UITP ADVANCING PUBLIC TRANSPORT

→ Insights

India on Track:
The Growth Story of Urban Rail Transit in India

Offering a comprehensive examination of the evolution and impact of India's urban rail sector amid rapid urbanisation, this publication examines detailed case studies of major metro systems and the Namo Bharat RRTS to illustrate how rail-based transit is redefining mobility, strengthening regional connectivity, and shaping urban development. It brings into focus key innovations in multimodal integration, digitalisation, sustainability, and inclusivity, alongside an assessment of emerging financing and governance frameworks. The analysis provides valuable insights into the sector's transition towards an integrated and resilient mobility ecosystem, and its wider significance for advancing sustainable and inclusive urban growth.

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Introduction

India's transport landscape has undergone a significant transformation over the past few decades, driven by rapid urbanisation, economic growth, and the rising demand for efficient mobility solutions. This rapid urban expansion has been accompanied by challenges such as traffic congestion, air pollution, long commute times, and a declining quality of urban life. Over the years, intra-urban mobility in India has evolved from a system largely reliant on buses, Intermediate Public Transport (IPT) such as auto-rickshaws (three-wheeled motorised vehicles), and non-motorised modes to a more diverse and multimodal transport structure. As travel demand within cities has increased, high-capacity public transport systems have been progressively introduced to improve mobility efficiency.

Amongst the various modes of public transport, metro rail has emerged as a central element of urban transport planning, providing fast, reliable, and high-capacity connectivity while contributing to more sustainable patterns of urban mobility. In this context, rail-based mass transit has become an important pillar of sustainable urban development. The evolution of India's urban rail sector, particularly metro rail systems and the recently introduced RRTS, reflects a strategic shift towards high-capacity, energy-efficient, and integrated public transport networks.

With India attaining the landmark milestone of surpassing 1,000 kilometres of metro rail network in January 2025, this paper presents an overview of the evolution, expansion, and transformative impact of urban rail systems across the country. It further highlights selected case studies to illustrate their contribution to shaping sustainable urban mobility through a range of key initiatives and strategic interventions.

Trajectory of Urban Rail in India

The origins of modern urban rail transit in India can be traced to the commissioning of the Kolkata Metro in 1984. As the country's first metro rail system, it represented a pioneering effort in introducing underground and elevated rapid transit in the densely populated city of Kolkata. However, for nearly two decades thereafter, progress remained limited due to financial constraints and the absence of a comprehensive national policy framework for urban rail projects. It was only with the launch of the Delhi Metro in the early 2000s that urban rail development gained momentum. The Delhi Metro Rail Corporation Limited (DMRC) introduced modern project management practices, advanced technologies for operations, and global engineering standards, setting a benchmark for future metro projects across the country.

Metro rail organisations in India are typically constituted as joint ventures in which equity participation is shared between the Government of India and the respective state government. However, an illustrative example of integrated urban transport governance which is also the world's largest Public-Private Partnership (PPP) project in the metro rail sector as of 2025, is the Hyderabad Metro Rail Project. The project has been implemented through a PPP model of Design-Build-Finance-Operate-Transfer (DBFOT) in which Larsen & Toubro established L&T Metro Rail (Hyderabad) Limited to implement the project, while Hyderabad Metro Rail Limited provides governmental coordination and oversight, and Keolis Hyderabad Mass Rapid Transit System Pvt. Ltd. which is a subsidiary of Keolis, is responsible for operating and maintaining the metro network[1].

In India, the financing of metro rail organisations is predominantly structured around a capital-expenditure (CAPEX) intensive model, wherein the central and state governments typically share equity, often on an approximately 50:50 basis, and secure loans from multilateral and bilateral institutions to fund construction and infrastructure development.

The Ministry of Housing and Urban Affairs (MoHUA) plays a pivotal role in facilitating such capital investments under the framework of the national Metro Rail Policy. Operational expenditure (OPEX), encompassing day-to-day operations and maintenance costs, is generally supported through a combination of farebox revenue, non-fare commercial income, and periodic government assistance, thereby ensuring both service continuity and long-term operational sustainability[ii].

The success of DMRC played a catalytic role in reshaping urban transport policy in India. It demonstrated that metro rail could be both operationally efficient and socially transformative. As a result, several other Indian cities initiated metro rail projects, leading to a period that marked the transition of metro rail from a niche solution to a mainstream urban mobility strategy in the nation.

→ Commuters waiting for Namo Bharat train at station ©NCRTC

National Policy Shaping the Future of Urban Rail

A decisive acceleration in metro rail development in India occurred with the introduction of the Metro Rail Policy in 2017[iii]. The policy defined metro rail as a fully segregated, rail-based mass transit system that may operate at grade, on elevated structures, or underground, and owing to its dedicated right-of-way and advanced system technology, it can support very high passenger capacities of approximately 40,000–80,000 passengers per hour per direction (PPHPD). Monorails have been classified in the Policy as a type of metro rail that generally offers lower capacities and entail higher maintenance costs; while regional rail has been defined as a passenger rail system serving a metropolitan area by connecting suburban and peripheral zones to the city centre, characterised by moderate station spacing and higher speeds than metro rail but greater frequency of stations spaced at shorter intervals than those of long-distance railways.

The Metro Rail Policy emphasised multimodal integration, value capture financing, and private sector participation, while also linking metro approval to comprehensive mobility planning at the city level. As a result, the pace of construction and commissioning increased substantially. By the end of the year 2025, India's metro rail length touched 1,090 kilometres, spanning across 26 cities in the country[iv]. This rapid expansion has positioned India as the third-largest metro rail network in the world, behind only China and the United States of America[v].

The New Era of Urban Rail in India

Beyond network length, the impact of metro rail in India is evident in ridership growth and urban transformation. With expansion of existing and new metro rail networks, the daily metro ridership has increased manifold across Indian cities over the last decade, reflecting growing public acceptance and reliance on rail-based transit. In the Union Budget 2025–26, the Government of India made a concerted effort to bolster urban rail infrastructure by significantly increasing its financial commitment to metro and Mass Rapid Transit Systems (MRTS). The budget allocated for metros for the financial year 2025-26 was ₹348,070 million (≈ €3.24 billion), underscoring the federal government's intent to accelerate network expansion and modernisation across the country[vi]. This allocation included dedicated grants for individual metro projects and broader urban transit planning, aimed at completing ongoing corridors and initiating new ones in emerging urban centres, as part of a strategic focus to enhance sustainable mobility and reduce urban congestion[vii].

World Records Set by Metro Rail in India

- Delhi Metro made global history as the world's first railway network to earn carbon credits from the United Nations for cutting greenhouse gas emissions[viii].
- Hyderabad Metro Rail stands as the world's largest PPP project in the metro rail sector, as of 2025.
- Maha Metro set a Guinness World Record in Nagpur by constructing the world's longest double-decker viaduct of 3.14 kilometres long, supporting both a highway flyover and a metro rail on a single column[ix].

While metro rail systems primarily cater to intra-city mobility, India's evolving urban structure has created a parallel need for fast and reliable connections between core cities and their surrounding satellite towns. This requirement is particularly prominent in large metropolitan regions such as the National Capital Region (NCR) of Delhi, where daily commuter flows extend well beyond municipal boundaries. To address this gap, India has introduced RRTS, a new category of high-speed, high-frequency regional rail designed to bridge the space between urban metro services and conventional long-distance railways. The Delhi–Ghaziabad–Meerut corridor, branded as Namo Bharat, represents the country's first operational RRTS project and a significant milestone in India's urban rail modernisation journey.

→ Aerial view of Kochi Metro ©KMRL

The development of India's urban rail sector represents a remarkable evolution from isolated metro projects to a comprehensive, multi-tiered rail-based mobility framework. This progress is complemented by landmark innovations such as India's first underwater metro in Kolkata below the Hooghly River demonstrating advanced engineering, and Kochi's waterborne electric ferry service known as water metro in India which is the country's first integrated water-based urban transit system, strengthening last -mile connectivity. Together with the vast and continually modernising urban rail network, these initiatives underscore India's growing stature as a global leader in sustainable urban mobility, positioning public transport at the heart of the country's future development.

Case Studies

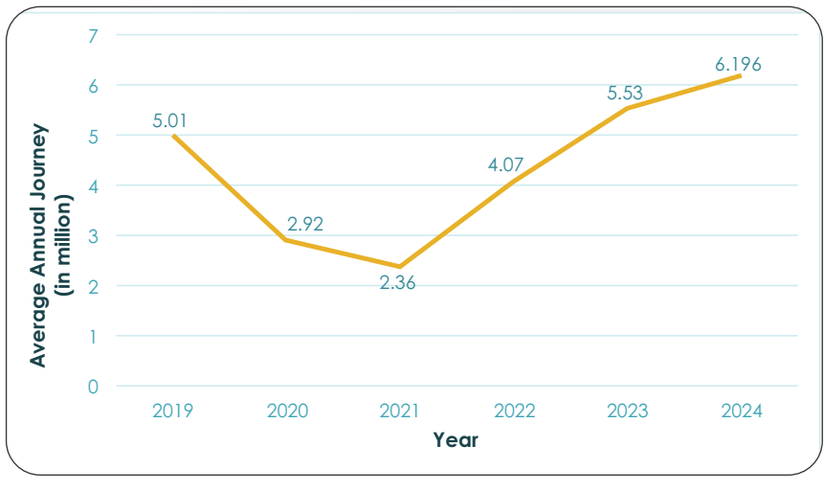
To better understand how urban rail systems are shaping mobility outcomes across Indian cities, the following section presents a series of case studies. These examples illustrate how different metro and regional rail organisations are addressing mobility challenges through technological innovation, sustainability initiatives, multimodal integration, and diversified financial models.

1. Delhi Metro Rail Corporation Limited (DMRC)

Delhi Metro represents a benchmark in sustainable urban transformation, significantly reshaping the social, economic, and environmental fabric of Delhi NCR by emerging as a critical driver of urban and regional development through providing a high-capacity, reliable, and efficient mass transit system that supports the daily mobility needs of millions of people. DMRC oversees the planning, construction, operation, and maintenance of its metro network, ensuring high standards of service, safety, and sustainability, and serving as a model for metro projects across India.

Overview

Operational since	25 December 2002
Cities covered	Delhi and adjoining cities of Noida, Ghaziabad, Faridabad, Gurugram, Bahadurgarh, Ballabhgarh
Organisation structure	Joint venture of Government of India and Government of National Capital Territory (NCT) Delhi
Number of operational lines	10
Number of lines under construction	1
Total operational network length	352.24 kilometres
Network length under construction	110.61 kilometres
Number of operational stations	257
Number of stations under construction	83
Average monthly passenger journey in 2024	188.97 million people
Base fare	₹11 (≈ €.10)
Types of ticketing	Contactless Smart Card (CSC), National Common Mobility Card (NCMC), paper Quick Response (QR) ticket and mobile QR ticket through WhatsApp / Paytm / Make My Trip / One Delhi App / Indian Railway Catering and Tourism Corporation (IRCTC) / Amazon / PhonePe / Open Network for Digital Commerce (ONDC)
% of digital transactions	68.40%
Availability of mobile application	Yes, Delhi Metro Sarthi App
Availability of emergency helpline number	Yes, 155370
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	E-rickshaw, e-auto, public bicycles, e-bike sharing, app based services like bike, taxi, auto (three-wheeler paratransit), and SherRyds exclusively for women



→ Figure 1: Average annual journey of DMRC from 2019-2024 (Source: DMRC)

Socio-economic and environmental impact

- DMRC's intricately designed network length with continuous improvements in passenger amenities and digital integration has effectively increased its bankability among the public over the years. The ongoing expansion in multiple corridors is expected to further integrate previously underserved areas into the urban mobility framework, thereby deepening spatial inclusion, supporting economic activity, and contributing to the broader socio-economic transformation of the region through improved and equitable mobility of not only Delhi but the entire NCR[x].

- Amongst metro systems in India that provide airport connectivity, till date, only the Delhi Metro Airport Express Line offers airline check-in and baggage drop services at selected stations for international passengers travelling to Indira Gandhi International Airport[xi]. DMRC has also introduced app-enabled, rental digital locker facilities at 50 stations, allowing passengers to temporarily store personal belongings[xii], supporting more seamless and convenient mobility across the metro network.

- Recognising the limitations of fare-based revenue in a mass transit system, DMRC has strategically strengthened its financial sustainability by diversifying income beyond passenger fares through a structured focus on non-fare revenue sources. It leveraged its extensive real estate assets and station spaces to generate consistent commercial income. DMRC has also experimented with innovative commercial initiatives, such as dynamic in-tunnel advertising, parking facility by stations, enhanced retail spaces within stations, particularly along high-ridership corridors, and operations and maintenance consultancy services as a proactive approach to asset utilisation; transforming transit infrastructure into a revenue-generating ecosystem, resulting in its share of non-fare box earnings over fare box earnings to be 28.37%[xiii].

- Delhi Metro has systematically integrated universal accessibility into its infrastructure and operations by ensuring 100% assistance for person with disabilities and incorporating barrier-free design elements across the network. Stations feature extra-wide automatic flap gates, clear and prominent signage, and step-free circulation to facilitate independent mobility. All lifts are equipped with wide access doors, handrails, audio-visual indicators, emergency telephones, and braille-enabled controls, enhancing usability for persons with visual and mobility impairments. Additionally, dedicated women-only coaches reflect DMRC's commitment to inclusive and safe public transport, reinforcing its approach to socially equitable urban mobility.

- In 2024, DMRC introduced its first 'Make in India' driverless metro trainsets, designed at Alstom's Sri City facility and equipped with Grade of Automation (GOA) 4 technology, to operate fully autonomously on new and extended corridors while improving efficiency and operational capacity[xiv].

- DMRC has adopted Artificial Intelligence (AI) to strengthen the efficiency, safety, and responsiveness of its metro services[xv]. AI-based systems are used to analyse operational data to support predictive maintenance and improve network reliability, while digital tools provide passengers with timely travel information and assistance. The introduction of Chetna, an AI-powered virtual assistant, further enhances commuter support by helping users with route guidance, fare details, and general travel queries across the metro network in Delhi.

- As India's first metro rail system and the world's first railway network to earn carbon credits under the United Nations framework, DMRC has demonstrated leadership in climate-responsive transport through the integration of regenerative braking, energy-efficient operations, and large-scale adoption of renewable solar energy across depots and stations. Assessment by DMRC as of 4 February 2026 reveals, it has earned ₹296.5 million (≈ €3.22 million) by generating approximately 9.3 million carbon credits through its registered projects.

- DMRC's transition towards a 'Sustainable Built Environment' is reflected in its extensive green infrastructure initiatives. A total of 158 metro stations, six depots, and 12 receiving substations (RSS) have been certified as Green Buildings, alongside 11 staff colonies and the headquarter at Metro Bhawan. These measures, complemented by rainwater harvesting, waste recycling, and eco-sensitive design principles, have contributed to reduced urban heat stress, improved resource efficiency, and enhanced environmental performance of transit infrastructure.

- DMRC has achieved carbon-neutral certification for its Blue Line (Yamuna Bank–Vaishali), Metro Bhawan headquarters, and staff quarters in Sector-50, Noida, reinforcing its commitment to low-carbon mobility.

→ Solar panels installed on one of Delhi Metro's stations ©DMRC

- Based on data collected from DMRC, its operational benefits in 2024 across Phases I, II, and III are substantial as on an average, 644,252 vehicles are removed from roads daily, leading to an annual reduction of 4,026 million vehicle kilometres travelled. This has resulted in a reduction of approximately 3,11,000 tonnes of fuel consumption and 9,51,793 tonnes of air pollutants per year. Furthermore, metro ridership has delivered an estimated 337 million hours of annual time savings for passengers, underscoring its role in improving urban productivity and quality of life.

- A major national and global milestone is DMRC's energy transition strategy, wherein 35% of its total electricity demand is met through renewable sources. This includes 30% from an offsite solar plant in Rewa, Madhya Pradesh, 4% from rooftop solar installations, and 1% from a waste-to-energy facility in Delhi. DMRC is actively expanding its solar footprint across all stations and depots to further enhance energy sustainability.

- Beyond infrastructure and operations, DMRC emphasises carbon offsetting, stakeholder engagement, transparent environmental reporting, and continuous staff capacity building. These efforts collectively strengthen its long-term climate resilience and position DMRC as a globally replicable model for sustainable urban rail systems by demonstrating how mass transit can drive holistic urban regeneration while reducing emissions, enhancing mobility equity, and fostering environmentally responsible urban development. DMRC's model continues to inspire global metro systems, demonstrating how a transport infrastructure can drive holistic urban regeneration by connecting people, empowering communities, and nurturing a resilient, environmentally responsible ecosystem.

- DMRC envisions increasing its use of renewable energy to 50% by 2030 and become carbon neutral by 2070.

Key transferable practices

- **Financial resilience through revenue diversification:** Reduce dependence on fare-box revenue by monetising real estate, station retail, advertising, parking, and consultancy services by transforming transit infrastructure into a sustainable, asset-backed revenue ecosystem.
- **Climate-aligned and data-driven operations:** Integrate renewable energy and carbon credit mechanisms, supported by strong digital integration and data-driven decision making for measurable environmental and socio-economic impact reporting and clear long-term decarbonisation targets.
- **Inclusive and integrated urban mobility:** Expand networks strategically to connect underserved areas with embedding universal accessibility to promote equitable, socially inclusive mobility.

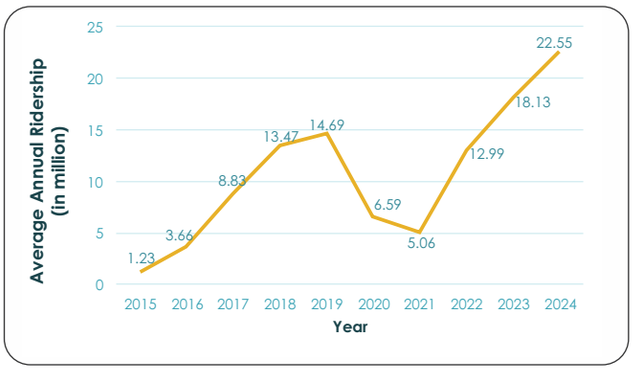
→ A glimpse of Delhi Metro's Operation Control Centre ©DMRC

2. Bangalore Metro Rail Corporation Limited (BMRCL) – Namma Metro

Bangalore Metro has become a key driver of sustainable urban mobility and environmental stewardship in Bengaluru. Through inclusive transport measures, extensive green initiatives, and growing non-fare revenue, BMRCL strengthens mobility equity, ecological resilience, and financial sustainability.

Overview

Operational since	20 October 2011
Cities covered	Bengaluru
Organisation structure	Joint venture of Government of India and Government of Karnataka
Number of operational lines	2
Number of lines under construction	3
Total operational network length	76.95 kilometres
Network length under construction	91.10 kilometres
Number of operational stations	68
Number of stations under construction	-
Average monthly ridership in 2024	0.74 million
Base fare	₹10 (≈ €0.094)
Types of ticketing	CSC, Contactless Smart Token (CST), NCMC, QR code ticket on paper and mobile
% of digital transactions	70%
Availability of mobile application	Yes, Namma Metro – BMRCL Official App
Availability of emergency helpline number	Yes, 180042512345
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	Feeder bus, auto, rental bikes, cycles



→ Figure 2: Average annual ridership of BMRC from 2015-2024 (Source: BMRCL)

Socio-economic and environmental impact

- Beyond reducing road congestion through sustainable public transport, BMRCL has supported critical healthcare logistics by facilitating the safe and secure transport of human organs for transplantation across multiple locations in Bengaluru, demonstrating the metro's role as a socially responsible urban mobility system[xvi].
- BMRCL is committed to preserving Bengaluru's identity as the 'Garden City of India' by implementing stringent tree management practices under the guidance of the Tree Expert Committee (TEC) constituted by the High Court of Karnataka to oversee tree retention, transplantation, and removal. The organisation follows a compensatory plantation ratio of 1:10 for all affected trees during the construction phase, ensuring minimal ecological disturbance while enabling metro development.
- Through Corporate Social Responsibility (CSR) initiatives, BMRCL has developed and maintained median gardens and beautified metro piers along its corridors, enhancing urban aesthetics while improving local greenery and contributing to carbon reduction. These interventions have made metro stretches cleaner, greener, and more visually appealing for the public.
- To improve safety and comfort for women commuters, BMRCL has reserved the first coach of every train exclusively for women passengers, reinforcing its commitment to inclusive and secure public transport.
- BMRCL generates significant non-fare revenue primarily from retail license fees, ATMs, parking, in-station/in-train advertising, and electric vehicle (EV) charging infrastructure.

Key transferable practices

- **Environmentally sensitive infrastructure development:** Implement strategies that blend in with the local environment like adopt high compensatory plantation ratios, and integrate corridor greening, median gardens, and urban beautification to preserve ecological identity while expanding transit.
- **Metro as a social infrastructure platform:** Take advantage of the high speed and congestion-free corridor to extend the role of metro systems beyond mobility by supporting critical public services like medical logistics.

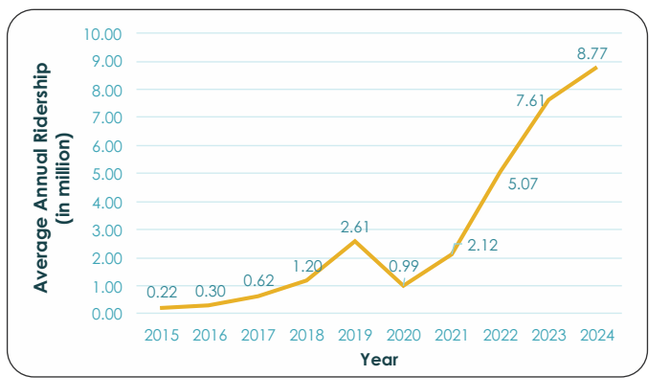
→ An interchange station of Bangalore Metro ©BMRCL

3. Chennai Metro Rail Limited (CMRL)

Chennai Metro has increasingly evolved into a critical component of the city's urban mobility system, playing a significant role in shaping travel behaviour and supporting economic activity. The system demonstrates its growing importance in daily commuting patterns, particularly for working professionals, students, and service-sector employees by providing improved access to employment, education, and essential services across the metropolitan region. This strengthened connectivity has also supported local business activity and commercial development around metro corridors and transit nodes, reinforcing the broader socio-economic integration of the city.

Overview

Operational since	29 June 2015
Cities covered	Chennai
Organisation structure	Joint venture of Government of India and Government of Tamil Nadu
Number of operational lines	2
Number of lines under construction	3
Total operational network length	54.6 kilometres
Network length under construction	115.66 kilometres
Number of operational stations	41
Number of stations under construction	119
Average monthly ridership in 2024	8.77 million
Base fare	₹10 (≈ €0.094)
Types of ticketing	QR code ticket on paper, and 20% discount on fare for tickets availed through - NCMC, QR code from store value pass and mobile, Paytm, PhonePe, WhatsApp, Chennai One App
% of digital transactions	≈ 78%
Availability of mobile application	Yes, Chennai Metro Rail App
Availability of emergency helpline number	Yes, 18604251515 and a dedicated women's helpline is also available 155370
Availability of grievance redressal system	Yes, grievances are addressed as per defined timeline by customer care cell
Availability of passenger feedback system	Yes, through mobile application, e-mail, and CMRL website
Last-mile connectivity options	Feeder bus, dedicated tempo traveller van



→ Figure 3: Average annual ridership of CMRL from 2015-2024 (Source: CMRL)

Socio-economic and environmental impact

- CMRL has demonstrated notable advancement in digital mobility integration, with approximately 55% of commuters shifting from closed-loop Metro Travel Cards to open-loop NCMC in accordance with the MoHUA guidelines.
- Data shared by CMRL on passenger satisfaction survey conducted in April–May 2025 recorded an overall rating of 4.3 out of 5, reflecting approximately 86% customer satisfaction.
- CMRL has shown that a diversified revenue model enhances the financial sustainability of the system while reducing reliance on subsidies, thereby strengthening its long-term viability as a public transport provider. Additionally, metro infrastructure investments have generated direct and indirect employment opportunities during both construction and operational phases, contributing to regional economic development and urban regeneration.

- CMRL has integrated special event travel passes into its Automated Fare Collection System (AFCS), enabling QR/barcode-based entry at metro gates for major events such as Indian Premier League (IPL), World Cup matches, Formula racing, football games, and large concerts. Organisers bulk-purchase and distribute these passes to attendees, allowing seamless, contactless travel without separate ticketing. This initiative helps manage peak crowds efficiently, reduces road congestion around event venues, and increases metro ridership during high-demand periods[xvii].
- For enhanced first- and last-mile connectivity, CMRL has made collaborations with Airports Authority of India, Southern Railway, Metropolitan Transport Corporation (Chennai) – MTC buses, and local stakeholders. Real-time displays at airports and railway stations, combined with app-based minibuses, corporate shuttles, and battery-operated buggies, serve over thousands of passengers daily, reducing access time, improving comfort, and expanding station catchment, thereby strengthening multimodal integration and metro usage.
- The Pink Squad launched by CMRL is a first of its kind initiative in India, comprising women security personnel trained in martial arts and customer service skills, deployed at busy stations and on trains to enhance safety for female commuters. This dedicated team supplements existing CCTV coverage and security measures, providing visible support to women passengers, deterring harassment, and fostering a more secure travel environment[xviii].
- Independent environmental assessments associated with Phase II expansion projects highlight significant potential benefits in terms of reduced congestion, lower pollution levels, and energy efficiency. The system has also received global recognition for its environmental initiatives, reflecting its commitment to integrating sustainability principles into infrastructure design and operations[xix].
- India's first unified multimodal public transport application called Chennai One, led by Chennai Unified Metropolitan Transport Authority (CUMTA), serves as a single digital gateway integrating CMRL, MTC buses, suburban trains, and last-mile connectivity into a seamless plan–pay–access ecosystem. The app enables real-time journey planning and a single QR ticket valid across modes, eliminating fragmented ticketing and reducing queues.

Key transferable practices

- **Digital and multimodal integration:** Adoption of open-loop payment systems like NCMC, integrated apps like Chennai One, and real-time journey planning across metro, buses, suburban rail, and last-mile services streamline ticketing, reduce queues, and enhance commuter convenience.
- **Leveraging on large events to enhance metro ridership:** Integrated event-based metro passes increase transit use during peak periods, improve crowd management, generate revenue, and stimulate economic activity around high-profile urban events.

→ Commuters waiting to board metro rail in Chennai ©shutterstock - gnanistock

- **Enhancing customer satisfaction through women's safety:** Deploying dedicated female security personnel, combined with real-time information and high-quality service, strengthens commuter confidence, promotes inclusivity, and elevates overall transit satisfaction.

4. Kochi Metro Rail Limited (KMRL)

Kochi Metro has played a transformative role in reshaping urban mobility and influencing the broader spatial and socio-economic development of the city. Its strong commitment towards creation of a gender inclusive mobility ecosystem, along with extensive connectivity and comprehensive multimodal integration have not only eased daily commute but have also improved access to employment, education, and public services, along with strengthened economic participation and enhanced overall urban productivity in the region.

Overview

Operational since	17 June 2017
Cities covered	Kochi
Organisation structure	Joint venture of Government of India and Government of Kerala
Number of operational lines	1
Number of lines under construction	Extension of the operational line in another direction
Total operational network length	27 kilometres
Network length under construction	11 kilometres
Number of operational stations	25
Number of stations under construction	10
Average monthly ridership in 2024	3 million
Base fare	₹10 (≈ €0.094)
Types of ticketing	Paper and app based QR tickets, stored-value cards like Kochi1 Card, QR tickets- app-based, festival passes and special-event tickets are also rolled out when needed
% of digital transactions	≈20%
Availability of mobile application	Yes, Kochi1 App
Availability of emergency helpline number	Yes, 18004250355
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	Feeder bus, e-autos, shared autos, rental bikes, pedestrian walkways, and integrated access to Kochi Water Metro at selected interchange points like Vyttila and High Court

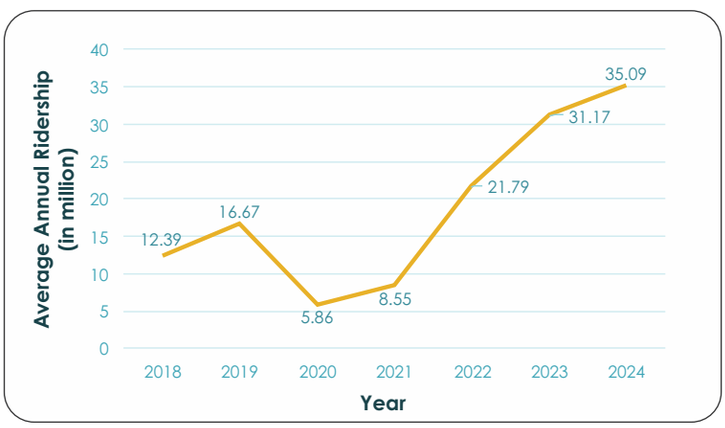


Figure : Average annual ridership of KMRL from 2018-2024 (Source: KMRL)

Socio-economic and environmental impact

- KMRL's well-planned, executed, and managed multimodal public transport network has encouraged a clear modal shift away from private vehicles, leading to lower greenhouse gas emissions, reduced noise pollution, and decreased road congestion. The metro's alignment with walking, cycling, and the Kochi Water Metro has created a cohesive, multimodal, and people-centred transport ecosystem that prioritises environmental sustainability and urban liveability.
- Since inception, KMRL strategically planned to harness solar energy with the long-term objective of achieving full energy neutrality for its train operations, in alignment with Government of India's priorities to reduce dependence on fossil fuels. As part of this strategy, an unused marshy land near Muttom Depot was repurposed into a solar power generation site. KMRL has implemented its solar initiative in three phased projects - SPV 01, SPV 02, and SPV 03 that are operated under the Renewable Energy Service Company (RESCO) model with 25-year Power Purchase Agreements (PPAs) ensuring maintenance responsibility with power producers. Through this phased approach, KMRL aims to progressively achieve its target of energy-neutral metro operations[xx].
- The integration of renewable energy sources, particularly solar power for stations and depots, reflects a strong commitment to sustainable operations. In the financial year 2024 -25, KMRL achieved 44% energy neutrality by procuring 12.82 million units of solar power through the RESCO-model at an average cost of ₹4.52 (≈ €0.43) per unit, accounting for 44% of its total electricity consumption. By lowering dependence on grid electricity by the same proportion, the system is estimated to have prevented approximately 11,356 tonnes of CO_2 emissions annually, underscoring its commitment to sustainable and climate-responsible operations.
- Several milestones highlight KMRL's innovative approach to integrated mobility, including becoming India's first metro to formally integrate a full-fledged electric boat system through the Kochi Water Metro, advancing renewable energy adoption across its infrastructure, and receiving consistent national recognition for inclusive, accessible, and gender-sensitive design.
- Data from KMRL reveals that it has adopted a distinctive model of inclusive employment by entrusting station facility management like ticketing, customer interface, and house-keeping, to Kudumbashree - a Government of Kerala initiative for poverty alleviation and women empowerment, engaging 568 personnel (525 women and 14 transgender staff). Additionally, 71 women security personnel constitute nearly 29% of the total 247 security workforce deployed across metro stations. As a result, KMRL records the highest proportion of women employees among Indian metro systems, with women comprising over 50% of its workforce across operational, technical, and managerial functions, reinforcing its leadership in gender equity and inclusive urban transport governance.
- KMRL has strategically diversified its non-fare revenue portfolio through retail and office space leasing, semi-naming rights / co-branding of selected metro stations, fuel station dealership with Bharat Petroleum Corporation Limited (BPCL), pier advertising, government office licensing, vending machines at metro stations, and land monetisation; generating substantial and recurring income streams. These initiatives collectively resulted in an approximate 10% increase in non-fare box revenue in the financial year 2024-25 over the previous year.
- Looking ahead to 2030, KMRL's vision is to establish a unified, low-carbon urban mobility framework through network expansion, deeper multimodal integration, improved last-mile connectivity, and widespread adoption of digital ticketing. Ultimately, the strategic objective is to make public transport sufficiently reliable, safe, and convenient to naturally incentivise citizens to shift away from private vehicles, fostering a cleaner, more efficient, and better-connected city.

Key transferable practices

- **Seamless multimodal integration**: Align metro networks with different modes of public transport along with NMT and walking to create a seamless, people-centred system that reduces private vehicle dependence, lowers congestion, and enhances urban liveability.
- **Sustainable operations:** Adopt renewable sources of energy and long-term energy agreements to achieve energy-neutral operations, cut grid reliance, and substantially reduce carbon emissions, by creating a climate-resilient transit ecosystem.
- **Create gender inclusive workforce models:** Engaging women and transgender in a male dominated sector by partnering with self-help groups and/or non-governmental organisations to enhance gender diverse workforce participation.

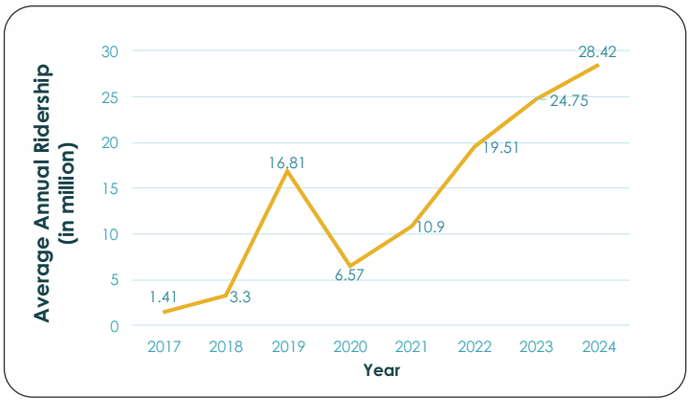
→ Students commuting in Kochi Metro ©KMRL

5. Uttar Pradesh Metro Rail Corporation Limited (UPMRCL) – Lucknow Metro Project

Lucknow Metro, as the first metro rail system in the Indian state of Uttar Pradesh, has played a pioneering role in demonstrating the potential of modern mass transit for urban mobility across the major cities of the state. Over time, it has evolved into a key catalyst for Lucknow's development by strengthening connectivity, advancing sustainable transport, and promoting inclusive, resilient, and environmentally responsible urban growth.

Overview

Operational since	6 September 2017
Cities covered	Lucknow
Organisation structure	Joint venture of Government of India and Government of Uttar Pradesh
Number of operational lines	1
Number of lines under construction	1
Total operational network length	23.67 kilometres
Network length under construction	11 kilometres
Number of operational stations	21
Number of stations under construction	12
Average monthly ridership in 2024	2.37 million
Base fare	₹10 (≈ €0.094)
Types of ticketing	At station through Ticket Vending Machine (TVM), Ticket Office Machine (TOM), Excess Fare Office (EFO) counter
% of digital transactions	-
Availability of mobile application	Under development stage and will be launched soon
Availability of emergency helpline number	Yes
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	Shared auto, rental bike/auto/taxi, e-rickshaw, bus; UPMRCL has MoU with Uber , Rapido and AjeGo to provide last and first mile connectivity
Additional information	UPMRCL also operates metro rail services in the cities of Kanpur and Agra



→ Figure 5: Average annual ridership of Lucknow Metro from 2017-2024 (Source: UPMRCL)

Socio-economic and environmental impact

- Lucknow Metro, under UPMRCL's Safety, Health, and Environment (SHE) framework, systematically integrates rigorous safety management and environmental stewardship into its operations, striving to adopt best practices that protect both commuters and staff while minimising ecological impact. The corporation emphasises occupational health and safety, robust passenger protection systems such as emergency intercoms, and continuous enhancement of environmental performance through certified management systems and sustainable practices, reflecting a comprehensive commitment to a safe, healthy, and environmentally responsible metro service[xxi].
- UPMRCL has been integrating renewable energy sources like rooftop solar panels at stations and depots to reduce their reliance on fossil fuels, while technologies such as regenerative braking help recover and reuse energy generated during train operations, collectively improving energy efficiency, lowering carbon emissions, and strengthening the sustainability of metro services. In Lucknow, the 3.312 megawatt solar plants installed, harness 3.6 million units of electricity per year leading to savings of ₹17 million (≈ €184,783) annually.
- Assessments by UPMRCL claims Lucknow Metro has achieved the milestone of being the most economical in terms of the operations and maintenance cost than any other metro in the country.
- UPMRCL is the first in India to have CO_2 sensor based Heating, Ventilation, and Air Conditioning (HVAC) control for less train energy consumption in Lucknow Metro.
- Besides Lucknow Metro, UPMRCL also has operational metro rail systems in the cities of Kanpur and Agra. Additional metro rail systems are expected to come in other cities like Prayagraj, Jhansi, Gorakhpur and Bareilly.

Key transferable practices

- **Integrated safety and environmental governance:** Implementing robust passenger and workforce safety protocols alongside certified environmental management systems establishes a metro operation that is simultaneously secure, healthy, and ecologically responsible.
- **Advanced energy efficiency strategies:** Leveraging renewable energy, regenerative braking, and smart energy management technologies, including CO_2 sensor-based HVAC control, optimises operational efficiency, reduces carbon emissions, and supports long-term sustainable transit operations.

→ Aerial view of Lucknow Metro ©UPMRCL

Disclaimer: The case study of UPMRCL is limited to the case of Lucknow Metro

6. Maharashtra Metro Rail Corporation Limited – Maha Metro

Maha Metro has emerged as a pivotal player in sustainable urban development by strengthening connectivity, enhancing mobility efficiency, and shaping more integrated and transit-oriented growth of the cities. Through modern infrastructure, digital innovation, and environmentally responsible operations, it has contributed to improved quality of life, economic vitality, and resilient urban transformation across its cities of operation.

6a. Nagpur Metro Rail Project

Overview

Operational since	18 April 2018
Cities covered	Nagpur
Organisation structure	Joint venture of Government of India and Government of Maharashtra
Number of operational lines	2
Number of lines under construction	Extension of an existing line
Total operational network length	40.1 kilometres
Network length under construction	43.8 kilometres
Number of operational stations	38
Number of stations under construction	32
Average monthly ridership in 2024	2.51 million
Base fare	₹10 (≈ €0.094)
Types of ticketing	QR paper ticket, 1-day pass, Maha Card, student card, WhatsApp ticket, ticket through Nagpur Metro Mobile App
% of digital transactions	43.89% in 2024
Availability of mobile application	Yes, Nagpur Metro App
Availability of emergency helpline number	Yes, 7410004333 / 18002700557
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	Feeder Bus, shared auto etc.

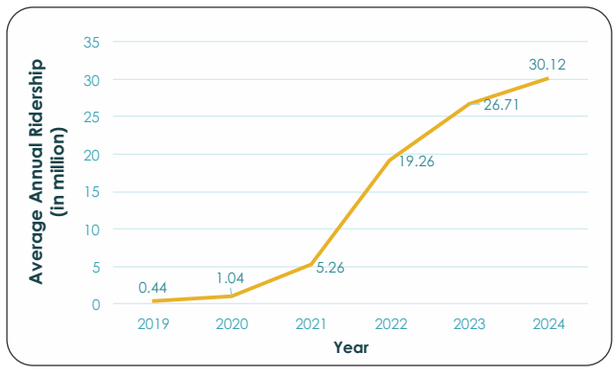


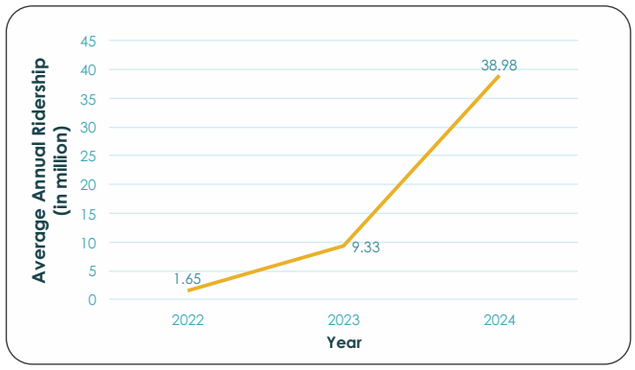
Figure 7: Average annual ridership of Nagpur Metro from 2019-2024 (Source: Maha Metro)

Aerial view of Nagpur Metro showing a stretch of the double-decker viaduct, supporting both a highway flyover and a metro rail on a single column ©Maha Metro

6b. Pune Metro Rail Project

Overview

Operational since	6 March 2022
Cities covered	Pune and Pimpri Chinchwad
Organisation structure	A joint venture of Government of India and Government of Maharashtra
Number of operational lines	1
Number of lines under construction	Extension of an existing line
Total operational network length	33.1 kilometres
Network length under construction	4.5 kilometres
Number of operational stations	29
Number of stations under construction	4
Average monthly ridership in 2024	3.25 million
Base fare	₹10 (≈ €0.094)
Types of ticketing	Paper ticket with QR code, 1-day pass, Pune One card, student card, WhatsApp ticket, ticket through Pune Metro Mobile App
% of digital transactions	72.50%
Availability of mobile application	Yes, Pune Metro App
Availability of emergency helpline number	Yes, 18002705501
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	Feeder bus, shared auto etc.



→ Figure 8: Average annual ridership of Pune Metro from 2022-2024 (Source: Maha Metro)

Socio-economic and environmental impact

- Under the Transit Oriented Development (TOD) framework, Maha Metro has initiated Land Use Action Plans (LAPs) for corridors of Nagpur Metro. This integration with TOD planning aims to transform areas within 500 meters of stations into mixed-use urban nodes, enhancing accessibility to offices, educational institutions, healthcare, retail, and residential spaces, thereby stimulating economic activity and social vibrancy in adjacent neighbourhoods[xxii].
- Nagpur Metro's relative success in ridership, operations, digitalisation, dedicated provisions for differently abled people[xxiii], and urban integration has made Nagpur a demonstration case for how metro rail can work beyond Tier-1 Indian cities[xxiv].

- As estimated, Pune Metro is pursuing diversified income streams such as advertising, station co-branding, telecom infrastructure, commercial leasing, and property development to bolster financial sustainability, with plans aimed at generating nearly 40% of total revenue from non-fare sources, reducing reliance on fares and public funding[xxv].
- Studies reveal that in Pune, metro connectivity has contributed to notable increases in property demand and values along metro corridors, particularly in rapidly developing areas such as Hinjewadi, Wakad, and Balewadi, which have experienced significant growth in home sales and investor interest due to improved accessibility and infrastructure[xxvi].
- Pune Metro is the first in the country to operate with indigenously designed aluminium-bodied trains, which are lighter than conventional rolling stock, resulting in improved energy efficiency, reduced operational costs, and lower overall carbon emissions during regular service[xxvii].
- Additionally, Maha Metro is responsible for metro development in Thane and is also involved in the Navi Mumbai Metro project under a long-term operational agreement, positioning Navi Mumbai as another city where it executes metro rail infrastructure.

Key transferable practices

- **Transit Oriented Development:** Integrating metro corridors with mixed land use and walkable neighbourhoods enhances accessibility, drives economic activity, and fosters socially vibrant, transit-centric urban areas.
- **Sustainable financing and local manufacturing:** Diversifying non-fare revenue while deploying indigenously developed, lightweight, energy-efficient trains not only reduce operational costs and emissions but also strengthens the domestic manufacturing sector, supporting local economic development.

→ Commuters boarding and alighting at a station of Pune Metro ©Maha Metro

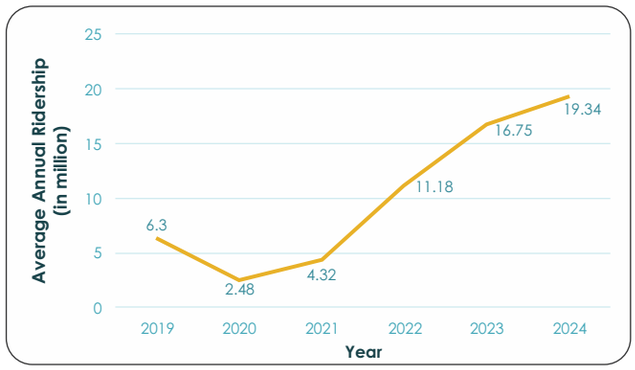
7. Noida Metro Rail Corporation Limited (NMRC)

Noida Metro is playing a crucial role in the city's development by strengthening connectivity, modernising mobility, and fostering more inclusive urban movement patterns. Through improved accessibility, integrated transport planning, and financially sustainable operations, NMRC continues to support economic vitality, environmental stewardship, and the long-term urban resilience of Noida and Greater Noida.

Overview

Operational since	26 January 2019
Cities covered	Noida and Greater Noida
Organisation structure	Joint venture of Government of India and Government of Uttar Pradesh
Number of operational lines	1
Number of lines under construction	0
Total operational network length	29.707 kilometres
Network length under construction	0
Number of operational stations	21
Number of stations under construction	0
Average monthly ridership in 2024	0.61 million
Base fare	₹10 (≈ €0.094)
Types of ticketing	QR ticket, SBI NMRC-City 1 Card, ticket purchased from mobile app 10% discount is applied to each journey made using a smart card

% of digital transactions	49.69%
Availability of mobile application	Yes, NMRC tickets app
Availability of emergency helpline number	Yes, 18001800247
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	-



→ Figure 9: Average annual ridership of NMRC from 2019-2024 (Source: NMRC)

Socio-economic and environmental impact

- The sanctioned 2.6 kilometres extension of NMRC's Aqua Line to the Boraki Multimodal Transport Hub, with two additional stations, is poised to deepen regional connectivity, integrate last-mile transport, and stimulate development around transit nodes, thereby strengthening the city's integrated mobility ecosystem.
- Data collected shows NMRC has demonstrated increasing self-reliance through strategic diversification of non-fare revenue which grew from ₹144.908 million (≈ €1.57 million) in the financial year 2023–24 to ₹182.455 million (≈ €1.98 million) in 2024–25. This expansion in commercial revenues from property, advertising, and allied services enhances the system's fiscal sustainability while enabling continued service improvements, ultimately supporting both economic efficiency and long-term urban resilience[xxviii].
- NMRC's strong commitment to promoting green and sustainable mobility is reflected by it receiving the Indian Green Building Council (IGBC) Platinum rating for all 21 elevated stations from IGBC Green Rating System.
- NMRC has fostered an inclusive and non-discriminatory workplace through dedicated welfare measures for women employees, resulting in women constituting 23% of the workforce. In addition, as an Equal Opportunity Employer, NMRC has advanced transgender inclusion by engaging six transgender outsourced employees at its designated "Pride Station".

Key transferable practices

- **Transit-integrated urban development:** Extending metro lines to multimodal hubs enhances regional connectivity, facilitates last-mile integration, and catalyses development around stations, reinforcing a cohesive urban mobility framework.
- **Sustainable practices:** Combining green-certified infrastructure with diversified non-fare revenue ensures environmental and financial sustainability, while proactive inclusion of women and transgender promotes equitable and socially responsible transit governance.

→ Trains parked at Noida Metro's depot ©NMRC

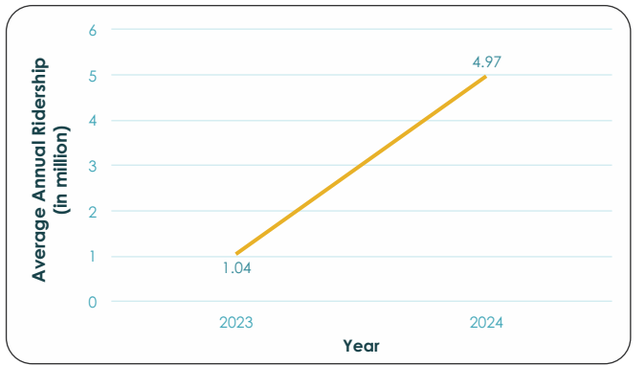
8. National Capital Region Transport Corporation (NCRTC)

NCRTC's Namo Bharat serves as a key driver of regional economic development by improving high-speed connectivity across the NCR. By integrating Tier II and Tier III towns with major urban centres, it supports polycentric growth and enhances access to education and employment for a large commuter base. Improved mobility is expected to attract industrial investment, facilitate the formation of new economic clusters, and generate employment[xxix]. Through this 'Trickle-Down Effect', Namo Bharat has been paving the way for equitable access to opportunities, contributing to sustained and balanced regional development. As a pioneer in operating the first RRTS in India, NCRTC has the vision to improve the quality of life of the people by providing equitable, fast, reliable, safe, comfortable, efficient and sustainable mobility solutions enabling economic development of NCR.

Leveraging upon Building Information Modelling (BIM) and digital twin technology to create precise virtual representations of its rail infrastructure, NCRTC enables real-time monitoring, predictive maintenance, and optimised planning and operations across the Namo Bharat corridors, which leads to enhanced efficiency, reduced operational risks, and more informed decision-making throughout the project lifecycle[xxx].

Overview

Operational since	21 October 2023
Cities covered	Delhi, Ghaziabad, Meerut
Organisation structure	Joint venture of Goverment of India and States of Delhi, Haryana, Rajasthan and Uttar Pradesh
Number of operational lines	1
Number of lines under construction	-
Total operational network length	≈55 kilometres
Network length under construction	-
Number of operational stations	11
Number of stations under construction	-
Average monthly ridership in 2024	0.41 million
Base fare	₹230 (≈ €2.16) for ≈52 kilometres Currently, NCRTC offers a 35% discount on each ticket, along with an additional 10% loyalty benefit extended to commuters
Types of ticketing	NCMC, paper QR tickets generated from TVM or ticket counters at stations or digital QR ticket generated through Mobile App
% of digital transactions	-
Availability of mobile application	Yes, Namo Bharat Connect App
Availability of emergency helpline number	Yes, +9180696 51515
Availability of grievance redressal system	Yes
Availability of passenger feedback system	Yes
Last-mile connectivity options	-



→ Figure 10: Average annual ridership of Namo Bharat from 2023-24 (Source: NCRTC)

Socio-economic and environmental impact

NCRTC upholds strong Environmental, Social, and Governance (ESG) commitments by embedding sustainability across all phases of the Namo Bharat project. Some of the key initiatives of NCRTC undertaken in 2024-25 that positively impacted the socio-economic and environmental development of the region are mentioned below[xxxi].

- Precast construction methods employed for elevated viaducts and underground tunnels to substantially reduce on-site dust emissions, thereby improving ambient air quality during construction.
- Integrated rainwater harvesting infrastructure, including recharge pits and dedicated ponds at the Duhai Depot, has been implemented across stations, depots, and viaducts to enhance water conservation and limit dependence on municipal water sources.
- Afforestation initiatives maximised at available spaces at stations, depots, and road medians to enhance green cover and biodiversity, prioritising native species. Compensatory plantations are undertaken in strict compliance with statutory requirements prescribed by the respective State Forest Departments.
- Contribution to renewable energy integration, with 4.7 MW of rooftop solar capacity commissioned at stations and depots, resulting in operational cost efficiencies and reduced CO_2 emissions, while advancing the objective of developing carbon-negative stations. Furthermore, the planned integration of a 110 MW captive solar power facility, intended to meet up to 60% of corridor energy requirements, underscores the NCRTC's long-term commitment to a low-carbon and sustainable development trajectory.
- As a part of its CSR initiatives, NCRTC sanctioned funds for construction of toilets in Meerut district of Uttar Pradesh.
- Community engagement was strengthened through awareness programmes focusing on environmental protection, public health, and social well-being.

Key transferable practices

- **Sustainable construction and environmental management:** Using precast construction methods and integrating rainwater harvesting, afforestation, and compensatory plantations minimises environmental impact, improves air and water quality, and enhances urban biodiversity during infrastructure development.
- **Community engagement and social responsibility:** Integrating CSR initiatives on environmental and social well-being builds community trust and promotes a model of socially responsible, inclusive urban transport.

→ Aerial view of Namo Bharat train ©NCRTC

Key Trends Observed in the Case Studies

- **Sustainability and climate-responsive operations:** 7 out of 8 case studies demonstrate strong environmental commitments through initiatives such as renewable energy adoption (particularly solar), regenerative braking technologies, green building certifications, and energy-efficient operations. These measures contribute to lowering carbon emissions, improving resource efficiency, and aligning metro systems with broader climate and sustainability goals of India's target of attaining Net Zero Emissions by 2070.
- **Digitalisation and smart mobility integration:** 6 out of 8 case studies emphasise the adoption of digital tools and intelligent transport technologies, including QR-based ticketing, mobile ticketing applications, NCMC integration, and data-driven operational systems. These digital innovations enhance passenger convenience, streamline ticketing processes, and improve operational efficiency.
- **Multimodal connectivity and last-mile integration:** 6 out of 8 case studies highlight the importance of integrating metro services with other transport modes such as buses, shared mobility services, non-motorised transport, and regional rail systems. Strengthening first- and last-mile connectivity expands station catchment areas, encourages modal shift away from private vehicles, and supports the development of more cohesive urban mobility networks.
- **Inclusive and socially responsible mobility systems:** 6 out of 8 case studies incorporate measures to improve accessibility, safety, and equity in urban transport. These include universal design features for persons with disabilities, women-only coaches or safety initiatives, gender-inclusive workforce participation, and community-oriented programmes that enhance public trust and social inclusion.
- **Revenue diversification and financial sustainability:** 5 out of 8 case studies highlight deliberate efforts to reduce dependence on fare-box revenue by expanding non-fare income sources such as retail spaces, station branding, advertising, parking, property development, and consultancy services. These strategies are aimed at strengthening the long-term financial viability of metro systems while maximising the commercial potential of transit infrastructure.
- **Urban development and transit-oriented growth:** 4 out of 8 case studies demonstrate how metro systems are increasingly linked with broader urban development strategies such as TOD, property value enhancement around corridors, and improved access to employment, education, and services. These initiatives position metro networks as catalysts for economic activity and spatial transformation in their respective cities.

Collectively, these trends demonstrate that India's urban rail systems are evolving from infrastructure projects into integrated urban mobility platforms that influence environmental performance, economic development, and social inclusion.

Conclusion – Way Forward

The development of urban rail transit across the case studies discussed, reflect a decisive step in India's urban transformation, illustrating how contemporary rail-based mobility can reshape cities beyond the transport sector itself. These systems have collectively enhanced regional connectivity, improved access to economic opportunities, and supported more balanced spatial development by better integrating peripheral and emerging urban areas into core metropolitan networks. Consistently rising ridership (other than the years affected due to the lockdown/restrictions imposed during the COVID-19 pandemic), increased digitalisation of services and diversified revenue strategies further demonstrate growing public confidence and institutional maturity in urban rail governance.

Equally significant are the wider socio-economic and environmental contributions of these mobility networks. By facilitating a modal shift from private vehicles to public transport, they have helped alleviate congestion, reduce emissions and promote more sustainable patterns of urban movement. Their emphasis on renewable energy, universal accessibility and inclusive employment practices underscores a broader commitment to equitable and climate-responsive urban development. Taken together, these urban rail systems provide a compelling model for India's future cities that aligns economic vitality with environmental responsibility and social inclusion, thereby strengthening the foundations of resilient and liveable urban regions.

→ Inside an interchange station of Delhi Metro showing signages for seamless passenger transfers ©DMRC

In January 2026, the Government of India approved a new high-speed rail corridor in Kerala and tasked DMRC with preparing the Detailed Project Report (DPR), which will be led by veteran engineer E. Sreedharan (popularly known as the Metro Man of India) to define its alignment, design and implementation strategy[xxxii]. The Union Budget 2026-27 reaffirmed the Government of India's strong commitment to expanding high-capacity public transport infrastructure, significantly boosting funding for metro rail and RRTS projects as instruments of sustainable urban and regional development. The metro sector received enhanced budgetary support with allocations aimed at accelerating ongoing project phases nationwide, reflecting continued emphasis on expanding urban rail networks to meet rising mobility demand[xxxii]. Meanwhile, NCRTC has been allocated ₹22 billion (≈ €239.13 million) for further development of RRTS[xxxiv]. These developments underscore a strategic shift towards integrated, high-speed, and environmentally responsible urban rail systems that reinforce the role of metro and rapid railways in shaping India's urbanisation trajectory.

Thus, the growth trajectory of urban rail in India extends well beyond the expansion of metro networks, reflecting the consolidation of an integrated, technology-oriented and internationally significant mobility framework. Through the systematic integration of metro systems, RRTS, city bus services, waterborne transport and TOD, Indian cities are advancing towards cohesive multimodal networks rather than fragmented corridors of movement. The deployment of advanced signalling, interoperable digital ticketing, data-driven planning and advanced technology -driven operations underscores a deliberate progress towards intelligent, resilient and people-centric transport systems. Concurrently, diversified financing structures, combining governmental support, multilateral and bilateral funding, land value capture mechanisms and carefully structured private sector participation have strengthened the institutional and financial foundations of infrastructure delivery while maintaining long-term public accountability. Beyond mobility outcomes, this transformation has stimulated wider socio-economic development by enhancing labour market accessibility, catalysing transit-oriented urban regeneration, generating employment and improving regional productivity. Collectively, these trends demonstrate that India's urban rail systems are evolving from infrastructure projects into integrated urban mobility platforms that influence environmental performance, economic development, and social inclusion, positioning India as an emerging global reference point.

UITP at Members' Service

UITP, as the International Association of Public Transport and a passionate champion of sustainable urban mobility, brings together (as per 2026) more than 2,000 among public transport authorities, operators, industry suppliers, academics and policy makers from around the world, and together with these members, advances public transport through advocacy, knowledge and networking.

Since 1885, UITP shares insights and experiences, inspiring innovation, shaping the future of urban mobility.

When it comes to Metro (also known as "Metropolitan Railways"), UITP is organised in several working bodies, each with its own purpose and functioning, to properly cover and fulfil the needs of members located in all corners of the world. This structure and functioning are mentioned in the paragraphs below.

The **Metro Division** is composed by over 100 metro operators worldwide. Any metro operator member of UITP is de facto a member of the Metro Division.

The **Metro Division Meeting** is the meeting that gathers, once a year with the representatives (CEOs, technical directors, etc.) of all UITP Metro Division members. In the Division Meeting, top level Metro Division members share their news and discuss problems at the highest level in a closed, non-commercial environment.

The **Metro Committee** is the strategic and executive force of the Metro Division. It plans, coordinates and monitors the work of the five technical Platforms and contributes to the preparation of the Metro Division Meetings and Conferences programme. This working body is composed by the Chairpersons of the technical Platforms and a number of regional representatives. Observers from other UITP Committees participate to the Metro Committee activities too.

The **Metro Platforms** are the "technical engine" of the Metro Division; these groups gather top specialists from all over the world in their respective fields and produce detailed technical reports (available to all UITP members on MyLibrary). Working topics are decided by the members of the Platform, considering the priority areas defined by the Metro Committee and UITP's Integrated Global Work Plan. Participation to Platforms is open to all members of UITP Metro Division.

The technical Platforms are:

- **Signalling, Energy and Automation Systems (SEAS) Platform,** previously called "Electrical Installations and Safety Systems (EISS)" Platform

In 2021, a new group was created under the SEAS Platform to focus on CBTC topics. The **CBTC Working Group** comprises all the members of the SEAS Platform and, as working guests, other operators or infrastructure managers of metro, light rail or suburban rail systems which are using CBTC or have completed a feasibility study and have the intention to carry it on based on CBTC technology.

Some of the recently completed topics include:

o CBTC Maintenance
o Power Purchase Agreement (PPA) conditioned to an energy production investment
o Broken rail detection and prevention
o FAQS in specific details in GoA4 migration

Some of the current work topics include:

o System integration and Big Data opportunities of SEAS systems

o Blackout resilience- lessons learnt and preparedness
o Managing Advanced Functions in Existing GOA4 CBTC
o Exploring Best Practices in the Administration and Management of Railway OT Systems
o CBTC migration from one supplier to another due to obsolescence

Operations Platform

Some of the recently completed topics include:

o Cost cutting measures
o Backup OCC
o Fatal incidents involving clients
o OCC organisation and layout

Some of its work programme currently covers, among other:

o Safety management in metro networks
o Comparison: Operational staff GoA1/2 – UTO
o Rules for carrying electric vehicles in metros
o Challenges due to cultural change among staff work-life-balance vs. shift work
o Preparing metro network assets and impact on operations due to changing climate and extreme weather situation

Fixed Installations Platform

Some of the recently completed topics include:

o Organisation and gender equality in Fixed Installations and Operations Departments
o Management of track auscultation data
o IoT for the conditional/predictive maintenance of assets
o Life cycle management

Current work topics include:

o Water management in tunnels
o BIM
o Operations 24/7: is it the future? Impacts/strategies for maintenance
o Modernisation of infrastructure and fire protection

Rolling Stock Platform

Recently completed topics include:

o Rolling stock of the future
o Lean Maintenance
o Special rail vehicles - engineering vehicle

Its current work programme covers the following topics:

o Obsolescence and replacement management
o Cybersecurity impact in rolling stock
o Replacement vs Refurbishment
o Software maintenance plan

Automated Metros Platform

This closed body gathers the main references in automated metro operation. Only UITP members with relevant operating experience or very advanced automation projects can take part.

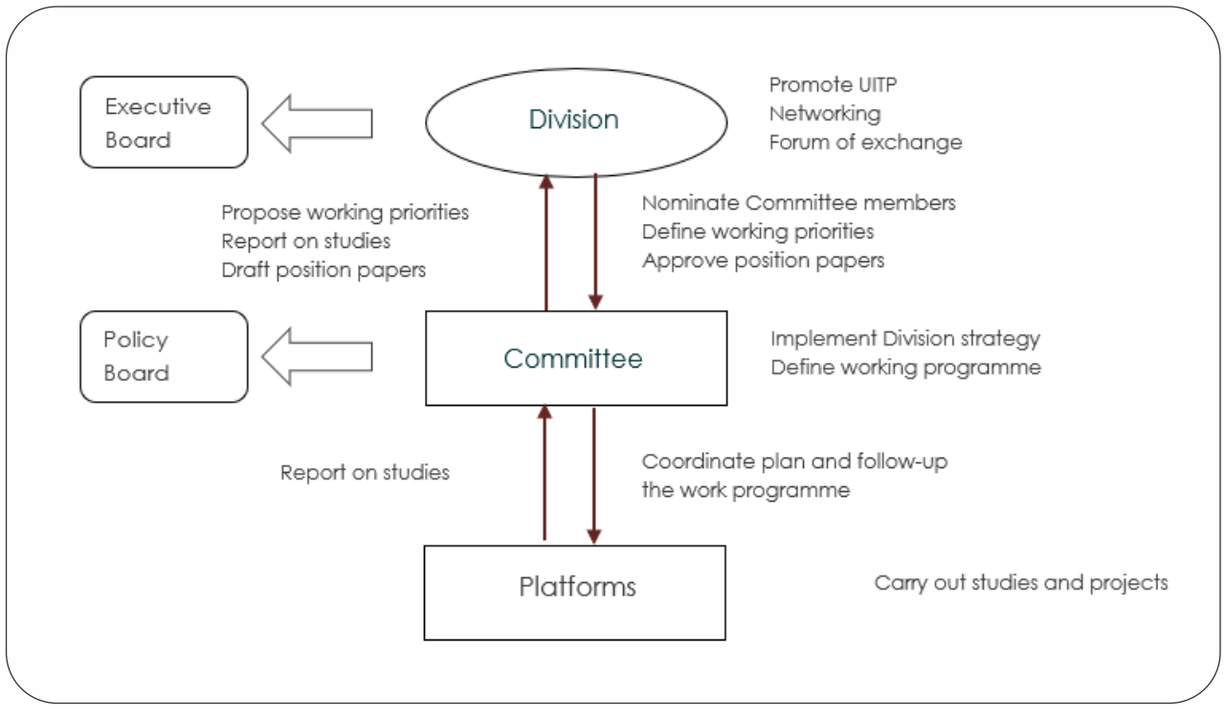
Recently completed topics include:

o Metro Automation Brownfield projects
o Trains coupling in an automated metro lines
o Spontaneous evacuation between stations in GoA4 lines

Its current work programme covers the following topics among many more:

o Automated metros statistics and benchmarking
o Risks in migration
o Comparison of operations staff between GoA1/GoA2 and FAO / Staffing models
o Use of Big Data/IoT for predictive maintenance

Access to the Platform reports is reserved to UITP members through MyLibrary; participation in meetings is reserved to UITP metro operators.



→ Structure and basic functioning of the UITP Metro working bodies

When it comes to **Regional and Suburban Railways (RSR)**, also known as commuter railways, UITP is structured into a Division, a Committee, and several Working Groups, each with a distinct purpose and function. This framework ensures that the needs of members across all regions of the world are effectively addressed. The structure and its functioning are outlined below.

The **RSR Division** comprises more than 100 member organisations that partially or fully operate rail services in regional and suburban areas. The Chair of the Division is also a member of the UITP Executive Board.

The RSR Division Meeting convenes at least every two years and brings together representatives from all members of the UITP RSR Division. During these meetings, members share updates and discuss key challenges at a strategic level in a closed, non-commercial environment. Participants also receive an overview of the technical activities carried out by the Division over the preceding two years and may propose new topics, thereby helping to shape the future direction of both the Division and the wider RSR sector.

The **RSR Committee** serves as the working body of the Division. It defines the work programme, produces knowledge in various formats, and contributes to the preparation of Division Meetings and conference programmes. The Committee is composed of a limited number of advanced and premium UITP members. Observers from other UITP committees, such as Light Rail and Industry, also participate in its activities.

The **RSR Working** Groups act as the technical engine of the Committee. These groups bring together specialists to develop knowledge and produce reports, which are made available to all UITP members via MyLibrary. The Committee may establish up to three Working Groups at any given time. Their topics are defined by Committee members for each mandate of the RSR Chair, in alignment with UITP's Integrated Global Work Plan. Participation in Working Groups is open to all members of the UITP RSR Division.

Current Working Group topics:

- Reviving Regional and Rural Railways Working Group

  This group provides a comprehensive framework for sharing insights, best practices, and lessons learned related to railway reopenings.

- Climate-Resilient Railways Working Group

  This group gathers insights from rail public transport operators, authorities, and relevant stakeholders on how climate change is affecting networks. It also examines the strategies, measures, and tools being developed to strengthen resilience, and identifies best practices, case studies, and recommendations to support the sector in adapting to climate risks.

The **Light Rail/Trams (LRT) Division** is composed of Division Ambassadors of member companies that are partly or solely involved in operation of tram and/or light rail networks. The Divisions are an administrative segmentation in UITP. Every operator of a light rail system that is member of UITP is de facto a member of the LR Division.

The **Light Rail Committee** is one of the bodies that addresses the specific needs and challenges related to light rail and tram systems. This committee serves as a platform for UITP members who operate or are interested in light rail and tram services to share their expertise, exchange best practices, and collaborate on common issues. The committee works towards promoting sustainable and efficient light rail and tram systems worldwide.

Current workstream topics:

Under the workstream of Operations and Safety, the current working items are -

o Driver management, leadership, digitalisation are currently being prepared within the Lean Management Workshop.

o Priorisation - coming as an input during the Joint Committee Meeting with the Bus Committee from Warsaw – timetabling and scheduling are included in this topic.

o Automation with safety focus – identify all systems to improve safety.

Under the workstream of Maintenance and Rolling Stock, the current working items are -

o Maintenance management - Depot placement and maintenance strategies

- Super Depot and Satellite Depots
- Stabling strategies
- Maintenance strategies - lane structure, depot automation (equipment movement, inspections)

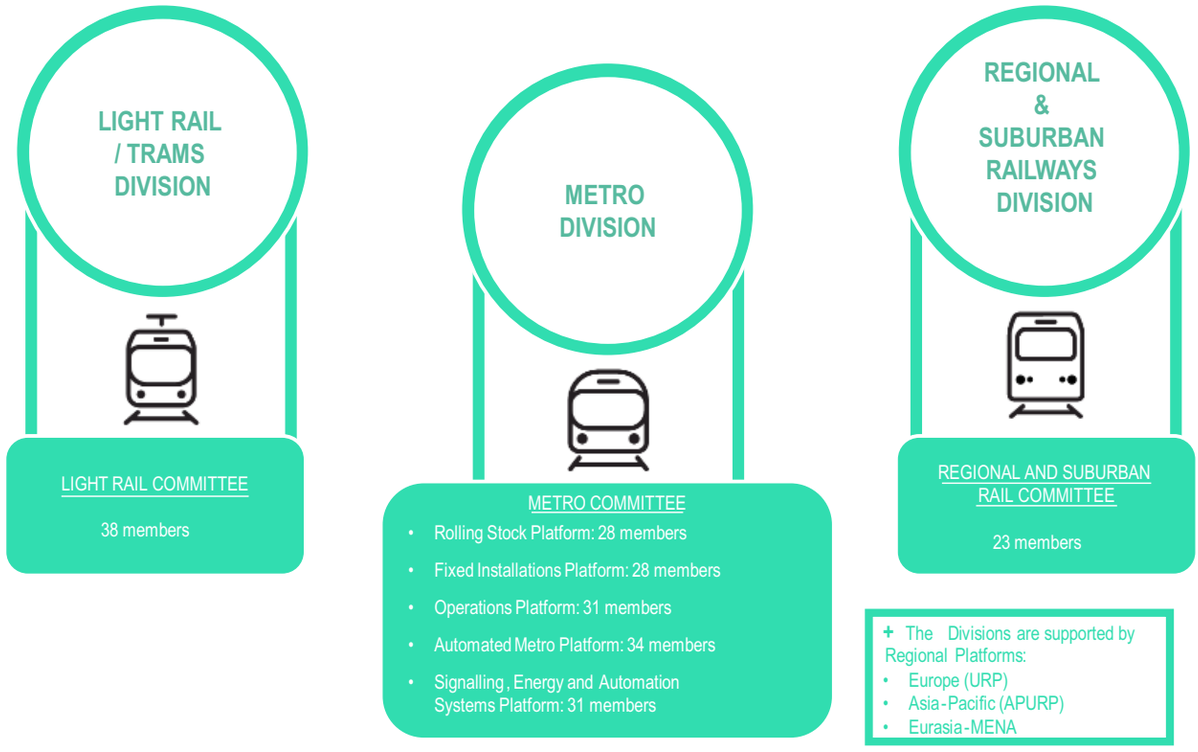
o Optimal wheel rail interfaces

- Internal organisation within operators
- Noise/Vibrations
- Technology
- Upgrade or Decommission
- Sustainability
- Better understand which option to select in the framework of obsolescence, advances in technology

Under the workstream of Statistics and Benchmarking, there are external statistics and internal statistics (benchmarking).

The external statistics liaisons with UITP Light Rail (LR) statistics exercise, and can be published in aggregated way, focussing on LR, and the audience comprise cities which don't have LR but plan to construct, decision makers, and general public.

The internal statistics /Benchmarking Group has access to data if they share data. This data is collected for internal discussions focussing on supporting operational decisions of operators, improve customer experience and collect best practices to improve the methodologies, management and business decisions, and the audience for this comprise Operators / Operating Authority of LR in the benchmarking group accepting its rules of sharing.



→ Rail at UITP in a glance

To read more about the publications and reports of UITP on urban rail, check out UITP MyLibrary at: https://mylibrary.uitp.org/

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This publication was prepared by UITP India, and it acknowledges with gratitude the support and substantive inputs provided by Bangalore Metro Rail Corporation Limited, Chennai Metro Rail Limited, Delhi Metro Rail Corporation Limited, Kochi Metro Rail Limited, Maharashtra Metro Rail Corporation Limited, National Capital Region Transport Corporation, Noida Metro Rail Corporation Limited, and Uttar Pradesh Metro Rail Corporation Limited which have significantly enriched the case studies included in this study. UITP India would like to express its sincere gratitude to Mr.Raymond Huisman, Manager – Strategy and CSR, GVB, Netherlands for his invaluable review and constructive feedback on this paper. UITP India also acknowledges with gratitude the continued support and contributions of its colleagues from the Rail Unit of Knowledge and Innovation Department of UITP which have been instrumental in shaping this publication.

Disclaimer: This paper is confined to examining the development and impact of urban rail organisations within India, with labour market dynamics and international city comparisons considered beyond its scope. The information in the case study section is mostly provided by the respective urban rail organisations, their latest Annual Report (2024-25), and newspaper articles, with the data provided in the overview section being based on the records available as on 30 June 2025 that have been shared by the respective organisations.

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