12

CHAPTER

INFRASTRUCTURE: LIFTING POTENTIAL GROWTH

The foremost among the responses initiated by the Union Government to overcome the pandemic-driven slowdown in the economy was increase in capital expenditure, aimed particularly at the creation of high quality physical and social infrastructure facilities. Keeping the momentum going over the last five years, capital expenditure of the Government has seen an almost three-fold increase in FY24, relative to FY20 levels. The major beneficiaries of this step-up are key foundational assets like roads and railways.

The burgeoning public investment has been complemented by a host of institutional and procedural reforms that facilitated project execution and timely issue resolutions. These include initiatives to enhance private sector participation through PPPs, facilitative measures like National Infrastructure Pipeline and Project Monitoring Group, de-bottlenecking procedures PM-GatiShakti, and novel instruments such as REITS and InvITs to ease the constraints on long-term finances required for infrastructure investments.

The Chapter shows that, with increased public investment over the last five years, India has witnessed significant expansion in physical and digital connectivity and social infrastructure including sanitation and water supply helping to improve quality of life of the people. At the same time, given the fiscal compulsions and consolidation plans of the Union and the State Governments, it is important that viable projects on the public-private participation mode emerge and get executed. Regular collection of sector-wise, source-wise information on infrastructure investment, bottom-up studies and aggregation of requirements of infrastructure and periodic assessment of utilisation of assets created will help making mid-course corrections on the country's developmental path.

INTRODUCTION

12.1. Creation of resilient, world-class infrastructure—physical, social, financial and digital—is a key plank of India's policy strategy to become ViksitBharat @ 2047. However, recent studies by the Asian Development Bank[1] and the World Bank[2] and recent estimates made by agencies like CRISIL[3] have identified gaps in infrastructure investment in different sectors. Against this background, this chapter examines the recent developments in India's infrastructure space with a special focus on the progress achieved in FY24.

1 Meeting India's Infrastructure Needs, ADB, 2017
2 Financing India's Urban Infrastructure Needs World Bank, 2022
3 The Infrastructure Yearbook 2023 published by CRISIL

12.2. The Chapter is divided into six sections. Section II investigates the question of infrastructure financing within the limitations of data and stresses the need for greater balance between private capital and public investment, which will be constrained by the requirements of fiscal consolidation by the Government. Section III discusses sectoral developments, challenges and outlook. Discussion on financial infrastructure and on social infrastructures like health and education is not covered in this chapter as these subjects are discussed in chapters 2, 7 and 8 respectively. The fourth section shows the glimpse of the challenges and the opportunities across the infrastructure sector. Section V examines the efforts by the Government to reduce the bottlenecks in India's infrastructure sector. Section VI summarises the discussions and presents some important aspects of the way forward.

INFRASTRUCTURE FINANCING: THE PUBLIC EXPENDITURE PUSH

12.3. This section brings out two important facts about infrastructure financing in India. Firstly, despite many financial innovations in infrastructure financing in the recent years, capital expenditure by the Union and State Governments still have the central role in funding of large-scale infrastructure projects. Secondly, with the emergence of a number of new funding instruments and strategies, the infrastructure financing space has become complex, and, given the differential definitions and patterns followed in maintenance of statistics by different agencies, it is difficult to aggregate the total flow of funds for the creation of infrastructure in any given year.

12.4. Even though budgetary capital expenditure cannot be equated to infrastructure spending[4], the infrastructure thrust of the Government has led to an unprecedented increase in capital expenditure. Chart XII.1 shows that the capital expenditure of the Union Government increased by 2.2 times from FY21 to FY24 (PA) while that of the State governments increased by 2.1 times during the same period.

12.5. The capital expenditure of the Union Government broadly includes two components—the spending by its line departments and the gross budgetary support (GBS) given to the Central Public Sector Enterprises (CPSEs). The share of gross budgetary support to two key connectivity segments, i.e., Railways and National Highway Authority of India, in the total capital expenditure of the Union Government increased from 36.4 per cent in FY21 to 42.9 per cent in FY24 (RE). These two components of capital expenditure increased by 2.6 times from FY21 to FY24 (RE) in their absolute values.

12.6. The aggregate investible resources of the CPSEs consists of the GBS and the resources raised by CPSEs themselves. In order to optimise the combined borrowing cost of the Union Government and the CPSEs, the higher-cost borrowings of the two major infra-CPSEs—NHAI and Indian Railway Finance Corporation (IRFC) - were progressively reduced from FY21 to FY24. This is, to a large extent, reflected in the reduction in the own resources of the CPSEs in

4 Capital expenditure of the Government includes its spending to create any capital asset, which may not be created under a sector classified as infrastructure under the harmonious definition of infrastructure.

Chart XII.1. However, this reduction was more than offset by the expansionary GBS, thereby allowing investment in roads and railways to increase sizeably between FY21 and FY24.

Chart XII.1. Union Government's capital expenditure and its support for CPSEs and State Governments expands considerably

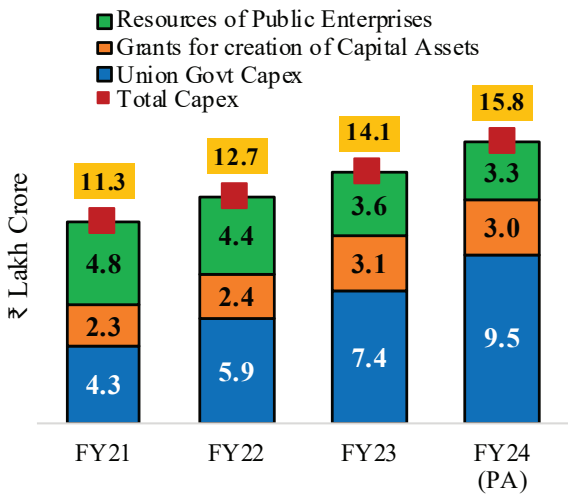
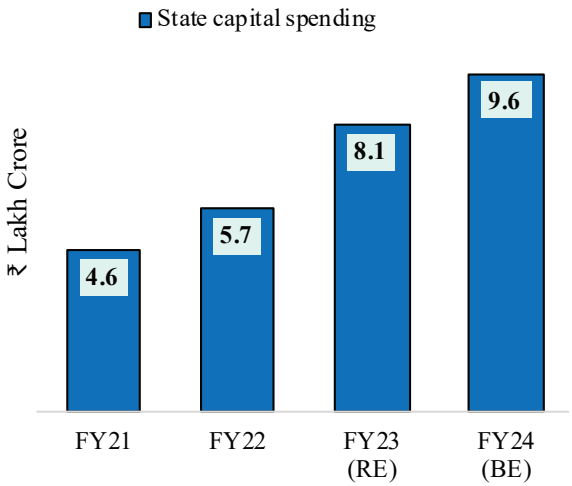


Chart XII.2. State Governments' combined capital spending* also expands robustly



Sources: Union Government Budget Documents for the Union Government and State Finance Accounts published by Comptroller and Auditor General of India and State Budgets for State Governments
Note: (i) RE stand for Revised Estimate, BE stand for Budget Estimate, PA stands for Provisional Accounts
(ii) *State capital spending includes capital outlay and loans and advances by State Governments
(iii) Data for resources of public enterprises for FY24 is a revised estimate

12.7. The support of the Union Government for capital expenditure of the State Governments and instititions increased by 31.6 per cent during FY21 and FY24. Further analysis of the capital expenditure of the State Governments is not possible as the data on the GBS by the State Government to the State Public Sector Enterprises (SPSEs) and the resources mobilised by SPSEs themselves are not available in a consolidated form.

12.8. Charts XII.3 through XII.9 on important non-government sources of funding reiterates the fact that the recent infrastructure thrust in India, especially the surge in connectivity projects, has banked predominantly on public expenditure. The net flow of funds to infrastructure sectors through bank credit between March 2023 to March 2024 was only around ₹79,000 crore, much less than the GBS by the Union Government for either railways or roads. Charts XII.3 to XII.5 also show that the net flow of bank credit between March 2020 and March 2024 was concentrated in only a few sectors roads, airports and power. However, the credit growth to infrastructure sectors in FY24 recovered to 6.5 per cent, as against the growth of 2.3 per cent, in FY23.

12.9. The gross inflow of external commercial borrowings to infrastructure sectors also picked up to USD 9.05 billion in FY24, as against an average of USD 5.91 billion during FY20 to FY23.

The resource mobilisation by infrastructure sectors[5] through debt and equity issuances in the capital market was just over ₹1,00,000 crore during FY24. Real estate investment trusts REITs) have raised ₹18,840 crore from year 2019 to 2024 while Infrastructure investment trusts (InvITs) raised a total of ₹1,11,294 crore in the last five years (2019-2024).

Chart XII.3. Outstanding credit to infrastructure: March 2024

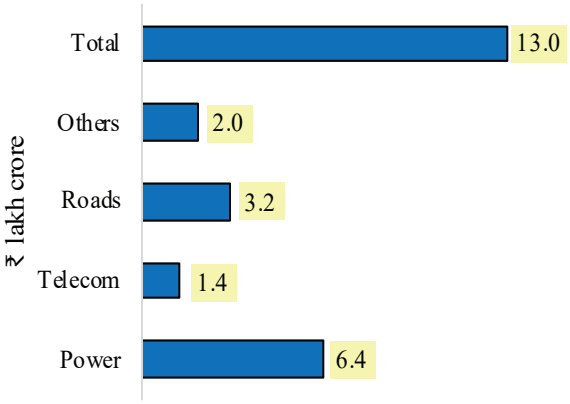


Chart XII.4. Average annual growth rate in outstanding credit from March 2020 to March 2024

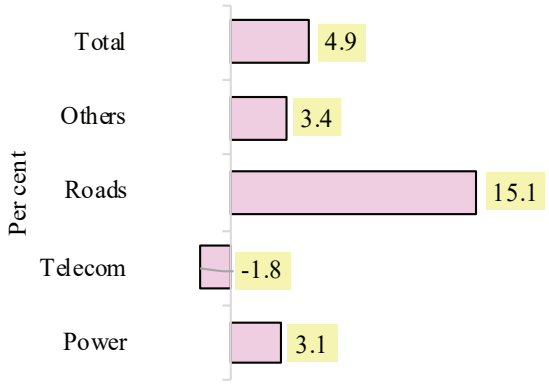


Chart XII.5. Share in change in outstanding credit from March 2020 to March 2024

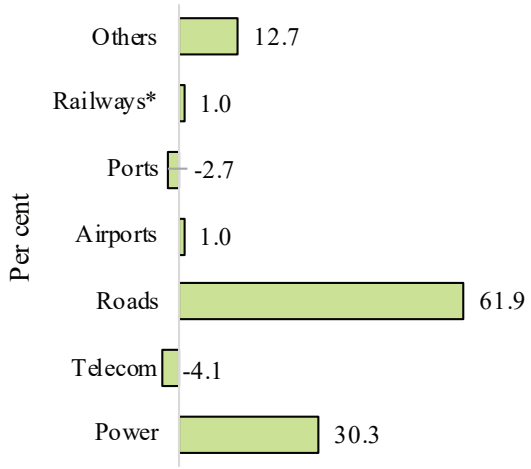
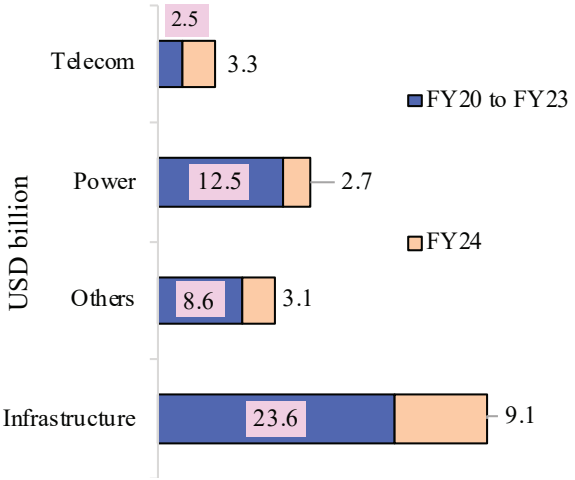


Chart XII.6. Inflow of external commercial borrowing to infrastructure sectors



5 Note: Infrastructure sector has been considered based on the following sub-sectors - For Equity: Airport & Airport services, Civil Construction, Education, E-Learning, Healthcare Research, Analytics & Technology, Hotels & Resorts, Port & Port services, Power – Transmission, Power Distribution, Power Generation, Railway Wagons, Real Estate Investment Trusts (REITs), Real Estate related services, Residential, Commercial Projects, Road Assets–Toll, Annuity, Hybrid-Annuity, Road Transport, Ship Building & Allied Services, Shipping, Telecom – Infrastructure, Waste Management and Water Supply & Management. For Debt: Construction, Infrastructure (Power, Telecommunications, Roads, Airports, Ports, Railways and Other Infrastructure), Civil Construction, Energy, Healthcare, Hotels & Resorts, Real Estate related services, Road Assets - Toll, Annuity, Hybrid-Annuity, Telecom – Infrastructure and Residential, Commercial Projects

Chart XII.7. Funding of infrastructure sectors through domestic capital market debt sources

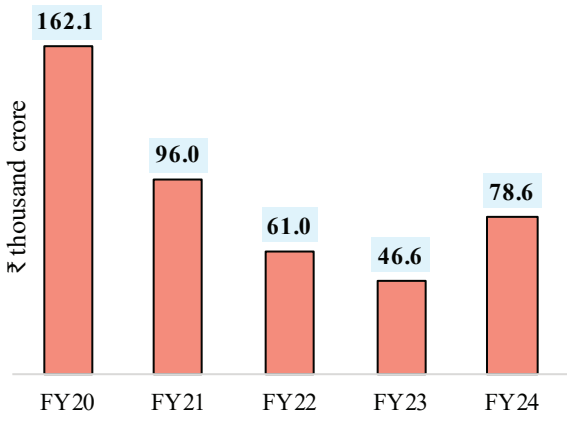
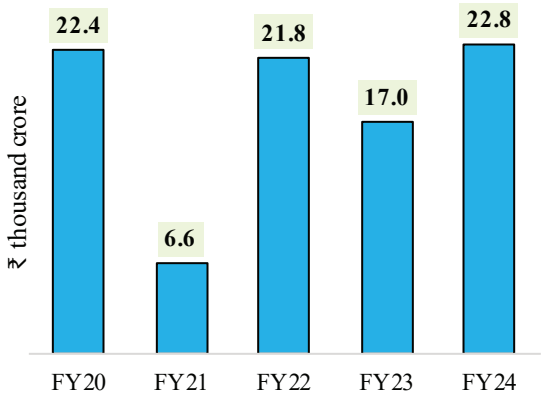


Chart XII.8. Funding of infrastructure sectors through equity issuance



Sources: Data on credit and external commercial borrowings were sourced from the Reserve Bank of India. The data on domestic debt and equity issuances were sourced from Securities and Exchange Board of India
Note: (*): In Chart XII.5, the reference to Railways does not include Indian Railways.

Chart XII.9. FDI equity inflows to infrastructure sectors during FY24

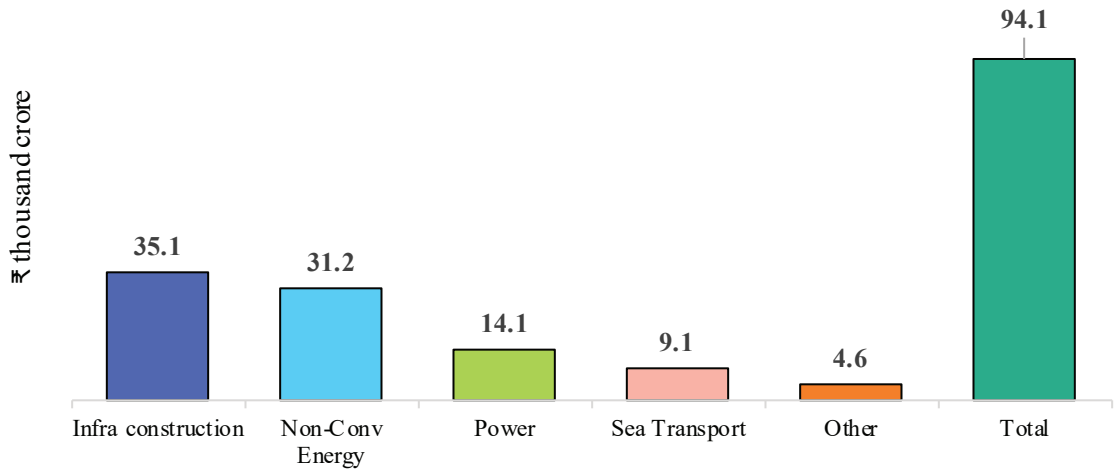


Table XII.1: Infrastructure-related FDI: key ratios

FDI Equity Inflows to Infrastructure Sectors as Per Cent of GDP: FY20 to FY24	0.28
FDI Equity Inflows to Infrastructure Sectors as Per Cent of GDP: FY24	0.32
FDI Equity Inflows to Infrastructure Sectors as Per Cent of Total FDI Equity Inflows: FY20 to FY24	17.3
FDI Equity Inflows to Infrastructure Sectors as Per Cent of Total FDI Equity Inflows: FY24	25.6

Sources: Calculations Based on Data Received from Department of Industrial Policy and Promotion
Note: The sectors considered include infrastructure construction, non-conventional energy, telecom, power, sea and air transport, railway components

Box XII.1: Major Mechanisms for fostering Public Private Partnership (PPP)

Public Private Partnership Appraisal Committee (PPPAC)

- Apex body for appraisal of central sector PPP projects
- 77 projects with a total cost of ₹2.4 lakh crore were recommended from FY15 to FY24.

Viability Gap Funding (VGF)

- Assistance to financially unviable but socially/economically desirable PPP projects.
- 57 projects costing ₹64,926.1 crore were granted in-principle approval and 27 projects costing ₹25,263.8 crore were granted final approval from FY15 to FY24.
- Total VGF approval of ₹5,813.6 crore (both Union Government & State share) from FY15 to FY24.

India Infrastructure Project Development Fund Scheme

- Financial support for project development of PPP Projects
- Notified in November 2022 with a total outlay of ₹150 crore for three years from FY23 to FY25.
- 28 proposals have been approved.

Other Supportive instruments

- Reference guides for setting up state PPP units, PPP project appraisal, and project implementation mode selection have been made. Web-based toolkits, post-award contract management toolkit and contingent liability for project sponsoring authorities have been developed to help them in PPP structuring.

National Monetisation Pipeline (NMP)

12.10. NMP was announced in August 2021 on the principle of 'asset creation through monetisation' i.e., tapping private sector investment for new infrastructure creation. The aggregate monetisation potential under NMP was estimated at ₹6.0 lakh crore through core assets of the Government, over four-years from FY22 to FY25[6]. The pipeline contained more than 20 asset classes across 12 Ministries.

12.11. Ministries are proactively working on developing a pipeline and transactions have been undertaken in line with their strategic initiatives. During the first two years, i.e., 2021-22 and 2022-23, transactions aggregating to about ₹2.3 lakh crore in accruals or private investments were completed under the core asset monetisation programme. Further, in 2023-24, transactions aggregating to ₹1.51 lakh crore in accruals or private investments were completed, 1.55 times those achieved in 2021-22.

DEVELOPMENTS ACROSS INFRASTRUCTURE SECTORS

12.12. This section discusses the progress in key infrastructure sectors along with outlook and challenges, including covering physical connectivity, electricity, water and sanitation, urban

6 Asset Monetization Pipeline.pdf (niti.gov.in) -https://tinyurl.com/mw3bdr74

development, strategic and digital infrastructure. An attempt has been made to present only the details relating to infrastructure development in this chapter, leaving the discussion on infrastructure-related services to chapter on services.

Physical Connectivity Infrastructure

Road Transport

12.13. Strategic planning and step-up in public investment have resulted in the upgradation of the road network system into a resilient and efficient infrastructure. The capital investment by the Government and private sector rose from 0.4 per cent in FY15 to about 1.0 per cent of GDP (around ₹3.01 lakh crore) in FY24. The sector has attracted its highest-ever private investment in FY24 as the private sector capitalises on a conducive policy environment. Further, tapping on the private investment, funds garnered through asset monetisation in the roads sector have exceeded ₹1 lakh crore since FY19. Notably, the Government achieved its highest-ever asset monetisation revenues of ₹40,314 crore in FY24.

12.14. Over the last ten years, there has been significant progress in the development of national highways, increasing by 1.6 times from 2014 to 2024. The Bharatmala Pariyojana has significantly expanded the national highway network, increasing the length of high-speed corridors by 12 times and 4-lane roads by 2.6 times between 2014 and 2024. Further, the efficiency of highway construction has improved due to the systematic push through the corridor-based National Highway development approach. The average pace of NH construction increased by ~3 times from 11.7 km per day in FY14 to ~34 km per day by FY24. The remarkable improvement of the NH network has brought about substantial advancements in logistics efficiency. This is evidenced by the consistently rising India's ranking in the World Bank's 'Logistics Performance Index, from 54 in 2014 and 44 in 2018, to 38 in 2023.

Chart XII.10: Total capital outlay for investment in road transport

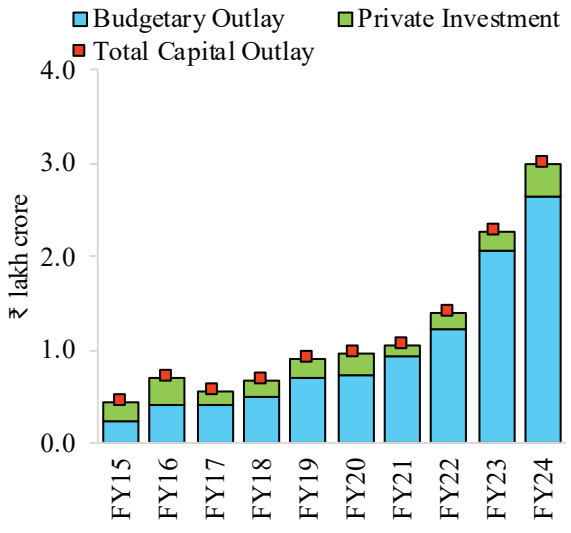
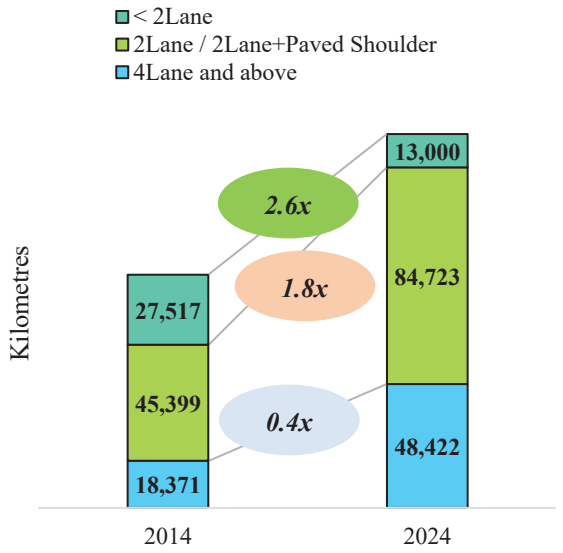


Chart XII.11: NH network - lane augmentation (values in kilometres)



Source: Union Budget Documents, Inputs Received from Ministry of Road Transport and Highways

12.15. To further enhance logistic efficiency, Ministry of Road Transport & Highways (MoRT&H) has dedicated Multi-Modal Logistics Parks (MMLP). A total of six multimodal logistics parks (MMLPs) have been awarded until FY24, and ₹2,505 crore have been awarded for dedicated multimodal logistics parks (MMLPs) in FY24. Further, seven MMLPs are planned to be awarded in FY25.

Box XII.2: Key Initiatives Enhancing Road Connectivity

- Toll digitisation has reduced waiting time at toll plazas by nearly 16 times from 734 seconds to 47 seconds during 2014-24[7]. Free flow tolling through Automatic Number Plate Recognition/Global Navigation Satellite System has also been initiated.
- About 900 wayside amenities (WSAs) are planned to be established to provide world-class facilities and amenities. 322 WSAs have already been awarded out of which 50 are operational. In FY24 alone, 162 WSAs have been awarded.
- A proactive policy for NH maintenance has been adopted by engaging a contractual maintenance agency for each km of the entire NH network. Contractual maintenance is done either through performance-based maintenance contracts or short-term maintenance contracts. About 37,500 km of NH network has been taken up under these two maintenance contracts. Long-term maintenance contracts on developed NH stretches of about 20 years have also been undertaken through toll operate transfer and infrastructure investment trust mode.
- Sustainable raw materials and new-age construction techniques have been incorporated into highway development. 13.79 lakh tonnes of inert material from landfill sites have been used in urban extension road-II and spur of the Delhi-Mumbai expressway. Recycling of bitumen & asphalt is done during the brownfield upgradation of NHs.
- High-tech machinery and cloud-based data-driven construction have resulted in time and cost reduction.
- Under the "Parvatmala Pariyojana" to boost last-mile religious and tourist connectivity, six ropeway projects have been awarded. Bids have been received for another two projects.

12.16. ***Outlook:*** The development of expressways and corridors, along with the adoption of transformative initiatives to promote user convenience and environmental sustainability, have been the highlight of the recent road sector growth journey. However, continuous ribbon development along developed NHs is posing a challenge for the construction of a new parallel road/bypass. Now, the Government has started focusing on the development of access-controlled NHs. The Government is also targeting to make all NHs a minimum of two lanes with paved shoulders standards. Another challenge is the slow onboarding of digital land records, leading to land acquisition delays. This is further impacted by delays in approvals for forest and other environmental clearances.

7 PIB, June 2023 by Ministry of Road Transport & Highways - https://tinyurl.com/yh6m7nrx

Box XII.3:Key Initiatives for Road Development

Development of Rural Roads - Pradhan Mantri Gram Sadak Yojana (PMGSY)

- PMGSY-I launched in December 2000, to provide connectivity through an all-weather road with necessary culverts and cross-drainage structures to eligible unconnected habitations in rural areas.
- PMGSY-II launched in 2013 to upgrade 50,000 km of selected through-routes and major rural links (MRLs) in various states and union territories.
- In 2016, a road connectivity project for strategically important roads in left-wing extremism affected areas was launched as a separate vertical under PMGSY.
- PMGSY-III launched in 2019 for consolidation of 1,25,000 km through routes and MRLs connecting habitations, inter-alia, to gramin agricultural markets, higher secondary schools, and hospitals.
- A total of 8,29,409 km of road length has been sanctioned under PMGSY out of which, 7,63,308 km of road length has been completed as on 18th June 2024 under various interventions/verticals of PMGSY at an expenditure of ₹3.23 lakh crore (including state share).
- 99.6 per cent of the targeted habitations under PMGSY-I have been provided connectivity.

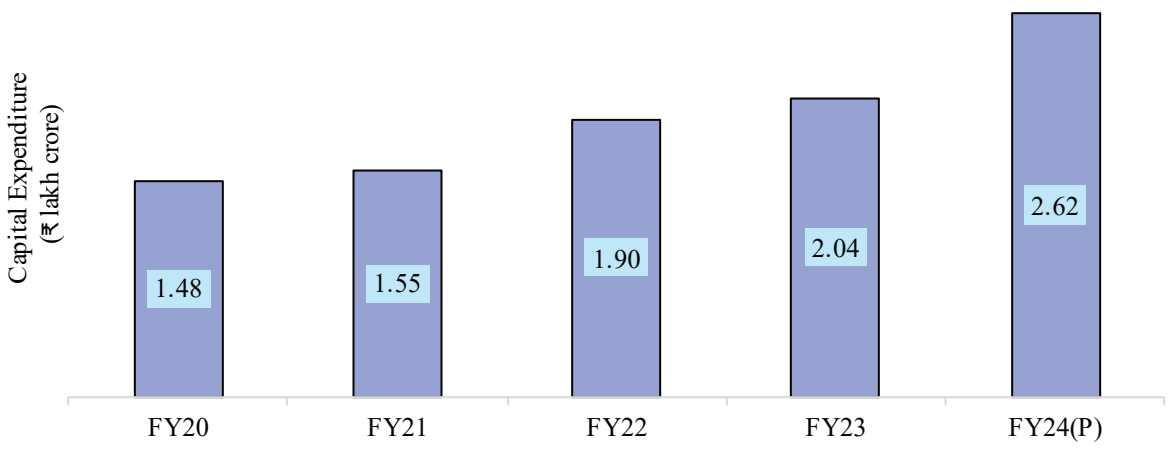
Development of Industrial Corridors

- The Government is developing 11 industrial corridor projects as part of the national industrial corridor programme in a phased manner. These include industrial corridors connecting Delhi-Mumbai, Chennai-Bengaluru, Amritsar Kolkata , East Coast and Vizag Chennai Corridor, Bengaluru-Mumbai, Extension of CBIC to Kochi via Coimbatore, Hyderabad-Nagpur, Hyderabad-Warangal, Hyderabad-Bengaluru, Delhi-Nagpur and Odisha Economic Corridor.
- The programme is aimed at providing multi-modal connectivity with complete "plug and play" infrastructure until the plot level with resilient and sustainable future-ready cities.
- A total of 308 Plots (1,789 acres) have been allotted until March 2024 in four cities.
- At present, about 2,104 acres of developed industrial land and 2,250 acres of commercial/ residential/ other land use are readily available for allotment.

Rail Transport

12.17. Indian Railways, with over 68,584 route km (as of 31st March 2023) and 12.54 lakh employees (as of 1st April 2024), is the fourth largest network in the world under single management. Capital expenditure on Railways has increased by 77 per cent over the past 5 years (₹2.62 lakh crore in FY24) with significant investments in the construction of new lines, gauge conversion, and doubling.

Chart XII.12: Capital expenditure on railways



Source: Ministry of Railways
Note: P stands for Provisional

Box XII. 4: Initiatives for Railway Enhancement

Amrit Bharat Station Scheme	Mumbai-Ahmedabad High Speed Rail (MAHSR) project	Dedicated freight corridors (DFCs)
• Launched in August 2023 for development of stations on a continuous basis. • Involves preparation of master plans and its phased implementation to improve amenities, building improvements, multimodal integration, and sustainability. • 1,324 stations have been identified for upgradation so far.	• Under this 508 Km project, executed with co-operation from Govt. of Japan, land acquisition and civil conduct award have been completed. • Overall physical progress of 41.7 per cent has been achieved and financial expenditure of ₹59,291 crore was incurred until 31st March 2024.	• Two DFCs are under implementation namely the eastern DFC with route length of 1,337 kilometre and the western DFC with route length of 1,506 kilometre. • By the end of FY24, 96.1 per cent of the total DFC route length has been completed.

12.18. Railways achieved its highest-ever production for both locomotives and wagons in FY24. Fifty one pairs of Vande Bharat have been introduced until March 2024. The fast pace of infrastructure augmentation has been the result of a substantial increase in financial allocation along with close project monitoring and regular follow-up with stakeholders for expeditious land acquisition and clearances.

Chart XII.13: Year wise production of coaches, locomotive and wagons

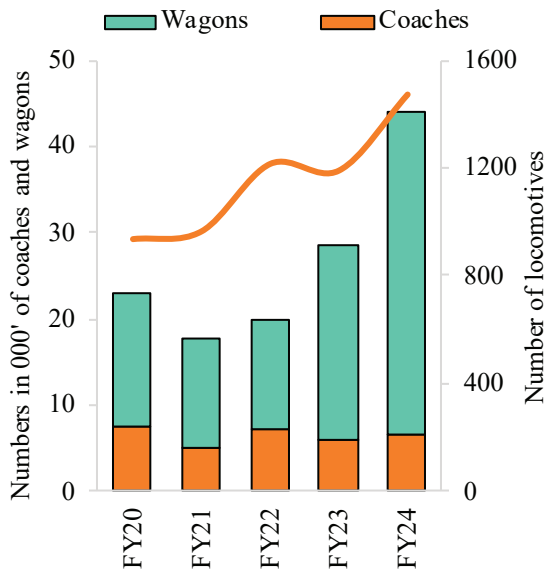
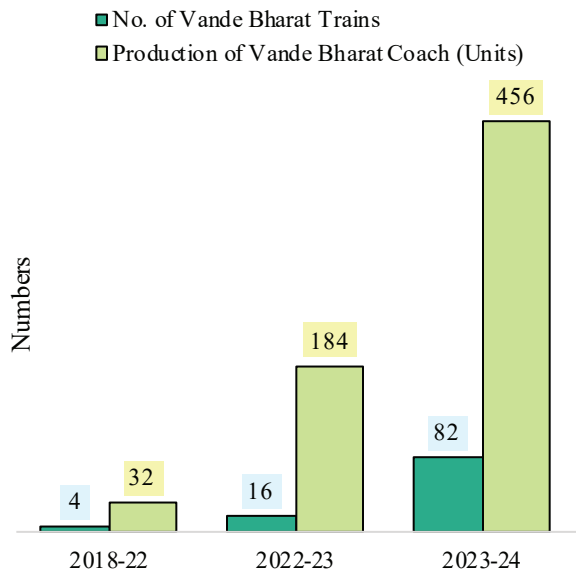


Chart XII.14: Vande bharat trains and production of coaches (2018-19 to 2023-24)



Source: Ministry of Railways

12.19. High-speed, long-distance Vande sleeper trainset coaches having features like quick acceleration, diffused lighting, automatic doors and Global Positioning System-based passenger information system are under development. Railways is also planning to introduce Vande metro trainset coaches with features such as sealed wider gangways, centrally controlled automatic sliding doors, CCTVs for safety and surveillance, route map indicator, passenger information & infotainment system, fire detection system and aerosol-based fire suppression system. The first lot is expected to be turned out in FY25.

12.20. Railways has taken several initiatives for providing clean environment in and around railway stations and trains, such as replacement of conventional toilets with bio-toilets on coaches leading to clean tracks, segregation of bio-degradable/non bio-degradable waste, solid waste management and discouraging use of single use plastic.

Box XII. 5: Key Initiatives in the Railway Sector

- GatiShakti Multi-Modal Cargo Terminal (GCT) is being developed by private players on the railway and non-railway land, based on demand from industry and the potential of cargo traffic. 77 GCTs have been commissioned and in-principle approval have been issued for 186 locations on non-railway land as of 31st March 2024.
- Launched 'Virtual Aggregation Platform' for online booking of parcel space allowing various cargo transporters to have live visibility of demand.
- Implemented a policy framework to establish 50 Pradhan Mantri Bhartiya Janaushadhi Kendras in railway station premises.

- Mechanical signalling is being placed with electrical/electronic interlocking systems. So far, eight zones have become free from mechanical signalling.
  - Electronic interlocking (EI) systems have been provided at 443 stations during FY24. Until 31st March 2024, EI has been provided at 3,424 stations
  - Kavach as automatic train protection (ATP) system has been deployed on 1,465 route kilometres (RKM) on south central railways.
  - Automatic Block Signalling (ABS) a proven low-cost signalling solution has been provided on 582 route km during FY24. Until 31 March 2024, ABS has been commissioned on 4,431 RKM on high-density network routes.
- Under the Mission 100 per cent Electrification Programme, electrified network of IR has been extended to 63,456 km (96.4 per cent). In past five years (2019-24) electrification has progressed at a pace of about 5,594 RKM per year.

Chart XII.15: Pace of Railway electrification

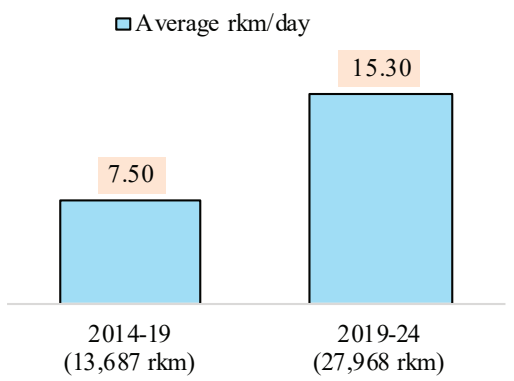
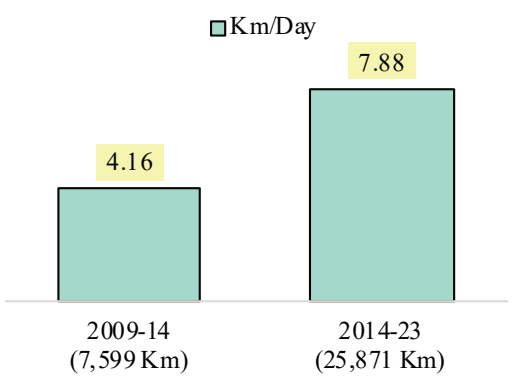


Chart XII.16: Track length commissioned (new line, multi-tracking and gauge conversion)



Source: Ministry of Railways

12.21. ***Outlook:*** The key focus areas for Railways include fast capacity augmentation, modernisation of rolling stock and maintenance, improving quality of services and energy efficiency. In line with this, investments are prioritised in areas like dedicated freight corridors, high-speed rail, modern passenger services like Vande Bharat, Amrit Bharat Express, Aastha Special Trains, high-capacity rolling stock and last-mile rail linkages. Projects for three major corridors viz. (1) High-traffic density corridors, (2) Energy, Mineral and Cement Corridors and (3) Rail Sagar (port connectivity) corridors are also planned to reduce logistics cost and carbon footprint. Railways has also planned to reduce its carbon footprint primarily through sourcing of its energy requirements through renewable energy sources. The expected requirement of installation of renewable capacity by 2029-30 is around 30 Giga Watts. Other strategies include shifting from diesel to electric traction, promotion of energy efficiency and afforestation. Carbon emission by 2029-30 as per business-as-usual mode is estimated to be 60 million tonnes[8]. As

8 PIB dated 07th Oct 2022, Ministry of Railways - https://tinyurl.com/89u3brm4

of March 2024, ~231 Mega Watt (MW) of solar plants (both on Rooftops and on land) and about 103 MW of wind power plants have been commissioned. Further, about 5,750 MW of renewable capacity has also been tied up.

Water Transport

12.22. Indian ports are rapidly expanding capacity to meet growing trade. Major port capacity has nearly doubled since 2014. Improved connectivity through coordinated planning under the PM Gati-Shakti National Master Plan and a focus on public-private partnerships have enhanced India's maritime competitiveness globally. India's rank in the International Shipments category in the World Bank Logistics Performance Index has improved to 22nd in 2023 from 44th in 2014. Further, policy reforms and the induction of new technology have enhanced port efficiency and productivity. As mentioned in chapter 4 on the External Sector, the container turnaround time has dropped by 50 per cent between 2014 and 2023-24. The union capital expenditure towards ports, shipping and waterways sector has grown by 27 per cent between FY23 and FY24.

Chart XII.17: Capital expenditure by the Government towards ports, shipping, and waterways

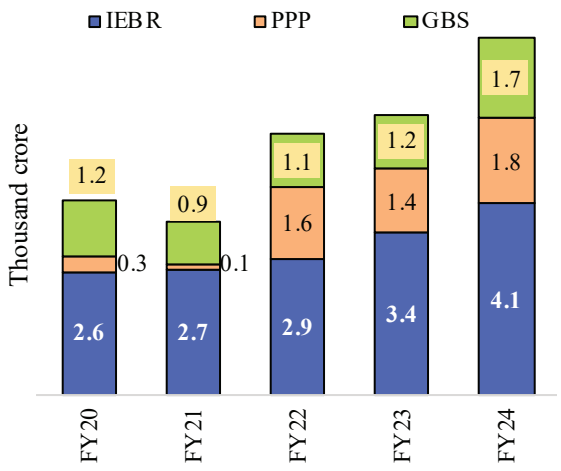
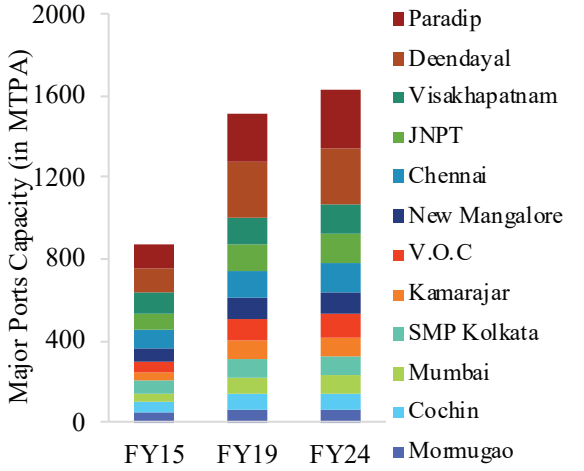


Chart XII.18: Major ports capacity



Source: Ministry of Ports, Shipping and Waterways; Port Capacity was re-rated based on Berthing Policy as per international norms.

12.23. Under the Sagarmala national programme launched in 2015, a total of 839 projects worth ₹5.8 lakh crore have been undertaken across five key areas of Port modernisation & fresh development, connectivity enhancement, port-led industrialisation, coastal community development and coastal shipping and inland water transport. Under this programme, 262 projects worth ₹1.4 lakh crore are completed, while 217 projects worth ₹1.65 lakh crore are under implementation and 360 projects worth ₹2.7 lakh crore are under development.

Chart XII.19: Share of Project cost based on key areas under Sagarmala

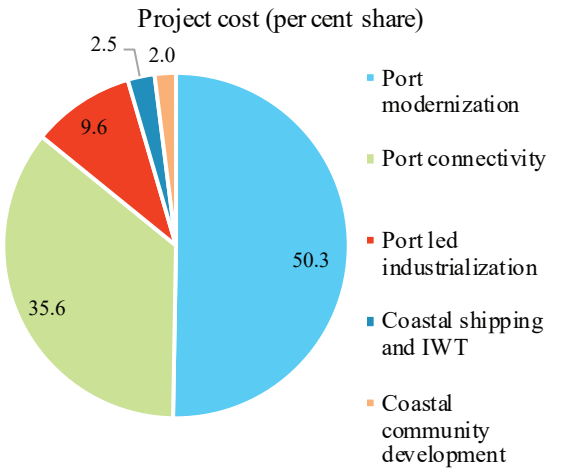
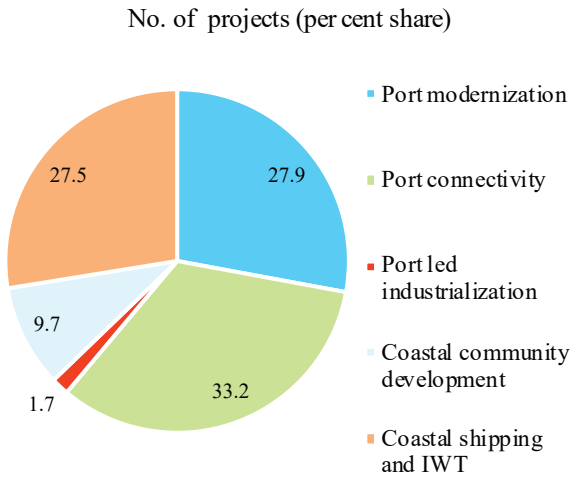


Chart XII.20: Share of Projects based on key areas under Sagarmala



Source: Ministry of Ports, Shipping and Waterways

Box XII. 6: Key Initiatives in the Ports

- Major Port Authorities Act, 2021 with a focus on decentralised decision-making, professionalism, and PPP models has enhanced efficiency and improved governance of major ports.
- 'Harit Sagar'- Green Port guidelines were launched in May 2023 - under which four major ports are already generating more renewable energy than their demand.
- 'Sagar Aankalan', a national benchmarking of Indian ports performance applicable to all Indian seaports was released in February 2024.
- A world-class National Maritime Heritage Complex being built at Lothal will showcase a vast collection of maritime artefacts and India's rich maritime history.
- Discovery campus of the National Technology Centre for Ports, Waterways and Coasts was inaugurated at IITM, Chennai.
- Development of an all-weather greenfield deep draft major port at Vadhavan in Maharashtra has been approved by the Cabinet. The total project cost, including land acquisition component, is ₹76,220 Crore. The project will be constructed by Vadhavan Port Project Limited, an SPV formed by Jawaharlal Nehru Port Authority and Maharashtra Maritime Board. This will include core infrastructure, terminals and other commercial infrastructure in PPP mode. The project will create a cumulative capacity of 298 million metric tonnes per annum[9].

9 Cabinet PIB dated 19 June 2024 - https://tinyurl.com/2ydtzb4k

12.24. **Island Development:** In Amrit Kaal Vision 2047, island development will be a key focus for coming years. Under the Maritime India Vision 2030, Andaman & Nicobar islands and Lakshadweep Islands are planned to be developed for tourism and other initiatives in a phased manner. Andaman Lakshadweep Harbour Works will develop the port infrastructure required to meet the growing demand and also provide technical support to local port departments for operations. Shortlisted islands in Lakshadweep, Andaman and Nicobar and Gujarat are proposed to be developed over the next decade around the themes of eco-tourism, ship repair, seaplane building and repair, maritime training institute, free trade zones and bunkering terminals. Such developments can further be expanded to other islands in the country[10].

12.25. **Ship building, repair and recycling:** Shipbuilding financial assistance policy scheme was launched to offer financial support to Indian shipyards for shipbuilding contracts signed between 1 April 2016 and 31 March 2026. A total of 39 shipyards have registered, and 18 shipyards have utilized the benefits. In May 2023, the Udupi Cochin Shipyard Limited, a wholly owned subsidiary of Cochin Shipyard Ltd., flagged off five deep-sea tuna long liner cum gill netter fishing vessels built under the Pradhan Mantri Matsya Sampada Yojana. An International Ship Repair Facility was inaugurated at Cochin Shipyard Ltd (CSL) in January 2024. The new dry dock allows building larger ships, including future aircraft carriers, and repairs.

12.26. The Recycling of Ships Act, 2019 and Rules thereunder aim to set international standards for ship recycling and ensuring safe and environmentally sound practices subsequent to accession to the Hong Kong International Convention. Under the Act, the Government has also notified the Directorate General of Shipping as National Authority for Recycling of Ships with authority to administer, supervise and monitor all activities relating to ship recycling.

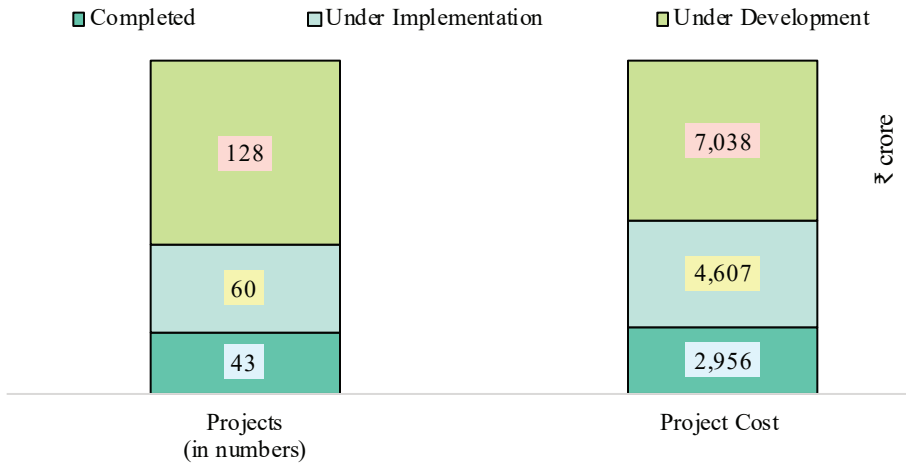
12.27. ***Outlook:*** The India's Maritime Vision 2030 outlines over 150 initiatives to improve ports, shipping, and inland waterways and envisions investments of ₹3-3.5 lakh crore. The Maritime Amrit Kaal Vision 2047 outlines over 300 initiatives across 11 key areas to drive growth and development in India's coastal regions. Its vision aims to reduce the average vessel turnaround time (containers) from 25 hours in 2020 to less than 20 hours in 2030. Likewise, it also aims to increase the average ship daily output (gross tonnage) from16,000 in 2020 to more than 30,000 in 2030.

Coastal Shipping and Inland Water Transport

12.28. With the focus of the Government to foster coastal shipping, the gross tonnage through this mode has increased from 1.19 million GT as on 1, April 2014 consisting of 846 vessels to 1.72 million GT with 1039 vessels as on 1, April 2024.

10 Ministry of Ports, Shipping and Waterways PIB dated 24 Nov 2023 - https://tinyurl.com/ytfb3jy9

Chart XII.21: Coastal shipping and IWT



Source: Ministry of Ports, Shipping and Waterways

12.29. India has a large endowment of rivers, canals, and other waterways, with a total navigable length of around 14,500 km[11]. The notification of the Inland Vessels Act 2021, was aimed at replacing the over 100 years old Inland Vessels Act of 1917, making the legislative framework user-friendly.

12.30. Capital expenditure by the Inland Waterways Authority of India (IWAI) for FY24 was ₹1010.5 crore. Based on feasibility and detailed project reports prepared for 106 new National Waterways (NWs), technical interventions have been planned for safe navigation and shipping on technically viable waterways. Over 63 per cent of the Jal Marg Vikas Project on NW-1 has been completed as of March 2024. Phase-I development of NW-3, NW-4, NW-5 & 13 new NWs was approved at a cost of ₹267 crore for 2025-2026.

12.31. The Indo Bangladesh Protocol (IBP) route, developed jointly by India and Bangladesh at an estimated cost of ₹305.84 Crore, provides an alternate connectivity for all North-eastern states from Guwahati and Jogighopa to Kolkata and Haldia ports. With the initiatives taken in last 9 years, the cargo handled via IBP route has increased significantly.

Civil Aviation

12.32. India is amongst the fastest-growing aviation markets globally. The Government has a capital expenditure plan of more than ₹26,000 crore for the period FY20 to FY25 to develop, upgrade and modernise airports to meet international standards. Out of the planned expenditure, the Airport Authority of India (AAI) has achieved around ₹23,000 crore during FY20 to FY24. PPP and other airport operators have incurred an amount of around ₹49,000 crore during the same period, taking the total capital expenditure of around ₹72,000 crore in the airport sector during the last 5 years.

11 As per Chapter 15, Report of the National Transport Policy Committee 1980) India's navigable inland waterways extend nearly 14,500 kilometers, comprising a variety of river systems, canals, backwaters, creeks, and tidal inlets. These include all waterways navigable by country boats. Source: Government of India, Ministry of Shipping & Transport, Report of the Committee on National Waterways, 1974, p. 58"

12.33. 21 Greenfield airports were accorded in-principle approval, out of which 12 airports have been operationalised. During FY24, new terminal buildings at 21 airports have been operationalised which has led to an overall increase in passenger handling capacity of these airports by approximately 62 million passengers per annum. During last seven years, after commencement of Ude Desh ka Aam Nagrik (UDAN) Regional Connectivity Scheme (RCS), 1,390 valid awarded routes have been allotted to various airlines. Out of this, 579 RCS routes connecting 85 unserved and underserved airports have been operationalized.

Box XII. 7: New Segments – Drones, Leasing and MRO

- Drones offer vast benefits across sectors like agriculture, healthcare, disaster relief, surveillance, and defence. The Government introduced liberalized drone rules in 2021. Other measures include publishing drone airspace maps, implementing a PLI scheme, and introducing a drone certification scheme. Key progress includes the establishment of 109 training organisations and the issuance of 10,603 remote pilot certificates, 22,943 unique identification numbers for registered drones, and 67 DGCA-approved Type-Certificate for drone models.
- The Government is promoting aircraft leasing through the International Financial Services Centre (IFSC) at GIFT City. More than 28 aircraft lessors have already registered, which have together leased more than 20 aircraft and 49 aircraft engines. Recently, Air India has commenced leasing of its wide body aircrafts from the IFSC zone and other airlines are also in process of establishing leasing company in IFSC.
- Realising the potential of the MRO industry in India, the Government has introduced several policies and regulations to bring India's MRO sector at par with global peers. MROs in India have enhanced their capacities in traditional segments such as airframes and the industry is branching to other MRO segments such as engines in collaboration with global OEMs. After the announcement of the National Civil Aviation Policy (NCAP-2016), the number of MROs in India has increased to 147, from 114 in 2016. The setting up of new MROs has increased employment in the sector. More airports are building MRO facilities to add capacity thereby addressing infrastructure constraints.

Outlook: The number of airports in India has more than doubled since 2014. However, there is need to augment this capacity by adding more airports as well as expansion/upgradation of existing airports in the next five years. In spite of impressive growth in the last decade in the Indian aviation market, there is still largely untapped potential. At around 0.13 air trips per capita[12], the current passenger air traffic is a fraction of India's potential. MRO and skill development will fuel the growth of the sector further. Initiatives such as the International Aviation Hub Strategy and engagements with global bodies signal India's intent to emerge as a key player in the global aviation landscape. For India to take a leadership position in aviation, focus is required on improving the efficiency and viability of airlines while ensuring environmental sustainability. A large proportion of Indian international traffic for the long

12 Ministry of Civil Aviation

haul goes through connectivity hubs in the Middle East and Southeast Asia. There is also need to provide adequate long-haul connectivity from India by strengthening Indian airlines.

Energy Infrastructure

Power Sector

12.34. Power transmission in India is connected into one grid running on one frequency with the inter-regional capability of transferring 1,18,740 megawatts (MW). It is emerging as one of the largest unified electricity grids in the world. Until 31 March 2024, transmission systems have expanded to 4,85,544 circuit kilometre of transmission lines and 12,51,080 mega volt amp (MVA) of transformation capacity.

12.35. The peak electricity demand increased by 13 per cent to 243 GW in FY24. The Government of India has accelerated its efforts to enhance the sector and meet the continuously rising demand for electricity in the country. Between FY23 and FY24, the maximum rise in electricity generation was recorded in renewable energy resources for utilities.

Box XII. 8: Revamped distribution sector scheme (RDSS)

RDSS was launched in 2021 to help distribution companies improve operational efficiencies and financial sustainability by providing result-linked financial assistance to strengthen supply infrastructure based on meeting pre-qualifying criteria and achieving basic minimum benchmarks.

- RDSS has an outlay of around ₹3.04 lakh crore from FY22 to FY26[13] which includes an estimated Government budgetary support of around ₹0.98 lakh crore.
- RDSS aims to reduce aggregate technical & commercial losses to 12-15 per cent by FY25[14], reduce the Average Cost of Supply and the Average Revenue Realized gap to zero by FY25 and improve quality, reliability, and affordability of power supply to consumers through a financially sustainable and operationally efficient distribution sector.
- Under RDSS, 19.79 crore prepaid smart meters, 52 lakh distribution transformer meters and 1.88 lakh feeder meters have been sanctioned.

12.36. A total of 2.86 crore households have been electrified since the launch of the Saubhagya period in October 2017 under various schemes. Further, the implementation of Electricity (late payment surcharge and related matters) Rules, 2022 have given relief to the DISCOMs, as well as electricity consumers and generating companies. Since implementation, as of 2nd April 2024, total bills amounting to ₹8.1 lakh crore have been settled against the total billed amount of ₹8.7 lakh crore from May 2022 (excluding EMI Payments against legacy dues and including disputed invoices).

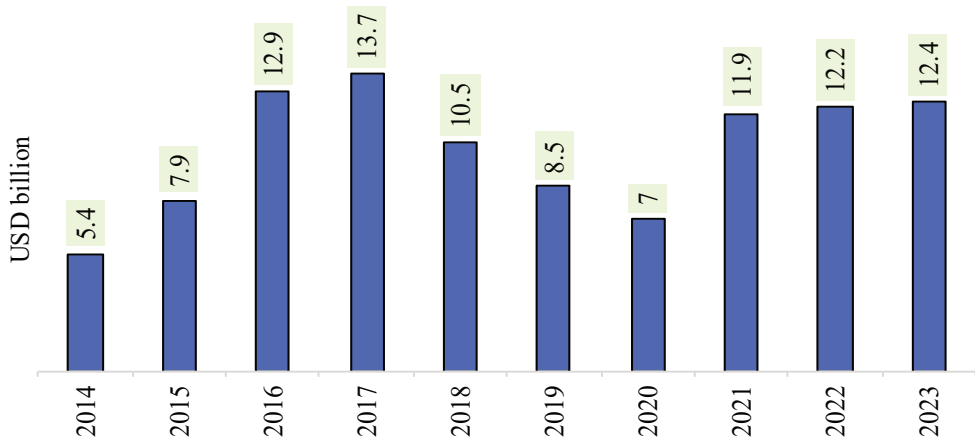
13 PIB dated 11 Aug 2023, Ministry of Power - https://tinyurl.com/yc6e8wev
14 PIB dated 11 Aug 2023, Ministry of Power - https://tinyurl.com/yc6e8wev

Box XII. 9: Some Key Initiatives in the Power Sector	
SAMARTH Mission	**One Sun, One World, One Grid Initiative**
• Launched in 2021, the Sustainable Agrarian Mission on Use of Agri-Residue in Thermal Power Plant (SAMARTH) has a full-time mission directorate to coordinate and monitor implementation. • Biomass co-firing in NCR thermal power plants has reached 1.68 per cent; efforts are underway to take it up to 5 per cent.	• A task force is studying the feasibility of interconnection of regional grids viz. Southeast Asia, South Asia, Middle East, Africa and Europe for exchange of renewable power. • Presently, discussions are going on with Saudi Arabia, UAE, Sri Lanka, Myanmar, Singapore, etc.
UJALA Scheme	**Street Lighting National Programme**
• Unnat Jyoti by Affordable LEDs for ALL (UJALA), launched in 2015, LED bulbs, LED tube lights and energy-efficient fans are sold to replace conventional and inefficient variants. • According to the Ministry of Power, this has resulted in an estimated energy savings of 48.42 billion kWh per year with avoided peak demand of 9,789 MW and GHG emission reduction of 39.30 million tonne CO_2 per year, and annual monetary savings of ₹19,335 crore in consumer electricity bills.	• This programme was launched in 2015 to replace conventional streetlights with smart and energy-efficient LED streetlights. Over 1.31 crore LED streetlights have been installed so far. • According to the Ministry of Power, this is estimated to have resulted in estimated energy savings of 8.80 billion kWh per year with avoided peak demand of 1,467 MW and GHG emission reduction of 6.06 million tonnes CO_2 per year and estimated annual monetary savings of ₹6,162 crore in electricity bills of municipalities.

Renewable Sector

12.37. India submitted its updated nationally determined contributions to the United Nations Framework Convention on Climate Change on 26 August 2022 and committed to achieve about 50 per cent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030. The Ministry of New and Renewable Energy is working towards achieving 500 Giga Watt (GW) of installed electricity capacity from non-fossil sources by 2030. A total of 190.57 GW of renewable energy (RE) capacity has been installed in the country as of 31 March 2024. The share of RE in the total installed generation capacity in the country stands at 43.12 per cent.

Chart XII.22: Investment in Renewables



Source: REN21. Renewables 2024 Global Status Report

12.38. The clean energy sector in India saw new investment of ₹8.5 lakh crore (USD 102.4 billion) between 2014 and 2023[15]. The RE sector is expected to attract investments of about ₹30.5 lakh crore in India between 2024 and 2030[16]. This would create significant economic opportunities across the value chain. The RE sector received approximately USD 17.88 billion as FDI from April 2000 until March 2024[17].

Box XII.10: Major Programmes, Projects, and Initiatives in the Renewable Energy Sector

- Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM): As of 31 March 2024, 166 MW decentralized solar capacity has been installed and 3.26 lakh agricultural pumps have been solarized under the Scheme.
- Production Linked Incentive Scheme for National Programme on High Efficiency Solar Photovoltaic (PV) Modules: To achieve manufacturing capacity of GW scale in High Efficiency Solar PV modules with outlay of ₹24,000 crore. As of 31 March 2024, four manufacturers have started manufacturing of solar PV modules.
- Solar Parks Scheme: To provide solar power developers with a plug and play model, by facilitating necessary infrastructure along with all statutory clearances. Scheme has a sanctioned capacity of 39.7 GW for the development of 56 Solar Parks in 13 States. Solar projects of capacity 11.59 GW have been commissioned in these parks and the remaining capacity is at various stages of implementation.
- PM - Surya Ghar: Muft Bijli Yojana: Aimed to install rooftop solar plants in one crore households with a total financial outlay of ₹75,021 crore and to be implemented until FY27. This is expected to enable an installation of around 30 GW of residential rooftop solar capacity and 40-45 GW of overall rooftop solar capacity addition by FY27.

15 REN21. Renewables 2024 Global Status Report- Renewables in Energy Supply
16 Investment Estimates by Indian Renewable Energy Development Agency
17 FDI Inflow Factsheet, Department for Promotion of Industry, and Internal Trade (DPIIT), Govt. of India

- CPSU Scheme Phase-II (Government Producer Scheme): Aimed at setting up grid-connected solar PV power projects by PSUs and the Government organisations, using domestically manufactured solar PV cells and modules, with VGF support for self-use or use by the Government or Government entities. Out of the 8.2 GW capacity of solar PV power plants, about 1.66 GW capacity has been commissioned and the balance is under implementation as of 31 March 2024.
- Wind Power: Wind energy is led by indigenous wind power industry and strong project ecosystem, operation capabilities and a manufacturing base of 18 GW per annum[18]. As of 31 March 2024, the wind power installed capacity has grown by about 2.1 times during the past 10 years to about 45.89 GW. As per REN21 Report, India stands fourth in wind power installed capacity in the world[19].
- New Solar Power Scheme (for Particularly Vulnerable Tribal Groups (PVTG) Habitations/Villages: Launched on 04 January 2024 under the Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan for electrification of one lakh un-electrified PVTG households located in 18 States and one Union Territory by provision of off-grid solar systems where electricity supply through grid is not techno-economically feasible.
- Green Energy Corridor (GEC) projects: Initiated to facilitate renewable power evacuation and reshaping of the grid for future requirements. GEC-I is under implementation in eight States with cumulative achievement of 9,111 circuit kilometer (ckm) transmission lines and 21,303 MVA substations. GEC-II is under implementation in seven States.
- Bio Energy Programme: The National Bioenergy Programme notified in November 2022 to be implemented from 1April 2022 to 31 March 2026 in two phases. As of 31 March 2024, installed capacity of biomass power and cogeneration projects was about 9.4 GW (grid-connected) and 0.92 GWeq. (off-grid), waste to energy projects capacity was 249.74 MW (grid-connected) and 336.06 MWeq. (off grid). Under biogas programme, about 51.04 lakhs of small biogas plants and 349 medium size biogas plants (10.6 MWeq.) have been installed.
- National Green Hydrogen Mission: Approved in January 2023 with outlay of ₹19,744 crore. The mission targets to achieve about 5 million metric tonne (MMT) of annual Green Hydrogen production capacity, associated renewable energy capacity of about 125 GW, ₹8 lakh crore in total investments, and 50 MMT CO_2 annual emission expected to be averted by year 2030.

18 Estimates by Ministry of New and Renewable Energy
19 REN21. 2024. Renewables 2024 Global Status Report - Renewables in Energy Supply

Box XII. 11: Key Policies in Renewable Energy Sector

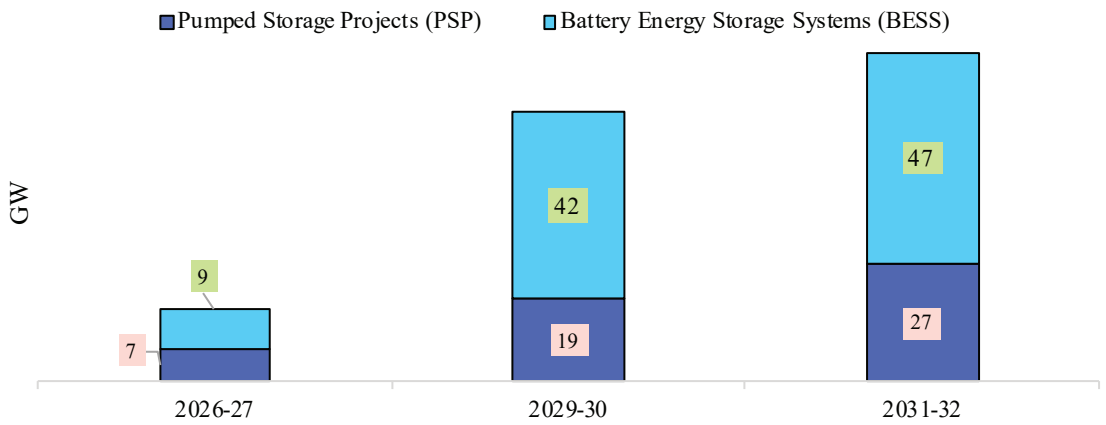
National Framework for Promoting Energy Storage Systems (ESS)

- ESS can be used for storing energy available from RE sources to be used at other times of the day.
- This can bring down the variability of generation in RE sources, improving grid stability, enabling energy/peak shifting, providing ancillary support services, and enabling larger renewable energy integration.
- Benefit consumers by bringing down peak deficits, peak tariffs, reduction of carbon emissions, deferral of transmission and distribution capex, and energy arbitrage.

Guidelines to promote development of Pumped Storage Projects (PSP)

- Amongst the various technologies available for addressing the above requirement of storage and ancillary services, pumped storage projects (PSPs) are clean, MW scale, domestically available, time tested and internationally accepted.
- Guidelines to promote development of PSPs were issued by the Ministry of Power in April 2023.

Chart XII.23: Energy storage capacity requirement



Source: National Electricity Plan (NEP) 2023 & Central Electricity Authority's Report on Optimal Generation Mix 2030 Version 2.0

Box XII. 12: Challenges in Renewable Energy Sector

- **Mobilisation of the necessary finance and investment on competitive terms:** Gearing up the banking sector for arranging finances for larger deployment goals, exploring low-interest rate, long-term international funding, and developing a suitable mechanism for risk mitigation or sharing by addressing both technical and financial bottlenecks.
- **Land acquisition:** Identification of land with RE potential, its conversion (if needed), clearance from land ceiling Act, decision on land lease rent, clearance from revenue department, and other such clearances take time. State Governments must play a major role in acquisition of land for RE projects.

12.39. **Outlook:** India is steadfast in its commitment towards non-fossil fuel-based energy resources with the gradual transition from conventional sources to non-fossil fuel sources. India has put in place a target[20] of achieving 50 per cent cumulative installed capacity for generating electric power from non-fossil fuel-based energy resources by 2030. As per the National Electricity Plan of the Central Electricity Authority, non-fossil fuel (hydro, nuclear, solar, wind, biomass, small hydro, pump storage pumps) based capacity which is around 203.4 GW (46 per cent of the total) out of 441.9 GW of total installed capacity in 2023-24 is likely to increase to 349 GW (57.3 per cent) in 2026-27, and 500.6 GW (64.4 per cent) in 2029-30. India already accelerated its effort to enhance its contribution of non-fossil fuel in its energy mix.

Chart XII.24: Percentage share of different sources in installed capacity of power

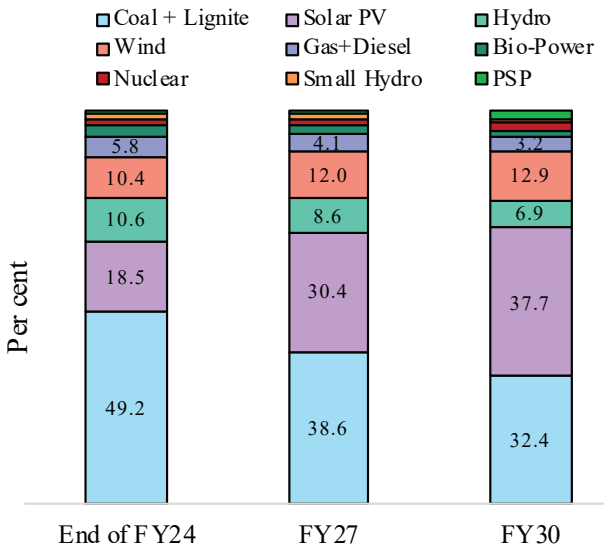
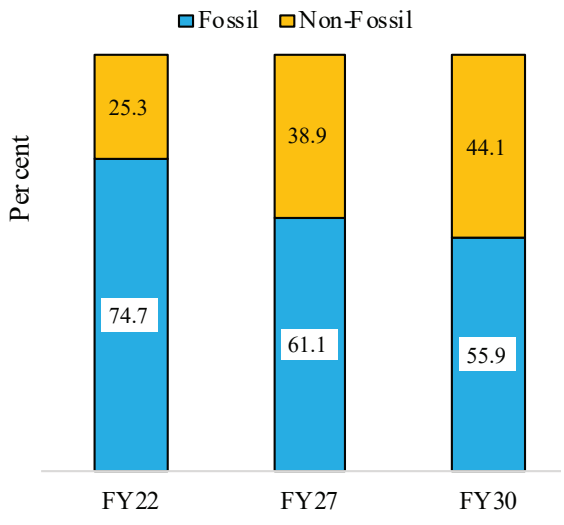


Chart XII.25: Percentage share in power generation



Source: Ministry of Power

Social and Economic Infrastructure

Sports Sector

12.40. The Government has been supplementing States and Union territories in their efforts to bridge critical gaps in sports infrastructure in the country.

20 India's Updated First Nationally Determined Contribution Under Paris Agreement (2021-2030), August 2022 Submission to UNFCCC - https://tinyurl.com/2p9ncj48

Box XII. 13: Major Programmes, Projects, and Initiatives in Sports Sector

- National Programme for Development of Sports (Khelo India) programme: 323 infrastructure projects have been sanctioned at a total cost of ₹3,073.7 crore. In FY24, 38 new infrastructure projects were sanctioned, and 58 projects were completed.
- National Sports Development Fund: Ten (seven sports infrastructure and three sports promotion) projects have been sanctioned in FY24.
- Sports Authority of India: Nine infrastructure projects were approved for different centres in FY24. 13 infrastructure projects completed during FY24.
- National Sports University, Imphal: Development underway to enhance India's sports infrastructure and create world-class facilities for sports education, training, and research. The project has a sanctioned cost of ₹611.74 crore, which has reached an overall physical progress of 56 per cent.
- Model Concession Agreement (MCA): To promote private participation in the development of sports infrastructure, Department of Sports has drafted an MCA for Development of Integrated Multi sports Arena on Design, Build, Finance Operate and Transfer (DBFOT) basis for development of integrated sports stadium complex (greenfield/brownfield) on PPP mode, in consultation with Infrastructure Finance Secretariat, Department of Economic Affairs, Ministry of Finance. Once finalised, States/UTs and Union Government departments can utilise the MCA to expedite the onboarding of private players for the development of sports infrastructure.

Water & Sanitation Sector

12.41. The year 2024 marks 10 years of Swachh Bharat Mission – Grameen (SBM-G), Phase I which was launched in October 2014, with a focus on making India open defecation free (ODF) wherein financial incentives were provided for the construction of individual household latrines and funds for construction of community sanitary complexes. After achieving ODF, SBM-G Phase II has been launched to achieve Sampoorn Swachhata, i.e., sustaining the ODF status, managing solid and liquid waste by 2024-25 and transforming all the villages from ODF to ODF Plus Model. The total estimated outlay of SBM-G Phase-II is ₹1.4 lakh crore which is to be dovetailed through convergence between different verticals of financing and various schemes of the Government of India and State Governments. During FY24, 1,61,525 villages were covered with solid waste management arrangements, 2,83,998 villages with grey water management, 2,070 blocks were linked with plastic waste management units and material recovery facilities and 159 districts were initiated with faecal sludge management arrangements. Also, in FY24, ₹7,000 crores were allocated to SBM-G, out of which ₹6,802.58 crore (97 per cent) have been utilised.

Box XII. 14: Steel (Barthan) Bank[21]: The idea of Siddhipet district in Telangana

The concept revolves around addressing the challenge of managing plastic waste, particularly disposable utensils, in the Siddipet district through a creative and sustainable solution. The initiative originated during the Kanti-Velugu program in 2022, a state-wide universal eye testing program where medical camps were held across villages, necessitating daily food arrangements for 15-20 staff members.

- The steel bank concept entails providing a variety of steel utensils such as plates, spoons, glasses, bowls, and basins, which are stored as a bank at the Gram Panchayat Office.
- The benefits of the initiative have been the reduction of plastic waste accumulation, increased community awareness regarding the adverse effects of plastic consumption, such as cancerous and digestive issues due to indirect consumption of micro-plastics, additional income sources for communities, Self-Help Groups (SHGs), and Gram Panchayats, which is utilized for operational, maintenance, and expansion purposes.
- The key outcome has been reduced plastic waste collection, dumping, and burning, with an expected reduction of 6-8 kilograms of plastic waste per event and 28 quintals per month.
- The initiative of Barthan Bank has been implemented in the local bodies of many other States.

12.42. The Jal Jeevan Mission (JJM) launched in August 2019 to provide a tap water connection to every rural household by 2024 with a total outlay of ₹3.6 lakh crore. Out of this outlay, the central share is ₹2.08 lakh crore and the remaining ₹1.58 lakh crore is to be shared by the States. Out of around 19.30 crore rural households, at the time of inception of the mission, only 3.23 crore rural households (17 per cent) had provision of tap water connection which has now increased to more than 14.89 crore rural households (76.12 per cent).

Box XII. 15: Sailam:[22] A model village of Mizoram for sustainable rural water supply

- Under JJM, Sailam transformed from water scarce to a water-sufficient model village. Sailam is now a 'Har Ghar Jal' village with a 24x7 community-managed water supply system. A 900 KLD capacity water storage tank was built, and water collected from the nearby spring was pumped into the reservoir through solar pumps. Water from the reservoir is fed to individual households as well as a zonal reservoir of capacity 700 KLD by gravity system. Existing sources as well as infrastructure have been well integrated with the new scheme to optimize cost and ensure 24x7 adequate and potable water at nominal cost.

21 Department of Drinking Water and Sanitation, Ministry of Jal Shakti
22 Department of Drinking Water and Sanitation, Ministry of Jal Shakti

- Water meters have been installed by villagers on their own. They are paying user charges @ of ₹0.04/ litre/ per month, based on actual consumption. Encouraged by the work of providing water in every rural household, the community is now protecting 30 acres of forest under the catchment area of existing spring sources to ensure long-term source sustainability. Some villagers have donated their land voluntarily for watershed development. Also, a local pump operator has been trained, who is responsible for the O&M of the water supply system. The operator is also responsible for generating bills based on water consumption, collecting monthly water service from each household, keeping records of daily water consumption and expenditure in O&M, water quality testing through Field Testing Kits (FTKs) and maintaining a complaint register etc.

Water Resource Management Sector

12.43. The Namami Gange programme - National Mission on Clean Ganga (NMCG) launched in 2014-15 is a flagship integrated conservation mission focusing on pollution abatement, conservation, and rejuvenation of river Ganga. The budget for the programme has increased from ₹20,000 crore (2014-2020) to ₹22,500 crore (2021-2026)[23].

12.44. Namami Gange is using the widely popular Hybrid Annuity Model (HAM) for the sewage treatment plants being set up under this initiative. HAM is PPP-based approach to the sewerage infrastructure sector, wherein 40 per cent of capex is paid during construction and the balance 60 per cent is paid in 15-year annuity along with interest with separate payments for O&M. As on date, 33 projects have been sanctioned. Further, the approach of 'One City-One Operator' has also been adopted and this model has been followed for HAM projects where existing Sewage Treatment Plants (STPs) in towns are being integrated with newly sanctioned projects and tendered under HAM-based PPP mode.

Box XII. 16: Major Programmes Water Resource Sector

Dam Rehabilitation and Improvement Project (DRIP)

- DRIP is being implemented with financial assistance from the World Bank to improve the safety and operational performance of selected existing dams along with dam safety institutional strengthening with system-wide management approach.
- In DRIP phase-I (2012-21), 223 dams were rehabilitated at a total cost of ₹2,567 crore. Six states and two central agencies participated in the scheme.
- DRIP Phase II and Phase III (2021-31) envisage improving the safety and operational performance for rehabilitation of 736 dams with a budget outlay of ₹10,211 crore; 19 States and 3 central agencies are participating in the scheme.

23 PIB dated 13 Feb 2023, Ministry of Jal Shakti - https://tinyurl.com/3dx3prp5

Atal Bhujal Yojana

- World Bank aided Central Sector Scheme with an outlay of ₹6,000 crore, being implemented from 1st April 2020 for five years. Planned in 8,213 water-stressed gram panchayats (GPs) of 229 administrative blocks/ talukas in 80 districts of seven States.
- Only program targeting demand side groundwater management, focusing on behavioural change of the community. GPs are equipped with instruments for monitoring water level, water quality, rainfall, and groundwater extraction.
- The water budget & water security plans of all 8,213 GPs have been prepared and updated by the community. 47 blocks and 813 GPs have shown an improvement in the rate of decline of groundwater.

Pradhan Mantri Krishi Sinchayee Yojana (PMKSY)

- Launched in 2015-16 to enhance physical access to water on farms and expand cultivable areas under assured irrigation, improve on-farm water use efficiency and introduce sustainable water conservation practices.
- PMKSY is an umbrella scheme, consisting of two major components namely, the accelerated irrigation benefit programme (AIBP), and Har Khet Ko Pani (HKKP).
- Under AIBP, 58 projects have been completed out of 99 projects with central assistance of ₹14,372 crore during 2016-24. As a result, 25.80 lakh hectare of additional irrigation area was created during 2016-17 to 2023-24.
- Under the HKKP - Surface Minor Irrigation sub-component, 2,497 schemes out of 4,305 have been completed with the creation of an irrigation potential of 266.49 thousand hectare during 2016-17 to 2023-24. Under the HKKP - Repair, Renovation and Restoration of Water Bodies subcomponent, 1,489 out of 3,450 schemes have been completed with restoration of irrigation potential of 109.14 thousand hectare during 2016-17 to 2023-24.

Interlinking of Rivers Project

- Under this project, 30 links (16 under the Peninsular Component and 14 under the Himalayan Component) have been identified under the National Perspective Plan (NPP).
- Five-link projects have been identified as priority link projects viz; Ken Betwa Link Project, Modified Partbati-Kalisindh-Chambal link project and Godavari-Cauvery link project (comprised of 3 link segments).
- Ken Betwa Link Project is the first link of NPP under implementation that was approved in the year 2021 for implementation with central support of ₹39,317 crore and to be implemented jointly by Madhya Pradesh, Uttar Pradesh, and the Union Government.

Box XII. 17: Major Initiatives in the water management sector

- A platform for real-time analysis of Yamuna, Ganga, and their tributaries (PRAYAG) an online dashboard for continuous monitoring of river quality and sewage treatment infrastructure has been launched in April 2023
- Global River Cities Alliance led by NMCG is a unique and first-of-its-kind alliance covering over 275 global river cities in 11 countries, international funding agencies and knowledge management partners toward river conservation and sustainable water management.
- Under the groundwater management & regulation (GWMR) scheme, the groundwater regime at the national level is monitored through around 26,000 groundwater monitoring stations spread across the country. More than 5,000 stations are equipped with digital water level recorders with telemetry for real-time monitoring. Around 300 demonstrative artificial groundwater recharge structures have been created in different parts of the country.
- The first census of water bodies in the country was completed and published in 2023. 24,24,540 water bodies have been enumerated in the country, out of which 97.1 per cent (23,55,055) are in rural areas and 2.9 per cent (69,485) are in urban areas.
- To address dam safety issues holistically, the Government has enacted the landmark Dam Safety Act in December 2021 to provide for surveillance, inspection, operation, and maintenance of the specified dam for prevention of dam failure-related disasters and to provide for institutional mechanisms to ensure their safe functioning. All the large dams in the country come under the ambit of the Dam Safety Act 2021. As per National Register of Large Dams 2023, there are 6,281 dams in the country.
- Technological Innovations such as WQMIS, India-WRIS Portal, PM GatiShakti NMP portal etc. have been developed to improve data-led water governance.

Urban Sector

12.45. **Housing for All**: The vision being pursued by the implementation of Pradhan Mantri Awas Yojana-Urban (PMAY-U) since 2015 to provide pucca houses with basic amenities to all eligible beneficiaries in urban areas. Based on a demand survey conducted by States/UTs, more than 1.18 crore houses have been sanctioned of which about 1.14 crore have been grounded for construction and more than 84 lakh have been completed/delivered. The scheme has been extended for two years, until 31st December 2024 to complete all sanctioned houses. The total investment under the scheme is estimated to be ₹8.07 lakh crore which includes Central, State/ UT and beneficiary contributions. Central assistance of ₹1.64 lakh crore has already been released to States/UTs out of ₹2.00 lakh crore approved under the Scheme.

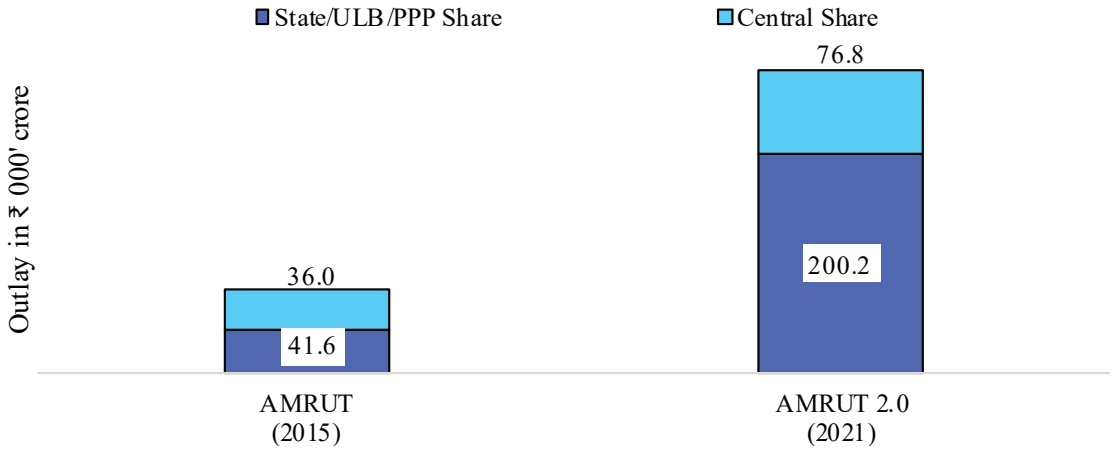
12.46. Affordable Rental Housing Complexes (ARHCs) initiative is being taken up for the first time in the country to improve living conditions and obviate urban migrants/ poor from staying in slums, informal settlements or peri-urban areas. So far, under Model 1, a total

of 5,648 houses have been made operational and another 7,413 houses are in process. Under Model 2, MoHUA has approved proposals of 82,273 new ARHC units in 7 States with a Technology Innovation Grant (TIG) of ₹173.89 crore of which construction for 44,116 ARHCs units is grounded for construction. Out of these grounded units, construction has been completed for 3,969 units at Sriperumbudur.

Box XII.18: Atal mission for rejuvenation and urban transformation (AMRUT)

- AMRUT launched in June 2015 in 500 cities focused primarily on providing safe and assured drinking water supply universally.

Chart XII.26: Total outlay for AMRUT 1.0 and 2.0



Source: Ministry of Housing and Urban Affairs

- Contracts for 5,999 projects worth ₹83,327 crore awarded of which 5,304 projects worth ₹51,434 crore (62 per cent) were completed.
- AMRUT includes eleven reforms comprising of 54 milestones to be achieved by the States and Union Territories over four years. These were aimed to improve service delivery, mobilise resources and make municipal functioning more transparent and accountable.
- AMRUT 2.0 launched in October 2021 for five years with a focus on making the cities self-reliant & water secure and providing universal coverage of sewerage & septage management in 500 AMRUT cities. The rejuvenation of water bodies and wells is one of the important components of this mission.
- Major reforms under AMRUT 2.0 include notification of property tax and user charge, enhancing financial sustainability and water security of urban local bodies, recycle/ reuse of 20 per cent treated used water, double entry accounting system and efficient town planning etc. To encourage PPPs, projects worth 10 per cent of allocation in million plus cities are mandated to be implemented in PPP mode.

12.47. At present, 945 km of metro rail or regional rapid transit system (RRTS) lines are operational, and 939 km are under construction in a total of 27 cities. About 86 km of metro rail/RRTS lines have been operationalised in FY24. Daily ridership achieved for the operational metro rail/ RRTS lines was 1.01 crore as of March 2024.

Box XII. 19: Smart Cities Mission (SCM)

- SCM launched in June 2015 to promote cities that provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of 'smart solutions'.
- A total number of 100 cities have been selected for development as smart cities. As on 20 June 2024, 100 SPVs have undertaken 8,011 multi-sectoral projects worth around ₹1.64 lakh crore; of which 7,153 projects (89 per cent) worth ₹1.43 lakh crore (87 per cent) have been completed.

Chart XII.27: Value of projects completed under smart city mission (FY23 & FY24)

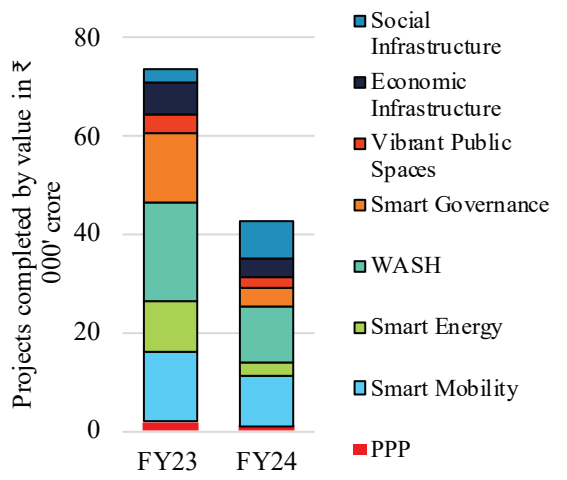
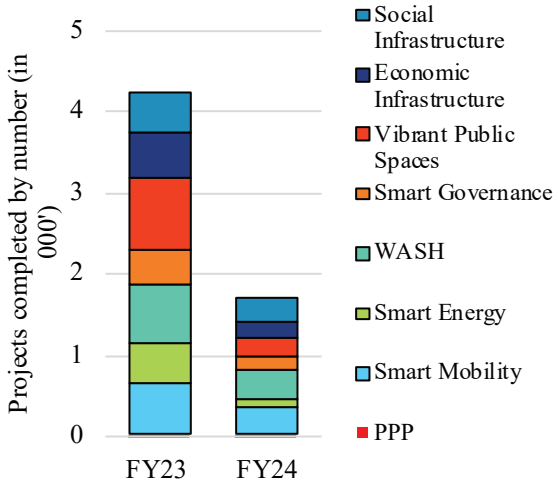


Chart XII.28: Number of projects completed under smart city mission (FY23 & FY24)



Source: Ministry of Housing and Urban Affairs

12.48. **Swatch Bharat Mission Urban (SBM-U):** Focuses on ensuring every citizen including poor household of urban India has access to sanitation facilities. The objectives of SBM-U are to make the urban areas open defecation free (ODF) and achieving garbage free status for all cities through 100 per cent source segregation, door to door collection and scientific management of all fractions of waste[24]. SBM-U achievement includes the construction of 63.07 lakh individual household latrine (IHHL) units surpassing the target by reaching 113.75 per cent and 6.37 lakh community and public toilets, exceeding the target by nearly 128 per cent.

24 MoHUA PIB dated 21 Dec 2023 - https://tinyurl.com/yxzxeufu

Box XII. 20: Case Studies on Swatch Bharat Mission Urban (SBM-U)

Organic waste management

- Indore's 500 tonnes per day (TPD) Bio-methanation Plant Set up in PPP Model: In November 2021, Indore Municipal Corporation (IMC), established 500 TPD Bio-methanation plant. The plant operates on DBFOT Model which is Design-Build-Finance-Operate-Transfer as a Public-Private Partnership (PPP). The plant generates around 44,000 - 45,000 m3 of raw biogas daily from which around 17,000 kg of bio-CNG is produced every day. The CBG plant has contributed to reducing 1,30,000 CO_2 emissions annually.
- Black Soldier Flies (BSF) being used in Mangalore for treatment of wet waste: A facility has been set up in Mangalore as part of a public-private partnership for treating around 10,000 tonnes of wet waste annually. Innovative technology in BSFs breeding provides an advantage of large-scale deployment at rapid speed to consume all the wet waste quantity of a city and thereby solve the problem of wet waste management. It takes 12-14 days for the wet waste to be converted into compost through BSFs compared to 45-60 days in the case of aerobic composting.
- Indore Bio CNG: The plant boasts a processing capacity of 400 metric tons per day, operating under a Public Private Partnership. The plant processes organic waste, yielding 14.8 metric tons of Bio-CNG for use as transportation fuel and 80 metric tons of Fermented Organic Manure daily.

Waste to Electricity

- Waste to Electricity plant in Pimpri-Chinchwad municipal corporation: The biodegradable waste is converted into Compost and sold to nearby farmers. The project includes a material recovery facility with a capacity of 1000 TPD, which features mechanised windrow composting of 500 TPD. The energy generated from the waste to energy plant is captive use for municipal purposes and any other use with the corporation's consent. The project is being operated on a PPP Model on a DBFOT basis (Design, Build, Finance, Operate, and Transfer).

12.49. ***Outlook:*** It is expected that by 2030, more than 40 per cent[25] of India's population will live in urban areas, cities need to be transformed into economic centres of growth by building future-ready urban infrastructure with combined efforts of central, state, and urban local bodies. This can be achieved by efficiently planning urban areas, developing robust project frameworks, and strengthening urban local bodies (ULBs). Project-based funding models with clearly ring-fenced revenue streams can effectively tap not only viability gap-based funding but also market borrowings and credit enhancement structures. ULBs and project-implementing agencies need to undertake value-for-money analysis and apply the waterfall mechanism to derive the optimum mode for implementing the projects.

25 Inputs provided by Niti Aayog

Tourism Sector

12.50. Under the PRASHAD scheme which caters to the augmentation of tourism infrastructure at pilgrimage and heritage sites, 29 new sites have been identified for development. Out of the total sanctioned amount of ₹1,621.14 crore for the projects under the scheme, 62.7 per cent has been disbursed. The Government has also revamped its Swadesh Darshan scheme in the form of Swadesh Darshan 2.0 with an outlay of ₹3,800 crore. The mission aims to create a robust framework for the integrated development of tourism destinations. Under the scheme, 57 destinations across 32 State Government and Union Territory administrations have been identified to date. Twenty nine projects have been sanctioned at a total cost of ₹644 crore.

Strategic Infrastructure

Space Sector

12.51. Over the last few years, the space sector has seen remarkable progress in the build-up of rockets, satellites and spacecraft used for space exploration, and ground infrastructure. Presently, India has 55 active space assets which include 18 communication satellites, nine navigation satellites, five scientific satellites, three Meteorological Satellites, and 20 Earth Observation satellites. In addition to existing Launch Vehicles with ISRO viz. Polar Satellite Launch Vehicle (PSLV) and Geosynchronous Satellite Launch Vehicle (GSLV), the organisation has added two more to its fleet i.e., Launch Vehicle Mark-3 (LVM3) and the Small Satellite Launch Vehicle (SSLV).

12.52. A string of Space exploration missions has been conducted viz. Mars Orbiter Mission (2014), ASTROSAT (2015), Chandrayan-2 Orbiter (2019) and subsequently, Chandrayaan-3 landing on the Moon (2023) & Aditya – L1 mission (2023). Further, the indigenous satellite navigation constellation i.e., NavIC series was completed and operationalised in 2016. New Space India Limited [NSIL] has successfully executed its contract to launch 72 satellites of OneWeb to Low Earth Orbit through LVM3, M2 and M3 missions, establishing LVM3 as a reliable Launch Vehicle in the global commercial launch services market.

Box XII.21: Private participation in the Space sector

Space sector reforms announced in 2020 have been transformative in enhancing the participation of private players in the Indian space programme. Some key initiatives to promote private participation and boost India's market share in the global space economy are below:

- Indian National Space Promotion and Authorisation Centre (IN-SPACe) – a single window agency to promote and authorise space activities was inaugurated in June 2022 at Ahmedabad. IN-SPACe has received 440 applications as on 1st January 2024 from more than 300 Indian entities pertaining to authorisation, handholding, facility support and consultancy, technology transfer, and facility usage.
- 51 MoUs and 34 joint project implementation plans have been signed with various non-governmental entities as of 1st January 2024, to extend the necessary support for carrying out the space activities.

- Several entities in the private sector have developed satellites and functional payloads for operations in outer space viz., PixxelSpace, Digantara, Dhruva Space, Azista BST Aerospace, Tata Advanced Systems Limited, etc.
- Launch of Vikram-S (Prarambh mission), a suborbital launch vehicle from M/s Skyroot Aerospace Pvt. Ltd., Hyderabad, was accomplished on 18th November 2022.
- The first private launchpad and mission control centre was established by M/s Agnikul Cosmos Pvt. Ltd., Chennai in ISRO campus at SDSC, SHAR on 25th November 2022.
- HAL and L&T consortia has been selected as the Indian industry partner for the end-to-end production of five PSLVs.
- The process for transfer of small satellite launch vehicle technology has been initiated.

12.53. Adoption of space-based technology and services are often related to their adequate integration into the societal applications, towards meeting the requirements of end users. Major technological areas wherein a developmental gap exists include the development of indigenous capability for the realisation of carbon fibres, dedicated captive semiconductor fab for space applications, availability of major alloying elements, etc. Challenges related to the commercialisation of technologies include the presence of a very niche and/or competitive marketplace, pricing constraints, typically limited demand that inhibits large-scale commercialisation, lack of visibility of long-term demand, etc.

Digital Infrastructure

12.54. The construction sector accounted for around 9 per cent of India's annual GVA (2023-24), however, it is amongst the least digitalised sectors. In recent years, various aspects of infrastructure development have been integrated with technology to improve the efficiency of infrastructure plans, designs, and assets. Some of the most significant uses of technology have been through PM GatiShakti, Bhuvan, BharatMaps, Single Window Systems, PARIVESH portal, National Data Analytics Platform, Unified Logistics Interface Platform, Pro-Active Governance and Timely Implementation (PRAGATI), India Investment Grid (IIG) and many similar dashboards and data stacks for almost all ministries.

Box XII.22: Building Information Modelling (BIM)

- According to the OCMS[26], about 27% of projects witness cost overruns, whereas 45% witness time overruns. One of the least digitalised sectors, it is estimated that 20% of time is lost in searching relevant information in infrastructure and construction sector.

26 Online Computerised Monitoring System (OCMS) for Projects and Infrastructure Monitoring – initiative of The Project Monitoring Division and Programme Implementation Wing in the Ministry of Statistics and Programme Implementation (MOS&PI) that provides management services by providing latest information on implementation of projects costing Rs 150 crores and above and performance of infrastructure sectors.

- It is estimated that for complex infrastructure projects in India, adopting BIM can reduce the average project delays of 39 months, reduce infrastructure construction costs up to 30 per cent, maintenance costs up to 20 per cent, information and systemic inefficiencies up to 20 per cent, construction sector related carbon emission up to 38 per cent, water consumption up to 10 per cent and improve investments in construction R&D by one per cent, and result in over four million skilled professional employment and about 2.5 million additional construction sector jobs by reinvesting savings in additional infrastructure.
- The motto of BIM is to construct digitally before constructing physically. Niti Aayog has identified the challenges, solutions and enablers related to BIM implementation. Relevant public/ private and academic stakeholders have been identified and are being engaged. Based on a roadmap for creating an ecosystem towards faster adoption of BIM in India, guidance, and strategies are being provided to infrastructure projects, including Central Vista, New Parliament, and Central Secretariat.
- BIM is now being extensively utilised and leveraged by some ministries and departments like the National Capital Region Transport Corporation, all metro rails, select complex industrial and tourism projects, various airports, along with organisation-wise acceptance at Central Public Works Department and extensive digitalisation in the form of Data Lake across NHAI that is now being extended to entire Ministry of Road Transport & Highways.

Telecommunication Sector

12.55. The usage and underlying technologies of telecommunications have undergone massive changes, especially in the past decade. The Telecommunications Act 2023 was enacted to amend and consolidate the laws on telecommunication services and networks, assignment of spectrum and related matters.

12.56. The total number of mobile towers in the country is 8.02 lakh as of June 2024 while number of Base Transceiver Stations (BTSs) stood at 29.37 lakh and 5G BTSs were 4.5 lakh. The Government has also initiated the project for saturation of 4G mobile services with a total cost of ₹26,316 crore in 24,680 uncovered villages in remote and difficult areas. 6,279 villages having only 2G/3G connectivity shall be upgraded to 4G.

Box XII.23: BharatNet Project

- The BharatNet project is being implemented in a phased manner to provide broadband connectivity to all (2,50,000) the Gram Panchayats (GPs) in the country. The project has been amended to expand the scope with a focus on utilisation of services, using professional agencies for construction, upgradation and maintaining the network.
- 6,85,501 km of optical fibre cable has been laid, 2,11,021 GPs have been connected by Optical Fiber Cable (OFC) and a total 2,12,229 GPs are service-ready (OFC+ Satellite), as of 30th April 2024. Fibre to home (FTTH) connections and pilot projects to enhance data usage are also planned across rural areas.

12.57. Test labs for telecom equipment are important for ensuring the functionality, reliability, and interoperability of telecommunications devices. These specialised facilities are equipped with advanced testing infrastructure to evaluate the performance of various telecommunications equipment such as routers, switches, base stations, and communication protocols. More than 69 labs have been designated as conformity assessment bodies for EMI/EMC, safety evaluations, technical requirements and RF testing of telecom products.

12.58. The Government has introduced guidelines for the Spectrum Regulatory Sandbox (SRS), or Wireless Test Zones (WiTe Zones), as part of the Millennium SRS initiative to foster innovation, enhance ease of doing business, promote "Make in India" in the telecommunications sector. This initiative provides a simplified regulatory framework to facilitate Research and Development (R&D) activities, promote exploration of spectrum bands and drive technological advancements. WiTe Zones have been categorised into urban or remote areas for experimentation across various frequency bands, with eligibility extending to academia, R&D labs, telecom providers and others.

Electronics & Information Technology Sector

12.59. The Government has envisioned the India AI programme as a mission-centric approach for leveraging transformative technologies to boost inclusion, innovation, and adoption for social impact. Pillars of India AI include AI in Governance, AI IP & Innovation, AI Compute & Systems, Data for AI, Skilling in AI, and AI Ethics & Governance. As part of building 'AI in India and AI for India', the first edition of the IndiaAI was released in October 2023.

12.60. India is the founding member of the Global Partnership on Artificial Intelligence (GPAI), having joined the multi-stakeholder initiative in June 2020. Since then, India has contributed to the GPAI goals and objectives and is working on various domestic initiatives for the responsible development, deployment, and adoption of AI. India served as an Incoming Council Chair of GPAI in 2023, then subsequently Lead Chair in 2024, and Outgoing Chair in 2025. The Union Cabinet has approved an allocation of over ₹10,300 crore towards the comprehensive IndiaAl Mission to democratise access to Al innovation pillars and ensure global competitiveness of India's Al ecosystem.

12.61. AI Research Analytics and Knowledge Dissemination Platform (AIRAWAT) which is an AI Supercomputer, installed at C-DAC, Pune has secured 75th position in the top 500 global supercomputing list declared at the International Supercomputing Conference 2023 in Germany.

12.62. Under the Digital India programme, initiated in July 2015 to transform India into a digitally empowered society and knowledge economy, various digital initiatives have been undertaken for the delivery of citizen-centric services. MeriPehchaan[27], a National Single Sign-On (NSSO) is a user authentication service wherein a single set of credentials can provide access to multiple online applications or services. Currently, more than 9,600 services of various Ministries/States are integrated with NSSO. The DigiLocker[28] platform that provides citizens with ease of digital storage, issuance and verification of documents and certificates has now

27 https://meripehchaan.gov.in/
28 https://www.digilocker.gov.in/

reached over 26.28 crore users registered and over 674 crore documents. The unified mobile application for new-age governance (UMANG) platform that been developed to deliver major government services through a single Mobile app, now has 2,019 services of 207 Central and State Government departments.

Box XII.24: GI Cloud - 'MeghRaj'

- To harness the benefits of Cloud Computing, the Government has embarked upon an ambitious initiative – 'GI Cloud'.
- The objective of the initiative is to deliver information and communications technology (ICT) services over the Cloud to all the Departments/Ministries at the Centre and States/UTs to ensure the proliferation of Cloud ecosystem in the country.
- Presently, 25,806 virtual machines are running on GI Cloud and it is being used by more than 1,767 applications of the Government departments.
- To proliferate the MeghRaj ecosystem, the Government has also empanelled cloud service offerings of domestic and international cloud service providers (CSPs). Until date, 22 CSPs are empanelled and so far, more than 250 central and state departments are using the cloud services of empanelled CSPs.

CHALLENGES AND OPPORTUNITIES

12.63. As the different sections in this Chapter show, there has been a quantum jump in infrastructure build-up in the last five years. However, there are some areas for corrective and collective actions, as presented in this section.

12.64. **Land Related:** Despite the large build-up of connectivity infrastructure and energy-related assets, both the sectors reported the need for corrections in the delay in land acquisition, and land-related clearances. Issues are also raised about slow on-boarding of digital land records. In the case of airport development, greenfield airport projects are time-intensive due to the need for appropriate site selection, land acquisition and necessary approvals. Addressing challenges related to land in physical infrastructure requires coordinated action at different tiers of the Government.

12.65. **Skill Demands:** The aviation sector highlighted that technical knowledge for the development of segments such as maintenance, repair and overhaul (MRO) operations and manufacturing are concentrated with a limited number of original equipment manufacturers. The airline industry is a highly competitive segment, susceptible to external shocks such as oil prices, exchange rates, epidemics, wars, and equipment issues. These shocks can affect the operations of an airline and impact its viability, hence the development of capabilities in segments such as MRO, leasing and skilling are needed to further support the airlines. Many aspects related to project development, feasibility assessment, financial return analysis and different stages of project management, in the case of infrastructure projects, involve specialised technical skills that need to be nurtured based on systematic need assessment. Effective public-private participation is essential for this.

12.66. **Need to improve private participation:** The addition to the stock of infrastructure in the last five years owed predominantly to public sector financing. Private sector participation is not forthcoming to the extent desired. Literature suggests that many factors are impeding private participation in infrastructure building. Some of the important ones are the following:

a. Lumpy capital investment and long payback period and difficulty in mobilising large equity and debt at affordable cost. Many novel PPP financing models like hybrid annuity model, have been introduced to mitigate this constraint. But private sector participation through these modes has so far been limited to only certain sectors like roads and water.

b. Project structuring issues related to risk estimation, allocation and mitigation

c. Delays in getting clearances and land acquisition

d. Lack of an independent regulator for infrastructural sectors, etc.

e. Contractual issues and inadequate arrangements for dispute resolution and arbitration, leading to prolonged litigation.

12.67. The question of **climate and environmental sustainability** is increasingly becoming important in infrastructure building as discussed in the sections on physical connectivity and energy infrastructure. An emerging challenge for the aviation sector would be compliance with mandatory phase of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) from 2027. Since India is a Member State of ICAO, obligated to comply with offsetting requirements i.e., either use sustainable aviation fuel (SAF) or offset their emissions by purchasing carbon credits from ICAO approved emissions unit programmes. However, there are no ICAO-approved emissions unit programmes in India to supply CORSIA-eligible emissions units, to meet the offsetting requirements of airline operators. The cost of SAF is almost 3 to 5 times the cost of fossil ATF depending on the feedstock and pathway used for the production of SAF[29].

12.68. **Lack of aggregation of financial flows into infrastructure:** Infrastructure financing structure is complex with the involvement of multiple stakeholders, including all tiers of the Government, public sector enterprises, commercial banks and non-banking financial companies, special purpose vehicles, capital market players, development financial institutions and foreign investors. The instruments of resource mobilisation are many, i.e., credit, bonds, equities, hybrid instruments like mutual funds, foreign capital inflows and instruments like InvITs and REITS. The following are some issues that merit attention:

a. A common issue is about different reporting formats and sectoral splits followed in different sources of financing. The detailed information required for the Central and State Governments can be obtained from the object heads of expenditure maintained by the CGA and C&AG. However, such detailed information on sectoral financial flows is hard to come by for almost all other sources. Besides, the information of bank credit is reported in a different format than the capital market flows, external commercial borrowings and FDI data. The periodicity of reporting, and even the definition of the term 'infrastructure'

29 Working Paper on Views on Global Framework on SAF, LCAF and other Aviation Cleaner Energies, Related Assistance and Finance, International Civil Aviation Organization, 2023 - https://tinyurl.com/yck3bwbs

employed are also different. Some data, like the data on bank credit, are available only as an outstanding figure on a particular date.

b. Among the Government sources, the available information on the capital expenditure by the local self-governments is inadequate. The city finance portal of MoHUA is an important source of information on the finances of urban self-governments. Likewise, the eGramSwaraj portal, maintained by the Ministry of Panchayati Raj, is an emerging source on the finances of rural self-governments. However, the information on capital expenditure, with sectoral split, is not available in good shape from these portals.

c. The information on budgetary support by State Governments to State public sector enterprises (SPSEs) is available in the C&AG reports. However, there is no ready source of information on the fund flow from SPSEs to infrastructure sectors.

d. One exhaustive source of information on the capital expenditure by the private corporations (and public sector enterprises) is the MCA database. However, expansive data filings by companies become available only with a lag, which also require rigorous consistency checks before attempting any aggregation.

e. There are several forms of flow of funds between different infrastructure financing sources, which makes a simple aggregation of all sources largely meaningless. Such financial flows occur between different tiers of the Government, between Governments and their public enterprises, between banks and NBFCs, etc. Hence, avoiding double counting of financial flows requires careful scrutiny of different datasets.

12.69. **Lack of total picture of physical progress in infrastructure projects:** The last decade witnessed earnest efforts on the part of the Government to build institutions and structures that monitor progress in infrastructure and disentangle bottlenecks. A discussion on these measures follows this section. However, there is no single source that gives an inventory of infrastructure projects in the country, undertaken at different levels so as to evaluate progress sectorally and sub-sectorally vis-à-vis corresponding targets. Overcoming this limitation involves coordination of central, state and the third tiers of the Government working with project authorities, including public sector enterprises and private partners.

FACILITATION AND ADDRESSING THE BOTTLENECKS

National Infrastructure Pipeline (NIP)

12.70. The portal provides opportunities for Ministries and States/UTs to collate all major infrastructure projects at a single location, thus acting as a centralised portal to track and review project progress across all economic and social infrastructure sub-sectors. The portal also enables project-sponsoring authorities to showcase investment opportunities to national and international investors.

12.71. The Government launched the NIP with a forward-looking approach and with a projected infrastructure investment of around ₹111 lakh crore during FY20-25 to provide high-quality infrastructure across the country[30]. NIP includes infrastructure projects of more than ₹100 crore each covering greenfield and brownfield investments. As of 12 April 2024, out of

30 Report of the Task Force National Infrastructure Pipeline (NIP), 2020 - https://tinyurl.com/3j48tuhj

the total capital outlay under NIP, the transportation sector dominates with a contribution of 58 per cent, followed by the energy sector at 24 per cent, and the water and sanitation sector at 12 per cent, and balance five per cent by other sectors such as social infrastructure, communication, etc.

12.72. NIP currently has over 9,666 projects and schemes covering 37 sub-sectors (as on 12th April 2024) that are hosted and monitored through the India Investment Grid (NIP-PMG) integrated portal. Out of these projects, 4,413 projects (46 per cent) are under implementation while 2,062 projects (21 per cent) have been completed.

Project Monitoring Group (PMG)

12.73. PMG is an institutional mechanism for expeditious resolution of issues and regulatory bottlenecks in projects with an investment of ₹500 crores and above. The PMG mechanism allows project proponents to raise issues with concerned the Government agencies that are causing hindrances in the implementation of projects.

12.74. PMG has facilitated resolution of 6,867 issues in 1,443 projects worth ₹46.1 lakh crore. The PMG portal has on-boarded 2,457 projects worth ₹62.5 lakh crore until March 2024 which consist of all important mega infrastructure projects including high-impact PM GatiShakti projects and critical infrastructure gap projects.

PM GatiShakti National Master Plan (PMGS-NMP)

12.75. PMGS-NMP is a whole-of-government approach adopted to facilitate integrated planning of multimodal infrastructure through collaboration among the Ministries concerned. PMGS-NMP has been adopted at the State and Centre level to assess last-mile connectivity gaps and ensure seamless movement of people and goods. This is a transformative approach for planning multimodal infrastructure connectivity to economic nodes, thereby bringing logistics efficiency.

12.76. As on March 2024, 43 Ministries have been onboarded on PMGS-NMP portal. 1,530 data layers (642 Ministry data layers & 888 State data layers) of Ministries and States have been uploaded on the PMGS-NMP portal. 16 Ministries have a dedicated PMGS cell which has streamlined project planning. 22 social sector Ministries onboarded with over 200 data layers mapped on portal. All 36 States and Union Territories have formed State-level institutional mechanism and State Master Plan portals and 533 projects have been planned on NMP. Network Planning Group, a central-level institutional mechanism of the PMGS-NMP has evaluated 149 project proposals with total estimated project cost of ₹13.3 lakh crore.

Box XII.25: Implementation of NLP gains steam

lndia's focus on improving logistics infrastructure has led to an improvement of six places from 44 in 2018 to 38 in 2023 out of 139 countries in the Logistics Performance lndex of the World Bank.

National Logistics Policy (NLP) was launched in September 2022 to complement PMGS-NMP i.e., to drive business competitiveness through an integrated, efficient, sustainable, and cost-effective logistics network by leveraging best-in-class technology, and processes. The aim is to reduce the cost of logistics, improve the Logistics Performance Index ranking, and create a data-driven decision support mechanism for an efficient logistics ecosystem. NLP is being implemented through a comprehensive logistics action plan. The progress under each of these action areas is below:

i. **Integrated Digital Logistics Systems:**
   - Unified Logistics Integrated Platform, a single window platform, integrating 36 logistics-related digital systems/portals across eight Ministries and providing real-time information on 1,800 data fields has been developed.
   - For tracking 100 per cent of India's containerised EXIM cargo, a Logistics Data Bank has been developed which uses Radio Frequency Identification (RFID), IoT, and Big data analytics and is integrated with 28 port terminals of India, over 95 toll plazas, 407 container freight station/inland container depot and empty yards, 56 SEZs, three integrated check posts.

ii. **Service Quality Standards:** An e-book has been developed on warehousing standards delineating existing standards issued by the Bureau of Indian Standards and Warehouse Development and Regulatory Authority.

iii. **Capacity Building:** Training courses on logistics and PMGS-NMP are being integrated with central and state training institutes.

iv. **State engagement:** States are developing State Logistics Plans aligned with NLP to give policy focus at the State level. 26 States have notified their State Logistics policies. An annual "Logistics Ease Across Different States (LEADS)" survey is also deployed in all State and Union Territories.

v. **EXIM Logistics:** To streamline EXIM logistics, infrastructure gaps are addressed through action plans developed by the National Committee on Trade Facilitation (NCTF). NCTF Working Groups formulated a National Trade Facilitation Action Plan 2020-23. The action plan for 2024-26 is being developed.

vi. **Services Improvement Framework:** The Service Improvement Group has been established with the involvement of over 30 business associations. Critical issues are raised by associations on the E-LoGS platform.

vii. **Sectoral Plans for Efficient Logistics:** This aims to address the needs and challenges in the logistics sector, particularly of bulk and breakbulk cargo. Coal Logistics Plan and Policy was launched in February 2024. Comprehensive Port Connectivity Plan was prepared in 2022 that identified 107 port projects to strengthen connectivity between ports, railways, roadways, and inland waterways.

viii. **Facilitation of Development of Logistics Park:** Guidelines for Multi-Modal Logistics Park are being reviewed.

CONCLUSIONS AND OUTLOOK

12.77. Transformative changes have dawned upon the infrastructure landscape of India in the last decade in terms of facilitative institutional architecture and the quality and stock of infrastructure assets. The consistent focus on road, rail and air connectivity, sanitation and digital infrastructure have brought in a considerable growth in assets in these sectors.

12.78. However, infrastructure-creation efforts in India are predominantly public sector-led. As per the Infrastructure Monitor 2023 published by Global Infrastructure Hub and the World Bank, India's investment in infrastructure was largely funded by the public sector – which includes the Government agencies and state-owned entities and banks[31]. Between fiscal year 2019 and 2023, the Central and State Governments contributed to 49 per cent and 29 per cent of the total investments, respectively, while the private sector contributed 22 per cent[32].

12.79. For India to continue down the path of building quality infrastructure, a higher level of private sector financing and resource mobilisation from new sources will be crucial. Facilitating this would not only require policy and institutional support from the Central Government, but State and Local Governments would have to play an equally important role. International experience shows us how initiatives at the sub-national level can facilitate resource mobilisation for infrastructure development. Examples include pooled financing mechanisms for municipal projects[33], specialised municipal intermediaries[34], asset recycling programs[35], tax increment financing[36] and land sales and development rights[37] among other innovative approaches. Each of the measures witnessed broad-based implementation, succeeding in mobilising finances for critical infrastructure projects.

12.80. As mentioned above, there is a need to improve data capture and reporting mechanisms for investments in infrastructure across instruments and sectors as well its composition across different projects on a granular level. The Rangarajan Commission Report on Infrastructure Statistics (2001) had underscored the importance of collecting and maintaining a reliable statistical database for the infrastructure sector. Major strides have been made since then to collect data on policy direction, institutional strength, project performance and monitoring. However, data gaps persist in some key areas.

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31 Infrastructure Monitor 2023: Global trends in private investment in infrastructure, Global Infrastructure Hub

32 CRISIL Infrastructure Yearbook 2023

33 Municipal Pooled Financing of Infrastructure in the United States: Experience and Lessons, the World Bank Group, June 2017. A municipal bond bank allows smaller municipalities to collectively access the financial markets, thus lowering cost of funds borrowed.

34 Innovative Approaches to Municipal Infrastructure Financing, Commonwealth Library (based on the Vietnam experience). Local Development Investment Funds are operational and legal vehicles for provincial governments to mobilize funds and enter into contracts with the private-sector.

35 Robust sector-specific pipelines enable effective asset-recycling program, Global Infrastructure Hub, November 2015 (based on the Australian experience). This mechanism allows the State Government to sell public assets to the private sector and utilise the proceeds for new infrastructure development.

36 Report on the use of Tax Increment Financing, Prepared for Governor's Office of Planning and Research, State of California, December 2020. This is a subsidy given for redevelopment, infrastructure, and other community-improvement projects.

37 Developing the Business and Financial District in Marina Bay, Lee Kuan Yew School of Public Policy at the National University of Singapore, 2016 (based on Singapore experience). The local government sold parcels of land and granted development rights to private participants for residential, commercial and mixed-use development.

a. Existing databases fall short on assessing the demand for infrastructure and tracking the utilisation of facilities built in the sub-sectors. Demand aggregation can provide an insight into the appetite for infrastructure projects based on sub-sectors and regions, while the construction of an index that tracks the utilisation rates would shed light on sub-sectors where there is either an oversupply or shortfall of required infrastructure facilities. Addressing these two gaps can provide additional diagnostic measures for enabling policymakers and other stakeholders to optimally allocate scarce resources.

b. Currently, statistics on the infrastructure sector can be derived from several available databases such as the National Infrastructure Pipeline, the PPP India Portal, heads of budget accounts and reports of the respective infrastructure focused ministries, fund flows of Central and State Public Sector Enterprises and financial flows to the infrastructure sector from Non-Governmental institutions such as Banks, NBFCs and the Capital Markets. These databases are useful to assess infrastructure statistics at the project level and to track financial flows at the sectoral level. However, when attempting to assess infrastructure spending and development across time based on the Harmonized List (HML) classifications for a macro-level overview, these databases fall short due to the lack of consistency in the frequency of data collection, lack of uniformity in the methodology followed and cross fund flows between institutions which can lead to double counting. This also makes comparing data from different sources difficult. Therefore, going forward, it would be useful if a mechanism is developed for consolidating infrastructure development and financial flow data from various sources, as per the HML classification, under a single access point which is updated at a regular frequency. It would also be of use to policymakers if the consolidated statistics are recorded with the public and private sector bifurcation.

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