Industry and Infrastructure

08
CHAPTER

A higher industrial growth supported by well-connected infrastructure facility is vital for India to maintain the momentum of higher sustainable economic growth. Moderation of industrial growth in 2016-17 can be attributed to decelerated global economic growth, twin balance sheet problem and depressed private investment cycle. Meanwhile, the eight core infrastructure supportive industries have achieved reasonable growth in the same period. The Government has initiated a number of measures in crucial sectors to accelerate higher manufacturing growth and create jobs for millions. The Government's commitment to provide qualitative physical infrastructure has been reflected in global ranking of the World Bank's 2016 Logistics Performance, where India jumped to 36th rank in 2016 from 58th rank in 2014. Although initiatives are being taken for bringing well-structured infrastructure projects, yet some issues continue to constrain the development of road, railways, port, civil aviation, telecom and power sector etc. It is some of these challenges that are discussed in the chapter. The chapter has also attempted to make an initial assessment of the programme Ujwal DISCOM Assurance Yojana (UDAY) in addressing some of the problems with the power sector.

Trends in Industrial Sector

8.1 The Industrial sector in India, including construction, is an important contributor to the growth with the sector accounting for 31.1 per cent of the total Gross Value Added (GVA) in 2016-17. A strong and a robust industrial and manufacturing sector helps in promoting domestic production, exports and employment, all of which can be catalysts for higher growth in the economy.

8.2 As per latest Central Statistics Office provisional data, the overall growth of GVA for 2016-17 is estimated at 6.6 per cent, and the industrial performance has declined from 8.8 per cent during 2015-16 to 5.6 per cent in 2016-17 (Table 1). This is against the background of decelerated overall global economic activity.

8.3 The slowdown of manufacturing sector of the economy can be attributed to the Twin Balance Sheet (TBS) problem (Economic Survey 2016-17 Vol I, Ch.4). The TBS refers to impaired balance sheets of public sector banks due to higher Non-Performing Assets (NPAs) and precarious financial position of corporates slowing down credit offtake, thereby leading to a further slowdown in Gross Fixed Capital Formation (GFCF) and hence industrial growth. Credit to industry in 2016-17 has contracted by 1.6 per cent, while GFCF has slowed down to 2.4 per cent in 2016-17 as compared to 6.5 per cent last year.

Table 1. Gross Value Added Growth Rate at Constant Prices (per cent) 2011-12

	2015-16	2016-17
Industry	8.8	5.6
of which		
Mining & quarrying	10.5	1.8
Manufacturing	10.8	7.9
Electricity, gas, water supply & other utility services	5.0	7.2
Construction	5.0	1.7

Source: **CSO**

8.4 However, industrial growth when seen in terms of Index of Industrial Production (IIP) which is the lead indicator of industrial activity shows positive growth (Table 2). As per the new series of 2011-12, overall IIP grew at 5.0 per cent in 2016-17 as compared to 3.4 per cent last year. The growth for April-May 2017-18 has been 2.3 per cent.

Table 2. Growth as per Index of Industrial Production (per cent) (Base Year 2011-12)

	2015-16	2016-17
IIP General	3.4	5.0
Mining	4.3	5.4
Manufacturing	3.0	4.8
Electricity	5.7	5.8
Use Based Classification		
Primary Goods	5	4.9
Capital Goods	2.1	3.2
Intermediate Goods	1.5	3.4
Construction/Infrastructure Goods	2.8	3.9
Consumer Durable Goods	4.2	5.1
Consumer Non-Durable Goods	2.7	8.5

Source: **CSO**

Table 3. Comparison of Index of Industrial Production growth rates (Base year 2004-05 and 2011-12)

	General		Mining		Manufacturing		Electricity	
	2004-05	2011-12	2004-05	2011-12	2004-05	2011-12	2004-05	2011-12
2012-13	1.1	3.3	-2.3	-5.3	1.3	4.8	4.0	4.0
2013-14	-0.1	3.4	-0.6	-0.1	-0.8	3.6	6.1	6.1
2014-15	2.8	4.0	1.5	-1.4	2.3	3.9	8.4	14.8
2015-16	2.4	3.4	2.2	4.3	2.0	3.0	5.7	5.7
2016-17	0.7	5.0	2.2	5.4	0.0	4.8	4.7	5.8

Source: **CSO**

8.5 With the new base year of 2011-12, there has been an upward revision in IIP growth rates (Figure 1). The two series do not move in the same direction and show a contrasting trend in 2016-17 growth rates. In 2016-17 Q1, the new series showed a rise in growth to 7.8 per cent, while the old series showed deceleration to 0.7 per cent. The new series captured the slowdown in industrial growth in Q3 and Q4 post demonetization, while the old series showed an acceleration in growth in the same period. The improved data is a reflection of expansion of the item basket, the frame of factories and revision of weights in the new IIP series.

8.6 Divergence between GVA (Manufacturing) and IIP (Manufacturing) has reduced with the new series as can be observed from Figure 2. It is also important to note that the difference between GVA (Manufacturing) and IIP (Manufacturing) has reduced to about 3 percentage points as compared to 8 percentage points earlier.

Figure 1. Comparison of growth rates between Index of Industrial Production (General) 2004-05 and Index of Industrial Production (General) 2011-12

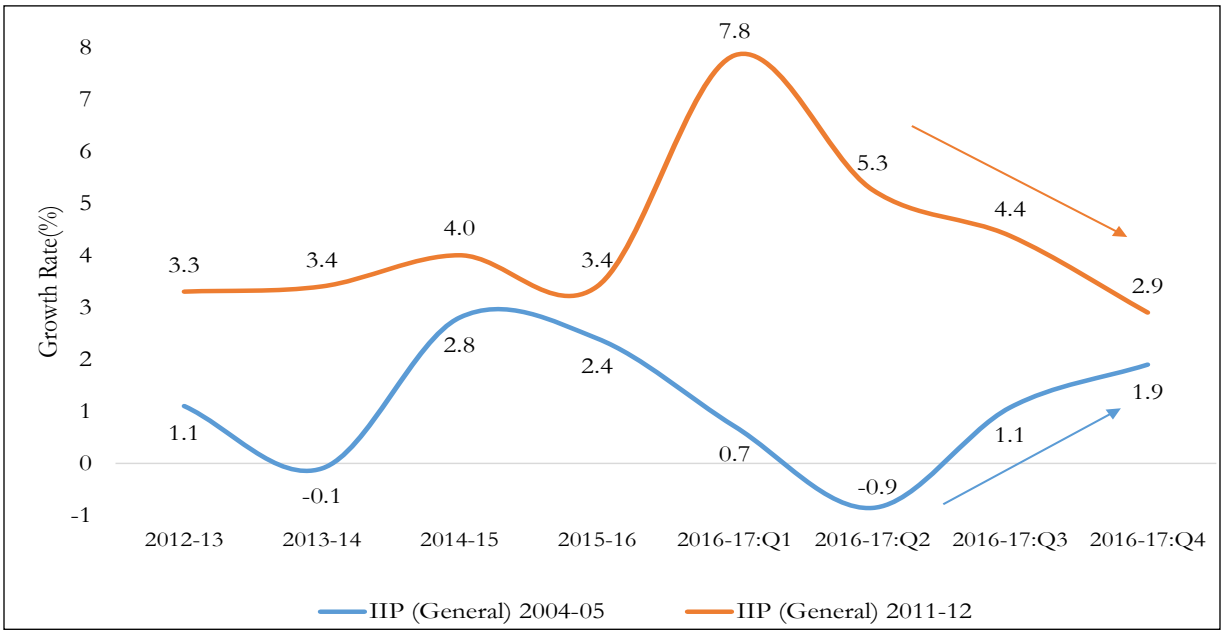
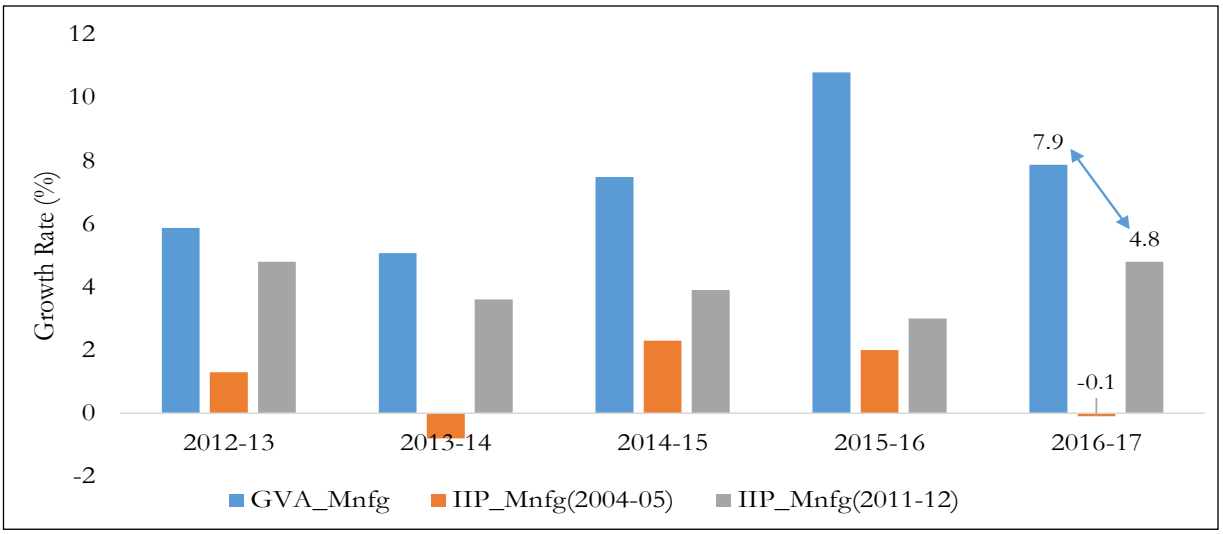


Figure 2. Comparison of Gross Value Added (Manufacturing) and Index of Industrial Production (Manufacturing)



Source: **CSO**

Performance of the Eight Core Industries

8.7 The industries covered in the Index of Eight Core are namely Coal, Crude Oil, Natural Gas, Refinery Products, Fertilizers, Steel, Cement and Electricity. The Base Year of the Index of Eight Core Industries has been revised from the year 2004-05 to 2011-12 from April, 2017 in line with the new base year of Index of Industrial Production (IIP). The Index of Eight Core Industries growth during 2016-17 was 4.8 per cent as compared to 3 per cent in 2015-16 (Table 4). The first two months of 2017-18 has shown a growth of 3.2 per cent. The revised Eight Core Industries have a combined weight of 40.3 per cent in the IIP. Performance of some of the critical sectors is discussed in detail in the chapter subsequently.

Table 4. Growth Rates of Eight Core Industries (Base Year 2011-12) (per cent)

Sector	Weight	2012-13	2013-14	2014-15	2015-16	2016-17
Coal	10.3	3.2	1.0	8.0	4.8	3.2
Crude Oil	8.9	-0.6	-0.2	-0.9	-1.4	-2.5
Natural Gas	6.8	-14.4	-12.9	-5.3	-4.7	-1.0
Refinery Products	28.0	7.2	1.4	0.2	4.9	4.9
Fertilizers	2.6	-3.3	1.5	1.3	7.0	0.2
Steel	17.9	7.9	7.3	5.1	-1.3	10.7
Cement	5.4	7.5	3.7	5.9	4.6	-1.2
Electricity	19.9	4.0	6.1	14.8	5.7	5.8
Overall Index	100.0	3.8	2.6	4.9	3.0	4.8

Source: **Office of the Economic Adviser, DIPP**

Box 1. Changes in new IIP series 2011-12

The basket of goods for Index of Industrial Production has been revised from the base year of 2004-05 to 2011-12. The methodological changes introduced are summarised as below:

The IIP in the new series consists of three sectors i.e. Mining, Manufacturing and Electricity. The new basket consists of 407 item groups with 259 item groups common with the old basket. The weights for the new series at the sectoral level have been calculated using the GVA figures from National Accounts Statistics (NAS) with base year 2011 – 12. Table 1 shows the comparitive weights for two base years at sectoral level.

Table 1. Weights of the New and Old Series of IIP

Sector	Base Year 2004-05	Base Year 2011 - 2012
	Weight (%)	Weight (%)
Mining	14.2	14.3
Manufacturing	75.5	77.6
Electricity	10.3	7.9
Total	100	100

In the revised IIP basket, data on a total of 109 item groups have been collected in value terms rather than in quantities. This is done so as to avoid jumps in data since many of these products have a life span of greater than one month. Such items have been classified as 'work under progress'. The value data collected for these item groups have been deflated using the Wholesale Price Index (WPI) 2011-12 in absence of a Producers Price Index.The Use based classification has replaced Basic Goods with Primary Goods. A new category named Infrastructure/ Construction Goods has been introduced. Weights of the new use based classification as compared to the old one are shown in Table 2.

Table 2. Weights for the New and Old Use Based Classification

	Base Year 2004-05		Base Year 2011-12		
	Item Groups	Weights (%)		Item Groups	Weights (%)
Basic Goods	88	45.7	Primary Goods	15	34.1
Intermediate Goods	106	15.7	Intermediate Goods	110	17.2
Capital Goods	73	8.8	Capital Goods	67	8.2
NA	--	--	Infrastructure/Construction Goods	29	12.3
Consumer Durables	43	8.5	Consumer Goods	86	12.8
Consumer Non-Durables	89	21.3	Consumer Non-Durables	100	15.3
Total	399	100	Total	407	100

Corporate Sector Performance

8.9 The corporate sector sales have shown moderate growth since Q2 of 2016-17. Net profit shows high growth till Q3 (Table 5). However, the last quarter shows a decline in growth of net profits. This decline could be attributed to lower non-operating income for companies, as well as impact of transition to Indian Accounting Standards in line with International Financial Reporting Standards (IFRS).

Table 5. Growth of Sales and Profit 2016-17[1] (per cent)

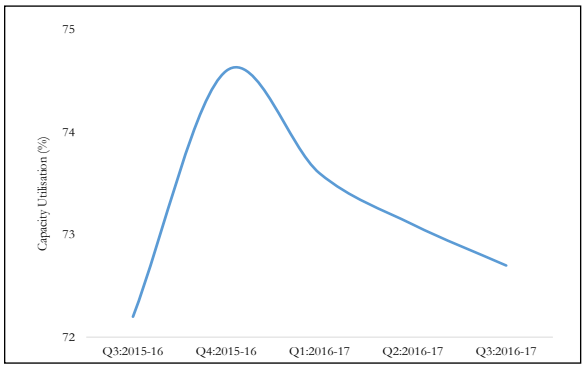
	Q1	Q2	Q3	Q4*
Sales	-1	3.7	4.9	18.8
Net Profits	28.8	27.5	57.5	6.6

Source: **RBI**

***Based on early results of Manufacturing companies available for Q4:2016-17 as of May 18, 2017**

8.10 It is also noteworthy to mention that the capacity utilisation of the manufacturing industries has shown a declining trend since Q1 of 2016-17 (Figure 3). Capacity utilisation depicts the extent to which a manufacturing company uses its installed capacity, which in turn depends on the demand conditions as well as the level of inventory. Lower capacity utilisation reflects a slowdown in industrial activity and investment in the economy.

Figure 3. Capacity Utilisation in Industry (per cent)



Source: RBI

8.11 The industrial slowdown is also reflected in growth of credit to industry. Figure 4 shows that rate of growth of nominal credit to industries turned negative in August 2016, and has remained in the negative territory for most of the period, with a slight upward trend since February 2017. Growth of real credit has also been declining and became negative in July 2016. This may be due to movement of inflation based on the Wholesale Price Index (WPI) in the positive zone since July 2016. Real credit growth has remained negative since then. For the year as a whole, growth in credit flow to industrial sector including mining and manufacturing has declined in 2016-17 to (-) 1.6 per cent as compared to 4.9 per cent in 2015-16. Major sectors which are affected by the low credit disbursal are Power, Telecom, Textiles and Mining and Quarrying.

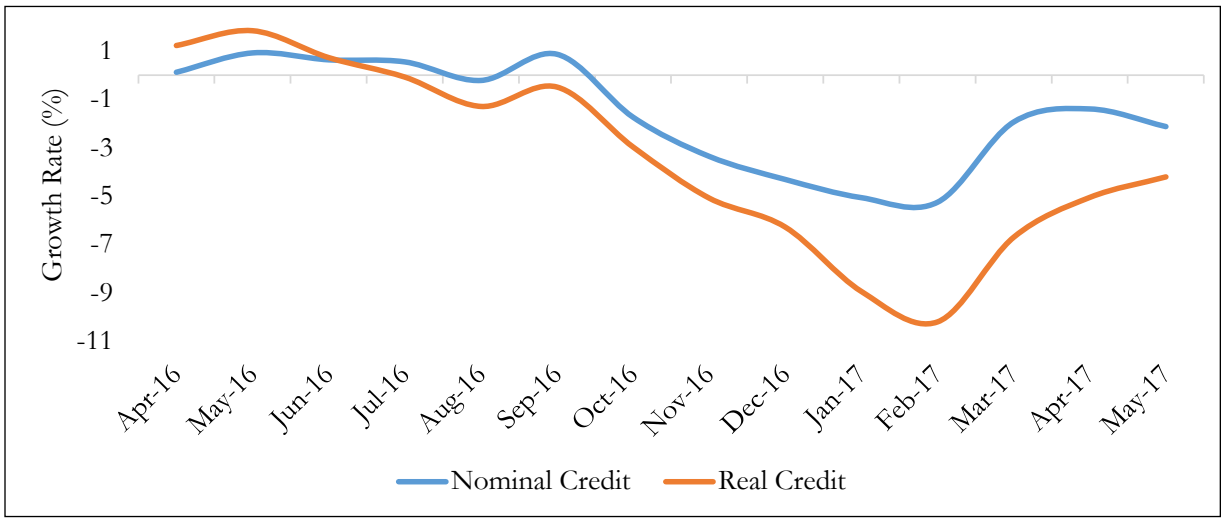
Central Public Sector Enterprises

8.12 The Central Public Sector Enterprises (CPSEs) play a significant role in the growing Indian economy. In 2015-16,165 CPSEs garnered a profit of Rs 1.4 trillion while there were 78 sick CPSEs in the economy, generating a loss of Rs 287.5 billion. The scale of such a magnitude of loss can lead to wastage of fiscal resources resulting in 'crowding out' of private investment. This is significant, especially when the banking sector is already riddled with a large amount of NPAs.

8.13 To address this problem, Department of Public Enterprises has issued guidelines on 07.09.2016 for "Time bound closure of Sick/ Loss Making Central Public Sector Enterprises (CPSEs) and disposal of Movable and Immovable assets". Under the scheme closure of Hindustan Cables Ltd, Tractor Unit of HMT Ltd, Kota Unit of Instrumentation Ltd, Indian Drugs and Pharmaceuticals Ltd,

[1] Number of firms for which the sample is taken- Q1-1808, Q2-1775, Q3-1818, Q4-389

Figure 4. Growth of Nominal and Real Credit (Deflated by WPI) to Industry (2016-17) (Month Wise)



Source: **RBI**

Rajasthan Drugs and Pharmaceuticals Ltd. National Jute Manufactures Corporation Ltd and Bird Jute Exports Ltd has been initiated.

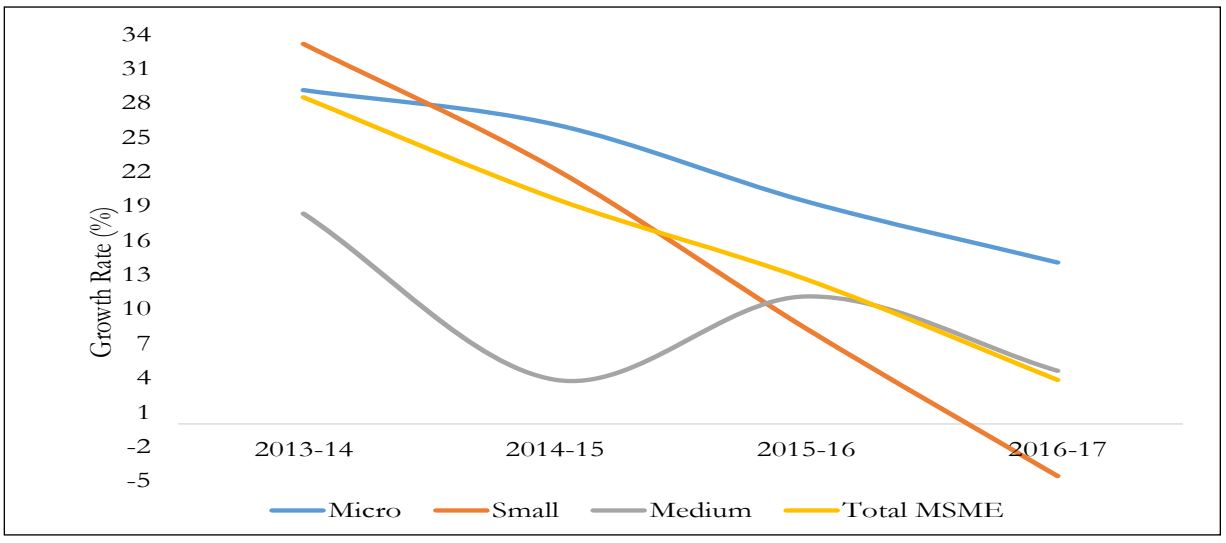
Sector- wise Issues and Initiatives

MSME Sector

8.14 The Micro, Small and Medium Enterprises (MSME) sector in India plays a crucial role by providing large employment opportunities, industrialization of rural areas, reducing regional imbalances etc. The MSME sector contributed 33% of industrial GVA and 31% of industrial Gross Domestic Product (GDP) at constant prices (base 2011-12).

8.15 The sector faces problems in terms of getting adequate, cheap and timely availability of institutional credit. Figure 5 shows that rate of growth of credit to MSME sector as a whole, as well as sectorally to Micro, Small and Medium enterprises has been declining, and is negative for Small enterprises in 2016-17. The decline in credit to MSME sector can be attributed to deteriorating health of public

Figure 5. Rate of Growth of Total Credit to Micro Small and Medium Enterprises (per cent)



Source: **RBI**

sector banks due to piling up of NPAs.

8.16 In order to tackle this problem, Ministry of Micro, Small and Medium Enterprises along with Reserve Bank of India (RBI) have been continuously monitoring the progress of credit devolved to MSME sector. Recently RBI has brought some changes in priority sector lending guidelines for MSME Sector by including a sub-target of 7.5% of Adjusted Net Bank Credit for lending to 'Micro' enterprises. The Government has also initiated the Pradhan Mantri Mudra Yojana for development and refinancing activities relating to micro industrial units. The purpose of MUDRA is to provide funding to the non-corporate small business sector. The Government has also set up Micro Units Development and Refinance Agency (MUDRA) Bank.

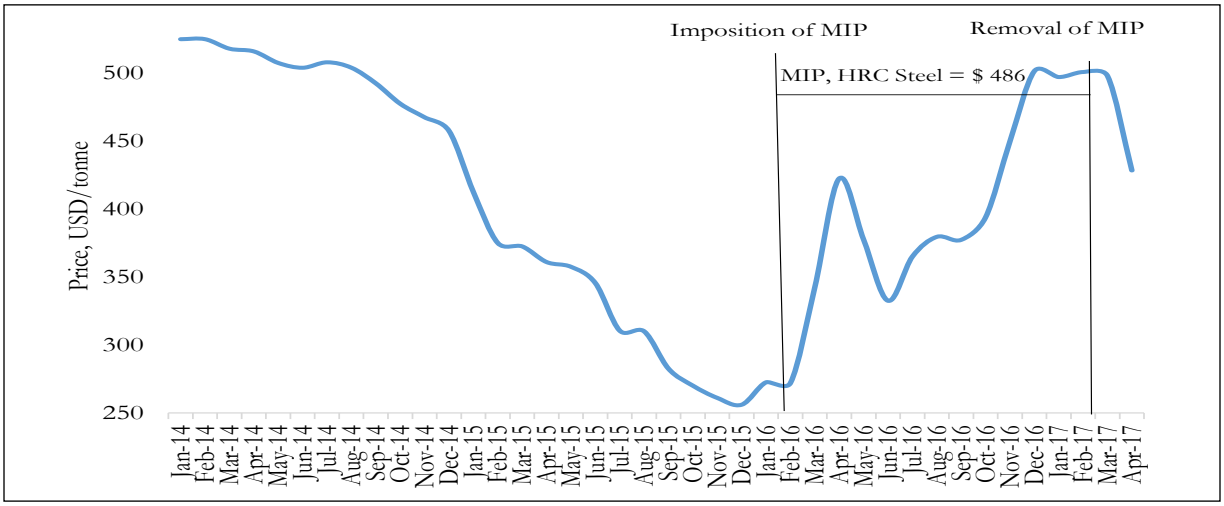
Steel sector

8.17 The steel sector is one of the core industries in the economy. India is the 3rd largest producer of Steel in the world. The domestic production of total finished steel in 2016-17 has been 101.3 million tonnes as compared to 91 million tonnes in 2015-16.

8.18 In the backdrop of China's recent economic slowdown, the global steel industry has faced major distress due to decline in global demand including China's demand for steel. In addition, excess capacity in steel production led to dumping of steel by China, South Korea and Ukraine into Indian markets at low prices. In response to this, the Government in 2016, introduced a host of measures like raising Basic Customs Duty, imposition of Minimum Import Price (MIP) and anti-dumping duties in order to shield the domestic producers. The Indian Government notified the Minimum Import Price of steel in February 2016 for a period of one year (Figure 6).

8.19 These steps taken by the Government have borne fruit. During 2016-17 imports of steel have declined, while exports of steel have doubled (Table 6). It is interesting to note that Indian exports of steel have been growing amidst a stable exchange rate of the rupee. The rise in exports of steel may also wipe away the excess capacity built up in the steel sector. Due to rise in demand for steel globally and slowdown in imports, domestic production of steel has risen by 11 per cent after accounting for the possible excess capacity in the sector.

Figure 6. Price of Hot Rolled Steel in China, Minimum Import Price of Hot Rolled Steel in India (USD/tonne)



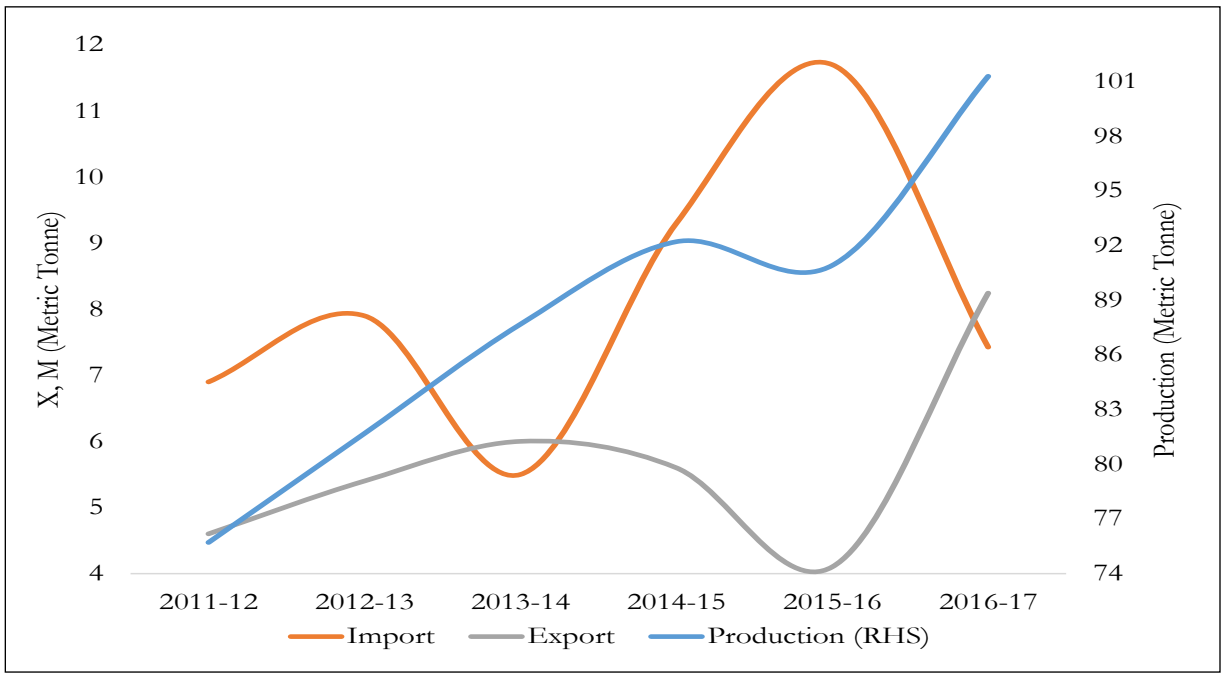
Source: **Joint Plant Commitee, Ministry of Steel.**

Table 6. Production, Import &Export of Finished Steel

	2015-16	2016-17	Growth (%)
Production (mt)	91	101.3	11.3
Import (mt)	11.7	7.4	-36.6
Export (mt)	4.1	8.2	102.1
mt - metric tonne			

Source: **Joint Plant Committee, Ministry of Steel.**

Figure 7. Production, Import, Export of Steel for 2011- 2016 (Metric Tonne)



Source: **Joint Plant Committee , Ministry of Steel.**

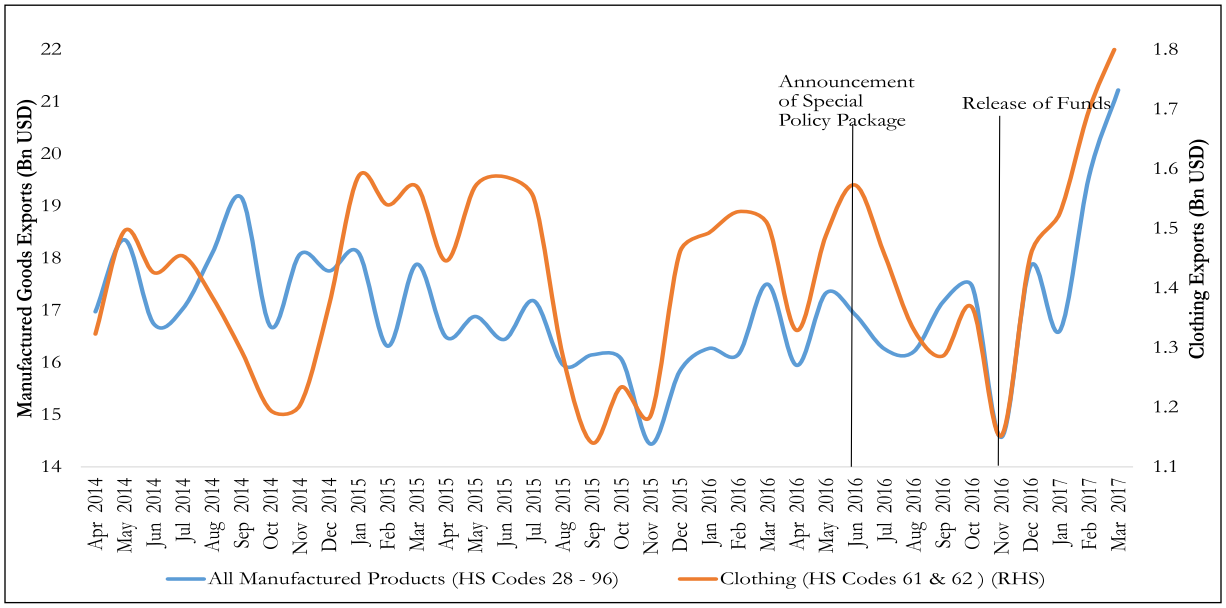
Clothing and Textiles Sector

8.20 The Apparel sector is a highly employment intensive industry especially for women. In the perspective of China losing share in the global market for exports in the apparel sector on account of rising costs of production, the time is ripe for India to make forays into this market. However, various challenges exist before India can reap the benefits of this situation. India's competitors like Bangladesh and Vietnams' exports have duty free access to markets of USA, EU and Japan. Other challenges include, high domestic taxes on man-made fabrics vis a vis cotton based fabrics; stringent labour regulations; and high logistics cost.

8.21 To address these constraints, the Government on 22nd June 2016 approved Rs.6,000 crore special package for textile & apparel sector to boost employment creation, exports and investment. Among other incentives, the subsidy under Amended Technology Upgradation Fund Scheme (ATUFS) was increased from 15% to 25% for the garment sector. A unique feature of the scheme is to disburse the subsidy only after the expected jobs are created.

8.22 A major component of the package announced for the textile and clothing sector is the Rebate on State Levies (ROSL)

Figure 8. Exports of Clothing and Manufactured Goods (US$ billion) (April 2014- March 2017)



Source: **Ministry of Commerce and Industry data**

Scheme. Disbursement under the scheme has been released to exporters in the month of November 2017. Figure 8 shows the exports of clothing and manufactured goods (Bn USD). Post the release of funds, it may be observed that there has been a marked rise in clothing exports, which is in fact more than overall growth in manufactured exports.

Leather and Footwear Sector

8.23 Just like the clothing sector, the leather and footwear sector is a highly employment intensive sector with lower capital requirements. With China ceding space, it is a favourable time to promote the footwear industry. However, many challenges persist. The global demand for footwear is moving towards non leather footwear, while Indian tax policies favour leather footwear production. India faces high tariffs in partner country markets in exports of leather goods and non-leather footwear.

8.24 In order to address these challenges, as also mentioned in the Economic Survey, 2016-17 (Vol I-Chapter 7), the Government has announced a special package for the leather sector in the Budget of 2016-17, the benefits of which will be visible in due course. Implementation of GST is expected to rationalize discrimination against non-leather footwear.

Foreign Direct Investment

8.25 Foreign Direct Investment (FDI) is an enabler of economic growth since it enhances productivity by bringing capital, skills and technology to the host country. In 2016, the Government has brought most of the sectors under automatic approval route, except a small negative list comprising atomic energy, manufacture of cigars and tobacco, real estate business, lottery, gambling and chit fund etc. With these changes, India is now one of the most open economy in the world for FDI. The Government has also abolished Foreign Investment Promotion Board (FIPB) as most of the sectors are under the automatic route now.

Table 7. Foreign Direct Investment (US$ billion) (2012 to 2016)

Year	FDI in Manufacturing	FDI in Services
2012-13	10.3	4.8
2013-14	15.6	2.2
2014-15	16.5	4.4
2015-16	13.4	6.9
2016-17	20.3	8.7

Source: **DIPP**

8.26 The measures taken by the Government has resulted in FDI equity inflow of 43.4 Billion USD in Financial Year 2016-17, which is not only an increase of 8 per cent over previous year but also highest ever FDI Equity inflows. Table 7 shows FDI Inflow segregated into Manufacturing and Services sectors respectively for the years 2012-13 to 2016-17. It can be observed that FDI in Manufacturing is substantially higher than FDI in Services. In terms of the sectors receiving FDI equity inflows, Services (Finance, Banking, Insurance etc.) sector received the highest FDI(19.9%) followed by Telecommunications (12.8%) and Computer Software & Hardware (8.4%). Looking at the source countries of FDI inflows, it may be noted that Mauritius, Singapore and Japan have been top three countries in India contributing 36.2 per cent, 20.0 per cent and 10.8 per cent respectively of the total FDI equity inflows during 2016-17.

Implementation of GST and its impact on Industry

8.27 The GST is a game changing reform introduced by the government. It is expected that implementation of GST will facilitate the creation of one common market in the country by removing tax barriers; eliminate cascading of taxes thereby reducing cost of production of manufacturing goods; and enhance ease of doing business by cutting down transaction costs associated with the complex tax regime. The implementation of GST is also going to cover the unorganized sector industries.

Key initiatives taken by the Government to boost industrial performance

Make In India

8.28 The 'Make in India' programme has been launched globally on 25th September 2014 which aims at making India a global hub for manufacturing, research & innovation and integral part of the global supply chain. This initiative is based on four pillars of New Processes, New Infrastructure, New Sectors and New Mindset.

Startup India

8.29 Startup India is a flagship initiative of the Government of India, intended to build a strong eco-system for nurturing innovation and Startups in the country that will drive sustainable economic growth and generate large scale employment opportunities. The Government through this initiative aims to empower Startups to grow through innovation and design.

Ease of Doing Business

8.30 The Government has taken up a series of measures to improve Ease of Doing Business. The emphasis has been on simplification and rationalization of the existing rules and introduction of information technology to make governance more efficient and effective. The "distance to frontier" (DTF) score measurement used by the World Bank to ascertain the distance between each economy and the best performance in that category has improved for seven of the 10 indicators in the World Bank's Doing Business report-2017, released in October, 2016. States too have been brought on board in the process to expand the coverage of these efforts.

Intellectual Property Rights (IPR) Policy

8.31 In May, 2016, Government for the first time adopted a comprehensive National Intellectual Property Rights (IPR) policy to lay future roadmap for intellectual property.

This aims to improve Indian intellectual property ecosystem, hopes to create an innovation movement in the country and aspires towards "Creative India; Innovative India" "रचनात्मकभारत; अभिनवभारत".

Objective of this policy is to increase IPR awareness; stimulate generation of IPRs; have strong and effective IPR laws; modernize and strengthen service-oriented IPR administration; get value for IPRs through commercialization; strengthen enforcement and adjudicatory mechanisms for combating IPR infringements; and to strengthen and expand human resources, institutions and capacities for teaching, training, research and skill building in IPRs.

8.32 A Cell for Intellectual Property Rights Promotion and Management (CIPAM) has been created under the aegis of Department of Industrial Policy and Promotion (DIPP) for addressing the 7 identified objectives of the Policy. An MOU has also been signed with U.K, Singapore and E.U in the field of Intellectual Property Trademark. Pendency in awarding patents has also come down from 3 months in 2015-16 to 1 month by the end of Financial Year 2016-17. In addition to this, India's rank in Global Innovative Index has gone up from 81 in 2015 to 66 in 2016.

Infrastructure Sector Performance - Issues and Initiatives

"You and I Come By Road Or Rail, But Economists Travel By Infrastructure"

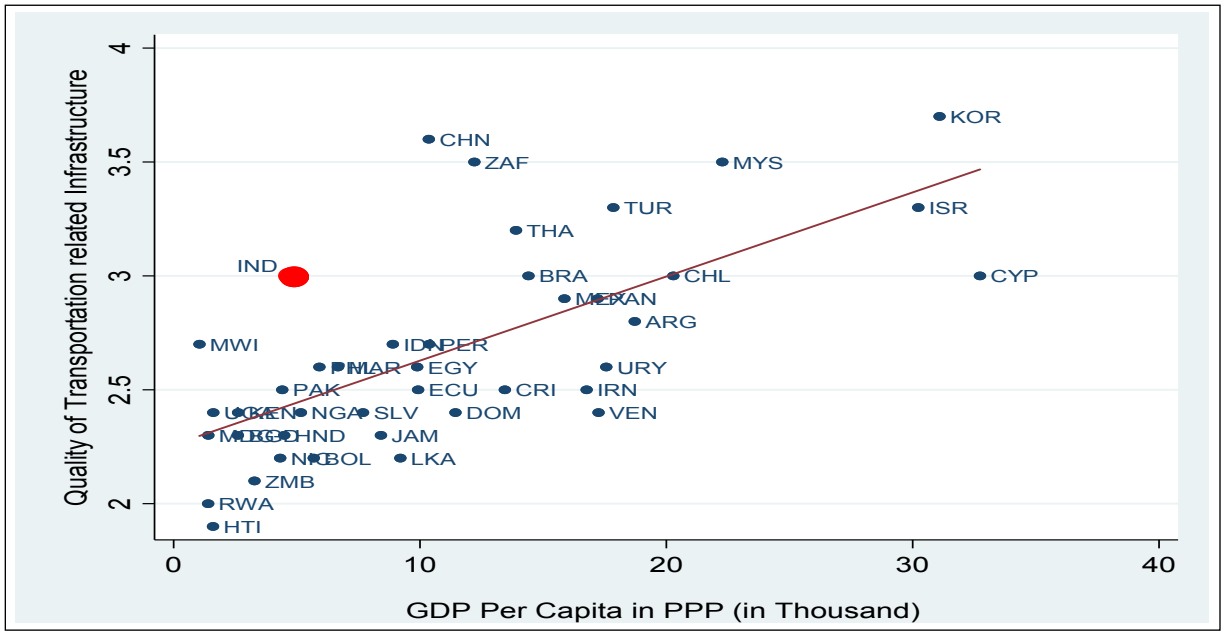
– Margaret Thatcher

8.33 To maintain the momentum of higher economic growth and to satisfy the expectations of all the diversified stakeholders of an emerging economy like India, it is indispensable to invest more on infrastructure sector. The Government is committed to invest more on qualitative infrastructure with an aim to make India an advanced, inclusive and a just economy. As per global ranking of the World Bank's 2016 Logistics Performance, India jumped to 36th rank in 2016 from 58th rank in 2014 in terms of providing qualitative physical infrastructure, which is quite remarkable achievement. The infrastructure sector is still facing multiple issues, for which the Government has adopted a multi-pronged strategy to address them through various schematic interventions like UDAN and Bharatmala.

8.34 This chapter has made an assessment of UDAY in terms of its contribution in improving the health of power distribution companies. The chapter has also highlighted some issues in the critical sector like civil aviation with a positive outlook.

8.35 World Bank has rightly pointed out that 'infrastructure development is critical to delivering growth, reducing poverty and addressing broader development goals. In a developing country like India, it is imperative to increase investment in infrastructure considering the infrastructure deficit in India to sustain a high economic growth momentum. A safe, inter connected and qualitative infrastructure is the key driver of growth and per capita income. Among emerging countries with same level of per capita income, India has performed significantly better in constructing qualitative infrastructure. Figure 9 shows how the quality of trade and transportation related infrastructure like road, railways, port and information technology has a positive relationship with the GDP per capita in emerging economies. In contrast to popular belief, though India's per capita income is low, India is far ahead of many emerging economies in terms of providing qualitative transportation related infrastructure (Figure 9).

Figure 9. Infrastructure Status in Emerging Countries (2007-2016)



Source: **World Bank's Logistics Performance Index, 2016-17 and World Development Indicators, World Bank.**
Note: **The full names of the emerging countries are in Appendix 1**

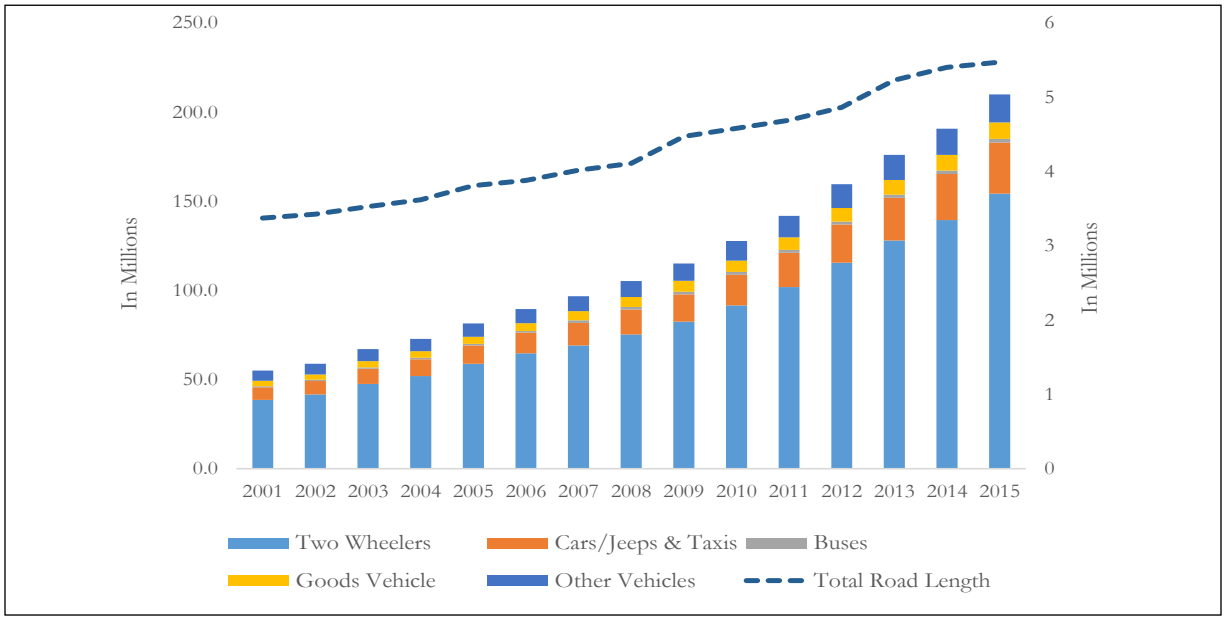
8.36 Both physical and social infrastructure has a big role in transforming the natural and human capital for the prosperity of society. The benefit of interstate trade and the success of 'Make in India' and other initiatives can only be gained, with the improvement of both hard and soft logistics infrastructure. Undoubtedly around the world, physical infrastructure like road, railways, port, civil aviation, telecom etc., have always opened up a range of new opportunities for developing the economy. In this backdrop, the following sections discuss the performance & issues in different infrastructure sectors.

Road

8.37 India has about 54.8 lakh kilometers of road network, which is the second largest in the world. As on 31st March, 2017, out of total road network the length of national highways comprises 1,14,158 km with 1,61,487 km of state highways and 52,07,044 km of other roads. In 2001 total road length was 33,73,520 km with total number of 55 million vehicles on the roads. In 2015, total road length increased to 54,72,144 km while the total number of motor vehicles grew by four times to 210 million. The composition of vehicle shows that the share of two wheelers and passenger cars, jeep & taxis has increased on Indian road while the share of public transport like buses and also goods vehicles contracted over the period (Figure 10). Both the two wheelers and passenger cars are putting pressure on Indian roads.

8.38 Realizing the need, the Government is developing more roads and taking a lot of major initiatives/programmes like National Highways Development Projects (NHDP), improvement of road connectivity in Left Wing Extremism (LWE) affected areas, Special Accelerated Road Development Programme for North-Eastern region (SARDP-NE), National Highway Interconnectivity Improvement Programme (NHIIP) under proposed World Bank Loan Assistance, and Bharatmala programme.

Figure 10. Road Network and Composition of Vehicle in India



Source: **Ministry of Road, Transport & Highways**

Note: **Total Road Length in RHS.**

8.39 The Government had proposed "Bharatmala Programme" with a view to develop the road connectivity to Border areas, development of Coastal roads including road connectivity for Non Major ports, improvement in the efficiency of National Corridors (the NHs developed under various phases of NHDP), development of Economic Corridors/ Feeder routes, removal of choke and congestion points, construction of ring roads, logistics parks, etc. The Government has initiated separate programme 'Setu Bharatam' in 2016 for construction, rehabilitation & widening of 1500 major bridges and 208 Railway Over Bridges (ROBs) / Railway Under Bridges (RUBs) on National Highways.

8.40 In the year 2016-17, around 88% of the projects involving around Rs 1,00,000 crores of investment have been appropriately re-engineered and restructured by proactive policy interventions and rigorous monitoring by the Ministry of Road, Transport and Highways (MORTH) and National Highways Authority of India (NHAI). This sector is still facing constraints like availability of land for NH expansion and upgradation; significant increase in land acquisition cost; lack of equity with developers; too many bottlenecks and checkpoints on NHs which could adversely impact benefits of GST; higher cost of financing; and lesser traffic growth than expected shortfall in funds for maintenance.

Railways

8.41 Among different modes of transportation, Railways is still preferable means for majority of Indians for long distance travel. During 2016-17, Indian Railways (IR) carried 1106.6 million tonnes of revenue-earning freight traffic (P), as against 1101.5 million tonnes during 2015-16 translating into an increase of 0.5 per cent. However, during 2016-17, freight earnings at Rs.104339 crore (P), registered a negative growth of 4.5 per cent over 2015-16 due to carrying larger volume of low fare freight in the year. Passenger earnings at Rs.46280

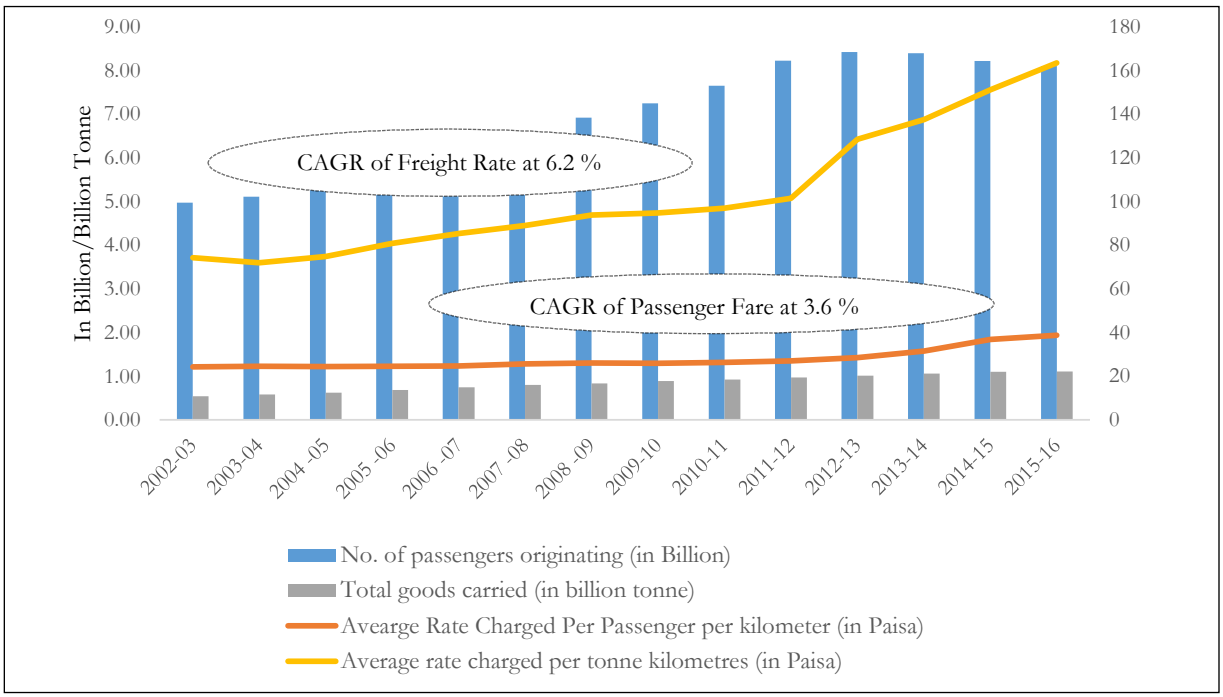
crore (P) registered an increase of 4.5 per cent during 2016-17.

8.42 After a consistent rise from 2002-03 to 2012-13, the number of passengers travelling by train has started declining since 2013-14 while the freight traffic has increased over the years. However, during 2002-03 to 2015-16 while the passenger fare increased at a CAGR of 3.6 per cent, the freight fare increased at a CAGR of 6.2 per cent (Figure 11). Thus passenger fare has remained more or less flat, the freight fare has increased sharply since 2012-13.

8.43 The recently introduced dynamic pricing model is aimed at enhancing higher passenger revenue without compromising on the passenger volume. For generating revenue, the Railways should go for more non-fare sources along with station redevelopment and commercially exploiting vacant buildings at the station, monetizing land along tracks by leasing out to promote horticulture and tree plantation, and through advertisement and parcel earnings.

8.44 In order to provide safe, secured and comfortable journey to passengers and attract more freight to be transported through rail, the Government has taken a number of steps like implementation of Safety Action Plans to reduce accidents caused by human errors; computerized Passenger Reservation System (PRS); Unreserved Ticketing System (UTS) through Smart card based Automatic Ticket Vending Machines (ATVM); fitment of Bio-toilets in order to improve cleanliness/ sanitation in Indian Railways(IR); and electrification of the railway tracks with a view to make the Railway System more eco-friendly. As on 01.04.2017, 30,012 route kilometers (RKM) have been electrified which is 45% of the total network length of 66,687 route kilometers. During 2016-17, all-time record of 2,013 RKMs have been electrified against the target of 2000 RKMs.

Figure 11. Comparison of Passenger Fare and Freight Fare



Source: **Railways Statistical Year Book, MOSPI and Ministry of Railways**

Note: **Average Rate charged per passenger per kilometer and per tonne kilometers in RHS**

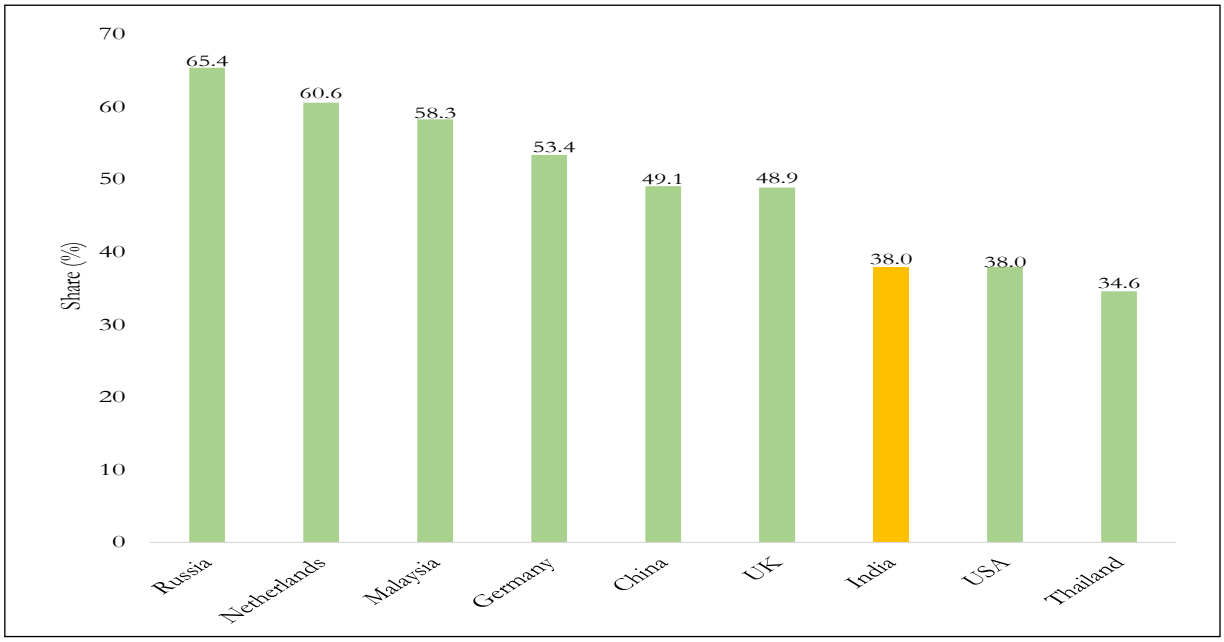
Civil Aviation: ***Are Indian Air Carriers taking off?***

8.45 The civil aviation is a potential sector in the country which can be a sunrise sector of growth. Our country has favorable conditions which are highly conducive for the sector's growth i.e. favorable demographics, a rising middle class population, high disposable incomes, and faster economic growth. Since 2001, domestic air passengers have increased 6 fold to 85.2 Million, while passengers travelling internationally have risen 4 fold to 49.8 Million in 2015.

8.46 Despite a strong home market for air travel, Indian (domestic) airlines have not captured the Indian market for international travel unlike many other countries. Figure 12 shows that Indian (domestic) airlines are utilising only 38 per cent of its international Available Seat Kilometres (ASKs) in 2016 compared to 60.6 per cent for Netherlands, 49.1 per cent for China and 48.9 per cent for UK. ASKs refer to the sum of the products obtained by multiplying the number of seats available for sale on each flight by the corresponding distance flown by the flight. In other words, Indian (domestic) airlines have not been able to carry out import substitution in the case of international air travel services to and from India.

8.47 In terms of passenger load, Indian (domestic) airlines carry only 36.6 per cent of international traffic to and from India in 2015 (Figure 13). It is surprising that a bulk of Indian traffic (to and from) are serviced by foreign airlines. Among foreign carriers, the countries of the Gulf and some of the South East Asian nations have proven to be our major competitors (for countries' names see footnote to Figure 13). The share of Gulf carriers in Indian traffic increased from 27 per cent in 2008 to 33 per cent in 2015. The share of the South East Asian countries increased over two times from 5.9 per cent in 2008 to 12.3 per cent in 2015.

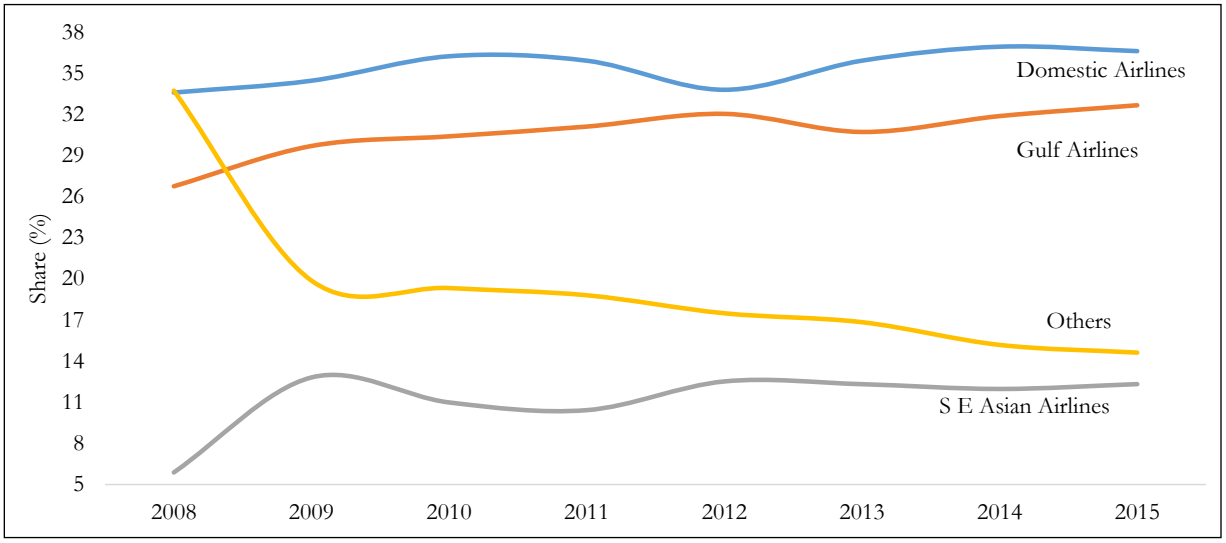
Figure 12. % Share of scheduled international ASKs* flown by home-country airlines (2016)



Source: **IATA**

***ASKs refer to the sum of the products of the number of seats available for sale on each flight multiplied by the corresponding distance flown by the flight. ASKs are a measure of supply of aviation service.**

Figure 13. Share of International Passengers flown (to and from India), airline wise* (per cent)



Source: **DGCA data**

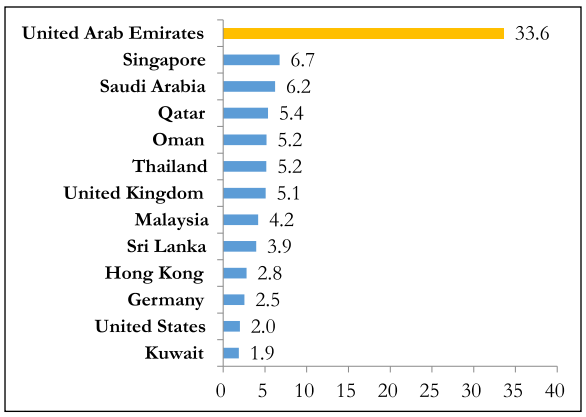
***Gulf Airlines include UAE, Bahrain, Oman, Qatar, Saudi Arabia, Kuwait; SE Asian Airlines include Singapore, Malaysia, Thailand & Hong Kong**

What can be the explanation for low share of Indian airlines in Indian origin international traffic?

A. Round Tripping of Passengers via international hubs of Dubai and Singapore, utilization of the 6th freedom of the air and increase in capacity entitlements under Bilateral Air Service Agreements (ASAs)

8.48 Figure 14 shows that top destinations of passenger traffic to and from India are the Gulf countries of UAE, Saudi Arabia, Qatar, Oman and the South East Asian countries of Singapore, Malaysia and Thailand. UAE alone accounts for 33.6 per cent of the total passenger flows. However, these countries are not the end destinations of all passengers. In fact, these countries are invariably being used as stop-overs/ hubs by their respective home airlines to carry passengers for onward destinations of USA, Canada, Europe etc. This is the 6th freedom of air which allows foreign airlines to fly from a foreign country to another while stopping in one's own country. The 6th freedom has to a large extent been responsible for reducing the share of direct long haul flights for Indian carriers from 25 per cent in 2011-12 to 20.5 per cent in 2015-16.[2]

Figure 14. Destination Wise Share of Passengers to and from India (per cent) (2015)



Source: **DGCA Data**

8.49 Table 8 shows the total number of passengers flown by foreign airlines to their respective countries segregated into point to point traffic (i.e. direct traffic between India and the foreign country), and the 6th freedom traffic. The percentage of sixth

[2] Source: DGCA Database & Survey calculations; Definition of long haul flight taken to be greater than 4000 km.

freedom traffic for most of the Gulf and South East Asian airlines is greater than 50 per cent. For countries of Qatar and UAE, this figure is greater than 60 per cent. This large utilization of the 6th freedom in turn has been made possible due to expansion in capacity entitlements under Bilateral Air Service Agreements (ASAs). Air Service Agreements between two nations negotiate the right of the home and foreign country airlines to fly passengers between them. These rights are reciprocal in nature.ie. both countries grant each other the same quantum of rights.

8.50 During 2003 and 2017, the capacity entitlements (seats per week each direction) between Dubai and India have increased 6 fold (Table 9). The same for Oman and Qatar have increased 9 and 12 fold respectively. While capacity entitlements are reciprocal in nature, the benefit of such increases in capacity entitlements have accrued more to the foreign partner vis a vis India. This is because India's utilization of these rights is lower than the foreign counterparts (Figure 15).

Table 9. India's Capacity Entitlements with Select Countries

Seats Per Week Each Direction (Summer Schedule) (In '000s)		
	2003	2017
Dubai(UAE)	10.4	66.5*
Oman	3.8	27.4
Kuwait	5.2	12
Bahrain	11.2	11.5
Qatar	2.9	24.8
Saudi Arabia	8.5	20(seats) +DMM Open Sky#
Singapore	23.05 units^ + 1650 seats @	29.4 seats@
Thailand	9.8	26.3
Malaysia	7 (+1500 negotiable)	20.7 @

Source: **CAG & MoCA**

*** However, 137.2 thousand seats are the capacity entitlement for UAE (including, Dubai, Sharjah and Abu Dhabi) as a whole in 2017**

 # Open sky Agreement with Dammam city of Saudi Arabia as per which only India Airlines can fly unlimited seats to Dammam

^ 1 unit = 400 seats

@ 18 Destinations with unlimited seats on particular cities as agreed upon in the Bilateral ASAs

Table 8. Percentage of Sixth Freedom Passengers Carried by Foreign Airlines to and from India (2015-16)

Name of Airline	Country	Total Passengers (Bidirectional) (Lakh)	Point to Point Passengers to & from India (Lakh)	6th Freedom Passengers (Lakh)	Percentage (of sixth freedom carriage)
UAE Airlines*	UAE	102.4	33.7	68.7	67.1
Gulf Air (Bahrain)	Bahrain	8.8	1.7	7.1	81.0
Kuwait Airways	Kuwait	6.0	3.5	2.5	41.6
Oman Airways	Oman	15.0	6.2	8.8	58.6
Qatar Airways	Qatar	18.3	3.8	14.5	79.4
Malaysia Airlines	Malaysia	8.9	3.7	5.2	58.7
Singapore Airlines	Singapore	15.0	6.3	8.7	58.3
Thai Airlines	Thailand	13.3	8.5	4.8	35.9

Source: **CAG**

***UAE Airlines include Air Arabia, Emirates, Etihad Airways and Fly Dubai**

Thus, large increase in capacity entitlements under Air Service Agreements; the resultant use of the 6th freedom of the air by Gulf and South east Asian airlines; and underutilization of India's own entitlements are responsible for India's lower share in international traffic to a large extent.

B. The 5/20 rule and Fleet Constraints

8.51 The 5/20 mandates that for an airline to carry out international operations, it needs to have 5 years of domestic flying operations and would have to deploy 20 aircraft or 20 per cent of total fleet of aircraft, whichever is higher, towards domestic operations. As a result of this rule, only three private airlines had been eligible to fly abroad – Jet Airways, Spice Jet and Indigo. In 2016, the Indian Government had relaxed this rule to 0/20. It is expected that more private players will now take advantage of this relaxation and take to international flying operations, thereby contributing to increasing the share of domestic airlines in international operations to and from India.

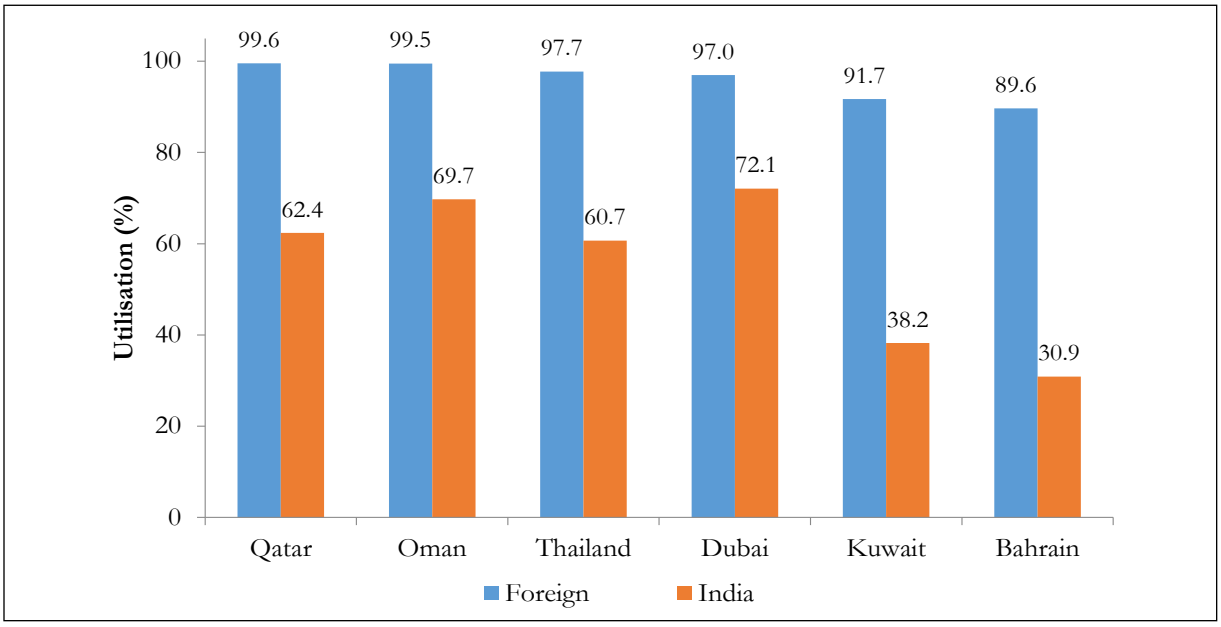
8.52 Another constraint has been that majority of fleet of Indian airlines consists largely of narrow body aircraft and not wide body aircraft, which are required for international long haul flights. With the exception of Jet Airways and Air India, which have 22 and 44 wide bodied aircrafts respectively in their fleet, all other Indian carriers have a narrow body fleet.

Policy Prescriptions

8.53 The following solutions are proposed for enhancing the Indian air carriers' share in international traffic:

- There is a need for committed action plan on privatization/ disinvestment of the national carrier Air India to enhance its operational and management efficiency because it is a major carrier of international traffic to and from India, accounting for 11.4 per cent of the total international travel. The recent announcement of the Government towards privatization of Air India is a

Figure 15. India's & Partner Country's Utilization of Capacity Entitlements (2017 Summer Schedule)



Source: **MoCA**

well thought out decision.

- There is need to reconsider the 0/20 rule so as to allow private airlines to fly abroad. In return, private airlines can be mandated to fly to under-served airports in Tier 2 and Tier 3 cities in order to have greater regional connectivity (UDAN is a good initiative in this direction).
- The Government may consider identifying major cities as aviation hubs because India is as advantageously placed in terms of geographic location as Dubai or Singapore.

Regional Connectivity through UDAN

8.54 UDAN (Ude Desh ka Aam Naagrik), a key element of National Civil Aviation Policy 2016, is an innovative Regional Connectivity Scheme to supplement air traffic growth in regional aviation through a market based mechanism. UDAN provides few seats at affordable passenger fares of Rs. 2,500 for an hour-long flight. Under UDAN, 70 airports and 128 routes are connected, and over 100 more unserved airports are to be connected in the next rounds of bidding of routes.

The Government offers fiscal support through Viability Gap Funding (VGF) and infrastructural development of under-utilized airport facilities to incentivize regional air

Map 1

Source: **Ministry of Civil Aviation**

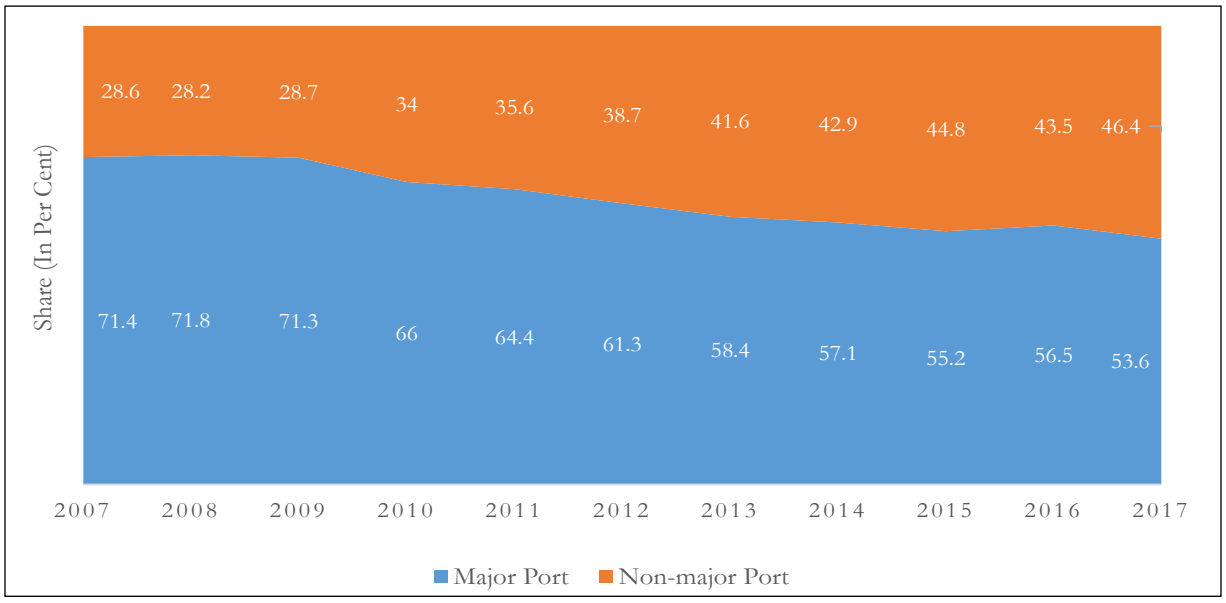
traffic. UDAN ensures route profitability to airlines to sustain their operations through reducing operating costs by eliminating airport charges on UDAN routes, subsidizing ATF, providing market based subsidy for half of the seats, and guaranteeing three years exclusivity on routes. Under UDAN, 13 Regional Connectivity Scheme airports have been covered in the Eastern and North-Eastern regions, 12 each in Northern and Western regions, and 8 in the Southern Region in the first round.

Port and Shipping

8.55 Connecting the non-major ports with hinterland: India having more than 7,517 KM coast line with more than 200 ports has both strategic and competitive advantages since most of the cargo ships that sail between East Asia & America, Europe & Africa pass through Indian territorial waters. Around 95% of India's trade by volume and 68% in terms of value is transported by sea. As on 30th April, 2017, India had a fleet strength of 1,323 ships with dead weight tonnage (DWT) of 17.50 million (11.70 million Gross Tonnage) including Indian controlled tonnage, with Shipping Corporation of India (SCI) having the largest share of around 34%. Of this, around 410 ships of 15.79 million DWT (10.17 million Gross Tonnage) cater to India's overseas trade and the rest to coastal trade. The cargo traffic of Indian Ports increased by 5.9 per cent to 1135.63 million tonnes in 2016-17, of which the traffic at Major Ports was 647.63 million tonnes and approx. 448 million tonnes at non-Major Ports. During the last few years the non-major ports are gaining more share of cargo handling compared to major ports (Figure 16). The contribution of non-major port's traffic to total traffic rose to 43.5 per cent in FY 2016 from 28.6 per cent in FY 2007. It is required to develop non-major port and also enhance their efficiency and operational capacity. The focus will be to connect the non-major ports with hinterland since the share of non-major port cargo handling is rising.

8.56 The year 2016 saw Indian shipping industry once again expertly sail through the choppy waters of volatile freight rates,

Figure 16. Share of Major and Non-Major Port handling cargo



Source: **Ministry of Shipping**

IMO rulings with onerous commercial implications and an improving but still non-competitive operating environment. Some of the following issues related to Indian shipping sector need to be focussed:

- Globally, maritime freight rates in most shipping segments endured volatility and overall downward movements. Weak demand and high fleet growth pushed fleet utilizations further down and intensified deflationary pressure on freight rates in most markets, except for tankers.
- There has been a sharp decline in the share of Indian ships in the carriage of India's overseas trade from about 40 per cent in the late 1980s to 7 per cent in 2015-16.
- The existing Indian fleet is also ageing, with the average age increasing from15 years in 1999 to 19.3 years as on 1 January 2017 (45.0% of the fleet is over 20 years old and 12.2% is in the 15 to 19-year age group).

8.57 To encourage the growth of Indian tonnage and for higher participation of Indian ships in Indian trade, the Government has implemented several measures which include making fuel tax free for all Indian flag coastal vessels engaged in container trade; giving income tax benefit to Indian seafarers working on Indian ships, thereby making the cost of personnel more competitive for the Indian shipping industry.

Time for Looking at Coastal Shipping and Inland Waterways

8.58 A vision for coastal shipping, tourism and regional development has been prepared, with a view to increasing the share of the coastal/inland waterways transport mode from 7 per cent to 10 per cent by 2019-20. Coastal cargo handled by ports in India in 2016-17 was 189.7 million tonnes. The key elements of the initiative include development of coastal shipping as an end-to-end supply chain, integration of inland water transport (IWT) coastal route development of regional centres to generate cargo for coastal traffic, development of lighthouse tourism.

8.59 However, certain intrinsic impediments such as additional cost due to first mile and last-mile connectivity, high duties on bunker fuel and other taxes and absence of assured return cargo that results in higher cost of transportation through coastal shipping thereby dissuading shipper's to prefer this mode. An analysis of the costs of coastal transportation by Indian ships as compared to foreign ships has indicated that operating costs of Indian ships are higher by 24% on account of duty on bunker (9%), Income Tax on Seafarers (6%), Service Tax (1%), Capital Gains Tax (5%) and Tonnage Tax (3%). Additionally, the cost due to inefficiency of Indian shipping companies is 6%.

8.60 To promote Inland Waterways Transport (IWT) several steps have been taken. The National Waterways Act, 2016 has been enacted and enforced to provide for the declaration of 106 additional inland waterways to be National Waterways (NWs) in addition to already existed five National Waterways.

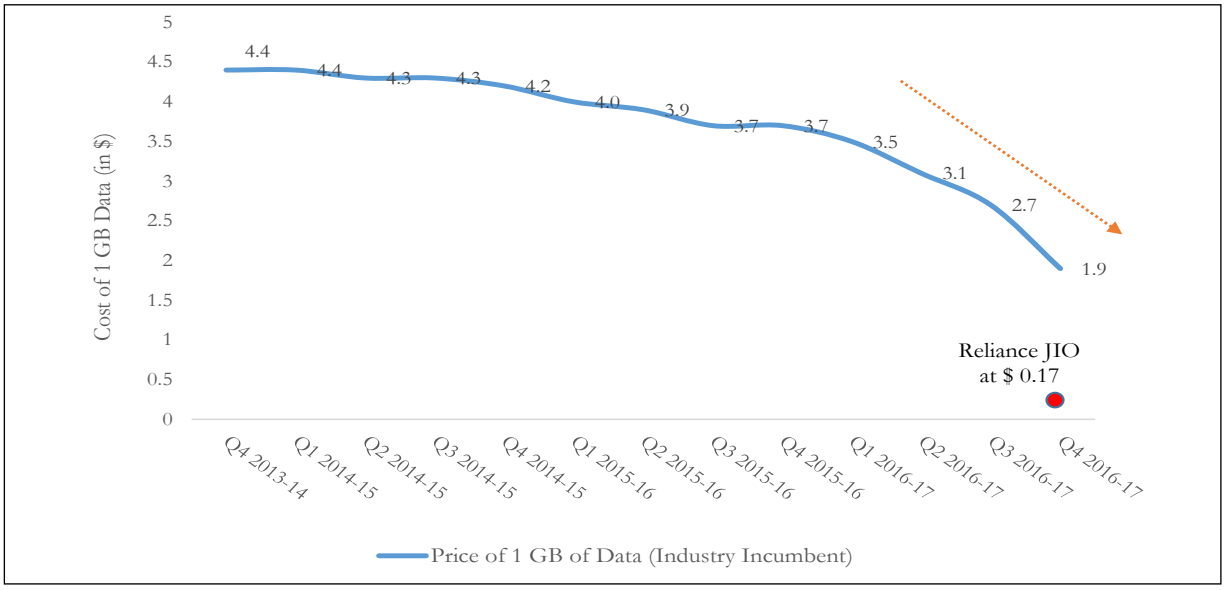
8.61 The 'Jal Marg Vikas Project' (on NW-I: River Ganga), a large integrated IWT project, has been launched with the purpose of ensuring navigation of 1500 to 2000 tonne vessels by developing infrastructure and a fairway of 2.2 to 3 meters depth between Varanasi and Haldia covering a distance of 1380 kms at an estimated cost of Rs. 5369 crore. The project is being implemented by the Inland Waterways Authority of India (IWAI) and is to be completed in six years, with technical and investment support of World Bank.

Telecom Sector

8.62 The Indian telecom sector has made rapid strides during the last few years because of several reforms and initiatives undertaken by the Department of Telecommunications. India now has the second largest network in the world, next only to China. India crossed the landmark of one billion telephone subscribers in the year 2015-16, and the total subscribers now stands at 1195.0 million as on 31.3.2017. Out of this, 501.8 million connections are in rural areas and 693.2 million in the urban areas. The wireless telephony constitutes 98.0 per cent (1170.6 million) of all subscriptions whereas share of the landline telephony now stands at only 2.0 per cent (24.4 million) at the end of March, 2017. The overall tele-density in India stands at 93.0 per cent as on 31.3.2017. In rural areas, tele-density was 56.9 per cent and in urban areas it was 171.5 per cent at the end of March, 2017. India, with 275 million smart-phone subscribers, has outpaced the United States to become the second largest smart-phone subscriber base in the world. Since September 2015, 38 new mobile manufacturing units have been set up, which has ramped up the manufacturing of mobile phone units in 2015-16 by 90 per cent. The mobile industry in India, currently contributes 6.5 per cent (USD140 billion) to country's GDP, and employing over 4 million people (direct and indirect). It is projected to grow rapidly in the coming years.

8.63 With the introduction of the new entrant Reliance Jio Infocom Ltd. on 5 September 2016, the competition extended from cheaper calls to cheaper data. As per Telecom Regulatory Authority of India, the Q3 of 2016-17 had recorded 1,127.4 Million wireless subscribers, which is 7.7 per cent higher than the previous quarter Q2 of 2016-17. Reliance Jio Infocom Ltd. recorded the highest net addition of 56.2 million subscribers which is much higher than the others service providers like Idea with 11.7 million and Bharti Airtel with 5.9 million subscribers during Q3 of 2016-17. Reliance Jio's pricing scheme forced incumbent telecom firms to cut voice and data tariffs to

Figure 17. Data Prices per GB of Telecom Industry



Sources: JP Morgan, Bharti Airtel, Idea Cellular, Reliance JIO.

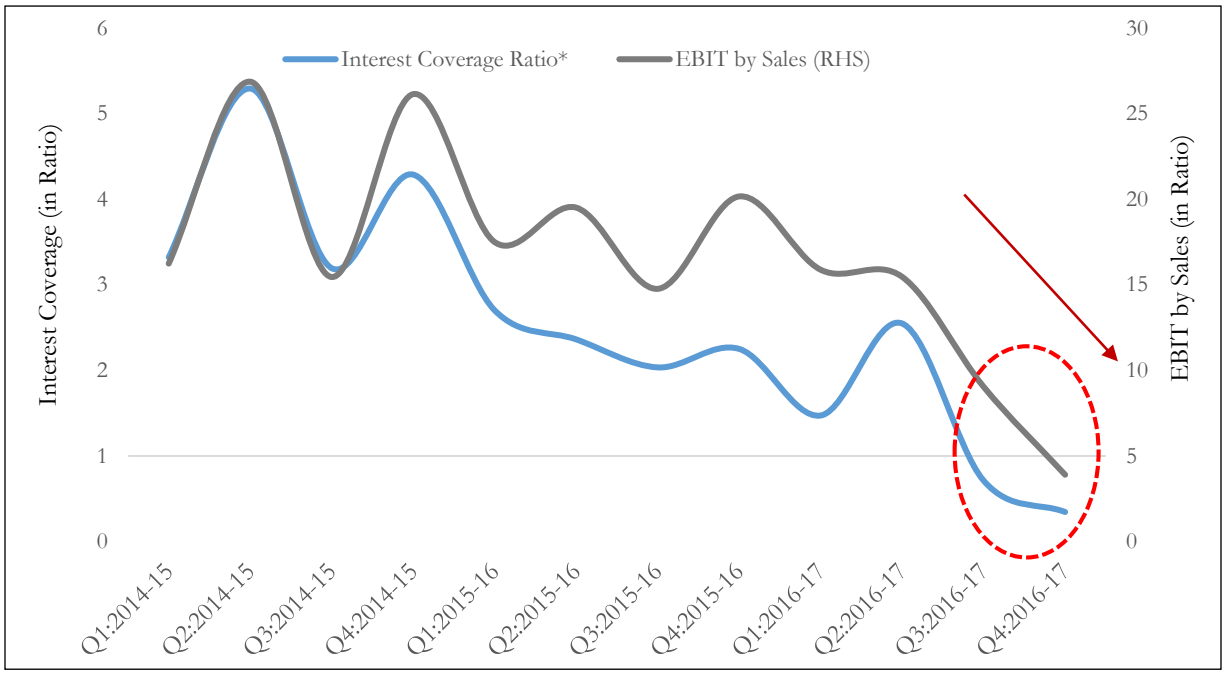
Note: **Industry incumbent average calculated using weighted average cost of 1 GB of data realization from Bharti Airtel/Idea Cellular. Reliance JIO data assumed at 10 INR/GB based on March'17 Realization.**

$1.9 per 1 GB data during January-March of 2017 (Figure 17). The cut in tariff due to stiff competition with JIO, the revenue of other operators fell. The adjusted gross revenue of the top three telecom companies in India i.e., Bharti Airtel, Vodafone India and Idea Cellular decreased by 7.98 per cent, 5.14 per cent and 4.91 per cent respectively during Q3 of 2016-17 as compared to its previous quarter.

8.64 Stiff competition, price war, reduced revenue has trapped telecom sector into highly leveraged with interest coverage ratio turning less than 1 since Q3 of 2016-17 (Figure 18). It has also witnessed declining Earnings before Interest and Taxes (EBIT) by Sales ratio (Figure 18). The industry also faces the issue of higher spectrum charges. However, what's worrying is that the share of the telecom sector in the non-performing assets (NPAs) has now increased. Though the total NPAs of telecom sector in Public Sector Banks (PSBs) has fallen to Rs. 2,335 crores in 2016-17 from Rs. 3,465 crores in 2015-16, the share of NPAs of telecom sector in total NPAs of infrastructure sector increased to 8.7 per cent in 2016-17 from 5.0 per cent in 2015-16.

8.65 The Government has placed emphasis on growth of telecom sector in the country for the success of Digital India campaign. The Government has brought reforms in spectrum management through the process like spectrum sharing, spectrum trading, spectrum harmonization and most importantly, spectrum auction. The Government is also committed to extend the reach of the mobile network to all over India especially the remote and rural villages in order to convert India into a digital economy and knowledge society. For the deeper digital penetration in rural areas, the Government has taken up 'Bharat Net' programme, in mission mode to link each of the 2.5 lakh Gram Panchayats of India through Broadband optical fibre network. On its

Figure 18. Interest Coverage Ratio and Earnings before Interest and Taxes by Sales Ratio



Source: **RBI**

Note: **EBIT by Sales in RHS**

completion, Bharat Net would facilitate Broadband connectivity (with a 100 Mbps of bandwidth) for over 600 million rural citizens of the country. This is the largest rural connectivity project of its kind in the world, and is the first pillar of Digital India Programme. It will facilitate the delivery of various e-Services and applications including e-health, e-education, e-governance and e-commerce in the future.

Power Sector

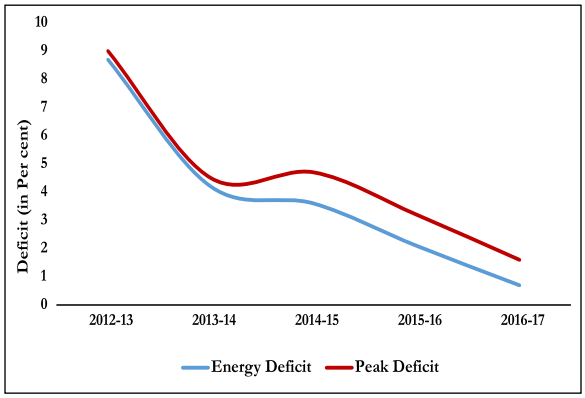
8.66 The Government has unveiled an ambitious plan to provide electricity supply for all by 2019. India has already made a great effort in improving access to energy, by reducing the number of people without electricity. Power generation capacity has surged over the years, but the issue of power outages remains a major concern. According to the 'The Global Competitiveness Report 2016-17' released by World Economic Forum, India ranks 88th position out of 138 countries in terms of the quality of electricity supplied. Efforts towards 100 per cent village electrification, 24*7 power supply and clean energy cannot be successful without improving the performance of the electricity distribution companies (DISCOM). Power outages also adversely affect national priorities like 'Make in India' and 'Digital India'. In addition, default on bank loans by financially stressed DISCOMs tends to seriously impact the banking sector and the economy at large.

8.67 The growth rate in electricity generation was 4.7 per cent in 2016-17 as compared to 5.7 per cent in 2015-16 and 8.9 per cent in 2014-15. In 2013-14, total installed capacity was 2,45,259 MW in 2013-14 which increased to 3,26,649 MW as on March 2017. During the period 2012-2017, 1,00,468 ckm against the target of 1,07,440 ckm of transmission lines and 2,88,458 MVA against the target of 2,82,750 MVA of transmission capacity have been completed. The peak deficit (the percentage shortfall in peak power supply vis-à-vis peak hour demand) has also shown a steep fall and was at (-) 1.6 per cent during 2016-17 as shown in Figure 19.

A special focus on the performance of Ujwal DISCOM Assurance Yojana (UDAY)

8.68 The Government formulated and launched the UDAY scheme for financial turnaround of power distribution companies on November 20, 2015. It is noteworthy to mention that the scheme envisages reduction in interest burden, cost of power and Aggregate Technical & Commercial (AT&C) losses. 27 states/UTs have already come under UDAY. A multilevel monitoring mechanism for UDAY has been put in place to ensure a close monitoring of performance of the participating States under UDAY. Also a web portal (www.uday.gov.in) has been created for monitoring purpose.

Figure 19. Reduction in Power Deficit (Per cent)



Source: **Central Electricity Authority**

8.69 As per UDAY scheme, the State Governments are allowed to take over 75 per cent of power distribution companies (DISCOMs) debt and pay back lenders by issuing bonds. The remaining 25 per cent of the debt to be paid back through DISCOMs issued bonds. As on 30.09.2015 total debt of all state owned DISCOMs was Rs. 3.95

lakh Cr. The 26 states and 1 UT which have joined the UDAY scheme account for total outstanding debt of Rs. 3.82 lakh Cr., which is 97 per cent of total outstanding debt of all state DISCOMs. So far, fifteen states have issued UDAY bonds totaling Rs.2.09 lakh Cr. and DISCOMs have issued Bonds worth Rs. 0.23 lakh Cr. A brief of issuance of bonds under UDAY is given in Table 10.

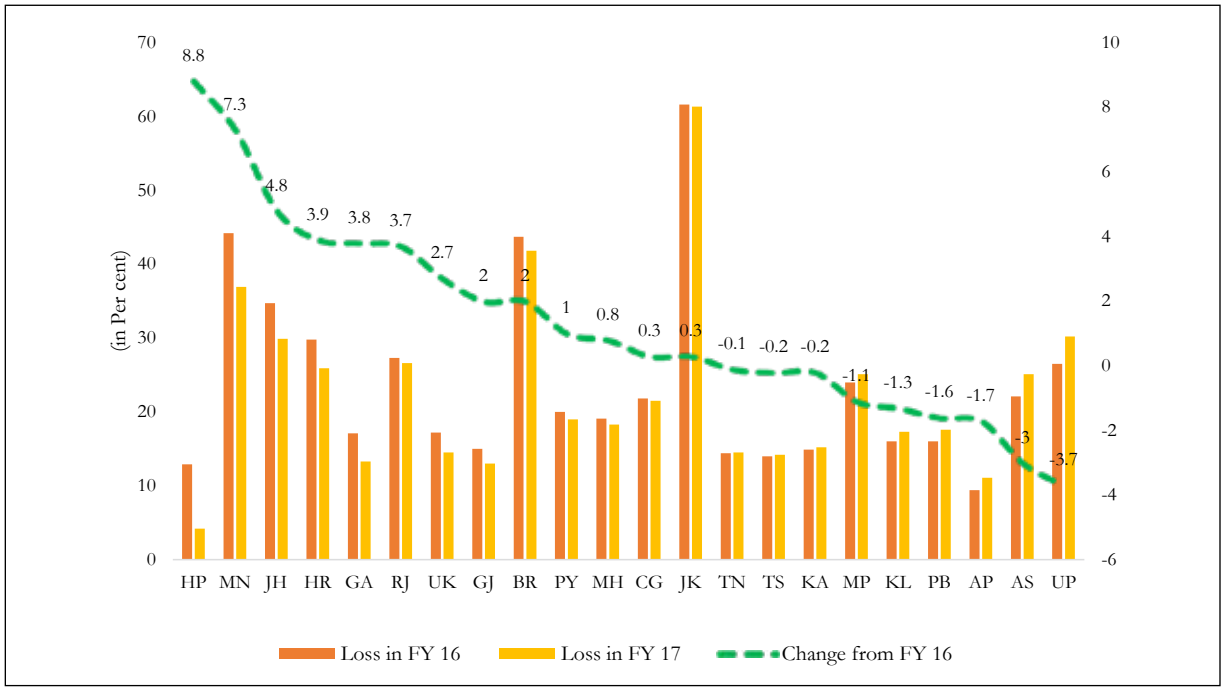
8.70 After the introduction of UDAY the states have made significant effort to reduce AT&C losses as shown in Figure 20. National average (all UDAY states) of AT&C loss has come down to 20.2 per cent in FY 2017 from 21.1 per cent in FY 2016. Himachal Pradesh, Haryana, Goa, Rajasthan, Uttarakhand, Gujarat and Puducherry have shown significant improvement. States like Chhatisgarh, Maharashtra, Manipur, Jharkhand, and Bihar have also reduced the AT&C losses but needs further improvement. Thirteen DISCOMs have reported improved AT&C loss at the end of Q3 of FY 2016-17 from FY 2015-16 level. The performance of some DISCOMs is shown in Figure 21.

Table 10. Summary of Issuance of Bonds Under UDAY till 31st March 2017

States	Net DISCOM Liabilities (to be restructured/Bonds to be issued) as on 30.09.2015 (in Rs. Crore)	Total Bonds Issued by States till Date (in Rs. Crore)	Total Bonds issued by DISCOM (in Rs. Crore)	Total Bonds issued under UDAY (in Rs. Crore
Rajasthan	76120	59722	12368	72090
Uttar Pradesh	49847	39133	10714	49847
Chhatisgarh	870	870	-	870
Jharkhand	6136	6136	-	6136
Punjab	20262	15629	-	15629
Bihar	3109	2332	777	3109
Jammu & Kashmir	3538	3538	-	3538
Haryana	34158	25951	-	25951
Andhra Pradesh	14721	8256	-	8256
Madhya Pradesh	11899	7360	-	7360
Maharashtra	6613	4960	-	4960
Himachal Pradesh	3854	2891	-	2891
Telangana	11244	8923	-	8923
Assam	State Govt. Loan, Bonds not to be issued			
Tamil Nadu	30420	22815	-	22815
Meghalaya	167	125	-	125
Total	273318	208641	23859	232500

Source: **Ministry of Power**

Figure 20. State wise AT&C Loss (in Per cent) of UDAY States

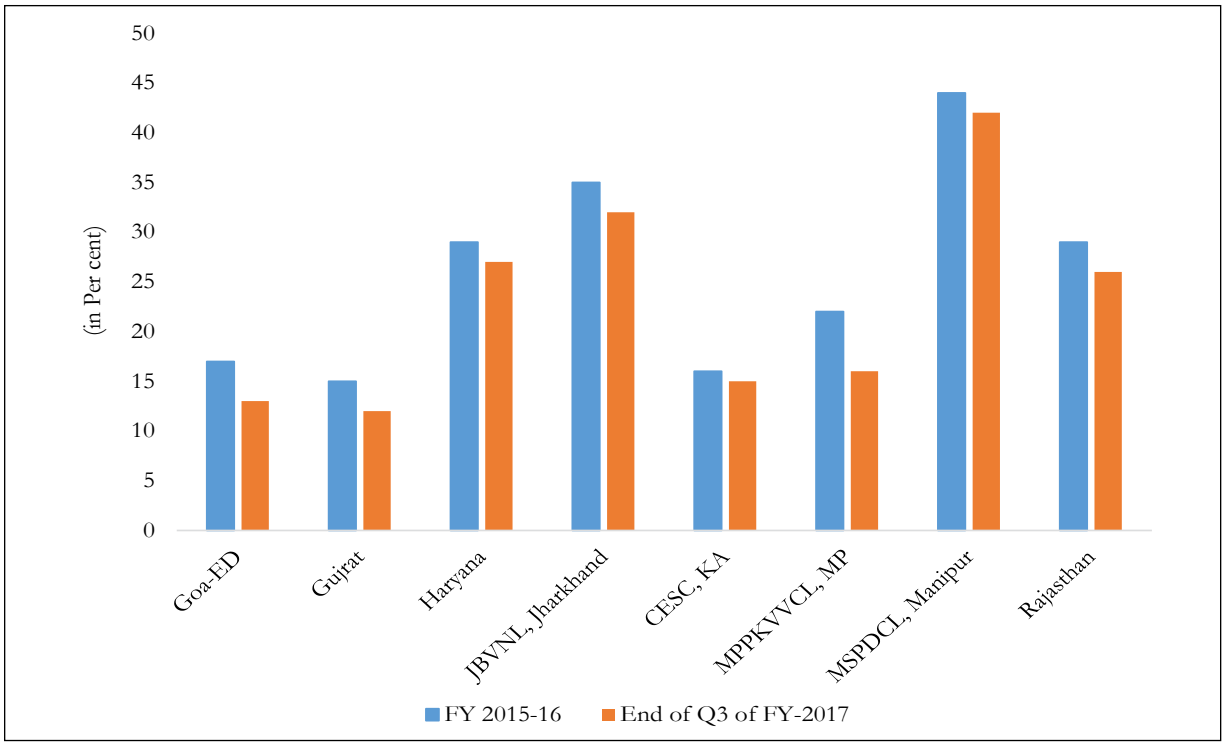


Source: **UDAY Cell, REC**

Note: **Change of AT&C Loss from FY 16 in RHS**

***Abbreviation of State Names in Appendix 2**

Figure 21. Aggregate Technical & Commercial (AT&C) loss of DISCOMs (in %)

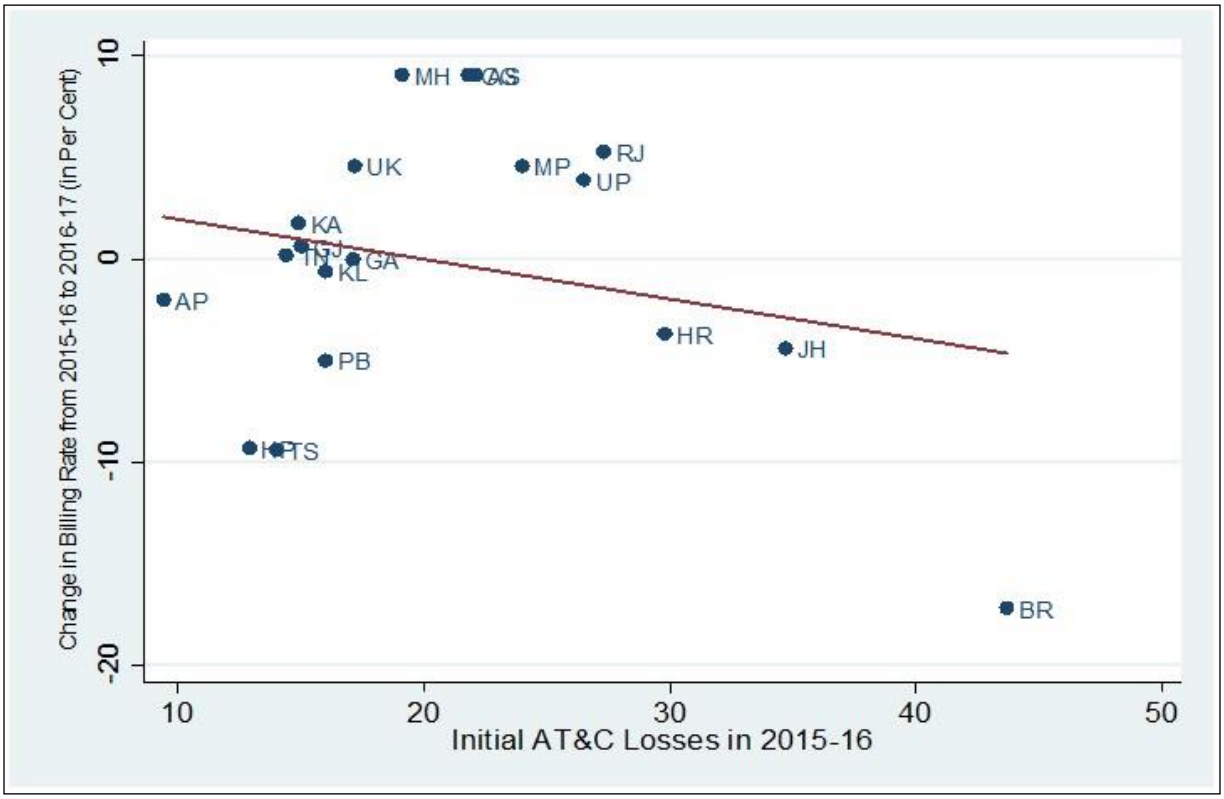


Source: **Ministry of Power**

8.71 After the introduction of UDAY, the primary focus has been given on billing and collection efficiency of DISCOMs. As per the information of Ministry of Power, at all India level, billing efficiency has been increased by 2 per cent from 81 per cent in 2015-16 to 83 per cent in 2016-17. The States with high AT&C losses should have increased their billing rate after the introduction of UDAY. Figure 22 shows the initial AT&C losses that prevailed in 2015-16 and change in billing rate from 2015-16 to 2016-17 in UDAY States. The expected relationship should have been positive. But many states with higher initial AT&C losses like Bihar, Jharkhand, Haryana and Punjab have not increased their billing rate, and in fact further reduced rates, Bihar being amongst the worst offender. However, States like Rajasthan, Uttar Pradesh and Madhya Pradesh with higher initial AT&C losses have increased their billing rate from 2015-16 to 2016-17. Unless States make timely revision of tariff, the problem of losses and debts of DISCOMs may not be resolved.

8.72 Electricity is a merit good. The tariff structure must reflect this. States with the highest losses are those where tariffs fail to cover costs on average. In states such as Rajasthan, Tamil Nadu, Jharkhand, Madhya Pradesh and Uttar Pradesh (top ranking states in loss distribution), the per unit average tariff (AT) is lower than the average cost of supply (ACS). After the introduction of UDAY, 15 states have issued tariff-revisions for FY 2017-18 by their respective Commissions to cover cost of supplies till date. The tariff revision of all the UDAY states has been given in the Table 11.

Figure 22. Initial AT&C Losses and Change in Billing Rate



Source: **UDAY Cell, REC**

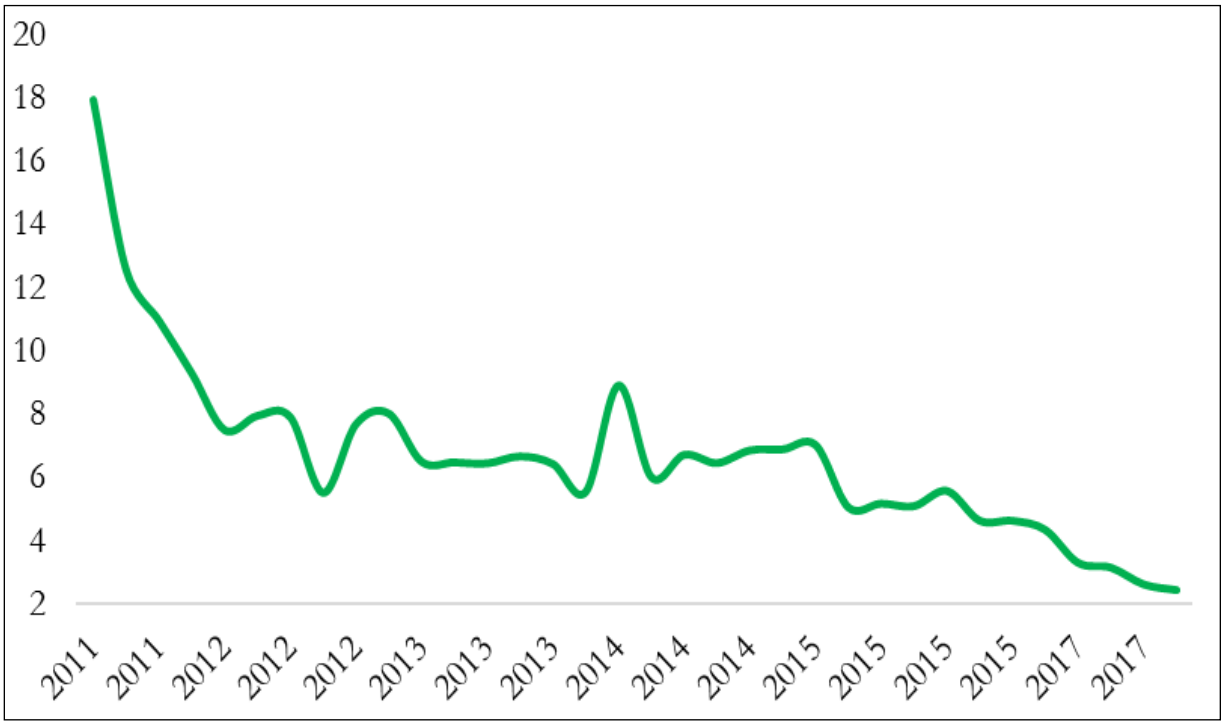
Table 11. Tariff Revision in 2017-18

S.No.	Name of State	Tarrif Order (Issued/Not Issued)	% Average tariff Hike	Applicable Date	MoU Tariff Hike Target for FY17-18
1	Bihar	Issued	55%	01-Apr-17	15.00%
2	Uttarakhand	Issued	5.72%	01-Apr-17	4.27%
3	Madhya Pradesh	Issued	9.42%	01-Apr-17	5.00%
4	Karnataka	Issued	8%	01-Apr-17	3%-4%
5	Gujrat	Issued	0%	01-Apr-17	0.50%
6	Andhra Pradesh	Issued	3.60%	01-Apr-17	5.00%
7	Chhattisgarh	Issued	2.0-2.5%	01-Apr-17	6.00%
8	Manipur	Issued	5%	01-Apr-17	Rs. 5.13/KWH
11	Assam	Issued	6%	01-Apr-17	6.50%
13	Meghalaya	Issued	5% (Approx)	01-Apr-17	8.68%
9	Maharashtra	Issued	-	01-Apr-17	9.01%
10	Himachal Pradesh	Issued	0%	01-Apr-17	3.00%
12	Telangana	Issued	0%	-	8.00%
14	Sikkim	Issued	-	01-Apr-17	15.00%
15	Mizoram	Issued	-	-	5.00%
16	Arunnachal Pradesh	-	No tariff Hike is proposed	-	0.00%
17	Rajasthan	Not Issued	-	-	8.00%
18	Haryana	Not Issued	-	-	Projection are not Given.
19	Punjab	Not Issued	-	-	9.00%
20	Puducherry	Not Issued	-	-	3.00%
21	Jharkhand	Not Issued	-	-	9.60%
22	Jammu & Kashmir	Not Issued	-	-	17.00%
23	Goa	Not Issued	No tariff Hike is proposed	-	5.00%
24	Tamil Nadu	Not Issued	No tariff Hike is proposed	-	8.00%
25	Tripura	Not Issued	-	-	4.50%
26	Uttar Pradesh	Not Issued	-	-	6.95%
27	Kerala	Not Issued	-	-	0.00%

Source: **Ministry of Power**

8.73 Tariff in many states have been increased due to tariff revision. But the higher tariff may face potential threat from lower solar and wind prices. As per latest available information, the solar energy price is at Rs.2.5 per KWH and wind energy price is at Rs.3.4 per KWH. The falling trend in solar prices is shown in figure 23.

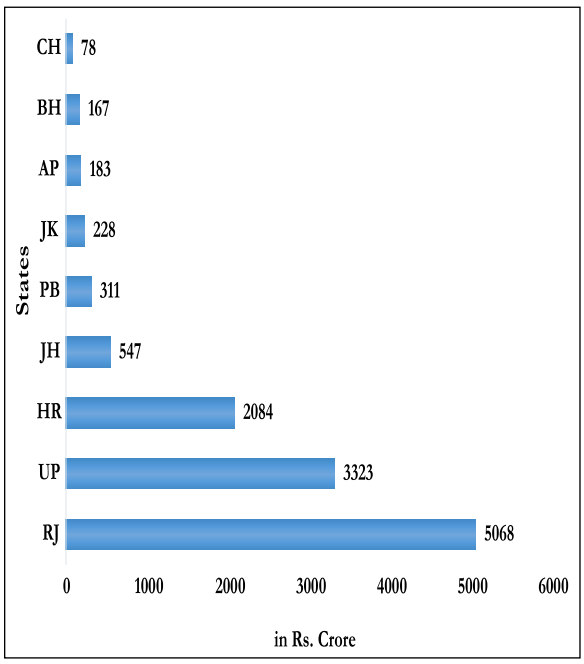
Figure 23. Price of Solar Energy (in Rs. per KWH)



Sources: MNRE

8.74 State power distribution companies have started reporting handsome savings and improvements in operational efficiency under the UDAY. Utilities in Rajasthan, Uttar Pradesh, Haryana, Jharkhand and Punjab are the major gainers in lowering their interest costs in 2016-17. DISCOMs of states have achieved an estimated savings of Rs.11,989 crore till December, 2016. Estimated savings in interest costs of different states are shown in Figure 24.

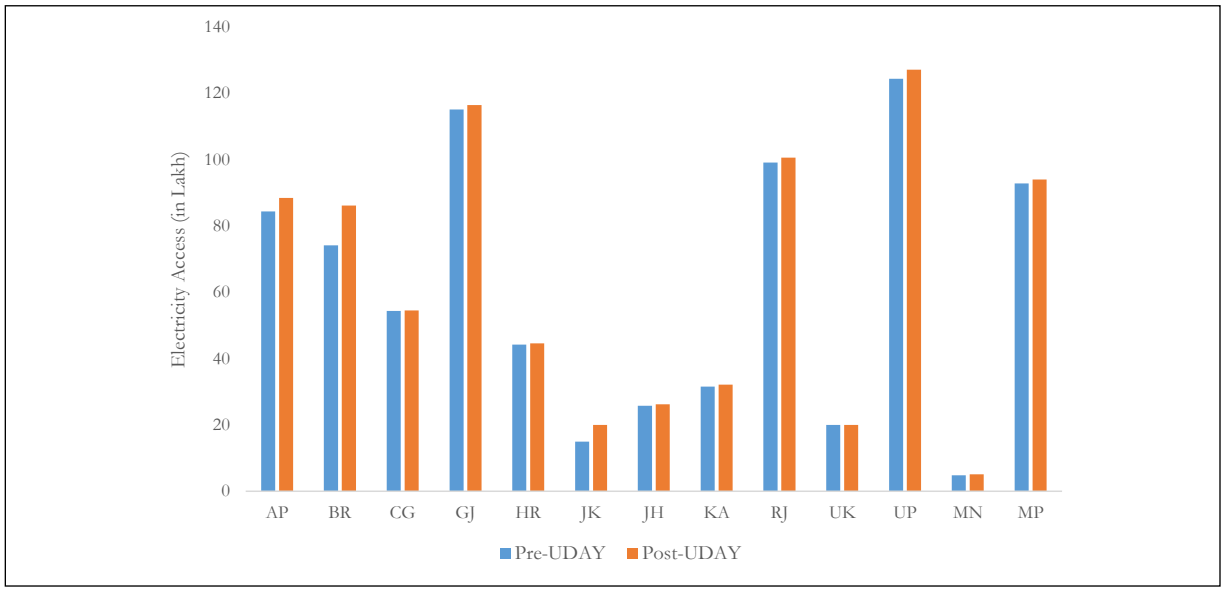
Figure 24. Estimated Savings in interest cost (in Rs. Crore)



Source: **Ministry of Power**

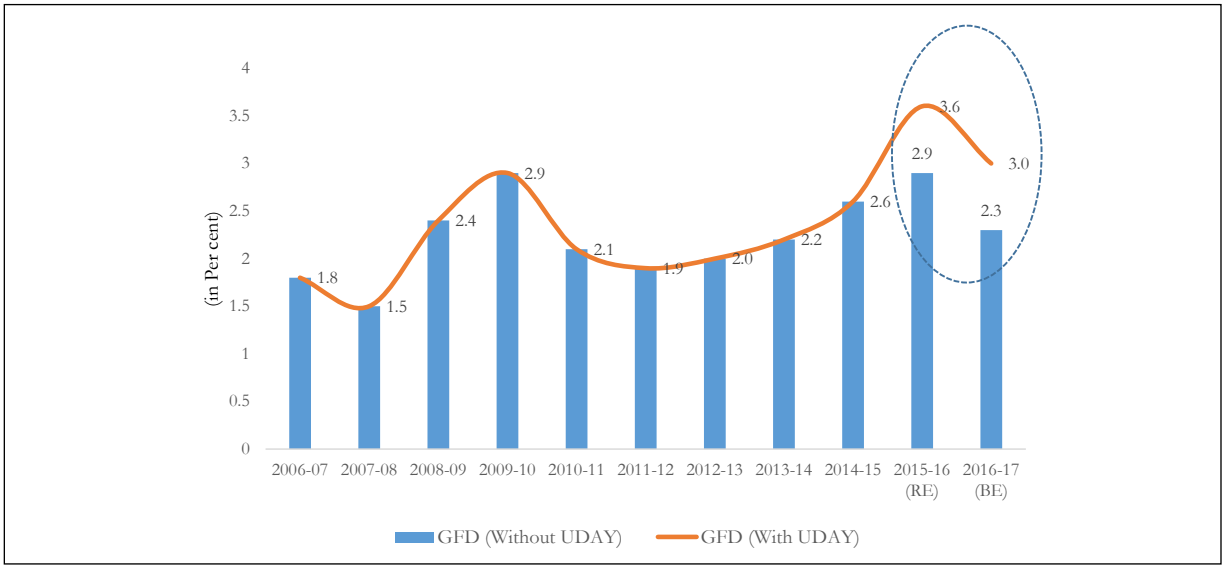
8.75 Apart from the above developments, many states have shown improvement in terms of electricity access to unconnected households, distribution of LEDs under UJALA, feeder metering and distribution transmission (DT) metering both in rural and urban area after the introduction of UDAY (Figure 25). States like Andhra Pradesh, Gujarat, Maharashtra, Karnataka have performed better in terms of operational aspects like electricity access, DT metering and Feeder Metering; but states like Uttar Pradesh, Tamil Nadu and Himachal Pradesh have not reported any improvement.

Figure 25. Change in Electricity Access to Un-connected Households due to impact of UDAY (in Lakh)



Source: **Ministry of Power**

Figure 26. States Gross Fiscal Deficit-GDP Ratio

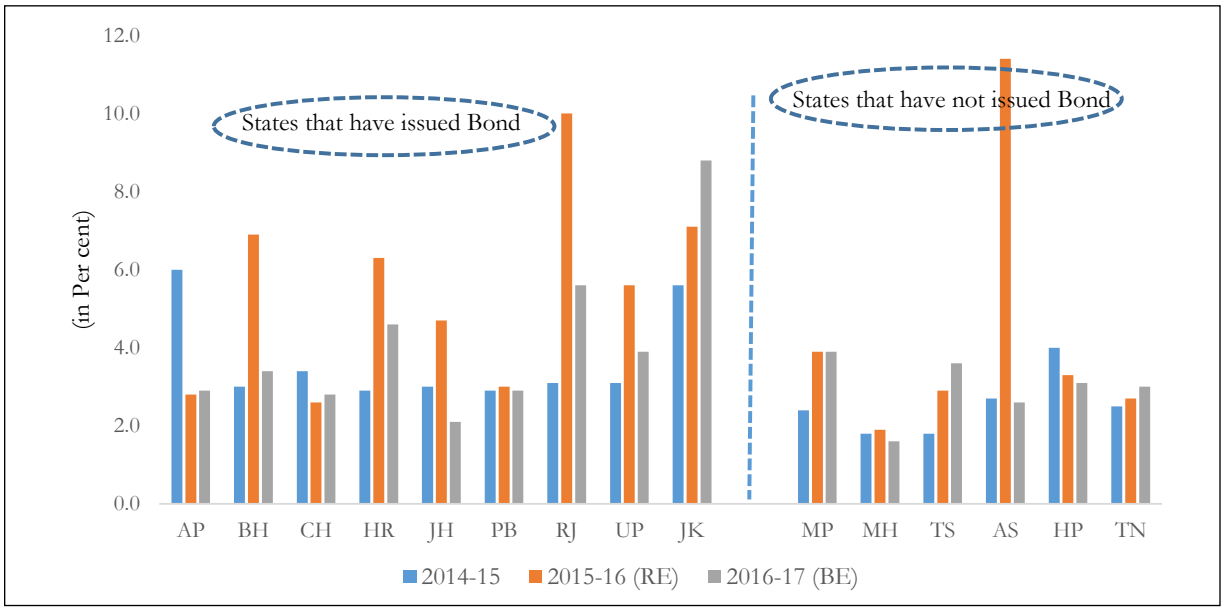


Source: **RBI**

Fiscal Burden on States

8.76 UDAY is not a panacea for addressing fiscal situations though it has had a significant impact on addressing the structural issues attached with the power sector. Under the UDAY scheme, states were allowed to issue non-SLR state development (SDL) bonds in the market or directly to banks or financial institutions holding the Discom debt. Due to these bonds, the state Gross Fiscal Deficit GFD/GDP ratio got increased by 0.7 percentage points to 3.6 per cent in 2015-16 from 2.9 per cent without UDAY (Figure 26). The GFD/GDP ratio of states who have issued UDAY bond is higher than the GFD/GDP ratio of states who have not issued UDAY bonds (Figure 27).

Figure 27. GFD/GSDP ratio of States with UDAY



Source: **RBI**

Petroleum and Natural Gas Sector

8.77 During 2016-17, crude oil production was 36.0 MMT as against the target of 37.1 MMT which is 97.1 per cent of the target. Similarly, the natural gas production target during 2016-17 was 34.1 BCM against which actual production was 31.9 BCM which is 93.5 per cent of the target. Shortfall in production both petroleum and natural gas was mainly due to declining production from old and marginal fields, delay in completion of some projects in western offshore, unplanned shutdown of wells, processing platform/ plants, pipelines. The Government has taken various measures to transform hydrocarbon sector in India as follows.

- *Hydrocarbon Exploration and Licensing Policy (HELP):* The policy envisages single license for exploration and production of conventional as well as non-conventional hydrocarbon resources, open acreage licensing system to select the exploration blocks without waiting for formal bid round, simply and easy to administer revenue sharing model. The National Data Repository has been developed to support the process by providing quality data on the prospectivity of the basins to investors.
- *Discovered Small Field Policy 2016:* As a step to reduce India's energy imports by 10% by 2022, 31 contracts (23 on land and 8 offshore) were signed for awarded fields under the Discovered Small Field (DSF) Bid Round 2016. The production from these contract areas will supplement the domestic production of crude oil and natural gas.
- *Hydrocarbon Vision 2030 for North East:* The Vision aims at doubling Oil & Gas production by 2030, making clean fuels accessible, fast tracking projects, generating employment opportunities and promoting cooperation with neighbor countries. An investment of ₹1.3 lakh crore is envisaged till 2030 in North East India.
- *Pratyaksha Hanstantrit Labh (PAHAL):* Government, as a measure of Good Governance has introduced well targeted system of subsidy delivery

to LPG consumers through PAHAL. The initiative of the Government was aimed at rationalizing subsidies based on approach to cut subsidy leakages, but not subsidies themselves. Since 2014-15, more than 17.5 crore LPG consumers have joined PAHAL scheme. PAHAL has entered into Guinness Book of World Records being largest Direct Benefit Transfer Scheme. So far, more than ₹50,000 crore have been transferred directly into the bank accounts of the consumers. Estimated savings in subsidy due to implementation of PAHAL during 2014-15, 2015-16 and 2016-17 is nearly ₹29446 crore.

- *Pradhan Mantri Ujjwala Yojana (LPG connections for BPL houses):* The Government has embarked upon providing 5 crore LPG connections to BPL families in the country with focus on States/ UTs having LPG coverage less than the National average of 61% as on 01.01.2016 with this scheme. The connections are released in the name of adult woman member of BPL family having no LPG connection either in the name of beneficiary or any other family members. Objective of the scheme is to provide clean cooking fuel solution to poor households, especially in rural areas. A target of 1.5 crore was fixed for the financial year 2016-17 and the connections released as on 31.03.2017 have surpassed the target at 1.98 crore.
- The first phase of 'Urja Ganga'- Jagdishpur – Haldia and Bokaro – Dhamra Pipeline project (JHBDPL) has been taken up since July 2015. The pipeline is being executed by GAIL (India) Limited as a part of National Gas Grid for extending the Gas Energy Corridor in Eastern India. The 2,539 km JHBDPL pipeline is being executed with an investment of ₹ 12,940 crore, which includes 40 per cent capital grant of ₹ 5176 crore from the Government of India. Urja Ganga will pass through five States i.e. Uttar Pradesh, Bihar, Jharkhand, Odisha and West Bengal covering 40 districts. It will also help in setting up of City Gas Distribution networks in 7 cities in the first phase. CGD Project will bring eco-friendly fuel natural gas to households, vehicles and industries. The Pipeline project will also be used for gas supply to 3 fertilizer plants in Gorakhpur, Barauni & Sindri in Eastern India, giving a new dimension to fertilizer & food processing industry.

Urban Infrastructure with a Note on Smart City Mission

8.78 Cities are regarded as "engines of growth" for economies. The confluence of capital, people and space in cities unleashes the benefits of agglomeration, creating a fertile environment for innovation of ideas, technologies and processes which produce huge economic returns. Cities in India generate two-third of national GDP, 90 per cent of tax revenues and the majority of formal sector jobs, with just a third of the country's population. Despite being centers of opportunity, the cities of India bring with them a host of environmental and infrastructure challenges, from pollution to lack of civic amenities like drinking water, sewage, housing and electricity, which disproportionally impacts the more vulnerable poor population. For addressing these issues, the Government has taken various steps to improve urban infrastructure like Swachh Bharat Mission (SBM, urban), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Heritage City Development and Augmentation Yojana (HRIDAY) and Smart Cities Mission.

Smart City Mission

8.79 India is witnessing rapid urbanization and the phenomenon requires a major policy response. As part of the policy response, the government conceived of the Smart City Mission. Let it be clear that "smartness" in this context should not be confined merely to the application of digital technologies. Right from the beginning, the definition of the "smart city" was left open. The real shift was to move from rigid master-plans and silos to a more ecosystem approach. The four key ingredients of a thriving urban ecosystem are institutional infrastructure, physical infrastructure, social infrastructure and economic infrastructure. So, the smart city approach aims to upgrade urban ecosystems either through targeted strategic interventions using one of the ingredients with city-wide impact (Pan City Initiatives) or through simultaneously upgrading more than one ingredient in a defined space (Area Based Project). It is understood that the exact implementation of such a strategy has to be customized to the specific context. A sibling programme called Heritage City Development and Augmentation Yojana (HRIDAY) has also been initiated to look at the special needs of heritage cities.

8.80 The Government of India launched the Smart Cities Mission on 25 June 2015. It was proposed to cover 100 cities over the period 2015-16 and 2019-20. Some of the unique features of the Smart Cities' Mission in India are: (i) Selection of cities through a city challenge competition; (ii) Implementation by Special Purpose Vehicles- companies owned by municipal authorities; (iii) Central grant funds used for leveraging funds from other sources; (iv) Citizen participation in planning and implementation of the Mission to ensure sustainability and accountability.

8.81 Following this process, 60 cities (20 cities in Round 1 in January 2016, 13 cities in fast track round in May 2016 and 27 cities in Round 2 in September, 2016) have been selected so far (See Appendix 3 for the list of Light House, Fast Track and Round 2 cities). The other 40 cities are expected to be selected in the 3rd round of the competition this year.

8.82 A total investment of ₹1,33,368.5 crore has been proposed by the 60 cities under their smart city plans. Projects focusing on revamping an identified area (Area Based Projects) are estimated to cost ₹1,05,621 crore. Smart initiatives across the city (Pan City Initiatives) account for the remaining ₹26,141 Crores of investments. Besides ABP and Pan city projects an amount of ₹1604.5 crore has been kept aside for O&M cost of the Mission and other contingencies.

8.83 Priority interventions at the city level include developing an integrated command and control centre, integrating data from multiple departments leading to better coordination and effective service delivery, smart water management through use of technology to reduce non- revenue water, smart roads, heritage and "place-making" projects (Also see Box 2).

8.84 57 projects worth ₹941 crore have already been completed as of April 2017. An estimated additional 462 projects worth ₹15307 crore are likely to be completed through 2018 provided all the projects that have commenced implementation and those that have been tendered stick to their timelines. In the best-case scenario, an additional 920 projects for which detailed project reports (DPRs) have already been prepared worth ₹24526 crore are estimated to be completed by the end of 2018 provided all timelines are adhered to. A quarterly break-up of the number and value of projects in the two scenarios is given in Table 13 below.

Table 12. Round- wise Project Implementation Details

Rounds of selection	DPR/ RfP Preparation Stage		Projects Tendered		Projects- Work Commenced		Projects- Work Completed	
	No. of Projects	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*
ROUND 1	571	32,433	135	7,112	72	3,500	32	503
FAST TRACK	468	18,446	8	684	7	107	6	150
ROUND 2	919	30,270	39	1,974	37	869	19	288
Total	1,958	81,150	182	9,769	116	4,476	57	941

Source: **Ministry of Urban Development**

Table 13. Estimated Minimum & Best Scenario of Smart Cities' Project Completion

	SCENARIO-1 (Minimum): PROJECTS LIKELY TO BE COMPLETED									
	Jan- Mar' 18		April- June'18		July- Sept'18		Oct- Dec.'18		Grand Total	
	No. of Projects	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*
ROUND 1	52	2652.9	72	3714.1	46	2334.6	58	2971.3	228	11673
FAST TRACK	2	79.1	2	118.6	3	158.2	8	434.9	15	791
ROUND 2	33	426.5	44	568.6	55	710.8	88	1137.3	219	2843
GRAND TOTAL	86	3158.5	119	4401.3	103	3203.5	154	4543.4	462	15307

	SCENARIO-2 (Best): PROJECTS LIKELY TO BE COMPLETED									
	Jan- Mar' 18		April- June'18		July- Sept'18		Oct- Dec.'18		Grand Total	
	No. of Projects	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*	*No. of Projects*	*Value (₹ Crore)*
ROUND 1	89	4680.0	122	6552.0	77	4118.4	98	5241.6	386	20592
FAST TRACK	9	86.1	13	129.1	17	172.2	47	473.5	85	861
ROUND 2	67	460.9	90	614.6	112	768.2	180	1229.2	449	3073
GRAND TOTAL	165	5227.0	225	7295.7	206	5058.8	324	6944.3	920	24525

Source: **Ministry of Urban Development**

8.85 So far as the priority sector interventions are concerned, 22 of the 60 cities have already initiated the smart roads and 18 cities have initiated integrated command and control projects. Additionally, 20 cities have initiated smart water projects and 26 cities have started implementing the solar roof top projects. Architectural, place-making and city beautification projects have been initiated in 18 cities.

EXAMPLE OF SMART CITY PROJECT: INTEGRATED COMMAND AND CONTROL CENTRE, PUNE

Name of the project: Transport Command and Control Centre

Sector: Integrated Command and Control Centre

Cost and Financing: ₹ 48 Crore

Brief Description: State of art Command and Control Centre for Traffic (2700 sqft) has been set-up at the PMPML Headquarter. The Command and Control Centre captures the real time movement of buses in the city based on the GPS tracker which is placed on the buses. The Office Space houses 4 servers and 20 computers which is managed by 21 people on the ground

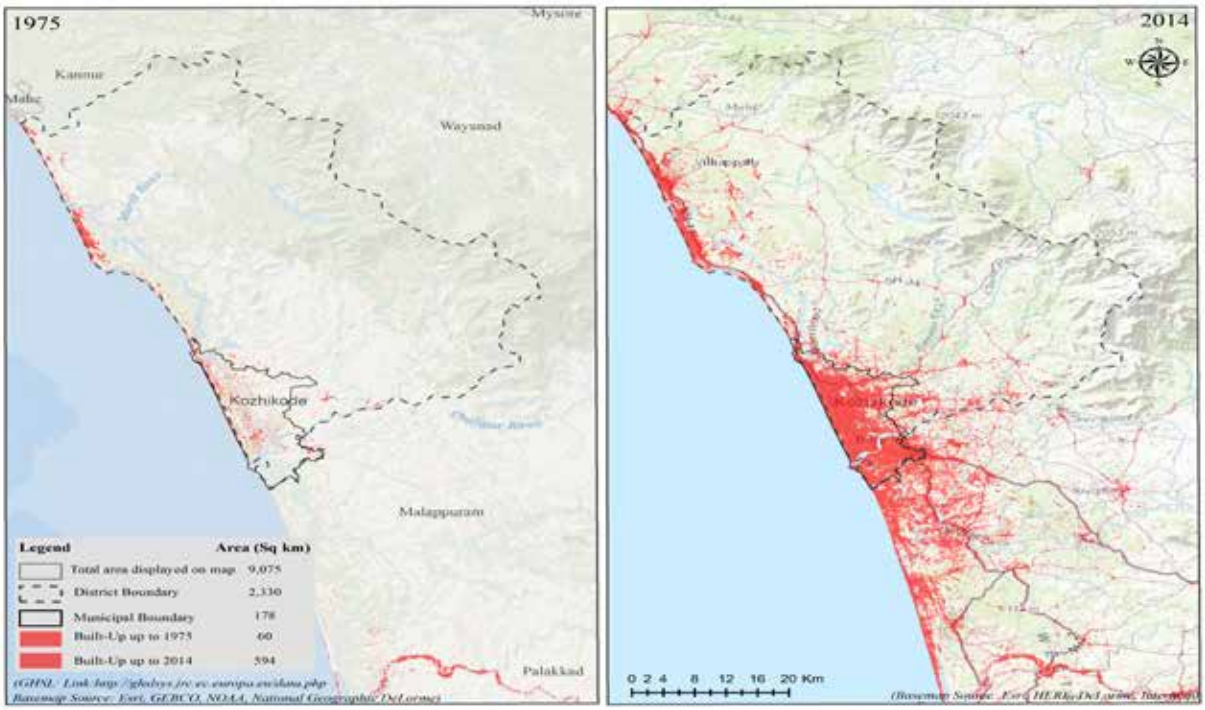
Current Status of project implementation: Fully implemented with 1500+ buses being tracked on the system (see photograph below).

How Urban is India?

8.86 India is rapidly urbanizing, but does the 2011 census based urbanisation rate of 31.2% fairly capture it? Urbanisation in India is officially defined by two metrics: (i) Administrative definition: which considers the population living in areas governed by urban local bodies such as municipal corporations, municipal councils or notified town committees. These urban settlements governed by urban local bodies are referred to as "statutory towns". Using the administrative definition, India was approximately 26% urban in 2011. State governments determine the administrative status of a settlement. By default all settlements are rural and become urban only after the state government converts them, following a requisite legal process. While there are guidelines for classifying a settlement as urban, these are not binding on state governments. (ii) Census definition: Under this definition, the population living in statutory towns described above as well as census towns together constitutes the urban population. Census towns are a category created by the census that fulfill the following three criteria: population of at least 5,000; density of at least 400 persons per square kilometer, and at least 75% of the male main working population engaged in non-agricultural activities. India stood at 31.2% urban in 2011 according to the census definition.

8.87 As India rapidly urbanises, these traditional measures are inadequate to capture the complex phenomenon, especially when we study this at the state or local level. To begin with, there is a large difference between urbanization as defined by the two official definitions. For example, Kerala is 15% urban by the administrative definition, but 47.7% by the census definition. The built-up density on ground processed from the satellite map of Kozhikode shows how the urban expansion ignored the administrative boundary between 1975 and 2014. Other definitions reveal even larger gaps.

Map 2. Built-up Area in Kozhikode Metropolitan region 1975 vs 2014



Source: **IDFC Institute, Mumbai.**

8.88 In countries like Ghana and Qatar, all settlements with 5000+ population are deemed urban. India would be 47% urban in 2011 by this definition. In Mexico and Venezuela, a 2500+ threshold is employed. India would be 65% urban in 2011 by this definition. Kerala is 99% urban both by the 5000+ and 2500+ population definitions. A 2016 World Bank report uses an agglomeration index to measure urbanisation and finds that more than half the population in India is urban.[3] Research by Jana, Sami, and Seddon finds that if we relax the population size and occupation categories and only use the density criteria of 400 persons per square kilometer, India is around 78% urban.[4] It finds that even if we use density criteria of 800 persons per square kilometer, India will still be more urban (55%); far more than the current official numbers suggest. The point is that different definitions give very different answers and the appropriateness of a particular framework really depends on the application. Also note that the urbanization is not black-and-white as there are many shades of semi-urban settlements. Thus, one needs to be careful of making blanket assumptions about the nature of urbanization in India.

Table 14. State Wise Urbanization Rate in 2011 as per different definitions

State Names	Admin	Census	5000+ pop	2500+ pop
Jammu & Kashmir	23.44	27.38	40.35	61.58
Himachal Pradesh	9.59	10.03	10.02	15.82
Punjab	34.44	37.48	46.83	64.49
Chandigarh	91.11	97.25	99.21	100.00
Uttarakhand	24.66	30.10	40.22	51.20
Haryana	31.01	34.88	56.79	78.90
Nct Of Delhi	67.92	97.50	98.56	99.70
Rajasthan	22.93	24.87	35.08	52.69
Uttar Pradesh	20.37	22.27	37.10	60.12
Bihar	10.80	11.29	48.61	72.19
Sikkim	24.19	25.15	27.79	41.18
Arunachal Pradesh	22.66	22.94	21.50	24.60
Nagaland	25.55	28.86	38.75	56.84
Manipur	24.77	32.45	41.90	59.51
Mizoram	52.11	52.11	50.64	58.63
Tripura	18.26	26.17	57.77	85.26
Meghalaya	12.67	20.07	21.42	26.81
Assam	10.64	14.10	21.08	43.42
West Bengal	23.11	31.87	50.71	70.64
Jharkhand	16.08	24.05	29.54	44.22
Odisha	14.24	16.69	19.56	33.10
Chhattisgarh	22.27	23.24	25.19	38.92
Madhya Pradesh	25.85	27.69	33.24	46.34
Gujarat	38.37	42.60	56.71	74.55

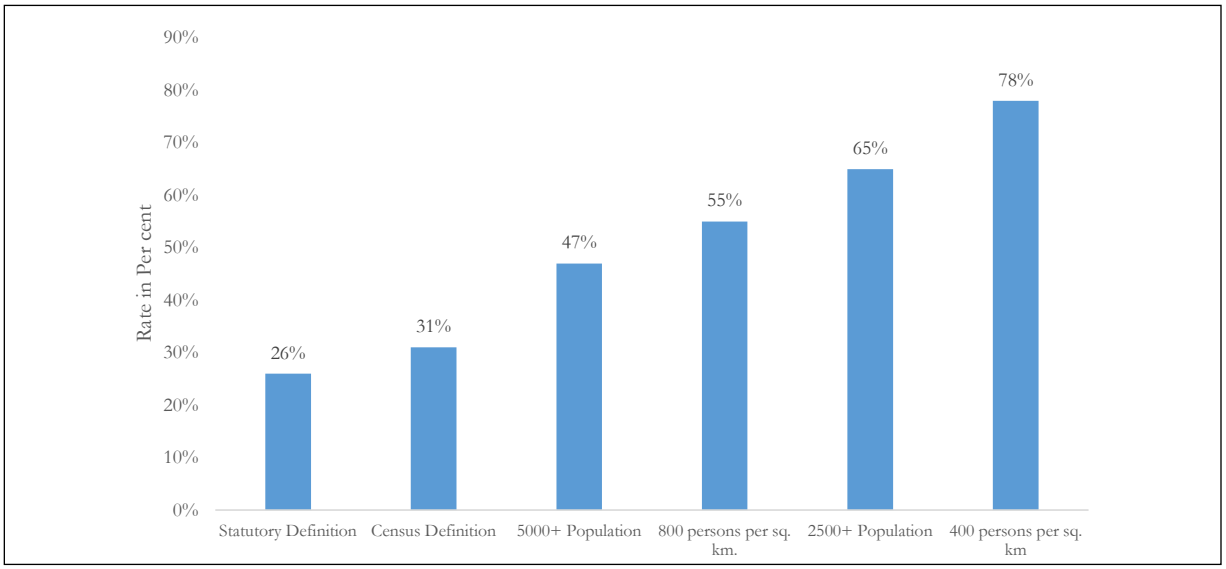
[3] See: http://www.worldbank.org/en/region/sar/publication/urbanization-south-asia-cities.

[4] See: https://www.theigc.org/wp-content/uploads/2014/08/Arindam-Jana.pdf.

State Names	Admin	Census	5000+ pop	2500+ pop
Daman & Diu	28.07	75.17	89.87	95.15
Dadra & Nagar Haveli	28.59	46.72	62.22	88.83
Maharashtra	41.63	45.22	56.39	69.55
Andhra Pradesh	27.20	33.36	57.31	77.88
Karnataka	36.28	38.67	51.35	67.17
Goa	27.56	62.17	66.64	85.74
Lakshadweep	0.00	78.07	82.88	95.85
Kerala	15.71	47.70	99.22	99.89
Tamil Nadu	41.35	48.40	65.86	83.73
Puducherry	59.96	68.33	86.02	96.33
Andaman & Nicobar Islands	28.39	37.70	40.35	56.53
All India	26.31	31.16	47.20	64.94

Source: **IDFC Institute, Mumbai and Census of India, 2011.**

Figure 28. Alternative Definitions of Urbanisation Rate



Source: **IDFC Institute, Mumbai and Census of India, 2011**

Note: **Percentage of India that was Urban in 2011 according to the different definitions**

Using Satellite Data

8.89 With recent advances in remote sensing technology and machine learning for processing satellite images, we can get much more granular data on how urbanisation is happening across India (see map 3). Based on publically available data from the Global Human Settlement Layer (GHSL),[5] we look at how built-up areas show the evolution of human settlements across India since 1975. It is also possible to disaggregate official census population numbers according to the density and form of these settlements to get granular population figures across the country.

[5] See: https://ec.europa.eu/jrc.

8.90 Using these satellite image datasets, we can then apply spatial definitions to classify urban areas. For instance, the Joint Research Center of the European Commission Science Hub, that generates the GHSL data, defines "high density clusters" (HDCs) as those areas that meet all of the following criteria:

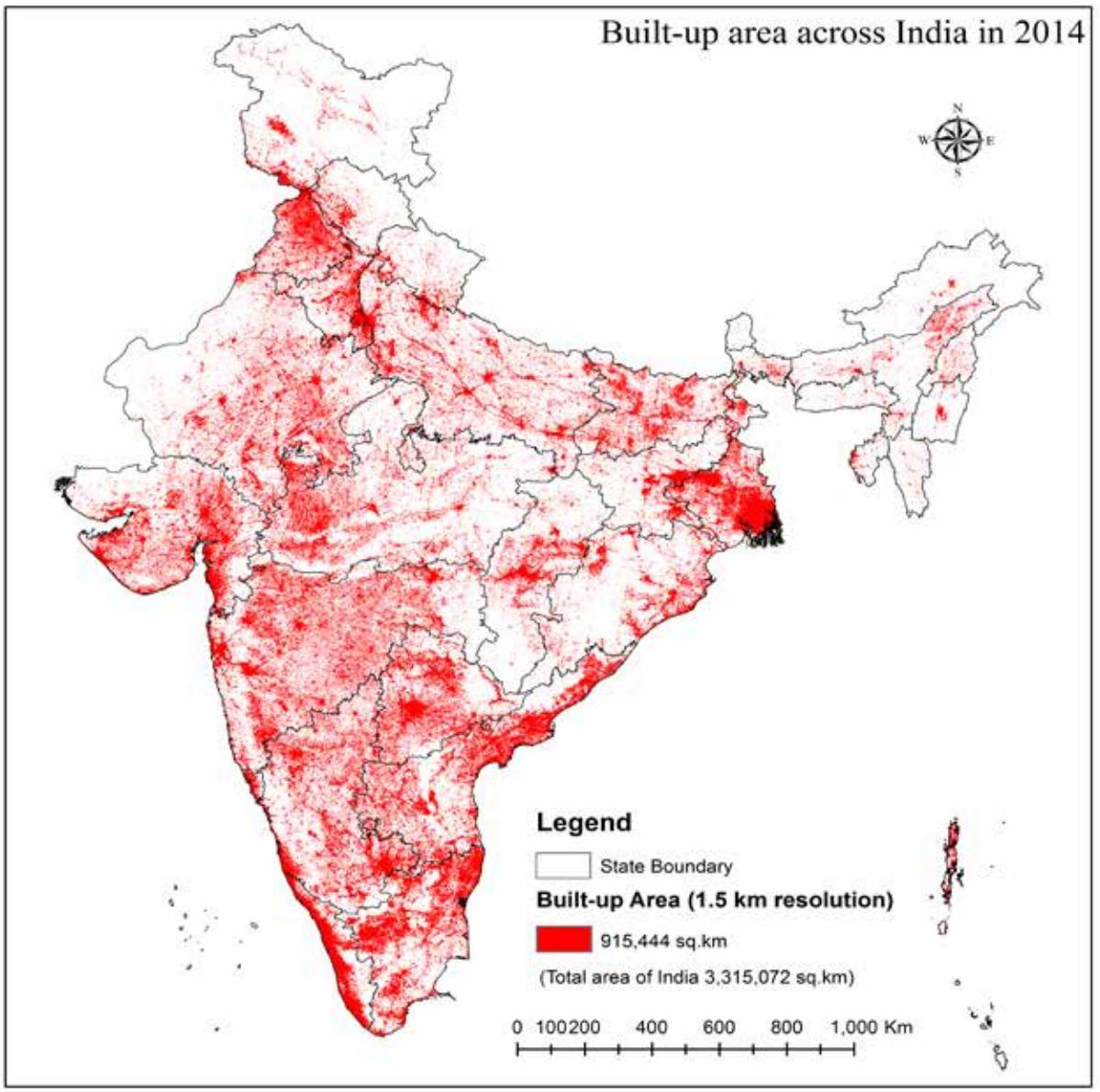
a) 4 contiguous cells with at least 1,500 persons per square kilometer,

b) Minimum of 50,000 persons per cluster, and

c) Density of built-up area greater than 50%

8.91 Based on this more detailed data and scientific definition of High Density Settlements, India was 63% 'urban' in 2015 -- more than double the urbanization rate estimated by the 2011 Census. Moreover, we can go into a much greater level of spatial detail with this data to uncover important insights for promulgating expeditious public policy at center, state and urban local body level.

Map 3. Built-up area across India in 2014



Box 2. Does India need a Transparency of Rules Act?

Almost everyone will agree that "rule-of-law" is fundamental to good governance. In turn, rule-of-law is based on the expectation that all citizens are aware of the country's laws and will follow it. Ignorance of the law is not accepted as defense. The problem is that it is not easy for ordinary citizens (& businesses) in India to navigate the multitude of rules, regulations, forms, taxes and procedures imposed by various tiers of government. Moreover, these rules frequently change and sometimes contradict each other. Often the citizen has to follow a long paper trail of circulars and notifications to know the current requirements. Note that we are not concerned here about the content of the rules/regulations but solely about the ease of finding out what the citizen is expected to so.

The opaque mesh of rules is so complicated that even government officials struggle to keep up with the latest version. This is the cause of a lot of inefficiency, and delay. Arguably it is also an important source of corruption and endless litigation. This is why India would benefit enormously if the average citizen could easily access the latest rules and regulations in a comprehensible format.

One way to solve the above problem could be a Transparency of Rules Act (TORA). The proposed legislation would have the following three elements. Each element is necessary and that together they are sufficient to significantly resolve this problem:

- TORA would make it mandatory for all departments to place every citizen-facing rule, regulation, form and other requirement on its website (preferably in English, Hindi and regional language). Once a department is declared "TORA-complaint", any rule that is not explicitly on the website would be deemed not to apply. No government official would be allowed to impose a rule, procedure or form that is not explicitly displayed on the website.

  This is not an entirely new idea as all state and central laws are currently required to be published in the Gazette. The new legislation extends this principle to say that a rule only applies if the citizen can easily find it on the website of the relevant department or agency. Simply placing a circular in the large heap of updates and circulars in the Gazette is not good enough.

- TORA will further specify that all laws, rules and regulations need to be presented as an updated, unified whole at all times. Citizens should not have to wade through decades of circulars to find out the current state of play. This is already being done in some places on an ad hoc basis, but this is not useful if one is never completely sure that the so-called updated version has itself not been superseded. The format used by Wikipedia is a simple example of a format where the main text can be constantly updated but also allows people to look up document history in order to compare changes. A presentation of laws as an updated whole will have an additional benefit that it will make internal contradictions obvious.

- The third critical element of TORA is that the websites should clearly state the date and time when each change is made. This should be embedded in the software. Laws would normally be applicable after a specified time (say seven days) after the rule has been posted. The principle is that the government must give the citizen a reasonable time to comply. The date stamp means that officials cannot retrospectively change a regulation. Note that the text on the website is deemed the law even if it has a mistake, till the correction is made. The department, and not the citizen, must pay for the consequences of any error.

Note that TORA needs all three ingredients in order to work. Leaving aside any one of them will create a loophole that will quickly make the other elements unworkable.

The technology requirements of TORA are simple and well-established, and it fits well with the Digital India initiative. The cost of implementation too is likely to be trivial. Moreover, it can be implemented by one department at a time and does not need large-scale nation-wide coordination. Once a department has shifted to the platform, it can be deemed "TORA-compliant" and citizens can be sure that the information is authentic and updated.

It could be argued that such a system could be implemented administratively and does not need legislative backing. One can indeed get the project moving before the Act is passed. However, without legal backing, it will be too dependent on the executive leadership of the time and will not be a permanent change.

Appendix 1

Abbreviations

Country Name	Country Code
Argentina	ARG
Bangladesh	BGD
Bolivia	BOL
Brazil	BRA
Chile	CHL
China	CHN
Costa Rica	CRI
Cyprus	CYP
Dominican Republic	DOM
Ecuador	ECU
Egypt, Arab Rep.	EGY
El Salvador	SLV
Haiti	HTI
Honduras	HND
India	IND
Indonesia	IDN
Iran, Islamic Rep.	IRN
Israel	ISR
Jamaica	JAM
Kenya	KEN
Korea, Rep.	KOR
Madagascar	MDG
Malaysia	MYS
Malawi	MWI
Mexico	MEX
Morocco	MAR
Nicaragua	NIC
Nigeria	NGA
Pakistan	PAK
Panama	PAN
Peru	PER
Philippines	PHL
Rwanda	RWA
South Africa	ZAF
Sri Lanka	LKA
Thailand	THA
Turkey	TUR
Uganda	UGA
Uruguay	URY
Venezuela, RB	VEN
Zambia	ZMB

Appendix 2

List of State Abbreviation

Abbreviation	States/UT
AP	Andhra Pradesh
AR	Arunachal Pradesh
AS	Assam
BR	Bihar
CG	Chhattisgarh
GA	Goa
GJ	Gujrat
HR	Haryana
HP	Himachal Pradesh
JK	Jammu and Kashmir
JH	Jharkhand
KA	Karnataka
KL	Kerala
MP	Madhya Pradesh
MH	Maharashtra
MN	Manipur
ML	Meghalaya
MZ	Mizoram
NL	Nagaland
OR	Orissa
PB	Punjab
RJ	Rajasthan
SK	Sikkim
TN	Tamil Nadu
TR	Tripura
UK	Uttarakhand
UP	Uttar Pradesh
WB	West Bengal
TN	Tamil Nadu
AN	Andaman and Nicobar Islands
CH	Chandigarh
DH	Dadra and Nagar Haveli
DD	Daman and Diu
DL	Delhi
LD	Lakshadweep

Appendix 3. Add to Statistical Appendix: Round- wise cities

#	Name of City	Name of State/UT
20 Light House Cities		
1	Bhubaneswar	Odisha
2	Pune	Maharashtra
3	Jaipur	Rajasthan
4	Surat	Gujarat
5	Kochi	Kerala
6	Ahmedabad	Gujarat
7	Jabalpur	Madhya Pradesh
8	Visakhapatnam	Andhra Pradesh
9	Solapur	Maharashtra
10	Davanagere	Karnataka
11	Indore	Madhya Pradesh
12	NDMC	Delhi
13	Coimbatore	Tamil Nadu
14	Kakinada	Andhra Pradesh
15	Belagavi	Karnataka
16	Udaipur	Rajasthan
17	Guwahati	Assam
18	Chennai	Tamil Nadu
19	Ludhiana	Punjab
20	Bhopal	Madhya Pradesh
13 Fast Track Cities		
1	Lucknow	Uttar Pradesh
2	Warangal	Telangana
3	Dharamshala	Himachal Pradesh
4	Chandigarh	Chandigarh
5	Raipur	Chhattisgarh
6	Newtown Kolkata	West Bengal
7	Bhagalpur	Bihar
8	Panaji	Goa
9	Port Blair	A & N Islands
10	Imphal	Manipur
11	Ranchi	Jharkhand
12	Agartala	Tripura
13	Faridabad	Haryana
27 Round 2 Cities		
1	Amritsar	Punjab
2	Kalyan-Dombivali	Maharashtra
3	Ujjain	Madhya Pradesh

#	Name of City	Name of State/UT
4	Tirupati	Andhra Pradesh
5	Nagpur	Maharashtra
6	Mangaluru	Karnataka
7	Vellore	Tamil Nadu
8	Thane	Maharashtra
9	Gwalior	Madhya Pradesh
10	Agra	Uttar Pradesh
11	Nashik	Maharashtra
12	Rourkela	Odisha
13	Kanpur	Uttar Pradesh
14	Madurai	Tamil Nadu
15	Tumakuru	Karnataka
16	Kota	Rajasthan
17	Thanjavur	Tamil Nadu
18	Namchi	Sikkim
19	Jalandhar	Punjab
20	Shivamogga	Karnataka
21	Salem	Tamil Nadu
22	Ajmer	Rajasthan
23	Varanasi	Uttar Pradesh
24	Kohima	Nagaland
25	Hubballi-Dharwad	Karnataka
26	Aurangabad	Maharashtra
27	Vadodara	Gujarat

Appendix 4. Explanation of Satellite Image Extraction & Processing

Primary Data Source: The built-up analysis has been conducted using the processed satellite imagery from the Global Human Settlements Layer (GHSL). Extracted and processed by the Group on Earth Observations at the European Commission, GHSL is constructed using a combination of different satellite imagery sources collected over the last several decades. This is in the form of built up maps, population density maps and settlement maps. This information is generated with evidence-based analytics and knowledge using new spatial data mining technologies. This framework uses heterogeneous data including global archives of fine-scale satellite imagery, census data, and volunteered geographic information. The GHSL data is processed fully automatically and generates analytics and knowledge reporting objectively and systematically about the presence of population and built-up infrastructures. The current study uses four widely-spaced time intervals: 1975, 1990, 2000 and 2014. The approach is still experimental and we hope to refine it and apply it in many new fields and geographies.