# Vision 2025 for the Railways sector

| Current status | Vision 2025 |
|---|---|
| • Low modal share of Indian Railways in freight traffic at 33%[22]<br>• Two DFCs of total length ~3,360 km under implementation<br>• High-speed railway network - NIL<br>• Two stations being developed on PPP basis - Gandhinagar and Habibganj, others under development | • Increased modal share of Indian Railways in freight traffic at > 40%<br>• EDFC and WDFC[23] fully operational with commencement of construction of other planned DFCs such as East-West DFC, North-South DFC, East-Coast DFC and Southern DFC<br>• Mumbai-Ahmedabad HSR to be operational and other identified HSR projects at implementation stage<br>• Higher private participation: 30% of net cargo volumes and 500 passenger trains privatised; 30% of 750 stations privatised; rolling stock from private sector |
| • 46% of the existing railway network has been electrified as of March 31, 2018<br>• High network congestion: 50% of the 227 sections on the high-density routes are operating at a capacity utilisation of above120% | • 100% of the existing railway network electrified<br>• Optimum utilisation of existing rail network – Less train delays, due to doubling/ tripling/ quadrupling of sections on high density corridors – completing multiple tracking works of 14,100 km on high density network and highly utilised network |
| • Limited focus on safety and security aspects<br>• Customer experience needs to be improved given lack of basic amenities and frequent delays<br>• Average accidents per year: ~113 for 2015-17 | • Focus on safer travel: Railway accidents to reduce drastically<br>• Improved customer experience with high-quality amenities with modern stations and high-quality catering<br>• Smart coaches with on-board infotainment, Wi-Fi, CCTV, fire and smoke detection facilities, tea and coffee-vending machines.<br>• Increasing average speed of freight trains to 40 km/hr by 2024 – Due to investment in better wagons, ROB, RUB, flyover/bypasses, track upgrades, upgradation to high-power locomotives |

[22] *Source: Indian Railways Annual Reports and Accounts, Bureau of Transportation & Statistics*
[23] *EDFC – Eastern Dedicated Freight Corridor, WDFC – Western Dedicated Freight Corridor*

## Reform imperatives in railways

Indian Railways faces stiff competition from roads in freight transportation and airlines in passenger transportation. While growth in passenger rail traffic has held steady, airline and road traffic have seen impressive growth in recent years. To remain competitive vis-à-vis other transportation modes and provide optimum service to passengers/freight, there is an urgent need to upgrade and expand the current railway infrastructure. This calls for greater private sector engagement in this sector by creating a conducive policy and regulatory environment.

## Autonomous regulation of tariffs and services

- For enhanced private participation in railways, it is important to shift the regulatory responsibility of tariff fixation, consumer protection. from the government to an independent regulator for railways – probably Rail Development Authority (RDA). However, sectoral regulators are also in place in several countries and therefore, regulatory responsibilities in Railways may also be transferred to an existing transport sector regulator, such as AERA

- The Regulator should provide a level-playing field for private players in the sector by making informed decisions on pricing of services, consumer interests, generating revenue and competition. This will help attract more investments and improve services in railways

**Easing organisational rigidity by introducing structural reforms**

- Having initiated private participation in railway stations and passenger trains, the next step is to corporatise the existing manufacturing and production units. It will bring in greater accountability and faster decision-making. It will also help production units look for state-of-the-art technologies, cut costs and explore overseas markets. Indian Railways should also implement accrual-based corporate accounting in all zones

- To enhance performance and efficiency, the proposal to open up the ownership/operations of locomotives and rolling stock to the private sector under a transparent and fair regulatory mechanism should be expedited

**Augmenting capacity in railways**

Railway infrastructure and technology have suffered owing to insufficient investments. They need to be upgraded. Timely completion of the Dedicated Freight Corridor (DFC) and semi-high speed rail initiatives would be game changers in freight and passenger segments.

- About 65% of routes operate at over 100% capacity utilisation, which has led to reduction in the average speed and service delivery of passenger and freight trains. Over-utilisation of the existing network has also raised concerns on safety. There is also a need for anti-collision technology and advanced signalling systems to improve passenger safety

## Ensure greater private sector participation

Faced with staggering investment requirements for expanding and upgrading India's railway infrastructure, greater private sector involvement is required in areas, such as station redevelopment, passenger movement  Initial steps in this direction have been taken with proposals for some railway stations and passenger routes being submitted for development through PPPs.

- The best practices in PPPs from other sectors, such as highways and airports, need to be followed, including favourable exit and substitution clauses, equitable risk sharing, and well-defined

obligations of the concessioning/contracting authority and concessionaire

- It would be necessary to ascertain the usage cost of track and other related infrastructure provided by the railways. For this, the railways needs to segregate its financial accounts under (a) track and related infrastructure development and maintenance, and (b) fleet management and regular operations. Cost allocation should be worked out in a manner so as not to discriminate against private operators

- Commissioning of DFC is also expected to open up opportunities for the private sector in areas, such as development of private freight terminals, rail-based logistics park and private rail sidings. This can also create a market for private rolling-stock operating companies. Hence, a conducive policy environment should be created to foster private sector participation and monetise the DFC assets once completed

**Focusing on core activities**

Indian Railways should focus on core activities, such as running of passenger and freight trains to efficiently compete with the private sector. It should distance itself from non-remunerative non-core activities, such as running a police force, schools and hospitals. These functions should be outsourced to private entities.

**Addressing challenges pertaining to station redevelopment**

- **Surrounding infrastructure plug-in** – Seamless entry and exit of freight, passengers and vehicles is essential for efficient performance of railway stations. The problem is that the area around a railway station comes under the jurisdiction of state government/urban local body and coordinating between different agencies can be a challenge. Also having a joint venture (JV) with state governments can be a good option

- **Approval glitches** - The system of approvals for real estate projects is a cause for delay. Construction permits that may be procured prior to award by Indian Railway Station Redevelopment Corporation (IRSDC) / Indian Railways in order to enable speedy completion of projects by the private partner

- **Market viability** – A project's financial viability can be adversely affected by delays in monetisation of real estate associated with station redevelopment and can consequently jeopardise finances of the private player involved. In case of tough market conditions, the spiral of delays and cost overruns can have an adverse impact on the project's financial viability. One of the mitigants could be equitable risk sharing between private players and Rail Land Development Authority. This will ensure that the private player has greater confidence in the project

## NIP project summaries and marquee projects

Total capital expenditure of Rs 1,367,563 crore by both Centre and States would be made between FY20 to FY25. About 724 identified projects will be implemented in the period 2020-25. Out of the 724 projects, 697 projects worth Rs 11.97 lakh crore will be implemented through EPC mode, while 27 projects worth Rs 1.61 lakh crore will be implemented through PPP mode. A summary of the projects is highlighted in the table below:

| Category | No. of projects | Capex over FY20–FY25 (Rs crore) |
|---|---|---|
| New lines/gauge conversion | 259 | 440,072 |
| Capacity augmentation | 266 | 247,985 |
| Dedicated Freight Corridor | 7 | 166,171 |
| Rolling stock | 31 | 275,539 |
| High-speed rail | 2 | 110,647 |
| Others | 159 | 118,406 |
| **Total** | **724** | **1,358,820** |

Around 259 projects with ~33% of the estimated capital expenditure are towards constructing new lines are gauge conversion, 266 projects with ~18% of the estimated capital expenditure are in capacity augmentation, 7 projects with ~ 12 % of the estimated capital expenditure are in constructing DFC, 31 projects with ~20% of the estimated capital expenditure are in production of locomotives, rolling stocks, 2 projects with ~8% of the estimated capital expenditure in development of high-speed network, 159 projects with ~ 9% of the estimated capital expenditure are in coach and freight terminals and maintenance sheds.

**Capital expenditure over FY20 to FY25 is shown below:**

| Rs crore | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | Total |
|---|---|---|---|---|---|---|---|
| Centre | 132,463 | 260,811 | 307,466 | 272,024 | 219,747 | 166,309 | **1,358,820** |
| State governments[24] | 924 | 1,655 | 1,334 | 1,808 | 1,462 | 1,560 | **8,743** |
| **Total** | 133,387 | 262,465 | 308,800 | 273,831 | 221,209 | 167,870 | **1,367,563** |

*[24]States/UTs include Uttar Pradesh, Maharashtra, Gujarat, Telangana, Jharkhand, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Karnataka, Haryana, Punjab, Delhi, Kerala, Odisha, Chhattisgarh, West Bengal, Sikkim, Mizoram, Andaman & Nicobar, Chandigarh and Puducherry. For some projects, year-wise phasing has not been provided, so capital outlay for FY20 to FY25 will not add up to total capital outlay.*

# Ports

# Sector Progress, Deficits and Challenges, Vision and Reforms

## Fourth Container Terminal at JNPT


### Project details

- Jawaharlal Nehru Port Trust (JNPT), a major port in India, has successfully completed Phase I of the project titled 'Development of Fourth Container Terminal (FCT) on a Design, Build, Finance, Operate and Transfer (DBFOT) basis' for a concession period of 30 years
- The project is a part of JNPT's initiative on modernisation and capacity addition programme. It was awarded to Bharat Mumbai Container Terminals Pvt. Ltd. (a subsidiary of Port of Singapore Authority) with a revenue share of 35.79% through a concession agreement signed on May 6, 2014
- The development of fourth container terminal at JNPT is a part of the modernisation of ports component of the Sagarmala programme. It is India's largest FDI project in the port sector
- The cost of Phase I of the above project is Rs 4,719 crore and the cost of the Phase II development is Rs 3,196 crore (total Rs 7,915 crore). The project was awarded in May 2014 and its scheduled completion date was December 22, 2017 (Phase I).
- Phase I was completed as per schedule and is in operation since December 22, 2017

### Salient features

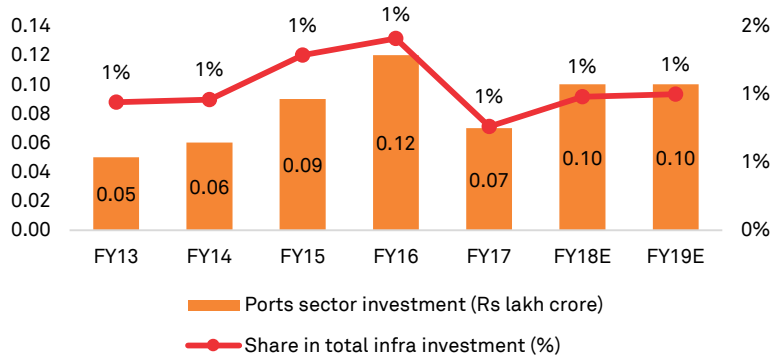
- The implementation of Phase I has enhanced the container handling capacity at JNPT by 2.4 million TEUs
- The storage facility with rail/road connectivity is also developed after reclamation of 90 ha of water area. Under Phase I, the fourth container terminal has augmented its container-handling capacity to provide reefer plugs to 1,630 containers. The facility will be beneficial for the large-scale export of agri-products from Maharashtra
- On completion of Phase-II, the capacity of container handling at JNPT will reach ~10 million TEUs. This will make JNPT, one of the top 20 container handling ports in the world

Most of India's international trade makes its way through ports, making the quality of ports a key factor in enhancing the competitiveness of our merchandise trade. The port sector has seen investments, both from the public and private sector to enhance port capacity, modernise existing ports and boost port connectivity. Even though port efficiency and productivity have improved significantly in the past 4-5 years, there still exists a need to further improve operational efficiency and productivity for cargo handling at Indian ports to bring them at par with well-managed ports globally.

## Historical investments

The port sector is critical to India as ~95% of the trade activity by volume is carried out through the maritime route. Overall, India has 12 major ports and more than 200 minor ports. During 2013 to 2017, the share of the ports sector investment in the overall infrastructure investment was ~ 1%, and clocked a CAGR of ~9%. Investments during the 12th Five-Year Plan have largely focused on capacity addition and modernisation of existing ports, creation of additional berths, mechanisation and development of port connectivity projects (refer Figure 25).

**Figure 25 Ports sector investment (Rs lakh crore) and share in total infrastructure investment (%)**



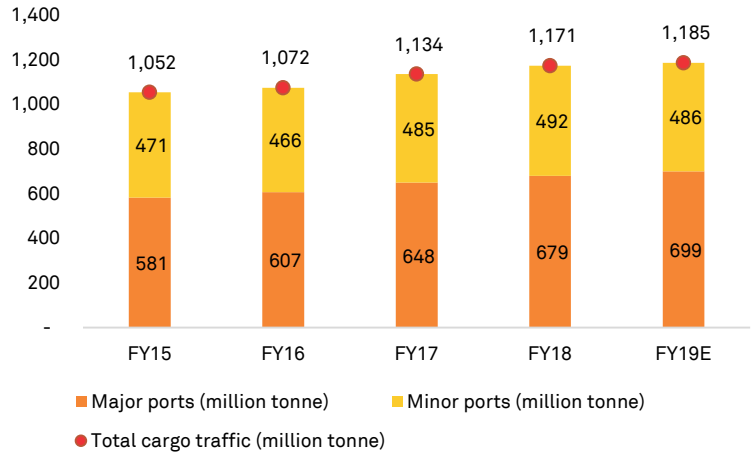

*Source: Appraisal documents for five-year plans, CRIS estimates (Investments mentioned are at Current prices)*

## Port sector trends

### Growth in cargo traffic in ports

Cargo traffic handled by ports increased at a CAGR of ~5% between fiscals 2015 and 2019. During this period, the share of major ports in overall cargo traffic handled remained same at 55%.

**Figure 26 Cargo traffic at ports (mn tonne)**

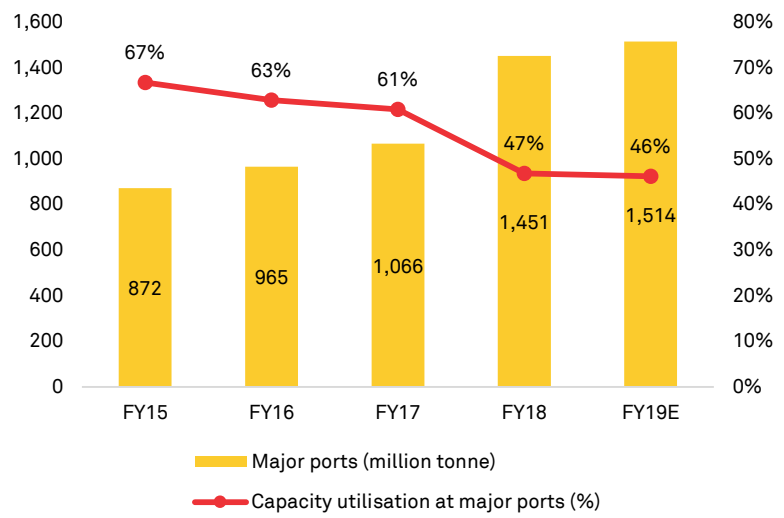



*Source: Ministry of Shipping, India Ports Association*

## Growth in capacity and capacity utilisation for major ports

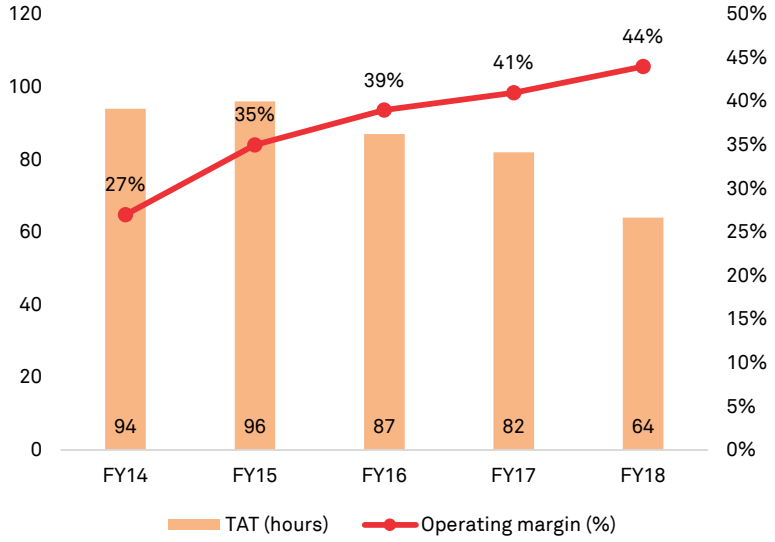
Capacity of major ports increased at a CAGR of ~15%, but utilisation declined, as there was no commensurate increase in cargo traffic.

**Figure 27 Capacity and capacity utilisation of major ports (mn tonne)**




*Source: Ministry of Shipping, India Ports Association*
*Note: optimum usable capacity is 70% for Ports sector*

**Figure 28 TAT (hours) and operating margin (%)**




*Source: Ministry of Shipping, India Ports Association*

## Operating margin and turnaround time (TAT) of ships at major ports

The average turnaround time of ships at major ports has improved from 94 hours in fiscal 2014 to 59 hours in fiscal 2019. Various initiatives have contributed in improving the overall TAT, including improving connectivity of ports, direct port delivery, direct port entry, issuance of e-delivery order and RFID-based gate-automation. These have helped major ports to improve their operating margins over years (refer Figure 28).

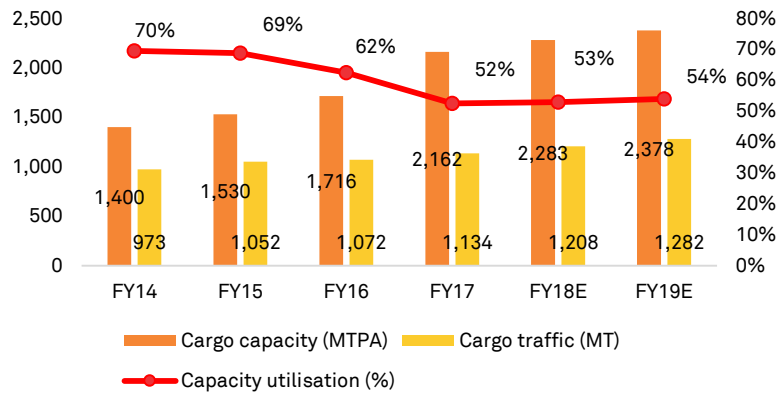
# Ports sector reforms timeline

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|
| | 100% FDI allowed for port development projects under the automatic route | Sagarmala scheme launched to promote port-led development and enhance port infrastructure | Major Port Authorities Bill introduced to allow private players to fix tariffs based on market conditions | | Relaxing of cabotage rules to allow foreign ship operators to transport containers between domestic ports<br>New model concession agreement to make it more investor-friendly<br>Relaxing of cabotage rules to allow foreign ship operators to transport containers between domestic ports | Strategic disinvestment of 100% Government of India shares in Dredging Corporation of India Ltd |
| Total cargo traffic at major ports (in million tonne) | 556 | 581 | 607 | 648 | 679 | 699 |

## Infrastructure deficit at ports

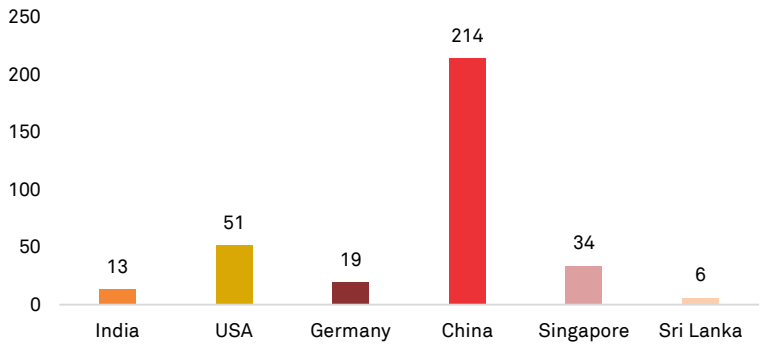
### Subdued capacity utilisation at ports

**Figure 29 Capacity utilisation at Indian ports**




*Note: Major ports capacity re-rated by the ministry based on Berthing Policy as per international norms. Total re-rated capacity during FY17 was 1,359 MTPA.*

**Figure 30 Container port traffic (million TEUs) in 2017**

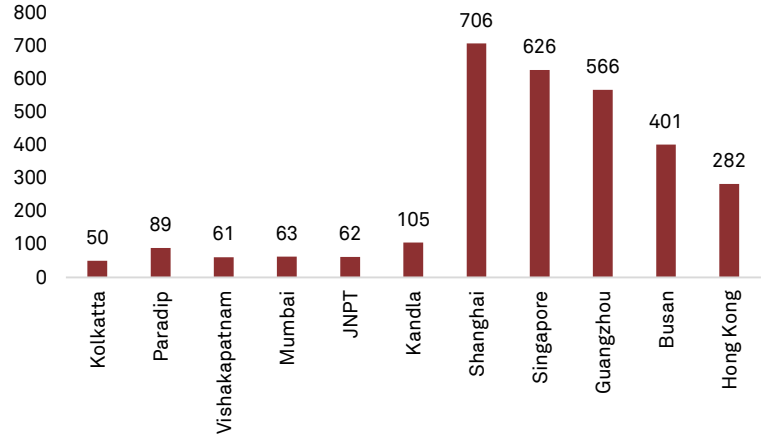



*Source: UNCTAD, World Development Indicators- World Bank*

- In the past five years, India's total port traffic registered a meagre ~5% CAGR, while its port-cargo capacity clocked an 11% CAGR. This has resulted in a significant drop in capacity utilisation in certain ports to below 50%
- The total container throughput is close to 13 million TEUs, but capacity is about 21 million TEUs, resulting in a ~62% capacity utilisation
- The container port traffic considerably lags that of global majors, such as China, Singapore and the US

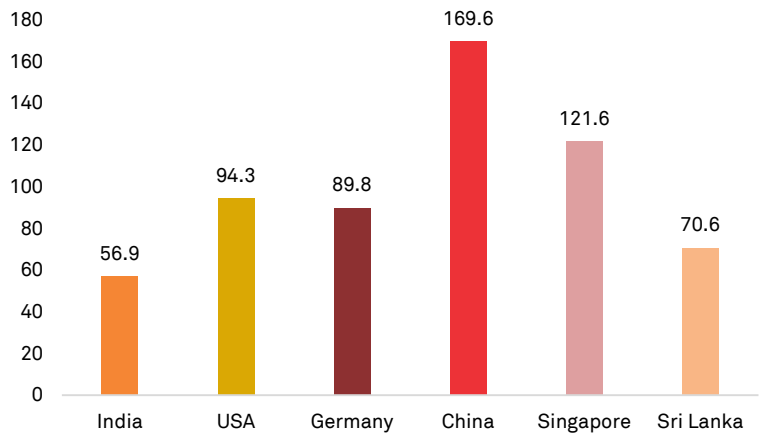
## Cargo throughput at major Indian ports lags a few Asian peers significantly.

**Figure 31 Cargo throughput (million tonne) in 2017**




*Source: UNCTAD Review of Maritime Transport, Indian Ports Association*

**Figure 32 Liner Shipping Connectivity Index for 2018**




*Source: UNCTAD, World Development Indicators- World Bank*

- India also has low Liner Shipping Connectivity Index score. The index captures how well countries are connected to global shipping networks: parameters include number of ships, their container-carrying capacity, maximum vessel size, number of services, and number of companies that deploy container ships in a country's ports

## Challenges in the port sector

### Overcapacity has hurt capacity utilisation

Owing to the challenging global trade scenario, in the past five years, India's total port traffic has increased at a meagre ~5% CAGR. However, India's port-cargo capacity clocked an 11% CAGR. This has resulted in a significant drop in capacity utilisation, from 71% in fiscal 2012 to 54% (major and minor ports) in fiscal 2019. In certain ports, capacity utilisation is below 50%.

### Need for level-playing field between major and minor ports

The Tariff Authority of Major Ports (TAMP) regulatory regime has prevented price parity between major and minor ports, as TAMP regulations are applicable only to the former. Due to this disparity, minor ports enjoy the distinctive advantage of fixing their own tariffs.

### Lack of multimodal connectivity

In terms of hinterland connectivity of ports, the approach has been unimodal. Indian ports need to implement efficient and modern multimodal systems, not just at the policy level but also on the ground. On the rail front, the DFCs need to be commissioned on a timely basis. The railway network also needs to be ramped up considerably. Currently, rake availability is a problem even when connectivity exists. On the road front, the NHAI has given an impetus to port connectivity, but many crucial projects suffer from implementation delays. As for other means of intermodal transport, coastal shipping and inland waterways transport need to be key focus areas as cargo evacuation by water is cheaper and cleaner, reduces cost and port congestion, and brings in efficiency.

# Vision 2025 for the Port Sector

| Current status | Vision 2025 |
|---|---|
| • India has 12 major ports and ~200 minor ports<br>• Overall capacity utilisation of Indian ports ~54% of total capacity of ~2.4 billion tonne[25] | • Under Sagarmala, new major and minor ports will be constructed, along with existing port modernisation and capacity expansion<br>• Overall capacity utilisation of Indian ports to be more than 65% of total capacity |
| • Higher logistics cost, turnaround time and low output per ship berth due to issues in hinterland connectivity and lack of use of advanced technologies<br>• Passenger and freight movement through inland waterways at very nascent stage – reforms, policies and projects under consideration/development | • Improved hinterland connectivity, port modernisation and computerisation to reduce logistics cost, shorten turnaround time, improve output per ship berth<br>• Use of robots for packing, delivering and inspection as well as data analytics to monitor logistics flow to improve operational efficiency and turnaround time<br>• Higher share of inland waterways in both freight and passenger traffic |
| • Maritime trade contributes ~95% of the trade by volume and ~70% by value | • Increased share of ports by volume and by value to the overall trade in India |

[25] *Source: Indian Ports Association*

## Reform imperatives at ports

Just about 72 ports (out of more than 200 ports) account for around 95% of India's foreign trade by volume. However, poor infrastructure and weak connectivity have prevented these ports from realising their full potential. Given this, a revival in the sector's fortunes hinges on supportive reforms and private investment in infrastructure.

## Regulatory reforms are need of the hour

- **Opening up the dredging market –** Efforts should be made so that bigger ships can ply while creating economies of scale and reduction in cost of port handling, including provisions for early environmental clearances to all major ports to create draft range between 15 metres and 20 metres. It is necessary to attract foreign players with superior dredging capabilities and technology. This would go a long way in creating hub ports. A roadmap can be prepared to develop major Indian ports as trans shipment hubs

- **Operationalising the Major Ports Authority Act –** The Major Port Trust Act, 1963, is "an Act to make provision for the constitution of port authorities for certain major ports in India and to vest the administration, control and management of such ports in such authorities and for matters connected therewith". Realising the complexities in the existing Act and the need to develop ports on the landlord model, it is suggested to replace the Act with the Major Port Authority Act (2019), which will be a simplified legislation and would envisage the abolition of TAMP. This Bill needs to be enacted, as it envisages more operational autonomy to major ports. Also, to address the issue of port capacity utilisation at major and minor ports, they may be corporatised for efficient management

- **Industrialise hinterland and enhance last-mile connectivity to ports–** At present, the ministries of shipping, road and railways are individually responsible for their respective sectors. To enhance connectivity and improve the turnaround time, there needs to be a more coordinated approach to handle traffic and evacuation, especially hinterland connectivity. Specific SPVs may be set up by state governments for planned industrial development, establishment of logistics hubs, improvement of connectivity around ports and monetisation of development for re-investment into infrastructure

## Increased investment in modernisation to boost operational efficiency of ports

Indian ports lag international peers on many performance parameters such as container dwell time, throughput handled, and capacity utilisation. Benchmarking Indian ports against Chinese and US counterparts shows that India lags in port infrastructure and turnaround time of vessels. This pushes up the cost of trade, which renders Indian ports less competitive.

- **Smart ports and blockchain logistics -** Investments are needed to enhance port infrastructure in areas, such as modernising equipment to handle large volumes, navigational aids and IT systems and developing blockchain for logistics. This involves several agencies and inter-departmental co-ordinations
  - Creation of smart ports - A smart port is an automated port that uses advanced technologies, such as big data, Internet of Things (IoT), blockchain solutions and other smart-technology based methods to improve performance and economic competitiveness. A smart port is more efficient, effective and secure, making it environmentally sustainable, economically efficient; it also has higher capability to handle port traffic
  - Port digitisation and IT: Various initiatives towards port digitisation have also been undertaken by Indian ports. All major ports are equipped to receive e-delivery orders from incoming ships. Manual forms, Form 13 and Form 11, have been eliminated at JNPT and a software for Web-based e-Form 13 has been developed, wherein

the customs authorisation/endorsement is obtained online, while accepting containers. Direct port delivery and direct port entry haves been facilitated at major ports to reduce the dwell time and cost

- Major ports are in the process of installing large container scanners to obviate the need for manual examination of individual containers. Radio Frequency Identification (RFID) system is implemented at all major ports
- Introduction of IT and automation needs to be fast-tracked at all major ports of India. Real-time decision-making and IT/automation adoption across processes with manual oversight need to be ensured to increase efficiency and reduce dwell time and logistic costs

- Cruise tourism - To promote cruise tourism along the Indian coast, the government has revised standard operating procedures (SOPs), such as e-visa facility at five sea ports (Mumbai, Goa, Mangalore, Cochin and Chennai) and the construction of new cruise terminals at five major ports in the country. Existing major ports such as Kolkata and Mumbai, which have been engulfed by cities, need to be converted into cruise tourism hubs

## Prioritisation of projects under Sagarmala to boost exports

- It is important to speed up the completion of various projects under Sagarmala, especially those aimed at improving port connectivity and establishing new ports

- Setting up of a single-window facility for cargo clearance and putting in place fully mechanised cargo-handling infrastructure is critical to increase the throughput

## Investment opportunities in bunkering

As the current capacity of ports is underutilised, it is imperative to bring in more reforms and greater involvement of private players in bunkering infrastructure. Appropriate bunkering facilities should be provided at internationally competitive prices.

- Emphasis should be on opening a bunkering facility close to a refinery and near a busy port to leverage the trade route to maximise volumes and minimise diversion for ships

- A national standard code of practice for bunkering based on global best practices should be set up to provide a clear and standardised operational framework for private players to operate in this area

## Policy interventions to promote inland waterways

- **Navigable route development –** For greater private sector participation in inland waterways, the government and Inland Waterways Authority of India need to take full responsibility of route navigability and ensuring adequate depth of rivers

- **Enhancing last-mile connectivity –** Inland water transport (IWT) should be integrated with multimodal/intermodal connectivity. This will enable efficient use of inland terminals having proper road and/or rail connectivity for seamless transfer of goods that will provide an efficient logistics supply chain

- **Development of industrial corridors -** There is a need to promote green industrial corridors and logistics hubs alongside waterway terminals and foster waterways that run parallel to transportation corridors and urban centres

- **Promoting passenger transportation –** Ferry services operating on national waterways are mostly unorganised country boats. Both Central and state governments can collaborate to promote river tourism in a big way by investing in passenger terminal development and improving safety of ferries. Private players should be encouraged for developing river tourism

- **Ensuring adequate air clearance –** On many sections of some waterways there are multiple bridges with low vertical clearance, which obstructs the passage of bigger vessels. The Centre can work closely with state governments to ensure sufficient vertical clearance for smooth passage of bigger vessels
- **Shortage of MRO facilities –** There is severe shortage of maintenance, repair and overhaul (MRO) facilities for IWT vessels. This hinders private players from investing in IWT and needs to be addressed

## NIP project summaries and marquee projects

The total estimated capital expenditure by both Centre and State governments in the port sector between FY20 and FY25 is Rs 121,194 crore. For projects executed by the Centre, about 58 identified projects are planned for implementation in the period 2020-25. The capital expenditure for these projects is estimated at Rs 49,950 crore.

Out of the above 58 projects, 47 projects worth Rs 39,949 crore are to be implemented by major port trusts, while 11 projects worth Rs 10,001 crore are to be implemented by Cochin Shipyard Limited, Inland Waterways Authority India and private sector players. A summary of the projects is highlighted in the table below:

| Particulars | No. of projects | Capex over FY20–FY25 (Rs crore) |
|---|---|---|
| Major port trusts - expansion | 47 | 39,949 |
| Inland Waterways Authority of India | 2 | 4,151 |
| Cochin Shipyard Limited, Kochi | 2 | 2,197 |
| Others | 7 | 3,653 |
| **Total** | **58** | **49,950** |

- The projects include construction of a new port at Vadhavan (a proposed new port 140 km north of Mumbai and near Dahanu, Palghar district, Maharashtra), building dry port at Nashik, Wardha and Jalna, enhancing evacuation capacity at major ports through building roads and rail connectivity and mechanisation of berths

**Capital expenditure over FY 20 to FY 25 is shown below:**

| Rs crore | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | Total |
|---|---|---|---|---|---|---|---|
| Centre | 8,724 | 10,793 | 12,442 | 8,123 | 2,935 | 6,933 | **49,950** |
| State governments[26] | 4,633 | 7,311 | 8,207 | 7,740 | 4,789 | 3,069 | **71,244** |
| **Total[27]** | **13,357** | **18,104** | **20,649** | **15,863** | **7,724** | **10,002** | **121,194** |

*[26]States/UTs include Uttar Pradesh, Maharashtra, Gujarat, Telangana, Jharkhand, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Karnataka, Haryana, Punjab, Delhi, Kerala, Odisha, Chhattisgarh, West Bengal, Sikkim, Mizoram, Andaman & Nicobar, Chandigarh and Puducherry. For some projects, year wise phasing has not been provided, so capital outlay for FY20 to FY25 may not add up to total capital outlay.*
*[27]Includes projects where yearly phasing has not been provided.*

## Marquee project

### Vadhavan Port

- Vadhavan Port will be developed by JNPT at an estimated cost of Rs 51,140 crore, out of which Rs 16,140 crore would be incurred by JNPT and Rs 35,000 crore will be invested through the PPP mode. The construction is expected to commence from June 2020 and the project would be completed by December 2025
- The project is designed to ease growing pressure on JNPT, India's busiest container handler, which is operating at its full capacity and has had to deal with major delays, mainly due to landside infrastructure bottlenecks. The port has potential to attract large ocean carriers, given the deep water depth at the site and the close proximity to major industrial locations in the western region

# Airports

# Sector Progress, Deficits and Challenges, Vision and Reforms

## Indira Gandhi International Airport, Delhi


### Project details

- In January 2006, following an International competitive bidding process, the concession to operate, manage and develop the Indira Gandhi International (IGI) Airport was awarded to the Delhi International Airport Limited (DIAL) consortium. The bid parameter was a revenue share of 45.99% of annual gross revenue, payable to the AAI for the entire concession period of 30 years
- The winning consortium was a joint venture of GMR (54%), Airports Authority of India (AAI) (26%) and Fraport AG Frankfurt Airport Services Worldwide (10%) and Malaysia Airports Holding Berhad (MAHB) (10%). In 2015, MAHB exited from the consortium by selling its entire stake to GMR thereby increasing its share to 64%
- Delhi airport completed its first phase of modernisation, i.e., construction of Terminal 3 by 2010 at a cost of about Rs 12,700 crore. The first phase of the airport design was capable of handling 60 million passengers per annum

### Salient features

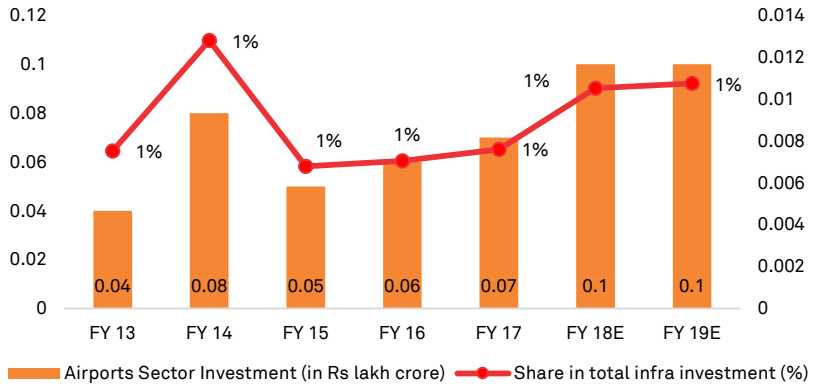
- Indira Gandhi International Airport, Delhi is the busiest airport in the country, as it handled 70 million passengers and more than 8.57 lakh tonnes of cargo fiscal 2018
- Delhi International Airport was ranked #1 in the highest category of over 40 million passengers per annum of Airport Service Quality Awards, 2018

India has seen massive growth in the airport sector with investments from both the government and private sector. The country has become the third-largest domestic civil aviation market in the world and has immense potential to grow further. This calls for higher investment to build new airports and augment the existing airport infrastructure to support future growth.

## Historical investments

During the fiscals 2013 to 2017, the share of airports sector investment in the overall infrastructure investment has been ~1% and has increased at a CAGR of ~16%. Investments in airports sector declined in the 12th Five-Year Plan, compared to the 11th Five-Year Plan, as some of the major airport sector projects, such as modernisation and expansion of Kolkata and Chennai were undertaken during the 11th Five-Year Plan (refer Figure 33).

**Figure 33 Airport sector investment (Rs lakh crore) and share in total infrastructure investment (%)**

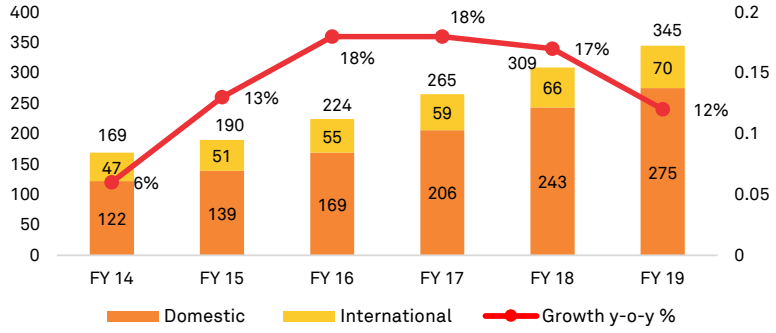



*Source: Appraisal documents for five-year plans, CRIS estimates (Investments are at current prices)*

## Airport sector trends

### Growth in passenger and air cargo traffic

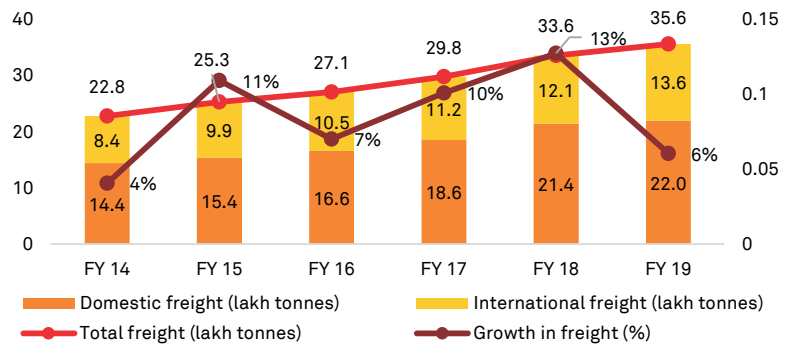
**Figure 34 Domestic and international passenger traffic (million)**




*Source: Airports Authority of India*

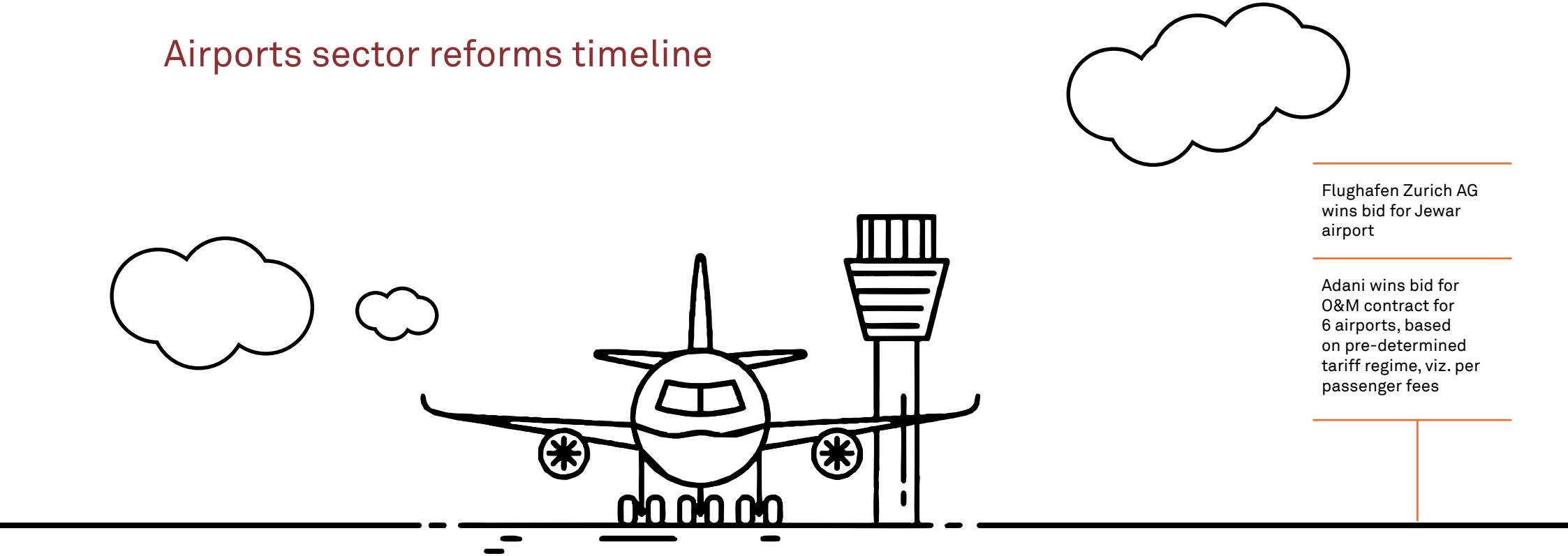
For fiscals 2014 to 2019, international and domestic cargo grew at a CAGR of 9% and 10%, respectively.

**Figure 35 Domestic and international air cargo traffic (lakh tonne)**




*Source: Airports Authority of India*

# Airports sector reforms timeline



Flughafen Zurich AG wins bid for Jewar airport

Adani wins bid for O&M contract for 6 airports, based on pre-determined tariff regime, viz. per passenger fees

Total passenger traffic

## 2016

**224 million**

Ude Desh ka Aam Nagrik (UDAN) scheme launched to boost regional connectivity at underserved and unserved airports

## 2017

**265 million**

Second round of bidding for UDAN scheme launched after successful bidding in the first round that covered 29 airports

## 2018

**309 million**

Six airports of Airports Authority of India (AAI) viz., Guwahati, Lucknow, Jaipur, Ahmedabad, Mangalore and Trivandrum identified for leasing out under PPP

## 2019

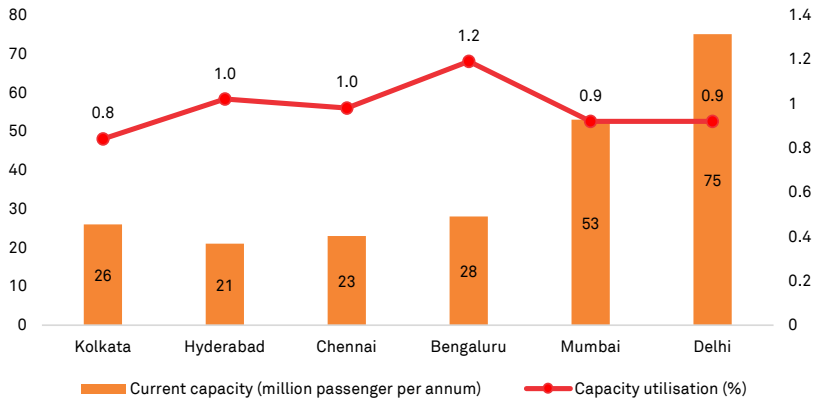
**345 million**

Digi Yatra platform operationalised to enable biometrics-based digital processing of passengers at airports

## Infrastructure deficit at airports

### High capacity utilisation rates at some major airports

**Figure 36 Capacity utilisation at major airports**

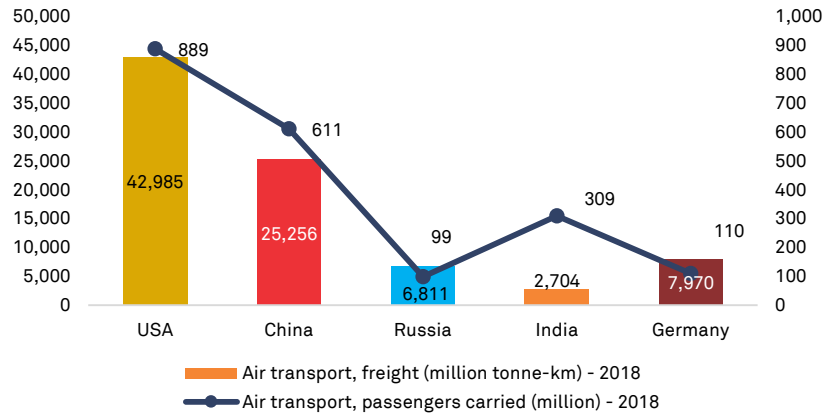



*Source: Airports Authority of India*

- Capacity utilisation across the six key airports remained high. In fiscal 2019, capacity utilisation at Hyderabad and Bengaluru airports was more than 100% while for Chennai, Kolkata, Delhi and Mumbai airports, capacity utilisation was ranging between 84% and 98%

- To address the capacity constraints, two steps have been taken to upgrade the airports by adding new runways and new terminal buildings at Delhi, Bengaluru and Hyderabad. The airport capacity at Delhi is expected to increase passenger capacity as follows: 110 million by 2023, 56 million at Bengaluru by 2022 and 36 million at Hyderabad by 2024. In addition, Jewar will come up as second airport in Delhi and Navi Mumbai Airport will be commissioned by 2023

**Figure 37 Freight (million tonne-km) and passenger (million) traffic through air transport**




*Source: World Development Indicators*

- Indian airports' utilisation remained high despite a relatively smaller passenger throughput compared with global peers. This is in view of the country clocking double-digit growth rates in passenger traffic over the last five years

- Further, air travel is concentrated in a few routes, leading to utilisation saturation in these routes. Ten city-pair routes[28] have high passenger volumes, and rank in the top 100 globally

- In addition, usage of air transport for ferrying cargo remained low. A pick-up in this segment is essential to drive growth in high-value-added agricultural produce

*[28] 10 City Pair Routes are: Mumbai-Delhi, Bangalore-Delhi, Bangalore-Mumbai, Kolkata-Delhi, Delhi-Pune, Delhi- Hyderabad, Delhi-Chennai, Mumbai-Goa, Mumbai-Chennai, and Delhi-Goa*

## Challenges for the airport sector

### Capacity enhancement lagging demand

Large airports such as Delhi and Mumbai cater to the lion's share of traffic and operate at near/more than 100% capacity utilisation, indicating the need to expand and/or develop a second airport in metros. Mumbai International Airport recently held the record of handling maximum number of flights in a 24-hour cycle, at around 974 on a single runway. This highlights high capacity utilisation and infrastructure constraints at Indian airports.

### PPPs at more airports

From being the worst airports in the world before being given over as PPPs, Delhi and Mumbai airports are today among the best airports in the world. In addition, Delhi and Mumbai airports have produced healthy returns for Airports Authority of India (AAI). Since a few major airports would be saturated over the next five years, due to exponential demand growth, it is imperative that these airports are developed and upgraded on PPP basis.

### Challenges in creating an MRO hub

The aviation maintenance, repair and overhaul (MRO) industry has not been able to flourish in India, partly due to high taxes being levied on the sector. This has resulted in making servicing costlier in India than abroad.

# Vision 2025 for the airport sector

| Current status | Vision 2025 |
|---|---|
| • India is the third largest domestic aviation market in the world<br>• ~345 million[29] passengers handled at airports in 2019<br>• Insufficient capacity: Major airports such as Delhi, Mumbai, Bengaluru and Hyderabad are operating at high capacity utilisation<br>• Six airports – Lucknow, Jaipur, Ahmedabad, Guwahati, Mangalore and Thiruvananthapuram, owned by the Airports Authority of India (AAI), are being developed as PPPs | • India to be in the top three world's largest aviation markets<br>• Make flying affordable for the masses<br>• Enable 500 million domestic ticketing by 2027 and 200 million international ticketing by 2027<br>• Cargo volumes should increase to 10 million tonne by 2027[30]<br>• All major airports will run at optimum capacity utilisation attributed to addition of new international/domestic airports and capacity expansion in existing airports<br>• Airports owned by the AAI will be developed as PPPs |
| • Regional connectivity scheme UDAN is expected to make air travel affordable and connect many under-served areas<br>• Absence of in-house MRO facility - India is dependent on foreign countries such as Sri Lanka, South-east Asian countries or Middle-east or European countries for MRO of their planes<br>• After aviation turbine fuel (ATF) costs, MRO forms the next major component of operating costs of an airline | • All tier-II and most tier-III cities will be well-connected with fully functional airports – with affordable fares and world-class facilities<br>• Development of high-quality in-house MRO facilities will substantially reduce the operating costs of carriers, thus making air travel more affordable |
| • Manual safety and security checks at the airports have led to long queues and delays in boarding at busy airports such as Delhi, Mumbai, Bengaluru and Hyderabad | • Digi Yatra Biometric Boarding System to be made operational at international and domestic airports to enhance passenger throughput<br>• Installation of smart cameras and use of robots for checking-in and transferring luggage bags of passengers |

[29]*Source: Traffic Summary, AAI fiscal 2019*
[30]*National Civil Aviation Policy 2016 – http://www.civilaviation.gov.in › files › Final_NCAP_2016_15-06-2016-2_1*

## Reforms imperative at airports

According to Airport Council International (ACI), the Indian aviation sector has already become the third-largest domestic aviation market in the world during 2018. Over the past few years, the government has announced several new initiatives and reforms to support this sector and spur growth. The civil aviation industry is vulnerable to several intrinsic and extraneous risks, such as volatility in oil prices and exchange rates. Therefore, to sustain growth momentum, it is imperative that the reform momentum continues to provide a conducive environment for private players to compete and contribute.

## Bringing in policy reforms

Some of the changes that can help the aviation sector to realise its true potential and unleash growth momentum – which until now was untapped – include:

- Aerotropolis approach – Policies need to be aligned to ensure that new airports are developed as a part of a holistically planned 'aerotropolis' than a mere plot of land, where aircrafts land and take off. While framing the policy, a cue can be taken from important hubs, such as Beijing and Hong Kong. These hubs obtain a significant part of their revenue from cities situated in their catchment areas, as they are complemented by multi-modal transport infrastructure, which allow ease of access for passengers and cargo. This approach can be used for developing Jewar Airport near Delhi, where an integrated transport hub could be developed

- Hub-development policy – A hub-development policy, which will provide fiscal, monetary and procedural benefits to all Indian carriers that venture into international routes, needs to be considered. A hub-and-spoke model would be useful

- Transshipment reform – Cumbersome customs, safety and security procedures for transshipment cargo have prevented its full exploitation until now. This needs to be addressed on priority to enable seamless transfer of transshipment cargo, followed by greater engagement with logistics companies

## Developing India as an MRO hub

- India has long been viewed with interest by global maintenance, repair and overhaul (MRO) operators seeking a valuable gateway between the Middle East and the Asia Pacific. Growth in the segment is boosted by the expansion and development of new airports, a liberal foreign direct investment policy, rising adoption of new technology and focus on regional connectivity

- Despite a rising fleet, the domestic MRO segment continues to struggle. The biggest challenge is the severe tax anomaly with foreign jurisdictions. Due to the sub-optimal tax structure, most Indian carriers carry out MRO operations in Sri Lanka, South East Asia, Middle East or Europe. This entails additional cost of empty ferry flights, additional logistics costs and payments in foreign exchange. There is also a need to focus on engine and component repairs, where nearly 60% of all MRO spending is done

## Refinements/ improvements in the UDAN scheme

The cornerstone of National Civil Aviation Policy was the Regional Connectivity Scheme (RCS), popularly known as Ude Desh ka Aam Naagarik (UDAN). It has received significant interest from leading domestic carriers and start-up airlines, due to the various monetary incentives and the three-year exclusivity rights to operate on the allotted RCS routes.

- To ensure that traffic growth momentum due to better regional connectivity is maintained, it is imperative to address challenges, for example, limited slots for UDAN flights in congested airports, such as Delhi and Mumbai, and restricted leasing options for

small-fleet owners. The state government should also provide funds to attract more private players in their tier-2 and tier-3 cities

- Promoting international connectivity from non-metro cities under the international UDAN scheme, by bringing more airports under the purview, could be the next phase. Here, the onus is on state governments to nominate their cities under this scheme to enhance tourism potential, economic growth and job creation

## Reforms to enhance private investments

- The PPP mechanism created world-class airports in India and generated large financial resources for the government with better operational efficiency and risk management

- Further, options to be considered include providing viability-gap funding (VGF) or grants for PPPs in smaller cities, where revenue and traffic risk could potentially be higher to improve private sector participation

## Increased investment in technology

- The Digi Yatra Biometric Boarding System, which aims to enhance passenger movement at airports through facial recognition after proper validations, should be operationalised at every major airport in India to promote paperless and hassle-free air travel

- Deploying smart cameras and re-positioning of security apparatus at all airports to end the practice of stamping hand-baggage tags during security checks

- It is also paramount to use latest air traffic management systems and benchmark airport handling capacity and productivity to international standards

## NIP project summaries and marquee projects

Overall, total capital expenditure of Rs 143,448 crore is estimated to be incurred by both Centre and State governments between FY20 and FY25. For projects to be executed by the Centre, about 58 identified projects will be implemented in the period. The capital expenditure for these projects is estimated at Rs 89,167 crore. Out the above 58 projects, 52 projects worth Rs 37,188 crore are to be implemented through EPC mode and 6 projects worth Rs 51,980 crore are to be implemented through PPP mode. A summary of the projects is highlighted in the table below:

| Particulars | No. of projects | Capex over FY20–FY25 (Rs crore) |
|---|---|---|
| Completely greenfield projects | 8 | 36,147 |
| Expansion and modernisation of existing airports | 50 | 53,020 |
| **Total** | **58** | **89,167** |

- The completely greenfield projects include construction of new airports at Navi Mumbai, MOPA (Goa), Jewar, Itanagar, Bhogapuram, Dholera (Gujarat), Agatti and Rajkot
- In order to improve passenger ammenities, upgradation and modernization work is being carried out at several existing airports such as Chennai, Trichy; expansion work being taken up at Delhi International Airport and Banglore International Airport

**Capital expenditure over FY20 to FY25 is shown below:**

| Rs crore | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | Total |
|---|---|---|---|---|---|---|---|
| Centre | 15,460 | 18,200 | 18,459 | 15,043 | 18,487 | 3,519 | **89,167** |
| State governments[31] | 3,207 | 3,455 | 6,361 | 6,291 | 6,899 | 1,622 | **54,281** |
| **Total[32]** | **18,667** | **21,655** | **24,820** | **21,334** | **25,386** | **5,141** | **143,448** |

## Marquee project

### Navi Mumbai Airport

The airport is being developed under PPP mode by the GVK group along with CIDCO. Recently, NIIF completed the acquisition of a majority shareholding in the project along with a few global pension funds. The project is being built at an estimated cost of Rs 16,704 crore and is expected to be completed by FY23. The much-needed new airport is expected to ease a lot of pressure from Mumbai's Chhatrapati Shivaji International Airport.

*[31]States/UTs include Uttar Pradesh, Maharashtra, Gujarat, Telangana, Jharkhand, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Karnataka, Haryana, Punjab, Delhi, Kerala, Odisha, Chhattisgarh, West Bengal, Sikkim, Mizoram, Andaman & Nicobar, Chandigarh and Puducherry. For some projects, year wise phasing has not been provided, so capital outlay for FY 20 to FY 25 will not add up to total capital outlay.*
*[32]Includes projects where yearly phasing has not been provided.*

# Urban Infrastructure

# Sector Progress, Deficits and Challenges, Vision and Reforms

## Delhi Metro Rail Project

### Project details

- Delhi Metro Rail Corporation, the implementing agency for Delhi Metro Rail Project, was formed in May 1995 as a joint venture between Central government and Delhi state government to provide a rail-based transport system that would alleviate Delhi's ever-growing transport congestion and vehicular pollution
- The project, constructed in three phases, is built at an estimated cost of Rs 85,700 crore and caters to ~ 3 million passengers per day
- Currently, the Delhi Metro network comprises about 389 km with 285 stations (including Noida–Greater Noida Metro and Rapid Metro Gurugram which are being operated by DMRC), connecting different parts of Delhi and extending to Ghaziabad and Noida in Uttar Pradesh and Gurgaon, Faridabad and Bahadurgarh in Haryana

### Salient features

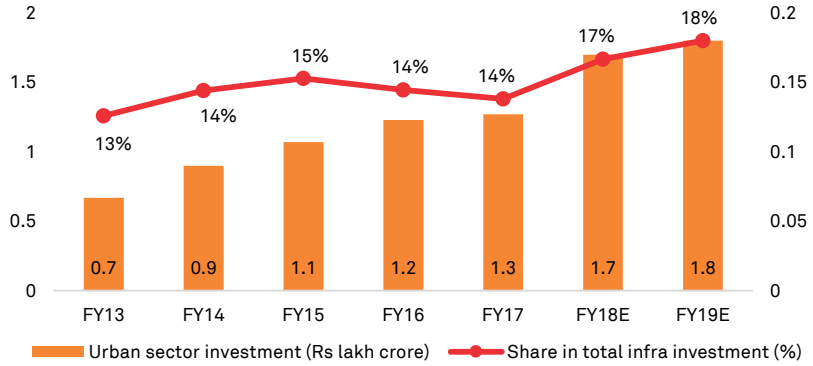
- The Airport Express link between the Indira Gandhi International Airport and New Delhi has propelled Delhi to the league of global cities with high -speed rail connectivity between the city and the airport
- The Delhi Metro has contributed tremendously on the environment front by becoming the first-ever railway project in the world to claim carbon credits for regenerative braking. DMRC has also been certified by the United Nations (UN) as the first metro rail and rail based system in the world to get carbon credits for reducing greenhouse gas emissions, as it has helped to reduce pollution in the city by 6.3 lakh tons every year, thus helping in reducing global warming

In recent years, the importance of urban infrastructure has grown owing to its link with economic growth, poverty reduction, and quality of life. As urban local bodies generally suffer from a dearth of funds, new financing mechanisms, such as land leasing, value capture finance and monetisation of assets, are being evaluated to source more funds to enhance urban infrastructure. India needs to invest significantly to improve urban services, such as water supply, solid waste management, sewerage, storm water drains, urban mobility, and public spaces.

## Historical investments

India has close to one-third of its population residing in urban areas and this could increase to 50% in the next two decades. Historically, investments in the urban sector have been close to 1% of GDP. While the urban population in India increased rapidly, there was no commensurate supply of quality basic urban services. Between 2013 and 2017, the share of urban sector investment in overall infrastructure investment was ~14%.

**Figure 38 Urban sector infrastructure investment (Rs lakh crore) and share in total infrastructure investment (%)[33]**




*Source: Appraisal documents for five-year plans, CRIS estimates (Investments mentioned are at Current prices)*

[33]*Refer to Annexure 1 for methodology used to estimate ULB FY14 to FY19 capex*

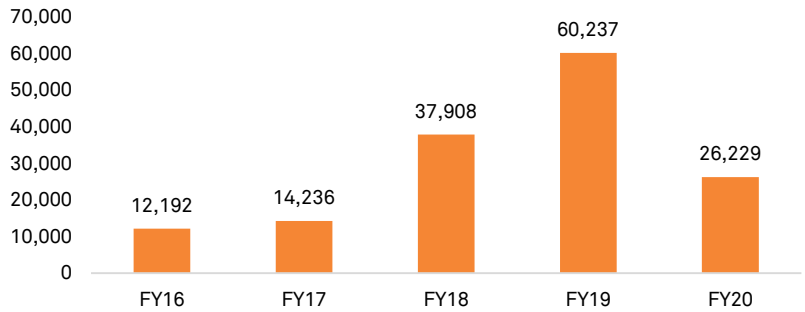
Investments in the urban sector have traditionally been undertaken by public sector entities through budgetary allocations until recently, when some projects were also undertaken through the private sector route. There has been a steep rise in state investments from fiscal 2013, due to the launch of flagship schemes such as Smart Cities, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Heritage City Development and Augmentation Yojana (HRIDAY), and Swachh Bharat Mission.

## Pradhan Mantri Awas Yojana (PMAY) – Urban

In recent years, the importance of housing infrastructure has grown, due to its link with economic growth, poverty reduction, and quality of life. To achieve the long-term goal of Housing for All by 2022, the Government of India in June 2015 launched Pradhan Mantri Awas Yojana (PMAY) to construct around 1.12 crore affordable houses in the urban areas and about 1.95 crore affordable houses in the rural areas.

During fiscals 2016 to 2020 (till December 2019), a cumulative investment of Rs 150,802 crore has been made under Pradhan Mantri Awas Yojana (Urban). As of December 12, 2019, around 93.19 lakh houses are sanctioned under PMAY (urban) out of which 28.60 lakh houses have been completed.

**Figure 39 Investment made under PMAY Urban (Rs crore)**



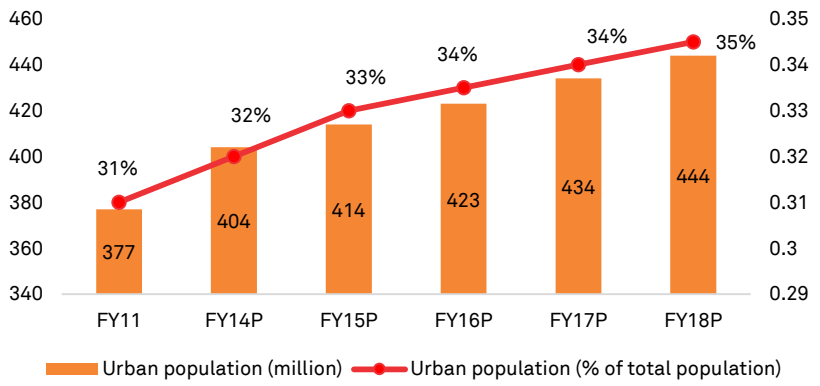

*Source: Ministry of Urban and Housing Affairs (FY 20 till Dec 19)*

## Urban sector trends

### Urbanisation in India

India's urban population is estimated to have increased from 377 million as per Census 2011 to 444.4 million in 2018[34], at a CAGR of 3%, with an urbanisation level of ~34%. As per Census 2011, Maharashtra, Uttar Pradesh, Tamil Nadu, West Bengal and Andhra Pradesh (including Telangana) were the top five states in terms of urban population.

**Figure 40 Urbanisation trend in India**



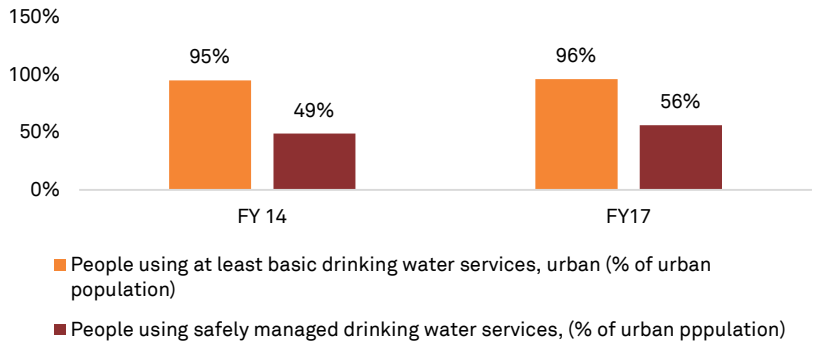

*Source: Census of India 2011, CRIS Estimates, World Bank Urban Growth Estimates, 2018 P - Projections*

## Drinking-water services

As of March 31, 2017, 96% of the urban population in India had access to basic drinking-water services, while 56% of the urban population had access to safely managed drinking-water services.

[34]*United Nations Population Division's World Urbanisation Prospects 2018*

**Figure 41 Access of urban population to drinking water-services**

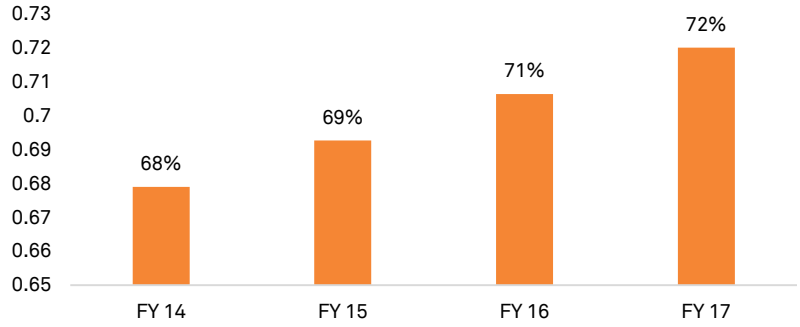



*Source: World Bank*

## Access to sanitation services

As of March 31, 2017, 72% of the urban population in India had access to basic sanitation services.

**Figure 42 Access of urban population to sanitation services**

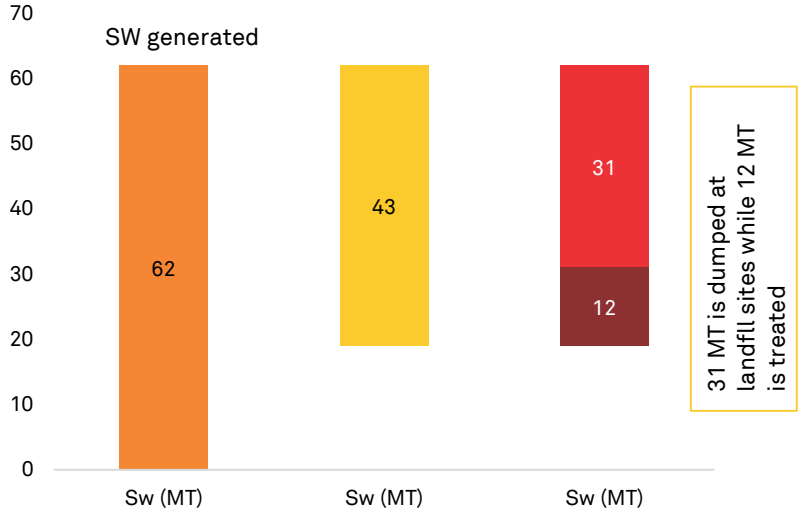



*Source: World Bank*

## Solid waste management (SWM) in India

As of March 31, 2019, India generated 62 million tonne of municipal solid waste annually, of which, 43 million tonne (~70%) was collected. Of this collected waste, 12 million tonne (28%) was scientifically treated, while the rest was dumped at landfills without any processing and treatment.

**Figure 43 SWM in India – 2019 (million tonne (MT) per annum)**




*Source: CRIS Analysis*

# Urban sector reforms timeline

## 2014

Swachh Bharat Mission launched to eliminate open defecation, improve municipal solid waste management

## 2015

Smart City Mission launched to implement area-based development and technology-driven city solutions

AMRUT launched to ensure adequate water supply and sewerage network in cities

PMAY launched with the aim of 'Housing for All' by 2022

HRIDAY launched to rejuvenate India's rich cultural heritage

## 2017

94 Indian municipalities get credit ratings, of which 55 received investment grade ratings

Pune Municipal Corporation issued a 10-year municipal bond to raise money for its Smart City Mission

City liveability index launched to measure quality of life in 116 major cities

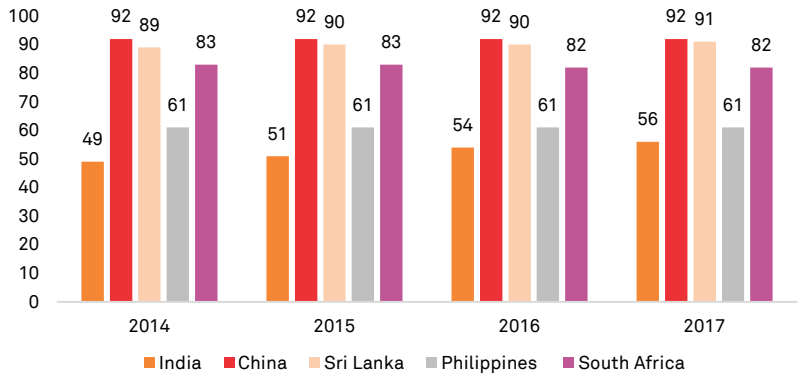
## 2019

Over 2.8 million houses completed, of which nearly 2.4 million houses delivered to beneficiaries under PMAY

## Infrastructure deficit in urban areas

### Significant gap in solid waste management and waste water management infrastructure and access to potable drinking water

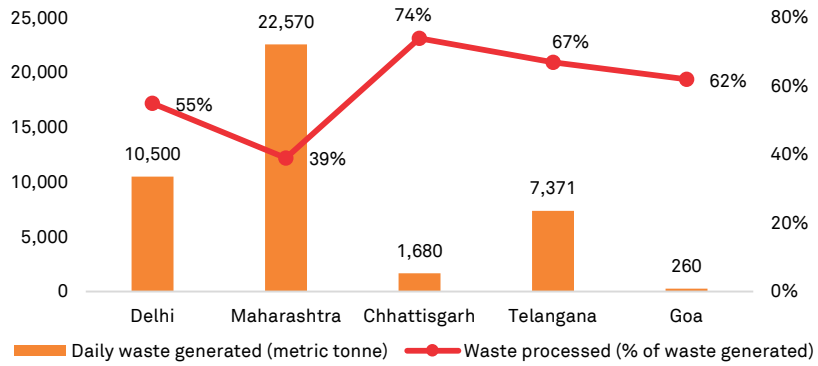
**Figure 44 People using safely managed drinking water services – peer comparison for period 2014 to 2017 (% of population in that year)**




*Source: World Bank*

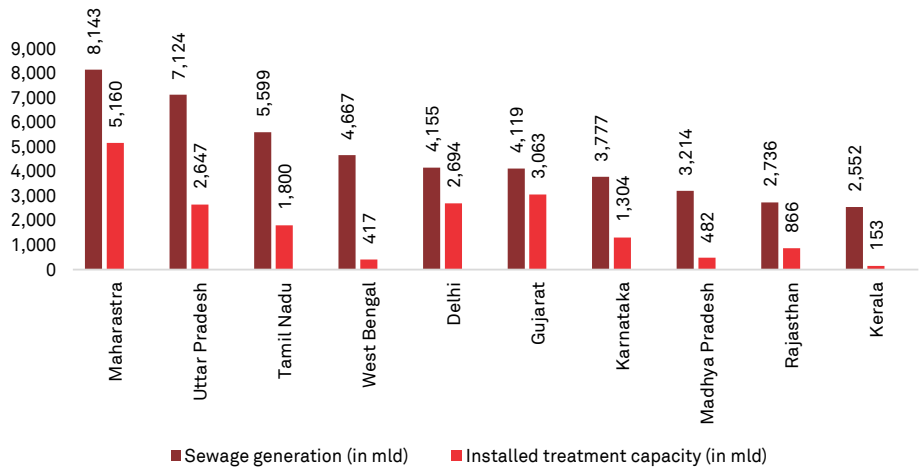
- In order to ensure that sanitation, sewage treatment and potable drinking water services are improved, urban local bodies need to build their capacity and learn from the best examples being used within the country and in South East Asian countries. For example, the Hybrid Annuity Model is being used for wastewater treatment in the Namami Gange Project; Manila has a highly successful water supply project being implemented by the Manila Water Company

**Figure 45 Solid waste management in select states 2018 (metric tonnes)**



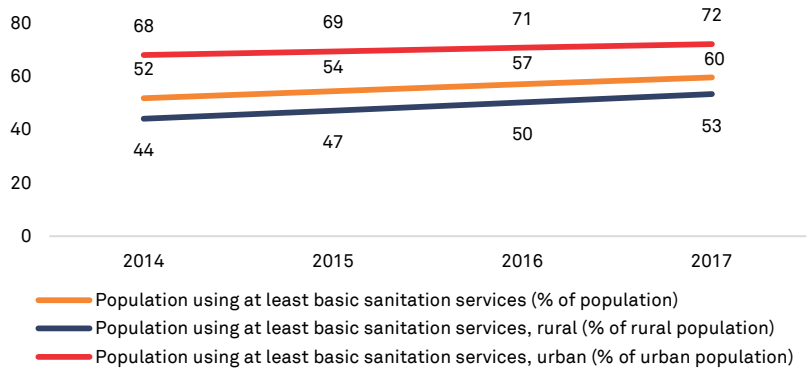

*Source: MoHUA*

**Figure 46 Sewage generation and installed capacity in selected states in 2018**



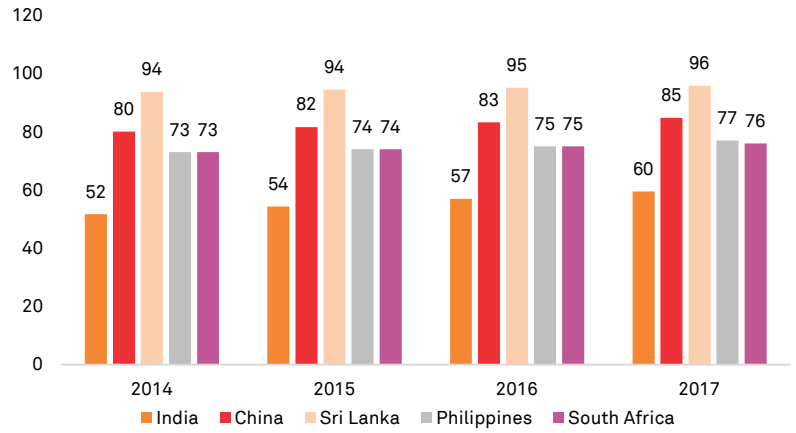

*Source: Ministry of Environment, Forest and Climate Change (MoEFCC), mld – million litres per day*

**Figure 47 Percentage of population using sanitation services**




*Source: World Bank*

**Figure 48 People using at least basic sanitation services (% of population)**




*Source: World Bank (2017)*

- Solid waste management has been a big issue in India. Even the best-managed states are able to process only around 75% of the waste generated daily

- Waste water and sewage management are inadequate owing to lack of sewage treatment plants and proper sewerage lines. The need is to ensure that urban local bodies adopt a scientific process of solid waste and sewage management

- Water resources are under tremendous pressure in most Indian cities and large sections of the population do not have access to piped potable water

## Challenges in the urban sector

### Rapid growth has exacerbated service delivery gaps

Demand for urban services grows with cities. In the absence of adequate institutional and financial capacity to cope with growth, glaring service gaps become visible. In water supply, while 'access' figures look reasonably healthy at 96%, the 'quality of access' and duration of supply are below par. Losses in distribution, high non-revenue water and inadequate cost recovery continue to plague urban water supply systems across the country. Less than 30% of urban domestic wastewater is treated, which has adverse consequences for health and environment. Also, the share of public transport is low and declining. Moreover, the slum population in urban areas was estimated at 26% of the population in 2010.

### Inefficiencies of urban local bodies

The sharp increases in budgetary outlays for state and central government schemes have not been backed with commensurate improvements in institutional and financial capacity at the level of

cities to equip them to deliver services effectively. Many urban local bodies (ULBs) are institutionally and financially incapacitated, leading to limitations in investment spending and delays in implementation. Even though a multi-fold increase in investment is needed to bridge infrastructure and service delivery gaps, capacity weaknesses constrain implementation and absorption of even available grants in many cities. The low absorption levels on several of the flagship schemes reflect this constraint. Also the 74th Constitutional Amendment Act, made with the aim to strengthen decentralisation and ensure that ULBs assume responsibility of urban planning, has not been operationalised completely since it did not lay down the revenue base for ULBs. This power continues to rest with the states. This has ensured that ULBs often do not have sufficient funds to perform their functions properly.

**Slower adoption of innovative financing mechanisms**

ULBs have been slow to leverage innovative financing mechanisms as an alternate source of revenue. It is important to adopt innovative financing mechanisms such as value capture finance (VCF) to raise financing for urban transit projects such as Metro and Bus Rapid Transit System (BRTS). Also, more ULBs should raise capital by issuing municipal bonds to reduce their financial dependence on states.

**Land availability and finance constraints in housing**

**Land availability:** There is a continuous tussle for land for industries, commercial/ retails spaces and for housing in urban areas. Therefore, land mass is under severe constraint to meet the housing requirement of the country's rapidly growing urban population. This implies that the vision of affordable housing for all will require acquisition/supply of large land parcels on a regular basis.

**Inadequate finance:** In urban areas where land and houses prices are high, finance is one of the biggest concerns for developers as well as home buyers particularly for the low-cost or affordable housing category.

# Vision 2025 for the urban sector in India

| Current status | Vision 2025 |
|---|---|
| • ~56% of urban households have drinking water on their premises<br>• ~16% of rural households are connected to piped-water supply<br>• 70% of water is contaminated – India ranks 120th among 122 countries in the water quality index<br>• Limited waste water is treated<br>• ~19% of the municipal solid waste generated is treated scientifically<br>• High proportion of population living in slums in India | • ~100% of urban and rural households connected to piped-water supply<br>• Significant improvement and use of advanced techniques in maintaining the quality of water<br>• Most waste water to be treated and re-used in urban and rural areas<br>• ~100% of the municipal solid waste generated to be collected and treated with advanced scientific techniques<br>• Slum population rehabilitated with implementation of the PMAY[35]<br>• Decongestion of urban spaces through urban planning<br>• National standards on urban infrastructure adopted by all cities |
| • Limited number of parks and green spaces for children and elderly population<br>• Total of 18 cities in India have an operational metro rail-transit system whereas it is operational/under construction in 27 cities<br>• Low quality and poor connectivity of public transport - ~7% of daily trips catered to by public transport | • Number of parks and green spaces to increase significantly<br>• Walkability of city neighbourhoods significantly improved and focus on river front development<br>• Mass rapid transit system to be available in more than 50 cities in India by 2025<br>• Improved quality and connectivity of public and mass-transport system<br>• Significant increase in the proportion of daily trips catered to by public transport including electric buses<br>• Availability of public charging infrastructure within 3 km in all cities, within commercial buildings and housing apartments |
| • Low awareness and penetration of electric vehicles<br>• High dependence on privately owned vehicles with internal combustion engines<br>• Advanced public transport technologies such as Hyperloop and Transit X are at conception stage | • Higher penetration of electric vehicles due to policy focus and increasing awareness about hazards of internal combustion engine vehicles<br>• Higher dependence on public transport to reduce the proportion of privately owned vehicles plying on roads<br>• Implementation of urban mobility solutions such as bicycles and e-bikes |

[35]*Source: PMAY*

## Reform imperatives in the urban sector

### Reforms needed to boost slum redevelopment and land pooling

The central government's vision of 'Housing for All' by 2022 is beingimplemented under the PMAY. It provides assistance to states/ union territories to address the housing requirement of people from economically weaker sections and the lower income and middle income groups. Though the government's efforts have been commendable in the past few years, a slum-free urban centre appears to be a difficult target.

- In India, housing has become unaffordable owing to skyrocketing land and construction costs which is an outcome of scarce land and skewed spatial development. The problem can partly be resolved by releasing unused government land for affordable housing projects

- The policy reforms that will enable the urban sector to realise its true potential and unleash the growth momentum are as follows:

  - Promote rental housing – A new model tenancy law needs to be introduced as the current rental laws are archaic and do not address the lessor-lessee relationship in an equitable manner. This has curtailed new investment in the rental housing segment

  - Using land pooling – The concept of land pooling should be encouraged and the associated legal framework needs to be fine-tuned so that it can be a true alternative to land acquisition in India. Authorities must lay down guidelines on compensation, resettlement and rehabilitation. Also, states must mandate documented land ownership records for land pooling

### Reforms to improve urban waste management

### Solid waste management

In India, segregation and storage of waste at source is lacking, and decomposable and non-decomposable waste is often disposed of at a common open site. There is no storage area to place the segregated waste in a scientifically safe manner. Street sweeping and drain cleaning activities are irregular and waste is dumped in the open. Scientific treatment methodologies are conspicuous by their absence.

- Creating the right environment for more private participation – Financial sustainability of ULBs has been the biggest bottleneck to upgrading the solid waste management system in the country. The annual budget for the present waste management system is insufficient to meet the challenges of daily collection, transportation, treatment, and disposal of waste. Therefore, it is important to bring in private investment and expertise through PPPs. Key success factors for increased private sector participation involve the presence of an experienced, accountable and independent management; conducive regulatory environment for contract enforceability; and availability of financial information and improved disclosure standards of ULBs. Balanced contracts and payment mechanisms through letters of credit or escrow account mechanism by local bodies will be critical for attracting high quality private investments. Further, MoHUA can also develop a model concession agreement for SWM. It may also be useful to have integrated SWM PPP concessioning (collection, transportation, processing, etc.) to avoid co-ordination issues

- Need to change the process of waste management – There are no proper systems to segregate waste – biodegradable and non-biodegradable – generated at source. ULBs lack proper tools and the knowhow, which results in primary collection of waste from source via street sweeping. The vehicles used for transportation of

waste from source to the common collection area often transport waste directly to the processing facility, which hinders effective waste management. There needs to be a well-defined process for proper door-to-door garbage collection to efficiently tackle waste in cities and towns

- Creating e-waste recycling facilities - Electronic waste (e-waste) consists of many hazardous heavy metals, acids, toxic chemicals and non-biodegradable plastics. Currently about 95% of India's e-waste is recycled in the informal sector in a crude and unscientific manner which is detrimental to the environment. At the same time, e-waste consists of high-grade metals such as gold, silver, copper, and palladium which could be extracted and used again. So there is a need for well-designed and well-regulated e-waste recovery facilities which will generate jobs as well as wealth

### Indore solid waste management case study

Indore today generates over 1,115 MT of garbage a day and all of it is collected from the source, whether it is a household or commercial establishments. The households and residential complexes are covered by the door-to-door collection system while the semi-bulk and bulk generators are covered by the bulk collection system. Indore ensures 100% coverage of its 85 wards through its door-to-door collection system.

**Implementation of door-to-door collection system –** In order to implement a successful door-to-door collection system, an identification study was carried out to figure the amount of waste generated at each ward and the population of each ward. On that basis, a detailed route plan was prepared to cover all wards to meet the waste collection demand of each ward. The door-to-door collection is done through the use of partitioned vehicles. There are three separate collection bins for wet, dry and domestic hazardous waste in each tipper. All vehicles used in the collection and transportation system are monitored by a GPS-enabled tracking system. The waste is then transported to the garbage transfer stations (GTS) for secondary collection.

**Processing of waste -** At the GTS, the tippers unload the wet waste and dry waste into dedicated compactors which compress and load the waste on dedicated hook loaders. The details of all the incoming waste collection vehicles are logged in the log books at the GTS. The bulk collection vehicles do not travel to the GTS but head straight to the processing plant after completing their respective collection routes. Domestic hazardous waste is sent straight from the GTS to the Central Domestic Hazardous Waste Treatment Facility to be incinerated. The wet waste is processed into compost and the dry waste is segregated into different components such as metal, rubber, board, plastic, etc.

## Waste water and sewage management

In urban areas, water resources are under significant pressure owing to high water demand and complex consumption patterns within small densely populated areas. Currently, demands of most cities are met by exploiting ground water. This is not only inefficient but also energy-intensive. Practices such as reuse of treated wastewater would be of immense significance in achieving water security.

- Using a decentralised system for waste water management – Developing a decentralised system is the best way for India for waste water treatment as against a centralised treatment system

Bengaluru can be used as a model given its stringent laws and partial on-ground implementation. Combining a decentralised system with increased water tariffs and strict enforcement would result in better waste water management in Indian cities

- Recycle water accreditation – Introducing recycled water accreditation will make water recycling and reuse mandatory across various user groups, such as domestic, commercial and agricultural users, by setting up a water conservation or recycling target (as a percentage of actual water consumption). If the recycling targets are achieved by the user group, they would be awarded a tradable recycled water certificate. This certificate would be a proof that the user has fulfilled its obligation of recycling the given amount of water. This mechanism is likely to help reduce water footprint, create and support recycled water market, and promote the company's commitment to recycle and reuse water. However, there must be a penalty mechanism for non-compliance

- Technology intervention – There is a pressing need for enhancing operational efficiency through digitisation, particularly in utilities and urban environments. Technology for leakage detection and intervention will allow for quick repair of leakages and reduce wastage

- Using a well-established PPP structure – On the lines of the sewage treatment plant installed under Namami Gange, the HAM can be replicated in the waste water sector. This will ensure greater private participation, limit the revenue risk for private players and give them complete freedom to choose the design and technology to deliver the desired performance. Also, the ticket size of HAM projects can be increased and/ or multiple small projects bundled together to make them attractive to established players

- Appropriate pricing of fresh and recycled water – For a market to develop, fresh water and waste water needs to be priced at the right level. If fresh water is available for free, market for waste water cannot develop

### Bamroli sewage treatment plant (Surat) case study

Surat, in order to meet its huge water requirement, has installed several sewage treatment plants to cater to the needs of its industrial sector by efficiently recycling and reusing water. The idea is to ensure tertiary treatment of secondary treated sewage and using it to generate industrial grade water for supply to Pandesara Industrial Estate. The plant uses Ultra Filtration Reverse Osmosis (UFRO) technology to treat water. This has ensured that precious potable water is not diverted for non-potable purposes and the process also generates assured revenues for Surat Municipal Corporation. This initiative has resulted in reducing pollution, conserving natural resources and has ensured continued water supply for industry along with generating revenue for the corporation.

## Improving the storm water drainage system

An efficient drainage system is extremely important for discharging storm water within minimum time, controlling floods, maintaining the drainage networks, and improving the environment in and around drainage networks. However, analysis shows that the drainage network in Indian cities is mired with problems related to design, maintenance, and encroachment and dumping of solid waste.

- **Need a holistic approach for designing the drainage system –** A holistic approach is needed to plan and design the drainage system of a city in an integrated manner based on the catchment area, its topography, slope, rainfall intensity and future expansion of the urban areas

- **Creating an enabling environment for the private sector to work with municipalities** – As municipalities often lack the necessary technical and management skills, it is important to bring in private players for their expertise in designing and planning and superior management skills to improve operations and maintenance of the drainage system. As the capital expenditure is very high, state governments should use the viability gap funding and the availability-based payment mechanisms (HAM model) to boost private investments

## Reforms to improve supply of drinking water

Water is a crucial sector in need of urgent reforms. Uninterrupted supply of basic drinking water to all remains a distant goal even as overexploitation and mismanagement have aggravated the water crisis in the country. However, such substantial amounts cannot be summoned from the public sector alone. Increased private sector participation is hence critical to meet the massive investment outlay required for efficient management of water. This section details further reforms needed to attract investments in water resources.

## Developing PPP models for water infrastructure projects

As water is a merit good, there remains a high revenue risk for private players on account of low tariffs, high capital costs, lack of central level regulation for the sector, and lack of support and capacity of local stakeholders. This requires the government to share substantial responsibilities in order to avoid market failures and attract private participation. Taking a cue from the success achieved in other sectors, such as roads, for a conducive environment in which the private sector can invest, the HAM needs to be adopted.

- **PPP in water needs a sector-specific thrust:** PPPs have not been adopted as a sector strategy and specific enablers such as model concession agreement have not been created. A aodel concession agreement needs to be developed with balanced risks and returns framework for the private and public sectors

- **HAM option:** An important option is to adopt HAM in the water sector. Under this model, 40% of the capital cost could be paid by the government and the balance by private players during the construction stage. For bearing the 60% capital cost, the private player must be compensated by the concessioning authority through inflation-indexed annuity payments, along with annual operation and maintenance (O&M) costs. All payments must be linked to performance standards. This will ensure limited revenue risk for the private player. The company will also enjoy complete freedom in choosing the design and technology required for delivering the desired performance level. Some sewage treatment plants (STPs) installed under the Namami Gange programme have been funded through the HAM route. There have been significant improvements in the overall contractual framework of projects under this programme. These changes have been well-received by lenders and investors. Hence, replicating this contractual framework for water infrastructure PPP projects too must be considered. Increasing ticket sizes of such HAM projects and/

or bundling multiple small projects together to make the bundle attractive to established players that look for a minimum ticket size of investment can be considered

- **Strengthening capacities of ULBs:** There is a need to develop capacity for ULBs and state governments to monitor and implement PPPs. The central government can play a key role in developing a Model Concession Agreement for the water supply sector

## Using innovative financing mechanisms at the local level

- **Impact investing:** Innovative financial instruments such as impact investing directed towards setting up sustainable water infrastructure are gaining traction, with instruments such as social impact bonds, development bonds, and green bonds hitting the market. Under AMRUT Mission, credit rating work has been completed in 469 cities, of which 163 cities have received Investment Grade Rating (IGR), including 36 cities with credit rating of A- or above. These cities are part of the AMRUT scheme, in which water and sanitation are key focus areas

- **Blue bonds:** Another instrument for financing water sector projects is blue bonds. These could be used for water-related infrastructure, taking into account climate change mitigation, adaption and resilience opportunities. The government, municipalities, banks, and corporates can issue them. Globally, blue bonds worth over $ 10 billion have been issued already. A reference point is the success of San Francisco's public utilities, which issued a climate-certified water bond of $ 350 million to fund storm water management and wastewater projects

- **User charges** – In order to improve the urban infrastructure and services, it is paramount that the user is charged for the service provided and these charges should be cost-reflective. There is also need for property tax reforms so that charges reflect the growing cost of land and level of services provided in the locality

## Reforms to improve urban mobility

A number of regulatory challenges prevent Indian cities from having sustainable mobility services. Different aspects of urban mobility are governed by different agencies at the centre, state and city levels. The absence of an overarching framework, along with multiple institutions with overlapping jurisdictions and lacking coordination, leads to distortions in service provision, financing, implementation, and pricing of mobility.

- **Setting up a central urban mobility standards authority** – A central urban mobility standards authority can be set up under a central act to conduct research, provide technical guidance and provide statutory standards that are mandatory for states to follow. The MoHUA has a number of such institutions and one of them may be given this responsibility. This would be on the lines of The Indian Road Congress that focuses on planning, design and construction of roads and highways

- **Non-fare revenue segment** – Focus should be on the non-fare revenue segment to reduce revenue and traffic risk. In order to have more private investments in metro rail and Bus Rapid Transport, emphasis should be on non-fare revenue by ensuring better land value capture and advertisement. Private vehicles may be disincentivised by increasing parking fees and fuel surcharge

- **Mass rapid transit systems:** While every city wants a metro rail system, it must be realized that metro rail is the most expensive form of mass transit at an average cost of over Rs 300 crore/ km. Whenever a metro rail system is desired, the aim should be to at least recover operational costs from user charges. There are other

cheaper options such as Bus Rapid Transit System, which may also be explored

## Improving the condition of urban roads, walkways and public spaces

- **Adhering to the Indian Road Congress (IRC) codes –** IRC codes or those laid down by the National Urban Standards Authority or other similar institution should be mandatorily adhered to for urban road development. Municipalities fail to enforce these standards on the contractors as these are voluntary. The IRC is the nodal agency that sets design guidelines and technical standards for construction of roads and bridges, primarily for intercity roads but also for urban roads. These standards are voluntarily followed by all road construction agencies, including public works departments of cities

- **Improving walkways and pedestrian infrastructure –** India has poorly developed pedestrian infrastructure such as sidewalks, signage, signals and proper zebra crossings, which makes pedestrians prone to danger while crossing the road. ULBs must make considerable investments to improve this. Attention should also be given to aesthetics of the structure; people typically do not mind paying for better amenities

- **Riverfront development –** The urban space can be revitalised by rejuvenating water bodies and thereafter leveraging it to promote densification with public transit and necessary urban amenities such as , drainage, sewerage, affordable housing, schools, green spaces, and work spaces. In many cities of India, the water bodies have been undergoing eutrophication, due to the sewage entering the rivers, lakes and ponds. This has led to the filling up of the waterbodies with organic and inorganic waste leading to urban flooding, even with normal rainfall intensity. Encroachment of water bodies has led to the reduction in the capacity of the water bodies to hold water. Some cities such as Ahmedabad have taken up projects for riverfront and lake front development. The steps involved are –

  - Identification of the waterfront area to be developed/ redeveloped;
  - Survey of the area and listing all the stakeholders of the area;
  - Preparing a master plan for waterfront development;
  - Diverting sewage through a closed pipeline network and a sewage treatment plant and releasing clean water into the system;
  - Demarcating the project area and preparing the list of activities;
  - Detailed Project Report;
  - Preparing the budget and funding. These projects are funded by the local body and state government in some states;
  - Apart from finances, the land of the water body needs to be transferred to the project executing agency, city government or a special purpose vehicle or a parastatal as the case may be. In Gujarat, the land was transferred to the SPV specifically formed for riverfront development with an arrangement where part of the land would be auctioned with clear bye-laws and the proceeds realized would be used for funding the project while also partly sharing with the state government. The land to be sold was only 13 percent of the total reclaimed land and

rest of the 87% was for public purpose, such as parks, gardens and urban forest. This has created a win-win situation for all stakeholders

– Apart from the sale of land, due to positive transformation of urban waterfront, the land value appreciates significantly around the waterfront. This land value capture can be done through releasing higher Floor Space Index (FSI) around this area, where a part of higher FSI is sold at 40% of the land price of the area, and the revenue realised is used to retrofit the infrastructure needs of the higher floor space index released. To ensure proper planning of the area provided with higher FSI for redevelopment, a local area plan (LAP) has to be prepared where the public spaces are contiguous and usable as the redevelopment takes place

The waterfront development projects can be taken up in many cities, as the economic and environmental gains are very high in addition to positive rate of return. Central government funds could be provided as an incentive to take up waterfront development with land value capture and increasing blue and green balance of the city. To start with 36 such projects in 36 states/union territories can be planned with a mobilising incentive for each state to achieve the following objectives :

- Capacity building to take up waterfront development projects;
- Protection of fresh water sources ensuring water security;
- World-class public space creation and good amenities;
- Mixed development for reducing travel time;
- Land value capture where the gains outweigh the funds required;
- Integration with urban planning- The LAP to revitalise the central areas of the cities.

## Reforms for boosting urban affordable housing

The government recognises the need for affordable housing and has actioned the PMAY to ensure 'Housing for All' by 2022. The scheme also aims to trigger economic growth and create millions of jobs for both skilled and unskilled labour. However, for the affordable housing initiative to succeed, it is important to address the following concerns.

- **Efficient land usage –** Unused land and non-core assets of sick/loss-making public sector undertakings (PSUs) of the central/state governments can be monetised and utilised effectively to resolve the issue of land availability for affordable housing projects under 'Housing for All'
- **Easy access to financing –** The Government has already included affordable housing up to 60 sq m carpet area in the Harmonised Master List of Infrastructure which provides easier access and terms of funding to this segment
- **Setting up an affordable housing fund in the National Housing Bank (NHB) –** This can be funded from the priority sector lending shortfall. It will enable the NHB to mobilise larger funds for housing projects and help achieve greater synergies among different agencies that are implementing the government housing schemes
- **Use of designs that optimise space –** The success of the East Kidwai Nagar redevelopment project in Delhi can be replicated wherever possible. The key feature of the project was replacement of old-style public housing, which suffered from gross inefficient use of land with a modern housing design, thus optimising space There is also a need to explore the possibility of replicating good practices of all agencies working in housing sector (rural, urban, armed forces, railways) by incorporating the latest cost-effective green technologies such as use of recycled and sustainable material, using rooftop solar system and rain water harvesting

- **Innovative financing mechanisms –** Financial engineering, such as 'rental-cum-ownership housing', can be used in which houses will initially be offered on rent and ownership will be transferred to the tenant once the cost of the unit is recovered. This will especially help people from the low income group who do not have access to formal financing and hence cannot afford to pay large sums of money upfront. The success of the Bhindi Bazaar Redevelopment Project may also be replicated

## Reforming regulations governing the rental housing sector

Rental housing is of paramount importance in rapidly urbanising India. Millions of migrants are moving to towns from villages to seek better opportunities. Buying and owning a home in towns is not a viable option for poor migrants, especially if they already own one in the village. So, it is important to focus on reforming the rental housing sector in our cities.

- **Need for regulatory reform –** Introducing a new model tenancy law in place of the current rental law can be a game-changer. The existing law, Model Rent Act, 1948, doesn't fairly address lessor-lessee relationships. Little investment is coming in the rental housing space owing to the unfavourable regulatory environment. Hence, supply has always been way behind demand. There is need to expedite the adoption of the Model Tenancy Law developed by MoHUA. The aim of the new law should, inter – alia, be to bring millions of vacant unsold houses into the rental market

## NIP project summaries and marquee projects

Overall capital expenditure of Rs 1,919,267 crore is estimated to be incurred by both the Centre and states from fiscals 2020-25 in the urban sector. For projects to be executed by the Centre, about 1,362 identified projects will be implemented in the period 2020-25. The capital expenditure for these projects is estimated at Rs 1,572,410 crore. The summary of the projects is highlighted in the table below:

| Category | No of projects | Capex over FY20-25 (Rs cr) |
|---|---|---|
| Affordable Housing | 98 | 540,711 |
| Urban Transport / MRTS* | 50 | 573,366 |
| Street Lighting / Solid Waste Management (Smart City Mission) | 809 | 131,460 |
| Water Supply and Sanitation / Green Parks / Sewage Treatment Plant (AMRUT) | 405 | 47,382 |
| Water supply, rejuvenation of water bodies, waste water collection and treatment (Jal Jeevan Mission) | - | 279,492 |
| **Total** | **1,362** | **1,572,410** |

** Mass Rapid Transit System*

The capital expenditure over FY20-25 is shown below:

| Rs crore | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | Total |
|---|---|---|---|---|---|---|---|
| Centre | 271,698 | 421,412 | 362,144 | 194,608 | 183,773 | 138,776 | **1,572,411** |
| States[36] | 26,475 | 40,796 | 41,990 | 40,251 | 33,391 | 21,086 | **346,856** |
| **Overall Total[37]** | **298,174** | **462,208** | **404,134** | **234,858** | **217,164** | **159,862** | **1,919,267** |

## Marquee project

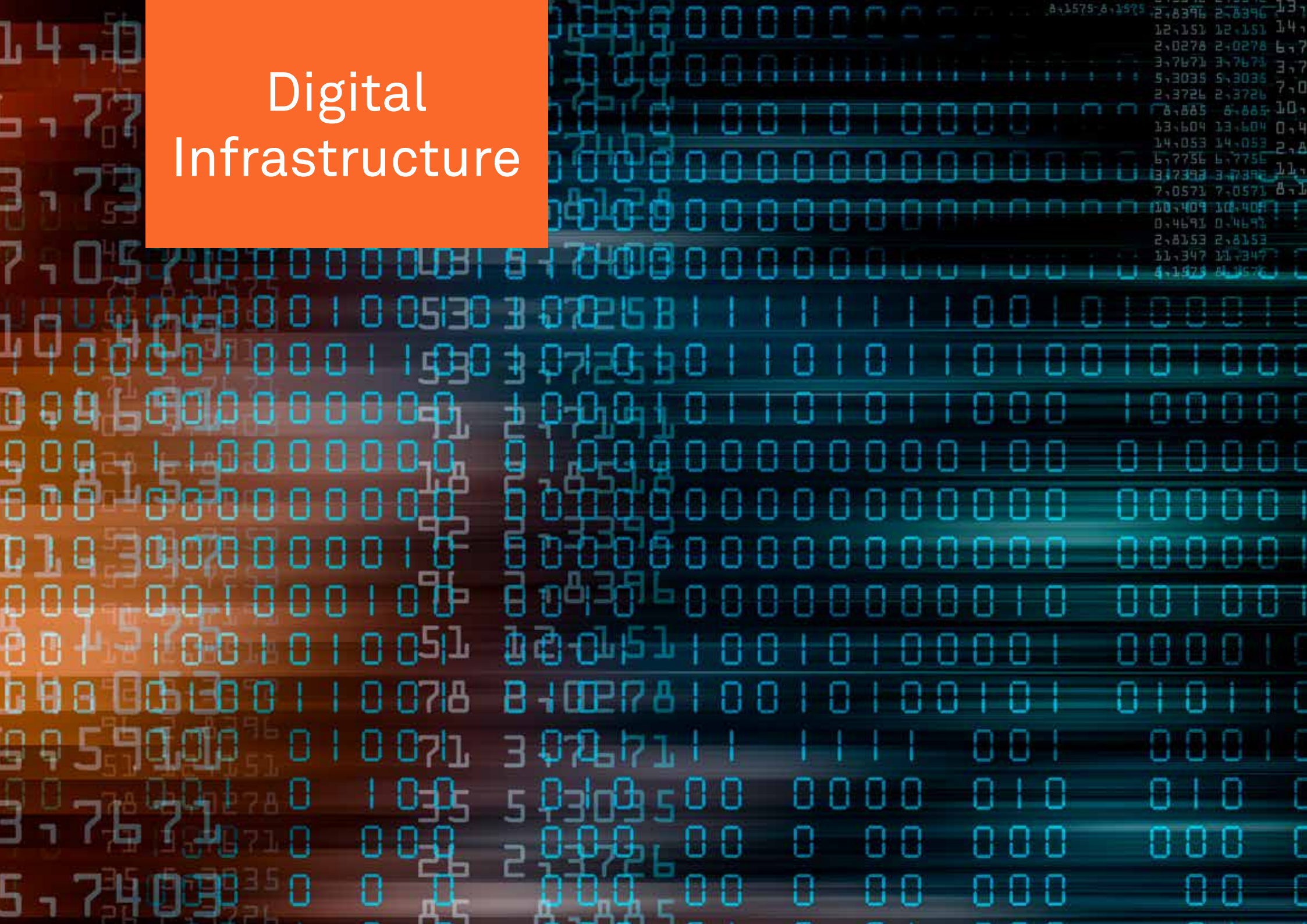
### Surat metro rail project

The Surat metro rail project is being implemented by Gujarat Metro Rail Corporation Limited and is estimated to be built at an at a cost of Rs 12,020 crore. The project will initially have two metro rail corridors with a combined length of 40.35 km. The project is estimated to be completed by end of April 2024. The proposed corridor will have multimodal integration and will have a feeder network of bus, intermediate public transport and non- motorized transport. The project aims to provide affordable, reliable, safe, secure and seamless transport system in the city. This will reduce travel time, pollution, and accidents as well as regulate urban expansion and provide sustainable and eco-friendly transport to commuters and residents.

*[36]States/UTs include Uttar Pradesh, Maharashtra, Gujarat, Telangana, Jharkhand, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Karnataka, Haryana, Punjab, Delhi, Kerala, Odisha, Chhattisgarh, West Bengal, Sikkim, Mizoram, Andaman & Nicobar, Chandigarh and Puducherry. For some projects, year wise phasing has not been provided, so capital outlay for FY 20 to FY 25 will not add up to total capital outlay.*

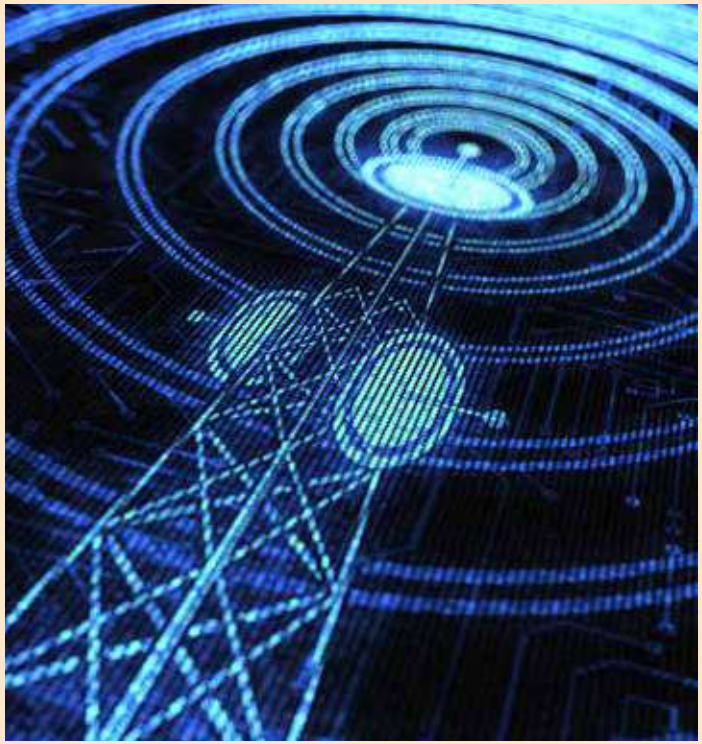
*[37] Includes projects where yearly phasing has not been provided.*

# Digital Infrastructure



# Sector Progress, Deficits and Challenges, Vision and Reforms

## BharatNet



### Project details

- BharatNet, also known as Bharat Broadband Network Limited, is a telecom infrastructure project being implemented by the Department of Telecommunications, Government of India, for establishment, management, and operation of the National Optical Fibre Network
- The objective is to provide a minimum of 100 Mbps broadband connectivity to all 250,000 gram panchayats (GPs or village councils) in the country, covering nearly 625,000 villages, to improve telecommunications
- BharatNet Phase-I, connecting 100,000 village councils covering 300,000 villages, was completed in December 2017 at a cost of Rs 11,000 crore funded entirely by the central government
- Additional work of connecting 26,264 GPs is under progress
- The project is being implemented through CPSUs: BSNL, RailTel and PGCIL. Existing fibre of BSNL is used to lay and the connect new optic fibre cable (OFC) under the project
- CSC e-Governance Services India Limited is responsible for operation and maintenance of BharatNet infrastructure
- BharatNet Phase-II will be implemented under PPP model (with viability gap funding) and will involve lifetime maintenance of the network by the PPP provider

### Salient features

- As of November 30, 2019, the status was as follows:
  - Length of OFC laid: 388,838 km
  - No of GPs where OFC laid: 142,678
  - No of GPs made service-ready (On fibre & satellite) 130,371

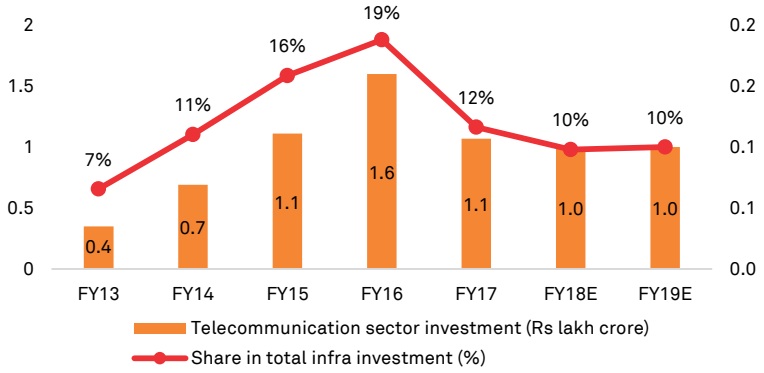
Telecom has attracted large foreign direct investment inflows between fiscals 2015 and 2019, amounting to $ 18.7 billion. Most of the investment has come from private players and the sector has seen a lot of mergers and consolidation in the past two years. India is the second-largest telecom market in the world; yet, large investments are still needed to improve data speeds and service quality.

## Historical investments

In the past decade and a half, telecommunications has been the fastest-growing sector in the infrastructure space. With advancements in technology and increasing affordability of smartphones, the subscriber base has been increasing steadily, thus encouraging investments in this sector.

Over fiscals 2013 to 2017, the share of telecommunications sector investment in the overall infrastructure investment has been ~13%, clocking a CAGR of ~32%. But, lately the sector has seen little investments. (refer Figure 49)

**Figure 49 Telecommunications sector investment (Rs lakh crore) and share in total infrastructure investment (%)**



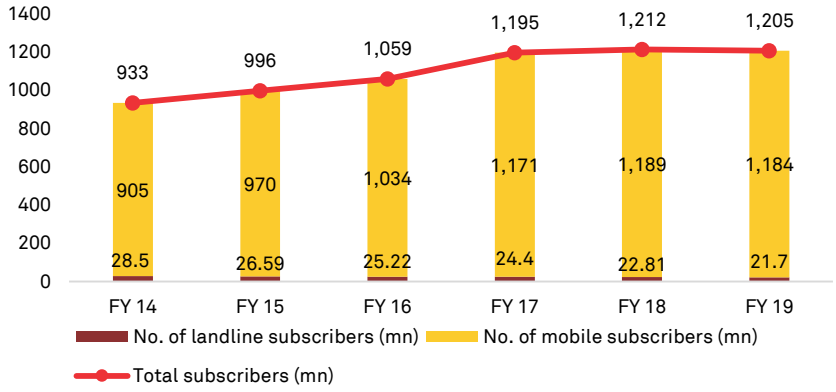

*Source: Appraisal documents for five-year plans, CRIS estimates (Investments mentioned are at Current prices)*

## Telecommunication sector trends

### Telephone and mobile subscribers in India

Between 2014 and 2019, the overall subscribers in India increased to 1,205 million (with 98% mobile subscription), increasing at 5% CAGR. The number of landline subscribers declined at 5.3% annually, while mobile subscribers increased at 5.5% CAGR. As of September 30, 2019, the overall teledensity is 91%. The strong growth in mobile subscription can be attributed to fall in prices of smart mobile handsets and internet data packs (refer Figure 50).

**Figure 50 Trend in telephone and mobile subscribers in India**



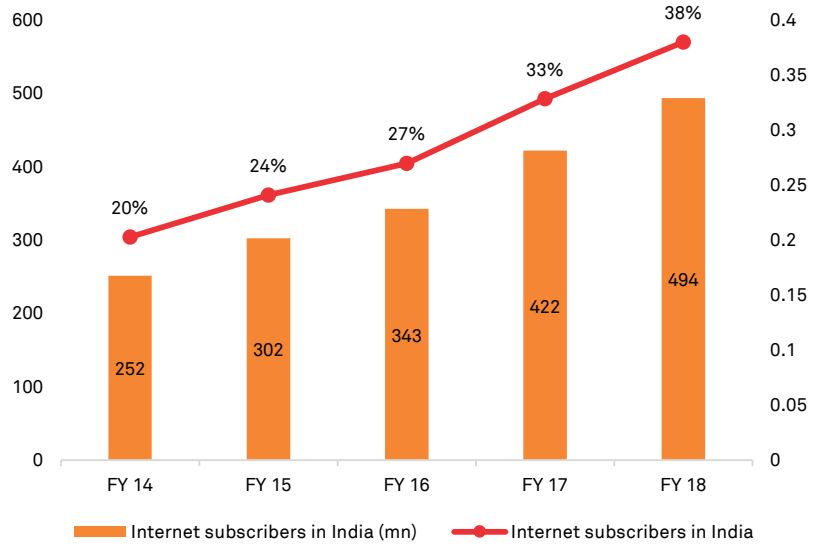

*Source: Telecom Statistics India, Department of Telecommunications*

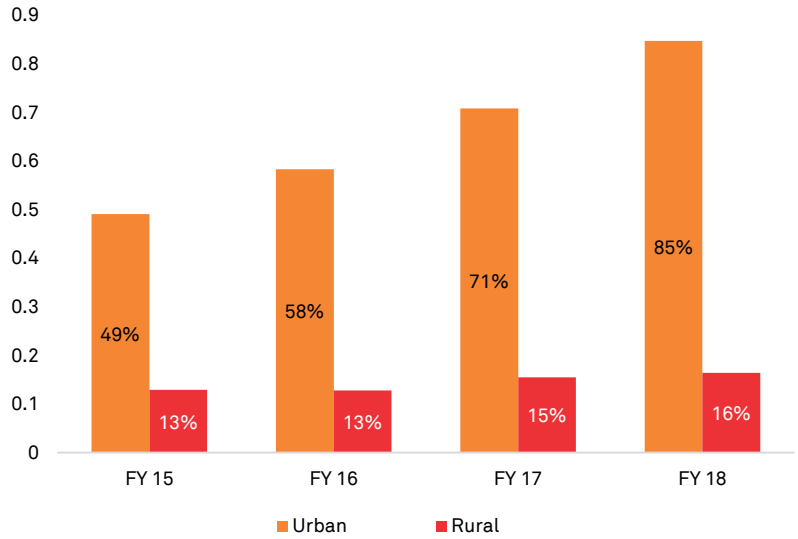
## Internet subscribers in India

Internet subscribers in India grew at a healthy 18% CAGR between 2014 and 2018 to reach 494 million and internet penetration increased from 20.3% in fiscal 2014 to 38% in fiscal 2018. Internet penetration

was higher in the urban areas than in rural areas. As of March 31, 2018, 85% of the urban population was connected to the internet vis-à-vis 16% of the rural population.

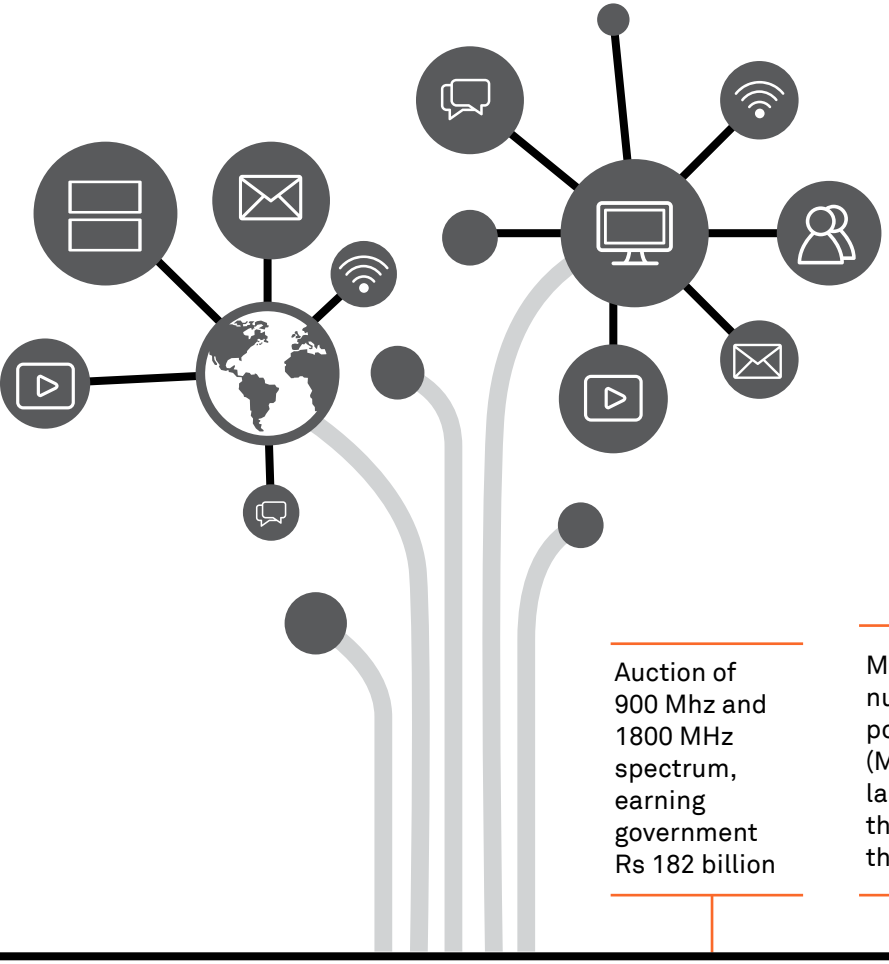
**Figure 51 Trend in internet penetration in India**




*Source: Telecom Statistics India, Department of Telecommunications*

# Digital infrastructure reforms timeline

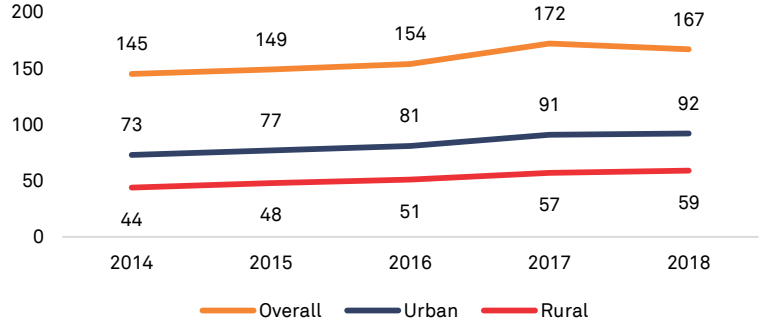


| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 |
|---|---|---|---|---|---|---|
| | Auction of 900 Mhz and 1800 MHz spectrum, earning government Rs 182 billion | Mobile number portability (MNP) launched throughout the country | Auction of 4G airwaves for 700 Mhz band, earning government Rs 324 billion | Consolidation of Indian telecom market, from 14 operators in 2011 to 3 large private players (Bharti Airtel, Reliance Jio and Vodafone Idea) and 1 public player (BSNL) | New digital communication policy approved to create a flourishing digital economy | National Broadband Mission to bridge the digital divide and provide universal access of broadband to all |
| **Teledensity in India (per 100)** | **73** | **77** | **81** | **91** | **92** | **89** |

## Infrastructure deficit in digital sector

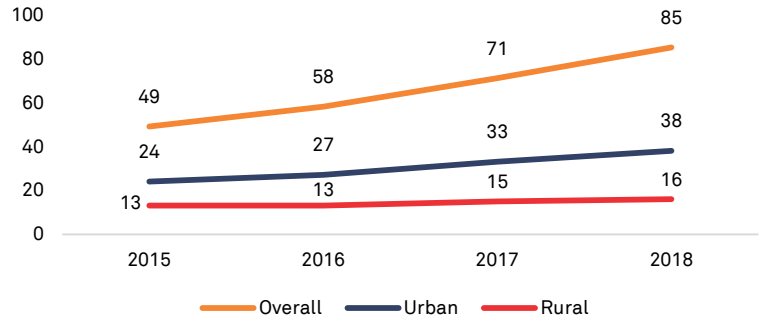
**Lower penetration in rural areas, and low data speeds have restricted leveraging full potential of digital technologies such as Internet of things (IoT), cloud, artificial intelligence (AI)**

**Figure 52 Mobile teledensity in India per 100**




*Source: TRAI*

**Figure 53 Internet subscribers per 100**

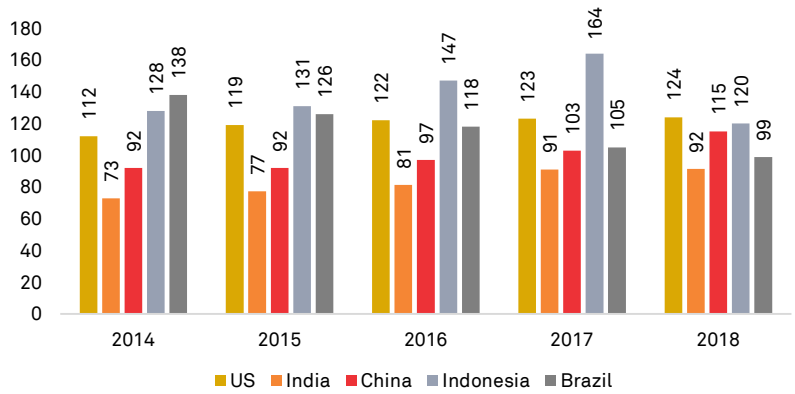



*Source: TRAI*

- Telecom and network connectivity are critical enablers of a nation's socio-economic growth. Though urban India is reaping the benefits of the telecom revolution, rural teledensity is still low

- There is still huge potential to ramp up Internet and broadband penetration in rural areas. Also providing optimal data speeds and quality of service has remained a challenge for industry players in both urban and rural India

**Figure 54 Mobile cellular subscriptions (per 100 people)**

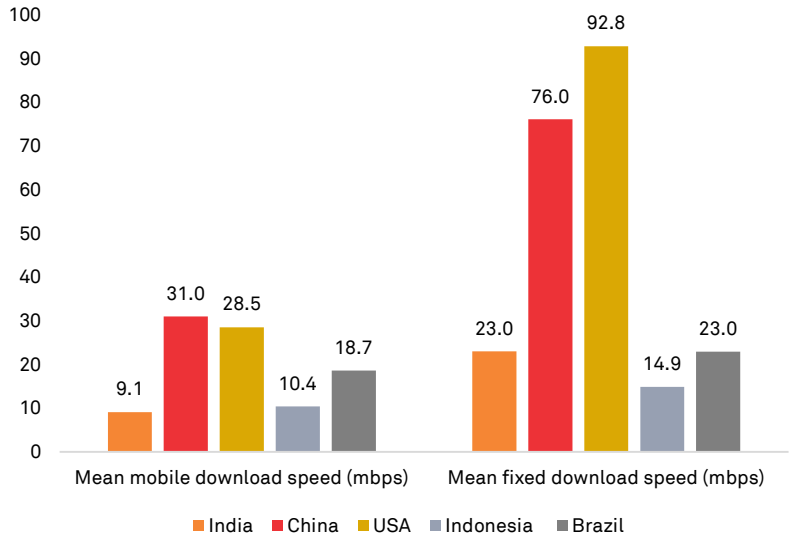



*Source: World Bank*

- Several initiatives have been taken by the Department of Telecommunications to enhance the country's digital ecosystem and to expand digital infrastructure to bridge the urban-rural digital literacy divide

- The corpus from the Universal Service Obligation (USO) Fund can be efficiently utilised to further enhance the country's digital ecosystem

**Figure 55 Data speed comparison 2018**




## Challenges in the digital infrastructure sector

### Broadband connectivity

There is an urgent need to fast track the progress, necessitating fundamental changes in the way we operate, specifically with respect to creation of digital communications infrastructure, which faces several hurdles. This will enable us to reach a stage where digital communications is able to fulfill its potential of becoming a universal platform for equitable and inclusive growth across the country. Several challenges delay the roll out of broadband services to the unserved, underserved, rural and remote regions of India. Investments in infrastructure need to be enhanced and universal last-mile connectivity needs to be promoted.

### Right-of-way issue

Creation of the digital communications infrastructure requires coordination and alignment of the work of multiple stakeholders and agencies - the central ministries and departments, state governments, local/municipal authorities, industry and user communities to achieve the intended objectives. One of the major challenges is implementation of Indian Telegraph Right of Way Rules, 2016. The cost of fibre rollouts remains high in India due to complicated and uncertain right-of-way (RoW) policies across the country.

With continued increase in demand for data, additional telecom towers need to be installed to increase coverage in rural or non-metros and to increase capacity in metros. Currently, India has ~5.5 lakh towers and the industry believes the country will require additional ~1 lakh towers per year over the next 2-3 years to meet the estimated demand. Further, only ~25-30% of telecom towers are fiberized. India will need to fiberise over 50%-60% of its towers (ideally) before launching 5G. This requires quick approval by state authorities for laying fibre, especially in metros and Tier 1 cities. This issue has resulted in continuing delays for operators in setting up the needed infrastructure.

### Stress in the telecom services sector

In recent years there has been an overall decline in gross revenue (GR), adjusted gross revenue (AGR), profit after tax (PAT), average revenue per user (ARPU) of the telecom service providers (TSPs). The debt exposure of the TSPs has been estimated to be Rs 7.7 lakh crore by the Inter-Ministerial Group (IMG) on Financial Stress in Telecom Sector in its report dated August 31, 2017. As of November 30, 2019, the component of deferred payment liability of spectrum auction of the three major private TSPs amounts to about Rs 2.9 lakh crore. Financial leverage ratios have been further impacted by the Hon'ble Supreme Court AGR judgement of October 24, 2019 consequent to

which approximately Rs 135,000 crore towards prior period (2006-07 onwards) licence fee and spectrum usage charges, and interest, penalty and interest on penalty thereon are payable by the TSPs. These dues generally pertain to assessments up till fiscal 2016. Incremental amount since then would also have to be added. Many of the affected TSPs are now no longer in business. The liability of some of the TSPs is significant, thereby placing these companies in a precarious position, considering that a huge amount is required to meet this liability in a very short time – that too when the financials of these TSPs are already stretched. There are serious concerns about the capability and capacity of some of the companies to meet their contractual commitments.

# Vision 2025 for the digital infrastructure sector in India

| Current status | Vision 2025 |
|---|---|
| • India ranks 2nd in terms of mobile phones – 119 crore[38] total mobile subscribers<br>• Internet penetration is 38%[39] in India | • India to rank 1st in terms of mobile phones – 100% of the population connected to internet<br>• Internet penetration of more than 80%<br>• India to have a strong foothold in ICT[40] development by providing high speed connection to gram panchayats and development institutions<br>• Propelling India to the top 25 nations in the ICT Development Index of ITU from 134 in 2017 |
| • > 100,000 gram panchayats have been connected under BharatNet project<br>• Utilisation of BharatNet infrastructure and last-mile connectivity needs to be enhanced | • Universal access of broadband by 2022<br>• Provide seamless connectivity of rural and remote areas, bridging the digital divide<br>• Availability of government services in real time on mobile<br>• Greater financial inclusion and access to quality education and healthcare facilities to remote areas through mobile<br>• Improved utilisation of Bharat Net infrastructure and last- mile connectivity through public private partnership |
| • 4G technology has enabled India to move towards a digital economy by providing faster internet connectivity at affordable prices<br>• Limited penetration of data centres due to stringent regulations and complex processes | • 5G technology will fuel industry growth and innovation, harnessing the power of emerging digital technologies, such as IoT, cloud, AI and big data<br>• Increased penetration of data centres due to better regulatory environment<br>• India to emerge as a data centre hub fuelling growth of Fintech, Payment Gateways, e-commerce, over the top (OTT) sector |

[38] *as of August 31, 2019, Source: Department of Telecom*
[39] *Internet Penetration as of March 31, 2018*
[40] *ICT - Information and Communication Technology*

## Reform imperatives in the digital infrastructure sector

### Improving the performance of BharatNet

The BharatNet project is being implemented in a phased manner to provide broadband connectivity to all the Gram Panchayats (~ 250,000) in the country. The project is under implementation and the infrastructure being created is a national asset, accessible on a non-discriminatory manner for provision of services. The project envisages providing affordable broadband services in rural and remote areas to help realise the vision of Digital India. To overcome the challenges in implementation of BharatNet project, the recommendations of the High Powered Committee may be followed, which has suggested an implementation approach across the BharatNet to assign the work of creating, maintaining and utilising the network to a single entity in the Public Partnership (PPP) Model through Private Sector Partner (PSPs).

### Reforms to improve the health of the digital infrastructure sector

The government has come out with a National Digital Communication Policy (NDCP) 2018 for telecom, a sector with high technology churn and increased capital costs of operations. The key objectives of the policy include providing broadband to all, achieving digital empowerment and improving the well-being of the people. This is in line with the government initiatives such as Digital India. A healthy and vibrant telecom sector is extremely important for the success of these schemes. However, the industry is reeling under a debt of Rs 7 lakh crore, which is reflective of the players' financial stress. Recently the government has provided a moratorium of two years in payment of spectrum charges by the private sector to improve their financial health.

### Pricing of spectrum

- For the upcoming auction of 5G airwaves, the Department of Telecom (DoT) has suggested a base price of Rs 492 crore per MHz. This is very high compared with the base price in countries where 5G is already deployed. The high price comes at a time when the demand for spectrum is likely to be subdued as consolidation has reduced the number of players in the sector to effectively only four. However, providing inclusive and affordable 5G services to all sections of the population in the country is important to achieve the NDCP goals. For this, participation of the private players in the 5G auction should be robust. In order to enable this, the authorities should rationalise all elements of spectrum pricing for the auction, including base price, period of payment of charges and interest rates

### Creation of collaborative institutional mechanism between the Centre, states and local bodies for common right of way (RoW), standardisation of costs and timelines

- With continued increase in demand for data, additional telecom towers need to be installed so as to increase coverage in rural and non-metro cities and to expand capacity in metros. Additional towers take time to be installed mainly due to delay in getting permission from local authorities and other procedural issues. As per industry estimates, an additional 10 lakh towers need to be established and an 30 lakh km of optical fibre cable (OFC) need to be laid by 2025. Typically, about Rs 50 lakh is the required investment for setting up a tower. Around 30% of the telecom towers in India are fiberized. In order to quicken the process of giving RoW permissions, adoption of India Telegraph RoW Rules 2016 by state/ union territory government and central agencies is required. There is an imminent need to develop innovative implementation models for RoW and to work with states/UTs for having consistent policies pertaining to expansion of digital infrastructure

- The sizeable corpus of the Universal Service Obligations (USO) Fund can be utilised more efficiently. The excess funds can

be redeployed to boost schemes such as BharatNet which will facilitate sectoral growth and increase the penetration of broadband connectivity in the country

**Enabling environment for developing data centre infrastructure**

- Growth of the data centre services market is hindered by regulations and complex processes at present. A number of permissions and clearances are required from multiple government departments and agencies which delays setting up of a centre

- Tax incentives or exemptions on select equipment may be provided to help increase investments in data centres. At present there are one-time and recurring taxes that have a significant impact on costs and viability. The data centres are capital-intensive and attract relatively high sales taxes and property taxes. Further, electricity tariff, import duties on equipment sourced from outside India and multi-jurisdiction tax implications impact data centre costs

**Setting up super computer Infrastructure**

Investment in supercomputing is needed if India truly wants to become a knowledge-driven, $ 5 trillion dollar economy in the next five years that can support cutting-edge science and consequently benefit its economy and the businesses.

- High-performance computing is important if India wants to make significant progress in areas such as weather forecasting, drug discovery, astrophysics and bioinformatics. India can learn from China where a number of supercomputers are already deployed to carry out a range of tasks

- As setting up of super computer involves many stakeholders, it should be promoted as a nationally coordinated collaborative programme involving developers and users of supercomputing systems and academic and research institutions

## NIP project summaries and marquee projects

Overall capital expenditure of Rs 309,672 crore would be incurred by both the Centre and states from fiscals 2020-25. For the projects executed by the Centre, about 14 identified projects will be implemented in the period 2020-25. The capital expenditure for these projects is estimated at Rs 304,692 crore. The summary of the projects is highlighted in the table below:

| Category | No of projects | Capex over FY20–25 (Rs crore) |
|---|---|---|
| 4G Project of BSNL and MTNL | 2 | 37,284 |
| Network for Spectrum | 1 | 14,768 |
| BharatNet | 1 | 13,000 |
| Private Player Capex | 2 | 228,000 |
| Others | 8 | 11,640 |
| **Total** | **14** | **304,692** |

- The projects include capex done by BSNL and MTNL to start 4G services, expenditure incurred towards spectrum on a pan-India basis, private players capex, connecting gram panchayats through BharatNet and providing telecom and internet connectivity in border and remote areas.

**The capital expenditure over FY20-25 is shown below:**

| Rs crore | FY20 | FY21 | FY22 | FY23 | FY24 | FY25 | Total |
|---|---|---|---|---|---|---|---|
| Centre | 76,694 | 60,676 | 53,322 | 38,000 | 38,000 | 38,000 | **304,692** |
| States[41] | 1,662 | 1,171 | 1,216 | 719 | 119 | 93 | **4,980** |
| **Overall total[42]** | **78,356** | **61,847** | **54,538** | **38,719** | **38,119** | **38,093** | **309,672** |

## Marquee project

### BharatNet

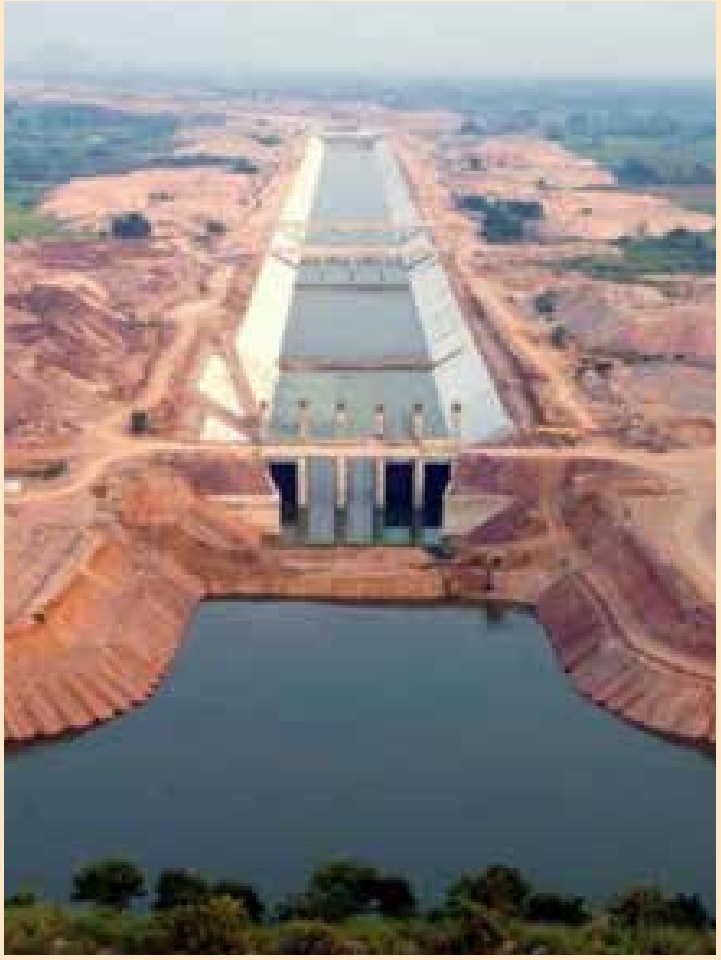
Bharat Broadband Network Limited is currently implementing the BharatNet Project which aims to connect 250,000 gram panchayats in India through broadband using optimal mix of underground fibre, fibre over power lines, radio and satellite media network and provide 100 Mbps of speed to all gram panchayats. The project is being done at a cost of Rs 17,145 crore and is estimated to be completed by fiscal 2022. Capital expenditure of Rs 13,000 crore would be incurred over fiscals 2020-2022 on this project.

*[41]States/UTs include Uttar Pradesh, Maharashtra, Gujarat, Telangana, Jharkhand, Tamil Nadu, Andhra Pradesh, Madhya Pradesh, Karnataka, Haryana, Punjab, Delhi, Kerala, Odisha, Chhattisgarh, West Bengal, Sikkim, Mizoram, Andaman & Nicobar, Chandigarh and Puducherry. For some projects, year wise phasing has not been provided, so capital outlay for FY 20 to FY 25 will not add up to total capital outlay.*
*[42]Includes projects where yearly phasing has not been provided.*

# Irrigation

# Sector Progress, Deficits and Challenges, Vision and Reforms

## Kaleshwaram Lift Irrigation



### Project details

- The Kaleshwaram Lift Irrigation Project is aimed at making Telangana drought-proof by harnessing the flood waters of the Godavari. The project will divert 180 thousand million cubic feet (TMC) of Godavari flood water, first to Sripada Sagar Yellampalli barrage and then to Mallanna Sagar from the Pranahita confluence point
- The project is being built at a cost of Rs 80,190 crore and is the world's largest multi-stage, multi-purpose lift irrigation project. The waters of the Godavari will be tapped by reverse pumping and storage, thereby facilitating agriculture over 38 lakh acres, including the creation of about 18 lakh acres of new area
- The project would help in rejuvenating thousands of tanks, providing water for industries and supplying drinking water to a number of cities, including Hyderabad and Secunderabad, by creating a series of storage tanks and a network of pipelines

### Salient features

- Water is stored in the Godavari via the construction of barrages and reservoirs. This has saved the government from the hassles of land acquisition and resettlement of people
- The world's largest pumping station has been set up underground, with an 81 km tunnel running between Yellampalli barrage and Mallanna Sagar reservoir. The tunnel can carry 2 TMC of water continuously

*Irrigation is critical to food security and economic growth of India. The performance of irrigation systems is of vital importance to farmers who rely on them for crops and livelihood. India has been grappling with water scarcity which calls for investment in efficient water management technologies such as micro-irrigation. There is also a need for private sector participation, for resource augmentation and efficiency.*