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METRO RAIL NEWS

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COVER STORY
INTERVIEW

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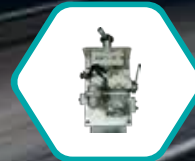
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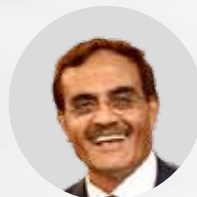
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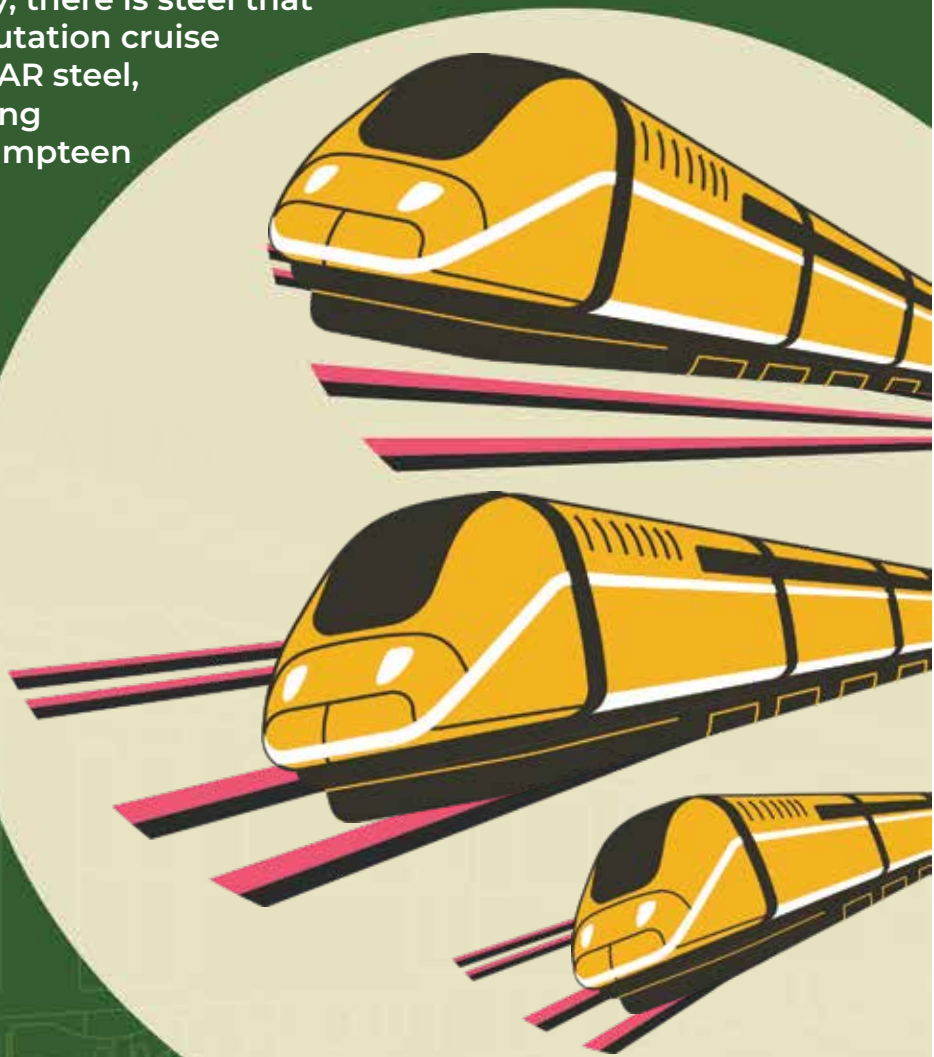
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EDITOR'S NOTE



Narendra Shah
Managing Editor

Budget 2025: New Avenues for Investments in Rail Transport

Dear Readers,

Welcome to the February 2025 issue of Metro Rail News. This budget special edition of our magazine uncovers the opportunities in the rapidly growing rail transportation sector.

On 1 February 2025, Finance Minister Smt. Nirmala Sitharaman presented the eighth consecutive budget. Within this union budget, the Indian Railways has received a total allocation, featuring the highest-ever capital allocation of ₹ 2.65 lakh crores for the Ministry of Railways. This budget features substantial investments in the development of infrastructure, trains, and improvements in connectivity, safety, and passenger comfort. This allocation reflects a massive increase compared to the ₹ 45,900 crores allocated during the fiscal years 2009-2014. Additionally, Indian Railways has plans to roll out 50 new Nammo Bharat trains, 200 Vande Bharat trains, 50 Vande Bharat Sleeper trains and 100 Amrit Bharat trains (Non AC). The businesses engaged in the rolling stock market and infrastructure projects have a chance to utilise the potential as the rail transportation industry strengthens its roots across the nation. The cover story of the February Issue discusses allocations for the major components of railways, including infrastructure, safety enhancement, signalling, and rolling stocks.

In addition to the railways, the metro landscape in India is expanding at a rapid pace. The conventional metro projects like the Delhi Metro are setting benchmarks for new projects like the Patna Metro which this issue of Metro Rail News studies as the project of the month. The state government of Bihar signed an MoU with DMRC to combine the expertise of DMRC for the effective execution of the Patna Metro Rail Project. Upon completion, the Patna Metro Rail Project will support the city in many ways as the project will not only connect the key areas of Patna including Patna University and Patna Medical College but also improve the socio-economic state of the residents.

The Bhubaneswar Metro is another example of a new metro project which is being developed to support the long-term development of the city. DMRC which is serving as the turn-key consultant for the project has expedited the execution of the project by awarding all three major civil contracts for the Bhubaneswar Metro. Explore all the key details of this project in the featured metro section of this issue.

Expansion of the rail infrastructure is an intricate process influenced by various factors, including financial constraints, land acquisition challenges, and legal procedures. The integration of AI and IoT-based technology in metro systems will

further ease the convenience for passengers. In addition to this, these technologies will ensure the maximum use of existing infrastructure increasing overall efficiency of operations. This issue highlights the successful implementation of AI and IoT-based solutions in metro systems, highlighting their impact on modern urban transportation.

We hope this edition provides valuable insights into Budget 2025 and its impact on India's railway and metro sector, highlighting key investments, policy measures, and growth opportunities.

We appreciate your continued support for Metro Rail News and trust that this edition provides valuable insights into the latest developments and trends in the rail transportation industry, enriching your understanding of India's advancements in urban mobility.

Narendra Shah
Managing Editor
Metro Rail News



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Hitachi Rail – Shaping the Future of Mobility in India



From powering India's first underwater metro Kolkata East-West Metro1 to driving a paradigm shift in the way people travel with the pioneering Mobility as a Service (MaaS) project in India, Hitachi Rail India is revolutionising the transportation landscape, ushering in a new dawn of seamless, safe, convenient, and sustainable mobility.

The landscape of Indian rail mobility is in the throes of a remarkable transformation. The technological leaps by Indian Railways, burgeoning urban transport, and redefinition of freight logistics through Dedicated Freight Corridors (DFC) are collectively unleashing industrial and economic growth on a scale never witnessed before.

At the epicentre of this unparalleled transformation stands Hitachi India – a growth partner of the nation in envisaging futuristic rail infrastructure through Hitachi Rail India's comprehensive rail solutions – from rolling stock and digital signalling to Mobility as a Service (MaaS), smart ticketing, services and maintenance, and beyond.

“Hitachi India stands at the vanguard of India's mobility transformation, leveraging its unparalleled Green, Digital, and Innovation capabilities to pioneer its future. By enhancing passenger experiences and propelling India's net-zero aspirations, we are redefining the very fabric of urban transit ecosystems to propel the nation towards an integrated, efficient, convenient, and environmentally sustainable future.”

Dr. Bharat Kaushal

Corporate Officer, Hitachi, Ltd. and
Managing Director, Hitachi India

Indian Railways: Cementing a Long-Standing Partnership

Indian Railways, the lifeblood coursing through the veins of the nation, is essential to the daily journeys and cherished memories of billions.

Hitachi Rail is at the forefront of fortifying

the mobility landscape, enhancing both passenger experience and environmental stewardship. A testament to this commitment is the implementation of

Hitachi Rail's Electronic Interlocking

System on vast Indian Railways network and optimising over 1,200 stations for enhanced efficiency and reduced CO2 emissions, paving the way for sustainable rail transport.

Forging Connections through the Himalayas:

Connecting Kashmir's serenity with India's heartland via the iconic Udhampur-Srinagar-Baramulla Rail Link (USBRL) project.

Massive Technological Upgrade: Enhancing efficiency with India's largest Electronic Interlocking System at Juhi Yard, Kanpur, Uttar Pradesh.



Distinguished Projects for Indian Railways

Enhancing Capacity Throughput for Supporting Journeys for Millions:

Streamlining traffic with bi-directional Automatic Signalling on the Ghaziabad-Aligarh segment, ensuring smoother, faster journeys.

Seamless Rail Management Under One Roof:

Pioneering India's first Centralized Traffic Control (CTC) system at Tundla for real-time train operations across the High Density Network of Kanpur-Ghaziabad corridor.

Breathing New Life into India's Freight Ecosystem

India's visionary DFC project is redefining the nation's growth trajectory with its distinctive freight-only tracks, unlocking capacity for more passenger trains on the existing Indian Railways network and fuelling a new era of overall sustainable development.

As a consortium leader for the Western DFC, Hitachi Rail is offering its distinguished rail technologies, including the trusted

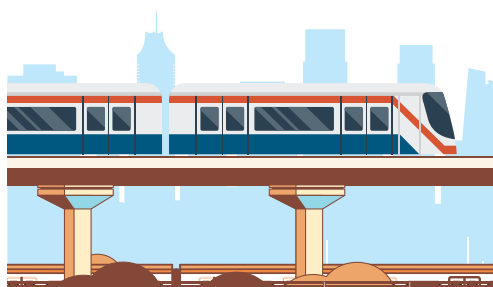
Electronic Interlocking System with Automatic Signalling, using indigenously manufactured multi-section digital axle counters, Train Monitoring and Diagnostic System for real-time tracking, enhanced by remote monitoring and diagnostics system for asset management, and Train Protection and Warning System (TPWS) for enhanced safety, speed and throughput. Playing an

instrumental role in building India's largest industrial belt along Delhi-Ajmer-Ahmedabad-Mumbai corridor, Hitachi Rail is also supporting Indian Railways' vision to drive modal shift through safer, digital, greener railways while reducing millions of tons in carbon emissions for a Net Zero future.



Elevated to Underwater: Driving India's Metro Revolution

The urban transport revolution is propelling India into one of the world's largest Metro network league, with Hitachi Rail leading transformative projects in Delhi NCR, Kolkata, Mumbai and Navi Mumbai region, and Chennai that strengthen urban mobility, connect communities, and build sustainable cities for today and tomorrow.



“Hitachi Rail India is unwavering in its commitment to passenger safety and experiential journeys, meticulously binding the length and breadth of India into one cohesive fabric. By driving the success of Make in India, Aatmanirbhar Bharat, and Gati Shakti National Master Plan, we are progressing to forge a seamless, sustainable mobility ecosystem.”

Dr. Manoj Kumar Krishnappa
Director, and Head of
Hitachi Rail STS India Pvt. Ltd.

Uplifting the Urban Commuter

Kolkata East-West Metro

India's first underwater metro project is enabling seamless connectivity across major hubs of the Metro city – Howrah, Sealdah, and Sector V.

Mumbai Metropolitan Region

Powering Mumbai Metro Line 2A, 2B, and 7 to decongest mobility in India's financial capital.

Navi Mumbai Metro Rail

Transforming commutes across the Greater Mumbai Region with distinguished rail technologies.

Greater Noida Metro Rail

The 29.7 km Aqua Line is enabling seamless connectivity across Noida, Greater Noida, and India's national capital region (Delhi NCR).

Chennai Metro

Leading the Phase 2 of the Chennai Metro Rail project with digital signalling and Automatic Train Operation (ATO), Driverless and Unattended Train Operation (GoA4).

Hyderabad Metro

Signalling and Train Control System along with a comprehensive Integrated Communications and Supervision (ICS) package on three corridors.

Heralding a New Era of Smart Mobility: Pioneering Mobility as a Service (MaaS)

In a groundbreaking initiative, Hitachi Rail is partnering in one of the world's first large-scale implementations of Mobility as a Service (MaaS) – a revolutionary model that integrates various modes of transport into a single, unified platform. Collaborating with the Indian Railway Catering and Tourism Corporation Limited (IRCTC), Delhi Metro Rail Corporation (DMRC), and Centre for Railway Information Systems (CRIS), Hitachi Rail is

integrating main line railway and metro on a unified ticketing / fare collection National Common Mobility Card (NCMC) platform, offering a new travel experience to millions. By allowing passengers to book Delhi Metro QR Code tickets directly through the IRCTC website and mobile App, this landmark initiative seamlessly combines journeys while promoting the 'One India – One Ticket' vision.

“Ensuring smooth first-mile and last-mile transitions, Hitachi Rail is fostering a truly interconnected and adaptive mobility ecosystem, positioning India as a global leader in the MaaS domain and enhancing the everyday lives of citizens through seamless, smart, and eco-friendly journeys.”

Pankaj Bhatia
Managing Director, Hitachi Rail GTS India

Seamless Ticketing for Hassle-Free Journeys

- Hitachi Rail India is upgrading one of the world's biggest Metro Automatic Fare Collection (AFC) systems, handling over 7 million daily transactions comprising Phase I, II, and III.
- Integrating NCMC, QR codes, and Unified Payments Interface (UPI) payments across 254 stations and supplying AFC systems for 44 additional stations in Delhi Metro Phase IV.
- Enhancing urban transit with a seamless and hassle-free ticketing experience.

Driving the digital and green transformation of mobility, Hitachi Rail continues to help every passenger, multiple operators, and our vast community enjoy the benefits of more seamless, safe and sustainable travel.

“Rail journeys are the lifeblood of India's narrative, intricately woven into the emotional tapestry of our lives. Hitachi Rail India, with its end-to-end rail solutions, is at the forefront of empowering a resilient, world-class rail infrastructure that enhances the quintessential travel experience for billions.”

Mangal Dev
Head - Hitachi Rail India & South Asia,
& Director, Hitachi India Pvt. Ltd.

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Metro

TBM Gomati Achieves 1st Breakthrough for Kanpur Metro Line-2

The Kanpur Metro project progressed as Kalpataru Projects International Ltd. (KPIL) – Gulermak JV's TBM Gomati achieved the first breakthrough near Agriculture University station of Line 2 spanning 8.38 km from Agriculture University to Barra-8. In October 2024, TBM Gomati was deployed for its first assignment and constructed a 622 m tunnel from Rawatpur station to the ramp at Agricultural University. TBM Gomati is the first of two TBM machines commissioned for the underground package KNPCC-11 covering a total distance of 4.08km between the Agriculture Depot and Double Pullia Ramp on Line 2. KPIL- Gulermak secured Package KNPCC-11 from Uttar Pradesh Metro Rail Corporation (UPMRC) at Rs. 762.50 crores with a 30-month deadline.



NEWS HIGHLIGHTS



Kolkata Metro: TBM S-1410A Passes Factory Acceptance Test For Purple Line

Herrenknecht AG has finished testing a tunnel boring machine (TBM) named S-1410A in Alinjivakkam, Tamil Nadu. The TBM will be commissioned by Larsen & Toubro (L&T) for Kolkata Metro's 5.05 km underground Package UG1 of Purple Line (Line 3) spanning 15.215 km between Joka and Esplanade through 12 stations. L&T bagged Package UG1 of the Kolkata Metro Line-3 at ₹2,447 crore. In May 2024, L&T officially commenced the construction work on Package UG1 of Kolkata Metro Line-3, with initial activities starting at the Victoria Memorial Station site in Maidan. In July 2024, L&T began producing tunnel ring segments at its Sarkarpool yard near Majerhat Station on the same metro line.



Delhi Metro: Afcons Completes Final Tunnel Segment for Package DC-07

Afcons Infrastructure has completed a major milestone for Package DC-07 of Delhi Metro's Golden Line by casting the last tunnel ring segment. In total, 8,327 segments were cast for this package which connects Sangam Vihar Station to Sarita Vihar Depot. The Delhi Metro's Golden Line spans 23.622 km and links Aerocity to Tughlakabad with 16 stations. In January 2022, Afcons bagged Package DC-07 from the Delhi Metro Rail Corporation, valued at Rs 1,669.20 crore, with a deadline of 42 months. These segments are being used by four Tunnel Boring Machines (TBMs) to construct the twin tunnels of the Golden Line. Additionally, Afcons will construct three underground stations at Maa Anandmayee Marg, Tughlakabad Railway Colony, and Tughlakabad.



Nagpur Metro: Kalpataru Starts Casting Pile Cap for Reach 3A

On January 14, Kalpataru Projects International Ltd. (KPIL) started work on Package C11 of Nagpur Metro Phase 2 by casting the first pile cap for Reach 3A, which connects Lokmanya Nagar and Hingna with seven stations. Construction on Reach 3A which is part of the 19.4 km Aqua Line, officially began in November 2024. In December 2024, KPIL held a bhoomi puja ceremony to open the casting yard for Reach 3A. Package C11 includes building three viaducts in different areas and was awarded to KPIL by Maharashtra Metro Rail Corporation Limited (Maha Metro) for Rs. 999 crore, with a deadline of three years for completion.



TBM Tejas Records 1st Breakthrough for Delhi Metro Phase 4

Afcons Infrastructure's TBM Tejas (S-711) recorded a breakthrough at Maa Anandmayee Marg Station of Delhi Metro's Golden Line spanning 23.622 Km between Aerocity and Tuglakabad via 16 stations for Package DC-07. In November 2023, TBM Tejas became the second TBM commissioned by Afcons for the Delhi Metro Phase 4 under Package DC-07. TBM Tejas constructed a 2.674 km downline tunnel between Air Force Launch Shaft, (east to Sangam Vihar Station) and Maa Anandmayee Marg Station in 14 months. Afcons was awarded Package DC-07 by the Delhi Metro Rail Corporation in January 2022 for an estimated cost of Rs. 1669.20 crore, with a completion deadline of 42 months.



Indore Metro: RVNL – URCC JV Begins Casting Segments for Package IN-04

Indore Metro phase 1 is progressing as the Rail Vikas Nigam Ltd. and URC Construction (RVNL – URCC) joint venture has started casting segments for Package IN-04. This package covers 5.2 km from Shaheed Bagh to Palasia Chauraha and includes 5 stations. Each segment will be 8.5 meters wide and 2.1 meters tall, used to build the viaduct for the elevated stations. RVNL – URCC won this package from the Madhya Pradesh Metro Rail Corporation for ₹543 crore in March 2024. It is the fourth civil package for the main line and the fifth overall for the Yellow Line of Indore Metro.



CRRC Supplies Prototype Train For Bangalore Metro's Purple Line

Bangalore Metro Phase 2 advanced as CRRC supplied the prototype train for the Purple Line at Green Line's Peenya Depot. The 6-coach train set delivered by CRRC is part of Phase 2's rolling stock 4RS-DM which was originally awarded to Chinese rolling stock manufacturer CRRC by Bangalore Metro Rail Corporation Ltd (BMRCL). This train for Purple Line has been equipped with a DTG (Distance to Go) signalling system. CRRC rolled out this prototype from its Nanjing Plant in December 2024. As per the contract, Out of 36 trains, 21 trains (126 coaches) will be deployed on the Purple and Green line while 15 trains (90 coaches) are planned to be deployed on the Yellow Line by BMRCL. The rest of the 34 trainsets will be supplied by Titagarh Rail Systems.



Kanpur Metro: TBM Vidyarthi Starts Tunneling toward Kanpur Central

The Kanpur Metro project progressed as the Afcons – Sam India consortium launched the Tunnel Boring Machine (TBM) Vidyarthi from Transport Nagar station toward Kanpur Central on Line 1. This work is being carried out under Kanpur Metro's underground package KNPCC-06 which connects Nayaganj Station with Transport Nagar Ramp. This TBM was commissioned in January 2024 as the 4th TBM for Kanpur Metro Phase 1. The Afcons–Sam India consortium grabbed underground Package KNPCC-06 from Uttar Pradesh Metro Rail Corporation (UPMRC) at Rs. 1087.67 crore. This contract has a 36-month deadline.



Meerut Metro Hits Tracks for Trial Run

The Meerut Metro project progressed as the National Capital Region Transport Corporation (NCRTC) conducted trial runs on a 9.4 km route spanning from Meerut South Station to Meerut Central Station. This new metro system is part of the Delhi-Meerut RRTS project. Starting from Meerut South Station, the NCRTC team operated a 3-coach Alstom metro train along a 9.4 km stretch, primarily elevated, reaching up to Meerut Central Station. The primary objective of the trial run was to validate the Schedule of Dimensions (SOD) clearances by ensuring the train maintains adequate spatial conformity with designed infrastructure. Additionally, the trials aimed to analyze dynamic interactions between rolling stock and civil structures.

Metro

DMRC Conducted Trial Runs on Pink Line's Extension

Delhi Metro Phase 4 progressed as DMRC conducted successful trials on the Pink Line Extension spanning 12.098 km from Majlis Park to Maujpur. This development came under Delhi Metro Phase 4's package DC-02. Longjian - KEC JV secured this contract from DMRC at Rs. 1,080 crore in November 2019. The trials were conducted between a 5km section from Majlis Park to Jagatpur Village, comprising 3 elevated stations located at Burari, Jharoda Majra, and Jagatpur Village. To execute the trial DMRC commissioned a 6-coach Hyundai Rotem train at a speed of 5 kmph. During the trial the train ran from the siding line at Majlis Park Station, heading eastward, and then returned.



NEWS HIGHLIGHTS



Bullet Train

NHSRCL Initiates Electrification on Mumbai Ahmedabad Bullet Train Corridor



The electrification work for the Mumbai-Ahmedabad High-Speed Rail corridor has started. The first two steel masts have been erected on the viaduct between Surat and Bilimora in Gujarat, standing 14 meters tall. In total, over 20,000 steel masts, varying in height from 9.5 to 14.5 meters will be installed along the corridor. These masts will support the Overhead Equipment (OHE) system, which includes the overhead wires and related components. The complete system will use a 2x25 kV overhead traction setup, enabling high-speed trains to operate on the corridor.

Bullet Train Project: Full Span Girder Box Cast For Maharashtra Section



The Mumbai-Ahmedabad Bullet Train Project is making progress as the National High-Speed Rail Corporation (NHSRCL) has cast its first large Pre-Stressed Concrete (PSC) Box Girder for the Maharashtra section. This 40-meter girder, weighing about 970 tons, is the heaviest of its kind in India and is made as a single piece without joints, using 390 cubic meters of concrete and 42 tons of steel. To keep up with the demand for girders, 13 casting yards have been set up along the route in Maharashtra, from Shilphata to the Gujarat-Maharashtra border. Currently, 3 of these yards are operational—2 for segment casting and 1 for full-span girders.

4th PSC Bridge Completed for Mumbai-Ahmedabad Bullet Train Project



The Mumbai-Ahmedabad Bullet Train Project has reached an important milestone as MG Contractors Pvt. Ltd. completed a 210-meter-long pre-stressed concrete bridge under Package P1(C). This bridge crosses NH-48 at Dabhan village, near Nadiad in the Kheda district of Gujarat. MG Contractors won this contract from the National High-Speed Rail Corporation for ₹261.24 crore in August 2021. This is the fourth pre-stressed concrete bridge finished for the project along NH-48. The bridge is located between the Anand and Ahmedabad bullet train stations, has a span configuration of 40m + 65m + 65m + 40m, and consists of 72 precast segments. It was built using the Balanced Cantilever Method, which works well for larger spans.

Railways



Railways Deploys Electronic Interlocking at Shakurbasti

Indian Railways has improved passenger safety by upgrading the signalling system at Shakurbasti in New Delhi. They replaced an old mechanical interlocking yard with a new electronic system that uses a Visual Display Unit (VDU) to control 493 routes. This upgrade enhances the safety, efficiency, and reliability of train operations. Union Minister for Railways Ashwini Vaishnaw mentioned that train accidents have decreased from 135 in 2014-15 to 40 in 2023-24, showing the positive effects of safety measures introduced over the past ten years.



Indian Railways: PM Modi Inaugurates Jammu Railway Division

The Prime Minister, Shri Narendra Modi, recently inaugurated the new Jammu Railway Division and the Charlapalli New Terminal Station in Telangana. He also laid the foundation stone for the Rayagada Railway Division Building, which will improve connectivity in Odisha and Andhra Pradesh. PM Modi stated "Integration of J&K into the national railway network is a monumental step towards transforming Indian Railways into a global leader in efficiency, speed, and passenger experience. He also mentioned "As the railway network expands, setting up new divisions like Jammu will benefit regions like Jammu, Kashmir, Himachal Pradesh, Punjab, and Leh-Ladakh. J&K is achieving new milestones in railway infrastructure, with the Udhampur-Srinagar-Baramulla rail line is being discussed all over the country today,"

RRTS



NCRTC Extends Namo Bharat Trials to Shatabdi Nagar Station

To facilitate the timely implementation of Delhi-Ghaziabad-Meerut RRTS corridor, the National Capital Region Transport Corporation (NCRTC) has initiated trials of the Namo Bharat Train on a 6 km segment connecting Meerut South Station to Shatabdi Nagar Station. The primary aim of the trial was to evaluate the interaction between the rolling stock and the associated infrastructure. Currently, the Namo Bharat Train operates on a 55-kilometre route that extends from Ashok Nagar to Meerut South Station.



Railway Launches SwaRail App for Passenger Convenience

The Ministry of Railways has officially launched a new application, 'SwaRail,' which is designed to integrate all train services into a single platform for the convenience of passengers. The Centre for Railway Information Systems (CRIS) developed this app to consolidate various Indian Railways services that were previously distributed across multiple applications into a cohesive, user-friendly interface.

The SwaRail application offers an array of services for train travellers, including the booking of reserved and unreserved tickets, platform and parcel reservations, inquiries regarding train schedules and PNR status, as well as customer support through the Rail Madad platform. Currently, the application is available for beta testing on both the Google Play Store and Apple's App Store, with a comprehensive rollout anticipated following the completion of the testing phase.

Industry



Kineco Group Announces 100% Acquisition of Semvac A/S

Kineco Group, a leading Indian company with diversified business interest across Railways, Defence, Aerospace, Renewable energy and Industrial sectors has announced the acquisition of Semvac, A/S, Denmark – a marquee brand in the global rail industry known for its sanitary systems. Kineco acquired 100% equity stake in Semvac from Wabtec UK Holdings Ltd. through a group SPV, Kineco TrainTech Pvt. Ltd. in an all-cash transaction.

This acquisition marks a strategic milestone for Kineco's "Global Rail" brand and provides it with access to Semvac's established European customer base.

Analysing the Budgetary Support for Indian Railways for FY 25-26



➔ Indian Railways has been a major contributor to India's growth since British rule. Over the years it has evolved to support the nation in multifaceted ways including transportation, infrastructure, and economic growth. Apart from being the 4th largest railway, it is also one of the largest employers in the world with a workforce of about 1.2 million people. Its expansion has led to the emergence of new businesses which has further created employment on a very large scale across the country.

The Indian Railways is closely working with start-ups due to its clear innovation policy and new ideas. From June 2022 to July 2024, the railways approved about Rs. 43.87 crore (US\$ 5.27 million) to support 23 projects.

This article primarily delineates the allocations designated for Indian Railways as stipulated in the Union Budget for the fiscal year 2025-26. Furthermore, the study seeks to examine the growth potential of the railway industry in light of the provisions outlined in the budget.

Budget Allocation & Capital Expenditure (Capex)

Component	Amount (₹ crore)
Total Railway Budget	265,000
Gross Budgetary Support (GBS)	252,000
Extra Budgetary Resources (EBR)	10,000
Total Capital Expenditure (Capex)	262,000
Internal Resource Mobilization	3,000



Overview of Railway Budget 2025-26

On 1 February 2025, Finance Minister Smt Nirmala Sitharaman, created history by presenting a record eighth consecutive budget. The budget allocation for the Indian Railways for the fiscal year 2025-26 is set at ₹2.65 lakh crore, maintaining the same level as the allocation from the previous fiscal year.

During a **press briefing** following the budget presentation, **Union Railways Minister Ashwini Vaishnaw** stated, *"The Railway Capex stands at ₹2.52 lakh crore from the total ₹2.65 lakh crore allocation, which includes Public-Private Partnership (PPP) investments."*

The budget places a strong emphasis on **infrastructure development, modernization of stations and trains, improved connectivity, and enhanced passenger safety and comfort.**

Utilisation of Railway Budget for FY 2024-2025 As of 5 January 2025

Category	Budget Estimate (₹ crore)	Amount Spent (₹ crore)	Utilisation (%)
Total Capital Expenditure (Capex)	265,200	192,446	76%
Gross Budgetary Support	252,200	-	-
Rolling Stock	50,903	40,367	79%
Safety-Related Works	34,412	28,281	82%

Union Budget: A Roadmap for Viksit Bharat

Shri Ashwini Vaishnaw, the Union Minister for Railways, Information & Broadcasting, and Electronics & IT stated that the Union Budget serves as a strategic roadmap for Viksit Bharat.

1. The budget allocates ₹4,60,000 crore for railway infrastructure projects.

Expansion of Rail Network

- **New Railway Lines:** ₹32,235.24 crore allocated for accelerating the construction of new railway lines.
- **Gauge Conversion:** ₹4,550 crore earmarked for gauge conversion projects.
- **Doubling of Tracks:** ₹32,000 crore designated for track doubling to enhance capacity.

Rolling Stock Expansion

- **Rolling Stock Allocation:** ₹57,693 crore assigned for rolling stock procurement and upgrades.

• Introduction of New Trains:

• **50 Namo Bharat Trains:** The Railways plans to launch 50 new Namo Bharat trains that will connect cities situated at a distance of 100- 200 kilometres from each other. Each train will comprise 16 coaches, inclusive of both air-conditioned and non-air-conditioned options.

• **100 Amrit Bharat Trains:** Additionally, the launch of 100 Amrit Bharat trains, which will be non-air-conditioned, aims to provide affordable and accessible travel alternatives.

• **200 Vande Bharat:** Furthermore, the introduction of a total of 200 Vande Bharat trains will enhance the high-speed travel network across the nation.

• **Expansion of Non-AC Coach Fleet:** To accommodate an increase in passenger numbers, the Railways intends to manufacture 17,500 non-air-conditioned general coaches of which 1,200 have already been manufactured.

• **Phasing Out ICF Coaches for Safer LHB Coaches:** Over the next five years, conventional ICF coaches will be progressively replaced with LHB coaches to improve passenger safety standards.

• **Provision for 50 Vande Bharat Sleeper Trains:** The first Vande Sleeper train is currently undergoing testing, and there are plans to manufacture 50 Vande Sleeper trains between 2025 and 2027, with a total of 200 rakes projected for production.

2. Boost to Safety Enhancement

A dedicated ₹1,16,514 crore has been earmarked for railway safety projects, including:

- Track renewal.
- Signaling and telecom upgrades.
- Construction of new railway points and crossings.
- Development of 1,000 Road Over Bridges (RoBs) and Road Under Bridges (RuBs).

3. Reimbursement for Strategic Line Operations

The reimbursement for losses related to the operation of strategic lines has been allocated at ₹2,739.18 crore in the Budget Estimate for the fiscal year 2025-26, compared to ₹2,602.81 crore in the Revised Estimates for 2024-25.

4. Debt Servicing for National Projects

This fiscal year, an allocation of ₹706 crore has been made for debt servicing associated with market borrowings for National Projects.

5. Net Revenue Expenditure

The net revenue expenditure of Indian Railways is projected

to be ₹3,02,100 crore in this year's Budget Estimate, an increase from ₹2,79,000 crore in the revised estimates of the previous fiscal year.

6. Investment in PSUs: The budget allocation for investments in Public Sector Undertakings (PSUs) and joint ventures has decreased from the revised estimate of **₹27,570.77 crore** for the fiscal year 2024-25 to **₹22,444.33 crore** for the fiscal year 2025-26.

7. Allocation to DFCCIL: Budgetary funding for the Dedicated Freight Corridor Corporation of India (DFCCIL) has seen a sharp reduction in the Budget for 2025-26 with funding set at **₹500 crore**. This outlines a steep decline from the **₹8,155 crore** allocated in the previous year.

According to the Revised Estimates for the fiscal year 2024-25, DFCCIL is projected to expend **₹5,499 crore** by the conclusion of FY 2024-2025. This decreased fund for **FY 2025-2026** highlights the project is nearing completion as the last section of the project between Vaitarna-JNPT will be completed by the end of 2025

Minister Vaishnav stated that by March 2025, the Indian Railways is anticipated to achieve a critical milestone of a 1.6 billion-tonne cargo carrying capacity. "With this, we will become the second-largest cargo-carrying railway globally, surpassed only by China, which has a capacity of 3.7 billion tonnes."

8. Allocation for Mumbai Ahmedabad High-Speed Rail Corridor: In the fiscal year 2023-24, an amount of ₹18,295 crore was allocated to the Bullet Train project. The budget estimate for FY 2024-25 was projected at ₹21,000 crore. However, the allocation has been subsequently reduced to ₹19,000 crore in the budget for FY 2025-26.

Statewise Allocation

Among the states, Maharashtra received the highest budgetary allocation, amounting to Rs 23778 crore, followed by Uttar Pradesh, which was allocated Rs 19858 crore. Gujarat and West Bengal received allocations of Rs 17155 crore and Rs 13955 crore, respectively. The combined allocation for Assam and the North Eastern states is Rs 10440 crore. Additionally, Jammu and Kashmir received a budgetary allocation of Rs 844 crore for the financial year 2025-26.

The budgetary allocations for other states are as follows:

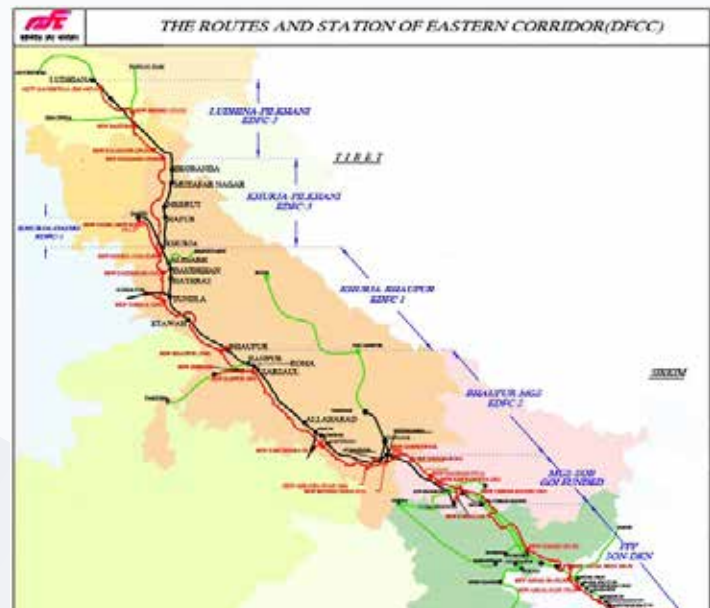
State	Allocation (Rs crore)
Andhra Pradesh	9,417
Bihar	10,066
Chhattisgarh	6,925
Delhi	2,593
Goa	482

Haryana	3,416
Himachal Pradesh	2,716
Jharkhand	7,302
Karnataka	7,559
Kerala	3,042
Madhya Pradesh	14,745
Odisha	10,559
Punjab	5,421
Rajasthan	9,960
Tamil Nadu	6,626
Telangana	5,337
Uttarakhand	4,641

Conclusion

The Indian Railways Budget for FY 2025-26, with an allocation of ₹2.65 lakh crore, underscores the government's vision for modernisation, safety, and infrastructure expansion. An allocation of ₹57,693 crore has been designated for rolling stock procurement, which includes the acquisition of 50 Namo Bharat trains, 100 Amrit Bharat trains, and 200 Vande Bharat trains. Additionally, ₹1.16 lakh crore has been allocated for safety enhancements, covering track renewals, signalling upgrades, and the construction of 1,000 RoBs/RuBs.

Freight expansion remains a priority, with Indian Railways targeting 1.6 billion tonnes of cargo capacity by March 2025. In summary, this budget aligns strategically with the vision of Viksit Bharat and presents substantial growth opportunities for businesses engaged in the rail transportation sector.



Need and Importance of Freight Corridors In India



Overview

Rail freight transportation in India is integral to the country's logistical infrastructure, facilitating the movement of 27% of all goods across a comprehensive network spanning **68,584 kilometers**. As one of the largest railway systems in the world, India's freight trains navigate a variety of terrains connecting industrial centres, agricultural regions, and maritime ports.

The freight network adeptly manages a diverse range of commodities, including coal, minerals, agricultural products, petroleum derivatives, and manufactured goods. The system is responsible for the transportation of approximately 1.4 billion tonnes of freight annually, underscoring its critical role in the nation's economy.

Dedicated Freight Corridors

The National Rail Plan aims to increase the share of freight traffic transported by rail from the current level of 28% to 44% by the year 2051. The establishment of Dedicated Freight Corridors (DFCs) along key high-density routes represents a strategic initiative by Indian Railways to counteract the decline in the market share of rail transport within the country.

Dedicated Freight Corridors, are a network of electric broad gauge freight railway lines that are solely designed for the transportation of freight, goods, and commodities. Dedicated Freight Corridors (DFCs) represent an altering approach to freight transportation, characterized by high-speed and high-capacity railway routes exclusively designated for the movement of goods and commodities. The DFCs segregate freight operations from passenger services and enhance the operational efficiency, speed, and safety of cargo transit. The DFC's main objective is to reduce India's logistics costs through advanced infrastructure and cutting-edge technology.

Project Funding for Corridors

- Total Cost Estimate: ₹81,459 crore
- Construction Cost: ₹73,392 crore

COVER STORY

- Soft Cost: ₹19,390 crore
- Land Cost: ₹8,067 crore
- Funding Sources: Combination of debt from bilateral/multilateral agencies, equity from the Ministry of Railways, and Public-Private Partnership (PPP)
- Debt-Equity Ratio: 3:1

Performance of DFCs

• **Between** January 2024 and November 2024, Indian Railways recorded a total of **1,473.05 million tonnes (MT)** in revenue-generating freight loading. This figure represents a **3.86%** increase in comparison to the same period in the preceding year.

Corridors	No. of Train Runs		Gross Ton Kilometer (GTM) (Millions)		Average Speed
	Oct-24	Cumulative Runs (2024-25)	Oct-24	Cumulative Runs (2024-25)	
EDFC	5,915	41,054	11,088	73,022	44.6
WDFC	5,109	31,563	5,643	33,255	51.3
Total	11,024	72,617	16,731	106,277	

Brief History of DFC

Introduction of Dedicated Freight Corridors (DFCs): The Minister for Railways announced the establishment of Dedicated Freight Corridors (DFCs) during the presentation of the Railway Budget for 2005-06 in Parliament.

Japan-India Summit Discussion: After the proposal, the idea to create Dedicated Freight Corridors was discussed at the Japan-India Summit Meeting in April 2005.

Agreement Between India and Japan: The Prime Ministers of India and Japan signed an agreement to conduct a feasibility study and potential funding for the dedicated rail freight corridors by the Japanese Government.

Feasibility Study Report Submission: The feasibility study report was submitted to the Ministry of Railways in October 2007.

Incorporation of DFCCIL: In response to this, Dedicated Freight Corridor Corporation of India Limited (DFCCIL), a special-purpose vehicle was established by Indian Railways and is responsible for the planning and development, financial resource mobilization, construction, operation and maintenance, and business development of dedicated freight corridors.



Freight Corridors along the Eastern and Western sections of the Golden Quadrilateral to address the growing demand from the increasing economy and trade.

Eastern and Western Dedicated Freight Corridors

The establishment of the Eastern and Western Dedicated Freight Corridors marks a major step by the government to enhance the efficiency and reliability of rail transport in India.

Feature	Existing on IR	On DFC
Heavier Axle load		
Axle Load	22.9 T/25T	25/T (Track Structure), Bridges & Formation Designed for 32.5T
Track loading Density	 8.67t/m	 12t/m
Minimum Speed	 75 Kmph	 100 Kmph
Grade	Up to 1 in 100	1 in 200
Curvature	Up to 10 Degree	Up to 2.5 Degree
Traction	Electrical (25 KV)	Electrical (2x25 KV AT Feeding)
Station Spacing	7-10 Km	40 km on Double Line 10 Km on Single Line
Signalling	Absolute/Automatic with 1 Km spacing	Automatic With 2Km Spacing
Communication	Emergency Socket/Mobile Train Radio	Mobile Train Radio

By creating a partnership with Indian Railways, the government aimed to redeem the market shares of railways. These dedicated corridors have optimized freight transportation and alleviated congestion on traditional rail networks by enhancing capacity. Furthermore, the corridors provide a better experience for logistics and transportation businesses nationwide.

Eastern Dedicated Freight Corridor

The Eastern Dedicated Freight Corridor spans **1856 km** and consists of two distinct segments.

- An electrified double-track segment spanning 1409 km from Dankuni in West Bengal to Khurja in Uttar Pradesh.
- An electrified single-track segment spanning **447 km** between Ludhiana (Dhandarikalan) - Khurja - Dadri in the states of Punjab, Haryana, and Uttar Pradesh.

Statewise Route length	
Punjab	88 km
Haryana	72 km
UP	1078 km
Bihar	239 km
Jharkhand	195 km
West Bengal	203 km

Current Status of Eastern Dedicated Freight Corridor

Commissioned Sections

• Sahnewal - Pilkhani

- Length: 179 km
- Commissioning Date: 12.03.2024

• Pilkhani - Khurja

- Length: 222 km
- Commissioning Date: 12.03.2024

• Khurja - Dadri

- Length: 46 km
- Commissioning Date: 25.01.2024

• Khurja - Bhaupur

- Length: 351 km
- Commissioning Date: 29.12.2020

• Bhaupur - DDU

- Length: 402 km
- Commissioning Date: 18.12.2023

• DDU - Sonnagar

- Length: 137 km
- Commissioning Date: 07.07.2023

Western Dedicated Freight Corridor

The Western Dedicated Freight Corridor spans 1,504 km of double electric rail track (2 X 25 KV) connecting JNPT to Dadri through Vadodara, Ahmedabad, Palanpur, Phulera, and Rewari. The route runs mostly parallel to existing rail lines, with specific detours at Diva, Surat, Ankleshwar, Bharuch, Vadodara, Anand, Ahmedabad, Palanpur, Phulera, and Rewari.

Current Status of Western Dedicated Freight Corridor

Commissioned Sections:

• Dadri - Rewari

- Length: 127 km
- Commissioning Date: 25.01.2024

• Rewari - Madar

- ▶ Length: 306 km
- ▶ Commissioning Date: 07.01.2021

• Madar - Palanpur

- ▶ Length: 353 km
- ▶ Commissioning Date: 18.06.2022

• Palanpur - Makarpura

- ▶ Length: 290 km
- ▶ Commissioning Date: 30.09.2022, 30.10.2023

• Makarpura - Sachin

- ▶ Length: 135 km
- ▶ Commissioning Date: 12.03.2024

• Sachin - Vaitarna

- ▶ Length: 193 km
- ▶ Commissioned: Yes

Upcoming Section:

• Vaitarna - JNPT

- ▶ Length: 102 km
- ▶ Commissioning Date: To be Commissioned on 31.12.2025

The Impact of DFCs In the Long Run

Environmental Sustainability

The Dedicated Freight Corridor (DFC) is projected to mitigate more than **450 million tons** of carbon dioxide emissions over its initial 30 years of operation, as per an assessment conducted by Ernst & Young. A carbon footprint analysis performed by Indian Railways indicates that the DFC is anticipated to produce 2.25 times fewer greenhouse gas emissions over a 30-year horizon. For example, the **Khurja-Bhaupur segment** is expected to reduce the nation's CO₂ emissions by approximately 4.2 million tons between the years 2022 and 2052.

Decongestion

According to estimates from the World Bank, the decongestion of roadways along the corridors is projected to save India approximately **Rs 4.9 billion** in logistics costs. By reducing the current strain on rail tracks, the DFC is expected to improve the speed and reliability of passenger trains along high-demand routes.

Boost to GDP

According to a study conducted by the University of New South Wales in Australia, India's existing Dedicated Freight Corridors (DFCs) are projected to contribute approximately Rs 16,000 crore to the nation's gross domestic product.



Conclusion

The development of Dedicated Freight Corridors (DFCs) is a significant step toward improving India's freight transportation efficiency. By increasing capacity, alleviating congestion within the existing rail and road infrastructures, and reducing logistics costs, DFCs facilitate the establishment of a more streamlined supply chain. Furthermore, these corridors promote environmental sustainability by decreasing carbon emissions. As India endeavours to elevate the proportion of rail freight, the ongoing development of DFCs will be instrumental in rendering freight movement more reliable and economically viable, thereby aligning with the nation's long-term economic and infrastructural objectives.



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Presented by:



Organized by:



EXCLUSIVE **INTERVIEW**

MR. NIKO WARBANOFF

CEO OF DB INTERNATIONAL OPERATIONS & DB E.C.O. GROUP



**METRO RAIL NEWS
CONDUCTED AN EXCLUSIVE
INTERVIEW WITH MR.
NIKO WARBANOFF, CEO
OF DB INTERNATIONAL
OPERATIONS & DB E.C.O.
GROUP. DURING THE
INTERVIEW, MR. WARBANOFF
HIGHLIGHTED THE
SIGNIFICANCE OF DB'S ROLE
IN DELHI-MEERUT RRTS.
IN ADDITION TO THIS, MR.
WARBANOFF EMPHASISED
THE POTENTIAL FOR
GROWTH IN INDIA'S RAIL
TRANSPORTATION SECTOR.
HERE ARE THE EDITED
EXCERPTS.**

1. You have a long-standing career in rail transportation. How has your role as CEO of DB International Operations (DB IO) and DB E.C.O. Group influenced your leadership approach in the railway industry?

For the last 15 years, I have worked in the railway industry. During this time, I learned about different railway systems around the world. As CEO of DB International Operations and DB E.C.O. Group, I gained important insights into best practices and regional differences in rail transportation. These experiences have helped me contribute to the success of each project.

2. DB IO has a global footprint in managing rail transport operations. What potential do you foresee in the Indian market?

The Indian rail transportation sector has great potential for growth. For the past 15 years, DB has been involved in India by working on engineering projects. We have served as a general consultant for various railway systems, including the Dedicated Freight Corridor. These projects have built a strong foundation for our work in the region.

In 2022, DB took an important step by entering the Operations & Maintenance (O&M) market in India. Our first project is operating and maintaining India's first RRTS Corridor (Delhi-Meerut). We are eager to further expand

our footprint in India by putting our global expertise into action to contribute to the growth and success of its rail transportation sector.

3. Could you share the key highlights of DB IO's involvement in the Delhi-Meerut RRTS project? What were the major challenges encountered during the preparation phase?

Every project has its own challenges, and the Delhi-Meerut RRTS project is no exception. I remember signing the contract on July 1, 2022, and within just two weeks, we had onboarded our first 150 employees at DB RRTS. Establishing a railway operations company from scratch is quite challenging, but I am immensely proud of the exceptional work our team has accomplished.

Now, we have over 700 people working with us and we are achieving great results every day. We maintain a 99% punctuality rate and excellent customer satisfaction. These figures show the solid foundation we have built. A major breakthrough was the inauguration of Stage 3A on January 5, which extended the operational RRTS network to 55km spanning from New Ashok Nagar to Meerut South. We look forward to opening the entire corridor later this year.

4. The RRTS features ETCS Level 2/Hybrid Level 3 and LTE-

based communication. How will these technologies impact rail operations in India and globally?

The Delhi-Meerut RRTS uses advanced technology like ETCS Level 2/Hybrid Level 3 and LTE-based communication. These technologies represent the future of railway operations. ETCS is a worldwide standard that improves safety, efficiency, and connectivity in rail systems. This progress will set a high standard for future rail projects, both in India and around the world. We are proud to be part of this important change.

5. You've mentioned that the technology used in the RRTS will also be implemented in Germany. What specific lessons or innovations from this project can benefit German rail modernisation efforts?

A great example of the advanced technologies integrated into the RRTS is the infrastructure for automatic train operations, such as platform screen doors at stations. Interestingly, this is something we don't commonly encounter in Germany. At the Duhai Depot, we have set up a lab specifically for training staff on how to operate these doors and handle emergencies. This facility not only supports operations but also provides us with valuable learning opportunities. In fact, the only platform screen door lab within the Deutsche Bahn network is located here in Delhi.



EXCLUSIVE INTERVIEW

In addition to operations and maintenance, we also focus on training train operators. We equip them with skills such as proficiency in the German language. This creates opportunities for those interested in working with Deutsche Bahn's regional operations in Germany. This shows that our cooperation goes beyond regular operations, promoting a deeper exchange of knowledge and expertise.

6. How does DB IO plan to facilitate continuous knowledge exchange between Indian and German rail systems to streamline technological advancements and sustainable practices?

DB IO is in continuous exchange between Indian and German rail systems. When we started our business, we combined a German team with a local Indian team to develop and improve our standard operating procedures. These procedures were thoroughly practised before implementation and are now an integral part of daily operations.

Technology exchange is also important. For example, we learned a lot from introducing platform screen doors, and sharing knowledge is key to our collaboration. In addition, Germany currently has a shortage of skilled workers, and we need that expertise. Starting with train operators could help, but we also need technicians for railway maintenance and other roles that we can bring into our business in Germany. This partnership shows the benefits of combining expertise from both countries.

7. India's capital region is expected to become the world's most populous metropolitan area by 2030. How does DB IO envision expanding its presence in India? Are there plans to participate in other rail or metro projects in the country?

Rail and metro projects, including RRTS, are highly strategic for India's mobility infrastructure. The capital region, as you mentioned, is set to become the world's most populous metropolitan area by 2030. Having visited the area many times, I am always amazed by its size. Developing just one RRTS corridor is not enough the region will require second and third corridors in the capital region

alone to effectively address the traffic situation and significantly enhance mobility for its residents.

Beyond the capital region, other cities with multimillion populations also present opportunities for RRTS projects. These systems could be pivotal in addressing congestion challenges in such metropolitan areas. DB IO is open to exploring options in these areas to support India's expanding rail and metro network.

8. How do you define success for a project like the RRTS, and what milestones are you particularly looking forward to achieving?

Enhanced Accessibility: Success for a project like the RRTS means achieving key goals such as reducing travel time, reducing CO2 emissions, promoting easy connections between different transport options, and making sure all passengers can access the system. The project is already meeting these goals and providing great benefits to commuters.

Ridership Goal: An important milestone is increasing ridership, which is steadily picking up. To ensure long-term success, it will

be important to promote the system and attract more daily passengers.

Operational Excellence: Operational excellence is also crucial. This means keeping services on time, maintaining clean stations, and ensuring a safe and welcoming environment for all passengers, including women and disabled individuals. With these qualities, the RRTS is one of the most modern and innovative transit systems in the world, and I believe it will continue to meet high standards as it expands.

9. What message would you like to convey to the readers of Metro Rail News?

I am passionate about the work we are doing in India, particularly the RRTS project. Our DB RRTS team focuses on meeting performance goals and ensuring passenger satisfaction through our hard work. We are dedicated to upholding high standards in our operations and are ready to help with other RRTS or metro projects in the future. We look forward to contributing to India's development in modern rail transportation.



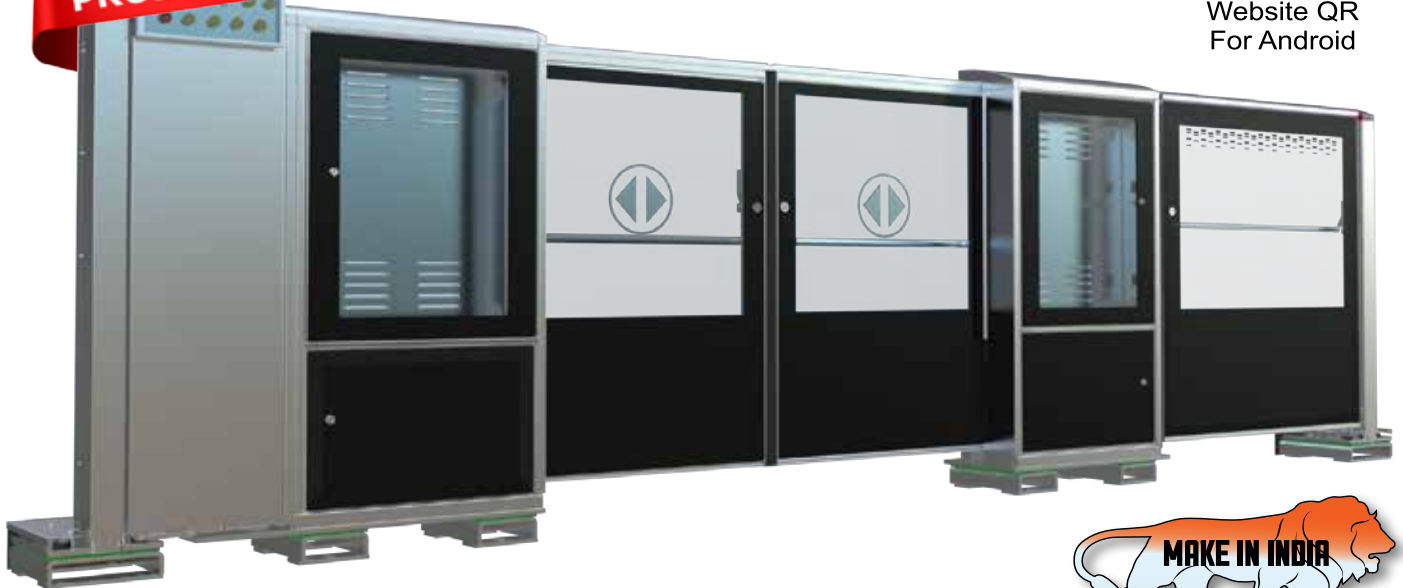
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Patna Metro: A Landmark Project in Bihar's Urban Transportation



A Quick Tour to Patna

Patna is the capital and largest city of the state of Bihar in India, known for its rich historical and cultural legacy. Historically known as Patliputra, the city is located on the southern banks of Ganges River, extending approximately 35 kilometers in length and 16 to 18 kilometers in width. In 2009, the World Bank ranked Patna as the second best city in India to start a business. The city serves as a home to several educational institutions, including the University of Patna, established in 1917.

Patna was ranked as the 21st fastest-growing city in the world and fifth fastest-growing city in India in 2010. The current metro area population of Patna in 2025 is 2,690,000, 2.16% increase from 2024. Patna witnessed a sudden increase in the pollution rate of the city over the time and soon became one of the most densely populated cities in India.

Due to the growing population the city started facing critical issues like traffic congestion on the roads which questioned the public transportation system of the city. To conquer these challenges, a metro system was proposed for the city. Patna Metro, a fast and reliable mode of public transport will efficiently alleviate the traffic congestion on the roads by reducing the dependency of residents on private vehicles. Furthermore, The introduction of the metro system in Patna will also enhance the economic growth of the city.

Patna Metro: Accelerating Patna's Growth

Overview

- The Patna Metro is an ambitious rapid transit project aimed at transforming urban transportation in Patna, the capital of Bihar, India.
- Patna Metro Project is an under construction **Mass Rapid Transit System (MRTS)** for the city of Bihar.
- The Phase 1 of Patna Metro comprises two corridors and 24 stations. The project is estimated to cost Rs.13365.77 crore (approx).
- On 17 February 2019, The Hon'ble Prime Minister, Shri Narendra Modi laid the foundation stone of Patna Metro.



DPR & Approval

- **Rail India Technical and Economic Service (RITES)** was appointed to create the Detailed Project Report (DPR) of the Patna Metro Project.
- On 9 February 2016, the Bihar state government approved the DPR prepared by RITES.
- On 25 September 2018, The Bihar government approved the constitution of **Patna Metro Rail Corporation Ltd (PMRCL)**, a Special-Purpose-Vehicle (SPV) for the implementation of the Patna Metro project. Later on, PMRCL appointed Delhi Metro Rail Corporation (DMRC) as the General Consultant (GC) to assist the project's implementation.
- On 6 February 2019, the Central Government approved the Patna Metro Project.

Revision of Alignment

In November 2019, the Delhi Metro Rail Corporation (DMRC) announced modifications to the Detailed Project Report (DPR) and the alignment for both metro lines.

Key changes included:

- Establishment of a second interchange at Khemni Chowk.
- Removal of the planned depot for Line-1 at Aitwarpur.
- Addition of two new stations at Ramkrishna Nagar and Jaganpura.

Funding Mechanism

- The Project is being developed under a Public Private Partnership Mode at an estimated cost of Rs.13365.77 crore.
- The 60% project will be partly financed through an INR 5521 crore Official Development Assistance (ODA) loan from the Japan International Cooperation Agency (JICA).
- The remaining 40% of the project will be funded by the state government and centre government.
- In November 2024, the state cabinet approved the allocation of Rs.115 Crores from the state plan fund. A portion of these funds will be utilised by DMRC for track work, lift and escalator installations as well as the supply of train sets.

Key Specification

Speed and Track	Top Speed: 80 kmph
	Average Speed: 34 kmph
	Track Gauge: Standard Gauge – 1435 mm
Electrification	25 kV, 50 Hz AC OHE
Signalling	Communications-Based Train Control (CBTC)
Estimated Project Cost	Rs.13365.77 crore
Estimated Ridership	2.10 lakh/day (2026)



Contractor's List

Contract	Awarded
General Consultant	Delhi Metro Rail Corporation (DMRC)
PC-01: Construction of Line-2's Malahi Pakri – New ISBT (6.1 km viaduct, 5 stations)	NCC Limited
PC-02: Construction of New ISBT Depot	Quality Buildcon
PC-03: Construction of Line-2's Patna Junction – Rajendra Nagar underground twin tunnel section (8 km, 6 stations)	Larsen & Toubro (L&T)
PC-04: Construction of Line-1's Danapur – Patlipura Ramp and Mithapur Ramp – Khemni Chak sections (8 km, 7 stations)	YFC Projects – MCL JV
PC-08R: Design and Construction of Single Tunnel (Subway) between Bihar and Patna Museum by Shield TBM	Larsen & Toubro (L&T)
PT-4R: Design, manufacturing & supply of UIC-60 Turnouts & Scissor Crossover	Voestalpine VAE VKN India
PT-7R: Manufacturing & Supply of 1200 MT 90 UTS, UIC 60, 13 m, Class A 880 Grade Rails, IRS-T-12-2009 for New ISBT Patna Depot	Steel Authority of India (SAIL)
PT-8R: Standard gauge track work (Ballasted, Embedded and Column lines) at New ISBT Depot	S.C. Agarwal

Route Information

Operational	0 km
Under Construction	22.1km
Approved	8.8 km

Phase 1

Line-1 (East – West Line): Danapur Cantonment – Khemni Chak

- **Length:** 16.86 km
- **Type:** Elevated & Underground
- **Elevated:** 9.36 km with 8 stations
- **Underground:** 7.5 km with 6 stations
- **Number of Stations:** 14

- **Station Names:** Danapur Cantonment, Saguna More, RPS More, Patliputra (formerly IAS Colony), Rukanpura, Raja Bazar, Patna Zoo (formerly JD Women's College), Vikas Bhawan (formerly Raj Bhawan), Vidyut Bhawan, Patna Junction (interchange), Mithapur, Ramkrishna Nagar & Jaganpur and Khemni Chak (interchange)

Line-2 (North – South Line): Patna Junction Railway Station – New ISBT

- **Length:** 14.05 km
- **Type:** Elevated & Underground
- **Elevated:** 6 km with 5 stations
- **Underground:** 8 km with 7 stations
- **Number of Stations:** 12
- **Station Names:** Patna Junction (interchange), Akashvani (formerly Dak Bungalow), Gandhi Maidan, PMCH, Patna University, Moin UI Haq Stadium, Rajendra Nagar, Malahi Pakri, Khemni Chak (interchange), Bhoothnath, Zero Mile and New ISBT.

Updates

1. TBM Breakthrough

In May 2024, TBM Buddha (DZ1091), deployed by L&T achieved a second breakthrough at Patna University Station of Line 2 under Package PC-03. The TBM was deployed from Moin-ul-Haq Station and constructed a 1494 m upline tunnel. The first breakthrough was achieved by TBM Mahavir in March 2024 at Patna University Station for the downline.



India's Efforts in Millennial Railways

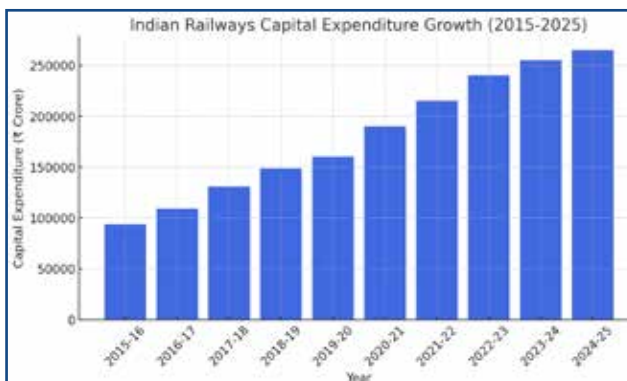
Introduction

Indian Railways is a state-owned enterprise under the Ministry of Railways, Government of India, and operates the country's national railway system. The idea of Indian Railways was first proposed in 1832 in Madras. As of 2024, Indian Railways cover a network of 68,584 kilometres. The Indian Railways is the fourth largest network in the world in terms of size. Indian Railways has not only enhanced the movement of people but has also made the transport of goods more convenient thereby reducing the logistic cost.

India's Efforts in Millennial Railways refers to modernising and transforming India's railway system to meet the demands of the 21st century, catering to technological advancements, growing passenger numbers, sustainability, and future-ready infrastructure. Millennial Railways emphasises the need to adapt Indian Railways to the expectations of modern society, with a focus on innovations, technology, speed, and efficiency.

Efforts by India to Modernise the Indian Railways

The Indian Railways has been putting striking efforts to modernise and upgrade one of the world's largest railway networks. Over the years, the Indian Railways has taken various initiatives to enhance safety, improve passenger services, and advance infrastructure. This article reflects the key elements driving the modernisation of Indian Railways:



Increased Capital Expenditure

In the last decade, Railways's Capital Expenditure has increased substantially. It grew from Rs 93,520 crore in 2015-16 to Rs 2.65 Lakh crore in 2025-26. This is an annual growth rate of 12%. The central government grants and additional borrowing have financed this increase.



1. Technological Upgrades

The Indian Railways has been introducing and implementing a wide range of technological upgrades to enhance the efficiency of the operation by real-time monitoring of trains and train tracks. Moreover, the integration of technology in the railway system has also contributed in improving the passengers' experience by providing services like automated ticketing systems and real-time updates about the trains. Some of the major technological revolutions that contributed to modernising the railway systems are mentioned below:

a. Digitalisation and Automation: Indian Railways, one of the largest railway networks globally, is undertaking a major initiative towards digitalisation and automation of railway systems to modernise operations and enhance passenger services. Some major initiatives by railways towards digitalisation and modernisation are:

► **Introduction of Advanced Signalling System:** The most critical step taken by the Indian Railways is the introduction of advanced and modern signalling systems. These systems utilise technologies which contribute to the effective management of operations.

• For example, the **automatic block signalling (ABS) system** is deployed on railways, and the movement of the trains is controlled by automatic stop signals, preventing trains' collisions.



b. GPS and Tracking Systems: Another major step taken by Indian railways towards modernisation is the adoption of GPS-enabled tracking systems. The Global Positioning System (GPS) technology provides real-time data about trains. Train tracking permits the railway operator to monitor the location and speed of trains accurately. This data allows the operator to schedule the trains, ensuring that they operate on time.

c. Online Ticket Booking System: One of the major technological adoptions is the computerised reservation system that Indian Railways has implemented to enhance passengers' experience. Through this, commuters can purchase reserved or unreserved train tickets, cancel train tickets and claim refunds online at any time according to their convenience.

• **One India - One Ticket Initiative:** The Indian Railway Catering and Tourism Corporation Limited (IRCTC), Delhi Metro Rail Corporation (DMRC) and Centre For Railway Information Systems (CRIS) joined hands to promote the 'One India - One Ticket' initiative, streamlining the travel experience for Main Line Railway and Metro passengers in the Delhi NCR area.

- **Collaboration with NCRTC:** Indian Railways and the National Capital Region Transport Corporation (NCRTC) have collaborated to provide passengers with a convenient travel experience. This collaboration allows travellers to seamlessly book and use both Indian Railways and Regional Rapid Transit System (RTTS) services.

d. Digital platforms for Real-Time Updates: The Indian Railways has improved the efficiency and convenience of travel by creating several digital platforms which provide passengers with real-time updates about the trains.

- For example, **RailYatri** is an app and website which provides real-time information about the train's positions, delays and train arrival times.

2. Infrastructure Development

In order to modernize operations, increase safety, and improve passenger facilities, Indian Railways is implementing a number of important infrastructure development projects. The following are the main projects that are underway at the moment:

1. Amrit Bharat Station Scheme: The Amrit Bharat Station Scheme aims to modernize railway infrastructure stations throughout the Indian Railways network. Under this scheme, a total of 1,337 railway stations have been identified for redevelopment to improve passengers' amenities and services.

- Several stations like **Rani Kamalapati Station** and **Gandhinagar Capital Station** have been redeveloped so far and are currently operational.

- Meanwhile, Indian Railways has already started work on 1,198 stations out of 1,337 stations under the Amrit Bharat Station Scheme.

2. Introduction Of Dedicated Freight Corridors: The share of railways in freight traffic dropped from 83% in 1950-51 to 35% in 2011-12. To increase this share, railways started a plan to build Dedicated Freight Corridors (DFCs) in 2005. It is intended to increase the effectiveness and speed of goods transportation by constructing railway lines that are only used for freight traffic.

Eastern & Western Dedicated Freight Corridors (DFC)

Corridor	Length (km)
Eastern DFC	1,337
Western DFC	1,506
Total Length (excluding Sonnagar-Dankuni)	2,843

Completion Target: December 2025.





Current Status of Western Dedicated Freight Corridor

Section/Package	Length (km)	Commissioning Date	Financial Progress
Dadri - Rewari	127	25.01.2024	93%
Rewari - Madar	306	07.01.2021	
Madar - Palanpur	353	18.06.2022	
Palanpur - Makarpura	290	30.09.2022, 30.10.2023	
Makarpura - Sachin	135	12.03.2024	
Sachin - Vaitarna	193	Commissioned	
Vaitarna - JNPT	102	To be Commissioned on 31.12.2025	

Current Status of Eastern Dedicated Freight Corridor

Section/Package	Length (km)	Commissioning Date	Financial Progress
Sahnewal - Pilkhani	179	12.03.2024	95%
Pilkhani - Khurja	222	12.03.2024	
Khurja - Dadri	46	25.01.2024	
Khurja - Bhaupur	351	29.12.2020	
Bhaupur - DDU	402	18.12.2023	
DDU - Sonnagar	137	07.07.2023	

Note: Indian Railways loaded 1,473 MT of freight in 2024, achieving a 3.86% growth, with EDFC and WDFC facilitating over 72,000 train runs.

3. Electrification of Railway Tracks: The Indian Railways has been making continuous efforts towards enhancing railway track infrastructure in order to increase train running efficiency and support high-speed rail and freight transportation in India. The major step taken by Indian Railways in order to achieve this is the electrification of railway tracks.

- In Year 2024, a total of 3,210 route kilometres (RKM) were electrified, extending electrification to approximately 97% of the Broad Gauge (BG) network.

3. Passenger- Centric Services

Indian Railways' top most priority is the passengers' convenience and overall journey experience. In order to enhance the overall travel journey of Passengers, Indian Railways has been improving its infrastructure and striving hard to provide modernised and advanced amenities like wifi connectivity, and an online ticket booking system to commuters. Key initiatives and amenities introduced by Indian Railways to enhance overall passenger experience are mentioned below:

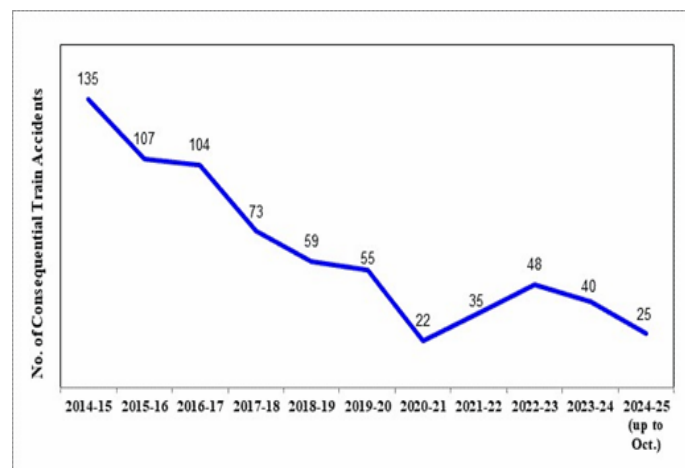
- **Wi-Fi Connectivity:** The Indian Railways has been providing passengers with free wifi facility at stations. Currently, Wi-Fi services are available at 6,112 stations across the Indian Railways network.

• **Water Vending Machines (WVMs):** To maintain the hygiene protocol the Indian Railways installed Water Vending Machines (WVMs) at various stations to provide passengers with clean drinkable water.

- **Installation of CCTV Camera:** The safety of passengers is the main concern of Indian Railways. In response to this Indian Railways installed CCTV cameras at all stations (except halt stations).

4. Safety Measures and Innovations :

In the last decade, Railways' Efforts to reduce train accidents and provide safer travel to passengers have been unparalleled. The organisation has implemented multiple initiatives that have established Railways as a safer mode of transportation for travellers.



The Key Initiatives Include

1. Deployment of Kavach System

Kavach is an Automatic Train Protection System (ATP), the thing that makes Kavach stand out among other safety systems is that it was developed indigenously by the Research Design Standard Organisation in collaboration with Medha Servo Drives, Kernex Microsystems and HBL Power Systems. The cost for the Track Side and Station equipment of Kavach is about **Rs. 50 Lakhs per kilometre**, while the cost for Kavach equipment on locomotives is around **Rs. 80 Lakhs per locomotive**.

- Railways aims to equip 10,000 locomotives with Kavach in the coming years.

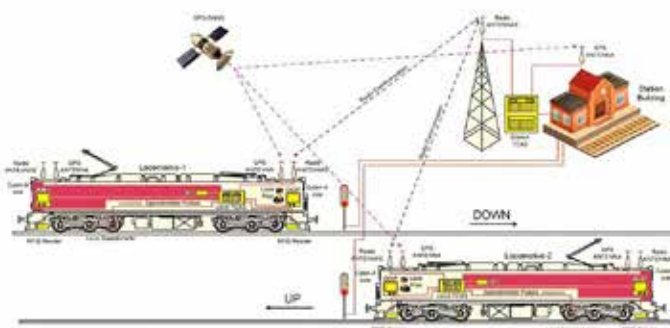
- To facilitate the Kavach installation Railways is preparing 69 loco sheds.

- **Working Mechanism**

It's a high-tech system that meets the highest safety standards (SIL-4). Its main purpose is to prevent trains from passing a red signal, which indicates danger, and to prevent collisions. If the driver doesn't manage the train's speed properly, the system can automatically activate the brakes. The system also helps prevent crashes between two trains that have the system installed.

- **Progress on the Kavach System**

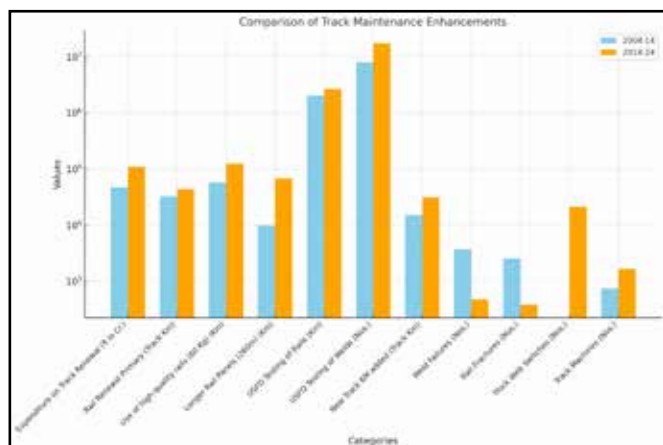
Aspect	Details
Funds Utilized (so far)	₹1,547 Crores
Allocation of Funds (2024-25)	₹1,112.57 Crores
Kavach Version	Version 4.0 (Approved by RDSO on 16.07.2024)
Deployment Completed	1,548 Rkm (South Central & North Central Railway)
Current Work in Progress	Delhi-Mumbai & Delhi-Howrah corridors (~3,000 Rkm)
Trackside Works Completed	1,081 Rkm
Trackside Works Details	- 705 Rkm (Delhi-Mumbai section)



Comparative Analysis of Track Maintenance Enhancements:

2004-14 vs. 2014-24

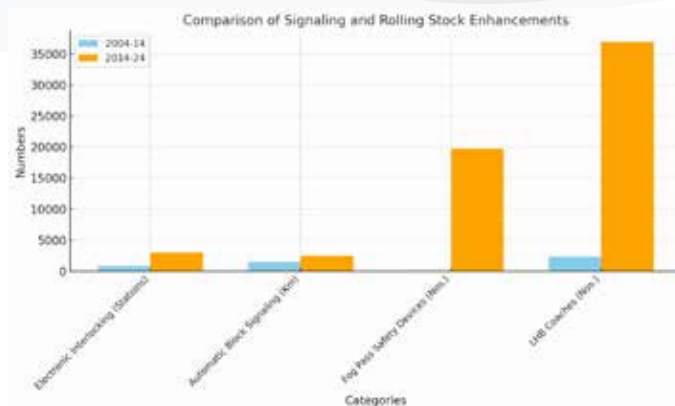
Item	2004-05 to 2013-14	2014-15 to 2023-24	2014-24 Vs. 2004-14
Expenditure on Track Renewal (₹ in Cr.)	47,038	109,577	2.33 times
Rail Renewal Primary (Track Km)	32,260	43,335	1.34 times
Use of high-quality rails (60 Kg) (Km)	57,450	123,717	2.15 times
Longer Rail Panels (260m) (Km)	9,917	68,233	6.88 times
USFD (Ultra Sonic Flaw Detection) Testing of Rails (Km)	2,019,630	2,652,291	1.31 times
USFD (Ultra Sonic Flaw Detection) Testing of Welds (Nos.)	7,943,940	17,306,046	2.17 times
New Track KM added (Track Km)	14,985	31,180	2.08 times
Weld Failures (Nos.)	2013-14: 3,699	2023-24: 481	87% reduction
Rail Fractures (Nos.)	2013-14: 2,548	2023-24: 383	85% reduction
Thick Web Switches (Nos.)	Nil	21,127	-
Track Machines (Nos.)	As of 31.03.14: 748	As of 31.03.24: 1,661	122% increase



Signalling and Rolling Stock Enhancements: 2004-14 vs. 2014-24

SN	Item	2004-05 to 2013-14	2014-15 to 2023-24	2014-24 Vs. 2004-14
1	Electronic Interlocking (Stations)	837	2,964	3.52 times
2	Automatic Block Signaling (Km)	1,486	2,497	1.67 times

3	Fog Pass Safety Devices (Nos.)	As on 31.03.14: 90	As on 31.03.24: 19,742	219 times
Rolling Stock				
1	Manufacture of LHB Coaches (Nos.)	2,337	36,933	15.80 times



Paradigm Shift Towards Green Energy

Indian Railways is committed to achieving net-zero emissions by the year 2030. In alignment with this goal, the organization is actively employing renewable energy sources to fulfil its power supply requirements.

Renewable Energy Source	Capacity (as of November 2024)	Description
Solar Power	487 MW	Includes both rooftop and ground-mounted solar power plants commissioned by Indian Railways.
Wind Power	103 MW	Wind power plants are installed to contribute to renewable energy generation.
Renewable Energy - Round the Clock (RE-RTC)	100 MW	100 MW of RE-RTC began supplying continuous renewable energy.
Total Renewable Capacity Tied Up	2,014 MW	Total secured renewable energy capacity, covering various sources including solar, wind, and RE-RTC.

Development of High-Speed Rail Corridor

The Mumbai- Ahmedabad High-Speed Rail Corridor is India's first high-speed rail corridor. The National High-Speed Rail Corporation Limited (NHSRCL) is implementing this 508 km long project at an estimated cost of Rs. 1,08,000 crore. The first section, spanning 50 km between Surat and Bilimora of this corridor, will become operational by August 2026 as mentioned by Railway Minister Shri Ashwini Vaishnaw. The remaining corridor will be opened between 2028 and 2030. The corridor is designed for bullet trains running at a maximum speed of 320 kmph. The significance of this project lies in the fact that the MAHSR corridor will reduce travel time between the two economic hubs, Ahmedabad and Mumbai, from the current 7 hours to just 2 hours.

Modern Trains: Giving Edge to Rail Transportation

To make journeys more comfortable, smooth, fast and safe, IR has taken various initiatives and one of them is developing smart trains that can provide a better travel experience at affordable costs. In recent years Railways has launched the following trains:

• Train 18

Initially known as “Train 18”, Vande Bharat Train became the first semi-high-speed train in India that was manufactured indigenously aligning Indian government’s Make in India initiative. The Vande Bharat is also the fastest train in the nation as it can run at a maximum speed of **180 kmph**. The first Vande Bharat train ran on **February 15, 2019**, on the New Delhi-Kanpur-Allahabad-Varanasi route. Currently, Indian Railways is operating **136 Vande Bharat trains** running across the country on medium & short distances. Union Minister Shri Jyotiraditya Scindia said that there will be **4500 Vande Bharat Trains** in India by **2047**.

• Vande Bharat Sleeper Train

India’s first sleeper version of Vande Bharat is gearing up for the launch. The Research Design Standard Organisation conducted multiple trials in January 2025. During the trials, the Vande Bharat sleeper train achieved a peak speed of 180 km per hour in a 40 km long trial run between Rohal Khurd to Kota.

• Namo Bharat Rapid Rail (Vande Metro)

To enhance connectivity between cities Indian Railways launched Vande Metro. The train was renamed Namo Bharat Rapid Rail. The train was initially launched between Bhuj and Ahmedabad.

Features	Details
Number of Coaches	12
Seating Capacity	1,150 passengers
Maximum Speed	110 km/h

• Amrit Bharat Train Services:

Amrit Bharat services provide quality travel with non-AC trains. Each train has 12 Sleeper Class coaches and 8 General Class coaches. In 2024, two new Amrit Bharat Express services were launched: the Darbhanga-Anand Vihar (T) Express and the Malda Town-SMVT Bengaluru Express. More services are planned for the future.



Conclusion

Indian Railways is using a multifaceted approach to support the growth of nation. With increased budgetary assistance from the central government, railways is not only upgrading its infrastructure but also striving to provide an efficient mode of transport to its passengers at affordable prices.



The electrification of 97% of the broad gauge network, commissioning of 2,843 km of Dedicated Freight Corridors, and introduction of advanced safety systems like Kavach highlight these efforts. With ₹2.65 lakh crore allocated in 2024-25 for infrastructure and technological upgrades, Indian Railways is steadily progressing toward a more sustainable and efficient future, aligning with global railway standards while addressing the growing demands of freight and passenger transport.





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BHUBANESWAR METRO: An Approach Towards Sustainable Growth

Introduction

Bhubaneswar, the capital city of Odisha, is known for its rich cultural heritage and modern infrastructure. Bhubaneswar is emerging as a hub for IT, education, and healthcare. The economy of the city is majorly driven by the tertiary sector, which involves trade, commerce, and tourism. The city is also emerging as a tech hub due to the establishment of “Infocity” which resulted in attracting several IT companies.

Currently, Bhubaneswar is witnessing a growth rate of 2.8% with a population of approximately 1,321,000. The city is projected to have a population of 1,649,410 in the next 10 years. However, this growing population resulted in numerous challenges like traffic congestion on the roads of Bhubaneswar. To conquer these challenges and address the demands of the growing urbanisation the city acknowledged the need for a metro system, a more reliable and efficient mode of public transportation. To address this need, the Bhubaneswar Metro Project was developed to upgrade the transport infrastructure in the city while efficiently catering for the increasing population.



Bhubaneswar Metro: From Idea to Implementation

27 July 2010: Delhi Metro Rail Corporation (DMRC) was appealed by The Odisha State Transport Department to conduct a survey regarding the possibility of a metro rail between Bhubaneswar and Cuttack.

8 January 2013: E. Sreedharan, Principal Advisor of DMRC, stated that establishing a metro rail is not feasible for Bhubaneswar as the city's population is below 2 million.

9 January 2013: Engineering Projects India Ltd. proposed to the state government to establish a monorail system from Bhubaneswar to Cuttack.

23 August 2014: The Odisha state government inked a contract with Balaji Railroad Systems Ltd. (BARSYL) to prepare a Detailed Project Report (DPR) for a Mass Rapid Transit System (MRTS) spanning 30 km between Bhubaneswar and Cuttack. BARSYL was allotted ₹2.52 crore and a 10-month deadline for the preparation of DPR.

June 2019: The Governor of Odisha stated that the government would investigate the possibility of connecting Cuttack and Bhubaneswar through a metro system.

April 2023: Odisha CM Naveen Patnaik approved the idea of a metro train between Cuttack, Bhubaneswar, Khordha, and Puri.

August 2023: Delhi Metro Rail Corporation (DMRC) was appointed to prepare the DPR for the metro project.

October 2023: The DPR of the project received approval from Odisha CM Naveen Patnaik with a total project cost of ₹ 6255.94 Crore.

November 2023: Delhi Metro Rail Corporation (DMRC) was appointed as the consultant for the Bhubaneswar Metro project.

1 January 2024: The former CM of Odisha, Mr Naveen Patnaik, laid the foundation stone for the Bhubaneswar Metro project.



Key Specification of Bhubaneswar Metro

Rolling Stock Composition	3 Coach Train Set
Carrying Capacity of Each Train Set:	764 Persons
Speed and Track:	Maximum speed: 80 Km/h
	Average speed: 34 Km/h
	Track Gauge: Standard Gauge Track measuring 1435 mm
Electrification:	750V DC Third Rail
Signalling:	Continuous Automatic Train Control System (CATC)
Estimated Cost:	₹ 6255.94 Crore.
Deadline	48 Months



Financing Mechanism

- The estimated cost of the Bhubaneswar Metro Project is **₹ 6255.94 Crore.**
- The entire project will be funded by the Odisha Government.



Bhubaneswar Metro Project Timeline

1 April 2023	The project was officially announced by Odisha Chief Minister Naveen Patnaik.
26 April 2023	DMRC was officially appointed to prepare the DPR for the project
July 2023:	DMRC initiated soil testing for Bhubaneswar Metro.
16 August 2023:	DMRC submitted the complete DPR to the Bhubaneswar Metro Rail Corporation (BMRCL).
1 January 2024	The foundation stone for Phase 1 of the Bhubaneswar Metro was laid at Trisulia Square.

FEATURED METRO

Contractor's list

Contractor name	Contract detail
General Consultant	Delhi Metro Rail Corporation (DMRC)
SYSTRA MVA Consulting (India)	Package BCDD-01: Detail Design Consultant (DDC) for Standardisation of U-Girder, precast post-tensioned pier caps and bearings along with design and drawings.
Intercontinental Consultants and Technocrats (ICT)	Package BCDD-02: Detail Design Consultant (DDC) for Architectural and Building Services including E&M, Traction works and Civil works for Depot and OCC building including proof checking of substructure for the viaduct, special span including its superstructure and stations.
MIA Construction Pvt. Ltd.	Package BBC-02: Construction of Phulapokhari Depot's Cum Workshop, OCC Buildings including Plumbing, Drainage, External Development Works ETC.
Ranjit Buildcon Ltd.	Package BBC-03: Design and construction of an elevated viaduct and 6 stations from Capital Hospital to Acharya Vihar Square.
Ranjit Buildcon Ltd.	Package BBC-04: Design and construction of the elevated viaduct and 7 stations from Acharya Vihar Square to KIIT Square.
Ceigall India Ltd. (CIL) (Subcontracted to IL&FS)	Package BBC-05: Design and construction of the Elevated Viaduct and 6 Station from KIIT Square to Trisulia Square, excluding architectural finishing work.
3 Bidders submitted bids rolling stock contract • Titagarh Rail Systems • Alstom • BEML	Package BRS1:Design, manufacture, supply, testing, commissioning and training of 39 no. standard gauge cars 13 Trainsets.

Route Information

Phase 1

Line 1 : Biju Patnaik International Airport- Trisulia

Length: 26.024 km

Depot: Phulapokhari Depot

Total Stations: 20

Stations: Biju Patnaik International Airport, Capital Hospital, Bapuji Nagar, Bhubaneswar Railway Station, Ram Mandir Square, Vani Vihar, Acharya Vihar, Jaydev Vihar, Xavier Square, Rail Sadan, District Centre, Damana Square, Patia Square, KIIT Square, Nandan Vihar, Raghunathpur, Nandan Kanan Zoological Park, Barang, Phulapokhari and Trisulia Square

Recent Updates on the Project:

Land Acquisition Progress

For the Phase I implementation of the Bhubaneswar Metro project, approximately 92.5 acres of land, including 34 acres of private land, will be acquired. According to Bhubaneswar MP Aparajita Sarangi, around 77 acres have already been secured, with efforts underway to acquire the remaining 15 acres.

Financial Progress

- BMRC officials reported that approximately ₹460 crore has been spent on the Bhubaneswar Metro project so far.
- This includes ₹250 crore released in October 2024.
- An additional ₹350 crore is expected to be released by the state government by March 2025.

Construction Activities

- Work on the metro depot and casting yard has begun at Ratagada and Malipada, located on the city outskirts.

Soil Testing Progress

- Soil testing is underway, with 10% of the process already completed.

Advantages of Bhubaneswar Metro



1. Reduced Traffic Congestion: Bhubaneswar has been witnessing a major increase in population rate due to the growing urbanization. The current metro area population of Bhubaneswar in 2025 is 1,321,000, a 2.48% increase from 2024. Projections indicate that by 2035, the population is expected to reach approximately 1,649,410. The construction of a metro system will minimize the traffic congestion on the roads of the city by offering a more efficient and reliable mode of public transport to the residents, and also reducing the reliance on private vehicles.

2. Enhanced Connectivity: The city has been becoming a major centre for both education and economic activities. A well-established metro system will enhance the connectivity in the city by linking the key destinations with residential areas. Through enhanced connectivity, the residents of the city will be able to commute to prominent places of the city like educational and economic centres more conveniently and smoothly.

3. Economic growth: The introduction of the metro system in the city will create more employment opportunities in the city which will contribute to enhancing the economic growth of the city. Furthermore, The construction of metro stations will also attract more business setups in the city which will alleviate the local economics of the city.

Challenges in Bhubaneswar Metro

1. Ridership Concerns: The sustainability of the Bhubaneswar metro will also depend on the ridership level. However, many metro systems in India are failing to meet their ridership projection which raises a concern about the long-term sustainability of the metro project. To make the Bhubaneswar metro project successful it is very crucial to achieve the

projected ridership.

2. Financial constraints: The estimated cost of the Bhubaneswar Metro Project is ₹6255.94 Crore. While the Odisha Government has pledged to fully finance the project, ensuring financial sustainability throughout its execution remains a key challenge. Effective budget management is crucial for the efficient implementation of a project.

4. Integration with other modes of transport: One of the crucial elements is integrating the Bhubaneswar metro system with the existing transportation options like buses and railways for the maximum use of transport infrastructure. This enhanced connectivity will contribute to the smooth transition of commuters to different modes of transport making the journey more convenient for them. In addition to this ensuring last-mile connectivity will be necessary so more commuters can opt for the metro system.

Conclusion:

The Bhubaneswar metro project is an initiative taken by the Odisha government in order to meet the city's increasing urbanization and transportation demands. With an emphasis on improving connectivity, lowering traffic, and boosting economic expansion, the project is expected to transform the infrastructure of Bhubaneswar. However, issues including fare affordability, site acquisition, ridership concerns, and financial sustainability must be carefully managed.

Overcoming these obstacles while guaranteeing effective integration with other forms of transportation will be essential to the Bhubaneswar metro's success. The Bhubaneswar Metro could improve the city's transit system and citizens' quality of life if it is well implemented.



Successful Implementation of AI & IoT-based Solutions in Metro Systems



Introduction

In the last decade, urban infrastructure growth has been incredible worldwide, especially in developing countries like India. The heightened urban infrastructure also increased the population in emerging urban centres. The rapid growth of urbanisation has placed tremendous pressure on metro systems. This necessitated innovative solutions to ensure efficient, safe, and reliable public transportation. The integration of technologies

such as Artificial Intelligence (AI) and Internet of Trains (IoT) into metro infrastructure has not only increased efficiency and frequency but also reduced human errors through the automation of critical systems such as rolling stock. This paper explores the role of IoT and AI in transportation infrastructure, particularly Metro Systems. With cities striving to build smarter transit networks, AI and IoT have become indispensable in creating intelligent metro systems that can adapt to the demands of modern urban mobility.

Internet of Trains (IoT)

The concept of the Internet of Trains emerged from the Internet of Things. It refers to the integration of intelligent onboard devices and cloud-based applications that facilitate improved communication, control, and data exchange within railway networks. This digital interaction allows for real-time monitoring and management of train operations, infrastructure, and passenger services.

Key Components

- **Connected Devices:** Trains are equipped with various sensors and devices that collect data on performance, location, and environmental conditions.
- **Cloud Computing:** Data from trains is transmitted to cloud-based platforms for analysis, which enables real-time decision-making.
- **Communication Networks:** High-speed communication systems (such as LTE and 5G) facilitate seamless data exchange between trains, control centres, and infrastructure.

The Need for AI & IoT in Metro Systems

Metro systems are lifelines to an urban area, but traditional systems always seem to struggle to manage increasing passenger numbers, inefficient operations, and maintenance-related issues.

Challenges in Traditional Metro Systems:

1. Overcrowding

Overcrowding is the most common problem of the metro, especially during rush hour. Tozai, Japan's metro line, has a congestion rate of 199%. A 100% congestion rate would mean that there is not a single free seat in the train; 199% is almost double this capacity. New Delhi is to emerge as the world's largest agglomeration with a mind-boggling population of 37.2 million people by 2028. In such a scenario where expanding the infrastructure is tough and costlier, the integration of advanced technology like IoT may make the metro systems even more efficient by increasing the efficiency & safety of their operations.

2. Unpredictable Breakdowns

Mechanical or electrical failures in trains or infrastructure lead to service interruptions. Frequent breakdowns can strain operational resources and require additional maintenance efforts. These issues can be addressed by implementing IoT technologies as they provide real-time monitoring of assets which helps to identify the issues before the fault escalates.

3. Higher Operational Costs

The frequent breakdowns increase the operational costs of metro systems. Unexpected breakdowns necessitate immediate repairs, which can be costly. The cost of maintaining an inventory of spare parts also increases as systems strive to minimise downtime.

Key Applications AI & IoT in Metro Systems

1. **Predictive Maintenance:** IoT sensors are applied to critical components, which are tracks, wheels, and signalling systems to obtain real-time data on their condition. AI algorithms analyze such data for anomalies and predictive potential in issues, hence allowing





maintenance on time. Machine learning analyzes historical data and real-time data, identifying patterns in maintenance activities and when specific components will fail. This approach has reduced the amount of downtime associated with these systems, averted some unexpected failures, and maximized resource usage. Integrating IoT with AI enables metro systems to be reliable, efficient, and at low maintenance cost, making them operate more smoothly and safely.

Example: Metro systems in Hong Kong use predictive maintenance to avoid unexpected breakdowns, and reduce

delays and operational disruptions. Similarly, Delhi Metro's Phase 4 is set for the integration of artificial intelligence (AI) into its operations and project management.

2. Smart Ticketing and Fare Collection: AI makes it possible to have dynamic fare pricing, while IoT allows for contactless payments via mobile apps, smart cards, or digital wallets. This provides a seamless experience for passengers and reduces the time spent in queues.

Example: London Underground has an Oyster card system that integrates IoT for efficient and smooth fare collection.

3. Traffic and Crowd Management: Traffic and Crowd Management: Using data from IoT-enabled cameras and sensors, the AI-powered tools analyze the flow of passengers. Therefore, operators can change train frequencies and reroute traffic in real time to prevent bottlenecks during peak hours.

Example: Hong Kong's Mass Transit Railway or MTR uses AI to forecast congestion levels and move more trains proactively into that area.

4. Energy Efficiency: AI-driven systems analyze train schedules and passenger density to optimize energy consumption. IoT-enabled devices manage station utilities such as lighting, air conditioning, and escalators based on real-time usage.



AI-Enabled Metro Systems

1. Enhanced Passenger Travel Experience

Artificial Intelligence (AI) has the potential to upgrade passenger experiences. It can offer smarter, safer, and more accessible train journeys. Here's how AI-driven technologies transform train travel:

► **Accessibility Support:** AI-powered computer vision systems can enhance the boarding process for passengers with mobility challenges. For instance, object detection algorithms can identify wheelchair users and guide them to designated accessible sections of the train.

► **Empty Train Check:** At the final station of a metro or train network, AI-driven computer vision systems can perform an "empty train check" to ensure no passengers remain onboard. These systems can scan each compartment and promptly alert station staff if any individuals are still inside, thus improving operational efficiency and passenger safety.

► **Abandoned Luggage Management:** Abandoned luggage poses a potential security threat and inconvenience to passengers. AI-based computer vision systems can identify unattended items, analyze their location, and flag them to security teams.

2. AI for Last-Mile Connectivity



Artificial Intelligence (AI) offers practical solutions for improving last-mile connectivity, helping passengers transition smoothly from metro stations to their destinations. By integrating AI into bike-sharing stations, ride-hailing services, and shuttle systems, transport networks can make these services more efficient and responsive.

1. Optimising Resource Availability

AI systems can analyze real-time data to predict demand for last-mile services, ensuring that resources like bikes, shuttles, or ride-hailing vehicles are available when needed.

2. Applications of YOLOv8 in Last-Mile Solutions

AI models like Ultralytics YOLOv8 contribute to last-mile solutions through real-time object detection and tracking. YOLOv8's capabilities include:

- ▶ **Passenger movement tracking:** Monitor the flow of passengers to assess demand for last-mile services.
- ▶ **Congestion analysis:** Identify crowd patterns through video feeds from station cameras.
- ▶ **Resource planning:** Count passengers exiting a station to predict requirements for nearby services.

3. Implementing AI for Track Inspection

AI enhances track inspection and maintenance by streamlining monitoring processes. Systems like the Duos Technologies Railcar Inspection Portal (RIP) use AI to capture and analyse 360-degree images of train cars at regular operating speeds. These systems identify potential maintenance issues and provide timely notifications to railway personnel for prompt intervention.

4. Energy Management

AI plays a crucial role in optimising energy usage in metro system. For instance, Metro de Madrid (Spain) employs an AI-based system to improve ventilation efficiency. The system manages 891 ventilation fans, which consume up to 80 gigawatt-hours of energy annually, using an optimisation algorithm inspired by the foraging behaviour of bee colonies. This approach has enabled Metro de Madrid to reduce energy costs for ventilation by 25% and cut CO2 emissions by approximately 1,800 tons annually.

Concerns Associated with AI-Driven Systems

AI has brought several benefits to metro systems. It enhances efficiency by ensuring that trains run on schedule. It minimises delays, and optimise operations for smoother services. AI also improves safety by providing continuous monitoring, while predictive maintenance helps identify potential issues before they lead to accidents or malfunctions. However AI-driven systems face some challenges which are as follows:

- ▶ **Data Privacy:** Collecting passenger data raises privacy concerns. Proper measures are needed to protect personal information.
- ▶ **Integration with Existing Infrastructure:** AI systems may require changes to the current metro infrastructure, which can be complex and costly.
- ▶ **High Implementation Costs:** The initial cost of installing AI technology can be high, which may be a barrier for some metro systems.
- ▶ **Need for Skilled Professionals:** Implementing and maintaining AI systems requires skilled professionals, which may be a challenge to find and retain.

Case Studies of Successful AI and IoT Applications in Metro Rail Systems

1. China's AI-Driven Train Operations: China's high-speed rail network uses AI to manage train scheduling and operations which contributes to improving efficiency and punctuality across the extensive network.

2. India's Smart Railway Stations: Indian Railways is integrating IoT and AI at major stations to enhance passenger services, including automated ticketing and real-time platform information.

3. Japan's AI-Powered Safety Systems: Japan employs AI-driven drones and robots for safety inspections, which enables more accurate monitoring of track conditions and reduces human error.

4. US Freight Railways Adopting IoT: In the United States, freight rail companies use IoT to track cargo, monitor train health, and optimise fuel usage, which results in cost savings and improved operational efficiency.

Conclusion

The integration of Artificial Intelligence and the Internet of Things introduces practical solutions to challenges faced by metro systems, such as overcrowding, maintenance issues, and energy efficiency. Predictive maintenance, automated ticketing, energy management, and crowd control are some of the key applications that improve operational efficiency and passenger services.

While these developments have been instrumental, there are still challenges: data privacy, the cost of implementation, and the need for highly skilled professionals to manage the systems. Case studies from China, and Japan are examples of how these technologies can be effectively implemented.

As urbanisation continues to grow, adopting AI and IoT in metro systems can help improve efficiency and reliability, but careful planning and addressing associated concerns will be crucial for sustainable progress in public transportation.



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Company	Package	Amount	Brief Description
M. Venkata Rao Infra Projects Pvt. Ltd.	--	₹ 563.9 Cr	Construction Of Important Bridges (br. No. 73 & 75) In Vasai Creek, Minor Bridge (br. No.74) On Panju Island, Side Drain, Retaining Wall & Earthwork For Embankment From Bhayander Station To Naigaon Station Including Earthwork On Panju Island (ch. 43700 To Ch. 47500) In Connection With Proposed 5th & 6th Line In Between Borivali-virar Stations Of Western Railway Under Mumbai Urban Transport Project (mutp) – Phase -iiia Project.
Rahee Infratech Ltd.	Package PT-09 of Patna Metro Phase 1	₹ 23.9 Cr	Installation of Ballastless Track including Supply of Buffer Stop and others for Priority Corridor (Malahi Pakhri to New ISBT) for Patna Metro Rail Project.
Rahee Infratech Ltd.	Package T-02 of Nagpur Metro Phase 2	₹ 174.19 Cr	Design, Supply, Installation, Testing, and Commissioning of Ballasted-Ballastless track in At Grade section of Reach 1A, and elevated viaduct of Reach 2A and Reach 4A of NMRP Phase-2
KPC Project Ltd.	--	₹ 209.72 Cr.	Construction of Bangalore Suburban Railway Project (BSRP) Rolling Stock / Train Maintenance Depot with Administration & Workshop Buildings At Soladevanahalli (Chikkabanawara) including Civil, MEP, Roofing, Signage, Architectural Finishes, STP, External Drainage, Internal Roads, Boundary Wall, construction of At-Grade Formation of Length 1.00 Km (Approximately) and other Associated Works between Chikkabanavara Station to Soladevanahalli Depot of Bangalore Suburban Railway Project (BSRP)

CONTRACTS BAGGED

Company	Package	Amount	Brief Description
Arun Soil Lab Pvt. Ltd	Package LKGS-01 of Lucknow Metro	₹ 58.76 Lakh	Detailed Geo-Technical Survey of East-West Corridor (Charbagh to Vasantkunj) including Depot at Hardoi Road for Lucknow Metro Rail Project Phase 1B
MR Constructions	Package A1 of Bangalore Metro's Blue Line	₹ 65.57 crore.	Station finishing of 6 elevated stations of Blue Line located at Central Silk Board , HSR layout, Agara, Ibbalur, Bellandur Kadubeesanahall
Godrej & Boyce	Package A2 of Bangalore Metro's Blue Line	₹ 66.77 crore.	station finishing of 7 elevated stations of the Blue Line located at Kodibeesanahalli, Marathahalli, ISRO, Doddanekundi, DRDO sports complex, Saraswathi Nagar (Mahadevpura) , KR Puram
YFC Projects – BBG Infrastructure JV	Package C-09 of Nagpur Metro Phase 2	₹ 219.3 Cr.	Construction of Eight Elevated Metro Stations viz Ashokvan Dongargaon Mohgaon Meghdoot CIDCO Butibori Police Station MHADA Colony MIDC KEC and MIDC ESR in Reach 1A of NMRRP Phase2
Aurionpro ToshiAutomatic		₹ 39 Crores	Design, Manufacture, Supply, Installation, Testing and Commissioning of Automatic Fare Collection (AFC) Gates for different Operational Stations in the Existing Phase I, II and III Networks of Delhi Metro Rail Corporation (DMRC).

Dates	Event Name	Venue
Feb 22-26, 2025	ELECRAMA	India Expo Mart, Greater Noida , Delhi Ncr
Mar 15, 2025	India Logistics Submit & Awards 2025	Chennai, India
Mar 19 -21, 2025	10th Smart Cities Expo	Bharat Mandapam, Pragati Maidan , New Delhi
Mar 26-27, 2025	RailTech Belgium	Brussels
Apr 15-17, 2025	27TH INTERNATIONAL EXHIBITION OF ELECTRONICS: COMPONENTS AND TECHNOLOGIES, MATERIALS AND EQUIPMENT, EMBEDDED SYSTEMS AND TURNKEY SOLUTIONS	Moscow, Crocus Expo
Apr 24-26, 2025	INDIA STEEL 2025	Bombay Exhibition Centre, Mumbai
May 13-15, 2025	Railtex 2025	NEC, Birmingham
May 13-14, 2025	Africa Rail	Sandton Convention Centre, Johannesburg, South Africa
May 21 - 22, 2025	5th Edition InnoMetro	Bharat Mandapam(Pragati Maidan), New Delhi, India
Jun-25	Rolling Stock Maintenance & Depot Innovation - Europe 2025	Hilton London Paddington, United Kingdom
June 18-20, 2025	Eurasia Rail	IFM (Istanbul Expo Center), Turkey'
June 18-19, 2025	Rail Live 2025	Porterbrookâ€™s Long Marston Rail Innovation Centre
June 24-25, 2025	Middle East Rail	Dubai World Trade Center
June 24 - 26, 2025	SIFER 2025	Lille Grand Palais, France
July, 2025	Urban Rail 2024	Sofitel Brisbane, Australia.
July 3, 2025	Rolling Stock Networking	Derby Arena, England
Sep 23 - 26, 2025	16th International Railway Fair (TRAKO)	Gdansk, Poland
Oct 29 - 31, 2025	IREE 2025	New Delhi



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INDIAN RAILWAY

TENDER DETAILS	LOCATION	VALUE	DEADLINE
survey, design, supply, installation, testing and commissioning of trackside kavach (indian railway automatic train protection system) equipments at stations/lc gates/ibs locations including ofc works, erection of towers and associated civil/track/electrical works required for kavach in itarsi-manikpur, mahdeiya-bina malkheri-mahadeokheri, entire katni complex, bina malkheri-agasod, satna-rewa, kaima-sagma, bansapahar-ohan section of jabalpur division of west central railway.	Jabalpur, Madhya Pradesh, India	₹ 276.52 Cr.	15-04-2025
design manufacture supply testing & commissioning of on track utility track vehicles 8 wheeler for bg 1676 mm along with training of indian railway personnel and 3 years post warranty amc	New Delhi, Delhi, India	₹ 267.07 Cr	14-02-2025
plan, construct, develop & operate gati shakti multi-modal cargo terminal (gct) for handling cargo by extension of hot axle siding towards new dadri end of new dabla station on dfccil/railway land under schedule- 2 of gct policy of indian railways	New Delhi, Delhi, India	₹ 13.10 Cr.	13-02-2025
plan, construct, develop & operate gati shakti multi-modal cargo terminal (gct) for handling cargo at line no. 1a of new gulaothi station on dfccil/railway land under schedule- 2 of gct policy of indian railways.	New Delhi, Delhi, India	₹ 11.40 Cr.	20-02-2025
maintenance of 2x25 kv ohe/psi and miscellaneous ohe/psi and testing of psi equipment in new pt deen dayal upadhaya nagar to new sone nagar/ new chiraila pauthu (sebn/cpbn) section of dfccil including ir link line/connecting line connection to indian railways for a period of 24 (twenty-four) months under cgm ddu unit.	Chandauli, Uttar Pradesh, India	₹ 8.40 Cr.	27-02-2025
at rny division: - provision of iot devices/intelligent field devices (ifds) for monitoring & control (indian railways native iot based yield analysis telemetry, recording and control -ir-niyantrac) of electrical general assets like pump, platform (30/70%) lighting, street lighting, etc at rny, bngn, nbq, dtx, glpt & rpan. (phase -ii).rangiya	Rangiya, Assam, India	₹ 5.92 Cr.	25-02-2025
transportation of railway material from various railway workshops store depots over indian railway to northern railway carriage workshop alambagh lucknow and vice versa through truck of capacity 06 mt 09 mt 15 mt msme exemption - no startup exemption - no	Lucknow, Uttar Pradesh, India	₹ 90.35 Lakh	01-03-2025
transportation contract for transportation of materials on anywhere to anywhere basis for collection/distribution of railway materials from /to various depots of indian railways, on per km basis through 16mt, 19mt, 25 mt & 30 mt capacity truck/trailer for different distance slab for the year 2025-2027(for 2 years) with loading/unloading per ton	Multi Location, Multi State, India	₹ 87.92 Lakh	17-02-2025
corrigendum : design engineering, supply including dismantling of the existing system, transportation, erection, testing, commissioning (including foundation work) and handing over of cnc surface wheel lathe machine (broad gauge) for turning of wheels used in locomotives, wagons (bg) used on indian railway along with dismantling of existing wheel turning lathe machine, 02 years comprehensive preventative maintenance and 05 years comprehensive annual maintenance- 1. design, engineering, supply including transportation, erection and	Damanjodi, Orissa, India	Damanjodi, Orissa, India	12-02-2025
design, manufacture, supply, testing & commissioning of switch rail grinding machine (srgm) along with training of indian railway personnel, operation & comprehensive maintenance during warranty period of 24 months and postwarranty operation & maintenance for 60 months.	Chandrapur, Maharashtra, India	₹ Refer Docs	18-02-2025
supply of design, manufacture & supply of diesel engine operated snow cutter as per leading parameters specified in clause 2.1(a), design features given in clause 2.2 suitable for mounting and dismounting on indian railway locomotive wdm3a with parameters given in clause 2.1(b) of attached specification. [warranty period: 24 months after the date of delivery]]	Jammu, Jammu And Kashmir, India	₹ Refer Docs	26-03-2025

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METRO RAIL

TENDER DETAILS	LOCATION	VALUE	DEADLINE
facility management services (fms) for 18 stations, mihan depot and 11 trainsets of line-1 of nagpur metro rail project for providing the following: (a) mechanized house-keeping, cleaning service (b) ticketing (tom/efo) services (c) security services for the period of 03 (three) years.	Nagpur, Maharashtra, India	₹ 71.65 Cr.	27-02-2025
facility management services (fms) for 19 stations, hingna depot and 12 trainsets of line-2 of nagpur metro rail project for providing the following: (a) mechanized housekeeping, cleaning service (b) ticketing (tom/efo) services (c) security services for the period of 03 (three) year	Nagpur, Maharashtra, India	₹ 66.63 Cr.	27-02-2025
balance architectural finishing works for six underground metro stations (cantonment, pottery, tannery road, venkateshpura, kg halli and nagawara) of rt-03 and rt-04 and one elevated metro station (kalena agrahara) in reach-6 line of bangalore metro rail project, phase-2 under package-2	Bangalore, Karnataka, India	₹ 32.19 Cr.	28-02-2025
work-1- plantation and raising of 5000 no. saplings and its maintenance for 3 years at harohalli 2nd phase kiadb area, bengaluru rural district and other government premises at various locations for bangalore metro rail project, phase-2a and 2b.	Bangalore, Karnataka, India	₹ 1.32 Cr.	25-02-2025
under package in 05 metro rail project shifting and cutting work of plants from treasure island mall - regal chouraha railway station imc chota ganapati, bada ganapati, ramchandra nagar, bsf - kalani nagar station and airport station.	Indore, Madhya Pradesh, India	₹ 83.41 Lakh	25-02-2025
r.k salai station to sholinganallur station including bored tunnel and viaduct between the stations, cut and cover tunnel, u section and elevated ramp (ch. 17250.000 to ch. 35437.030) for corridor-3 of chennai metro rail project phase ii.	Chennai, Tamil Nadu, India	₹ Refer Docs	14-03-2025
including bored tunnel between stations, cut and cover box, u section and ramp (chainage 0 -173 m to 9 plus 949 m) for corridor- 4 chennai metro rail project phase ii- supply, installation, testing, commissioning and training of electrical, plumbing and fire protection works for 8 underground stations from light house metro to kodambakkam metro	Chennai, Tamil Nadu, India	₹ Refer Docs	29-03-2025

HIGH SPEED RAIL

TENDER DETAILS	LOCATION	VALUE	DEADLINE
design, supply and construction of track works including testing and commissioning on design-build lump sum price basis for double line high speed railway between mumbai stn. at bandra-kurla complex (mahsr km. -0.255) and zaroli village (km.156.600)	New Delhi, Delhi, India	₹ Refer Docs	20-02-2025
design, manufacture, supply, installation, over all integration, testing commissioning, and comprehensive maintenance, of signalling & train control system, telecommunication system, and operation control center system on mumbai ahmedabad high-speed rail project	Multi Location	₹ Refer Docs	26-03-2025
auction sale of property: list of movable items (machineries) are(1. trapezoidal profile roll forming machine 5 ribs including automatic decoiler 10 tons with coil car 2. profile roll forming machine with 10mtr de coiler (8 rib) 3. new profile roll forming machine 4. de- coiler 10 tons with coil car 5. crimp curve machine 2 profile die sets 6. ridge capping machine including 2mt de coiler input: 406/610 mm 7. gutter machine 2mt de coiler input: 406mm 8. slitting line machinery with accessories 9. cut to length machinery with 10. roll forming machine,	Kochi, Kerala, India	₹ Refer Docs	13-02-2025 2 Days Left
scr construction organization: carrying out final location survey involving preparation of dpr, final alignment design, traffic survey report, ror calculations, detailed estimate and preparation of epc documents for high speed elevated rail corridor between hyderabad-bengaluru and hyderabad-chennai using modern survey techniques e.g. airborne or terrestrial lidar"-reg.	Multi Location	₹ 33.00 Cr.	24-02-2025

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