Modernisation of Indian Railways

Mains: *GS III – Infrastructure-Railways*

Why in News?

As India aspires to become a developed nation by 2047, the railways are undergoing a paradigm shift—from a system focused on mass mobility to one prioritising speed, efficiency, safety, and integration.

What is the evolution of Indian railways?

- **The beginning** – The journey of Indian Railways began in 1853 with the first passenger train running between Mumbai and Thane.
- Since then, its evolution can be understood in 3 phases.
- **Pre-independence era (1853–1947) –** Railways were developed primarily to serve colonial economic interests, facilitating the extraction of resources.
- However, they also became a powerful instrument for national integration and mobilisation during the freedom struggle, enabling leaders like Mahatma Gandhi to connect with masses across regions.
- **Post-independence expansion (1947–2014) –** After independence, the focus shifted to expanding connectivity and ensuring affordability.
- Railways became a tool for socioeconomic integration, linking remote regions and supporting inclusive development.
- However, over time, issues such as congestion, aging infrastructure, and capacity constraints became evident.
- **Transformation era (2014–present) –** The current phase emphasises modernisation, technological advancement, and service quality.
- It focuses on improving speed, safety, and passenger experience while aligning with global standards.

What are the recent developments?

- **Infrastructure Push under PM Gati Shakti –** A major driver of railway modernisation is the PM Gati Shakti National Master Plan, which integrates various modes of transport for seamless connectivity.
- Under this plan, 100 railway projects have been sanctioned in FY 2025–26 with an investment of ₹1.53 lakh crore.
- The initiative aims to expand more than 6,000 km of railway tracks through new lines, doubling, and multitracking.
- It also emphasises multimodal integration by aligning railways with highways, ports,

and inland waterways.
- This approach marks a shift from isolated planning to holistic infrastructure development, enhancing efficiency and reducing logistics costs.
- **Technological Advancements –** One of the most visible symbols of railway modernisation is the Vande Bharat Express.
- Introduced in 2019, these semi-high-speed, indigenously developed trains operate at speeds up to 160 km/h and offer modern amenities, enhanced safety features, and improved passenger comfort.
- The expansion of the Vande Bharat platform to include sleeper variants reflects the ambition to provide high-quality overnight travel and compete with air transport.
- These trains signify India's growing technological capabilities and self-reliance in manufacturing.
- Complementing train modernisation is the Amrit Bharat Station Scheme, launched in 2022.
- It aims to redevelop over 1,300 railway stations, particularly in tier-2 and tier-3 cities, with world-class amenities.
- Features such as roof plazas, better passenger facilities, and integration with urban spaces are designed to transform stations into modern transit hubs.
- Additionally, initiatives like "One Station One Product" promote local economies by providing platforms for indigenous goods, linking railway development with regional economic growth.
- **High-Speed Rail and the 'Diamond Quadrilateral' Vision –** Another crucial dimension of railway modernisation is the development of high-speed rail (HSR).
- India's ambition to create a network of bullet trains is embodied in projects such as the Mumbai Ahmedabad High Speed Rail.
- With Japanese collaboration, this project introduces cutting-edge technologies such as slab track systems, seismic monitoring, and advanced viaduct construction.
- It represents a shift towards global standards in rail infrastructure.
- Further, seven new HSR corridors—connecting cities like Mumbai, Pune, Hyderabad, Bengaluru, Chennai, Delhi, and Varanasi—are envisioned under the "Diamond Quadrilateral" framework.
- Spanning approximately 4,000 km, these corridors aim to drastically reduce travel time and enhance connectivity between major economic hubs.
- High-speed rail is not merely a technological upgrade; it is an economic catalyst.
- By reducing travel time, it enables businesses to operate across cities seamlessly, fostering regional integration and boosting productivity.
- **Enhancing Connectivity in the Northeast –** A key aspect of inclusive development is improving connectivity in geographically challenging regions, particularly the Northeast.
- Projects such as the Bairabi Sairang railway line aim to connect Aizawl to the national railway network.
- Similarly, ongoing projects to link Imphal, Kohima, and other state capitals reflect a commitment to integrating the Northeast into the national economy.
- These initiatives rely on advanced engineering techniques, including tunnelling and the construction of high bridges, to navigate difficult terrains and seismic conditions.
- Such connectivity projects are transformative, facilitating the movement of goods and people, boosting tourism, and promoting economic development in previously isolated

regions.

- **Engineering Marvels and Strategic Projects –** Modernisation is also reflected in landmark engineering projects such as the Pamban Bridge in Tamil Nadu.
- As India's first vertical lift sea bridge, it demonstrates advanced engineering capabilities and enhances connectivity to Rameswaram island.
- These projects highlight India's ability to undertake complex infrastructure development, reinforcing its position as an emerging global infrastructure leader.
- **Balancing Passenger and Freight Operations –** Despite these advancements, a major challenge remains: balancing passenger and freight traffic.
- India's railway tracks are heavily congested, leading to delays and inefficiencies.
- The solution lies in the development of Dedicated Freight Corridors (DFCs), which aim to segregate freight and passenger traffic.
- By shifting heavy cargo to dedicated tracks, passenger trains can operate at higher speeds without disruption.
- This functional segregation is crucial for achieving the objectives of modernisation.
- It ensures that both freight efficiency and passenger mobility are optimised, enhancing overall system performance.

What are the challenges and measures?

- **Challenges** – While significant progress has been made, several challenges persist.
- These include:
  - High capital requirements,
  - Land acquisition issues,
  - Environmental concerns, and
  - The need for continuous technological upgrades.
- **Measures** – Going forward, the focus should be on:
  - Strengthening public-private partnerships to mobilise resources.
  - Ensuring sustainable and environmentally friendly infrastructure development.
  - Enhancing safety through advanced signalling systems like Kavach.
  - Promoting multimodal integration for seamless transport.

What lies ahead?

- The modernisation of Indian Railways represents a transformative shift in India's infrastructure landscape.
- Through initiatives such as the PM Gati Shakti National Master Plan, Vande Bharat Express, high-speed rail corridors, and enhanced regional connectivity, the railways are evolving into a world-class transport system.
- As India moves towards its 2047 development goals, a modern, efficient, and inclusive railway network will be central to sustaining economic growth and national integration.
- By balancing speed with accessibility and innovation with inclusivity, Indian Railways can continue to serve as the backbone of the nation's progress.

Reference

The Hindu| The Journey of Indian Railway



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