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# The Evolving Transportation Ecosystem in India - A Comprehensive Overview

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## *Abstract*

*India's ambitious growth targets and liberalized economic policies aim to transform it into a \$5 trillion economy, with infrastructure development playing a critical role. In recent years, significant investments have expanded the National Highways network, railways, and airports, reflecting a commitment to modernize and enhance connectivity. Key initiatives, such as Public-Private Partnerships and the National Monetization Pipeline, support these efforts, while the transportation sector is projected to grow at a 4.5% CAGR from 2022 to 2050. Despite these progresses, challenges like infrastructure gaps, traffic congestion, and environmental concerns persist, requiring continued investment and innovative solutions.*

**Keywords:** Government of India, Transportation Sector, Policies, Economic Development.

## 1. Introduction

Since independence, India has made substantial progress across various sectors but continues to face the challenge of meeting its vast potential. The country is ambitiously working towards becoming a \$5 trillion economy through liberalized economic policies that promote market orientation, private capital, and global competitiveness. A key element of this strategy is the expansion of infrastructure, particularly in transportation

In the past nine years, India's National Highways network has grown by 60%, now covering 1,45,240 kilometers, including new expressways for faster travel. Indian Railways has accelerated its construction of new tracks from 1,452 km per year to 5,243 km per year, introducing modern train

services like Vande Bharat. The aviation sector has also expanded, with the number of operational airports increasing from 74 to 148, reflecting rising air travel demand. For fiscal year 2024, the government allocated 3.3% of GDP to infrastructure, setting targets to extend the highway network to 2 lakh km, increase airports to 220 by 2025, and build 19 km of new railway tracks daily. The transport sector is expected to grow at a 4.5% CAGR from 2022 to 2050, with projects worth around Rs. 69 lakh crore in various stages of development. Public-Private Partnerships (PPPs), particularly in Greenfield highway projects, are encouraged, with 75% expected to be PPP-based. The National Monetization Pipeline aims to raise Rs. 45,000 crore from the transport sector in fiscal 2024. The aviation

market is rapidly expanding, with air passenger numbers expected to increase to 400 million by 2025-26. Significant investments, including Rs. 98,000 crore for new and modernized airports, are planned, with Rs. 67,000 crore from the private sector. Indian Railways' capital expenditure has surged, with the metro rail network growing significantly, indicating India's commitment to becoming a global economic powerhouse. This comprehensive infrastructure development call attention to India's commitment to becoming a global economic powerhouse.

### **Transportation in India – A Conceptual Background**

India's transportation system has evolved over centuries, influenced by its geographical diversity, cultural heritage, and economic development. Initially, transportation relied on footpaths and animal-driven carts, with the Indus Valley Civilization using bullock carts. Ancient India had vibrant inland and maritime trade, utilizing rivers like the Ganges and Yamuna for transportation. During the Maurya and Gupta empires, significant roads like the Grand Trunk Road were developed for trade and administration. The Chola Dynasty expanded maritime trade, building a powerful navy and establishing a presence in Southeast Asia.

The British colonial period marked a major transformation with the introduction of railways in the mid-19th century, starting with the first passenger train in 1853. The British also developed an extensive road network and modernized ports like Bombay, Calcutta, and Madras to facilitate trade and military movement. This era saw the decline of traditional transport systems in urban areas and the growth of cities, necessitating infrastructure like trams and public buses.

Post-independence, the Indian government nationalized and expanded the railway network, making Indian Railways one of the world's largest. Initiatives like the National Highways Development Project and the Golden Quadrilateral improved road connectivity. The civil aviation sector also grew, with Indian Airlines and Air India facilitating domestic and international travel. Urban areas saw the rise of public bus systems and metro rails, while private vehicle ownership surged after economic liberalization in the 1990s.

Recent trends include the rise of ride-sharing services and a focus on electric vehicles and sustainable transportation, driven by challenges like traffic congestion and air pollution. Despite progress, rural areas still face infrastructure deficits. Future plans include high-speed rail, metro expansion, and smart city initiatives, aiming to integrate and modernize India's complex transportation system.

## **2. Discussion**

### **Current Status and Trends of Transport Sector**

The transportation landscape in India is a complex and diverse system encompassing road, rail, air, and maritime travel. Each mode serves specific purposes, catering to the population's diverse needs and supporting economic growth.

India boasts an extensive network of roads, including approximately 142,000 kilometers of national highways crucial for inter-state connectivity. In addition, there are over 176,000 kilometers of state highways and millions of kilometers of rural roads. The country is also developing a growing network of expressways, such as the Delhi-Mumbai Expressway and the Yamuna

Expressway, to facilitate high-speed travel. State transport corporations and private operators provide comprehensive bus services, while auto-rickshaws, taxis, and app-based ride-hailing services offer convenient urban transport. However, the increase in private vehicles has led to challenges like congestion and pollution.

Indian Railways operates one of the world's largest rail networks, covering over 67,000 kilometers. It offers a range of services, including long-distance trains, suburban rail, and freight services. Modernization efforts include semi-high-speed trains like the Vande Bharat Express and ongoing electrification of the network. Metro systems in cities like Delhi and Mumbai, along with suburban rail networks, are critical for urban commuters and are continually expanding to accommodate growing passenger numbers.

India has over 100 operational airports, with major hubs like Indira Gandhi International Airport in Delhi. The UDAN scheme aims to enhance regional connectivity by subsidizing flights to underserved airports. The aviation market is competitive, with several major airlines and a significant presence of low-cost carriers providing affordable travel options, contributing to the sector's rapid growth.

India has 12 major ports and over 200 minor ports, playing a vital role in handling cargo traffic. The Sagarmala initiative aims to modernize port infrastructure and promote coastal shipping. Additionally, several National Waterways, like the Ganga-Bhagirathi-Hooghly system, are being developed to enhance inland water transport for cargo and passengers.

The Smart Cities Mission and the FAME scheme promote the adoption of electric vehicles and the development of intelligent

transportation systems. Ride-sharing platforms and eco-friendly options like bicycle-sharing and electric scooters are becoming popular. Despite these advancements, challenges remain, including infrastructure gaps, environmental concerns, and road safety issues.

### **Challenges Facing India's Transportation Sector**

India's transportation sector is critical for economic and social development but faces some challenges affecting its efficiency, sustainability, and inclusivity. They are listed and presented.

- While major cities have relatively better infrastructure, rural and semi-urban areas lack adequate transportation facilities, limiting connectivity and access to essential services.
- Metropolitan areas face severe traffic congestion and overcrowded public transport due to rapid urbanization and insufficient infrastructure, affecting daily commutes and quality of life.
- Many roads, bridges, and railways need regular maintenance and upgrades, as poor upkeep can lead to safety hazards and inefficiencies.
- Insufficient investment in infrastructure development and maintenance results in project delays and inadequate facilities.
- The sector is a major contributor to air pollution and greenhouse gas emissions. Despite interest in electric vehicles (EVs), adoption is hindered by high costs, inadequate charging infrastructure, and low consumer awareness.
- India has one of the highest road traffic accident rates, with poor road conditions, reckless driving, and inadequate traffic law enforcement contributing to fatalities.
- The sector is fragmented, with multiple authorities leading to inefficiencies. New

technologies like autonomous vehicles present additional regulatory challenges.

- Infrastructure projects often face delays due to land acquisition issues, legal disputes, and funding constraints. Public-private partnerships (PPPs) offer potential solutions but come with challenges.
- Rising costs in public transportation burden lower-income populations. Ensuring accessible infrastructure for people with disabilities, the elderly, and those in remote areas is crucial.
- The logistics sector struggles with inadequate infrastructure and inconsistent policies, particularly affecting last-mile delivery in congested urban areas and rural regions. Additionally, uneven adoption of advanced technologies hampers efficiency.

### **Government Commitment and Policies towards Transportation Sector – A Brief Overview**

The Indian government has been actively implementing various initiatives and policies to address the challenges facing the transportation sector, promote infrastructure development, enhance connectivity, and ensure sustainable growth. These initiatives cover multiple modes of transportation, including road, rail, air, and maritime transport. Below is an overview of some key government initiatives and policies.

**Bharatmala Pariyojana:** Launched to develop a robust road infrastructure network, Bharatmala Pariyojana focuses on optimizing the efficiency of the movement of goods and people across the country. The project aims to construct about 83,677 kilometers of new highways, improve connectivity to border areas, develop

economic corridors, and enhance the efficiency of the national highway network.

**Pradhan Mantri Gram Sadak Yojana (PMGSY):** This initiative aims to provide all-weather road connectivity to unconnected rural areas, thereby enhancing access to economic and social services. The program focuses on constructing and upgrading rural roads to improve rural-urban connectivity and support rural development.

**National Highway Development Project (NHDP):** The NHDP aims to expand and upgrade the national highway network across India. The project includes the construction of the Golden Quadrilateral, North-South and East-West corridors, and other major highways to improve inter-city connectivity.

**Dedicated Freight Corridor (DFC) Project:** To decongest existing railway lines and facilitate faster movement of goods. The project includes the construction of the Western and Eastern DFCs, with plans for additional corridors. These dedicated corridors are expected to improve the efficiency of freight transportation and reduce logistical costs.

**Indian Railways Electrification Program:** To electrify the entire Indian Railways network, reducing dependence on fossil fuels and promoting sustainable transport. The program aims to achieve complete electrification of the rail network by 2023–24, which will reduce carbon emissions and enhance energy efficiency.

**Station Redevelopment Program:** To modernize and upgrade railway stations

across India, providing world-class amenities to passengers. The initiative includes the redevelopment of major railway stations with modern facilities, improved passenger services, and commercial development.

**UDAN (UdeDeshkaAamNaagrik)**

**Scheme:** To enhance regional connectivity and make air travel affordable for the common man. The scheme provides financial incentives and subsidies to airlines for operating flights to underserved and unserved airports. It aims to increase the number of operational airports and promote balanced regional development.

**NABH (NextGen Airports for Bharat)**

**Nirman:** To expand airport capacity in line with projected growth in passenger and cargo traffic. The initiative focuses on developing new airports, expanding existing ones, and modernizing airport infrastructure. It aims to handle over 1 billion air passengers annually by 2040.

**Sagarmala Project:** To promote port-led development and enhance the efficiency of the maritime logistics sector. The project includes the modernization of major and minor ports, the development of port-based industrial clusters, and the enhancement of coastal shipping and inland water transport. It aims to reduce logistics costs and promote economic growth.

**National Waterways Development:** To develop India's inland waterways as a viable mode of transport for cargo and passengers. The government has identified 111 National Waterways for development. Key projects include NW-1 (Ganga-Bhagirathi-Hooghly river system), NW-2 (Brahmaputra river), and NW-3 (West Coast Canal). These

projects aim to reduce congestion on roads and railways and promote eco-friendly transportation.

**FAME (Faster Adoption and Manufacturing of Hybrid and Electric Vehicles) Scheme:** To promote the adoption of electric vehicles (EVs) and hybrid vehicles in India. The scheme provides subsidies for the purchase of EVs, supports the development of charging infrastructure, and incentivizes the domestic manufacturing of EV components. The government aims to have 30% of vehicle sales be electric by 2030.

**National Electric Mobility Mission Plan (NEMMP) 2020:** To promote electric mobility and manufacturing in India. The plan outlines a roadmap for the adoption of EVs, including fiscal and monetary incentives, and aims to establish India as a global manufacturing hub for electric vehicles.

**Smart Cities Mission:** To develop smart infrastructure in urban areas, including smart transportation systems. The mission includes initiatives like intelligent traffic management, integrated public transport systems, and the use of digital technology to improve urban mobility. It aims to enhance the quality of life and promote sustainable urban development.

**Viability Gap Funding (VGF):** To support PPP projects that are economically justified but not financially viable. The VGF scheme provides financial support to bridge the viability gap in infrastructure projects, including transportation projects. It aims to attract private investment and accelerate project implementation.

**Infrastructure Investment Trusts (InvITs):** To provide a platform for investors to invest in infrastructure projects, including transportation. InvITs allow developers to monetize completed projects and raise funds for new ones. This mechanism helps in the efficient recycling of capital and promotes investment in the infrastructure sector.

**Motor Vehicles (Amendment) Act, 2019:** To improve road safety and enhance regulation of the transport sector. The act introduces stricter penalties for traffic violations, mandates the use of safety equipment, and strengthens the legal framework for motor vehicle registration and licensing. It also includes provisions for the protection of good samaritans and the regulation of app-based cab aggregators.

**National Road Safety Policy:** To reduce road accidents and fatalities. The policy outlines measures for road safety awareness, stricter enforcement of traffic laws, improved road engineering, and better emergency response systems. It aims to achieve a 50% reduction in road traffic fatalities by 2025.

**3. Concluding Remarks and A Future Ahead:** India's transportation ecosystem is evolving rapidly, driven by technological advancements, policy changes, and societal needs. The adoption of electric vehicles (EVs) and cleaner fuels is crucial for reducing air pollution and environmental degradation. Expanding public transportation, including metro networks and bus rapid transit (BRT) systems, will lessen reliance on private vehicles and lower carbon emissions. Green technologies and sustainable practices in logistics will further support environmental goals. Smart

technologies, such as intelligent transportation systems (ITS) and Mobility as a Service (MaaS), will improve traffic management and user convenience, making urban transport more efficient. Projects like the Sagarmala initiative and dedicated freight corridors are essential for economic growth, enhancing trade competitiveness and reducing logistics costs. To ensure social inclusion, transportation systems must be accessible and affordable for all. Technological innovations like autonomous vehicles and AI-driven systems promise greater safety and efficiency. However, significant investment, clear regulations, and data security are necessary to manage these rapid changes and develop a sustainable transportation ecosystem.

## References

1. <https://www.financialexpress.com/business/infrastructure-india-expanding-its-transport-infrastructure-at-a-rapid-pace-know-the-detailed-report-on-railways-highways-and-aviation-3361853/>
2. Ill, M. J. B. India's Transportation Energy Problem. *Transportation Research Record*, 848, 15.
3. Kenworthy, J. R. (2006). The eco-city: ten key transport and planning dimensions for sustainable city development. *Environment and urbanization*, 18(1), 67-85.
4. Kumar, H., Singh, M. K., Gupta, M. P., & Madaan, J. (2020). Moving towards smart cities: Solutions that lead to the Smart City Transformation Framework. *Technological forecasting and social change*, 153, 119281.
5. Singh, S., Jindel, J., Tikkiwal, V. A., Verma, M., Gupta, A., Negi, A., & Jain, A. (2022). Electric vehicles for low-emission urban mobility: current status and policy review for India. *International Journal of Sustainable Energy*, 41(9), 1323-1359.
6. Singh, V., Tejyan, S., Kumar, S., & Singh, T. (2024). Enabling sustainable freight transport with longer, heavier vehicles in India. *Case Studies on Transport Policy*, 15, 101138.