

# **FTTx: Connecting the way to Industry 4.0**

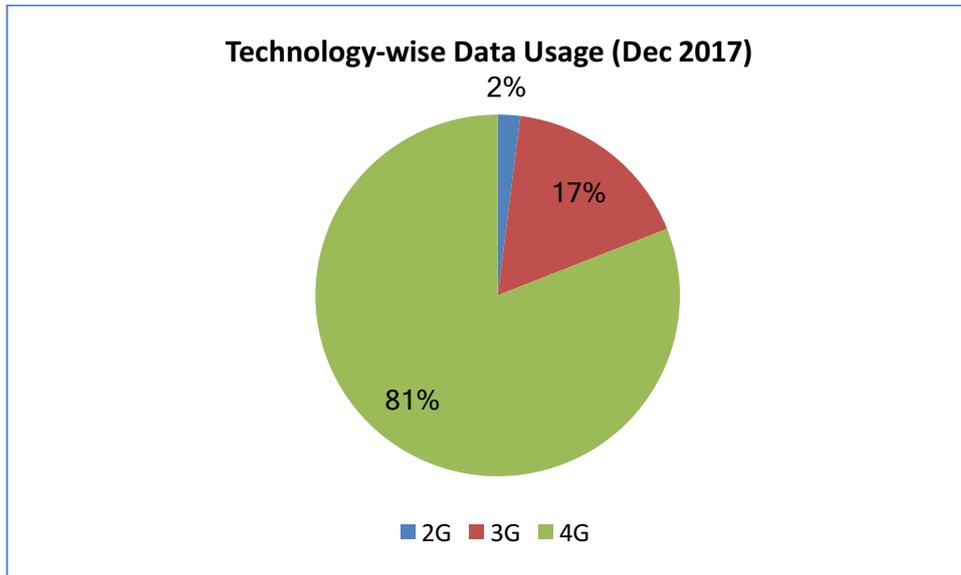
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## 1. Introduction

Since the 1990s, four generations of cellular network technologies have propelled us to move from "bag phones" that used slow 1G voice networks to sleek devices that make use of high throughput 4G LTE. Modern consumers have access to seemingly limitless multimedia content on mobile devices, monitor fitness using wearable technologies, and answer the front door using a smartphone application.



Source: TRAI

As India forges ahead with one of the world's largest and perhaps the most ambitious digital inclusion agendas through its Digital India vision, it is imperative to design, build, and manage the optical-fibre infrastructure in much the same way that other essential infrastructure (power, water and gas) is architected. Fibre is the backbone of ambitious digitalization plans, and all initiatives to ensure its fast and efficient roll out sit at the center of digital Success.

**Data consumption drives progress.** The scale of data consumption in India is unparalleled with 40% internet user growth at a time when global growth is flattening. The Government's JAM platform will transform the entire population base towards progress. With India expected to be the most populous country in less than a decade, the complexity and scale of data will also increase. The need for Smart Cities based on its liveability standards is pivotal to India's goals as a productive global leader.

**A strong fibre network backbone is imperative for high-speed broadband, integrated sensors, public Wifi, and other smart elements to help the country truly tap its digital potential.**

While significant investment is made in the infrastructure of power grids and water and gas supplies to ensure better quality of life for citizens, equal focus is required to be given to fibre networks. The immediate need for strong backhaul fibre i-Ways and smart buildings and homes with FTTx is known. Behaviour wise, fibre is in many ways similar to other utilities like roads and electricity – in terms of deployment and end benefit to the consumers and hence needs an ease of business policy that addresses similar issues.

India's National Digital Communications Policy (NDCP) has ambitious goals for fixed line access and bandwidth for citizens. It has recognized optical fibre as a public utility and rendered importance to a Fibre First initiative, a National Digital Grid with constitution of National Fibre Authority and fiberisation of towers. While the rollout of optical fibre networks is well recognized in the NDCP, **An integrated Ease of Business policy that addresses the objectives of high quality robust Networks with efficient roll outs becomes extremely pivotal to ensure the FTTx infrastructure is well laid out and is sustained for a minimum of 30 years.** Similar to the Private sector, the public sector or Govt organisations are fast becoming an equal or a big stakeholder in data intensive networks through BharatNet, Smart Cities, Defence Networks and prospects of NagarNet, GramNet, among others.

**An ease of business policy that address operational and fiscal hurdles of both the private sector and the Government needs early activation for India's digital leadership.**

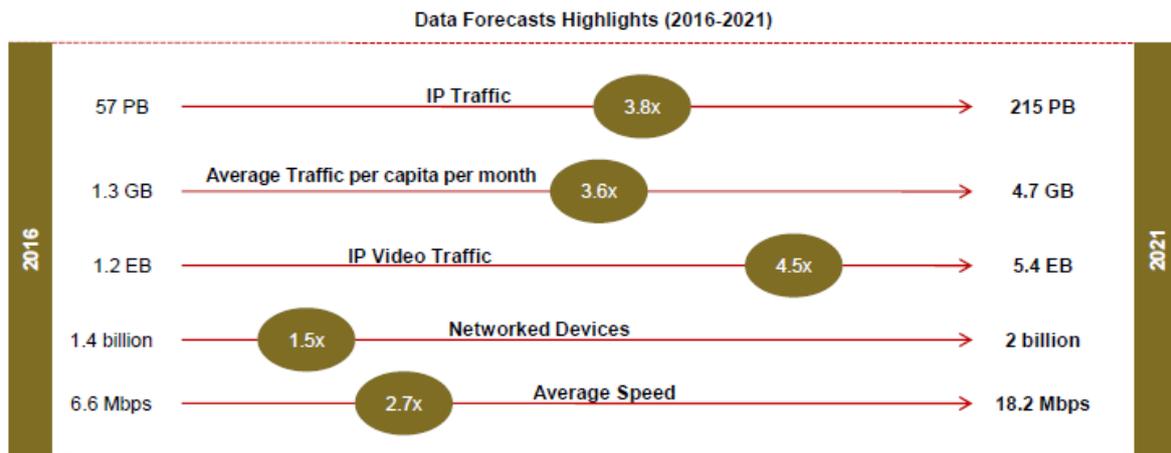
The government in many ways is outpacing the private sector in large scale deployments. As a key stakeholder of digitisation, **an Ease of Business policy for Government deployments** is very important at this stage to ensure the government networks stand the test of time and integrate seamlessly with the private sector roll out. A governance mechanism also needs to be set around the high scale deployment of these data intensive networks. Here, role of an empowered steering committee becomes extremely critical.

The private sector welcomes the common ducts initiative of the government and in the near future needs fast and easy ROW permissions at calibrated prices. The ROW Portal can become a testimony of ease of business and transparency. It can simplify timely approval for ROW permissions, include integrated maps of all utilities to prevent any damage to other pipelines and become the single platform of engagement for ROW thereby reducing significantly the number of on-ground personnel needed to address ROW. Security for all public utilities including Fibre can be better addressed by synergising all utilities through integrated maps and inclusion as a part of city planning. For FTTH Fiber, notification in Building codes is needed to ensure fast and easy roll out into all buildings. Given the challenging economics of deploying fibre, as well as its inherent public utility, legal recourses need to be designed to protect from and enforce against the willful damage of Optical fiber networks.

5G is the next step in the evolution of communications technology. Connected devices of the future will include large numbers of autonomous vehicles, augmented/virtual reality (AR/VR) devices, infrastructure sensors for smart transportation, public safety applications, and airborne drones. 5G will enable these kinds of technologies at exceptional scales, data rates, and low latencies. To support all of this, 5G is expected to provide gigabit speeds, sub one-millisecond latency, and the capacity to connect an astonishing 2.5 million devices per square mile.

5G will also place enormous demands for fixed- wireline networks. 5G will use much higher radio frequencies than today's cellular networks. While these higher frequencies carry larger amounts of data, they also have very short ranges. For 5G to work well, many additional small radios or "cells" must be installed close together—as close as 100 feet apart, leading to densification of networks. To provide multi-gigabit service to many users and applications, these small cells will need to be connected to hundreds of thousands—perhaps millions—of miles of new fiber optic cable.

As per Cisco, India's IP traffic will grow 4-fold from 2016 to 2021, at a compound annual growth rate of 30%, of which internet video traffic will reach 3.6 Exabytes per month in 2021, which is approximately 5 million GB per hour. A high speed technology, capable of high throughput and low latency is fundamental to achieving this growth. Fiber to the home is the only viable contender that can deal with this effectively.



Source: CISCO VNI Index

There is no doubt Digital inclusion can help improve any nation's economy and sustainable development. Ubiquitous broadband is a growth engine for democracy. What is unfolding in front of us is a massive digital inclusion ecosystem, driven by the multiplier effect of *–More 'connected' people, More devices per person, More 'content' per device and more data consumption per content type:* Already, the annual global IP traffic has crossed 1 Zettabyte (ZB) and is expected to exceed 3 ZB in the next five years (1 ZB =  $10^{21}$  bytes). Per capita data consumption is set to multiply nearly five times in the next three years! With the uptake of IOT, M2M and 5G, data consumption is expected to rise by significant orders of magnitude.

Optical fiber is getting implemented as "Fiber to the Home (FTTH)" solution. Once a home is connected through fibre in the last mile, we can say that it has direct access to the Internet Super Highway: entire content, information and applications available through the web can be accessed without any limitations or constraint. One of the most valued applications that will drive demand for FTTH in India will be 'quad play' of high speed broadband access with speeds up to 100Mbps, high-definition video, unlimited telephony and smart applications viz. IPTV, Interactive TV, HD-TV, VoIP, Smart Appliances (IoT /M2M), live music & Movie streaming and downloads, multiplayer online gaming and home security systems with remote monitoring. Enterprise businesses will benefit significantly from the implementation of FTTH networks through the use of bandwidth intensive applications viz. next generation video conferencing, interactive distance learning, telemedicine, etc.

## 2. FTTH a key objective under National Digital Communications Policy

While the Government is promoting the development of fixed line communications through its newly drafted telecom policy – National Digital Communications Policy – India’s predominant mode of communication, whether voice or data is still done over mobile networks. The government has identified the key benefits of OFC and has built upon various missions to achieve the vision of Digital India through its draft National Digital Communication policy 2018. *“Implementing a ‘Fibre First Initiative’ to take fibre to the home, to enterprises and to key development institutions in Tier I, II and III towns and to rural clusters:*

- i. According Telecom Optic Fibre cables the status of Public utility*
- ii. Promoting collaboration models involving state, local bodies and private sector as necessary for provision of shared duct infrastructure in municipalities, rural areas and national highways*
- iii. Facilitating Fibre-to-the-tower programme to enable fiberisation of at least 60% base stations thereby accelerating migration to 4G/5G*
- iv. Leveraging existing assets of the broadcasting and power sector to improve connectivity, affordability and sustainability.*
- v. Incentivising and promoting fibre connectivity for all new developmental construction*
- vi. By making requirement for telecom installations and the associated cabling and in-building solutions mandatory in in all commercial, residential and office spaces by amending National Building Code of India (NBC), through Bureau of Indian Standards (BIS)”*

**The NDCP 2018 has accorded optical fibre the status of a public utility and rendered import to a Fibre First initiative, a National Digital Grid with constitution of National Fibre Authority and the fiberisation of towers.**

### 2.1 Why optical fibre is critical

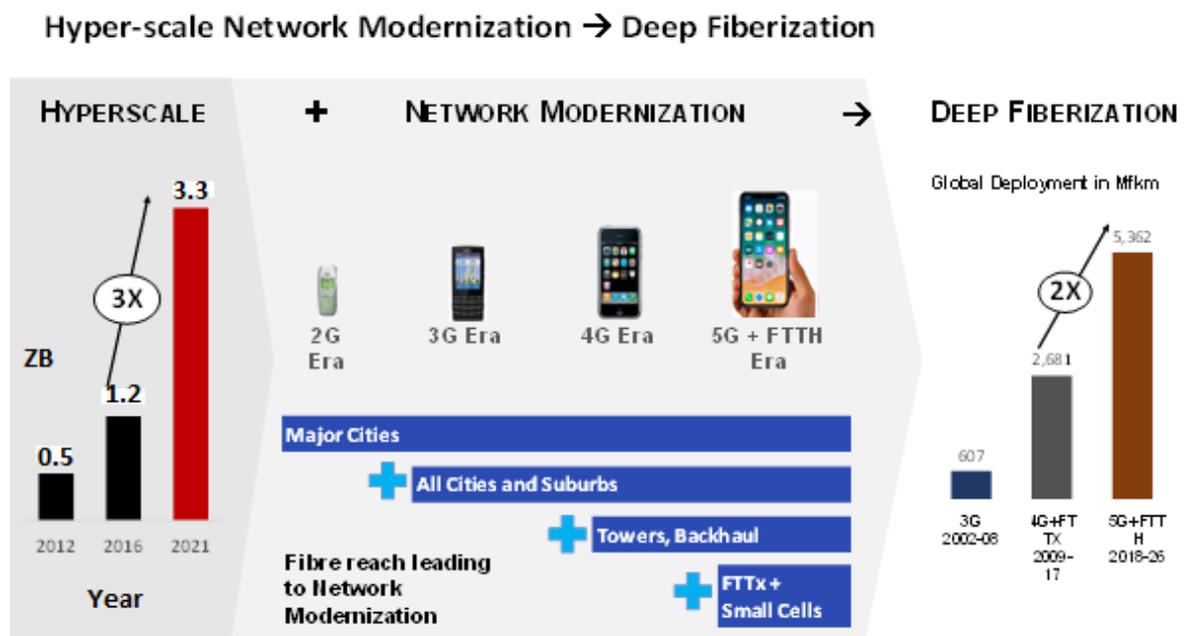
- Almost unlimited data capacity, very little attenuation: For enhanced citizens’ and government’s needs
- Ultra-fast speeds: Data can travel at 70% of the speed of light! Speed multiplies as several wavelengths travel at the same time
- 1GB data can travel over 120 km on a single fibre
- Resistance to EM waves: Ideal for deployment in cities where there can be interference from power wiring
- Easy to bend: Ideas for use in congested urban areas for last-mile connectivity
- Secure: Signals travel at the centre of the cable (core) and do not get radiated out; and attempts at tapping can easily be monitored

Moreover, across generations (2G – 5G) of technologies, fibre has played a key role, either in backbone network, mobile backhaul or as access technologies like FTTx. Fibre has formed the core of the network from the 2G era, connecting major cities, to 3G where it connected smaller towns and sub-urban areas, to 4G for tower backhaul. With FTTx and 5G, fibre will be essential for connecting homes and buildings. Its use has progressed from core metros and is now entrenched in the last mile as well.

### 2.2 Deep deployment of fibre is a national imperative

The future of Digital-India lies in the data intensive 5G, M2M and IoT. Optical Fibre networks are foundational to the success of the data driven era. India has ambitious plans on the usage of the data networks. Optical fibre connectivity is critical for data intensive environment but India is deficient in Fibre Connectivity, pivotal to quality utilization and adaption of 5G, data intensive usage, era of video and video calling and IoT. Private sector can support in achieving the objectives of data empowerment to the next billion with true broadband.

With a promise of 10Gbps speed, less than 1 ms latency and 90% reduction in network energy utilization, 5G will spur the next round of telecom infrastructure investments. The growth of 5G will be fueled by a sharp hike in consumer data and the proliferation of IoT devices. Self-sustaining smart cities will become lands of progress and the 65% rural population will become the real disruptor. Rural India will give us unique case studies that we can take to the world. 5G and IoT will reshape the way data will be used and the way networks will be built. With the coming of connected mobility, low or no latency requirements will be the need of the hour. Therefore, data centers will move to the edge and fibre will become the great disruptor in the network infrastructure where Software Defined Networks (SDN) will have fibre connected directly to white boxes.



Source: Cisco, Sterlite technologies

**Annual global IP traffic will reach 3.3 ZB per year by 2021**, or 278 exabytes (EB) per month. In 2016, the annual run rate for global IP traffic was 1.2 ZB per year, or 96 EB per month.

Deloitte predicts 5G will expand the network effect dramatically by extending the reach of the Internet to almost any kind of connection, by almost any kind of device, wherever a wireless signal can reach. Markets that attract the most users first will also influence further innovation as 5G networks mature and become ubiquitous. As different kinds of devices connect, new use cases will emerge for collections of devices previously considered unrelated, attracting even more investment and driving spillover economic benefits. The United States, Japan, and South Korea have all made significant strides toward 5G readiness, but none to the same extent as China. Infrastructure spending and tower density distinguish China's leap forward and highlight the degree to which China outpaces the United States during these early stages of 5G deployment.

Bharat net, the world's largest rural broadband connectivity project, envisages a network of close to 700,000 km of OFC to provide broadband connectivity in the country's 250,000 villages. As of 2<sup>nd</sup> September 2018, a total of 2,87,878 kms of Optical fiber has been laid over 1,19,035 GPs.

India is set to witness surging data traffic owing to higher number of connected devices, increase in video consumption and growing data consumption per unit led by higher data speeds. To deliver internet reliably and deliver bandwidth-hungry applications such as live streaming coaching classes, fibre is the most suitable medium for carrying high amount of data over long distances.

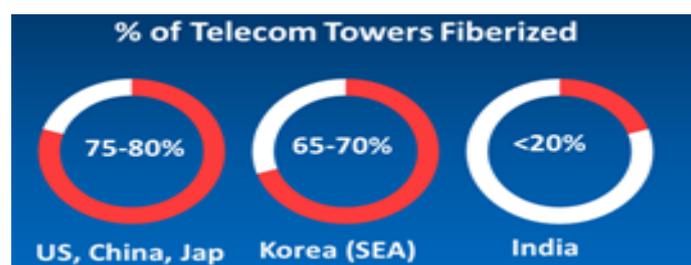
The main advantage of optical fiber communication over electrical cable transmission is its high bandwidth capability (almost 10Gps) over long distances due to the extremely low loss at same specific wavelengths (e.g. 1.3 um and 1.55 um). Moreover, optical fibers are also immune to electromagnetic interference. Multimode optical fiber can readily transmit high bandwidth data over long distances; a typical bandwidth-distance product for multimode fiber is 500 MHz/km, so a 500 m tether can transmit 1 GHz (several Gbits/second, with appropriate modulation). Signal losses over 500m are negligible; the bandwidth is limited by dispersion of signals.

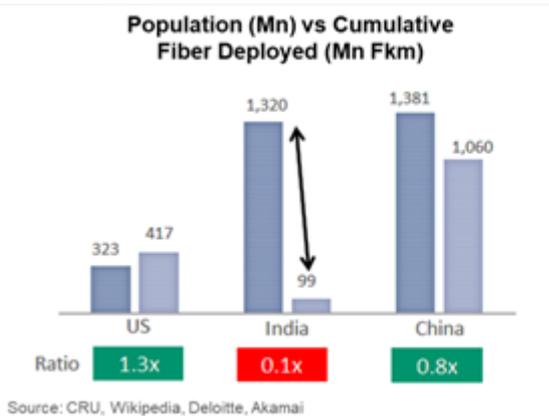
The fibre network backbone is the information highway for crucial services like high-speed broadband, integrated sensors, public Wifi, and other smart elements to help cities truly tap their potential. While significant investment is made in the infrastructure of power grids and water and gas supplies to ensure better quality of life for citizens, equal focus is required to be given to fibre networks.

### 2.3 Fiberisation of Towers is needed

India has currently 4,82,271 towers (Tarang Sanchar) and only 20-30% are fiberized. The International Telecommunication Union (ITU), in its "Trends in Telecommunication Reform 2017" report estimates that ongoing capital investments related to fibre infrastructure will reach a staggering \$144.2 billion between 2014 and 2019 A huge explosion of data, especially video, flowing from tomorrow's 5G radios and base transceiver stations (BTS) is the primary driver for this immense capital investment into fibre infrastructure deployments.

In terms of the total fibre deployed to population ratio, India has a lot of catching up to do when compared with the US and China. India's ratio stands at just 0.1x when compared to USA's 1.4x and China's 0.9x. Additionally, a broadband density of just 13%, compared to China's 81% presents a huge opportunity for infrastructure planners to design a shared common fibre infrastructure for telecom service providers, cable TV providers, internet service providers and cloud and data-center providers.





**Fiberization of infrastructure – critical to address the data revolution**

Source: CRU, Wikipedia, Deloitte, Akamai, Sterlite technologies

The government's historic and ambitious plan on BharatNet is one such answer to how India will lead digital disruption and how the roll out of BharatNet will become A global case study. Unlike the current stats on our rural community, 65% of India's population will surprise the world with innovative adaption and disruptive consumption of data. As an example, rural is not known to be a reading population but this very population will redefine interactive education, entertainment, e-Gov, health etc. New business models basis the way they engage the Network will emerge. Rural will capture the era of video and video calling. All this requires a robust and scalable sustained Fibre Network.

The essential nervous system of optical fibre across the nation's broadband infrastructure needs to be in place at the earliest and should be deployed in a manner that sustains the infrastructure for a minimum of 30 years. **Ease of Business initiation in roll out and maintenance needs to be addressed. India ranks 100<sup>th</sup> on the World Bank's coveted Ease of Doing Business Index with aspirations to move to rank 50<sup>th</sup> by 2018.** Appropriate measures should be taken by the country to re-orientating their parameters of ranking in the ITC development index. Industry and ministry must work together to improve India's ranking to reach every household swiftly. Countries are ranked on regulatory aspects of business climate.

The entire lifecycle to infrastructure roll out has to be addressed - From planning to deployment, with focus on business process. This will address speed of roll out, quality of network and efficient cash flow. **A strong ease of business policy in telecom infrastructure will ensure better accountability, lesser delays and stronger SLAs.** The existing process is riddled with many challenges, that if solved will ensure healthy competition, and a sustainable industry that promotes the objectives of the government All measures need to be taken for better accountability & faster deployments of BB infrastructure. Further, in government deployments, a single POC for faster approvals, quick government payments and advice on better resource management will support speed, quality and healthy industry- which is the need of the hour.

## 2.4 Market Size, Investments and Status of FTTH in India

Given the fact that there are 20 Mn Fixed Broadband connections as of now in India and only 2 Mn Fiber-to-the-Home (FTTH) connections, there is huge potential to convert the remaining 18 Mn fixed broadband connections to FTTH Connections. Assuming an conservative average ARPU of INR 250-

500 per subscriber per month, the Total Market size in India is estimated to be of the order of 5400-10800 Cr (USD 2 billion).

Investments in FTTH are increasing. Based on research conducted by RVA LLC for the Fiber to the Home Council Americas (now Fiber Broadband Association) in 2016, 13.7 million homes are connected directly to fiber, and 34 million have access to FTTH. There are well over 1,000 fiber-to-the-home deployments in the U.S. of varying sizes and architectures and the momentum is picking up. Fiber will enable 5G deployment and the two technologies are complementary.

BSNL & MTNL are one of the earliest operators to have launched FTTH services in Rajasthan (six districts) & Delhi respectively. The services included IPTV, HD-TV, Video-on-demand, and High Speed Broadband & Video Conferencing. Other operators viz. RJio & Airtel have launched their high speed fiber access networks based on FTTH in the metros and urban cities. RJio has plans to launch it in small towns as well.

Home Broadband and Enterprise Broadband based on fiber provides true high speed Broadband with speeds upto 100Mbps and with high capacities upto 100Gbps per sub per month. Almost all service providers are bullish on the outlook for this market. A plethora of broadband enabled services in the area of entertainment, home automation besides other services as real-time online security services, automated lighting, are driving the uptake of these services. Also a fixed infrastructure based on fiber lends itself to a robust reliable, always-on Wi-Fi services which helps drive broadband and also helps in faster data services by offloading mobile traffic at Wifi hotspots.

With the emphasis on rapid broadband penetration and also with ROW rules being notified by the Govt and with Building Codes being mandated, it is expected that there will be increasingly larger rollouts of FTTH in the future by all operators. The prospects of the telecom sector could be inextricably linked with the potential and performance in the broadband sector. With 1 billion citizens waiting to be broadband-connected, spectrum deficiencies getting overcome, difficulties in rolling out OFC & towers nearing resolution and the enormous opportunities of Digital India, the potential in Indian Broadband is expected to be truly remarkable. It would however be naive to expect that, in 1-2 years, we would be able to completely close the enormous gap between us and comparable economies in respect of broadband penetration. With all efforts and dedication, we might accomplish global parity in maybe next 3-5 years; however, the great take-off could well happen right now with launch & acceleration of FTTH.

### **3. Government's Network infrastructure roll out is pivotal to India's ambitions –need reforms in Ease of Business.**

**India has the real opportunity to fast expand in socioeconomic growth through digital networks.** To future proof the progress of our citizens in our cities and villages, we must ensure scalable robust secure networks that stand the test of time through an holistic Ease of doing Business policy given the importance of this infrastructure. With 1.3 billion citizens and growing, congested India does not have the luxury to disrupt movement for multiple roll-outs of optical fibre Networks. With time of essence, certain measures can accelerate the efficiency and pace of quality network roll out.

Much unlike the current stats on our rural community, the 65% of India's population will surprise the world with innovative adaption and disruptive consumption of data through the BharatNet. As an example, rural is not known to be a reading population but this very population will redefine interactive education, entertainment, e-Gov, health etc., new business models basis the way they engage the Network will emerge. Rural will capture the era of video and video calling. All this require a robust scalable sustained Fibre Network. **Therefore, Steps taken by the Govt. towards the fast roll**

**out of such Networks like BharatNet, NagarNet, Gram Net with assertive timelines is well appreciated.**

The essential nervous system of the optical fibre across the nation's broadband infrastructure needs to be in place at the earliest and should sustain a minimum of 30 years. **Ease of Business initiation in the fast roll out and maintenance needs to get addressed. India ranks 100<sup>th</sup> on the World Bank's coveted Ease of Doing Business Index with aspirations to move to the 50<sup>th</sup> by 2018.** Appropriate measures should be taken by country for re-orientating their parameters of ranking in the ITC development index. Industry and ministry must work together to improve India's ranking to reach every household swiftly. Countries are ranked on regulatory aspects of business climate.

India has an opportunity to leapfrog and very rapidly deploy fibre. Bridging this divide for a Digital India is a huge responsibility. The entire lifecycle to infrastructure roll out has to be addressed - From Planning to deployment with focus on business process. This will address speed of roll out, quality of network and efficient cash flow. **A strong ease of business policy in telecom infrastructure will ensure better accountability, lesser delays and stronger SLAs.**

To build future ready networks, OFC density has to be immensely improved , and requires a comprehensive plan and synergies with other Private Sector Networks and other core infrastructure such as power, water supply, and roads.

### 3.1 Suggested objectives of Government roll-out

**Build, expand and de-risk** the infrastructure with the objective that it:

- Meet the capacity requirements for the next 40 years
- Meet global standards on reliability of 99.999 percent (59s) with almost no latency
- Comprehensive coverage for on-demand availability and uniform growth.
- Minimum inconvenience to citizens during initial build out and during operations
- Minimise time to roll out
- Make available on demand to every user through a transparent process

### 3.2 Recommendations for Business policy focused on Government deployments

Govt Networks are critical for the ubiquitous BB network of India. **An Ease of Business policy focused on Government deployments** will ensure quality networks, predictability of time and the best partners to support in roll outs. It will also lead to better accountability, lesser delays and stronger SLAs. To Ensure Govt Deployments are fast paced and high quality by transforming the RFP process to ensure predictable timelines, benchmarked eligibility criteria for partners, quick and lesser number of approvals and on time payments. This will increase confidence in ensuring quality with stronger partners and competition.

- a. Need for a National Fiber Plan with an integrated Network map of physical layer that addresses higher Fibre Capacity sufficient for next 20 years.
- b. Transformation of the RFP process

- a. Pre RFP-Planning with Integrated Budget planning
  - b. standardisation of RFP to increase efficiency and protect against delays
  - c. Clearly defined timelines at each stage – from evaluation to final award that is adhered to increase accountability towards timelines.
- a. **Efficiencies in ROW Permissions** through Single Window Clearance portal: across center and state to bring transparency and predictability.
  - c. **Execution efficiencies with lesser approvals:** Better efficiencies and reduction of human touch-points in execution, documentation will lead to better efficiencies and much needed faster rollouts
  - d. **Predictability in cash flow to EPC partners for redeployment of resources and healthy industry ecosystem** through 80% payment before usage of the network post which an interest is levied. A minimum of 10-15% of advance mobilisation of should be paid by the govt against bank guarantee before roll out.
  - e. **Centrally Held Guidelines synergise with other Utilities** that include standards such as GIS mapping, 'call before you dig' and Utilities corridors. Create a broad-based Centrally Held Guidelines for deployment of fundamental infrastructure, 5G will require dense fiber network infrastructure
  - f. **Ensure a Strong Governance Mechanism through a Steering committee:** for expediting the entire lifecycle of payment to roll out of infrastructure. The head of the steering committee should be empowered to be the single point of contact from the govt and make decisions for smooth and on-time delivery of the government projects.

The existing process is riddled with many challenges, that if solved will ensure healthy competition, and a sustainable industry that promotes the objectives of the Govt. All measures need to be taken for better accountability & faster deployments of BB infra. Further, in Govt deployments a single POC for faster approvals, quick Govt payments and advice on better resource management will support speed, quality and financial health of the industry.

#### **Pre RFP-Planning: Budgets for mega roll outs**

- **The budget planning can be more integrated to cover all aspects of financial spend. An inclusive budgetary template must be created.** This exercise will ensure realistic budgetary exercise and will help strategize effectively. Technical modifications, resources, manpower cost, project margins, taxes, financial costs, SI margins are currently not factored in the budget. Pre-consultation with system integrators (SI) and financial consultants can help address this issue.
- **The budget template must also automatically factor in Inflation costs and project additions as delays from the creation of the budget to the awarding of the contract often create a significant gap.** As an example; Rs. 600 crores budget was created for an important project in the year 2007-08. The project was delayed by 8 years and the actual cost of the project due to inflation and additions increased by over 400%. However, the budget did not reflect the increase because the template did not automatically include any change in project or the time delay that led to inflation. The industry will face a big loss and a project of great pride and value drops in its priority.

## **RFP and Bid Planning: standardizing formats will reduce delays and create ease in selection**

- **The final bid format, if standardized, will bring better transparency and focus to deliver to quality.** Lack of a bid format invites **ambiguity and huge resource time in figuring out the process** with bids submitted in various formats. This ambiguity also leads to significant delays in selection and critical timelines are impacted while awarding the project.
- **The RFP can also explicitly highlight roles, responsibilities with timelines that the buyer and vendor are accountable to. This will bring better accountability, efficiency and clarity in how the process functions.** At present, roles, responsibilities and clear timelines are not defined and clearly set, which leads to ambiguity and extension of projects which are of national importance to us
- **The timelines at each stage – from evaluation to final award - should be clearly defined and adhered to increase accountability towards timelines.** Currently, the evaluation process often takes long, leading to delays in final awarding. The industry is often not aware of by when the final award will take place. For example: A bid agreed in 2015 saw the PO in late 2017.
- **Digitisation of document submission should become a benchmarked standard to save time and resources.** Currently, hundreds of documents are submitted by hand with the government authorities by the bidder, leading to wastage of paper, time and resources. This small shift will lead to more efficiency and sustainable practices. The digitised process will set clear timelines for completion.

### **Planning: Award**

- **Payment process and payment authorities, if clearly defined and documented at the time of awarding the contract,** will lead to an increase in efficiency and ease of business attributes. Payment framework, processes, time taken at each step and sample template of documents should be explicitly defined, lack of which leads to avoidable delays and effort on part of the bidder.
- **Timeline of the project should start** from the day when the authorities give the final go ahead for beginning of the project **post permissions like RoW and approvals.** For example: a project agreed to be finished in 3 months is not able to start on time due to 2 months taken for getting all necessary RoW permissions and approvals, which leads to delay of 2 months in completion of a 3-month long project. **Due to this delay, Liquidated Damages (LD) are deducted by the purchaser, even when the project gets extended with no fault of the bidder. Hence, a clear line of authority should be identified in the tender for time extension instances.**

### **Execution: Permissions**

ROW continues to create delays to roll out optical fibre. Currently, due to lack of defined processes, permissions and approvals during the awarding and execution stage of project takes too much time.

- Approvals within 30 days of application submitted and if not acted upon, a deemed approval must automatically come into play.
- Standard rates for the ROW will bring ease to cash flow predictability.
- A nodal agency to ease the multiple permissions required and to drive project from customer side for smooth operation.
- A single window clearance by leveraging digital to bring transparency and predictability.

## **Execution: Approvals**

Multiple government personnel are currently tasked to approve the same sections of deployment with significant number of human touch points leading inefficiencies in time, cost and resource. Each representative currently needs to come to the site to approve the next level. This leads to tedious processes, massive delays and frustrations on both ends. A project often has 15 days of deployment and 40 odd approvals.

**Better efficiencies and reduction of human touch-points in execution, documentation will lead to better efficiencies and much needed faster rollouts through:**

- Stringent vendor selection criteria
- Focus on operating from standards and strong SLAs
- Reduction of approvals by further empowering government officials to represent various departments and simultaneously have an efficient utilisation of technology for surveillance and documentation
- Technology supported audits also support the commitment to quality
- Self-certification and sample auditing for optimising time, resources and cost.
- Digitization of documents: Automated workflow for interdepartmental approvals and concept of partner portal to be leveraged using ERP systems.
- The Project Management consultant/Third Party Administrator should be made accountable for the project delays and hence need to share the LD/Penalty burden.
- Number of processes in deployment identified, timelines for each and every project to be fixed. Fix the accountability of a person to the concerned action of the project.
- Improper surveys during deployment causes delay in execution. Hence, nationally available data should be leveraged and a central GIS agency for comprehensive area wise database should be created. Continuous review of work should be done by monitoring daily progress and creating reports. Further, flags can be raised in case of missing daily target.

## **Execution: Payments**

**Predictability in Cash Flow for redeployment of resources and healthy industry ecosystem:**

With Large Government roll-outs in BharatNet, Smart Cities, and defence, predictability of cash flow is essential to strengthen the industry, create vibrant competition and ensure a motivated focus towards smart and fast roll outs. Significant delays in payment are often viewed as a big barrier due to the financial risk and create serious cash flow issues. Ease of business is ensuring on time payments will bring transformational change resonating into a vibrant mature ecosystem. And ensure faster redeployment of resources towards the common cause. We suggest:

**Predictability in Cash Flow for redeployment of resources and healthy industry ecosystem:**

- **On time payment before usage of the network post which an interest is levied.**
- **A minimum of 10-15% of advance mobilisation of should be paid by the govt against bank guarantee before roll out.**
- A digital approval framework to synergise execution approvals, documentation and payments for optimisation of time, effectiveness and resource.
- Single window clearance for payments
- Strengthen the penalty & the accountability towards late payment

- Document around govt payment & deployments- should include automation of docs, automation of digital payments, automation of credits.
- Issuance of 'Letter of credit' should be adopted as the payment mechanism by the Government. This is a widely accepted payment mechanism with almost 90% transactions in the private sector happening through LOC. The process involves payment by a bank on behalf of the purchaser post submission of work completion documents, including a completion certificate from the purchase.
- Recognition in the form of incentives should be given for completion of work before time. Incentives should also be given for no cuts in fibre.

These measures will lead to faster roll outs, better utilization of talent and a predictable cash flow leading to less financial risk.

### **Some of the best practices from the world capture efficiency and ease in payment processes.**

#### **Payment practices in Australia**

- The Australian Government is a leader in terms of payment times and practices.
- Material NCCEs pay on average 97% of contracts valued under **\$1 million within 30 calendar days**.
- Reducing payment terms to **20 calendar days** will improve cash flow for Government tenderers and influence industry to put downward pressure on payment times.
- The Government is ensuring businesses are paid faster through encouraging greater usage of payment cards. The Government's Facilitating Supplier Payment through **Payment Card**. Policy states that for eligible payments to suppliers valued below \$10,000, debit or credit cards are the preferred payment mechanism.
- **Late Payment of Commercial Debts (Interest) Bill 2003** provides for interest to be levied on the late payment of commercial debts arising in relation to contracts for the supply of goods and services, and for related purposes. **Statutory interest** is payable by the purchaser to the supplier for late payment of qualifying debt in accordance with the terms of this Act. A formula has been constituted for calculation of statutory interest.

#### **Payment practices in UK**

UK has multiple policies and acts to safeguard players against delayed or untimely payments.

- Statutory guidance is present for public sector buyers and suppliers on paying undisputed, valid invoices within 30 days down the public sector supply chain.
- Public sector buyers must pay prime contractors (Tier 1 suppliers) within 30 days and must ensure that their prime contractor includes equivalent 30 days' payment terms in any subcontracts through the supply chain.
- Central Government Prompt Payment policy: The government restated its long-standing policy commitment to pay 80% of undisputed and valid invoices within 5 days with the remainder paid in 30 days. Government departments are now required to report their performance against these payment targets on a quarterly basis on GOV.UK. These new reporting requirements were announced in the Budget 2015.

- **Electronic Invoicing:** The Govt. is working with departments to introduce digital solutions to speed up the payment process to improve efficiency and save money on processing costs. It includes leading the rollout of electronic invoicing (e-invoicing) across government. Since June 2015 all central government departments have been required to accept unstructured e-invoices (invoices which can be sent in by email) and are also working towards greater use of structured e-invoices (invoices that can be processed automatically)
- **Late Payment of Commercial Debts (interest) Act 1998:** Suppliers can claim statutory interest where a public sector buyer hasn't paid an undisputed and valid invoice within 30 days (or any earlier payment date agreed in the contract).

The interest that can be charged if another business is late paying for goods or a service is 'statutory interest' - this is 8% plus the Bank of England base rate for business to business transactions. This statutory interest can't be claimed if there's a different rate of interest in a contract.

### 3.3 Synergizing with other essential infrastructures

The procurement and deployment behaviours of infrastructure pipelines such as water, electricity, gas and that of data pipes (fibre) are similar. Synergies in the procurement and roll out of all infrastructure, including fibre, can lead to optimisation of time, cost, and resources.

- **Synergetic approach for Right of Way (ROW) and nodal agency:** Since all utilities such as water, electricity, gas pipes, and optical fibre require ROW permissions for digging and trenching, a common approach for all utilities will make execution faster and more efficient. The savings on civil cost can be utilised for other 'Smart' ICT features. Moreover, a single nodal agency for ROW permission for all utilities will help ease the process of rolling out infrastructure. Post approval, an automatic notification should be sent by the ROW Nodal Agency to all the utilities so that the time and resources are used effectively as well as efficiently. Further, this would also reduce duplicity of work i.e. multiple digging or trenching of different utilities (power, water or gas pipelines) in the same stretch of land.
- **Synergised GIS system:** A common GIS platform for on-going maintenance and management of utilities will help city planners design utility infrastructure. We should leverage technology to build approval processes and databases along with a workflow system for permissions, reminders, disciplined delivery, close follow-ups and empower all managers across all milestones. The nodal agency for ROW should be the custodian of the utilities map since integration of a database for all the utilities is of umpteen importance for a synergetic approach.
- **Dig-once rule:** A uniform 'dig-once rule' must be introduced where all utility players adopt a synergised approach and carry out the expansion of infrastructure in an efficient and effective manner. Currently local bodies charge in full for the reinstatement of road surface each time either fresh fibre is laid or the network accessed in event of a break, resulting in multiple civil works. Civil works constitute almost 70% of the total cost of laying fibre, according to leading telecom service

providers. Eliminating the current inefficiencies, will bring down the cost of creating a city fibre infrastructure significantly.

- **Utility corridor:** Setting up a utility corridor can optimise roll out and management of all infrastructure. A strategy to collaborate with all upcoming utility and infrastructure projects will optimise execution. Design, planning and coordination is need of the hour and countries such as Tokyo, Yokohama, Qatar already have utility ducts in place.
- **Building codes to include fibre:** Amending the building codes to include fibre along with water, electricity, and gas pipelines will ensure fast roll out of much needed broadband access.
- **Infrastructure optimisation:** In areas, where infrastructure is lacking in terms of roads, power and water, fibre must be laid along other pipes when a stretch of land is being trenched. This will help achieve infrastructure optimisation.

These efforts will lead to significant cost, resource and time optimisation. For instance, if a city already has a good duct Infrastructure and fibre network in place, it will enable faster roll out of Smart City elements and other digital initiatives to serve its citizens. Citizen convenience will be a natural advantage. Synergistic work will help to reduce inconveniences caused to citizens due to multiple agencies digging the road surfaces repeatedly. Unnecessary traffic jams, and danger to life due to open trenches can be avoided.

### 3.4 Synergy between Fibre and Core City Infrastructure

Integrated Infrastructure set up will mean higher ROI (one ROI framework here)

- **Broadband Readiness Index:** Can be a way to ensure cities further the Digital infrastructure with parameters that include percentage of fiber densification, Ease of business in ROW, synergies with other utilities, security parameters for the physical infrastructure. Tax rationalisation to private sector that ensure readiness, etc.
- **Design Synergies:** The real benefit of thinking fibre as an Infrastructure element is because of the synergy in deploying this service along with other services
  - **Similar network designs:** On the ground, designs of roads, power and water networks significantly mirror the ideal design for a ubiquitous broadband network.
  - **Large option set to ride on:** Access designs for water, power and road networks give a large range of options to design a ground-level fibre network that can leverage the available ROW and network designs of these access infrastructures
- **Higher ROI with Lower Plastic Cost:** Since the cost of dark fibre is less than 20% of the deployment cost, which is majorly ROW and deployment service cost, an integrated deployment will reduce the cost of the ubiquitous broadband network to one-fifth and enable

a much higher RoI even in low revenue situations. This will make it reasonable to provide much lower cost services to all underprivileged sections of the society.

- **Faster, Low-disruption Deployment:** Integrated deployment will also ensure that there is speedier implementation and much lower disruption in the life of citizens
- **Deploy Fiber, not empty plastic duct** - Some cities have tried deployed multiple empty plastic ducts in the ground with the presumption that can be used for fibre deployment later. *It is ironic that the cost of these plastic ducts is more than the cost of deploying fibre directly.* Also, by deploying fibre and ducts at different times have proved to be difficult. Most of the times, these ducts have been un-usable and been a share waste of both economic resources as well as poor for the environment.

### 3.5 Network planning specialist as part of city planning

Network design is a specialised skill, and having a network design specialist on the core Smart City planning team will be of immense value for designing cities of the future. Better network design and management can help optimise all city resources. Network design can ensure that when all utilities are networked, better daily management of resources such as water and electricity, come standard with the network design. Citizen services such as e-governance, healthcare, education and other cloud-based services can also reach all nooks and corners of cities.

## 4. Optical Fibre deployments

### 4.1 Global Optical fibre deployments

According to the report “Fiber Optics Market by Cable – Global Forecast to 2021”, *the optical fiber cable market is anticipate to grow at a CAGR of over 9.8% during 2016-2021.* The increasing demand for cloud computing, data transfer & storage, and IoT is driving the use of Internet, which is further enhancing the fiber optic cable market, as it acts as the backbone for data transmission. Moreover, growing technological advancements, increase in number of connected devices and data centers are expected to positively influence global optical fiber cable market. In addition, next generation technologies such as LTE and FTTx, which require last mile connectivity, is expected to propel the demand for optical fiber cables in the coming years. All these factors have led to an increase in Internet users, which in turn has led to the higher usage of optical fiber cable to transfer information over the Internet, thus driving the fiber optics market.

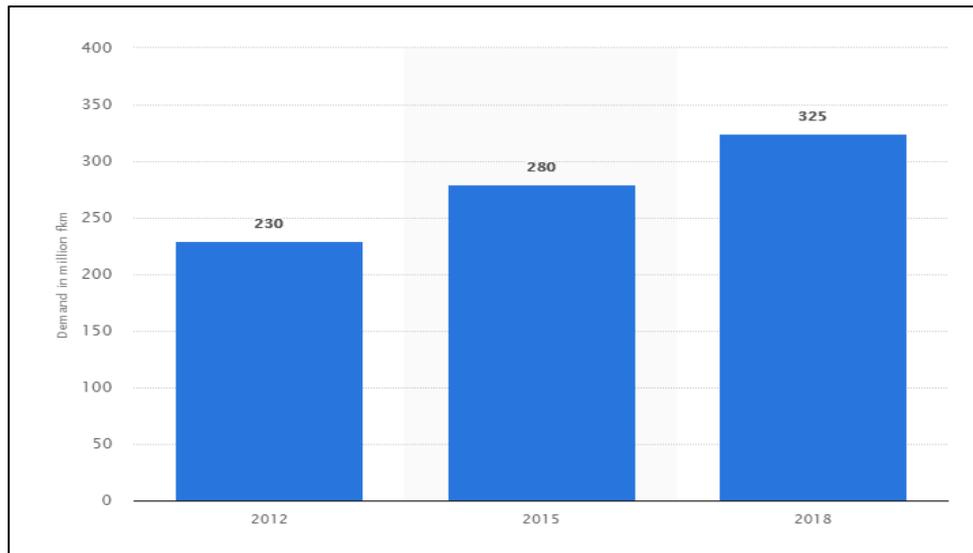


Figure 3: Global Optical Fibre cable demand  
Source: Statista

Submarine optical fiber cables are undersea cables used for carrying data across interconnected networks between continents. With the advancements of technology, most of the submarine optical fiber cables that currently form the backbone of the Internet connect the U.S. to Europe and Asia by crossing the Atlantic or Pacific oceans. Instead, there is a proposal for deployment of Trans-polar submarine cable system in Arctic Ocean. Laying an undersea fiber optic cable is meant to connect Asia and Europe by crossing the Arctic Circle – the shortest practical distance yet for Internet signals traveling between the two continents. According to the report by Global Industry Analysts (GIA), *cumulative installations of submarine optical fiber cables globally are projected to reach 2 million kilometres by 2020*, driven by the growing demand for fiber broadband and the ensuing deployment of fiber optic cables in the Internet backbone. Presently, submarine optical fiber cables transmit 100% of the international Internet traffic, and more than 95% of the world’s combined data and voice traffic.

Optical fiber cable is being caught up in the global move to broadband in the near future. The next generation of high bandwidth applications, along with the proliferation of connected devices, is expected to require faster and higher bandwidth networks which will require the use of multimode fiber cable for data transfer. This growth in the FTTx networks in turn is expected to drive the fiber optics market. Future Market Insights (FMI) forecasts the global fiber to the home (FTTH) market’s value will grow from \$9.5 billion in 2017 to more than \$37 billion by the end of 2027, a 14.4% compound annual growth rate (CAGR). In the leading Asian economies, more than 44% of all homes and buildings are already directly connected to the fiber optic cable network; in North America penetration is 8.4%, in Europe 5.6%.

## 4.2 India vis-à-vis other countries

- India’s high rate of 4G expansion and readiness for 5G rollout, there is an increasing need for fiber deployment to support reliable, high speed connectivity.
- Less than 25% of towers are fiberized as compared to 70-80% in China & Korea.

- Leading service providers have begun investments in deploying fiber connectivity with significant non-spectrum Capex towards backhaul & last mile OFC to towers in addition to next-gen RAN upgrades.
- Fiberization curve in India's tower Market is expected to rise to 70% by FY20, increase of fiberized towers from 90,000 to about 333,000.
- In India, FTTH is at a very nascent stage as compared to other countries with penetration at mere 1.25 mn connections.
- One of the major service providers in India are introducing low-cost FTTH plans which are expected to create incremental demands.
- With growing penetration of cloud computing, smart grids, e-learning, e-Health & e-governance services in India, concurrent FTTH market growth is expected to multi-fold by 2025.

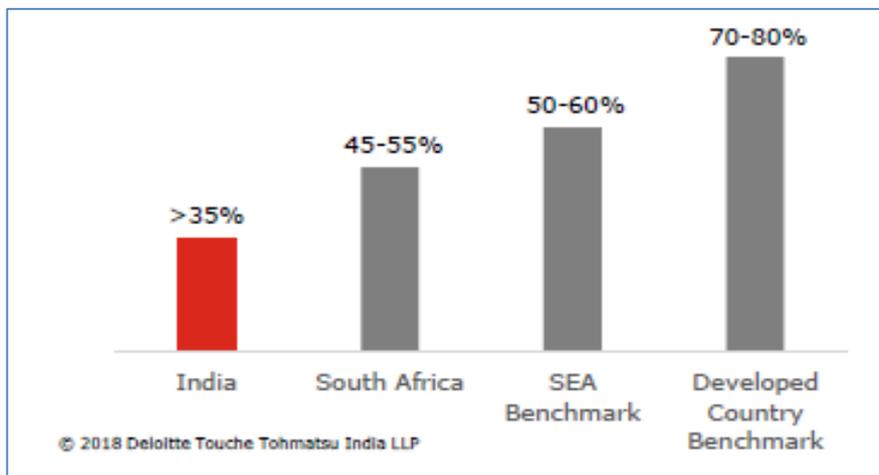


Figure 4: Rate of fiberization across countries  
Source: Deloitte

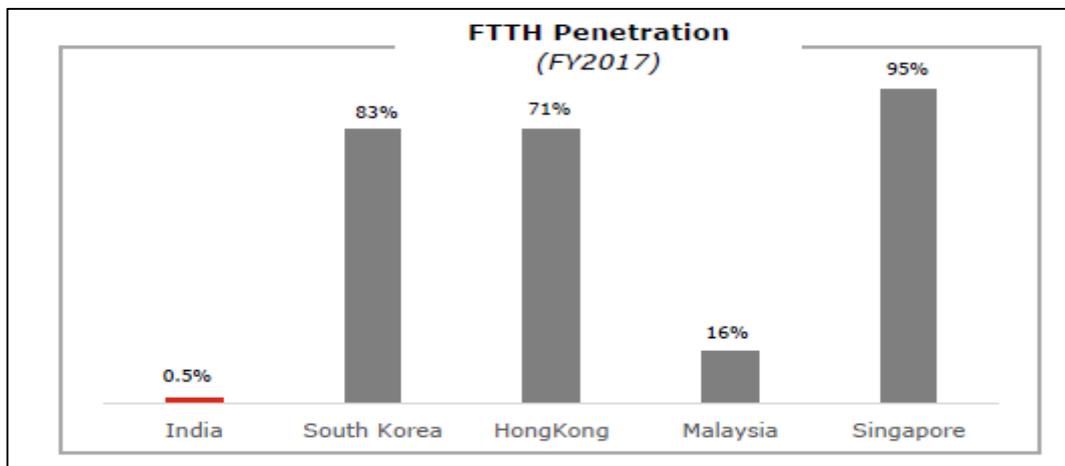


Figure 4: FTTH penetration across various countries  
Source: Deloitte

### 4.3 Challenges faced by private sectors in the deployment of Optical fibres in India

Although FTTH segment offers several opportunities, the roll-out by the service providers in India has been slowing owing to several challenges in the deployment:

#### a. Deployment Challenges:

- Policy support in terms of approvals and permissions and need for policies like “Dig once”
- Lack of availability of skilled workforce.
- Incorrect interpretation of the Gazette Notification of 2016 on RoW process by different state and local municipal bodies resulting in cost variances and delays or lack of SLAs for time bound RoW decisions.

#### b. Financial Challenges:

- Burden of RoW charges which range from INR 1 lakh- 50 lakh per km or laying fibre.
- Cost of the related Customer Premise Equipment (CPE) and Optical Line Terminal (ONT).
- Existing burden of debts on Telcos taken to finance spectrum acquisitions

#### c. Demand Challenges:

- Availability of high speed wireless connectivity leading to decline in value proposition of FTTH.
- Lack of relevant applications and content to support business case for FTTH.
- Low demand of broadband and lack of awareness in the rural segment.

### 4.4 Policy and Regulations Recommendations

**Policies and Regulations have a direct impact on commercialization and service provision. The suggestions that follow are intended to have clear and shared understanding of Fiber deployment policies and regulations in order to align the agendas of operators, industries, the regulator, policy makers and other stake holders.**

#### a. Draft Policy Framework to Support FTTH deployment:

- **Uniform policy around establishment of above ground and below ground infrastructure i.e. telecom towers and OFC;** covering permissions and approval processes across States/local bodies time bound approvals, nominal one-time charges and single window clearance mechanism.

- i. Establishment of the critical infrastructure in India is accompanied by challenges faced in the installation of towers and extension of OFC to required installations, RoW permission and charges, in-building access etc. These challenges largely stem from fragmented and non-uniform policies adopted by various states and local bodies. The Gazette Notification on RoW issued by Government in 2016, was one such effort to bring out uniform approach for granting RoW permissions for above and below ground telecom infrastructure. There is an urgent need for an early adoption of these Gazetted RoW Rules to be integrated into the RoW policies of the states and local bodies and to further actuate efforts towards establishment of uniform rules around installation of telecom towers and OFC and related outdoor plant.
- ii. Since the Next generation services envisages the delivery of 10Gbps speed, less than 1 ms latency and 90% reduction in network energy utilisation, this will require the next round of telecom infrastructure investments across the globe. The growth of fiber will be fuelled by the sharp hike in consumer data and the proliferation of M2M/IoT devices. ITU estimates the market for IoT devices will result in over USD 1.7 trillion in value added to the global economy by 2019. In view of these developments, ITU expects that investments on fibre infrastructure will surpass \$144.2 billion during 2014 – 2019. The fact that the network will have to support bursty data from emerging applications like Video on Demand (VoD), IoT, Smart Cities, and the like also makes reliable backhaul a critical requirement. In several markets, operators are dependent on OFC backhaul. Since fibre is essential for both wireline and wireless networks, there are greater levels of confidence in fibre investment. 5G technology will also require a multi-fold increase in small cells deployment, with each small cell having backhaul on fibre. We in India are woefully inadequate in terms of OFC density both in urban and rural areas and a special focus for OFC densification in a time bound manner is essential for 5G deployments. We advocate a “Fiber to the Tower” policy regime. **The percentage of tower backhaul on fibre for the operators will need to increase significantly from 20% to 70-80% levels.**
- iii. The regulatory bottlenecks in rolling – out new sites/digital infrastructure must be addressed by the Government to enable swift network deployments and make ultra-high speed broadband a reality in India. Further, it is necessary that the scope of sharing is broadened and the telecom infrastructure is labeled as ‘Common Digital Infrastructure’ with no distinction between passive and active components in the network. One way to boost the roll-out of fiber infrastructure is by extending the benefits of ‘Infrastructure Status’ accorded to the industry in the year 2012. The benefits of the status which already have been extended to sectors like roads, railways and aviation should also be extended

to the telecom sector. This will ensure easier access to capital at reduced financial cost, thus making it easier to roll-out digital infrastructure.

- iv. The Government should also consider announcing dedicated spending on Information and Communication Technology (ICT) sector like other sectors such as education, health, etc. in their annual budgets. A fixed spending by the Government on Digital infrastructure will bolster the digital eco-system in the country and help bridge the digital divide by enhancing coverage and capacity. The government should make provisions with special focus on investment and financial incentives favorable to development of telecom ecosystem for upcoming technologies viz. 5G, IoT, etc.
- v. Robust Infrastructure is at the forefront of the deploying telecom infrastructure which is the support system for provisioning of telecom services. The 'sharing model' practiced by the IP-I will accelerate the adoption of broadband services in the country. Under the 'Sharing Model', the telecom infrastructure is shared on a non – discriminatory basis with the TSPs leading to savings in capex, faster go-to-market time, positive impact on environment, avoids site duplication and improves aesthetics. The concept of 'Tower sharing' created a strong incentive in Indian Telecom market.
- vi. **Aesthetics:** With a need to deploy new towers and enable site densification for 5G networks, the appearance of the infrastructure, particularly at street furniture level will be important. As building permits become more difficult to achieve, aesthetics will be an essential design parameter. IP1s will require to work with local bodies to install aesthetically designed infrastructure to be integrated in existing landscape.
- **Fast track streamlined, automated and online paperless approval process which can help reduce execution challenges with respect to RoW applications and permissions.**

The current process of RoW approval at the state and local body level requires multiple approvals from variety of agencies at each municipality/local body level making it operationally challenging. Moreover, there are challenges such as Multiple NOCs (No Objection Certificates), Multiple Documents, Multiple Levies and High Administrative Charges which would have to be addressed on priority. Further, the present rules doesn't allow small cells/fiber to be laid using existing street furniture such as electric poles, bus stands, post boxes, advertisement apparatus etc. due to various restrictions imposed by local bodies like Municipal corporations etc. on the Discoms. Discoms are not allowed to generate commercial revenues using the existing and planned city/town public infrastructure (that includes even commercial hoardings etc.). We recommend better efficiencies and

reduction of human touchpoints in execution, documentation especially in Govt. deployments through:-

- i. Reduction in number of operational approvals
  - ii. Stringent vendor selection criteria
  - iii. Focus on operating from standards and strong SLAs
  - iv. Efficient utilization of technology for approvals
  - v. Technology supported audits
  - vi. Deemed Approvals
    - vii. Nominal charges
- Making available existing **and new municipal infrastructure (for e.g. street furniture) for site densification (small cell deployments/telecom infrastructure installation)** –Need Pan- India permission to allow TSPs and (IPs) to lay Fiber/ Small Cells using the existing street furniture.
    - i. Integrate an architectural/ design requirement in tenders for all electricity poles being changed from existing to LED power to have a small cell integrated in the design of the pole.
    - ii. Fiber connectivity for any new building be made integral to all architectural approvals for new buildings.
    - iii. Non-exclusive rights to use municipal infrastructure for small cells/telecom infrastructure installation by the IPs for enhancing street level coverage.
    - iv. Developing Business models for adoption by State Government, Municipal Corporations and service providers/infrastructure providers.
    - v. Availability of government land and buildings to deploy telecom infrastructure

## 5. Governance

### 5.1 Suggested Regulatory framework

- Regulatory Framework to Support Optical Fiber Deployment:

Regulatory frameworks need to support the Optical Fiber Deployment viz.

#### 1. Simplified & flat network architecture across country.

Simplify network management tasks and minimise human intervention and labour in diagnosing complex network problems and then determining corresponding reactive or pro-active tactics to resolve existing or even avoid potential issues. Representative use cases include Self-healing against

network failures or vulnerabilities for improved reliability, Self-protection against cyber-attack threats for improved security, and Self-optimization against network constraints for improved users' QoE.

2. **Fibre Optic Network** - To build a high quality broadband network, OFC density has to be immensely improved.

To meet the vision and mission for Digital India, the infrastructure should meet following objectives:

- i. Meet the capacity requirements for the next 20 years.
- ii. Meet global standards on reliability of 99.999 percent (59s)
- iii. Ensure comprehensive coverage of the Urban, Semi-urban and Rural, areas. States Municipalities and local bodies to cater for meeting requirements of **"broadband on demand"** plan for this availability and uniform growth.
- iv. Meet current requirement and enable future expansion of access to every building and home.
- v. Ensure minimum inconvenience to citizens during initial build out and during operations.

This will require the following:

- a. Higher Fiber Capacity sufficient for next 20 years.
- b. Fiber should be Fully Armored and Fully Protected.
- c. Access to Poles & Conduits
- d. Adhere to procurement and deployment standards such as GIS mapping, 'call before you dig' and "dig once" policy. Create a broad-based Centrally Held Guidelines for deployment of fundamental infrastructure, as next generation broadband networks will require dense fiber network infrastructure both in the access and core networks.
- e. **The world is bracing itself for the data revolution with high count fiber of the 1000s and is moving towards ultra-high count fiber over 3000. Service providers must be incentivised to lay higher count fiber which touches 1000 plus.**
- f. Centrally Held Guidelines for Fibre or a single Guidelines/Standards document must reside with the Ministry of Communications to ensure benchmarked procurement of quality fibre and deployment standards for streamlined, interoperable, and ubiquitous connectivity across the nation. Since the fibre i-ways play an arterial role in the infrastructure, focus on future proofed fibre standards must evolve.
- g. High count fiber with Multi-tube single jacket ribbon optical fiber cable that combines robust performance for duct or direct buried installations, with the productivity of high-count mass fusion splicing.
- h. Ribbon Technology utilised in high-fiber count cables offers better fiber management and handling capabilities for cable-installers. Ribbon in loose-tube helps the installer to manage the task of accurately identifying hundreds of fiber in one-closure. Ribbon in a loose-tube design allows for a side-by-side orientation for fibers which helps in mass fusion splicing- This capability will allow tremendous savings in time and labour costs
- i. Neutral fiber infrastructure provider, operations and uptime.

- i) Address fiberization for future demand. Most carriers would like to deploy double or triple the amount of fiber currently needed. They might want to leverage **right-of-way to install dark (unused) fiber** with the possible intention of leasing it **in anticipation of future demand**. *Prominent CATV operators in India, others in Europe, Middle-East are looking forward towards 1000+ fiber count optical fiber cables*
- ii) for laying out at least 96 pair of fiber network across India – to be provided on shared basis to all operators
- iii) deployments along with other utilities such as gas, oil pipelines, power, railway line & state highways

There is a Need for a National Fibre Plan to:

- Reduce cost & time for fiber deployments across the country.
- Readiness in next two to three years:
  - Unbundling & sharing of fiber among operators including BSNL / MTNL
  - Mandate fiberisation of all buildings by inclusion of this requirement in the National Building Code.
  - Sharing of common telecom Infrastructure – both towers and OFC

## 5.2 Role of Steering committee:

An empowered steering committee should be put into place for expediting the entire lifecycle of payment to roll out of infrastructure. The head of the steering committee should be empowered to be the single point of contact from the govt and make decisions for smooth and on-time delivery of the government projects. The head of the Steering Committee should be also be accountable for any delays (related to RoW permissions, approvals and payments) on part of the government.

## 6. Conclusion

Fibre as Critical Infrastructure can really speed up benefits to citizens which will not happen without a concerted effort from the Government and policy makers. We believe the time has come to ensure that policies are drafted that enable a collaborative approach between deployment organizations and enable the Government to deliver citizen services faster and to monetize a world-class infrastructure that is created in the process.

To cater to the requirement of the demand of high speed connectivity and to give way for the most talked about technologies such as Internet of Things (IoT), Block-chain, Smart Homes and Autonomous vehicles, India needs to urgently accord more impetus to deployment of fiber. Government's Fibre First initiative is, therefore, a most welcome step & the time for action is now. We hope that the proposed TRAI Consultation & the subsequent recommendations will help address the issues pertaining to the fibre cables and provide India the fibre base it desperately needs.



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