting potential overbuilding or underutilization. Overall, some countries effectively capitalized on infrastructure growth, while others experienced mismatches between investments and actual demand. In contrast, due to policies and investments, railway utilization in India increased from 25 million transport units per kilometer in 2011 to 28 million by 2023, with a rapid growth since the COVID pandemic. The increase is particularly due to freight transport (ton-km), which has increased by 32% since 2019 while the passenger activity has only increased by 1%.

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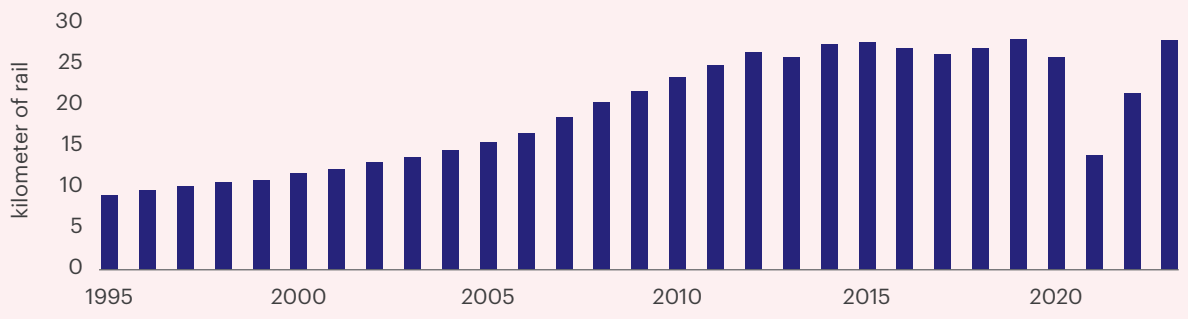

Figure 4: Heavy rail utilization

Source: (UIC, 2024)

Rolling Stock and Equipment Imports

The global trade in railway equipment has fundamentally shifted. The Asian market peaked in 2012. It has not recovered. By 2023, it had contracted by 37%.

The geography of demand has also been redrawn. In the 2000s, the Russian Federation and the People's Republic of China were the primary importers, accounting for 43% of the market. Their share has since shrunk. Australia's share grew to 13%, and India's rose from 4% to 6%, fueled by 8% annual import growth since 2010. On the supply side, the landscape is not diverse. The People's Republic of China is the dominant exporter, commanding 80% of the market (International Trade Centre, n.d.).

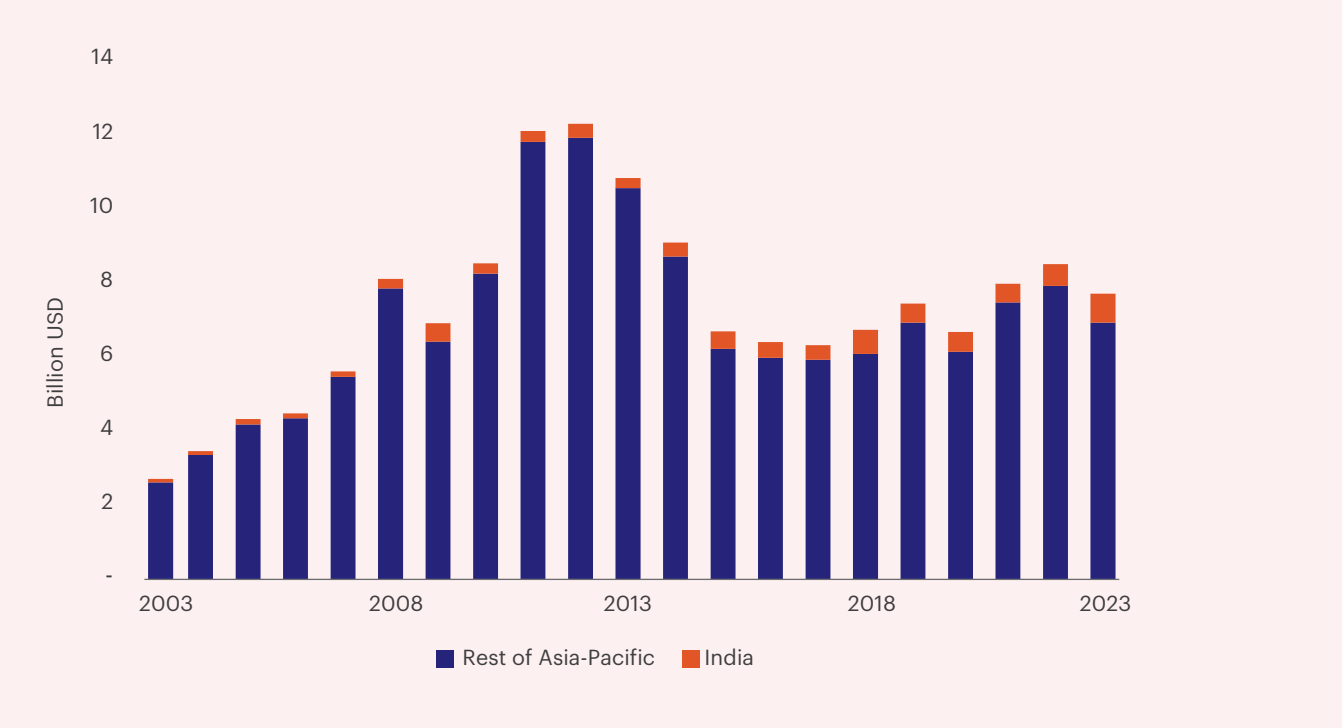

Figure 5: Import of rail equipment
Source: (International Trade Centre, n.d.)

Energy Use and Electrification in Railways

Modernization has brought efficiency. Across the Asia-Pacific, the energy intensity of rail has fallen dramatically, from 64 megajoules per thousand USD of GDP in 2000 to just 17 in 2023[1]. This marks a considerable enhancement. In comparison, India's energy intensity of rail transport decreased from 34 to 13 MJ per thousand USD. This indicates that India operates one of the most energy-efficient railways in the Asia Pacific. Further, the pace of improvement in India was much higher than in most Asian countries.

This efficiency narrative is also linked to the concept of electrification. Across the Asia-Pacific, the share of electricity in the rail sector's final energy consumption more than doubled, rising from 28 percent in 2000 to 59 percent by 2023. India's network saw a corresponding rise from 32 to 55 percent. The composition of fleets confirms this trend. Two-thirds of India's locomotive fleet is electric[2]. This level of locomotive electrification exceeds that of the Russian Federation (56 per cent), Azerbaijan (52 per cent), Uzbekistan (38 per cent), and Kazakhstan (35 per cent).

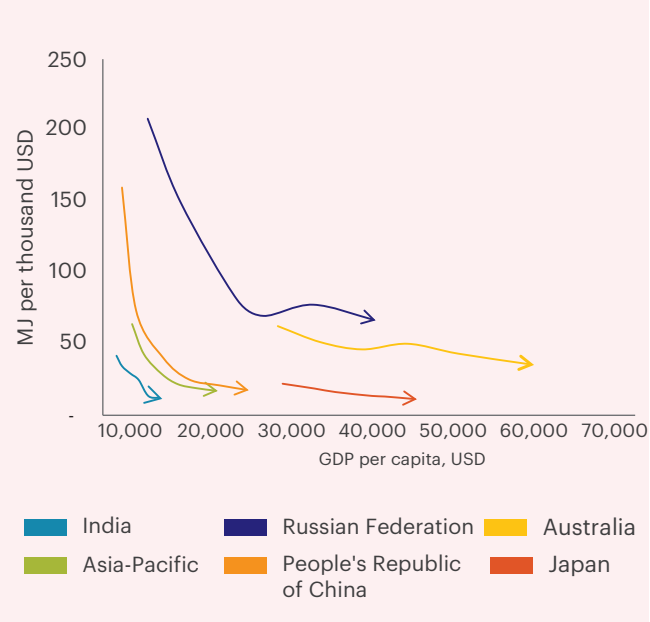

Figure 6: Rail energy intensity, 2000-2022

Source: Estimated using (United Nations Statistics Division, 2024) (World Bank, 2023)

Figure 7: Electricity in rail energy consumption

Source: (United Nations Statistics Division, 2024)

[1] Estimated using (United Nations Statistics Division, 2024) (World Bank, 2023)
[2] Calculated based on 'average daily operating locomotive fleet' data.

Railway Sector Emissions

The transport sector in Asia is at a crossroads, ith steadily increasing emissions driven by growing demand for both passenger and freight transport. Since 2000, fossil carbon dioxide CO2) emissions from the transport sector have increased by 3.0 per cent annually, while population and GDP growth rates have been 1.0 per cent and 7.5 per cent, respectively (Figure 7). In comparison, in India, transport CO2 emissions have increased by 5.5%. In 2024, the transport CO2 emissions was 340 Mt (European Commission. Joint Research Centre., 2025).

Railways offer a powerful counter-narrative. Their capacity for electrification and inherent energy efficiency make them a practical instrument for decarbonization. In 2023, railways in the Asia-Pacific region emitted approximately 40 million tons of CO_2 (Crippa et al., 2024). However, the region demonstrates fragmented progress in decarbonizing the rail sector. The carbon intensity of railways with respect to GDP varies significantly, ranging from 0.1 to 12.3 gCO2/USD, and the pace of change over the last decade varies from 0% to -12%. India, due to its massive push for electrification and freight corridors, experienced an improvement roughly 30% faster than the Asian average in carbon intensity.

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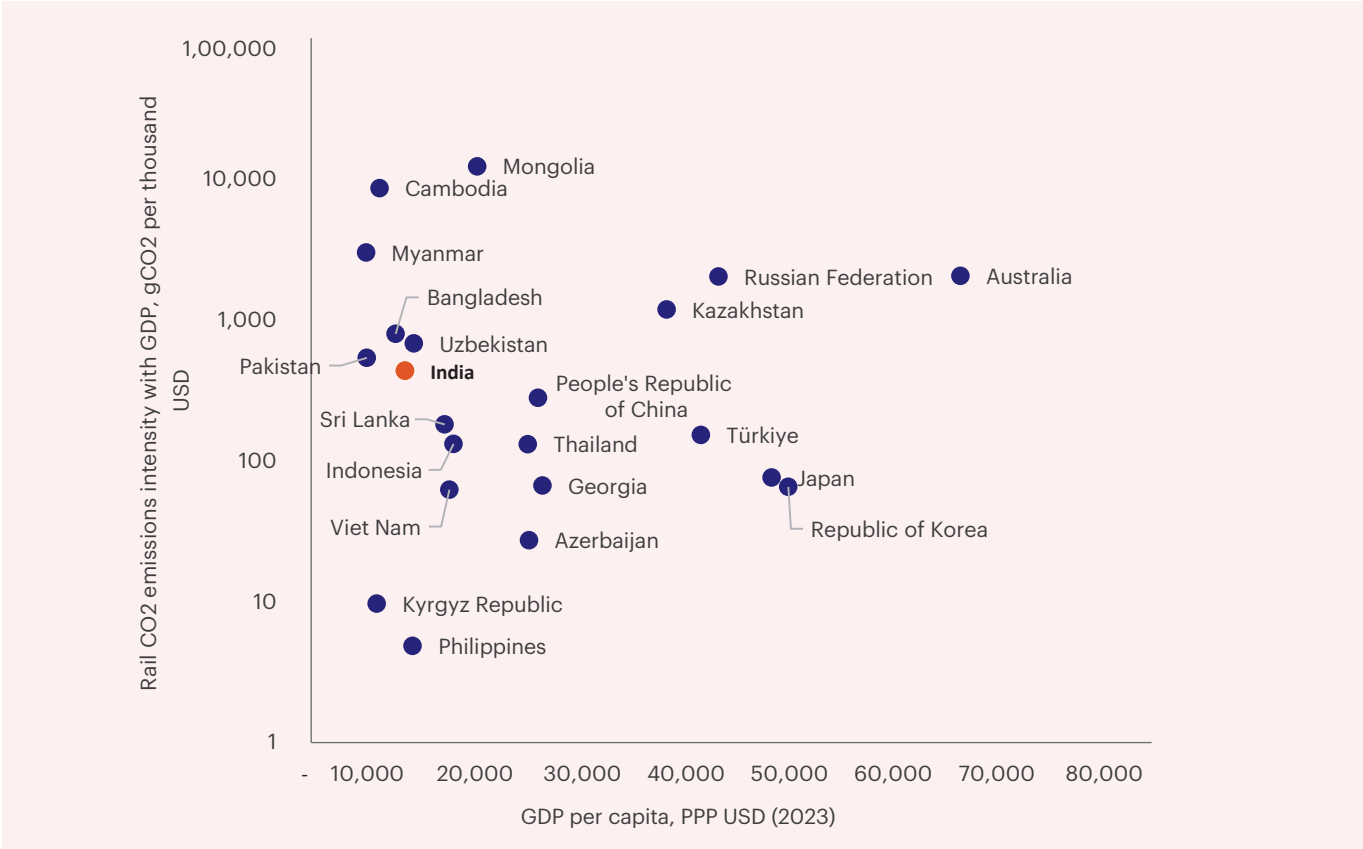

Figure 8: CO_2 emissions intensity

Source: Estimated using (Crippa et al., 2024; United Nations Statistics Division, 2024), (World Bank, n.d.)

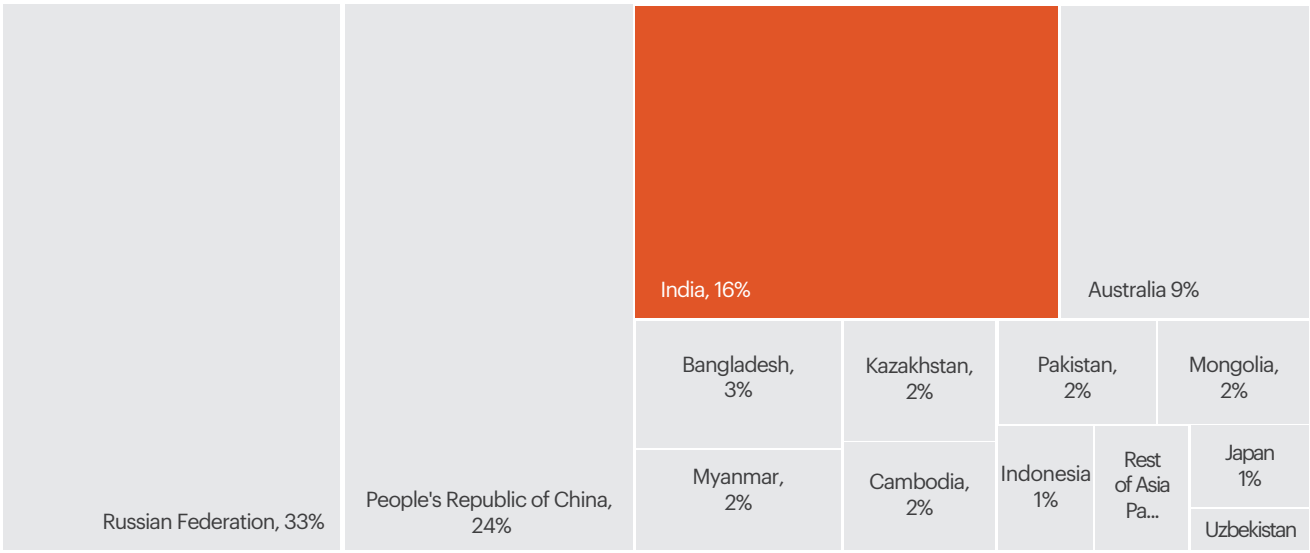

Figure 9: Rail CO2 emissions in Asia-Pacific, share by country (2023)

Source: (United Nations Statistics Division, 2024)

The share of rail in total transport PM2.5 emissions improved marginally from 12 percent in 2000 to 11 percent in 2022. In South Asia and South East Asia, the rail share in total transport PM2.5 emissions was about 24 per cent and 9 per cent in 2022, respectively, while in East Asia, it was 8 per cent in the same year (Ferrario et al., 2022). In India, the railways' PM2.5 emissions have decreased from 24 kt to 22 kt by 2022. This progress, set against the backdrop of a 6,000-kilometer network expansion, is significant.

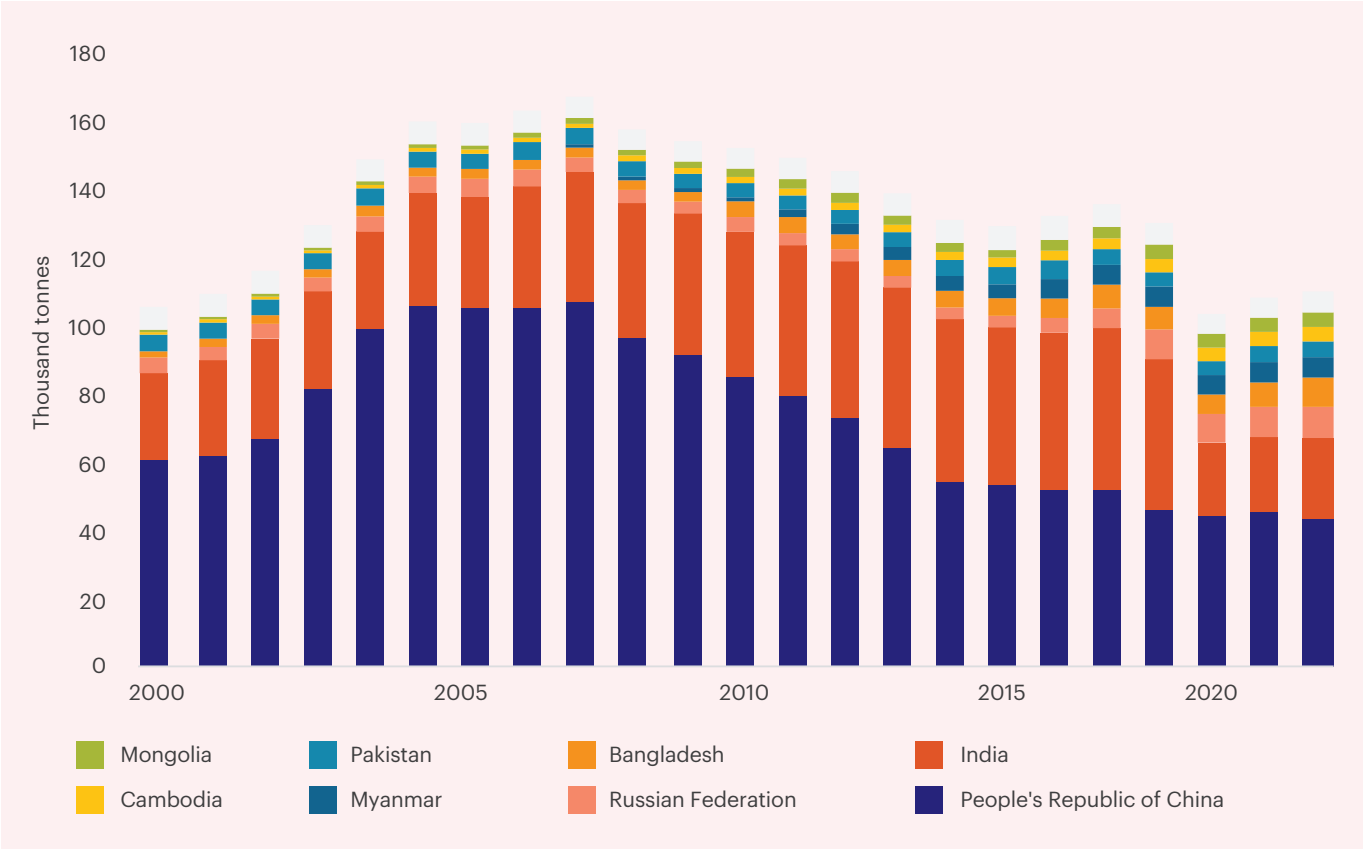

Figure 10: Rail transport PM 2.5 emissions

Source: (Ferrario et al., 2022)

Investment Trends and Financing

Capital flows to Asian transport have intensified since the advent of the SDGs. The continent's influence on global Official Development Assistance (ODA) for the sector is significant, with its share rising from around 43% in 2011-2015 to approximately 55% from 2016 to 2023. However, the nature of this funding has shifted, with rail now becoming the primary focus. ODA commitments to rail have grown from a modest $2.6 billion, which was 27% of transport ODA during 2002-2005, to about $26 billion—constituting 53% of the total—in 2016-2022. Meanwhile, road funding, though still substantial at $17 billion by 2016-2022, saw its share of development assistance decline from 53% to 35% over the same period timeframe (OECD, 2025).

Private capital flows tell a different story. The disruptions of the COVID-19 era coincided with a contraction in public-private partnership (PPP) investments across Asia, the region's global share dipping from 86% in 2019 to 42% by 2021. The road subsector's ability to attract private finance expanded intensely, its PPP portfolio increasing from $13 billion (43% of the total) in 2000-2005 to about $130 billion (64%) by 2016-2023 (World Bank, 2024).

Between 2002 and 2022, the ODA for Indian transport neared $25 billion. Railways claimed the majority share, with $19 billion—76% of the total—being directed to rail. This support accelerated sharply, rising from just under $1 billion in the early 2000s to over $12 billion between 2016 and 2022. The narrative for private investment offers a contrast. From a total transport PPP pool of $131 billion mobilized between 2000 and 2023, rail captured a meagre $8 billion, a mere 6%. This divergence in financing occurs as national ambitions crystallize-the Government of India has outlined a $1.4 trillion infrastructure vision for 2019-2023, underpinned by a goal to channel $750 billion into its railway system by 2030[3]. ATO estimates an investment need of about 0.4% of GDP for Indian railways between 2025 to 2035 (ATO, 2025).

Between 2000 and 2023, the Asian network expanded by 234,000 kilometers. This corresponds to a strong annual growth rate of 2.1%, slightly below the 2.2% growth in road network expansion (ATO, 2025).

[3] https://www.indembassy-tokyo.gov.in/public_files/assets/pdf/NRP.pdf

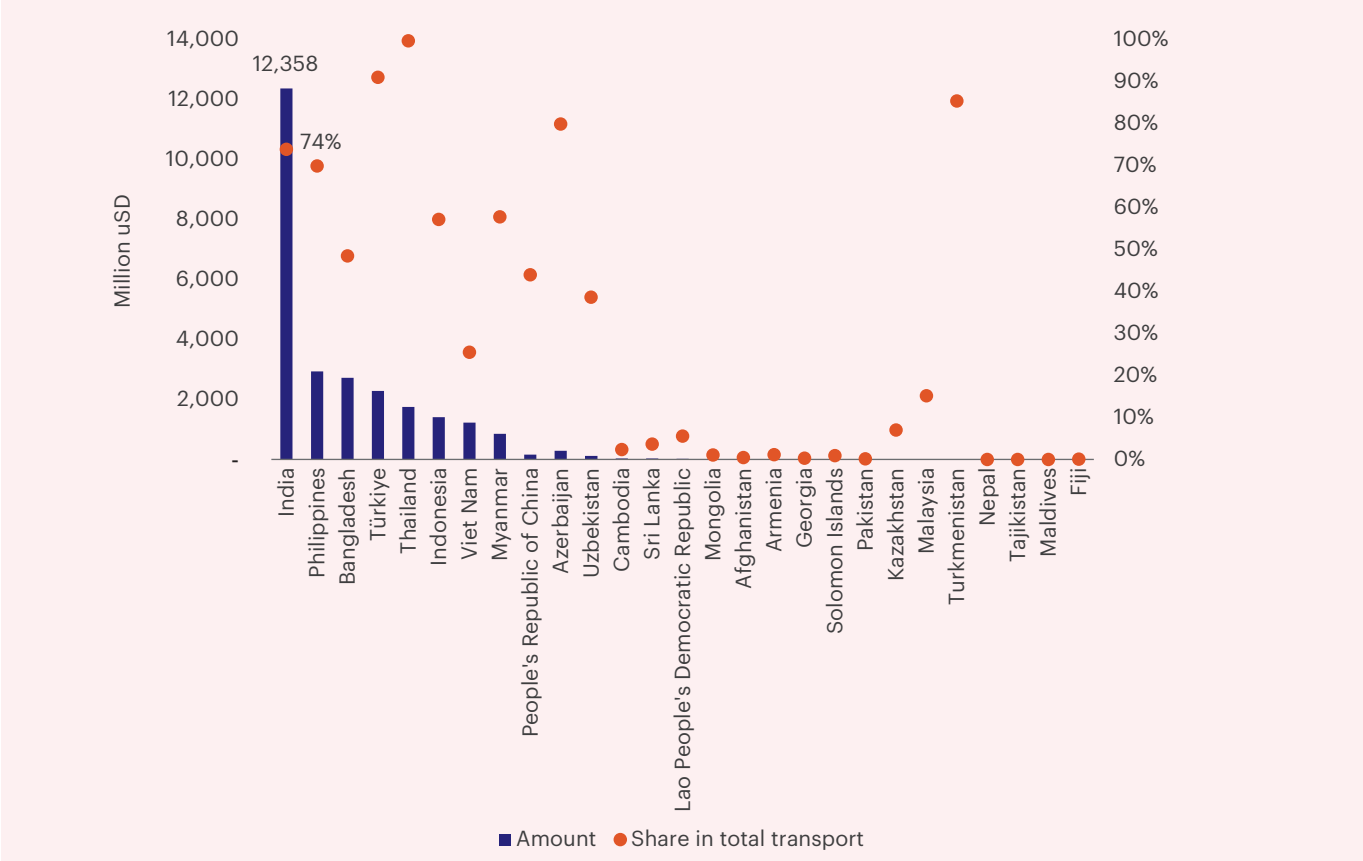

Figure 11: Official development assistance to the rail sector (2016- 2022)

Source: (OECD, 2025)

Figure 12: Public-private partnership investments in the rail sector (2016-2023)

Source: (World Bank, 2024)

Climate Resilience of Rail Infrastructure

The Coalition for Disaster Resilient Infrastructure (CDRI) highlights the significant vulnerability of rail systems in Asia and the Pacific through its Average Annual Loss (AAL) assessment. The analysis reveals that rail infrastructure accounts for approximately 26 per cent of total annual losses in the transport sector across the region (while only accounting for just 2% of infrastructure), indicating a significant exposure to disaster-related disruptions. There is a considerable contrast among countries: rail accounts for up to 61 per cent of AAL in Kazakhstan, highlighting the reliance on extensive rail networks, whereas Azerbaijan only reports 4 per cent, which may indicate a smaller network or reduced exposure to high-impact events. (CDRI, n.d.). Railway infrastructure in India accounts for 48 per cent of AAL or $ 257 million, which is considerably higher than in other economies.

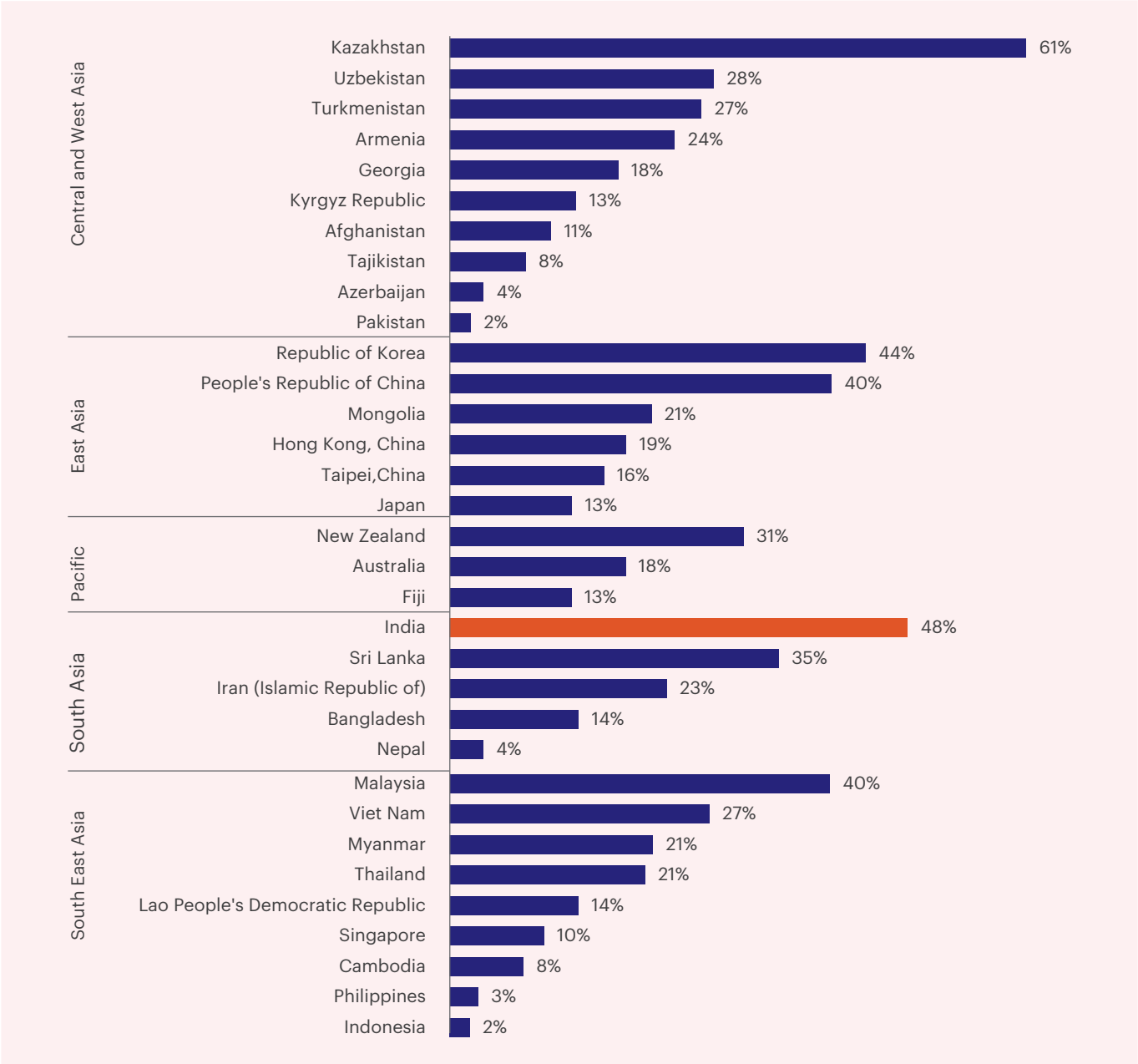

Figure 13: Average annual losses in railway transport infrastructure as a share of total transport AAL

Source: (CDRI, n.d.)

Policy and Regulatory Landscape

Policy is not static. A clear evolution in railway policy is underway, from a pre-2015 focus on general infrastructure expansion to a post-2015 emphasis on modal shift, railway electrification, and improvements in freight logistics. There's significant attention on dedicated freight corridors, operational improvements, and intermodal solutions. The firm ongoing focus on infrastructure expansion underscores the recognition that rail is crucial to decarbonizing the transport sector. India's national railway exemplifies this ambition. The target is a 45% freight mode share. In parallel, it aims to become the world's largest "Green Railway," running entirely on electric power and achieving net-zero carbon emissions by 2030.

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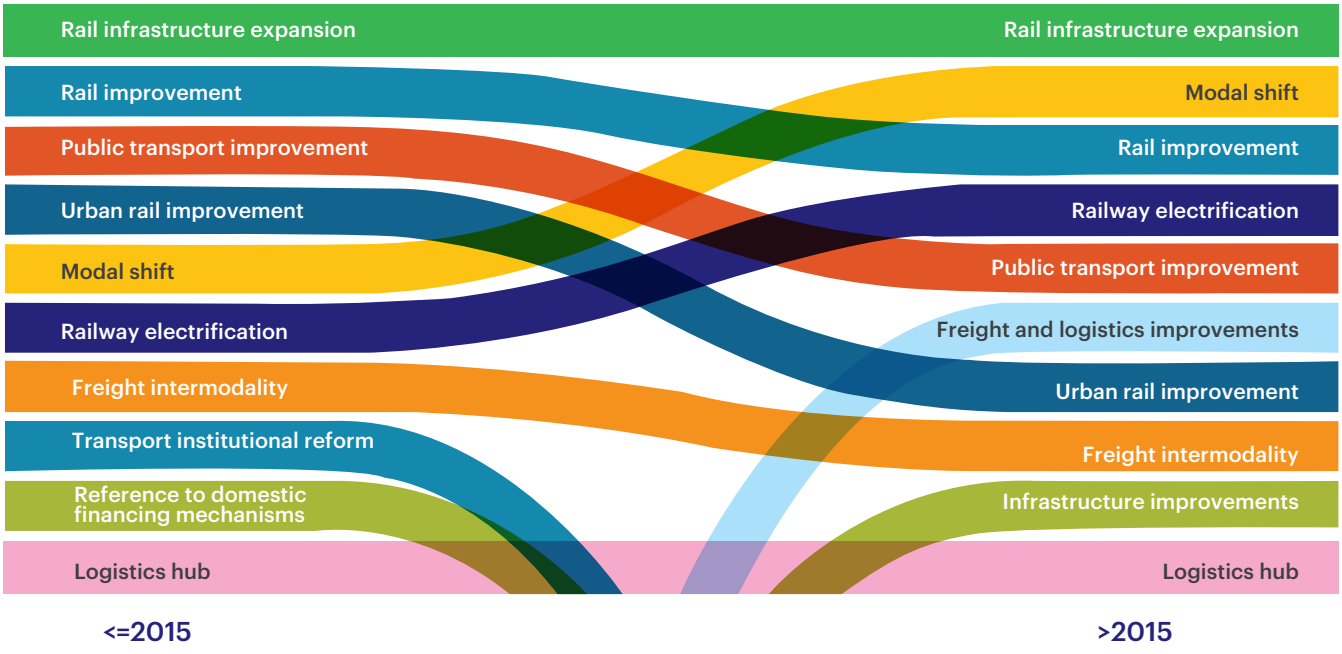

Net zero rail sector	• **India:** Net zero by 2030 • **Viet Nam:** 100% of vehicles and equipment at stations will be electrified and use green energy by 2050.
Expansion: Building new lines and extending the network.	• **India:** Network infrastructure interventions aimed to reduce line capacity utilization to below 100% until 2051, with a goal for substantial network operation to be below 70%. • **Viet Nam:** Adding 2,362 km of new lines by 2030.
Modernization: Upgrading physical assets and systems.	• **India:** 24 terminal/station clusters handling more than 2,00,000 passengers per day are proposed for immediate upgradation. • **Türkiye:** Target of 80% signalized line ratio
Connectivity: Linking railways with other transport modes.	• **India:** 2,722 network Km has been selected for Port Connectivity. • **People's Republic of China:** Over 95% railway access to major coastal ports.
Standardization: Adopting universal standards.	• **India:** Only 25 Tonne Axle load wagons should be manufactured in future across all categories (Open, Covered, Container, Flat, and Tank wagons). • **Bangladesh:** Permitting broad gauge rolling stock across the entire network by 2040.
Acquisition: Procuring new vehicles	• **India:** Locomotive requirements by 2051 - Freight Locomotives: 32,519; Coaching Locomotives: 13,498. • **Bangladesh:** 160 locomotives and 1,704 passenger coaches by 2025.
Efficiency: Improving performance and financial viability.	• **India:** India: Dedicated Freight Corridors to reduce emissions and improve efficiency. (Estimated to reduce CO2 emissions by ~457 million tonnes over 30 years) • **Bangladesh:** Full operational cost recovery by FY2025.
Safety & Security: Reducing accidents and improving safety measures.	• **India:** Introduction of the Kavach system, a safety technology certified at Safety Integrity Level 4 at an economical cost • **People's Republic of China:** Fatality rate less than 0.3 per billion tonne-km.
Modal Shift: Encouraging a greater proportion of transport to use railways.	• **India:** Freight modal share to shift from 35–36% to 45% by 2030. • **Indonesia:** Targets of 7-9% passenger and 11-13% goods market share.
Electrification: Converting lines and rolling stock to electric power.	• **India:** 100% BG electrification by 2025-26 • **Uzbekistan:** Increasing electrification level to 60%.

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Confederation of Indian Industry

The Confederation of Indian Industry (CII) works to create and sustain an environment conducive to the development of India, partnering Industry, Government and civil society through advisory and consultative processes.

CII is a non-government, not-for-profit, industry-led and industry-managed organisation, with around 9,700 members from the private as well as public sectors, including SMEs and MNCs, and an indirect membership of over 365,000 enterprises from 318 national and regional sectoral industry bodies.

For 130 years, CII has been engaged in shaping India's development journey and works proactively on transforming Indian Industry's engagement in national development. CII charts change by working closely with the Government on policy issues, interfacing with thought leaders, and enhancing efficiency, competitiveness, and business opportunities for industry through a range of specialised services and strategic global linkages. It also provides a platform for consensus-building and networking on key issues.

Through its dedicated Centres of Excellence and Industry competitiveness initiatives, promotion of innovation and technology adoption, and partnerships for sustainability, CII plays a transformative part in shaping the future of the nation. Extending its agenda beyond business, CII assists industry to identify and execute corporate citizenship programmes across diverse domains, including affirmative action, livelihoods, diversity management, skill development, empowerment of women, and sustainable development, to name a few.

For 2025-26, CII has identified "Accelerating Competitiveness: Globalisation, Inclusivity, Sustainability, Trust" as its theme, prioritising five key pillars. During the year, CII will align its initiatives to drive strategic action aimed at enhancing India's competitiveness by promoting global engagement, inclusive growth, sustainable practices, and a foundation of trust.

With 70 offices, including 12 Centres of Excellence, in India, and 9 overseas offices in Australia, Egypt, Germany, Indonesia, Singapore, UAE, UK, and USA, as well as institutional partnerships with about 250 counterpart organisations in almost 100 countries, CII serves as a reference point for Indian industry and the international business community.

Confederation of Indian Industry

The Mantosh Sondhi Centre
23, Institutional Area, Lodi Road, New Delhi – 110 003 (India)
T: 91 11 45771000
E: info@cii.in • W: www.cii.in

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Reach us via CII Membership Helpline Number: 1800-103-1244