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# *Taking US-India economic relations to the next level*





# Foreword

The US and India have established a close partnership based on their shared interest in free and fair trade. While the former is one of the world's pre-eminent superpowers, the latter is the fast-rising 'Tiger of Asia'. Both countries are focused on creating jobs, participating in fair trade, strengthening macroeconomic fundamentals, boosting industry and finding opportunities for joint collaboration.

## About the US

### The US is one of the most powerful economies in the world

- The US is the most technologically powerful economy in the world, with a per capita GDP of 57,300 USD. Although the dominance of US firms declined to some extent after World War II, they have since been at the forefront of technological advances, especially in the fields of computers, pharmaceuticals, medicine, aerospace and military equipment.<sup>1</sup>
- Based on a comparison of gross domestic product (GDP) measured at purchasing power parity conversion rates conducted in 2014, the US economy ranked as the largest in the world for more than a century. However, it has been overtaken by China (which has more than tripled the US growth rate for each year of the past four decades) and has now slipped to the second place.<sup>2</sup>

## About India

### India's macroeconomic fundamentals are expected to remain strong and get a boost from the government's focused initiatives

- The Indian economy is the third largest in the world in terms of PPP after China and the US, and the fifth largest in terms of nominal GDP.<sup>3</sup> It is one of the major G-20 economies, with an average growth rate of around 7% over the last two decades.<sup>4</sup>
- India's GDP forecast is 7.2% for the current fiscal and its global output is projected to grow by 3.5% in 2017 and 3.6% in 2018.<sup>5</sup> India is also among the top three global producers of several crops, including wheat, rice, pulses, cotton, peanuts, fruits and vegetables.<sup>6</sup>

PwC's report 'Destination India 2017' indicates that the strength of the Indian economy lies in its consumption-driven growth, which makes it resilient to global headwinds and stabilises its macroeconomic fundamentals. This stability, along with other factors, such as the government's pro-market reforms, decisive measures to improve infrastructure and create investment-friendly opportunities in infrastructure, and the desire to remove 'red-tapism' and make the business environment investor-friendly, has made India a destination of choice for investors.<sup>7</sup>

India's favourable demographic dividends are another strategic advantage. By 2025, India is projected to account for 20% of the world's working-age population, and by 2020, to be the youngest country in the world, with a median age of 29 years.<sup>8</sup> Also, by 2020, for every dependent person (the elderly or children), there are expected to be two employable individuals (in the working age group of 15–64 years).<sup>9</sup> India's demographic edge is expected to play a significant role in the country's growth story over the medium term, and emphasises its attractiveness as an investment destination with an abundant supply of young and skilled labour.



PwC is privileged to be the knowledge partner for this convention for the third year in a row. IACC has invited policymakers, regulators, investors and industry leaders to the convention to discuss, debate and find ways to improve US and India bilateral trade and engagement. The convention will be a common ground for the ‘who’s who’ of both countries to discuss key challenges and opportunities across different sectors in India. This thought leadership report was prepared by PwC’s sector teams and addresses various aspects related to these sectors in India with the aim of enhancing the US-India economic engagement.

As with the 2016 PwC-IACC report,<sup>10</sup> this year too, our industry experts have provided overviews of selected industries and investment opportunities for US companies. We hope this paper stimulates increased conversation, engagement and trade between India and the US.



**Sanjay Tolia**  
India Clients and Industries Leader  
PwC India

1 CIA. (2017). *The World Factbook*. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/us.html> (last accessed on 7 Aug 2017)

2 *Ibid.*

3 PwC. (2017). *Destination India 2017*. Retrieved from <https://www.pwc.in/publications/2017/destination-india-2017.html> (last accessed on 7 Aug 2017)

4 *Ibid.*

5 IBEF. (2017). *Growth in India to pick up further in 2017, 2018: IMF*. Retrieved from <https://www.ibef.org/research/reports/growth-in-india-to-pick-up-further-in-6-2017-2018-imf> (last accessed on 7 Aug 2017)

6 PwC. (2017). *Destination India 2017*. Retrieved from <https://www.pwc.in/publications/2017/destination-india-2017.html> (last accessed on 7 Aug 2017)

7 *Ibid.*

8 *Ibid.*

9 *Ibid.*

10 PwC. (2016). *Winning together: US and India investment opportunities and synergies*. Retrieved from <https://www.pwc.in/assets/pdfs/publications/2016/winning-together-investment-opportunities-and-synergies-for-the-us-and-india.pdf> (last accessed on 7 Aug 2017)

# Introduction

The PwC-IACC 2016 report, 'Winning together: US and India investment opportunities and synergies', indicates that India-US bilateral relations have developed into a 'global strategic partnership' based on shared democratic values and increasing convergence of interests on bilateral, regional and global issues. The two superpowers—one an emerging tiger and the other an established giant—have shared a 70-year strong diplomatic relationship. Growth, trade and commercial linkages between India and the US form an important component of the multifaceted partnership between the two countries.<sup>11</sup> Total bilateral trade (goods and services) between India and the US increased at a compound annual growth rate (CAGR) of 11.6% from 20 billion USD in 2000 to over 114.9 billion USD in 2016.<sup>12</sup> In 2016–17, foreign direct investment (FDI) inflows hit an all-time high of 60.1 billion USD according to the Ministry of Commerce and Industry.<sup>13</sup>

The US and India are important trading partners to one another. According to the Department of Industrial Policy and Promotion (DIPP), from April 2016 to March 2017, India received the maximum FDI equity inflows from Mauritius (15.73 billion USD), followed by Singapore (8.71 billion USD), Japan (4.71 billion USD), the Netherlands (3.37 billion USD), and the US (2.38 billion USD).<sup>14</sup> In 2016, the US



conducted trade worth 67 billion USD with India, making the Asian superpower its ninth largest trading partner.<sup>15</sup> In 2016, US imports from India exceeded its exports to the country, running a trade deficit of over 20 billion USD. Top US imports from and exports to India in 2016 are shown below:

## The US imported goods worth 45 billion USD from India in 2016<sup>16</sup>

Imports	Import value (USD)
Jewelry and silverware, Sporting and athletic goods, Toys	11.23 billion
Basic chemicals, Pharmaceuticals and Medicines	10.58 billion
Apparel and accessories	3.83 billion
Textile mill and furnishing products	3.45 billion
Coal and petroleum products	2.4 billion

## The US exported goods worth 21.7 billion USD to India in 2016<sup>17</sup>

Exports	Import value (USD)
Pearls, precious stones and metals	5.58 billion
Basic chemicals	3.33 billion
Metal manufacturing, Medical and surgical equipment	2.09 billion
Computer and electronic products	1.97 billion
Machinery, except electrical	1.48 billion

11 Embassy of India. (2017). India-US trade and investment. Retrieved from <https://www.indianembassy.org/pages.php?id=42> (last accessed on 7 Aug 2017)

12 Ibid.

13 Ray, R. K. (19 May 2017). India's FDI inflows at a record \$60.1 billion in 2016-17. *Hindustan Times*. Retrieved from <http://www.hindustantimes.com/business-news/india-s-fdi-inflows-at-a-record-60-1-billion-in-2016-17/story-7a8pt2u7e8JtptDQcwhO.html> (last accessed on 7 Aug 2017)

14 IBEF. (2017). Foreign direct investment. Retrieved from <https://www.ibef.org/economy/foreign-direct-investment.aspx> (last accessed on 7 Aug 2017)

15 Krishna, M. (28 June 2017). US-India trade by the numbers. *Investopedia*. Retrieved from <http://www.investopedia.com/news/usindia-trade-numbers/> (last accessed on 7 Aug 2017)

16 Ibid.

17 Ibid.

The two current leaders—President Donald J Trump and Prime Minister Narendra Modi—plan to expand and deepen their strategic partnership and advance mutually important objectives.<sup>18</sup> When the two leaders met in Washington DC in June 2017, one item discussed was increasing fair and free trade. The leaders agreed to increase their economic cooperation to make their nations stronger and their citizens more prosperous. Noting that the extensive economic and tax reforms launched in their respective countries will generate immense economic opportunities for both countries, the leaders committed to further expanding and balancing the trade relationship and to removing obstacles to growth and job creation.<sup>19</sup> As per the official statement, both leaders agreed that a close partnership was important to stability in the region.

Both Trump and Modi are focused on creating jobs and strengthening trade and economic ties. These are encouraging signs and convey a desire to build upon and enhance bilateral trade. Both leaders also agreed to leverage their innovation skills and capabilities to solve global development challenges by collaborating in healthcare, space and oceans, and other areas of science and technology.

During Modi's visit to the US in June 2017, he hosted a round-table meeting with 20 American CEOs. During the meeting, he noted that the Union Government in India is working on principles such as 'minimum government, maximum governance'.<sup>20</sup> On their part, the American CEOs appreciated the policy initiatives towards ease of doing business, Digital India, Make in India, Skill Development, demonetisation and the focus on renewable energy.<sup>21</sup>

In the last three years, the government eased approximately 90 FDI rules across many sectors to accelerate economic growth and boost jobs.<sup>22</sup> The government relaxed FDI norms in several sectors like defence, telecom and power exchange<sup>23</sup> in an effort to boost business activity and trade flows, position India as a country where there is ease of doing business, bring best practices into sectors, and allow investment to help grow the Indian economy. India remains one of the most attractive investment destinations due to its demographic dividends, large middle class, aspirational pool of young consumers, focus on streamlining business, etc. Several opportunities exist for US and Indian companies to collaborate across sectors. By investing together, US and Indian companies can transfer best practices and knowledge, increase the quality and standard of goods and services, boost bilateral trade and, in doing so, create stronger and more competitive industries together.



18 Saxena, N. (27 June 2017). Full statement from White House after PM Narendra Modi meets US President Donald Trump. NDTV. Retrieved from <http://www.ndtv.com/india-news/full-statement-of-the-white-house-after-pm-narendra-modi-leaves-us-for-the-netherlands-1717318> (last accessed on 7 Aug 2017)

19 Ibid.

20 Press Information Bureau, Government of India. (25 June 2017). PM interacts with American CEOs. Retrieved from <http://pib.nic.in/newsite/erelease.aspx?relid=:166892> (last accessed on 7 Aug 2017)

21 Ibid.

22 Ray, R. K. (19 May 2017). India's FDI inflows at a record \$60.1 billion in 2016-17. Retrieved from <http://www.hindustantimes.com/business-news/india-s-fdi-inflows-at-a-record-60-1-billion-in-2016-17/story-7a8pt2u7e8lJtptDQcwhO.html> (last accessed on 7 Aug 2017)

23 IBEF. (2017). Foreign direct investment. Retrieved from <https://www.ibef.org/economy/foreign-direct-investment.aspx> (last accessed on 7 Aug 2017)

# Preface

The Annual IACC Convention is a continuous dialogue. It seeks to highlight the prospects and challenges of dynamic business engagements between India and the US—two continent-sized countries that have huge potential for working together with mutual advantage. The future-oriented agenda that the convention sets for each year reflects the shared aspirations of two of the world's largest democracies to break new ground in the economic partnership.

If the discussions revolved around areas like aerospace, defence, banking and financial services and infrastructure last year, this year, the focus is on how India and the US can come together to fund growth; tap the soft power of culture, tourism and hospitality; and cooperate to enhance farm technology and smart mobility. Understandably, topics from previous conventions, such as conventional and renewable energy and a digital bridge to growth and infrastructure, continue to attract attention. This is indicative of the renewed emphasis on these domains in the bilateral economic engagement. For instance, for the first time, India has imported crude from the US in large quantities to be refined on Indian shores, which is a departure from the past. Also, there exists a huge scope for India to import equipment for tapping alternative sources of energy, such as solar power equipment and windmills. In addition, huge opportunities exist for US companies to invest in India's Sagarmala project to develop new sea ports and add capacities to the existing ones.

Globally, the digital space is constantly evolving. The shelf life of new technologies is becoming shorter. The rate of obsolescence is very high, particularly in the case of mobile and related technologies, given the penetration of artificial intelligence, robotics, sensors, biomarkers, etc. While some global giants are consolidating their presence in India, others are preparing to take advantage of the new ecosystem that gives primacy to manufacturing in India. Importantly, some of the global telecom companies, including those from the US, have presented a wish list for the Indian policy apparatus. The convention will provide a powerful platform for a range of companies to express their views and perceptions and for Indian policymakers and corporations to respond to them.

Growth with employment is the new motto to ensure an inclusive development paradigm. As manufacturing is becoming more capital intensive, avenues for employment should emerge from sectors like tourism, hospitality and healthcare, where manpower requirements are immense. Significantly, the global manpower requirements in these sectors are increasing exponentially. Countries like India, which enjoys a demographic advantage because of its high proportion of working population to the aged, can be a reliable source for supplying quality manpower. Imparting the right type of training and exposure to the global market is critical in this regard.

There is a growing mismatch between global population and farm growth, necessitating additional production of foodgrains, vegetables, dairy products, etc., to feed the ever-growing population. India can use of the right type of technology to increase production and productivity as well as the supply chain to move produce from the farm to processing centres without losses in transit. There is scope for Indian and US companies to come together in these domains to co-create, thus meeting not only domestic demand but also global requirements. Many new technologies and concepts will be discussed at the event.

We are grateful to PwC, our knowledge partner for the annual convention, for putting together an incisive, comprehensive and well-researched discussion paper that contains many new ideas and approaches to strengthen the Indo-US economic dialogue.



**Atul Vyas**  
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# Executive summary

As with our 2016 report, we discuss selected sectors which hold great opportunities for US and Indian companies to invest in together. These sectors also have strong potential for growth and will strengthen India's position as a global business hub.

## Funding growth

The private equity (PE) space in India continues to exude confidence with FY17 (April 2016–March 2017) recording 25 billion USD worth of investments, a visible uptrend over the last few years. In the last five fiscals, both global and domestic PE investors backed over 3,500 businesses and aided entrepreneurs in fuelling India's growth trajectory. In addition to capital, foreign investors have played a vital role in ushering in global expertise in optimising the way businesses are run.

Selected trends include increasing activity from sovereign wealth funds (SWFs), pension funds and family offices, the appeal of stressed assets from PE funds, venture capital/early-stage investments in the technology space, and heightened secondary and tertiary activity in recent times.

Selected challenges include the impact of the roll out of the Goods and Services Tax (GST) which will reflect in the rest of the year's performance, global political volatility which investors watch out for when investing in emerging markets, and public market valuations in key PE sectors have seen a sequential rise over the last year.

India continues to be a favoured destination among foreign investors, including US-based PE firms. Over the years, the government has been pruning the list of prohibited sectors and liberalising foreign direct investment (FDI) caps on various sectors. FDI in India crossed 43 billion USD in FY17, with PE accounting for around 58% of the capital inflow. Government reforms such as Make in India, Digital India, Startup India and Smart Cities have also garnered significant interest from foreign investors.

## Meeting India's energy needs (conventional and renewable)

The energy sector in India is transforming with a focus on core issues such as access, stability in energy production, sustainability and improved efficiency. This transformation in India's energy sector has been enabled through efficient governance with the creation of synergies between different departments—that is, the Ministries of Power, Coal and New



and Renewable Energy—and increased transparency in natural resource allocation through the introduction of an online auction process. Online portals and mobile apps to track the progress and disseminate information have further brought necessary transparency and speed to decision making. Some of the achievements in the sector in recent years have been broadly categorised across three sector objectives:

- Energy security – ensuring reduced electricity import dependence
- Energy equity – ensuring access to electricity for all at affordable prices
- Sustainability – mitigating the catastrophic effects of climate change with reduced fossil fuel usage and enhanced demand-side efficiency

Selected trends include significant reduction in demand-supply deficit, rationalisation of electricity tariffs, supply-side tie-ups, moving to short-term contracts and reduction in peak demand due to energy efficiency.

Selected challenges include completing the last mile of reliable access to electricity, improving the operational performance of existing thermal assets and integrating RE power on a large scale, enhancing the reliability of coal supply, and creating a robust captive power policy.

Over the years, India has forged strong bilateral ties with the US. India is one of the few countries where the US Department of State brought on board an energy specialist with the objective of leading, identifying, developing, implementing and administering loans, technical assistance (TA) projects and non-lending products and services (NLPS) in the energy sector. Several opportunities and synergies exist in areas such as advanced electrical equipment manufacturing, solar PV manufacturing, flexibility of energy sources, off-grid energy solutions and clean cooking energy access.

### **Opportunities in Indo-US farmtech: Thought for food**

Agriculture plays a significant role in the Indian economy. The sector provides livelihood to more than 58% of the rural population in the country.<sup>24</sup> The overall GDP of the agriculture and allied sector in India was 244.74 billion USD in FY16 and is growing at a compound annual growth rate (CAGR) of 6.64% (during FY07–16).<sup>25</sup> Moreover, with 157.35 million hectares of land, India holds the second largest share of agricultural land in the world.<sup>26</sup> Given the importance of the agriculture sector, the Government of India, in its Budget 2017–18, planned several steps for the sustainable development of agriculture.

Selected major trends include the growing use of farm machinery and equipment, the importance of irrigation technology and the potential of seed technology.

Selected major challenges include small and scattered landholdings, procurement processes for farmers, and lack of support infrastructure for warehousing and logistics.

The Government of India's emphasis on adopting technology in agriculture has resulted in an increase in production and productivity. However, there is considerable scope for improving the current level of productivity in the country. The vision is to create hubs for hi-tech and high-value farm equipment in the country. In addition, the availability of infrastructure will also help in enhancing the export of agricultural products from India and allow the country to develop as a major exporting hub.

### **The soft power of culture and tourism**

India's culture and tourism sector is one of its most vibrant service sectors. The country's rich culture and heritage make it one of the most interesting destinations in the world to visit. Both Indians residing in India and foreigners are interested in exploring the country, which boasts a remarkable diversity in terms of food, culture, customs and geography. The Incredible India campaign was launched by the Government of India in 2002 to promote India as a tourist destination.<sup>27</sup> India ranks 15th in the world in terms of international tourism receipts, with a 1.62% share of the world's tourism receipts,<sup>28</sup> making it a large market for travel and tourism.

Selected trends include the growth of business travel (CAGR of 11.5% till 2019), the increase in spiritual tourism due to Ayurveda, yoga, Siddha and naturopathy, and an increase in the number of online travel and tour operators who are providing competitive prices and options to consumers.

24 India Brand Equity Foundation. (2017). Agriculture. Retrieved from <https://www.ibef.org/download/Agriculture-April-2017.pdf> (last accessed on 21 Aug 2017)

25 Ibid.

26 Ibid.

27 India Brand Equity Foundation. (June 2017). Tourism and hospitality. Retrieved from <https://www.ibef.org/download/Tourism-and-Hospitality-June-2017.pdf> (last accessed on 29 June 2017)

28 Make in India website: <http://www.makeinindia.com/sector/tourism-and-hospitality>



Selected challenges include intense competition, the entry of new players and the bargaining power of consumers.

India is expected to be ranked among the top five business travel markets globally by 2030 as business travel spending in the country is expected to treble by 2030 from 30 billion USD in 2015. International hotel chains will likely increase their expansion and investment plans in India, and are expected to account for a 50% share in the Indian hospitality industry by 2022 (from the current 44%).

## **Infrastructure: Ports, inland waterways, roadways, logistics, railways, airports**

### **Ports and inland waterways**

Endowed with a vast coastline of around 7,500 km, spanning 13 states and union territories and with navigable waterways of over 20,000 km, India boasts of a rich maritime heritage. Indian ports handled about 1,135 million tonnes of traffic in 2016–17. Of this, around 57% was handled by ports that come under the purview of the Government of India (called major ports), and the rest was handled by ports under the purview of the state governments (non-major ports).

India has an extensive network of inland waterways. Of the total navigable length of 14,500 km, 5,200 km of the rivers and 4,000 km of canals can be used by mechanised crafts. As compared to the US, China and the European Union, freight transportation by waterways is highly underutilised in India.

Selected major trends include the Sagarmala programme under the Ministry of Shipping, which envisions port-led development in a comprehensive and holistic manner, the move towards a market-driven regime and autonomy of major ports, and the development of alternative modes of transport.



Selected major challenges include a continued focus on improving the public private partnership (PPP) environment, aligned development of the infrastructure value chain and the availability of manpower.

## Roadways

The Ministry of Road Transport and Highways (MoRTH) constructed around 8,200 km of national highways during FY 2016–17 and set an ambitious target to construct about 15,000 km of roads during FY 2017–18. In addition, there is an expectation that close to 9,000–10,000 km of roads would be awarded by MoRTH/the National Highways Authority of India (NHAI) and other Central Government agencies during FY 2017-18.

Selected major trends include the government's decision to retain traffic risk in road sector public private partnership (PPP) projects and the importance of operations and maintenance (O&M) capabilities.

Selected major challenges include issues in environmental clearances, acquisition of land and utility shifting to implement projects and some reluctance by banks to fund road projects due to gross non-performing assets (GNPAs).

We expect to see consolidation in M&A activity and the entry of institutional investors and specialised O&M players into the Indian road sector. US-based developers and those from other countries would find Indian market attractive from the risk-reward point of view. The prevalent market condition is conducive for new players to enter the Indian road sector.

## Logistics

The Indian logistics industry is estimated to be worth around 160 billion USD as of FY17 and has grown at a CAGR of 7.8% over the past five years.<sup>29</sup> Driven by improvements in regulatory reform and the development of supporting infrastructure, it is expected to exhibit strong growth in the near future.

Selected trends include regulatory reforms facilitating operational efficiency, infrastructure developments to facilitate multimodal transportation and create a hub-and-spoke distribution model, increasing penetration of e-commerce, and driving the need for logistics.

Selected challenges include the lack of skilled manpower/drivers, infrastructure bottlenecks to expand the network to tier 2 and tier 3 cities, and inadequate legal protection to foreign investors.

Given the vast expanse of the country, the development of a hub-and-spoke distribution model is essential for achieving operational efficiency. Such a distribution model requires the development of a conducive environment in terms of the

regulatory landscape and infrastructure development. While the implementation of GST is a positive step in this direction, the pace of infrastructure development will be key for the establishment of a hub-and-spoke model. In addition, the logistics sector is expected to become more organised.

## Railways

Spanning 66,687 km<sup>30</sup> and with more than 7,216 railway stations, the Indian Railways (IR) is the fourth largest railway network in the world. The volume of capital investments in the sector has doubled in the last two years, increasing from 587 billion INR<sup>31</sup> in FY15 to 1,210 billion INR in FY17.<sup>32</sup>

Selected major trends include increasing throughput, technological advancements, upgrading of infrastructure and reducing logistic costs.

Selected major challenges include inadequate infrastructure, cross-subsidisation of passenger services and implementation bottlenecks.

The railways have increasingly been attracting FDI through strategic alliances with various countries over the last few years. Companies from France, China and Russia too have joined hands with the IR to bring three semi-high speed rail corridor projects on track. Given the huge amount of investments required in the sector and the plethora of opportunities available, more players and countries are expected to enter India's railways market.

## Airports

Air passenger traffic in India has grown steadily in the past few years, with double-digit growth in the last two years. From 2015–2020, air passenger traffic in India is expected to grow at a CAGR of 10%, taking the overall passenger traffic from 219 million in 2015 to 354 million by 2020. Likewise, this traffic is expected to reach around 850 million by 2030, growing at a CAGR of 9%.<sup>33</sup>

Selected major trends include the rapid increase in air passenger traffic in India, an increase in air travel penetration in tier 2 and tier 3 cities and growth in the number of airports with an annual traffic of more than 1.5 million passengers.

Selected major challenges include volatile aviation turbine fuel (ATF) prices, infrastructural limitations and capacity constraints at Indian airports.

The Indian aviation market is growing and has great potential for the future. This growth will be driven by an increase in the number of airports in tier 2 and tier 3 cities and will, therefore, be more inclusive in nature.

29 PwC analysis

30 Indian Railways. (n.d.). *Statistical summary – Indian Railways*. Retrieved from [http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat\\_econ/IRSP\\_2015-16/Summary%20Sheet\\_Eng\\_pdf\\_pdf.pdf](http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat_econ/IRSP_2015-16/Summary%20Sheet_Eng_pdf_pdf.pdf) (last accessed on 18 Aug 2017)

31 Indian Railways. (n.d.). *Presentation on achievements and plans of Indian Railways*. Retrieved from <http://www.indianrailways.gov.in/Presentation%20on%20Achievements%20&%20Plans%20of%20Indian%20Railways.pdf> (last accessed on 18 Aug 2017)

32 Indian Railways. (n.d.). *Statistical summary – Indian Railways*. Retrieved from [http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat\\_econ/IRSP\\_2015-16/Summary%20Sheet\\_Eng\\_pdf\\_pdf.pdf](http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat_econ/IRSP_2015-16/Summary%20Sheet_Eng_pdf_pdf.pdf) (last accessed on 18 Aug 2017)

33 PwC analysis

## Smart mobility

Indian cities are evolving rapidly with the changing requirements of the country's increasing populace. Increasing urbanisation is posing immense pressure on the existing infrastructure and is compelling policymakers to take note of major issues related to inadequate and inefficient public transport services and related infrastructure, increasing greenhouse gas emissions, and the lack of technological interventions to promote service delivery to end users. One of the most ambitious projects launched by the Government of India is the smart city initiative under which the government has earmarked funds to the tune of 7.5 billion USD to be provided to 100 selected smart cities.<sup>34</sup> The smart city project has provided an opportunity to introduce and promote various technological interventions in the field of traffic and transportation, among other initiatives for the different cities of India.

Selected trends include the introduction of hybrid, electric and solar-powered vehicles, interconnected multimodal transportation, and non-motorised transport.

Selected challenges include the lack of an efficient and adequate public transport system and related infrastructural provisions, last mile connectivity, and changes in technology.

Over time, we expect to see more accurate and richer transport-related data and information, more opportunities for increased integration of and interaction between people to people, people to machine and machine to machine, and the application of advanced telematics interventions.

## A digital bridge to growth

Information technology (IT) has, over the years, evolved from being a business enabler to a business driver, and organisations have started differentiating themselves on innovative IT adoption. Digital is not just about technology implementation. It encompasses the transformation of business, enterprises and governments using technology, so as to make experiences better, communication effective and work simpler. Digitisation has become a vital component in the growth of the Indian economy. The digital boom in India is driven by a concerted play of both supply- and demand-side factors. The impact of digitisation can be seen across industries and several sectors, such as agriculture, education, finance and healthcare.

Selected trends include innovation, public service efficiency, economic growth and collaboration.

Selected challenges include connectivity, trust, digital literacy and data security.

Digital is uplifting our country towards advancement and filling gaps owing to physical infrastructure. With digital, government services are reaching citizens in the remotest of locations. Digital and technology are playing a crucial role in ensuring the efficient last mile delivery of services to citizens.



<sup>34</sup> Khanna, P. (25 June 2016). Narendra Modi launches smart city projects in Pune. Livemint. Retrieved from <http://www.livemint.com/Politics/OBAdsQSOHayTH-9FoYeW9VL/Narendra-Modi-launches-smart-city-projects-in-Pune.html> (last accessed on 13 July 2017)

# Funding growth

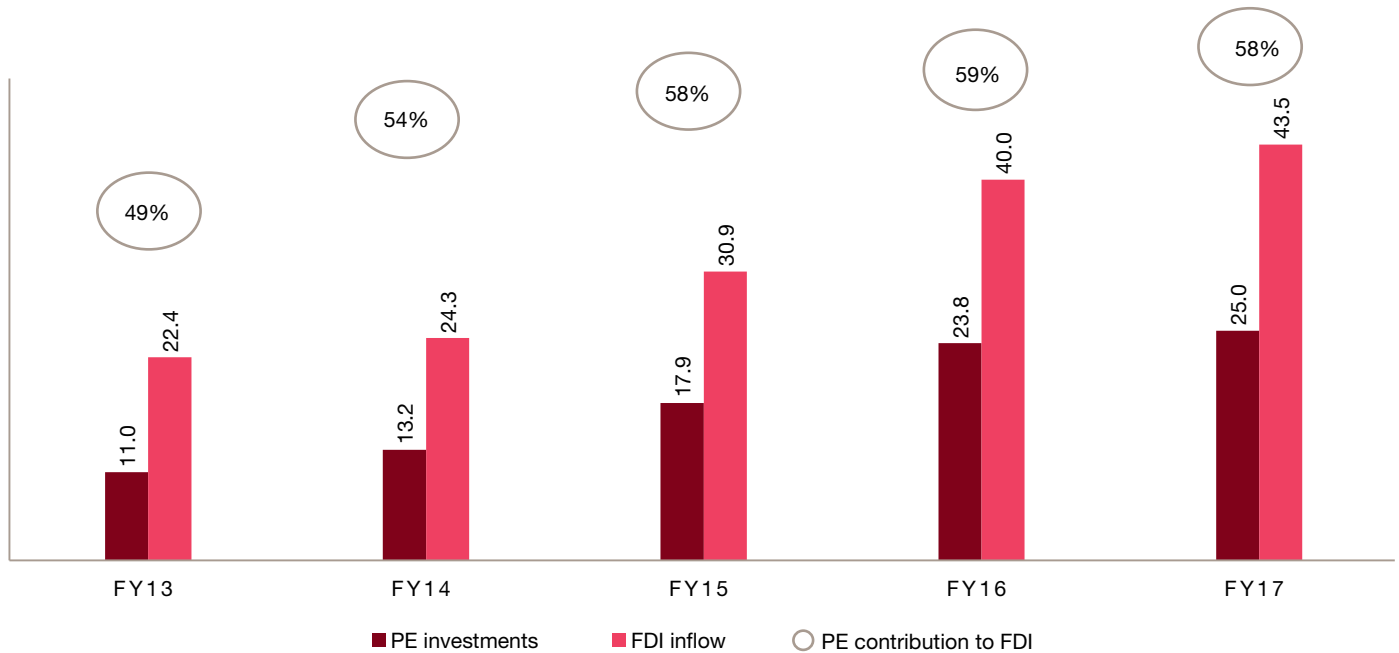
## Industry analysis

### Industry dynamics

The private equity (PE) space in India continues to exude confidence, with FY17 (April 2016–March 2017) recording investments worth 25 billion USD, a visible uptrend over the last few years. FY07, on the other hand, saw investments worth 12.8 billion USD, nearly half the value of capital invested in the last fiscal.

Total foreign direct investment (FDI) inflow into India between April 2007 and March 2017 was around 300 billion USD, of which PE investments accounted for 55% of the total investments.<sup>35</sup>

Contribution of PE investments to FDI inflow (billion USD)



Source: DIPP and Venture Intelligence

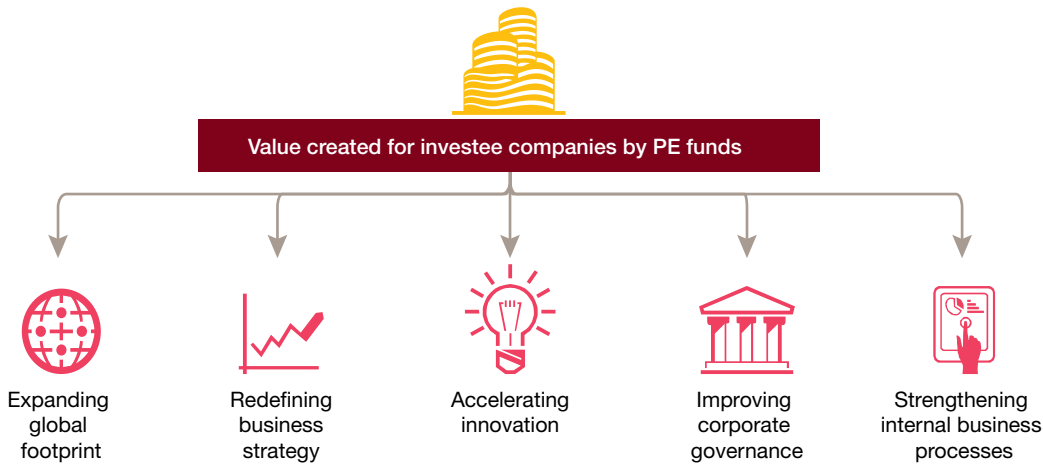
With the government taking up structural reforms such as the Bankruptcy Code and the Goods and Services Tax (GST) and with the dismantling of the Foreign Investment Promotion Board (FIPB), global investors continue to demonstrate optimism around India's growth story.

The first quarter of FY18 emphasises the positive investor sentiment, with PE investments worth 6.7 billion USD—a nearly 50% increase over the same period last year. Late-stage investments alone accounted for over 50% of the investment value this quarter.

<sup>35</sup> All data in this section has been sourced from the Department of Industrial Policy and Promotion (DIPP) and Venture Intelligence.



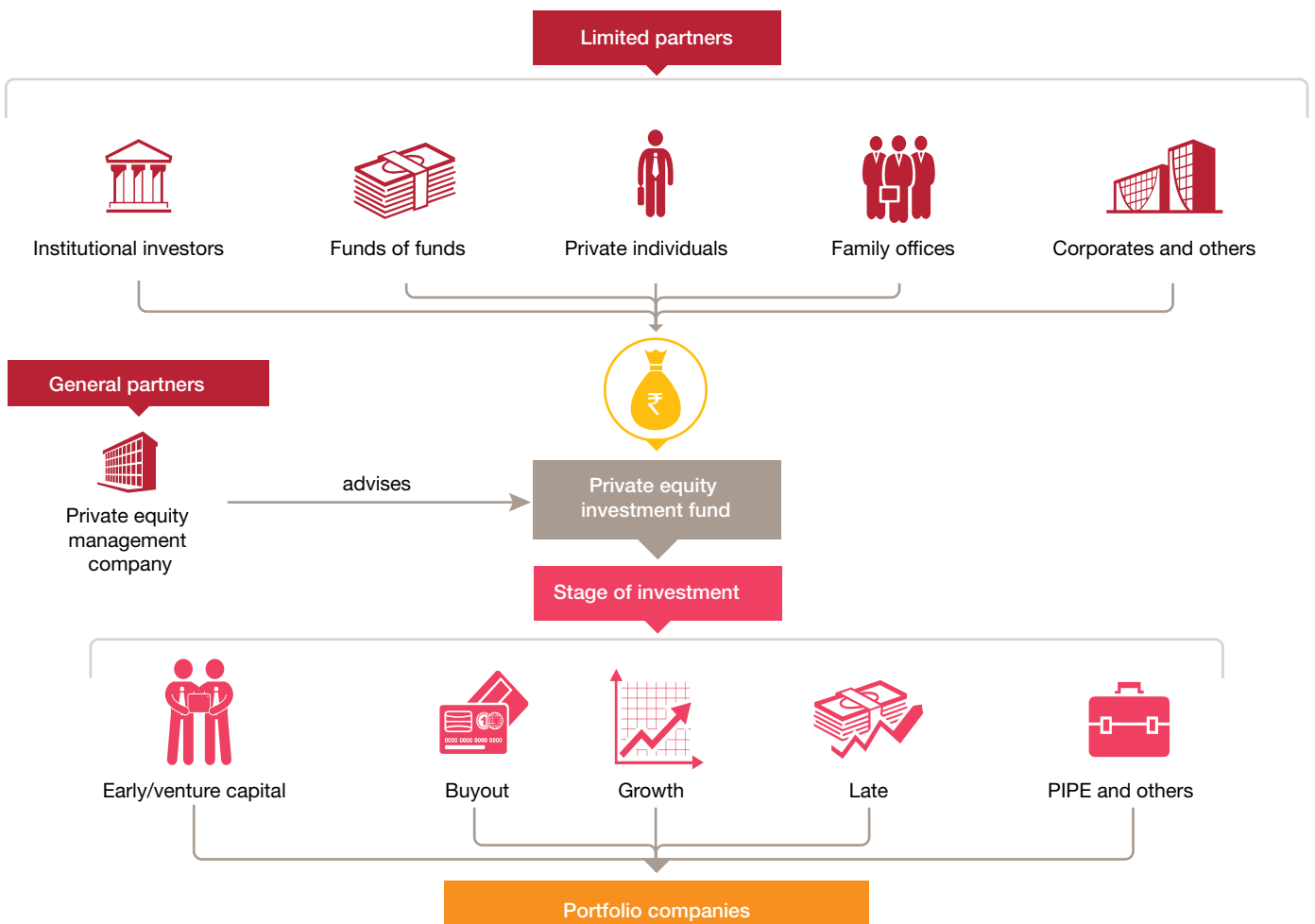
Value created for investee companies by PE funds



In the last five fiscals, both global and domestic PE investors backed over 3,500 businesses and aided entrepreneurs in fuelling India's growth trajectory.

In addition to capital, foreign investors have played a vital role in ushering in global expertise in optimising the way businesses are run.

Source of funding and key elements behind a PE fund's approach

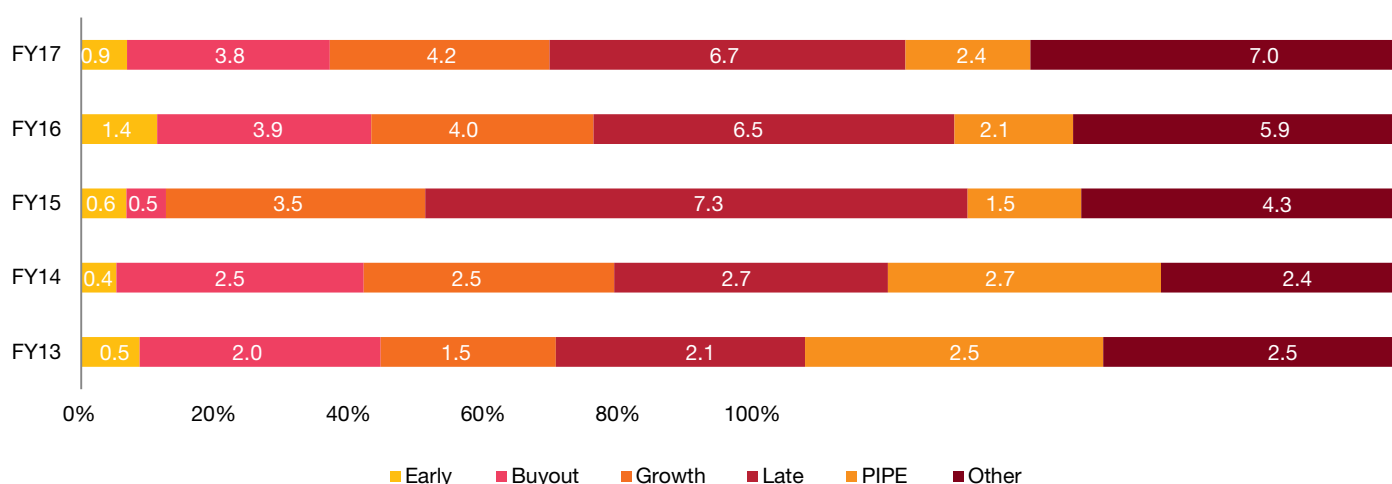


Source: PwC analysis and European Private Equity and Venture Capital Association (EVCA)



PE funds, being primarily value oriented, identify opportunities with a focus on vertical expertise, global integration, high-quality teams, value-added support and aligned incentives. While each PE has its own set of nuances, there are certain overarching themes attracting funds towards each stage of investment.

PE investments by stage of funding (billion USD)



Source: Venture Intelligence

### Early/venture capital:

- Portfolio diversification
- Exponential growth potential
- Funding the future—opportunity to invest in innovation
- More leverage over investees

### Buyout:

- Majority control
- Ease of exits
- Strategic mindset
- Cost competitive sectors

### Growth:

- Middle-market and growth companies consistent with specific regional investment considerations
- Controlling position

- Facilitating accelerated growth and scaling businesses
- Funding mature and proven business models
- Limited future capital requirements to achieve profitability potential

### Late:

- Higher stability in terms of returns
- Strong market presence and visible viability
- Positive cash flow generation with expansion plans
- Shorter holding period resulting in higher liquidity

### Private investment in public equity (PIPE):

- Liquid investment and scheduled exit
- Transparency and fair price
- Reduced asymmetry of information
- Fewer regulatory issues and quick execution of the transaction



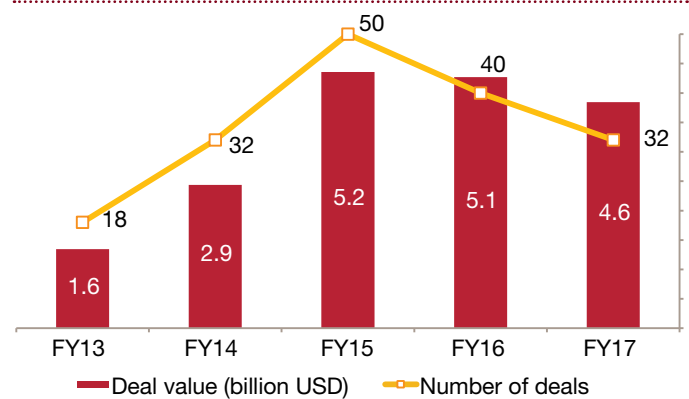
## Selected major trends

- Sovereign wealth funds (SWFs), pension funds and family offices have become increasingly active in recent times, with investments reaching almost 20 billion USD over the last five financial years, primarily in late-growth secondary investments.

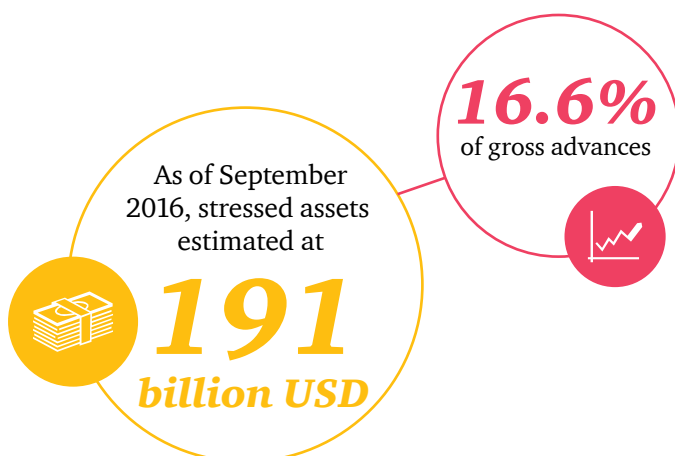
Global leadership teams of most of these funds have made a strong commitment to India, and India's investment needs meet their return expectations in most cases. This should continue to drive their interest in India going forward.

- Within the financial services space, stressed assets continue to see significant interest from PE funds. With the aim of encouraging investor sentiment and addressing the rising issue of non-performing assets, the Securities and Exchange Board of India (SEBI) eased rules for investors expressing interest in this space:
  - PE funds exempted from the one-year lock-in period in initial public offerings (IPOs)
  - Hedge and PIPE funds allowed to invest in commodity derivative

Deal activity: SWFs, pension funds and family offices



Source: Venture Intelligence



Source: Indian Finance Ministry's Economic Survey for 2016-17

A number of global PEs and SWFs have already tied up or are looking to tie up with local partners to set up asset reconstruction companies to tap into this opportunity.

Large Canadian SWFs/PE funds have already tied up with local players to buy stressed assets. Additionally, major US PE players have raised capital with plans to focus on large buyout deals.

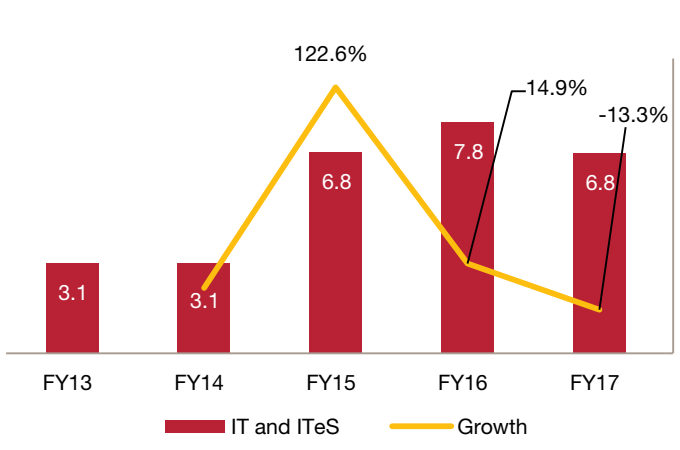
The enactment of the Insolvency and Bankruptcy Code is also expected to result in the swifter sale of distressed assets. This will also create incremental opportunities for financial investors in India, and a number of distressed asset funds (DAFs) are already looking at India.

- Over the last two fiscals (FY16 and FY17), venture capital/early-stage investments amounted to over 2 billion USD, with the majority of them in the technology space.

Despite the decline in investments in the technology space in FY17, the first quarter of FY18 witnessed PE investments worth 2.6 billion USD, which is double the investment value during the same period last year.

With innovation in the tech space on an upward trajectory, venture capitalists will continue to look at new deals in this space—in particular, in artificial intelligence, bitcoin, machine learning, etc.

PE investments in the technology sector (billion USD)



Source: Venture Intelligence

Having adopted some of the latest technology, digital banking has been gaining popularity, thus bringing in greater financial inclusion and, thereby, more sustainable growth. With the Unified Payments Interface (UPI), Aadhaar (biometrically verified unique identity) and affordable smartphones, 1.2 billion individuals can now use digital money.

- Secondary and tertiary activity has gained popularity in recent times, allowing investors to strategise and fund different markets with reduced risk. With investments made in more mature situations, the investor community expects to see quicker returns as compared to traditional investment channels.

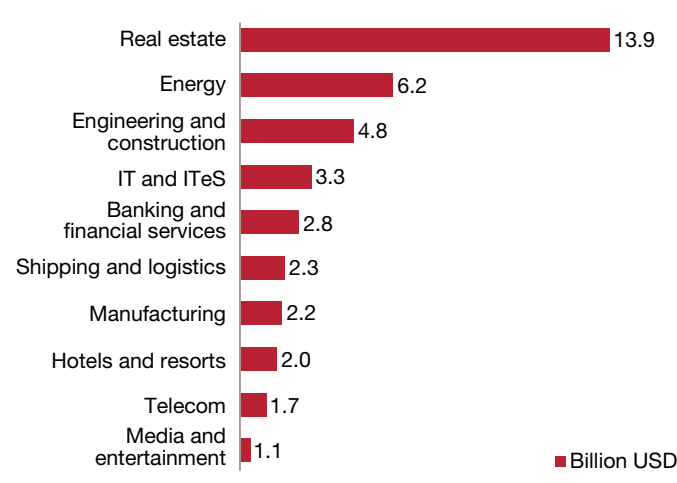
Of the investments made between 2007 and 2011, over 1,400 of them have not yet seen an exit/follow-on funding. If a fraction of these were to see a transaction this year, deal volumes could see a significant jump.

In this context, the government's efforts at improving the ease of doing business in India are key.

With corporate buyer activity picking up, there is a likelihood of increased tertiary opportunities and exit activity.

With interest rates falling, household savings are being diverted from fixed income assets (largely bank deposits) to equity, resulting in an upswing in domestic fund flow into the stock market. This could imply less volatility around exits, considering the growing pool of domestic money to absorb the sale by foreign investors, should that happen.

Top 10 sectors where PE investments made between 2007 and 2011 have still not seen an exit



Source: Venture Intelligence

### Selected major challenges

- The impact of the roll-out of GST will reflect in the rest of the year's performance, with investors in a wait-and-watch mode. This will impact investor sentiment towards the Indian economy.
- Global political volatility is another factor which investors watch out for when investing in emerging markets.
- Public market valuations in key PE sectors have seen a sequential rise over the last year, creating a potential challenge for PE investments. PE investors will have to compete with a rather buoyant public market for deals; thus, deal activity is expected to continue at a watchful pace.

### Vision for the future

Positivity around PE deal activity is expected to continue on the back of the changes in the Indian regulatory framework and the growth of the economy as a whole. Future investment cycles will possibly represent a more mature scenario, with both the quantum as well as quality of deals moving closer to those of developed nations.

Despite a few challenges, competition within the investment landscape is on the rise, with several global PE/venture capitalists continuing to look at India as an attractive investment destination.



## ***Opportunities for investment***

India continues to be a favoured destination among foreign investors, including US-based PE firms. Over the years, the government has been pruning the list of prohibited sectors and liberalising FDI caps on various sectors. FDI in India crossed 43 billion USD in FY17, with PE accounting for around 58% of the capital inflow.

Government reforms such as Make in India, Digital India, Startup India and Smart Cities have also garnered significant interest from foreign investors. The development of 100 smart cities, each with a population of 1 million, will lead to rural to urban migration of people and job creation around the construction and running of these cities, thus resulting in an economic thrust.

Additionally, GST is expected to impact the investment landscape with the merging of most of the existing taxes into a single system of taxation, thus eliminating the multiplicity of taxes and making India a single common market.

Cumulative FDI inflows from the US over the last five fiscals have amounted to a little under 10 billion USD. Major US-based PE firms have already established a strong presence in India.

The potential for US funds in India continues to grow, with India offering a host of opportunities across multiple sectors. Major US-based players have already expressed interest in partnering with Indian companies in sectors such as education, infrastructure, technology and manufacturing, and are currently monitoring the impact of GST.

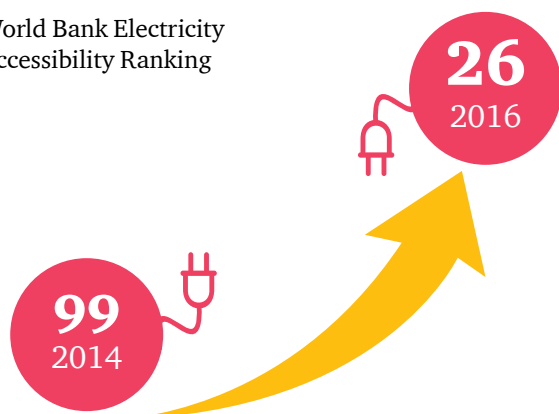


# Meeting and exceeding India's energy needs

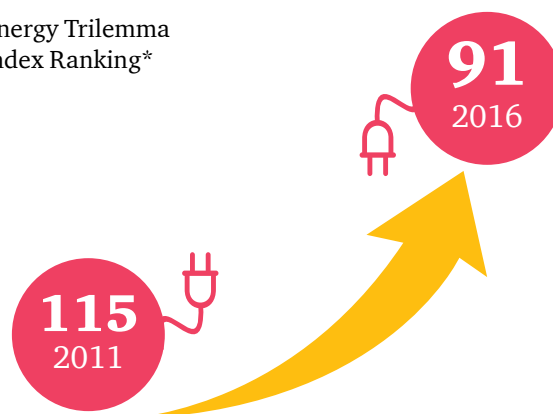
## Industry analysis

### Industry dynamics

World Bank Electricity  
Accessibility Ranking



Energy Trilemma  
Index Ranking\*



The energy sector in India is transforming with a focus across the core issues of access, stability in energy production, sustainability and improved efficiency.

Import dependence for thermal coal has stabilised over the years—around 160 million tonnes<sup>36</sup> were imported in 2016–17 as compared to 167 million tonnes in 2013–14, thanks to an increase in domestic coal production (around 725 million tonnes of coal were produced in 2016–17<sup>37</sup> in India, which is 160 million tonnes more than the coal production in 2013–14<sup>38</sup>). This has led to a foreign exchange saving of nearly 4 billion USD. The development of improved evacuation facilities for coal through improved handling, dedicated rakes and a focus on railway track development near coal mines has helped in improving the offtake of domestic coal.

The flagship reform programme of the electricity distribution sector, Ujwal DISCOM Assurance Yojana (UDAY), has helped improve the operational and financial efficiencies of the distribution sector and helped distribution utilities save 12,000 crore INR (1.85 billion USD) in the form of reduced debt/interest burden.<sup>39</sup>

From the energy access perspective, only 3,618 of the 18,453 villages identified are left to be electrified (expected to be completed by 2018) under the Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY) programme, which was introduced in 2015. The country on the whole has achieved 75%

\*The World Energy Council's Energy Trilemma Index ranks countries on their ability to provide sustainable energy through three dimensions: energy security, energy equity and environmental sustainability.

household electrification, which is expected to be completed by 2022.

The government has set a target of installing 175 GW of renewable capacity by 2022, out of which 33% has already been achieved. Accordingly, it has introduced multiple incentives for the establishment of a complete value chain for solar power—from manufacturing of panels to power distribution and installation of solar home systems in the country.

The distribution of over 1.85 million LED tube lights, 0.7 million energy-efficient fans and 2 million LED street lights under the Street Light National Program (SLNP) has led to a saving of 12,000 crore INR (1.85 billion USD) in consumer electricity bills. Energy Conservation Building Codes (ECBC) have been introduced for new commercial buildings with the aim of having energy-efficient buildings in the future.

This transformation in India's energy sector has been enabled through efficient governance with the creation of synergies between different departments—that is, the Ministries of Power, Coal and New and Renewable Energy—and increased transparency in natural resource allocation through the introducing an online auction process (e.g. coal block, solar park and wind power project auctions). Online portals and mobile apps to track the progress and disseminate information have further brought necessary transparency and speed to decision making.

<sup>36</sup> Ministry of Coal, Government of India. Retrieved from <http://coal.nic.in/content/production-supplies> (last accessed on 7 July 2017)

<sup>37</sup> Ministry of Coal, Government of India. Annual Report 2016-17 Retrieved from [http://coal.nic.in/sites/upload\\_files/coal/files/coalupload/chap1AnnualReport1617en.pdf](http://coal.nic.in/sites/upload_files/coal/files/coalupload/chap1AnnualReport1617en.pdf) (last accessed on 7 July 2017)

<sup>38</sup> Ministry of Coal, Government of India. Annual Report 2013-14. Retrieved from [http://coal.nic.in/sites/upload\\_files/coal/files/coalupload/Chap1AnRep1314.pdf](http://coal.nic.in/sites/upload_files/coal/files/coalupload/Chap1AnRep1314.pdf) (last accessed on 7 July 2017)

<sup>39</sup> Ministries of Power, Coal, New & Renewable Energy and Mines website: <http://ujwalbharat.gov.in/> (last accessed on 4 July 2017)



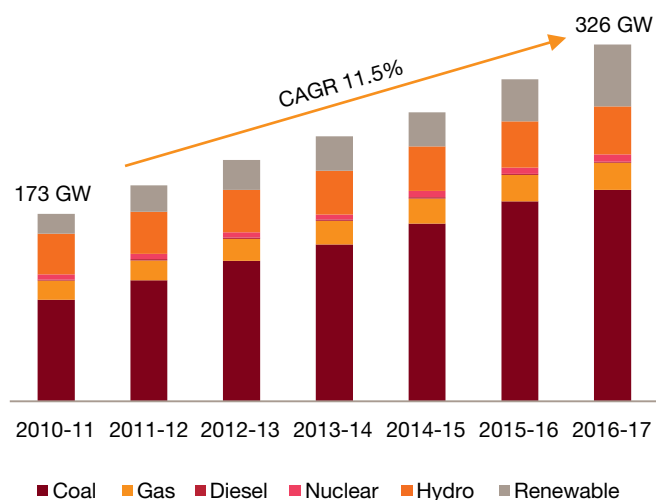
Some of the achievements in the sector in recent years have been broadly categorised across three sector objectives:

- **Energy security** – ensuring reduced electricity import dependence
- **Energy equity** – ensuring access to electricity for all at affordable prices
- **Sustainability** – mitigating the catastrophic effects of climate change with reduced fossil fuel usage and enhanced demand side efficiency

## Energy security

- **Key achievements:**<sup>40</sup>
  - **85 GW capacity addition:** Over the last three years, capacity addition has increased by 35% from capacity installed till March 2014. Private sector investments have been aided by the stable policy allowing 100% FDI in power sector.<sup>41</sup>
  - **From a net importer of electricity to a net exporter of electricity:** India exported electricity to Nepal, Bangladesh and Myanmar in 2016–17.
  - **One Nation, One Grid, One Price:** India is transitioning to a stable and secure single grid with not a single major disturbance since May 2014, with a vision of moving towards a single per unit price of electricity across regions.

Installed generation capacity



- **Rapid expansion of the transmission network:** There has been an increase of about 40% in transformation capacity from 0.53 million MVA in March 2014 to 0.74 million megavolt-amperes (MVA) in March 2017. Further, there has been an over one-fourth increase in transmission lines from 0.29 million circuit kilometre (ckm) in March 2014 to 0.37 million ckm in March 2017.
- **62% increase in coal exploration:** An increase in drilling to 1.13 million m in 2016–17 from 0.69 million m in 2013-14, along with a focus on improved quality-based grading, has ensured sustainable coal reserves at all thermal power plants. As a result, no coal shortage exists currently as compared to the situation in 2014 when two-thirds of the major power plants had a critical stock of less than 7 days.
- **Policy initiatives:** Increasing domestic production of power through improved domestic coal production, a large renewable energy (RE) programme to add significant capacity in the short term, tapping of hydroelectric potential and developing indigenous and imported technology-based nuclear power are the key elements of energy security. Securing sustainable gas supplies and integrating regional energy sources are other vital factors. A new hydroelectric power policy is being formulated. Scheme for Harnessing and Allocating Koyala Transparently in India (SHAKTI), a transformational policy was introduced in May 2017 for the auction and allotment of coal linkages.
- **Improved governance:** The Vidyut Pravah portal/app provides real-time information on power availability, while the Coal Mitra portal ensures flexibility for the optimal utilisation of coal.

40 Ministries of Power, Coal, New & Renewable Energy and Mines website: <http://ujwalbharat.gov.in/> (last accessed on 4 July 2017)

41 India has attracted an FDI inflow of 11.5 billion USD in conventional and 5.2 billion USD in non-conventional energy segments from April 2000 to March 2017.



- **Key achievements:**
  - **Significant increase in the speed of electrification:** Under DDUGJY, 13,866 out of 18,452 identified villages have been electrified (as on 30 June 2017), with 100% electrification expected by 2018, which will be well before the target date (2019). The country has achieved 75% household electrification; the balance will be completed by 2022.
  - **Reduction in aggregate technical and commercial (AT&C) and upgradation of power infrastructure:** Average aggregate techno-commercial losses reduced from 22.8% in 2013–14 to 20.15% in 2015–16 under the country's flagship loss reduction programme, UDAY, and power infrastructure improvement programme, Integrated Power Development Scheme (IPDS).
  - **Low electricity prices for consumers:** The amount of coal required to generate per unit of electricity has reduced by 9% in three years (in 2016–17, 0.63 kg of coal was used to produce 1 kWh of electricity versus 0.69 kg in 2013–14). Coal linkage rationalisation has the potential of saving 12,000 crore INR (1.85 billion USD). In addition, distribution utilities have saved a similar amount through refinancing of utility debt under the UDAY scheme. A marginal tariff of 2.44 INR (4 cents/kWh) per kWh has been discovered in recent bids of large solar parks and wind projects.
- **Policy initiatives:** Competitive bidding has been introduced for large solar and wind power projects, leading to the discovery of low marginal tariffs. The UDAY scheme was rolled out in 2015 to reduce aggregate technical and commercial (AT&C) losses and create headroom for investments in distribution infrastructure. In addition, all states in India onboarded 24x7 'Power for All', a joint initiative of the Government of India and state governments to provide round-the-clock electricity to all, with the DDUGJY scheme ensuring electrification of all villages.
- **Improved governance:** The Urban Jyoti Abhiyaan app/portal tracks the progress of IPDS. The UDAY online app/portal monitors and compares the performance of distribution utilities. The Grameen Vidyutikaran (GARV) portal tracks village electrification in mission mode. The Discovery of Efficient Electricity Prices portal/app monitors short- and medium-term power procurement through transparent e-bidding and e-reverse auction. The Urja Mitra app/website is used to send power cut information to consumers through email/SMS to increase transparency.



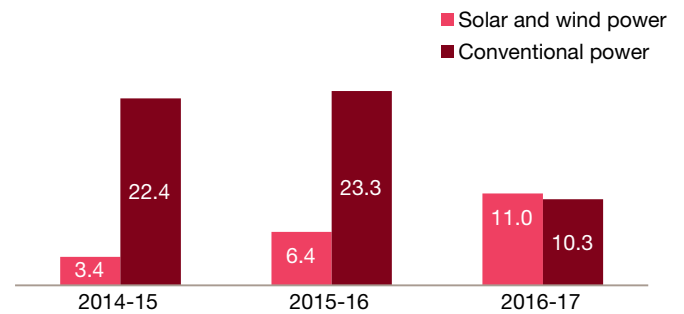


## Sustainability

### • Key achievements:

- **Solar capacity increased by 4.7 times from 2014:** India is adding RE through the world's largest RE expansion, with current installed capacity standing above 12 GW. Another 8 GW is in various stages of contracting/construction over the next year.
- **Highest ever wind capacity addition:** There has been a 52% increase in wind capacity from 21 GW in March 2014 to more than 32 GW in March 2017.

### Capacity addition (GW)



- **Focus on energy efficiency:** The largest LED distribution scheme was undertaken under the Street Light National Programme (SLNP), which was launched in January 2015, leading to savings of 12,860 crore INR<sup>42</sup> in electricity bills and a reduction of 260 million tonnes in CO<sub>2</sub> emissions. Between 2014 and 2017, demand side management (DSM) measures have reduced the requirement of energy generation by 2,667 MW while driving the deficit in energy down by 2.4%. The current market for demand side energy efficiency is valued at 24.8 billion USD,<sup>43</sup> and the potential is envisaged to deliver 178 billion units of electrical energy savings per annum. This roughly translates to 18–20% of the current levels of all-India annual electricity consumption and 150 million tonnes of annual CO<sub>2</sub> emission reduction potential.
- **Policy initiatives:** The Solar Park Scheme was introduced to incentivise the setting up of solar plants and aid investors/players in terms of financing, land allocation, etc. A national wind-solar hybrid policy was drafted to promote a large grid connected wind-solar PV systems, enhance grid stability and ensure optimal utilisation of transmission networks. In addition, transparent procurement of LED bulbs has enabled a reduction in price from 4.8 USD for a 7 W bulb (January 2014) to around 0.6 USD for a 9 W LED bulb (April 2017). Under the UJALA programme, around 2.5 million LED bulbs have been distributed to ensure demand side efficiency improvement.

<sup>42</sup> Till date

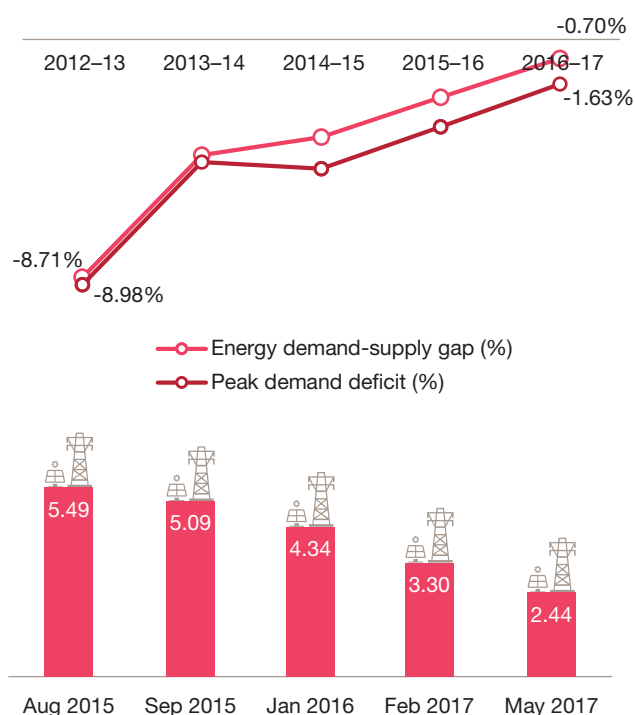
<sup>43</sup> World Bank, EESL, and PwC. (2016). Utility scale DSM opportunities and business models in India. Retrieved from <https://openknowledge.worldbank.org/bitstream/handle/10986/26316/113214-WP-P147807-Utility-Scale-Opportunities-PUBLIC.pdf?sequence=1&isAllowed=y> (last accessed on 4 July 2017)

- **Improved governance:** LED distribution was tracked through the UJALA online portal/app. Mobile apps have been launched for consumer convenience—Surya Mitra for installation, servicing and repairs of solar rooftop installations at the customer’s doorstep and Atal Rooftop Solar User Navigation (ARUN) to assist consumers with the installation of solar rooftop systems.

## Selected major trends

- **The demand-supply deficit has reduced** significantly from an 8.71% energy deficit and 8.98% peak demand deficit during 2012–13 to a 0.70% energy and 1.63% peak deficit respectively.<sup>44</sup>
- **Falling prices of RE:** A favourable investment climate, conducive policies and appropriate risk allocation have resulted in the tariffs for solar power falling from 17.91/ KWh INR (28.5 cents/KWh) in 2011 to a record low of INR 2.44/KWh<sup>45</sup> (3.8 cents/KWh), providing a boost to the government’s green energy drive. Sustained momentum is seen in solar capacity addition, with growing participation in upcoming solar opportunities. A related development has been a drop in thermal power plant load factor (PLF)<sup>46</sup> from 77.68% in 2009–10 to 59.64% in 2016–17.

Demand-supply deficit (%)



- **Rationalisation of electricity tariffs:** The central and state distribution utilities have started to actively design and implement a rationalised electricity tariff structure with the intent of making tariff classes simple to interpret and ensuring tariff levels are reflective of the costs.
- **Supply side tie-ups moving to short-term contracts:** A general shift has been observed from long-term power purchase agreements to short medium-term transactions, currently at around 10% of the total volume of power purchase. Key short-term transactions include bilateral trade through traders, bilateral trade between distribution utilities, trade through power exchanges and deviation settlement mechanism.
- **Reduction in peak demand due to energy efficiency:** Huge strides have been made in making energy-efficient products more affordable. This can largely be attributed to the demand aggregation strategy of Energy Efficiency Services Limited (EESL)<sup>47</sup>. The strategy has helped reduce the cost of a 7 W LED bulb from 4.8 USD in January 2014 to around 0.6 USD for a 9 W LED bulb. Similarly, the cost of energy-efficient five star fans offered by EESL is around 17.0 USD as against 38.8 USD in the retail market. This reduced cost of energy efficiency will result in the Central Electricity Authority reducing the peak demand projection at the end of 2021–22 to 235 GW,<sup>48</sup> which is about 17% lower than the projection made in the 18th Electric Power Survey (EPS) report. Additional initiatives have been targeted at labelling and promoting energy-efficient appliances and a comprehensive policy framework to drive energy-efficient buildings.
- **Digitisation of energy value chain:** PwC’s Power & Utilities Market Disruption Index<sup>49</sup> is expected to rise by 33% in 2020 from the 2015 level for the Asia Pacific region, indicating a significant change in utility business models. India is undergoing a similar transition with rapid digitisation of the complete energy value chain and trends such as green energy, distributed generation, local energy systems and regional super grid affecting the energy business. Realising the potential of digitisation, the Ministry of Power, Government of India has taken active steps through initiatives such as the National Smart Grid Mission (NSGM), an institutional framework driving the smart grid mission in India.

44 CEA Load Generation Balance Reports. Retrieved from <http://www.cea.nic.in/annualreports.html> (last accessed on 4 July 2017)

45 Tariff of 2.44 INR /KWh for 200 MW (Acme) and 2.45/KWh for 300 MW (SBG Cleantech) determined after reverse auction carried out by the Solar Energy Corporation of India (SECI) for 500 MW solar PV projects in the Bhadla Phase-III Solar Park in Rajasthan.

46 Plant load factor is a measure of the average capacity utilisation of a power plant.

47 EESL, set up under the aegis of the Ministry of Power, is the mother ESCO in India and executes most of the large demand-side energy efficiency measures in India.

48 Sengupta, D. (15 Dec 2016). CEA scales down power demand for next 10 years, analysts disagree. *Economic Times*. Retrieved from <http://economictimes.com/industry/energy/power/cea-scales-down-power-demand-for-next-10-years-analysts-disagree/articleshow/55989543.cms> (last accessed on 23 June 2017)

49 PwC. (2015). PwC Global Power & Utilities Survey 2015. Retrieved from <https://www.pwc.com/gx/en/industries/energy-utilities-mining/power-utilities/global-power-and-utilities-survey/download-the-survey.html> (last accessed on 6 July 2017)

## Selected major challenges

- **Completing the last mile of reliable access to electricity:** The execution of the last leg of the electricity value chain has become economically unviable because of the unaffordability of electricity due to increasing supply costs and low financial/operational health of distribution utilities incurring capex.
- **Improving the operational performance of existing thermal assets and integrating RE power on a large scale:** Though falling RE costs offer an opportunity for reduced transmission costs through distributed generation, high intermittency and variability of power are challenges. In addition, the underutilisation of existing thermal assets remains an issue to be addressed. Moreover, falling PLF of existing thermal generation capacity poses challenges in managing efficiencies and utilising the power plants with RE capacity augmentation.
- **Enhancing the reliability of coal supply:** Owing to a wide spectrum of coal usage, slippages in quality and quantity have been observed by e-auction coal consumers. Though Coal India has adopted an internationally used gross calorific value (GCV) based system of grading coal, they have failed to adopt other international practices, such as the sizing of coal below a 50-mm size.<sup>50</sup>
- **Creating a robust captive power policy:** The increasing installed capacity of diesel generator-sets, currently at 39 GW and growing at the rate of 7–8% every year,<sup>51</sup> indicates a continued need for reliable power. Large captive power plants are still managing coal from imports and e-auctions. A comprehensive captive power policy will address the need for reliable power supply, along with the requirement for additional capex for backup power and the high cost of power generation in captive power plants on account of low domestic coal availability.
- **Developing hydropower:** In order to tap India's hydropower potential, there is a need for a comprehensive policy framework. Issues ranging from land acquisition to large gestation periods need to be resolved so that India can benefit from environmentally friendly, low-cost hydropower. Similarly, commercial choices need to be exercised while developing the next wave of nuclear power through ongoing domestic pressurised water reactor (PWR) programmes or through the adoption of international technology.
- **Developing a regulatory framework:** Regulators at the central and state level need to balance the demands of multiple stakeholders and drive creative and bold regulatory decisions. Regulatory capacity building and the evolution of a regulatory structure will aid the growth of the energy sector.



<sup>50</sup> Press Trust of India. (17 June 2014). Multiple grade slippages in coal supply to NTPC by CIL. *Business Standard*. Retrieved from [http://www.business-standard.com/article/companies/multiple-grade-slippages-in-coal-supply-to-ntpc-by-cil-114061700827\\_1.html](http://www.business-standard.com/article/companies/multiple-grade-slippages-in-coal-supply-to-ntpc-by-cil-114061700827_1.html) (last accessed on 1 July 2017)

<sup>51</sup> PwC analysis

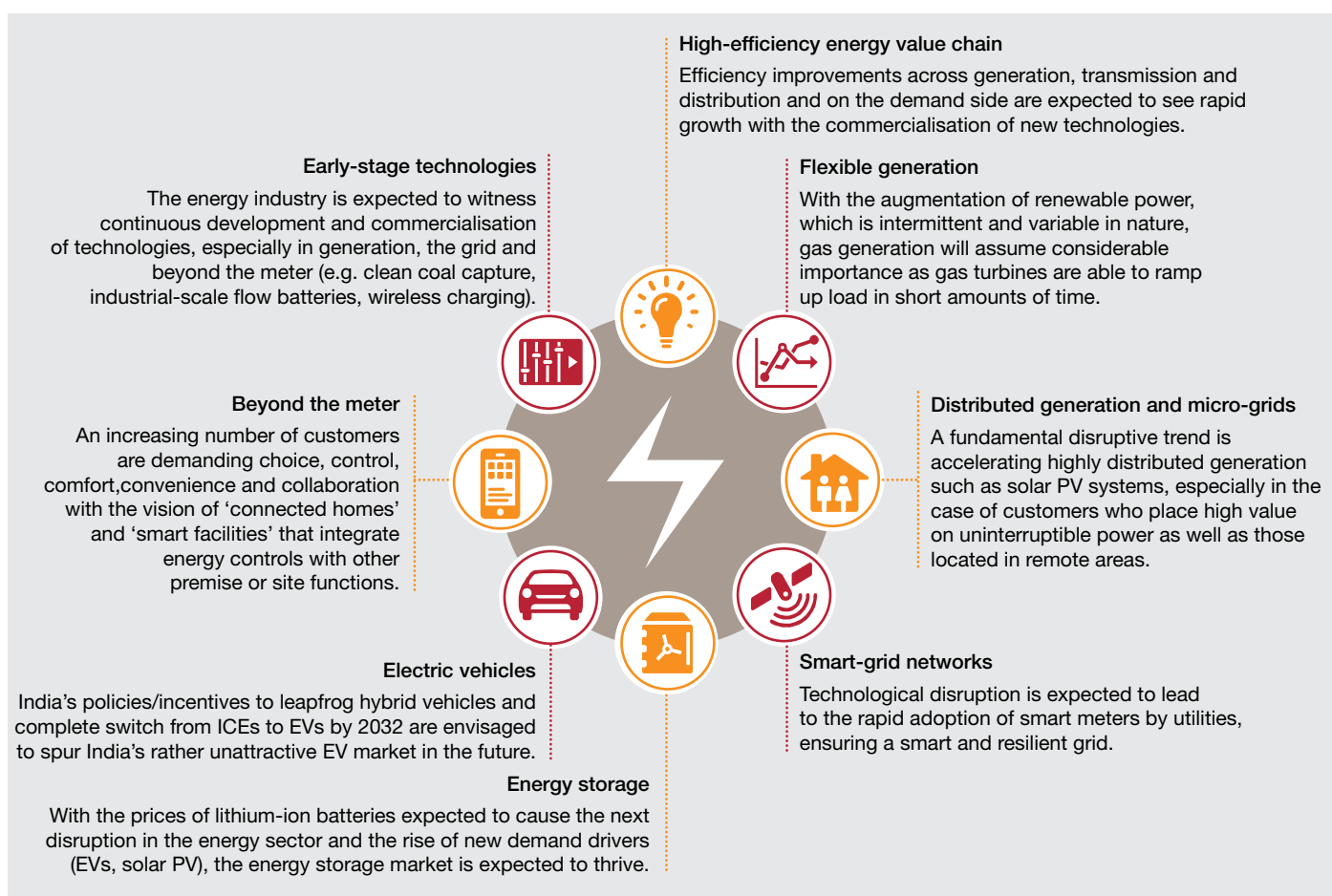
## Vision for the future

Owing to climate change mandates, India is expected to have a reduced dependence on fossil fuels (coal and oil) and an increased share of gas and RE (including nuclear and large hydro). As per the Central Electricity Authority (CEA), India's renewable installed capacity is expected to be 175 GW by 2022, which is envisaged to outnumber fossil-based generation with a further addition of 100 GW by 2027. This is expected to fundamentally change India's energy sector ecosystem and drive increased electric power consumption in new formats from cooking to mobility.

The overhaul of the energy fuel mix, with large portions of renewable, nuclear and hydro energy, presents opportunities in the manufacturing of solar PV, new technology equipment (such as clean coal capture, high-efficiency gas turbines, high-voltage transmission

equipment), adoption of advanced grid technology (sophisticated analytical engines for RE integration), energy generation through RE sources, flexible energy resources and upgradation of grid operations for grid stability. To address the challenges of energy accessibility and reliability, distributed power generation and off-grids/microgrids are expected to gain momentum.

On the demand side, energy usage through efficient appliances, clean cooking equipment and electric vehicles (EVs) present significant opportunities. Given the current high import dependence, efficiency improvement services for reducing energy consumption by buildings, industries and various sectors for a given level of output are a key area presenting lucrative opportunities. The figure below captures the significant trends and development areas in India's energy scenario.



## Opportunities for investment

Over the years, India has forged strong bilateral ties with the US. India is one of the few countries where the US Department of State has introduced an energy specialist with the objective of leading, identifying, developing, implementing and administering loans, technical assistance (TA) projects and non-lending products and services (NLPS) in the energy sector. Further, civil nuclear cooperation has been the cornerstone of US-India relations, with six Westinghouse AP1000 reactors proposed to be constructed in Andhra Pradesh in India. Natural gas from the US can further strengthen this relationship in terms of technology transfer.

As India moves beyond sector reform and ensuring basic energy availability and focuses on digitising the energy sector, opportunities for US investors are expanding from conventional energy plans towards more diverse options in the energy value chain. India offers a unique set of opportunities for investors to partner on and invest in solar and wind projects, apart from conventional ones such as thermal power generation. India's infrastructure development gives US players the opportunity to associate themselves with engineering, procurement, construction (EPC) in the power generation space. Moreover, with the privatisation of the transmission sector, investors can now participate in the sector as independent power transmission



companies (IPTCs). Apart from these areas, in its current phase, the sector offers a vast ocean of opportunities which have been discussed below.

- **Manufacturing opportunities**

- **Advanced electrical equipment manufacturing:**

With increased RE generation capacity, there is a need for significant technology upgrade in the transmission and distribution (T&D) equipment space. Accordingly, industry players are upgrading their transmission system to the next higher voltage system of 765 kV and are gearing up to supply transformers and related equipment of this class. In addition, the Government of India is encouraging the adoption of supercritical and clean coal technology for thermal power plants due to their efficiency and reduced emissions. The upgrade of the existing plants thus represents a major opportunity.

- **Solar PV manufacturing:** India's ambitious plans to generate 40 GW of power through solar rooftops (26 states have favourable net metering policies) and the Make in India campaign's incentives for domestic manufacturing present an opportunity for PV manufacturing in India.

- *Solar PV modules:* India's current domestic manufacturing capacity is not sufficient to meet its targets, leading to a majority of PV modules being imported predominantly from China. To boost domestic manufacturing, the government has launched many fiscal incentives.
- *Solar inverters:* The solar PV industry is now moving towards a low-cost '1,500 V architecture', moving from 600 V to 1,000 V. This has attracted global players who are keen to set up factories in India to meet the local power demand.

- **Energy-efficient product manufacturing and energy-efficiency services:** With EESL's efforts, India has been able to reduce the cost of a 7 W LED bulb from 4.8 USD in January 2014 to around 0.6 USD for a 9 W LED bulb.<sup>52</sup> Similarly, the cost of energy-efficient five star fans offered by EESL is around 17 USD as against 38.8 USD in the retail market. Investors may look at setting up low cost manufacturing for LED lights and other energy-efficient equipment in India for export throughout the world.
- **Flexibility of energy sources:** As India's energy mix is expected to be significantly altered in the next few years, the intermittency and variability associated with high solar and wind power penetration will increase the need for flexibility in power systems and backup capacities. This presents a significant opportunity for companies to invest in grid technology upgradation, such as sophisticated data generation sensors, energy analytics and control system technologies.
- **Off-grid energy solutions:** As India strives to attain 100% energy accessibility and reliability, especially with respect to last mile execution, off-grid, hybrid solar grid, mini-grid, microgrid and solar home system companies may invest in ensuring last mile reliable energy with innovative technologies and business/financing models to ensure power for all in India.
- **Clean cooking energy access:** Forty percent of India's population uses traditional fuels like wood and coal for cooking. With this in view, the development of a mass market ecosystem for electric cooking appliances has been actively taken up with the expectation of universal access to electricity by 2022. This presents an opportunity for firms to begin manufacturing low-cost, energy-efficient electric cooking appliances using innovative business/distribution models.



52 Ministries of Power, Coal, New & Renewable Energy and Mines website: <http://ujwalbharat.gov.in/> (last accessed on 4 July 2017)

- **Operational technology (OT) integration and smart grids:** One of the key issues faced by distribution utilities is high techno-commercial losses. To that end, the government is incentivising utilities for IT implementation through the Restructured Accelerated Power Development and Reforms Programme (RAPDRP) – Part A. Companies may invest in emerging technologies that integrate IT and OT to enhance monitoring/control of devices and processes. Smart metering is a huge investment opportunity, with the potential for installing 35 million smart meters by 2019 under the government’s UDAY scheme.

Besides, companies may explore other smart-grid opportunities, including the development of smart cities under the Smart Cities Mission, Internet of things based applications for consumers (e.g. smart homes), EV integration projects and consumer bill analysis for lifestyle improvements.

- **Energy storage:** With a growing interest in EVs and solar PV and a focus on improving the reliability of energy systems, there is tremendous potential for investors to explore technical collaborations to manufacture modern energy storage equipment in India. Further, to enable optimal RE integration, the energy storage market is picking up and identifying balancing reserves such as batteries, supercapacitors and pumped hydro systems.
- **EVs:** There are significant opportunities for battery manufacturers, charging station infrastructure and electric vehicle supply equipment (EVSE) companies in India, given the government’s initiative to leapfrogging from ICE to EVs.<sup>53</sup>
- **Energy efficiency services:** Energy efficiency services such as energy usage monitoring, efficient equipment installation, energy audits, billings and payments, and installation of smart appliances and efficient heating, ventilation and air conditioning (HVAC) systems are yet to be explored by investors and US energy services companies (ESCOs).

## Deal activity in the sector and way forward

Historically, investors have entered into the energy business in India through local partnerships due to regulatory provisions and a maximum FDI of 49%. However, over the last few years, the government has increased the FDI limits in the energy sector to 100%. The benefits of this increase in FDI are:

- Generation and transmission of electric energy produced in hydroelectric, coal/lignite-based thermal, and oil and gas-based thermal power plants
- Non-conventional energy generation and distribution

- Distribution of electric energy to households and industrial, commercial and other users
- Power trading (49% in power exchanges)

As per media reports, a US-based company entered the thermal generation space in India by acquiring an equity stake in a state power generation company through a bidding process. Recently, the firm expanded its footprint with the commencement of the construction of a supercritical thermal plant in collaboration with the state. Thus far, the company has invested millions of dollars as equity investments in the project.



<sup>53</sup> Niti Aayog and Rocky Mountain Institute. (May 2017). *India leaps ahead: Transformative mobility solutions for all*. Retrieved from [http://niti.gov.in/writereaddata/files/document\\_publication/RMI\\_India\\_Report\\_web.pdf](http://niti.gov.in/writereaddata/files/document_publication/RMI_India_Report_web.pdf) (last accessed on 6 July 2017)

The Indian solar sector reported over 1.6 billion USD in funding and M&A transactions in Q1 2017 in announced corporate, project funding and M&A deals.<sup>54</sup> The total global corporate funding, including venture capital funding, public market and debt financing, into the solar sector in Q1 2017 doubled to 3.2 billion USD compared to 1.6 billion USD in Q4 2016. Notably, in the first three months of 2017, transactions in the Indian solar sector and RE companies dominated the global solar funding landscape.

Although historically, investors have encountered a few challenges when starting operations in India (e.g. delays in land acquisition, water, power connections), the current administrative regime has implemented sweeping reforms such as a single taxation rate (GST), land acquisition bill, single window clearance and Insolvency and Bankruptcy Code to encourage investments in India. These measures are expected to boost India's Ease of Doing Business ranking. Also, they open numerous opportunities for US firms to invest in India through joint ventures or local partnerships with firms already established in India.

A global energy firm entered the Indian renewable space through a joint venture with an Indian energy generation company, with the firm investing millions of dollars as equity investment in the company.



<sup>54</sup> Mercom Capital Group. (n.d.) Indian solar sector sees \$ 1.6 billion in funding and M&A transactions in Q1 2017. Retrieved from [http://mercomcapital.com/indian-solar-sector-sees-\\$1.6-billion-in-funding-and-ma-transactions-in-q1-2017](http://mercomcapital.com/indian-solar-sector-sees-$1.6-billion-in-funding-and-ma-transactions-in-q1-2017) (last accessed on 7 July 2017)

# Opportunities in Indo-US farmtech: Thought for food

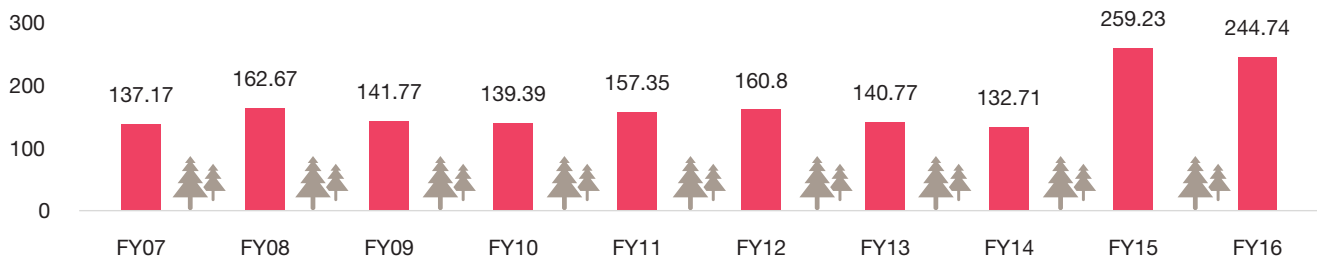
## Industry analysis

### Industry dynamics

Agriculture plays a significant role in the Indian economy. The sector alone provides livelihood to more than 58% of the rural population in the country.<sup>55</sup> The overall gross domestic

product (GDP) of the agriculture and allied sector in India was 244.74 billion USD in FY16 and is growing at a compound annual growth rate (CAGR) of 6.64% (during FY07–16).<sup>56</sup> Moreover, with 157.35 million hectares of land, India holds the second largest share of agricultural land in the world.<sup>57</sup>

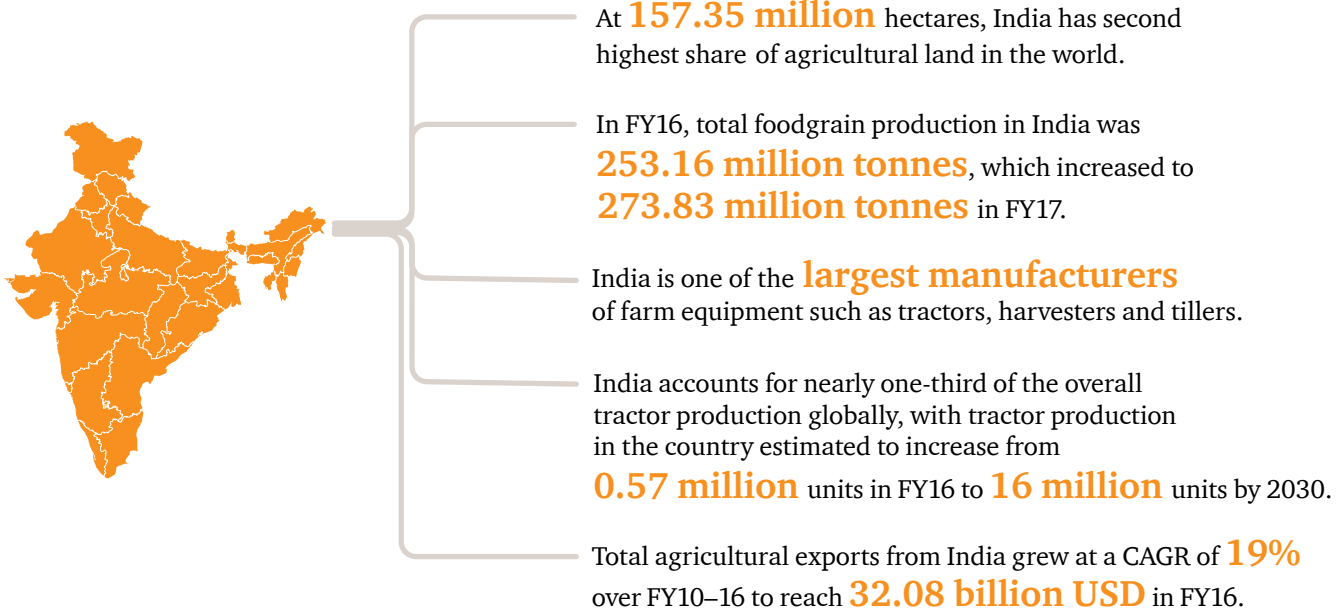
GDP by value added – size of agriculture and allied activities (billion USD)



Source: India Brand Equity Foundation, June 2017

In terms of production, India is now a leading contributor to the global food market. It is the largest producer, consumer and exporter of spices and spice products. Also, India's fruit production has grown faster than its vegetable production, making it the second largest fruit producer in the world.<sup>58</sup>

In terms of exports, India is among the 15 leading exporters of agricultural products in the world. The total agricultural exports from India grew at a CAGR of 19% to reach 32.08 million USD in FY16.<sup>59</sup> Agricultural exports constitute nearly 10% of the country's exports.<sup>60</sup> An overview of the Indian agriculture sector is provided below:<sup>61</sup>



<sup>55</sup> India Brand Equity Foundation. (2017). Agriculture. Retrieved from <https://www.ibef.org/download/Agriculture-April-2017.pdf> (last accessed on 21 Aug 2017)

<sup>56</sup> Ibid.

<sup>57</sup> Ibid.

<sup>58</sup> Ibid

<sup>59</sup> Ibid.

<sup>60</sup> Ibid.

<sup>61</sup> Ibid.



Given the importance of the agriculture sector, the Government of India, in its Budget 2017–18, planned several steps for the sustainable development of agriculture:<sup>62</sup>

- Total allocation for the rural, agricultural and allied sectors for FY 2017–18 has been increased by 24% year-on-year to 1,87,223 crore INR (28.1 billion USD). A dedicated micro-irrigation fund will be set up by the National Bank for Agriculture and Rural Development (NABARD) with a corpus of 5,000 crore INR (750 million USD). The government plans to set up a dairy processing fund of 8,000 crore INR (1.2 billion USD) over three years with an initial corpus of 2,000 crore INR (300 million USD).
- The participation of women in the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) has increased to 55% and allocation to the scheme has been increased to a record 48,000 crore INR (7.2 billion) for FY 2017–18.
- Short-term crop loans up to 300,000 INR (4,500 USD) will be provided to farmers at a subsidised interest rate of 7% per annum. An additional incentive of 3% is provided to farmers for prompt repayment of loans within the due date, effectively making the interest rate 4%.

### Importance of technology in the Indian agriculture sector

Currently, Indian agriculture is facing challenges in meeting the growing demands for food and being internationally competitive. In order to overcome these challenges and ensure sustainable growth, technology has to play a vital role in the sector.

Modern agricultural tools and technologies offer a great opportunity to tackle the world's growing food demands. Improved seeds, modern crop protection solutions and mobile technology for farmers on the fields are increasing overall productivity and also making food safer and healthier. Technology also plays a major role in ensuring that the agricultural and food system is more productive, sustainable and efficient. Greater investment in and broader adoption of science and technology can enable the world to meet the growing demand for food by:

- Enhancing the overall production and quality of the crops,
- Enhancing the nutritional value and safety of food,
- Contributing to agriculture sustainability through reduced resource use.

## Selected major trends

The average agricultural productivity of major crops in India (rice, wheat, oilseeds, horticulture crops, etc.) is relatively low as compared to that in other developed countries. Also, within the country, there are high regional variations in productivity. There is substantial scope for improving crop productivity and realising the true potential of the Indian agriculture sector, technological progress is required along farm machinery, irrigation, seeds, fertiliser and pesticides and also towards safe adoption of modern technology, including genetically modified (GM) seeds and precision farming. An overview of the various production technologies in India is provided in the following sub-sections.

### Farm machinery and equipment

The agriculture sector in India has witnessed a considerable decline in the use of animal and human power. This is primarily due to the adoption of farm machinery, which has paved the way for an efficient agricultural system. The use of machines in agriculture has resulted in a shift from the traditional agriculture process to a more mechanised process. Though the level of mechanisation in India is lower as compared to that in other developed countries, it is certainly growing.

Custom hiring of farm equipment is also becoming common in India, especially among small landowners who find ownership of large farm machines expensive and

<sup>62</sup> India Brand Equity Foundation. (2017). Agriculture. <https://www.ibef.org/download/Agriculture-June-2017.pdf> (last accessed on 21 Aug 2017)

uneconomical. The government is also promoting farm mechanisation by subsidising the purchase of equipment as well as supporting bulk buying through front-end agencies. It also provides credit and financial assistance to support local manufacturing of farm mechanisation equipment. Given the labour scarcity and the government's subsidy programmes, adoption of farm mechanisation is set to increase.

### Irrigation technology

Water is a critical input for agriculture. How much, at what time and how plants are watered determine the eventual yield. Good seeds and fertilisers fail to achieve their full potential if plants are not optimally watered. Thus, adequate availability of water is important to ensure good productivity.

At present, irrigation consumes about 84% of the total available water in the country. The industrial and domestic sectors consume about 12% and 4% of total available water, respectively.<sup>63</sup> With irrigation predicted to remain the dominant user of water, 'per drop more crop' is imperative. The irrigation infrastructure in India has seen substantial expansion over the years. The total irrigation potential created (IPC) from major, medium and minor irrigation schemes has increased from 22.6 million hectares during the pre-plan period to 113 million hectares at the end of the Eleventh Plan. However, the gap between the IPC and irrigation potential utilised (IPU) has been steadily increasing since the First Plan. Currently, the IPU is 80 million hectares (73.39%) as against the IPC of 109 million hectares.<sup>64</sup>

### Seed technology

Seeds are the true carriers of technology. In India, seeds are mainly provided to farmers by research institutions and agricultural universities, public sector seed-producing corporations and private sector firms, including multinationals. Agricultural production is largely dependent upon the development of improved varieties/hybrids in various crops, supported by efficient, cost-effective seed production technology. In the recent past, seed technology has emerged as a potent tool for achieving targeted agricultural production. Coupled with biotechnology and other crop improvement technologies, seeds offer a tremendous opportunity for improving the productivity of Indian agriculture.



63 Kant, A. (21 Sep 2016). *India's great drying out*. *The Times of India*. Retrieved from <https://www.pressreader.com/india/the-times-of-india-new-delhi-editi-on/20160921/282205125359921> (last accessed on 22 Aug 2017)

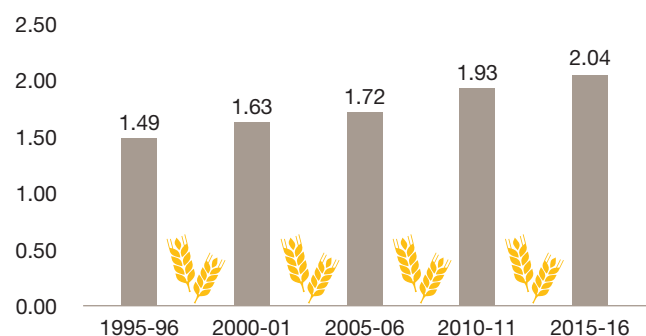
64 Patel, A. (6 Aug 2013). *Irrigation in India – Focus on some serious issues*. *India Microfinance*. Retrieved from <http://indiamicrofinance.com/irrigation-in-india.html> (Retrieved from 22 Aug 2017)

In the significant advances that India has made in agriculture in the last four decades, the role of the seed sector has been substantial. The expansion of the seed industry has occurred in parallel with the growth in agricultural productivity. It should however be noted that seed replacement rate (percentage of area sown using certified quality seeds other than farm saved seeds from the previous crop) remains low in the country. Another serious factor responsible for low use of quality seeds is the sale of spurious seed in the market. In order to increase productivity, there is a need to supply and promote the use of quality seed among farmers.

Some important initiatives have been taken under the recently amended New Policy on Seed Development. The policy permits 100% foreign direct investment (FDI) under the automatic route and simplifies the procedure for inclusion of new varieties in the Organisation for Economic Cooperation and Development (OECD) Seed Scheme.

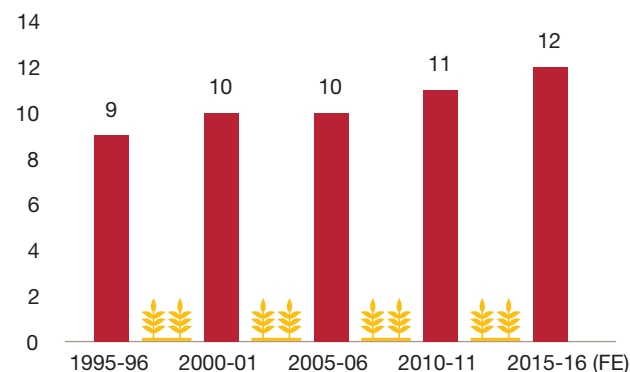
With the adoption of farm machinery, better seeds and better irrigation technology by farmers, the overall productivity of major crops in India has increased. An illustration of the change in productivity of food grains and horticulture crops in India is provided below:

#### Total productivity of food grains (in MT/ha)



Source: Ministry of Agriculture & Farmers Welfare, Government of India

#### Total productivity of horticulture crops (in MT/ha)



Source: Ministry of Agriculture & Farmers Welfare, Government of India

In the last one to two decades, GM seeds have emerged as a powerful new technology promising high productivity and lower use of fertilisers, weedicides and pesticides. They have gained increasing acceptance among farmers around the world and are likely to play an increasingly important role in addressing many of the current problems in agriculture. Nevertheless, GM seeds and technologies have remained controversial in India and other countries.

#### Precision farming and other modern technologies

Precision farming is a technological approach where inputs are used in precise quantity to increase average productivity when compared to traditional cultivation techniques. Precision farming approach recognises site-specific differences within fields and adjusts agricultural operations accordingly. Under this technology, a field is divided into many small meshes and the various data for each mesh, such as soil fertility, moisture content and yield, are measured and collected. The data is then fed into in the geographical information system (GIS) database, and further used by the global positioning system (GPS) to identify the exact location for suitable treatments and operations. This farming method not only helps in savings material resources and energy but also prevents exploitation of the environment.

#### Warehousing sector in India

Warehousing plays a very vital role in promoting agriculture marketing, rural banking and financing, and ensuring food security in the country. It enables the markets to ease pressure during the harvest season and to maintain an uninterrupted supply of agricultural commodities during the off season. Hence, it solves the problems of glut and scarcity, which are common problems in agricultural marketing. Currently, India uses 108.75 million MT of warehousing capacity for storing agricultural products.<sup>65</sup>

It should be noted that around 80% of the warehousing facilities are not mechanised and use traditional manual methods for loading, unloading and handling foodgrains and other commodities.<sup>66</sup> These numbers clearly indicate that there is an acute shortage of organised and good quality modern warehousing and storage infrastructure in the country for agricultural commodities.

The role of warehouses has increased due to wider product range, emphasis on shorter lead times and constant changes in customer demand. The increased demands forces companies to improve their warehousing operations for better service level and decreased costs. The emerging new technologies (like silos) are creating strategic opportunities for organisations to build competitive advantages in the warehousing sector.

65 Warehousing Development and Regulatory Authority. (2011). Annual report. Retrieved from <http://wdra.nic.in/AnnualReport12042012.pdf> (Retrieved from 22 Aug 2017)

66 ASSOCHAM. (2016). National Summit on Warehousing in India. Retrieved from [www.assochem.org/downloads/?filename=1459875564.pdf](http://www.assochem.org/downloads/?filename=1459875564.pdf) (Retrieved from 22 Aug 2017)

## Agriculture marketing in India

Agricultural produce marketing requires connectivity between the market; exporters, growers and traders; and industry consumers through a wide area network of national and international linkages in order to provide day-to-day information with regard to commodity arrivals and prevailing rates, etc.

A national IT-based integrated marketing information service (MIS) can play a useful role in helping the different stakeholders take decisions related to storing, pricing, marketing, etc. One of the major problems in designing an MIS is that the information needs of the individual target groups are diverse. To develop an information system, assessment of the information needs of the diverse target group is very important so that information management is holistic and integrated.

Currently, the Directorate of Marketing & Inspection (DMI) has initiated an information and communication technology (ICT) project, Agricultural Marketing Information System Network (AGMARKNET), to link all-important Agricultural Produce Market Committees (APMCs), State Agricultural marketing Boards/Directorates and regional DMI offices located throughout the country for effective information exchange on market prices. The AGMARKNET project has already networked more than 1,000 agricultural produce wholesale markets (APWMs), 75 State Agricultural Marketing Boards/Directorates and DMI regional offices thus far and plans to cover about 2,000 markets during the Tenth Plan Period (2002–2007). AGMARKNET appears to be filling a huge gap by providing access to information at a reasonable cost.

## Selected major challenges

Some of the major challenges faced by Indian farmtech sector are mentioned below:

- **Small and scattered landholdings:** The average farm size in India is less than 2 hectares, which is far lower than that in regions like the European Union (14 hectares) and the US (170 hectares). Large farm machineries are difficult to operate on such landholdings, which in some cases are completely unsuitable.
- **Equipment cost, quality and after-sales service:** Farm equipment, especially the energy-efficient options, are capital intensive and are a major investment for most of the farmers in India. A majority of them belong to the low-income bracket. The quality and after-sales service of farm equipment is another concern, since agriculture is largely carried out in rural parts of India and there are inadequate service centres for proper maintenance.
- **Procurement process for farmers:** The entire process of acquiring farm equipment is very tedious and cumbersome. A farmer has to go through various levels/departments to get his land records verified. Post clearance, he has to go



through further checks from the District Agriculture Officer in order to obtain approval and clearance for the purchase. This process itself becomes a big hindrance and inconvenience to the farmer.

- **Limited reach of ICT-based technology in rural areas:** Farmers have limited access to ICT-based technology in rural areas. The lack of basic infrastructure like computers, Internet connectivity and power are the key reasons for limited accessibility of ICT technology in rural areas.
- **Lack of support infrastructure for warehousing and logistics:** Warehousing operations are critically dependent on the supporting infrastructure like the interstate and intrastate road network and rail network. The existing support infrastructure needs to be upgraded to aid in the creation of an efficient warehousing sector.
- **Low utilisation of irrigation infrastructure:** The factors responsible for the low utilisation of irrigation infrastructure are lack of proper operation and maintenance, incomplete distribution systems, changes from the initially designed cropping pattern and diversion of irrigable land for other purposes.
- **Low adoption of modern technologies:** Although modern technologies are widely adopted in developed countries, the adoption of modern technologies like precision farming in India is yet to gain a foothold, primarily due to the country's unique pattern of landholdings, poor infrastructure, lack of farmers' inclination to take risk, and socio-economic and demographic factors.





## Opportunities for investment

Through investment and encouragement, the government is supporting the growth of the sector given its importance to the economy, farmers and consumers. Opportunities exist in four major areas: bilateral engagement, farm management, agricultural inputs, food processing and logistics.

**Bilateral engagement:** The Government of India and the Government of Israel have expressed their commitment to further strengthen bilateral relations in the field of agriculture and allied sectors, as well as to enhance cooperation at the government-to-government and business-to-business level.<sup>67</sup> The US and India could enter into a similar bilateral arrangement around farmtech in agriculture, centred on common goals and objectives.

**Farm management:** Opportunities exist for foreign companies to work with local communities and source locally, and to transfer technology and best practices. Produce that is generated can be exported to consumers outside India. NITI Aayog has proposed various reforms in India's agriculture sector, including liberal contract farming, direct purchase from farmers by private players, direct sale by farmers to consumers, and single trader licences, in order to double rural income in the next five years.<sup>68</sup>

**Increasing demand for agricultural inputs:**<sup>69</sup> In FY16, the production of foundation seeds reached 1,49,542 tonnes from 74,800 tonnes in FY06. There has been strong growth in the use of hybrid seeds because of their high yield and resistance. The use of hybrid seeds increased the yield of foodgrains to 2,056 kg/hectare in FY16 from 1,756 kg/hectare in FY07. The government has been encouraging the greater use of hybrid seeds. It also encourages private seed companies by providing a subsidy of 25% of the capital cost subject to a maximum of 50,000 USD per unit.

**Storage facilities:** 100% FDI is allowed under the automatic route in storage and warehousing, including cold storage. There is immense potential for companies to enter into this space and help create the storage capacity urgently needed for crops and food items. The Twelfth Five Year Plan estimated a potential storage capacity expansion of 35 million tonnes.<sup>70</sup> Thus, there is a need for cold storage capacity to grow rapidly from the current level of 24 million tonnes.<sup>71</sup>

**Food processing sector:** A wide array of products, coupled with increasing global connectivity, has led to a change in the tastes and preferences of domestic consumers. This trend is further supported by rising incomes, increasing urbanisation, a young population and prevalence of nuclear families. With policy support from the government, the size of the Indian food processing sector is expected to increase by three times by 2020.<sup>72</sup>

## Vision for the future

**Improvement in productivity and production of agricultural crops:** The constant emphasis of the Government of India on the adoption of technology in agriculture has resulted in an increase in production and productivity. However, there is much scope for improving the current level of productivity in the country. Therefore, Government of India has launched the Sub Mission on Agricultural Mechanization to increase the reach of technology to rural regions of the country and also create awareness among stakeholders about the benefits of technology through demonstration and capacity-building activities. The vision is to create hubs for hi-tech and high-value farm equipment in the country.

**Creation of agriculture infrastructure:** Led by the implementation of the various infrastructure creation programmes and schemes, the rising revenue gap between requirement and availability of key infrastructure (such as marketing infrastructure, irrigation infrastructure, warehousing infrastructure, roads, cold storage, export-oriented infrastructure) is expected to be addressed by the Government of India in the near future. Adequate infrastructure raises farm productivity, lowers farming costs and accelerates the economic growth rate. Furthermore, the availability of infrastructure will also help in enhancing the export of agricultural products from India and allow the country to develop as a major exporting hub.

67 India Brand Equity Foundation. (2017). *Agriculture in India: Information about Indian agriculture and its importance*. Retrieved from <https://www.ibef.org/industry/agriculture-india.aspx> (last accessed on 21 Aug 2017)

68 Ibid.

69 India Brand Equity Foundation. (2017). *Agriculture*. Retrieved from <https://www.ibef.org/download/Agriculture-April-2017.pdf> (last accessed on 21 Aug 2017)

70 Ibid.

71 Ibid.

72 India Brand Equity Foundation. (2017). *Indian food processing*. Retrieved from <https://www.ibef.org/industry/indian-food-industry.aspx> (last accessed on 22 Aug 2017)

# The soft power of culture and tourism

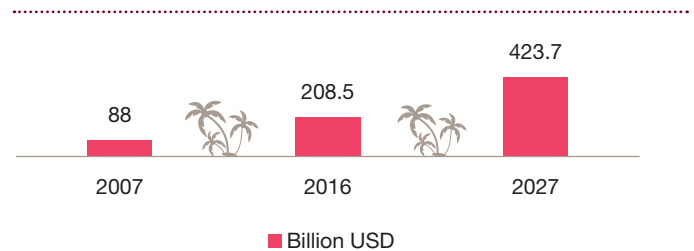
## Industry analysis

### Industry dynamics

India's culture and tourism sector is one of its most vibrant service sectors. The country's rich culture and heritage make it one of the most interesting destinations in the world to visit. Both Indians residing in India and foreigners are interested in exploring the country, which boasts a remarkable diversity in terms of food, culture, customs and geography. The Incredible India campaign was launched by the Government of India in 2002 to promote India as a tourist destination.<sup>73</sup> India ranks 15th in the world in terms of international tourism receipts, with a 1.62% share of the world's tourism receipts,<sup>74</sup> and is a large market for travel and tourism. It offers a diverse portfolio of niche tourism products—cruises; adventure; medicine; wellness; sports; meetings, incentives, conferences and exhibitions (MICE); ecotourism; film; and rural and religious tourism. India has been recognised as a destination for spiritual tourism for both domestic and international tourists. With 35 World Heritage Sites and 10 biogeographic zones, the country offers immense geographical diversity.

Foreign exchange earnings from tourism amounted to 23.15 billion USD in 2016, witnessing a compound annual growth rate (CAGR) of 10.4% during 2006–16.<sup>75</sup> The sector's total contribution to gross domestic product (GDP) stood at 208.5 billion USD (9.6% of GDP) in 2016—a significant increase from the 88 billion USD generated in 2007—and is expected to further grow to 423.7 billion USD by 2027. The sector's direct contribution to GDP is expected to grow by 7.9% per annum during 2016–26. India's growing middle class and increasing disposable income have continued to support the growth of domestic and outbound tourism.

Tourism's total contribution to GDP



73 India Brand Equity Foundation. (June 2017). *Tourism and hospitality*. Retrieved from <https://www.ibef.org/download/Tourism-and-Hospitality-June-2017.pdf> (last accessed on 29 June 2017)

74 Make in India website: <http://www.makeinindia.com/sector/tourism-and-hospitality>

75 India Brand Equity Foundation. (June 2017). *Tourism and hospitality*. Retrieved from <https://www.ibef.org/download/Tourism-and-Hospitality-June-2017.pdf> (last accessed on 29 June 2017)

## Selected major trends<sup>76</sup>

The hospitality and tourism sector is growing at a healthy pace. The growth is on various accounts and selected major trends in the sector are listed below:

### Business travel:<sup>77</sup>

- Driven by a combination of various factors such as globalisation of organisations, rising income levels, and policy and regulatory support by the government authorities, business travel has emerged as one of India's fastest growing industries.
- Business travel is an approximately 25 billion USD market in India, which will grow at a CAGR of 11.5% to 45 billion USD by 2019.

### Online travel operators:

- Over 70% of air tickets are now being booked online in the country.
- A number of online travel and tour operators, which provide better prices and options to consumers, have emerged in India.

**Wellness tourism:** Complemented by the nation's spiritual philosophy, the widespread practice of Ayurveda, yoga, Siddha and naturopathy makes India a popular wellness destination.

### Adventure:

- Adventure tourism is one of the most popular segments of India's tourism industry. Owing to India's enormous geophysical diversity, it has enjoyed substantial growth over the years.
- As part of India's tourism policy, almost every state has a definite programme to identify and promote adventure tourism.

### Spiritual tourism:

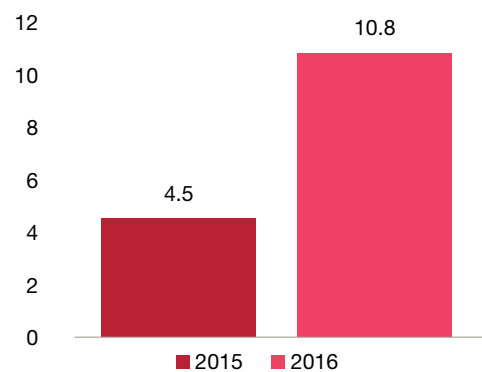
- India has been known as a seat of spiritualism and the country's cosmopolitan nature is best reflected in its pilgrim centres.
- India has been recognised as a destination for spiritual tourism for domestic and international tourists.

**Increase in domestic tourist visits (DTVs):** DTVs to states/union territories (UTs) grew by 15.5% YoY to 1.65 billion (provisional) during 2016, with the top 10 states/UTs contributing about 84.2% of the total number of DTVs.<sup>78</sup>

### Increase in foreign tourist arrivals (FTAs) on e-visas:

As per the Ministry of Tourism, FTAs on e-visas increased by 56.6% YoY in December 2016. In 2016, foreign tourist arrivals on e-visas more than doubled to 10,79,696 from 4,45,300 in 2015, partly because the e-visa facility was extended to 161 countries from 113 previously.

FTAs on e-visas (in lakhs)



## Selected major challenges<sup>79</sup>

Like other industries and sectors, tourism and hospitality has its own challenges. Four major challenges in this sector are listed here:

- **Intense competition:** The Indian hospitality sector is highly fragmented with a large number of small and unorganised players; this increases competition. Customers' low switching cost and price sensitivity further increase competition among players.
- **Threat of new entrants:** Entry is easy as it is not capital intensive, but a player needs to achieve economies of scale and access to a distribution channel to compete.
- **Bargaining power of suppliers:** There is the threat of forward integration; for instance, an airline can start selling directly to customers. Thus, the cost of switching suppliers is low.

<sup>76</sup> India Brand Equity Foundation. (June 2017). *Tourism and hospitality*. Retrieved from <https://www.ibef.org/download/Tourism-and-Hospitality-June-2017.pdf> (last accessed on 29 June 2017)

<sup>77</sup> Financial Express. (28 March 2016). *How business travel in India is changing*. Retrieved from <http://www.financialexpress.com/lifestyle/travel-tourism/how-business-travel-in-india-is-changing/230158/> (last accessed on 29 June 2017)

<sup>78</sup> Ministry of Tourism, Government of India. *Press release dated 2 March 2017*. Retrieved from <http://pib.nic.in/newsite/PrintRelease.aspx?relid=158781> (last accessed on 29 June 2017)

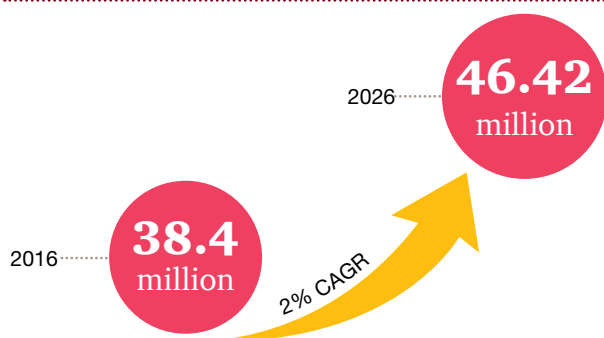
<sup>79</sup> India Brand Equity Foundation. (June 2017). *Tourism and hospitality*. Retrieved from <https://www.ibef.org/download/Tourism-and-Hospitality-June-2017.pdf> (last accessed on 29 June 2017)

## Vision for the future<sup>80</sup>

India is expected to move up five spots and be ranked among the top five business travel markets globally by 2030, as business travel spending in the country is expected to treble by 2030 from 30 billion USD in 2015. International hotel chains will likely increase their expansion and investment plans in India, and are expected to account for a 50% share in the Indian hospitality industry by 2022 (from the current 44%). FTAs into the country are forecast to increase at a CAGR of 7.1% during 2005–25. By 2025, FTAs in India are expected to reach 15.3 million.<sup>81</sup>

The travel and tourism sector in India is estimated to account for 9% of the total employment opportunities generated in the country in 2016, providing employment to around 38.4 million people during the same year. This number is expected to rise by 2% per annum to 46.42 million jobs by 2026. The sector's contribution to capital investment is projected to grow at 6.3% per annum during 2016–26, which is higher than the global average of 4.5%.

### Employment in the travel and tourism sector



### Opportunities for investment

- Domestic expenditure on tourism is expected to rise due to the growing income of households. A number of niche offerings such as medical tourism and ecotourism are expected to create more demand.
- The presence of world-class hospitals and skilled medical professionals makes India a preferred destination for medical tourism. India is projected to be the fastest growing nation in the wellness tourism sector in the next five years, clocking over 20% gains annually through 2017.<sup>82</sup>
- Cruise owners and operators can capitalise on the vast and beautiful coastlines, forests and idyllic islands.
- The tourism sector in India offers opportunities across various subsegments such as timeshare resorts, convention centres, motels and heritage hotels.

### Policy support

- 100% foreign direct investment (FDI) is allowed under the automatic route in tourism and hospitality, subject to applicable regulations and laws.
- A five-year tax holiday has been offered for two-, three- and four-star hotels located around UNESCO World Heritage Sites (except in Delhi and Mumbai).
- More than half of the Ministry of Tourism's budget is channelised for funding the development of destinations, circuits, mega projects as well as rural tourism infrastructure projects.

### Points to be kept in mind before entering the Indian tourism and hospitality sector<sup>83</sup>

**High seasonality:** The Indian hotel industry normally experiences high demand during October–April, after which demand drops during the monsoon months. Usually, the December and March quarters bring in 60% of the year's turnover for India's hoteliers.

**Labour intensive:** Quality of manpower is important in the hospitality industry. The industry provides employment to skilled, semi-skilled, and unskilled labour directly and indirectly. At 1.6 (2008–09), the average employee-to-room ratio in India is much higher than that for hotels across the world. The ratio stands at 1.7 for five-star hotels and at 1.9 and 1.6 for the four-star and three-star categories respectively. Hotel owners in India tend to 'over-spec' their hotels, leading to a higher manpower requirement.

**Fragmented:** The Indian hotel industry is highly fragmented, with a large number of small and unorganised players accounting for the lion's share.

Apart from the above, the points discussed under the section 'selected major challenges' should be considered.

### Recommendations for ease of doing business in this sector in India

India's Ease of Doing Business ranking has improved from 131 in 2016 and 134 in 2015 to 130 in 2017.<sup>84</sup> However, there is definitely a lot of scope for further improvement on some parameters. Some of the common issues faced by the hospitality industry in India are outlined below:

- **Retaining quality workforce:** Retaining the workforce by providing good wages
- **Customer expectations:** Focusing on customer loyalty and repeat purchases
- **Avoiding manual back-end processes:** Implementing IT systems to maintain data; avoiding manual filings

<sup>80</sup> India Brand Equity Foundation. (June 2017). *Tourism and hospitality*. Retrieved from <https://www.ibef.org/download/Tourism-and-Hospitality-June-2017.pdf> (last accessed on 29 June 2017)

<sup>81</sup> *Ibid.*

<sup>82</sup> According to a study conducted by SRI International

<sup>83</sup> Chadha, V. (27 June 2016). *Insights into the potential and growth of the Indian hospitality industry and India level challenges*. CEO World. Retrieved from <http://ceoworld.biz/2016/06/27/insights-potential-growth-indian-hospitality-industry-india-level-challenges/> (last accessed on 29 June 2017)

<sup>84</sup> Ministry of Commerce & Industry, Government of India. Press release dated 25 October 2016. Retrieved from <http://pib.nic.in/newsite/PrintRelease.aspx?relid=151967> (last accessed on 29 June 2017)

# Infrastructure: Ports, inland waterways, roadways, logistics, railways, airports

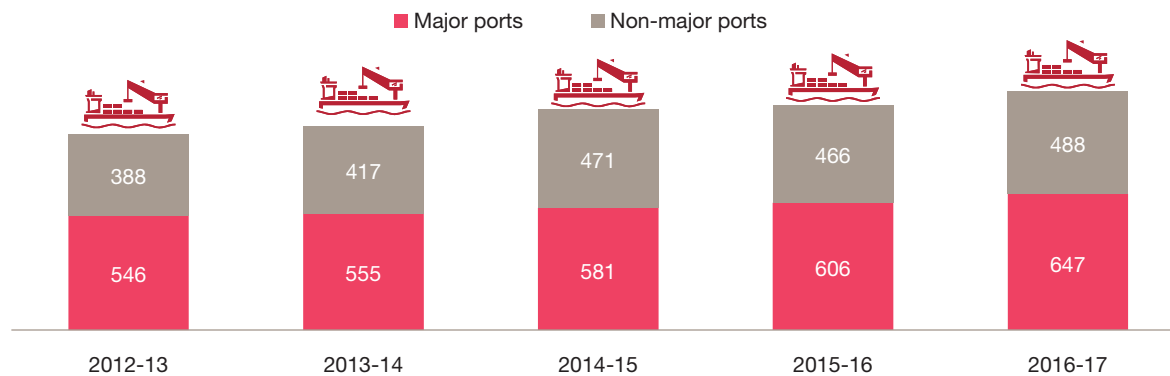
## Industry analysis: Ports and inland waterways

### Industry dynamics

India has a robust maritime logistics sector, which acts as a strong catalyst for economic growth by handling approximately 95% of the country's trade by volume and 70% by value.<sup>85</sup> Endowed with a vast coastline of around 7,500 km, spanning 13 states and union territories and with navigable waterways of over 20,000 km, India boasts of a rich maritime heritage.

Indian ports handled about 1,135 million tonnes of traffic in 2016–17. Of this, around 57% was handled by ports that come under the purview of the Government of India (called major ports), and the rest was handled by ports under state government purview (non-major ports). A majority of the non-major port traffic is handled across 15 ports, most of which are privately owned on long-term concessions from state governments.

### Traffic trends at Indian ports (million tonnes)



Source: Indian Ports Association

In the last five years, the major ports have recorded a compound annual growth rate (CAGR) of 4%, whereas non-major ports witnessed a higher growth of 6%.<sup>86</sup>



<sup>85</sup> Sagarmala report. Ministry of Shipping. Retrieved from <http://shipping.nic.in/> (last accessed on 21 Aug 2017)

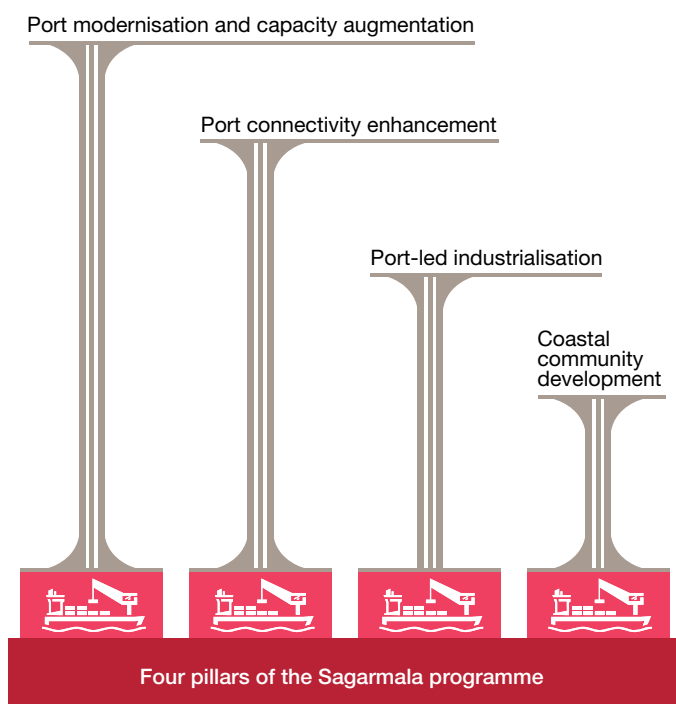
<sup>86</sup> Indian Ports Association

## Selected major trends

### Sagarmala – largest port development programme in the Indian port sector

The Government of India has launched several initiatives to harness the natural advantages of India and tap the vast growth potential of the maritime sector. One of the government's flagship initiatives is Sagarmala, a programme under the Ministry of Shipping. The programme envisions port-led development in a comprehensive and holistic manner, with 400 projects and an envisaged infrastructure investment of 69.2 billion USD.<sup>87</sup>

#### Four pillars of the Sagarmala programme



- **Port modernisation and capacity augmentation:** 142 port modernisation and capacity expansion projects (total cost: 14 billion USD) have been identified for implementation over the next 20 years.
- **Port connectivity enhancement:** 27 rail connectivity and 79 road connectivity projects for improving port-linked evacuation have been identified under Sagarmala.
- **Port-linked industrialisation:** The long-term plan is to develop 14 coastal economic zones (CEZs) aligned to relevant major and non-major ports in the region and create synergies with the planned industrial corridors.
- **Coastal community development:** The programme focuses on providing skilling for port staff and the port user community.

### Move towards a market-driven regime and autonomy of major ports

Recently, the Major Ports Authority Bill, 2016, replaced the Major Port Trusts Act, 1963. The bill will ensure greater efficiency through full autonomy in decision making and modernisation of the institutional structure of major ports. Further, the role of the key regulatory body for major ports, the Tariff Authority for Major Ports (TAMP), which had powers to set and regulate tariffs for all public private partnership (PPP) concessions, has been diluted. Now, individual port authorities have been given powers to fix tariffs which will act as reference tariffs for the purposes of bidding for PPP projects. PPP operators will then be free to fix tariffs based on market conditions. In addition, an Adjudicatory Board has been formed to facilitate the quick redressal of existing PPP concessionaires and to suggest measures to review stressed PPP projects.

### Development of alternative transport modes

- **Coastal shipping:** The government intends to boost the share of coastal and inland waterways in cargo transportation from the present 6% to 12%. The coastal shipping volume is expected to grow from around 90 million tonnes at present to around 400 million tonnes by 2025.<sup>88</sup>

Dedicated infrastructure development for improving hinterland connectivity to promote coastal shipping has been proposed through projects for dedicated coastal shipping berths, creation of supporting transport infrastructure, last mile connectivity projects, etc.

- **Inland waterways:** India has an extensive network of inland waterways and of the total navigable length of 14,500 km, 5,200 km of the rivers and 4,000 km of canals can be used by mechanised crafts. As compared to the US, China and the European Union, freight transportation by waterways is highly underutilised in India. India has now declared a plan to develop 111 national waterways. Of this, 32 new national waterways and 5 existing national waterways are to be developed in the next three years.

## Selected major challenges

Some of the key areas that need to be addressed in order to realise the future vision of this sector are as follows:

**Continued focus on improving the PPP environment:** A major part of the planned infrastructure funding is expected to come through private investments. Thus, aspects like ensuring depth of commercial financing for such projects, fair treatment of existing PPP projects in the new regulatory regime and timely execution of government-side initiatives like dredging/connectivity projects will go a long way in instilling investor confidence.

<sup>87</sup> India Maritime Investor Summit, Ministry of Shipping. Retrieved from <https://www.maritimeinvest.in/> (last accessed on 21 Aug 2017)

<sup>88</sup> Ibid.

### **Aligned development of the infrastructure value chain:**

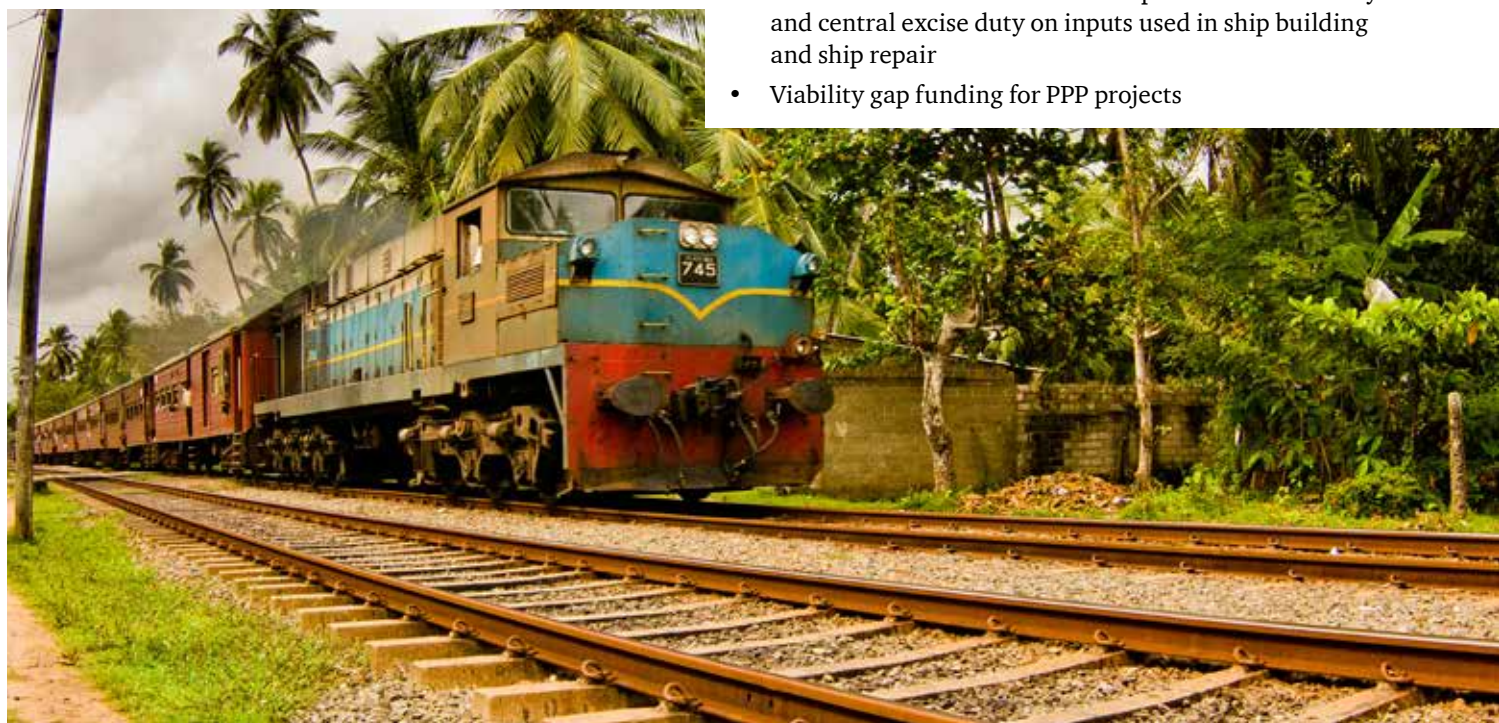
Port projects inherently rely on infrastructure development. They span seaside projects like channel dredging, berth-side projects like port infrastructure, and evacuation-side projects like rail and road connectivity. Many of these projects are executed by different government and private agencies. However, to ensure project sustainability, viability and holistic development of infrastructure, there is a need to ensure that the various projects are planned and executed in line with each other.

**Availability of manpower:** Ensuring availability of skilled manpower, with a focus on moving up the skill value chain to handle new technology and operational improvement initiatives, along with management of labour unions at certain ports, will be a key challenge for the sector to improve its efficiency and productivity.

### **Vision for the future**

Going forward, the National Transport Development Policy Committee estimates that Indian ports will handle about 1,700 million tonnes of traffic by 2021–22. At an optimum utilisation of around 70%, handling this traffic will require a port capacity of about 2,425 million tonnes, translating into a need for about 800 million tonnes of port capacity in the next few years.

The Indian maritime sector is poised to witness significant growth going forward. A slew of investments have been planned in order to develop this sector and address the capacity constraints issues. The Government of India has also implemented various initiatives to promote investments in the port sector by focusing on ease of doing business and incentives for investments.



### **Opportunities for investment**

Some of the key enablers and incentives for investments in the ports sector have been elaborated below.<sup>89</sup>

**Ease of doing business:** The following initiatives have been undertaken by the government to enhance ease of doing business in the port sector:

- One-time trading licence for vessels in lieu of annual renewal process
- Introduction of an e-governance initiative for online processing of chartering permission
- Web-based Port Community System to promote online port business
- Standardised bidding documents for PPP projects and transparent bidding process
- Slew of measures taken to reduce transaction cost and time across the logistics chain
- Relaxation of cabotage law for five years<sup>89</sup> to allow foreign flagged specialised vessels like roll-on roll-off (Ro-Ro), and liquefied natural gas (LNG) vessels to move cargo along the country's coastline

**Investment incentives:** The following investment incentives have been granted by the government to facilitate investments in the port sector:

- Foreign direct investment (FDI) up to 100% under the automatic route for port development projects
- Tax holiday for 10 consecutive assessment years for infrastructure development, including ports and inland waterways
- Reduction in service tax incidence on coastal shipping from 100% to 30% of the service value
- Financial assistance such as exemption of customs duty and central excise duty on inputs used in ship building and ship repair
- Viability gap funding for PPP projects

<sup>89</sup> India Maritime Investor Summit, Ministry of Shipping. Retrieved from <https://www.maritimeinvest.in/> (last accessed on 21 Aug 2017)

## Investments in the maritime and ports sector

The Indian ports sector has been attracting substantial investments in the past few years with growth opportunities and new policies for development. The Department of Industrial Policy and Promotion (DIPP), Ministry of Commerce and Industry, reported that the Indian ports sector received FDI worth 1.07 billion USD between April 2014 and September 2016.<sup>90</sup>

Some evolving and high-potential areas which are likely to generate investment opportunities for US-based players are:

Inland waterways	Works for dredging, civil amenities to be awarded for 7 waterways in this year
Port development	Six new mega ports: Vadhavan (Maharashtra), Enayam (Tamil Nadu) and others in the states of Andhra Pradesh, Odisha and West Bengal have been identified to add 400 MTPA of cargo handling capacity
Port modernisation	<ul style="list-style-type: none"> <li>Operational efficiency improvement programmes at major ports</li> <li>Digital and technology improvement initiatives like upgrade of Port Community Systems</li> </ul>
Port-led industrialisation	Ministry of Shipping is developing a special economic zone (SEZ) at JNPT and a free trade warehousing zone (FTWZ) at Ennore. It has also identified Kandla and Paradip for the development of smart port industrial cities (SPICs)
Shipbuilding, repairing and recycling	Opportunities to develop new dry docks and ancillary facilities

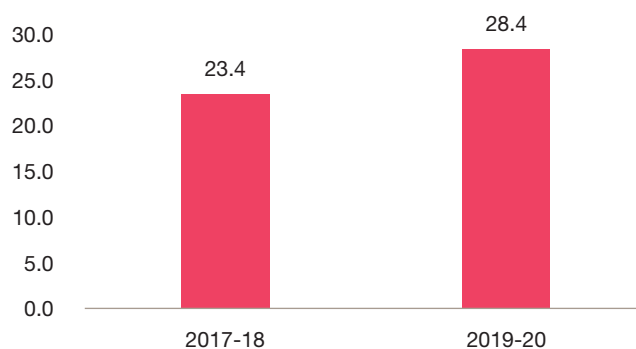
With a variety of mega projects being planned in this sector, engineering, procurement and construction (EPC) players involved in the construction of maritime assets like terminals, berths, and sea and waterway dredging are going to play a key role. Further, technology and operational companies that can bring in international experience to help modernise the port sector are expected to have many takers. Finally, foreign investors looking at private investments to fund this infrastructure push in the maritime sector are expected to have a multitude of opportunities. US-based expertise and investments in these areas can play a key role in harnessing this growth story.

## Industry analysis: Roadways

### Industry dynamics

We expect close to 15,000 km of highways to be awarded in FY 2017–18. The Ministry of Road Transport and Highways (MoRTH) constructed around 8,200 km of national highways during FY 2016–17 and has set an ambitious target to construct about 15,000 km of roads during FY 2017–18. In addition, there is an expectation that close to 9,000–10,000 km of roads would be awarded by MoRTH/the National Highways Authority of India (NHAI) and other Central Government agencies during FY 2017–18. States are also gearing up to increase the investment in the road sector and around 5,000–6,000 km of roads are expected to be awarded by the stated governments during FY 2017–18. The size of capital investment in the road sector is expected to increase YoY to reach around 1.8 lakh crore INR (28.4 billion USD) by FY 2019–20.<sup>91</sup>

Estimated investment in road sector (billion USD)



Source: PwC analysis

### Selected major trends

**Government to retain traffic risk:** The government has decided to retain traffic risk under road sector public private partnership (PPP) projects to de-risk road projects and help boost private investment in the sector. A clear example of this is the hybrid annuity model (HAM), which is a mix of engineering, procurement and construction (EPC) and build-operate-transfer (BOT) formats, with the government and private enterprise sharing the total project cost in the ratio of 40:60. The HAM model also reduces the equity investment and debt financing burden in a project—a major area of concern over the last two to three years. The NHAI has awarded more than 40 road projects under HAM, indicating the revival of private sector investment in the road sector.<sup>92</sup>

90 Department of Industrial Policy and Promotion (DIPP);

Make in India website. (n.d.) Ports and shipping. Retrieved from <http://www.makeinindia.com/sector/ports> (last accessed on 21 Aug 2017)

91 PwC analysis

92 NHAI sources

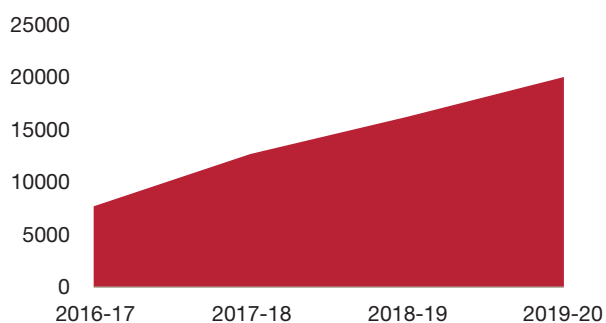


**Toll, Operate and Transfer (TOT) for operational projects:** The government has also decided to award some road projects that are under operation to suitable private investors under the TOT model of PPP, where projects would be awarded for a concession period of 30 years, with operation and maintenance risk vested with the private party. This model has been conceptualised to monetise already operational road projects and attract long-term institutional investors who eye projects with steady returns during a long-time horizon. About 10 road projects with an estimated investment of around 10,000 crore INR (1.6 billion USD) have been planned to be launched by the NHAI.<sup>93</sup> This model is also expected to entice some other players to enter the road sector market in India.

**EPC to be major mode of procurement in the short term:** While HAM as a mode of PPP has been adopted for several projects, EPCs as a mode of procurement are likely to play a key role, supported by central budget allocation, which has also increased by 12% during the current financial year.<sup>94</sup> However, institutional capacity may have to be strengthened.

**Operations and maintenance (O&M) capability crucial going forward:** As more and more projects are made operational (PPP or non-PPP), the requirement for O&M is set to increase, giving rise to tremendous opportunities in this space and also a new breed of players who specialise in the O&M of road sector projects. Developers with in-built O&M experience would find themselves in a better position and new players with good O&M capabilities would also enter this market. Even the TOT model would create a good amount of opportunity for specialised O&M players to penetrate this growing O&M market in India. As per a recent assessment, about 20,000 km of national highways would come under operation by 2019–20, suggesting an opportunity of around 600–700 million USD per year with an impressive growth rate.<sup>95</sup>

National highways under operation (km – estimated)



Source: NHAI, PwC analysis



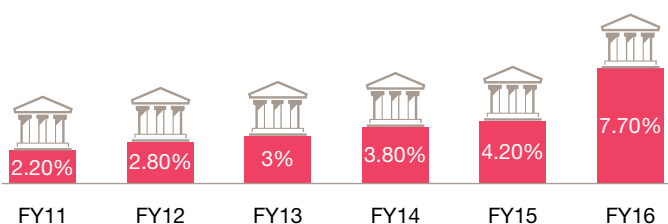
93 NHAI sources  
 94 NHAI sources  
 95 NHAI sources

## Selected major challenges

The biggest challenges are related to environmental clearances, acquisition of land and utility shifting to implement projects. The recent land acquisition bill is intended to eradicate these problems. Faster and time-bound settlement of dispute and litigation cases is essential to boost the interest of the private sector.

In addition, banks continue to face stress because of bad assets in this sector. The gross non-performing asset (GNPA) percentage has increased to 7.7% during FY 2016 as against 4.2% during FY 2015.<sup>96</sup>

### Trends in GNPA of banks



Source: Annual reports of banks

Note: The performance of 26 public sector and 15 private sector banks was analysed.

As a result of an increase in NPA, banks are reluctant to finance road sector projects. However, some measures have been taken by the Reserve Bank of India (RBI) and MoRTH to provide support to and revive eligible projects. It is expected that stress in this sector will reduce in the next one to two years, thus enabling banks to again support the sector wholeheartedly with stricter monitoring in place.

## Vision for the future

Going forward, we will see consolidation in merger and acquisition (M&A) activity and the entry of institutional investors and specialised O&M players in the Indian road sector. Not only developers from the US but also those from other countries will find the Indian market attractive from the risk-reward point of view. The prevalent market condition is conducive for a new player to enter into the road sector in India.

## Opportunities for investment

The days of cut-throat competition are slowly disappearing, clearing the way for a market with limited players. This is a great opportunity for foreign players to showcase their capabilities and enter the market. The presence of US companies in this industry is limited to some private equity (PE) funds that have invested in road assets.

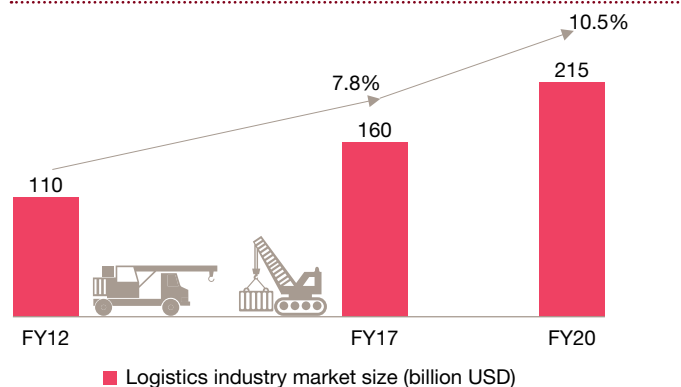
When entering the Indian market, US companies must consider their relationships with the local contractors as this will prove to be a prerequisite to survive in this industry.

## Industry analysis: Logistics

### Industry dynamics

The Indian logistics industry is estimated to be worth around 160 billion USD as of FY17 and has grown at a compound annual growth rate (CAGR) of 7.8% over the past five years.<sup>97</sup> Driven by improvements in regulatory reform and the development of supporting infrastructure, it is expected to exhibit strong growth in the near future. Considering the impact of short-term initiatives such as the implementation of the Goods and Services Tax (GST), the Indian logistics market is expected to reach about 215 billion USD in FY20, growing at a CAGR of 10.5%.<sup>98</sup>

### Logistics industry market size (billion USD)



Source: PwC analysis, Planning Commission of India



<sup>96</sup> PwC analysis

<sup>97</sup> PwC analysis

<sup>98</sup> PwC analysis

The Indian logistics industry can be broadly divided into two segments—transportation and warehousing and storage. Key organised players in this market have a market share of less than 5% of the overall market size.<sup>99</sup>

Segment	Sector
Transportation	Road freight
	Container train operations
	Express distribution
Storage	Cold chain
	Agri-warehousing
	Container freight stations/inland container depots
	Liquid storage
Others	Freight forwarding
	Port logistics
	Shipping

US companies have entered the Indian logistics market through private equity (PE) investments in Indian logistics companies. In the past decade, some US-based PE investors have invested in a number of logistics companies in India operating in different segments.

### Selected major trends

The key trends that are expected to shape the growth of the logistics market in India are discussed below.

#### Regulatory reforms facilitating operational efficiency:

The implementation of GST is one of the key enablers that is expected to result in increased efficiency for the logistics sector. Prior to the implementation of GST, industry players and logistics service providers based their warehousing decisions on tax considerations at the expense of operational efficiency. However, with GST in place, the logistics sector is expected to witness supply chain redesign and network optimisation, leading to operational efficiency.<sup>100</sup>

#### Infrastructure developments to facilitate multimodal transportation and create a hub-and-spoke distribution model:

Owing to inefficient rail operations and an underdeveloped inland water transport system, road transportation is the preferred mode of transport (approximately 60% share) for freight. In its bid to promote multimodal movement and reduce logistics cost, the government is prioritising the development of inland waterways, multimodal logistics parks and Dedicated Freight Corridors (DFCs). The expected faster transit time (18 hours as against 3–4 days) from Jawaharlal Nehru Port Trust to Delhi may catalyse the development of a hub-and-spoke model on the north-west and north-east trade lanes.

**Increasing penetration of e-commerce driving the need for logistics:** With the increasing penetration of the Internet in India, the online retail segment has also picked up pace. Logistics and infrastructure in the e-commerce segment are key enablers for establishing an efficient fulfilment network and ensuring that stringent service levels are met. Hence, a large proportion of investment in e-commerce is expected to flow into logistics and infrastructure development. This will in turn result in increased opportunities for logistics service providers and third-party logistics (3PL) players.

**Technological advancements expected to disrupt the existing logistics model:** Logistics technology start-ups and freight marketplaces will help improve utilisation by reducing empty backhauls. This will eventually have an impact on the overall cost of transportation. Adoption of such technology will help increase visibility of cargo and enable efficient logistics planning. These technological breakthroughs will further help regulate the fragmented trucking sector in India and result in increased organised play in road transportation.

**Increased propensity to outsource logistics requirements to 3PL players:** The Indian logistics landscape has evolved from traditional transport-based companies to complete logistics service providers offering various services across the value chain (transportation, warehousing, etc.). With an increasing share of 3PL players in India who can provide full-fledged logistics services, more and more manufacturing companies are looking to outsource their entire logistics requirements (transportation to inventory handling in some cases). This trend of increased outsourcing is further supported by tax reforms (GST) and infrastructure development initiatives such as DFC.



99 IBEF. (2013). Indian logistics industry: Gaining momentum. Retrieved from <https://www.ibef.org/download/indian-logistics-industry-gaining-momentum.pdf> (last accessed on 18 Aug 2017)

100 PwC. (2016). Goods and Services Tax: Transport and logistics (T&L) sector. Retrieved from <https://www.pwc.in/assets/pdfs/publications/2015/goods-and-services-tax-transport-and-logistics-sector.pdf> (last accessed on 18 Aug 2017)

## Selected major challenges

The following are the major challenges that the logistics sector currently faces in India.

**Lack of skilled manpower/drivers:** Currently, there is a dearth of skilled manpower in the logistics sector in India. The trucking segment (the largest component of the logistics market) faces a perennial challenge of availability of skilled and educated drivers. Lack of formal training, coupled with the low wages provided to these unskilled drivers, results in higher cases of breakdown, accidents, and theft of freight and fuel. There is a dearth of skilled labour in lower and middle management as well, resulting from the lack of training programmes and professional courses for logistics in the country.

**Infrastructure bottlenecks to expand the network to tier 2 and tier 3 cities:** Inadequate supporting transport infrastructure for logistics services is one of the key impediments to the growth of the logistics industry. Sub-standard connectivity to tier 2 and tier 3 cities in India is a major bottleneck, resulting in logistics service providers refraining from servicing these locations. For instance, due to unavailability of adequate transport infrastructure, many e-commerce companies in India primarily focus on tier 1 cities. This limits the opportunities for logistics service providers in the country.

**Inadequate legal protection to foreign investors:** The protection laws safeguarding the interests of foreign companies looking to invest in India need to be strengthened. The present regulatory landscape makes it extremely critical for foreign investors to carry out robust due diligence on their targets in order to safeguard their interests.

## Vision for the future

Given the vast expanse of the country, the development of a hub-and-spoke distribution model is essential for achieving operational efficiency. Such a distribution model requires the development of a conducive environment in terms of regulatory landscape and infrastructure development. While the implementation of GST is a positive step in this direction, the pace of infrastructure development will be key for the establishment of a hub-and-spoke model. The impact of infrastructure development will be visible in the long term, while the impact of GST implementation will be seen over the next two to three years.

Going forward, an increase in organised play in the logistics sector is expected. This trend will be driven by key enablers such as the development of multimodal transport systems, DFCs and improvement of the regulatory environment. This will further open up opportunities for large integrated logistics service providers to leverage the growth in this sector.

## Opportunities for investment

The logistics sector has witnessed significant investment over the last few years, driven by the favourable regulatory landscape and growth of the e-commerce sector. US companies have entered the Indian logistics market either directly or through the investment route. The Indian logistics sector is expected to open multiple investment avenues over the next few years in warehousing and 3PL. It is advisable to enter the market through the JV/minority investment route, given the complexity and diverse Indian logistics set-up. The role of a robust due diligence process becomes extremely critical to ensure the right partner fit.



## Industry analysis: Railways

### Industry dynamics

Spanning 66,687 km<sup>101</sup> and with more than 7,216 railway stations, the Indian Railways (IR) is the fourth largest railway network in the world. It caters to around 23 million passengers and transports approximately 3 million tonnes of freight daily.<sup>102</sup> The volume of capital investments in the sector has doubled in the last two years, increasing from 587 billion INR<sup>103</sup> in FY15 to 1,210 billion INR in FY17.<sup>104</sup> These investments are proposed to increase further in the next two years in order to meet the cumulative investment target of 8,560 billion INR, envisaged in the IR's five-year plan (2014–19).

Thus far, the Indian market has been majorly dominated by the IR (Ministry of Railways) and other public sector entities, with private players present in specialised areas of operations only. Unlike India, the US market is dominated by private players.



## Selected major trends

**Increasing throughput:** The use of high-capacity wagons and improvements in the availability/utilisation of rolling stock is expected to increase the overall efficiencies and throughput. Further, the implementation of integrated approaches across critical corridors so as to have seamless movement is also being addressed.

**Technological advancements:** Making the best use of new technological advancements through the implementation of high/semi-high speed rail and the use of electric multiple unit (EMU) coaches has been emphasised to a great extent.

**Upgrading of infrastructure:** There is a focus on decongesting existing railway lines through the implementation of Dedicated Freight Corridors (DFCs) and doubling of tracks. Upgrade/construction of a modernised terminal network is also being undertaken to make the best use of increased speeds and capacities.

**Reducing logistic costs:** Improvements in railway electrification and signalling systems, along with proper maintenance of tracks and other infrastructure, have been emphasised in order to cut down on unnecessary costs.

**Indigenous manufacturing facilities:** Based on the Make in India campaign, setting up of various locomotives and coach manufacturing facilities along with maintenance/overhauling facilities has been proposed across the country. These are targeted to meet the increased demand for rolling infrastructure.

**Enhancing capital investment:** The volume of capital investments can be increased by tapping new avenues of funds based on foreign direct investments (FDIs), along with continued support from multi-lateral organisations such as the World Bank, Asian Development Bank (ADB) and Asian Infrastructure Investment Bank (AIIB) through new means like the Rail India Development Fund (RIDF).

101 Indian Railways. (n.d.). Statistical summary – Indian Railways. Retrieved from [http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat\\_econ/IRSP\\_2015-16/Summary%20Sheet\\_Eng\\_pdf.pdf](http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat_econ/IRSP_2015-16/Summary%20Sheet_Eng_pdf.pdf) (last accessed on 18 Aug 2017)

102 Ibid.

103 Indian Railways. (n.d.). Presentation on achievements and plans of Indian Railways. Retrieved from <http://www.indianrailways.gov.in/Presentation%20on%20Achievements%20&%20%20Plans%20of%20Indian%20Railways.pdf> (last accessed on 18 Aug 2017)

104 Indian Railways. (n.d.). Statistical summary – Indian Railways. Retrieved from [http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat\\_econ/IRSP\\_2015-16/Summary%20Sheet\\_Eng\\_pdf.pdf](http://www.indianrailways.gov.in/railwayboard/uploads/directorate/stat_econ/IRSP_2015-16/Summary%20Sheet_Eng_pdf.pdf) (last accessed on 18 Aug 2017)

## Selected major challenges

**Inadequate infrastructure:** The current railway infrastructure is acutely inadequate and needs enhancements in all aspects. The dependence of various segments of operations on the underlying infrastructure makes it imperative to have the requisite infrastructure in place in the form of tracks, signalling systems, electrification, terminals, etc.

**Cross-subsidisation of passenger services:** Politicisation of tariff-setting has resulted in considerable cross-subsidisation of passenger services and a gradual erosion of the railways' market share in freight. Further, precedence given to passenger trains has caused uncertainties in running freight trains in a scheduled manner. The proposed Railway Development Authority is expected to work towards resolving these issues.

**Implementation bottlenecks:** Though many policy initiatives have been introduced in the sector, it is key that these initiatives are implemented in a seamless and timely manner without them being jeopardised by long approval processes and bureaucratic hassles.

## Vision for the future

The railways have increasingly been attracting FDI through strategic alliances with various countries over the last few years. For instance, in September 2015, Japan invested 140 billion USD<sup>105</sup> towards modernising the IR by 2020. Companies from France, China and Russia too have joined hands with the IR to bring three semi-high speed rail corridor projects on track. Given the huge amount of investments required in the sector and the plethora of opportunities available, more and more players and countries are expected to enter India's railways market.

## Opportunities for investment

100% FDI in the railway infrastructure segment has been allowed, thus opening up opportunities for the participation of companies in infrastructure projects. The IR envisages a prospective investment of 130.76 billion USD<sup>106</sup> in the next five years. The following are some segments where investment opportunities are available:

**DFC projects:** One of the long-term strategic plans of the Ministry of Railways is to construct six high-capacity, high-speed DFCs along the Golden Quadrilateral and its diagonals. Construction work on various segments of the Eastern DFC and Western DFC is in progress. Moreover, development of some segments on the Eastern DFC on public-private partnership (PPP) basis is expected. The contract for Dankuni-Gomoh section is expected to be issued in the near future. Other proposed DFCs—that is, North-South, East-West and East Coast—are in planning stages, and may also have PPP opportunities.

**Private freight terminals (PFTs)/multimodal logistics parks (MMLPs):** The development of 73 PFTs has been approved, of which 28 have already been commissioned. Further, the IR has targeted the setting up of 500 PFTs/MMLPs from FY17–FY19. To improve its attractiveness for investors, the PFT policy has been revised.

**Manufacturing rolling stock (including locomotives, wagons):** Two locomotive manufacturing plants, one at Madhepura and the other at Marowhra, were awarded to foreign companies in 2016. These joint ventures (JVs) with the IR are contracted to supply locomotives for 10 years and maintain them for 13 years. Other projects under similar contracts are proposed to be established.

**Station redevelopment:** The IR intends to upgrade over 400 railway stations around the country. The Indian Railway Station Development Corporation (ISRDC) has been formed to anchor this development. The bid process for two stations (Anand Vihar and Brijwasan, both in Delhi) has commenced, with bidders having been shortlisted after the request for qualification stage. Moreover, several other projects are proposed to be offered on a Swiss challenge basis (i.e. developers would be encouraged to submit unsolicited proposals, which would then be tested for competitiveness).

**High speed and semi-high speed projects:** The IR plans to build seven high-speed rail corridors to provide faster rail connectivity across the country. It also plans to invest 17 million USD in high-speed train projects.<sup>107</sup> In collaboration with the Government of Japan, a high-speed passenger train corridor between Ahmedabad to Mumbai has been undertaken. The IR intends to look for cost-effective options to increase the speed of trains on existing routes such as Delhi-Chandigarh and Delhi-Agra to 160–200 km per hour.

## Existing presence

Some US companies have already established operations in India in the railways sector:

- This US-based organisation manufactures equipment for the railroad, marine, mining and other industries. The company was awarded a JV contract by the IR to develop a factory to supply and maintain diesel locomotives. It is expected to build its factory and maintenance facilities in a few states.
- This manufacturer of diesel-electric locomotives, locomotive products and diesel engines for the rail industry delivers freight and passenger locomotives to India, along with provides the relevant technology and expertise. The company also provides service support to the IR's locomotive facilities at multiple locations across India, with a network of dedicated service support personnel. It has established a locomotive component warehousing and manufacturing facility in India.

<sup>105</sup> India Brand Equity Foundation. (2017). Railways. Retrieved from <https://www.ibef.org/download/Railways-April-2017.pdf> (last accessed on 18 Aug 2017)

<sup>106</sup> The Indian Lawyer and Allied Services. (n.d.). Indian Railways. Retrieved from <http://theindianlawyer.in/pdf/Railways.pdf> (last accessed on 18 Aug 2017)

<sup>107</sup> India Brand Equity Foundation. (2017). Railways. Retrieved from <https://www.ibef.org/download/Railways-April-2017.pdf> (last accessed on 18 Aug 2017)

- This third-party logistics (3PL) service provider for the automotive industry entered the Indian market through a JV. This JV operates automotive trains for domestic transportation of finished vehicles.

### Key issues and recommendations

**Legacy issues:** For a very long time, the Ministry of Railways had a monopoly over India's railways. It is only recently that policies and steps have been taken to encourage and facilitate the entry of private players. Thus, as the industry undergoes a paradigm shift, there would be certain legacy issues to be tackled at various levels of operations. It is best to plan in advance and have sufficient buffers in terms of time so as to account of any unwarranted delays due to such issues. Collaborating with an Indian entity having established operations and networks in the country is one of options to relatively mitigate this risk.

**Local procurement norms:** The Make in India campaign provides numerous opportunities for setting up manufacturing and maintenance facilities across the country. However, one of the key aspects of the campaign are the applicable local procurement norms which stipulate procurement from local sources. For example, it is now mandatory for metro rail companies to procure a minimum of 75% of train cars and 25% of critical equipment from within the country. Thus, it is important to be cognisant of the applicable norms for specific facilities before deciding upon an investment strategy.

**Strengthen patent rules:** One of the concerns of foreign companies investing in India is the lack of control they have over their intellectual properties. With cheaper replicas becoming available, Indian patent rules are being re-examined in order to completely safeguard investors' interests.



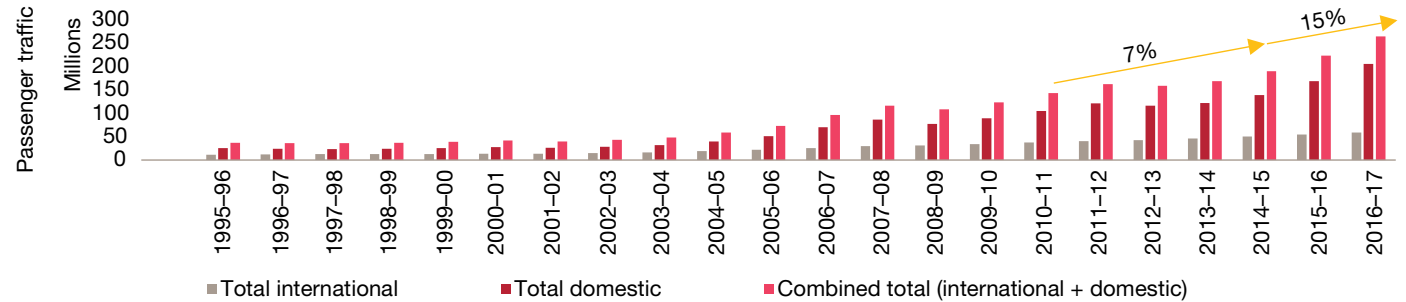
# Industry analysis: Airports

## Industry dynamics

Air passenger traffic in India has grown steadily in the past few years, with double-digit growth in the last two years. Air traffic grew by 7% from 2010–2014 and by a staggering 15% from 2015–2017.

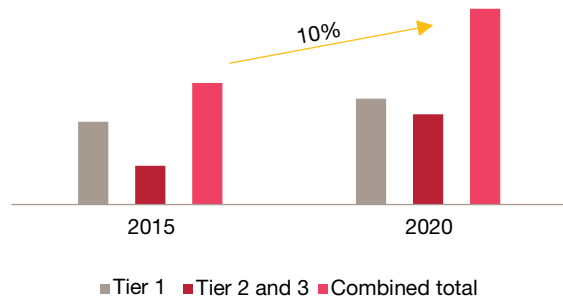
Specifically, in 2016–17, the total passenger traffic was approximately 265 million, there was total freight traffic of approximately 3 million MTs and total aircraft movement in India amounted to approximately 2 million.<sup>108</sup>

Overall passenger traffic in India (1995–2016)



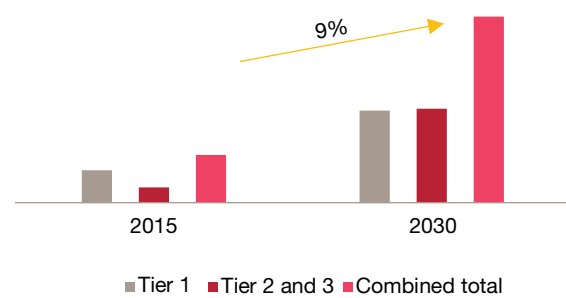
Source: AAI, PwC analysis

Passenger traffic growth in Indian cities (in crores)



Source: PwC analysis

Passenger traffic growth in Indian cities (in crores)



Source: PwC analysis

From 2015–2020, air passenger traffic in India is expected to grow at a compound annual growth rate (CAGR) of 10%, taking the overall passenger traffic from 219 million in 2015

to 354 million by 2020. Likewise, this traffic is expected to reach around 850 million by 2030, growing at a CAGR of 9%.<sup>109</sup>



<sup>108</sup> Airports Authority of India (AAI). Traffic news. Annexures II, III and IV. Retrieved from [http://www.aai.aero/traffic\\_news/Mar2k17\\_trafficnews.jsp](http://www.aai.aero/traffic_news/Mar2k17_trafficnews.jsp) (last accessed on 21 Aug 2017)

<sup>109</sup> PwC analysis

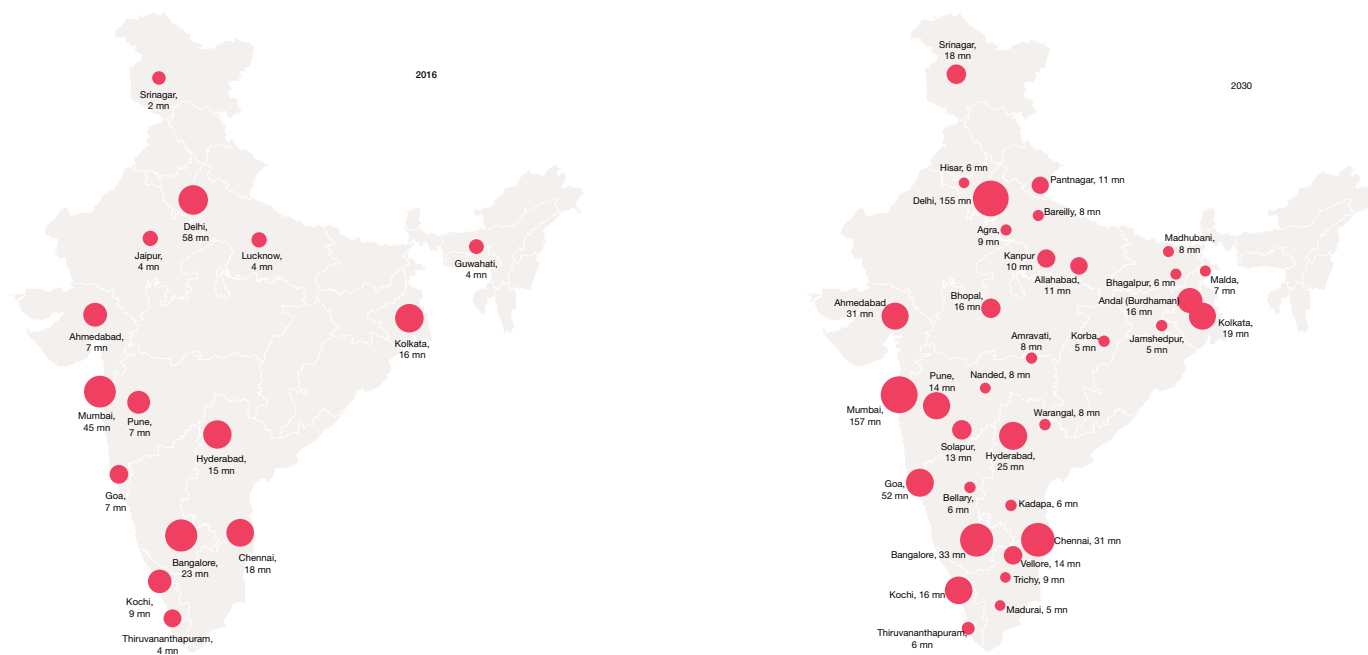


## Selected major trends

The rapid increase in the air passenger traffic in India has been fuelled by a phenomenal growth in GDP in the past few years. GDP per capita in India is expected to increase from 1,05,000 INR in 2015 to 1,36,000 INR in 2020 and 2,24,000 INR in 2030, growing at a CAGR of 5%.<sup>110</sup>

Owing to this rapid economic growth, there has been a steady rise in air travel penetration in tier 2 and tier 3 cities. Air passenger traffic from tier 2 and tier 3 cities is expected to grow at a CAGR of 18% between 2015 and 2020. During this period, air passenger traffic from tier 1 cities is only expected to grow at 5%, while the overall air passenger traffic in India is expected to grow at 10%. The contribution of tier 2 and tier 3 cities in India's passenger traffic is expected to grow from 32% in 2015 to 51% by 2030 at a CAGR of 13%.<sup>111</sup>

### Air passenger traffic in India



Source: PwC analysis

Category	Passenger traffic (2015) (in crores)	% share
1 Tier 1	14.9	68
2 Tier 2 and 3	7	32
3 India (total)	21.9	100

Source: PwC analysis

The number of airports with annual traffic of more than 1.5 million passengers is expected to increase from 24 in 2015 to 70 by 2030, growing at a CAGR of 8%.<sup>112</sup> India is expected to

Category	Passenger traffic (2030) (in crores)	% share
1 Tier 1	42.2	49
2 Tier 2 and 3	43.1	51
3 India (total)	85.2	100

Source: PwC analysis

become the third largest passenger market by 2035 in terms of million origin-destinations (O-Ds) to, from and within the country, growing at a CAGR of 7%.<sup>113</sup>

110 PwC analysis

111 PwC analysis

112 PwC analysis

113 Pearce, B. (n.d.). International Air Transport Association. The shape of air travel markets over the next 20 years. [Presentation]. Retrieved from <https://www.iata.org/whatwedo/Documents/economics/20yearsForecast-GAD2014-Athens-Nov2014-BP.pdf>

## ***Selected major challenges***

The biggest challenge for Indian air carriers is volatile aviation turbine fuel (ATF) prices, which are considerably high compared to international standards. The Government of India has not reduced jet fuel prices in proportion to the fall in international crude oil prices.

Additionally, infrastructural limitations and capacity constraints at Indian airports make it arduous for passenger and freight carriers to operate in India.

## ***Vision for the future***

The Indian aviation market is growing and has great potential for the future. This growth will be driven by the increase in the number of airports in tier 2 and 3 cities and will therefore be more inclusive in nature.

The Government of India has allowed up to 100% foreign direct investment (FDI) in Indian air carriers by a foreign entity and capped the stake for a foreign airline in an Indian air carrier at 49%. Several foreign airlines and organisations are investing in Indian airlines and this trend is expected to continue for the foreseeable future.

## ***Opportunities for investment***

Owing to increased air connectivity between the US and India, several new routes are expected to become active between the two nations. These routes will entail new opportunities for Indian as well as foreign air carriers. US carriers can either participate directly or in partnership with Indian air carriers to operate on these new routes. These developments have piqued the interest of major US airlines.



# Smart mobility

## Industry analysis

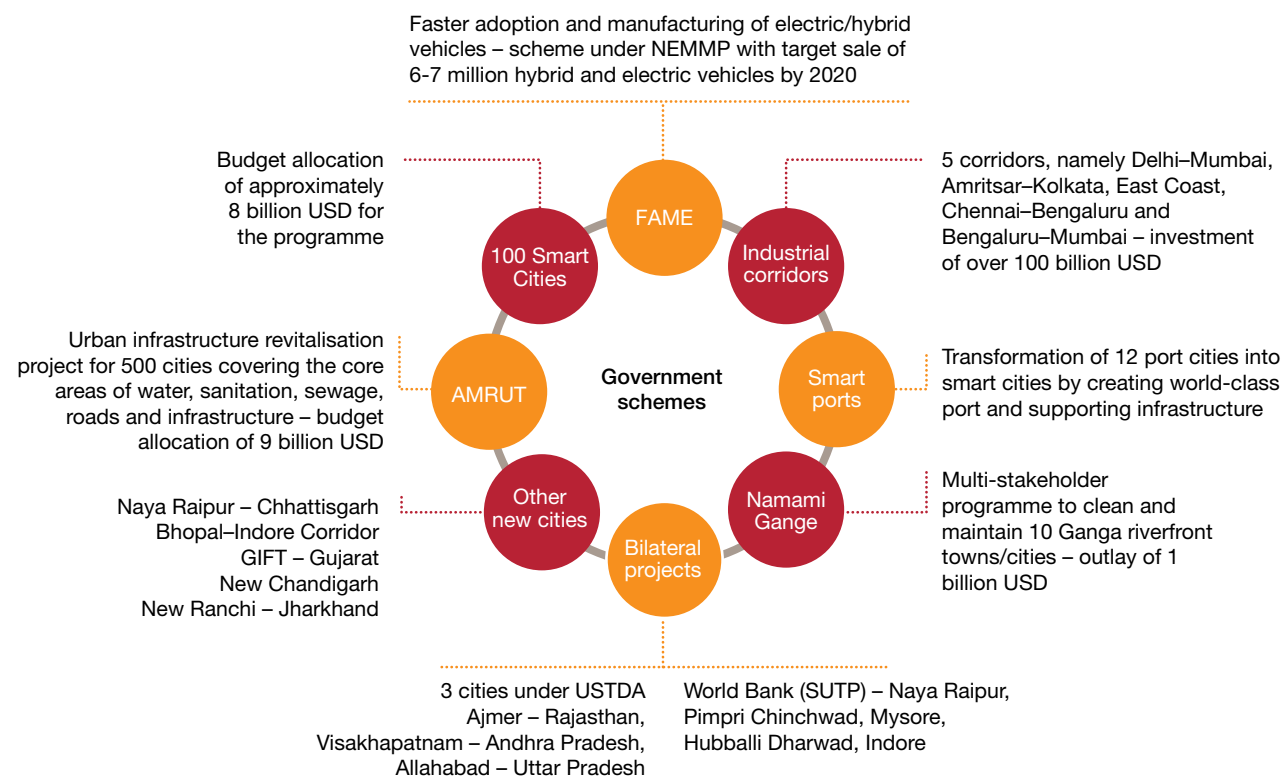
### Industry dynamics

Indian cities are evolving rapidly with the changing requirements of the country's increasing populace. Increasing urbanisation is posing immense pressure on the existing infrastructure and is compelling policymakers to take note of major issues related to inadequate and inefficient public transport services and related infrastructure, increasing greenhouse gas emissions, and lack of technological interventions to promote service delivery to end users.

With the aim of addressing these challenges, the Government of India is focusing on the development of urban as well as rural infrastructure, providing much-required impetus to the manufacturing sector and promoting trade policies and reforms to attract foreign direct investments (FDIs). Initiatives like Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Make in India, the introduction of the Goods and Services Taxes (GST) Bill and 100% FDI in select manufacturing sectors have projected India as one of the leading investment destinations.



### Schemes and plans of the Indian government<sup>114</sup>



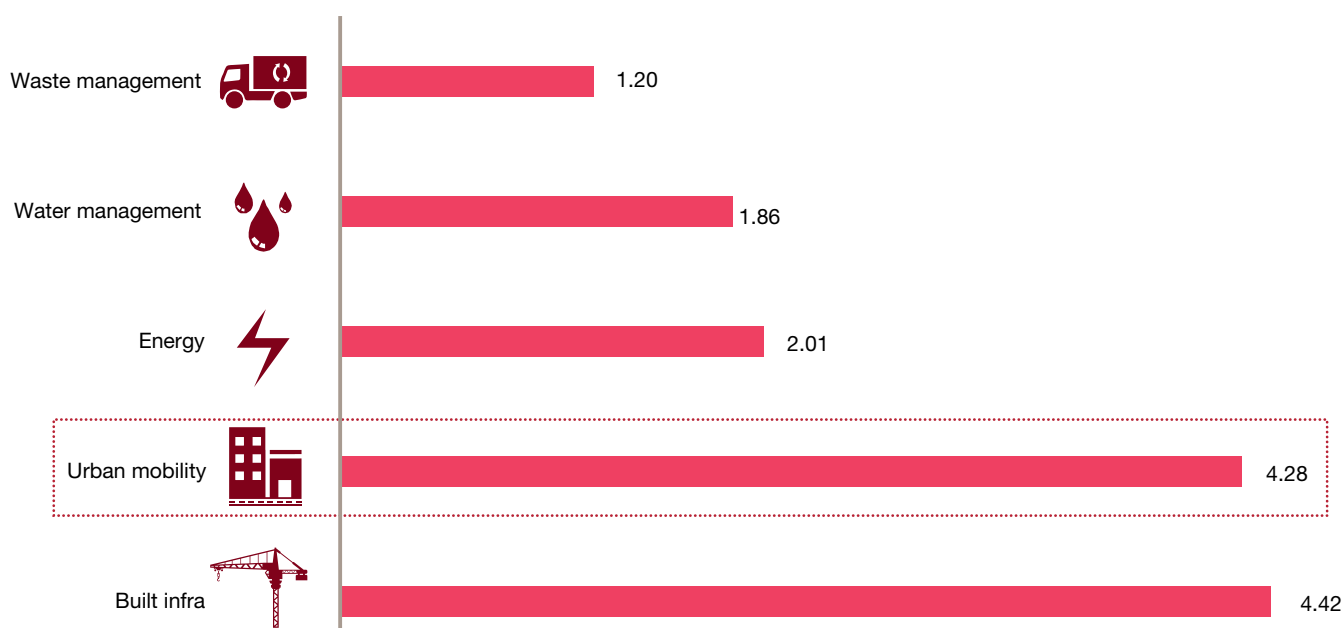
<sup>114</sup> Data taken from the websites of the initiatives: AMRUT.gov.in, Makeinindia.com, fame-india.gov.in, sutpindia.com

<sup>115</sup> Khanna, P. (25 June 2016). Narendra Modi launches smart city projects in Pune. Retrieved from <http://www.livemint.com/Politics/OBAdsQSOHayTH9FoYeW9VL/Narendra-Modi-launches-smart-city-projects-in-Pune.html> (last accessed on 13 July 2017)

One of the most ambitious projects launched by the Government of India is the smart city initiative under which the government has earmarked funds to the tune of 7.5 billion USD to be provided to 100 selected smart cities.<sup>115</sup> The cities are expected to be able to induct newer and integrated technologies to address challenges related to urbanisation and to improve the quality of life of city dwellers. The key pillars selected under the mission include mobility, energy, water management, environment, governance, citizen participation, digitisation, public safety, housing, education and healthcare.

The smart city project has provided an opportunity to introduce and promote various technological interventions in the field of traffic and transportation, amongst other initiatives for the different cities of India. The focus is now shifting towards moving people smartly and efficiently. Transport networks and related infrastructure form the backbone of any city. Without strengthening and modernising this infrastructure, cities will not be able to progress. It has been estimated that almost a quarter of the smart city funding sought by the 60 selected cities is for the implementation of smart traffic and transportation-related projects.

Top infrastructure segments under the smart city initiative (details for 60 cities – figures in billion USD)



The Government of India has already approved projects worth 8.8 billion USD<sup>116</sup> towards the development of urban infrastructure, including mobility, as one of the key focus areas under AMRUT. The government has plans to augment roads/highways, bus rapid transit projects, high speed trains, and mass rapid transit projects to provide efficient transport facilities and reduced peak time load on the transport network.

The Ministry of Shipping, Road Transport and Highways has set a target to achieve 2% of the country's GDP through the transportation sector and to create 15 lakh jobs. With an aim of constructing 30 km of road per day, the length of national highways is set to increase from 9,60,00 km to 1,50,000 km.<sup>117</sup> Programmes like Pradhan Mantri Gram Sadak Yojana are targeted at augmenting road infrastructure in rural parts of India. Also, Dedicated Freight Corridors have been planned to enhance rail and road networks.

High Speed Rail Corporation of India Limited (HRSC) was set up in 2012 with the aim of designing and implementing high-speed projects spanning the country's geography. Apart from the Diamond Quadrilateral project connecting Delhi, Mumbai, Chennai and Kolkata, feasibility studies for other corridors like Delhi–Chandigarh–Amritsar, Chennai–Bengaluru–Mysuru, and Mumbai–Ahmedabad are in advanced stages.<sup>118</sup>

The US Trade and Development Agency (USTDA) has signed three memoranda of understanding with the states of Rajasthan, Andhra Pradesh and Uttar Pradesh to work towards supporting the smart city initiative for Ajmer, Visakhapatnam and Allahabad, respectively.<sup>119</sup> Many US-based management consulting firms have been associated with multiple Indian cities. These agencies have been assisting cities in conceptualising and preparing smart city project proposals. Indian public sector enterprises, along with other private entities, are also active in this arena.

116 AMRUT website: <http://amrut.gov.in/> (last accessed on 14 August 2017)

117 PTL (1 Dec 2015). Transport sector targets 2% contribution to GDP: Nitin Gadkari. Retrieved from <http://economictimes.indiatimes.com/news/economy/infrastructure/transport-sector-targets-2-contribution-to-gdp-nitin-gadkari/articleshow/49999400.cms> (last accessed on 14 August 2017)

118 HSRC website: <http://hsrc.in/projects4.html> (last accessed on 14 August 2017)

119 US Trade and Development Agency (12 Dec 2016). USTDA deepens US partnership with smart cities in India. Press release. Retrieved from <https://www.ustda.gov/news/press-releases/2016/ustda-deepens-us-partnership-smart-cities-india> (last accessed on 6 July 2017)

Since the entire smart city project is at a nascent stage, a lot remains to be achieved as far as implementation of projects is concerned. Many cities are still under the process of setting up special purpose vehicles (SPVs) to manage the project, whereas a few of the proactive ones have appointed project management consultants.

Apart from smart city projects, several other upcoming initiatives indicate the development of new technological options under the mobility sector. A leading American automobile manufacturing company is already conceptualising a model around car sharing, which will cover vehicle scheduling and ownership management.

## Selected major trends

The digital revolution has revamped the entire concept of mobility. Simply tapping an icon on one's mobile screen gets one places. Similar changes are visible in many other forms—for instance, intelligent streets, smart mobility services such as public transport ticket booking, fare collection, parking, and a focus among automakers on next generation vehicles.

The digital age has already set in and brought innovations like smartphones, real-time journey planning applications, open data traffic and customer care services. These changes have empowered the user to a great extent and put him in the front seat. User choices are now defining the operational parameters of the system.



The introduction of **hybrid, electric and solar-powered** vehicles in the Indian automobile market has shifted the focus of policymakers towards promoting green modes of transport.

Options like electric cars, bikes and rickshaws not only offer economic rides as compared to their petrol-/diesel-/CNG-fuelled counterparts but also reduce greenhouse gas emissions. It is noteworthy that many participants in the smart city challenge have begun promoting these green mode of transport. The launch of initiatives like Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME) and Solar City Programme by the Government of India has provided a further and much-required impetus towards achieving the goal of reduced dependency on non-renewable sources of energy.



**Interconnected multimodal transportation** can ensure seamless journeys that are demand responsive. It also allows for the monitoring of systems and physical asset performance. Smart

systems are capable of responding to real-time situations and predicting and avoiding interferences. Many cities are now in the process of developing robust passenger information systems which not only provide information while travelling but also aid in journey planning beforehand. Bangalore Metropolitan Transport Corporation has developed a user-friendly travel information planner (website and mobile application) which provides real-time information related to the location of buses on routes, number of buses available at any given bus stop, trip planner from one point to another, etc.



Advancements with respect to **cashless transactions** have reduced the need of carrying cash currency. Digitisation through smart wallets and Internet ticketing have already transformed the ticketing and payment system for various transport modes.



More and more cities are now becoming sensitive towards the requirements of pedestrians and cyclists. The shift in focus towards the promotion and development of **non-motorised transport (NMT)** infrastructure has paved the way for initiatives like the introduction of public bike-sharing schemes (PBS), cycle tracks and footpaths equipped with suitable street furniture, and the introduction of electric rickshaws for last-mile connectivity.



**Innovation** is the need of the hour. The availability of many mobility options to the end user has given rise to dynamic requirements which necessitate innovation. Under this scenario, the ownership of protecting citizens and providing an enabling environment for business parties lies with the public sector. New players will take advantage of peer learning, already existing information and communication technology (ICT) options and low-cost models to scale universally.

Innovation in the automobile technology sector has seen tremendous growth. Since most of the road crashes are due to driving error,<sup>120</sup> auto manufacturers are now providing a range of safety systems that assist drivers in avoiding accidents. Anti-lock braking systems have been made compulsory in commercial vehicles from 1 September 2015. The Government of India is also enforcing mandatory stringent crash test norms for all new cars from October 2017 onwards.

The number of car-sharing users grew from 4.8 million worldwide at the end of 2014 to an estimated 6.5 million at the end of 2015. Roughly 1,000 cities worldwide have a bike-sharing programme. Ride hailing services have seen similar growth. Car-sharing service providers recently completed 500 million rides in India in 2016, up from 130 million a year earlier.<sup>121</sup> These trends support and indicate the need for and usability of innovative mobility options.

120 BBC. (10 June 2016). India road crashes kill 146,133 people in 2015. Retrieved from <http://www.bbc.com/news/world-asia-india-36496375> (last accessed on 14 August 2017)

121 Chakraborty, S. (17 Feb 2017). Ola, Uber see rides rise fourfold in 2016: report. Retrieved from <http://www.livemint.com/Companies/bjNzZDHCO25e00Zhj3oklJ/Ola-Uber-see-rides-rise-fourfold-in-2016-report.html> (last accessed on 13 July 2017)



## Selected major challenges

Some of the key challenges plaguing the urban mobility sector include:

- The lack of an efficient and adequate public transport system as well as related infrastructural provisions has resulted in a decline of modal share. Many Indian cities are struggling to provide efficient public transport systems to citizens. A recent study indicates that close to 50% of the workforce continues to work at home or travel to their workplace by foot. The share of public transport in work trips is a mere 18%.<sup>122</sup>
- Last mile connectivity is one of the biggest challenges faced by Indian cities today. Not all destinations can be connected via public transport; therefore, modes like electric rickshaws, cycles and public bike-sharing schemes merit consideration.
- Slow adaptation of modern technological interventions, reliability and punctuality of public transport services, idling of vehicles at traffic intersections, road accidents and fatalities due to crowded and mixed traffic conditions on roads are some of the issues which may be dealt through the application of technological interventions like solar-powered adaptive traffic control signals and city-wide passenger information systems connected to control and command centres.
- Change in technology (from petrol/diesel to hybrid/electric) has been another hurdle for the Indian automotive industry. Although initiatives like FAME have been devised, cost-effective technical know-how needs further improvement.
- The development of traffic infrastructure and management processes for new cities and ensuring the acceptability of the new systems among users is a challenge that implementing agencies have to deal with. Providing an enabling institutional support and environment is another obstacle which these cities face during the initial stages of implementation. Identification of funding sources and project structuring to maintain financial viability may be viewed as other hurdles in project execution.

<sup>122</sup> Singh, J. (2016). *City public transportation developments in India*. Eurotransport. Retrieved from <https://www.eurotransportmagazine.com/21458/transport-extra/city-public-transportation-india/> (last accessed on 6 July 2017)



## *Vision for the future*

**Information:** Consistent, reliable and accurate data is the foundation for many intelligent transport systems (ITS) and related services. In recent years, there has been a paradigm shift in sensor and data processing technologies, which has resulted in more accurate and richer transport-related data. There is a need for innovative and economical technological options for the collection and dissemination of data. Data standardisation and security will be the next big areas of opportunity to explore.

**Interaction:** More and more opportunities are being created for increased integration of and interaction between people to people, people to machine and machine to machine. With the ever-increasing penetration of smart mobile devices, transport information and related services are becoming personalised and customised to meet individual travel needs and preferences. Options like fleet management systems, road usage demand management, traffic junction management systems, integrated multimodal transport systems and crowdsourcing are some of the emerging areas.

**Assistance:** Connected vehicles and infrastructure, ITS and telematics have been evolving. This evolution enables the application of advanced telematics interventions such as road safety-related advisories, dynamic traffic routing and intelligent parking guidance.

**Green mobility:** It has now become imperative for society to develop, store and harness renewable sources of energy for mobility-related requirements. Transportation is one of the major contributors of harmful emissions which pose significant health risks and a social cost. The development and large-scale adoption of hybrid, electric and solar vehicles will be a game changer.

**High-speed connectivity:** Distances are getting shorter by the day. The expansion of urban areas and need for interconnectedness warrants superfast means of transportation. High-speed rail networks, MAGLEV and the Hyperloop are some of the noteworthy interventions.

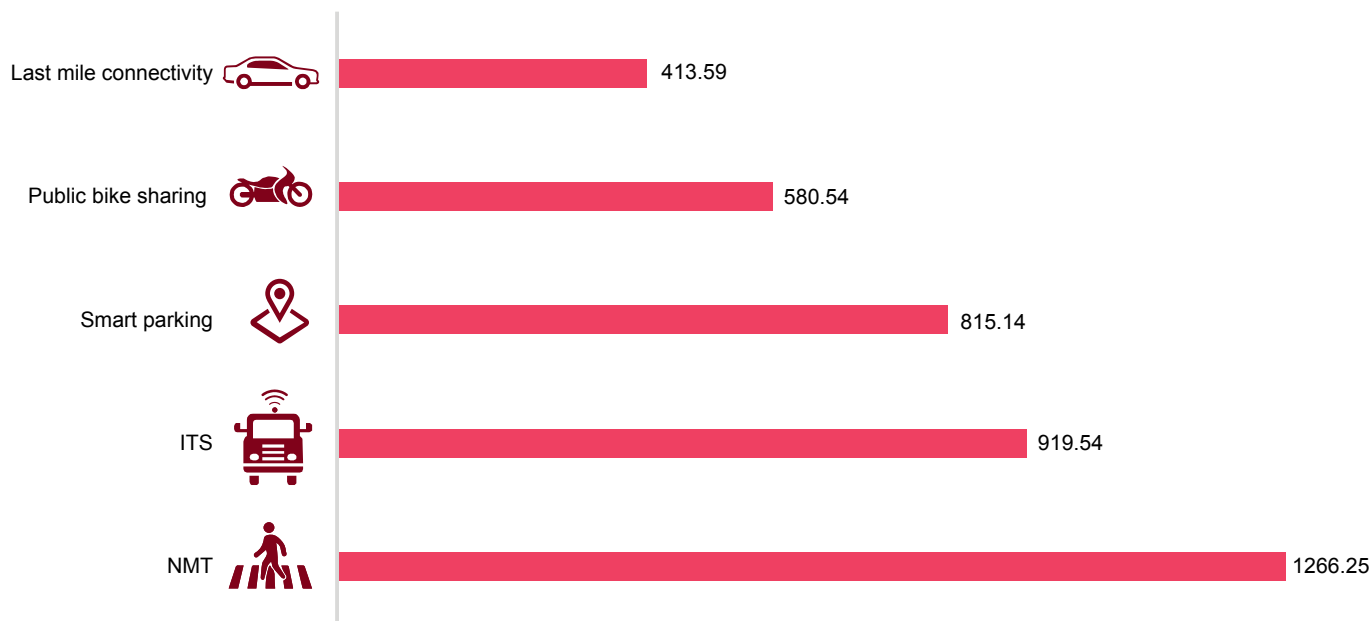


## Opportunities for investment

Analysis of the 60 cities selected under the Smart Cities Mission indicates that mobility has been one of the top sectors for investment. The total investment required in the urban mobility sector (only under the smart city project) is approximately 4.3 billion USD. Urban mobility has been further segregated into sub-sectors which form an integral part of smart and sustainable mobility. A few such sectors identified are PBS, smart parking, intelligent transport system, last mile connectivity through e-vehicles, etc.<sup>123</sup>



Projects identified as sub-sectors for urban mobility under the smart city project (figures in million USD)



In line with the advancement of megatrends and technology, major US companies have developed expertise which has helped them expand their presence in the mobility industry.

1. A US-based automobile company has pushed the envelope around mobility, with the aim of transforming itself from just a product company to a product and mobility company. Leveraging ICT, this leading automobile manufacturer has started several pilot projects in urban centres around the world. These pilot projects include parking systems, employee shuttles and car-sharing programmes. Initiatives like this will help in better parking and adaptive traffic management, leading to less congestion and air pollution.
2. A majority of the population living in cities these days prefers accessibility to ownership. Witnessing this trend, companies are launching e-hailing and ride-sharing services. App-based car-sharing companies have tapped this opportunity and invested heavily in emerging markets such as India. Promotional services like free rides, discounted fares and cashback offers are some of the methods utilised by these agencies to widen the consumer base as well as increase market penetration.

3. One of the major focus areas under smart mobility is green and electrical vehicles. A leading US auto manufacturer is setting up a plant in India to manufacture their products locally in order to cater to the EV market in India. It has been estimated that by the end of 2017, EVs could account for nearly 5% (or 1,75,000 cars) of the car market segment.<sup>124</sup>

India is one of the fastest developing economies in the world. Also, initiatives such as GST, the Smart Cities Mission and Make in India are providing the right environment for the private sector and foreign players to invest in the country. The role of the private sector has been pivotal to the success of many urban services delivered to citizens. A few of the important considerations for any potential investor have been detailed below.<sup>125</sup>

1. Clarity about ownership and legal framework: The lack of a robust legal framework or effective regulations is a major threat to public private partnerships (PPPs). The Foreign Exchange Management Act, 1999, lays down the rules and guidelines which are to be followed for PPP projects.

<sup>123</sup> PwC analysis

<sup>124</sup> Krishnan. (1 Feb 2016). Understanding the FAME India scheme. Ather. Retrieved from <https://blog.atherenergy.com/understanding-the-fame-india-scheme-485287729976> (last accessed on 6 July 2017)

<sup>125</sup> World Economic Forum and PwC. (February 2017). Harnessing public-private cooperation to deliver the New Urban Agenda. Retrieved from [http://www3.weforum.org/docs/WEF\\_Harnessing\\_Public-Private\\_Cooperation\\_to\\_Deliver\\_the\\_New\\_Urban\\_Agenda\\_2017.pdf](http://www3.weforum.org/docs/WEF_Harnessing_Public-Private_Cooperation_to_Deliver_the_New_Urban_Agenda_2017.pdf) (last accessed on 13 July 2017)



2. Go-to-market strategy, including local partnerships and proper tax budgeting: A well-defined go-to-market strategy will enable investors to identify sector-specific investment arenas. Sufficient provisions should be made by inventors to accommodate tax-related expenditures to be incurred while investing in India. Local partnerships might help bring in the much-required region specific market intelligence as well as user aspirations.
3. Realisation of investment: India is still an emerging economy whose citizens do not have a high purchasing power. Thus, companies have to manufacture products or provide services which are affordable, or else they may not be able to gain returns on their investments.

The Indian auto industry is one of the largest in the world. The industry accounts for 7.1% of the country's gross domestic product (GDP). The sales of passenger vehicles (PVs), commercial vehicles (CVs) and two-wheelers grew by 9.17%, 3.03% and 8.29% respectively during the period from April to January 2017. The increase in the sale of PVs and CVs and proposals for the introduction of electric vehicles in the smart cities sector present a huge opportunity for foreign companies to invest in India. Through the various initiatives it has implemented, the Government of India has provided organisations with a favourable investment environment.

A few of these are:<sup>126</sup>

1. The Government of India has encouraged foreign investment in the automobile sector and allows 100% FDI under the automatic route.
2. The government plans to introduce a new Green Urban Transport Scheme (GUTS) with central assistance of about 25,000 crore INR (3.75 billion USD). The scheme is aimed at boosting the growth of low-carbon urban transport in order to achieve a substantial reduction in pollution and provide a framework for funding urban mobility.
3. Automobile manufacturing has been envisioned as the main driver of the Make in India initiative.
4. Under the National Electric Mobility Mission 2020, FAME has been formulated to encourage the progressive induction of reliable, affordable and efficient electric and hybrid vehicles in the country.<sup>127</sup>

In addition, under the Smart Cities Mission, the transport and mobility segment can be expected to attract the maximum number of PPP projects.



<sup>126</sup> IBEF. (June 2017). Automobile industry in India. Retrieved from <https://www.ibef.org/industry/india-automobiles.aspx> (last accessed on 6 July 2017)

<sup>127</sup> Krishnan. (1 Feb 2016). Understanding the FAME India scheme. Ather. <https://blog.atherenergy.com/understanding-the-fame-india-scheme-485287729976> (last accessed on 6 July 2017)

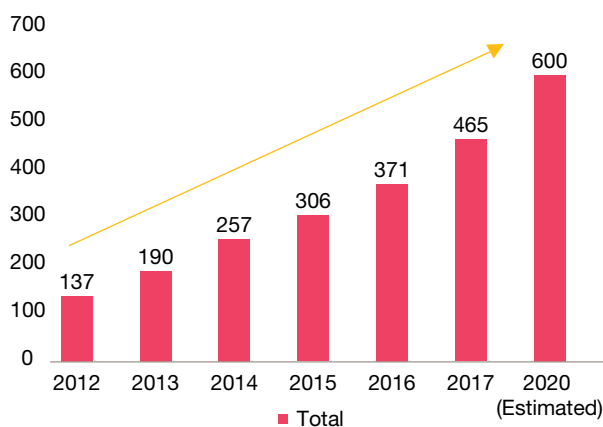
# A digital bridge to growth

## Industry analysis

### Industry dynamics

Information technology has, over the years, evolved from being a business enabler to a business driver, and organisations have started differentiating themselves on innovative IT adoption. Digital is not just about technology implementation. It encompasses the transformation of business, enterprises and governments using technology, so as to make experiences better, communication effective and work simpler. Thus far, digital has been characterised by four aspects—social media, mobility, analytics and cloud—commonly called SMAC. As SMAC evolves, new disruptions are emerging, especially in areas such as the Internet of things (IoT), artificial intelligence and cognition, machine learning, 3D printing, drones and blockchain technologies. These disruptions, in turn, are fundamentally changing the way services are delivered and business operations are undertaken. There is a growing sense that digital is not just a buzzword, but has actually been contributing to GDP worldwide, with some studies showing the contribution to be about 20% globally.<sup>128</sup>

Growth in the number of internet users in India (in million)



### Driving digital growth in India

Digitisation has become a vital component in the growth of the Indian economy. The digital boom in India is driven by a concerted play of both supply and demand side factors. On the supply side, organisations, both private and public, have made a substantial amount of their service offerings online, primarily with a focus on reducing cost, improving efficiency, personalising service, collecting user data, widening reach, etc. The Digital India campaign has accelerated the rate at which public service delivery is digitised. The demand side has been driven by the massive proliferation of the Internet, mobile devices and social media (including P2P messaging) platforms.

As per a report by the Telecom Regulatory Authority of India (TRAI), there has been a 9.72% increase in Internet usage over the past year.<sup>129</sup> In India, mobile phone penetration is currently in the range of 65–75%. This is forecast to increase to 85–90% by 2020.<sup>130</sup> A report by the Internet and Mobile Association of India and IMRB International indicates that 77% of the users in urban areas and 92% of the users in rural areas consider the mobile phone as the key device to access the Internet owing to its cost-effectiveness and easy availability.<sup>131</sup> Social media introduced a lot of Indians to digital for the first time, and with 200 million WhatsApp users<sup>132</sup> and 250+ million Facebook users,<sup>133</sup> the trend continues.

The euphoria is not just confined to SMAC. IoT and mobile-to-mobile (M2M) technologies are in a phase of unprecedented innovation. India's Ministry of Electronics and Information Technology estimates that the size of the IoT industry will rise to 15 billion USD by 2020. This will indirectly lead to a growth in the use of connected devices from around 200 million to over 2.7 billion by 2020.<sup>134</sup> The plan of developing 100 smart cities will also result in the rapid expansion of IoT.

128 Sheehy, A. (6 June 2016). GDP cannot explain the digital economy. Retrieved from <https://www.forbes.com/sites/andrewsheehy/2016/06/06/gdp-cannot-explain-the-digital-economy/#65d9ce8b18db> (last accessed on 1 Aug 2017)

129 Madanapalle, A. (20 Dec 2016) Trai releases data on internet usage: subscription has grown 9.72 percent over previous year. Tech2. Retrieved from <http://www.firstpost.com/tech/news-analysis/trai-releases-data-on-internet-usage-subscription-has-grown-9-72-percent-over-previous-year-3694519.html> (last accessed on 4 July 2017)

130 Sharma, S. (19 May 2017). Mobile phone penetration in India set to rise to 85-90% by 2020: report. Livemint. Retrieved from <http://www.livemint.com/Consumer/zxupEDYD560LJrnoRxcn4L/Mobile-phone-penetration-in-India-set-to-rise-to-8590-by-2.html> (last accessed on 8 Aug 2017)

131 Chopra, A. (1 March 2017) Number of Internet users in India could cross 450 million by June: report. Livemint. Retrieved from <http://www.livemint.com/Industry/QWzI0YEsfQJknXhC3HiuVI/Number-of-Internet-users-in-India-could-cross-450-million-by.html> (last accessed on 8 Aug 2017)

132 Tech Desk. (27 July 2017). WhatsApp now has 1 billion daily users, over 250 million on Status. The Indian Express. Retrieved from <http://indianexpress.com/article/technology/social/whatsapp-now-has-1-billion-daily-users-over-250-million-on-status-4768940/> (last accessed on 8 Aug 2017)

133 PTI. (14 July 2017). India now has highest number of Facebook users, beats US: Report. Livemint. Retrieved from <http://www.livemint.com/Consumer/CyEKdaltF64YycZsU72oEK/Indians-largest-audience-country-for-Facebook-Report.html> (last accessed on 8 Aug 2017)

134 PTI. (26 Oct 2014). Govt aims to make \$15-bn IoT industry in India by 2020. Business Standard. Retrieved from [http://www.business-standard.com/article/pti-stories/govt-aims-to-make-15-billion-iot-industry-in-india-by-2020-114102600119\\_1.html](http://www.business-standard.com/article/pti-stories/govt-aims-to-make-15-billion-iot-industry-in-india-by-2020-114102600119_1.html) (last accessed on 1 Aug 2017)

All these developments have created a lot of excitement, and both the private and government sectors are looking for key strategies to set up digital platforms and solutions. For the government, the shift to digital has primarily been about transparency and reach—taking services and resources in the healthcare, education and financial sectors to the rural population of India. While ambitious, these efforts mark a major paradigm shift in the planning of governance and service delivery.

### Impact of digitisation on key sectors

**Agriculture:** Arguably the most sensitive of all sectors and employing the highest percentage of the workforce, agriculture in India today is highly inefficient and marred by challenges. It is still dependent on unpredictable monsoons, and crop damage, bad farm loans and unstable prices are widespread issues. Digital interventions have been few and far; however, initiatives like the Soil Health Cards Scheme and digital National Agriculture Marketplace, show a lot of promise. India's focus on digital agriculture has to be more grounded as compared to countries with mature digital agriculture, like Israel, where an entire ecosystem beginning with analytics on climate and soil data to automated drip farming runs seamlessly. With small land holdings, age-old agricultural practices and a value chain dominated by middlemen, basic aspects like creating land health records, mobile-based farmer advisory, digitisation of supply chains and localised market places require greater attention.

**Education:** India is blessed with a demographic dividend that is skewed towards the studying and working age group, and most individuals in this age group are digital savvy. For a country with an acute shortage of skilled teachers, the e-learning revolution is a major boon. The e-learning industry of India has become the second largest after that of the US, reaching an estimated 40 billion USD this year.<sup>135</sup> Education technology like virtual classrooms, mobile devices, online tutorials and gaming applications have helped bridge the gap by making educational facilities affordable and widespread for all strata of society.

Sensing the huge potential for e-learning in India, the Ministry of Human Resource Development has taken initiatives towards providing access to e-learning through a specialised massive open online course (MOOC) platform named SWAYAM. While the platform provides online lectures from top universities, it also enables a mechanism where students from institutes across India can transfer credits of completed courses on SWAYAM to their universities.

**Finance:** A key economic area where digital will have an impact is financial inclusion and promoting a cashless economy. The Nachiket Mor Committee report highlights the impact that digital banking and payment channels can have on promoting financial inclusion across the country. For the government, the expectation is that the drive towards a digital and cashless economy will propel GDP growth through higher tax compliance and shrinking of the shadow economy. The challenges of taking the last mile banking services to Indians living in remote and rural areas is well acknowledged, and mobility has been chosen as a mechanism to bridge the gap. The government's Jan Dhan, Aadhaar and Mobile (JAM) initiative focuses on creating bank accounts for the marginalised and unbanked through Jan Dhan accounts, enabling government to citizen payments through Aadhaar, and enabling citizens to undertake banking and payments through mobile phones.<sup>136</sup>

The implementation of demonetisation in India in November 2016 led to a surge in cashless transactions and resulted in the most recent development in the FinTech industry, namely e-payments via payment gateway integration and wallets. Digital payments in India have seen a sudden high and are expected to hit the 500-billion USD mark by 2020.<sup>137</sup> The Government of India also launched the Bharat Interface for Money (BHIM) mobile app developed by the National Payments Corporation of India (NPCI), based on the Unified Payment Interface (UPI) which intended to facilitate e-payments directly through banks. This app is currently being used by 125 lakh Indian citizens.<sup>138</sup>

135 IBEF. (July 2017). *Education sector in India*. Retrieved from <https://www.ibef.org/industry/education-sector-india.aspx> (last accessed on 1 Aug 2017)

136 Ministry of Finance. (2015). *Economic Survey 2014-15, Chapter 3: 'Wiping every tear from every eye': the JAM Number Trinity Solution*. Retrieved from <http://indiabudget.nic.in/budget2015-2016/es2014-15/echapvol1-03.pdf> (last accessed on 8 Aug 2017)

137 PTI. (22 Feb 2017). *Digital payments industry to hit \$500 bn by 2020: GSMA-BCG*. <http://timesofindia.indiatimes.com/business/india-business/digital-payments-industry-to-hit-500-bn-by-2020-gsma-bcg/articleshow/57298295.cms> (last accessed on 4 Aug 2017)

138 Ghoshal, A. (1 Feb 2017). *Budget 2017: Jaitley says BHIM app now has 125 lakh downloads*. *Hindustan Times*. <http://www.hindustantimes.com/tech/budget-2017-jaitley-says-bhim-app-now-has-125-lakh-downloads/story-J785ljlDQREWGztyOLPrL.html> (last accessed on 4 Aug 2017)

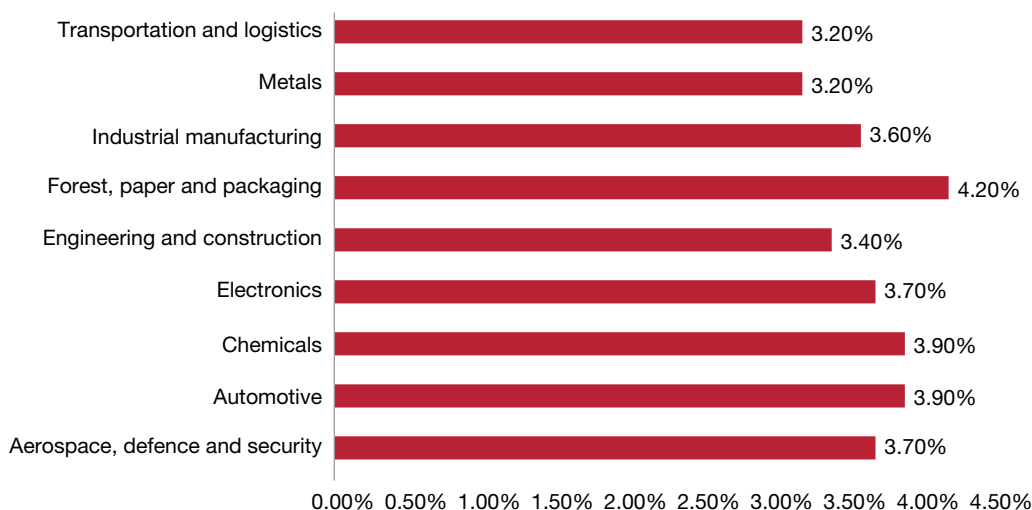
**Healthcare:** While the Indian healthcare sector is estimated to grow at a compound annual growth rate (CAGR) of 16% to reach a size of 280-billion USD by 2020,<sup>139</sup> the healthcare IT market is currently valued at 1 billion USD and is estimated to increase by 1.5 times by 2020.<sup>140</sup> The sector is marred by challenges around high cost, inefficiency, quality of care and access to care beyond urban and semi-urban areas. Use of technology is also sub-optimal, with health IT systems which are rarely interoperable and the complete absence of electronic, longitudinal health records of an individual.

Further, no seamless sharing of information happens between the healthcare provider and payer ecosystem, creating inefficiencies in the form of insurance leakage, treatment frauds, etc. Acknowledging the challenges, the government has embarked upon the setting up of a National Digital Health Authority (NDHA), a nodal body which will drive digital efficiencies in healthcare. The primary goal of the NDHA, as envisioned, is to deliver better health outcomes in terms of access, quality, affordability, lowering of disease burden and efficient monitoring of health entitlements to citizens.<sup>141</sup>

**Industry:** As mentioned, disruptions like IoT, artificial intelligence, robotic process automation (RPA) and 3D printing have created a new normal and the same applies to the industrial sector. A PwC survey found that most industries expect a significant efficiency gain through digitisation, as shown in the chart alongside.<sup>142</sup> The focus, however, is equally on creating an environment of efficiency while innovating new products and services, and venturing into new channels for sales and value delivery. Average savings of 3.5% would translate to around 20 billion USD every year for the Indian economy.



**Cost reduction (in % p.a. until 2020)**



Source: PwC analysis

139 PTI. (1 Sep 2015). Indian healthcare sector to grow to \$280 billion by 2020: Report. Economic Times. Retrieved from <http://economictimes.indiatimes.com/industry/healthcare/biotech/healthcare/indian-healthcare-sector-to-grow-to-280-billion-by-2020-report/articleshow/48742696.cms> (last accessed on 4 Aug 2017)

140 Sangani, P. (30 Apr 2016). Healthcare IT now a \$1billion market, says Nasscom. Economic Times. Retrieved from <http://economictimes.indiatimes.com/tech/ites/healthcare-it-now-a-1billion-market-says-nasscom/articleshow/52051209.cms> (last accessed on 4 Aug 2017)

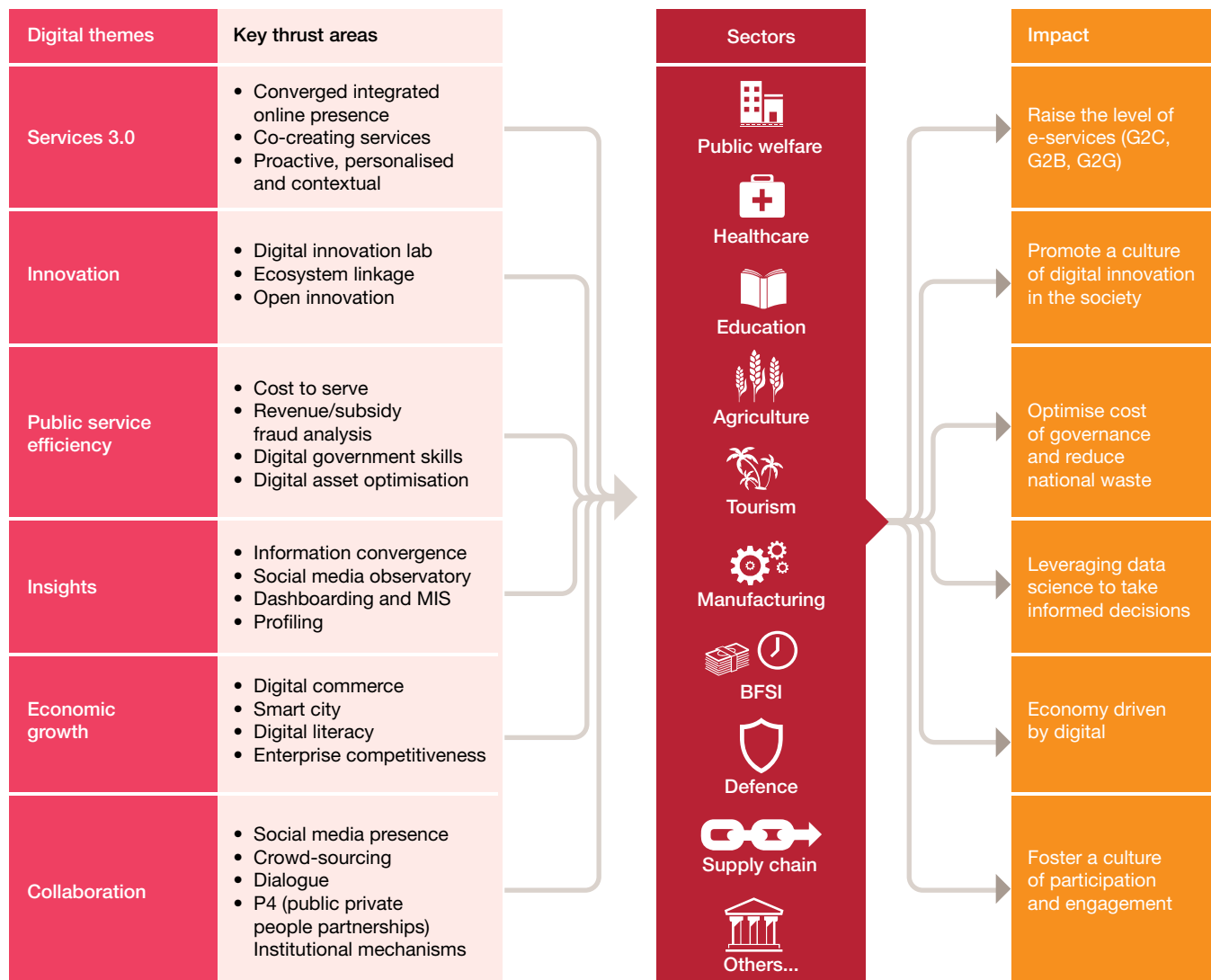
141 Ministry of Health and Family Welfare, Government of India. (2017). National Health Policy 2017. Retrieved from [https://www.nhp.gov.in//NHPfiles/national\\_health\\_policy\\_2017.pdf](https://www.nhp.gov.in//NHPfiles/national_health_policy_2017.pdf) (last accessed on 1 Aug 2017)

142 PwC. (2016). Industry 4.0: Building the digital enterprise. Retrieved from <http://www.pwc.com/gx/en/industries/industries-4.0/landing-page/industry-4.0-building-your-digital-enterprise-april-2016.pdf> (last accessed on 1 Aug 2017)

## Selected major trends

Innovations in technology continue to grow and impact all sectors as they evolve. Some of the major trends that have been

observed in the digital industry are Services 3.0, innovation, public service efficiency, economic growth and collaboration.



Source: PwC analysis

## Selected major challenges

The rising levels of digitisation and digital adoption, though noteworthy, are still not sufficient to bring the bottom layers of the pyramid under the coverage of digital benefits. This is a global challenge and impacts both developed and developing nations, albeit to varying degrees. Economic (extreme poverty) and social (high degree of illiteracy) factors are often universal, while India has some unique challenges of its own, accentuated by its vast geography and diversity of languages.

**Connectivity:** Internet penetration in India needs improvement. Access to digital services would require access network infrastructure which is capable of carrying growing levels of data traffic. Around 50,000 villages in India still do not have mobile phone connectivity.<sup>143</sup> Access to broadband connectivity in rural areas is work in progress. Such data connectivity divides not only debar a large percentage of Indians from accessing public services but also have the potential of further alienating them from the digital revolution. The BharatNet initiative aims to address this issue. The Universal Service Obligation Fund (USOF), under the Department of Telecommunications, Government of India, is working towards providing basic mobile connectivity in deprived areas.

143 PTI. (12 April 2017). 50,000 villages don't have mobile network. The Telegraph. Retrieved from [https://www.telegraphindia.com/1170412/jsp/frontpage/story\\_145969.jsp](https://www.telegraphindia.com/1170412/jsp/frontpage/story_145969.jsp) (last accessed on 4 Aug 2017)

**Trust:** A major hurdle is the inherent lack of trust among a large section of Indians towards using digital channels, especially for purposes such as banking transactions, payments and healthcare. A similar attitude prevails in government agencies as well, where regardless of large-scale digitisation, a lot of activities still need paper records. It may take some time for trust in digital modes to reach the desired levels.

**Digital literacy:** Basic digital literacy is lacking—that is, the ability to get on a computing device and use the services offered by the government and other service providers.

**Vernacular language:** India has 22 constitutionally recognised languages. Any service or content that aims to reach citizens across the country has to cater to these regional languages and the sub-dialects of each language.

**Security of data:** A digital strategy has to be complemented by a robust information security framework which preserves the privacy and security of citizen and government data. This is significantly more important in areas like banking, payments, healthcare, smart cities, citizen biometrics and smart transport. Digital assets have often been found to be vulnerable to cyberthreats. A robust framework is not only needed to safeguard the assets but also vital from the point of view of gaining citizen trust.

## *Vision for the future*

Digital is uplifting our country towards advancement and filling gaps owing to physical infrastructure. With digital, government services are reaching citizens in the remotest of locations. For instance, farmers are receiving weather updates on their phones, which is helping them plan their agricultural activities. Pregnant women, health workers and parents are receiving informative messages on pregnancy, childbirth and child through the Kilkari mobile application. Thus, digital and technology are playing a crucial role in ensuring the efficient last mile delivery of services to citizens.

With the passage of time, digital will bring about a significant transformation in governance and the way citizens interact with the government. Insights from SMAC will propel the government to pre-emptively respond to and resolve the pain points for citizens. Moreover, digital will bring about a massive shift towards citizen-oriented governance with real power lying with the people. However, it is imperative to foster cultural acceptance of technology and focus on digital inclusion with robust connectivity to take digital to the next level in India. Moreover, it is important to scale up cyber security to deal with cyberattacks and prevent the leakage of sensitive information in the public domain. It is also vital for the government to come up with necessary regulations to assuage privacy and data concerns. This will go a long way in solidifying the confidence and trust of the public in making digital the preferred channel for governance and service delivery.

## *Opportunities for investment*

With digital ushering in a significant transformation in India, there are several opportunities for US firms to foray into the Indian digital space. There could not be a better time to venture into a market which is witnessing massive activity to fulfil the vision of Digital India and smart cities. Digitisation and technology are bringing several incredible opportunities for US players to drive citizen engagement and create jobs while transforming the lives of billions of Indians. In fact, the public private partnership (PPP) model and knowledge transfer are some of the ways in which US-based firms may contribute to this transformation journey of India. Apart from these areas, firms may also focus on inorganic growth to ride high on the digitisation wave in India.

# Conclusion

Since Independence, a groundbreaking agricultural revolution transformed India from a country dependent on grain imports to an agricultural powerhouse that is among the top three global producers of several crops.<sup>144</sup> Apart from agriculture, India has diversified its basket of goods to include services and industry, which contribute 45.4% and 29.8% of the gross domestic product (GDP).<sup>145</sup> The major sectors based on foreign direct investment (FDI) equity inflows (as per information from December 2016) are as follows:<sup>146</sup>

- Services (18%)
- Construction development (8%)
- Computer software and hardware (7%)
- Telecommunications (7%)
- Automobile (5%)
- Drugs and pharmaceuticals (4%)
- Chemical (4%)
- Trading (4%)

Ties between the US and India have been strengthened over the past 70 years. Leaders of both nations are resolved to expand and deepen their strategic partnership. As leading engines of growth in the global economy, both countries face similar global challenges, such as generating employment and boosting industry. The recently concluded visit by the Indian Prime Minister Narendra Modi to the US will serve to intensify economic cooperation based on joint values and common interests.

India is poised for a fundamental change in terms of ease of doing business. The government has formulated an output-outcome framework to work towards improving India's ranking on the World Bank's Doing Business Survey. The government plans to climb 40 places by 2017–18 from its current ranking of 130.<sup>147</sup> This is an ambitious plan, but initiatives such as the passing of the Insolvency and Bankruptcy Code, easier processes for incorporation and the integration of processes through an eBiz portal are steps in the right direction. In addition, the easing of approximately 90 FDI rules across various sectors, the successful and smooth transition to the landmark Goods and Services Tax (GST) regime and a large urbanisation wave are reshaping India's growth story.

India is also looking for massive investments to create jobs for its burgeoning young workforce, housing and infrastructure. Several initiatives have helped bring FDI inflows into India. Some of the government's key initiatives to increase FDI inflows into India are:<sup>148</sup>

- 100% FDI in several segments, including railway infrastructure (excluding operations), manufacture of medical devices and financial services provided by non-banking financial companies (NBFCs)
- National Highway Authority of India (NHAI) offering a risk cover to foreign investors for faults in structural design, sub-standard quality of construction and loss of traffic
- Grant of Permanent Residency Status (PRS) to foreign investors investing a minimum of 10 crore INR within 18 months or 25 crore INR within 36 months
- 100% FDI in asset construction companies under the automatic route
- Easing of area restriction norms, reduction of minimum capitalisation and enablement of easy exit from projects in the construction development sector
- Raising of FDI cap in insurance from 26% to 49%
- Abolition of the Foreign Investment Promotion Board (FIPB) and permitting of the automatic route for over 90% of FDI inflows (without prior approval)

There are few examples of development on such a large and diverse scale. Today, India stands at a critical juncture. The country holds tremendous investment potential across many sectors. By working and investing together, Indian and US companies can bring about positive economic change across areas such as employment, development, and skills and knowledge transfer.

144 PwC. (2017). *Destination India 2017*. Retrieved from <https://www.pwc.in/publications/2017/destination-india-2017.html> (last accessed on 16 Aug 2017)

145 IBEF. (2017). *India: A snapshot*. Retrieved from <https://www.ibef.org/economy/indiasnapshot/about-india-at-a-glance> (last accessed on 16 Aug 2017)

146 *Ibid.*

147 PwC. (2017). *Destination India 2017*. Retrieved from <https://www.pwc.in/publications/2017/destination-india-2017.html> (last accessed on 16 Aug 2017)

148 *Ibid.*

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# *Notes*



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# *Notes*

# Acknowledgements

## ***India Clients and Industries***

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Lalitha Banerjee, Director, India Clients and Industries  
Vinit Acharya, Senior Analyst, India Clients and Industries

## ***Funding growth***

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PD/August2017-10516