

# ICT Technologies and KPIs for Smart Safe and Sustainable Cities

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**Abstract -- The future of cities will be built on a network of fiber-ready infrastructure. This paper highlights the ambitious Indian Smart City project and the need of accelerating the roll-out of fiber in India to transform cities to smart cities, the current fiber projects in India and the regulatory and operational challenges in deploying fiber.**

Cities across the globe occupy 3% of the earth's land surface, house half of the human population, use 75% of the resources and account for two-third of all the energy usage and greenhouse gas emissions. The existing cities are plagued with population explosion, high level of population, traffic chaos huge scarcity of houses, inadequate water supply, poor waste disposal management, etc. The origin of smart city concept lies among the widespread problems seen due to rapid urbanization. ITU-APT Foundation's National Conference delved upon these public issues through ICT based solutions.

*Keywords : Smart Cities, Fibre roll-out challenges, Broadband, Digital India, Knowledge economy, ICTs, Data services, Key performance indicators, Sustainable cities, Waste management*

PRESENTLY, nearly half of the world population lives in cities and the number is projected to grow to more than 6 billion by 2050. More than 30 per cent of India's one billion plus population lives in cities. This number is nearly equal to the total population of the US. The projections indicate that the urban population will be close to 600 million by 2031 in India and many metro cities will emerge by then. As more and more people are moving towards cities there is an increasing need for 'smart' city solutions which are both efficient and sustainable on one hand and generate economic prosperity and social wellbeing on the other. Thus, there is a need to plan our upcoming cities to meet the needs of today and demands of tomorrow.

## II. EVOLUTION OF SMART CITIES IN INDIA

Since 2014, urban-led economic growth in India was firmly framed around a vision of 'Smart Cities', a concept which promotes the integration of Information and Communication Technologies (ICTs) in cities to improve economic growth, quality of life, governance, mobility and sustainability. Given its current policy importance, smart cities have the potential for transforming the urban development in India. With the

emergence of Smart Cities in India, the vision and concept of Smart City has shifted over time; and has been evoked in different ways to serve different purposes.



Figure 1. Bharatnet is the world's largest rural connectivity program using optical fibres to provide broadband facilities to 2.5 lakh gram panchayats.

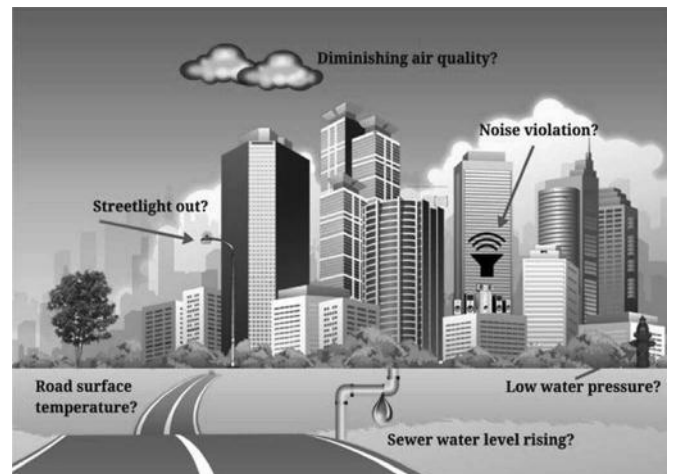


Figure 2. Smart cities design critically depends on efficient induction of Information and communication technologies.

Smart cities are urban habitats with a vision to integrate multiple information and communication technology (ICT) and Internet of Things (IOT) solutions to manage the city's assets. This

will require the network of fibers to provide the next level of telecom network connectivity.

**III. TELECOM INFRASTRUCTURE**

Telecom industry continues to be a key contributor for the growth and economies all around the world. Telecom infrastructure has been a contributor to the development of mobile industry and played a crucial role in proliferation of services particularly in a country like India.

Having surpassed 5 billion people connected to mobile services in 2017, the global mobile industry will reach further milestones over the next eight years. The number of unique mobile subscribers will reach 5.9 billion by 2025, equivalent to 71% of the world’s population. Growth will be driven by developing countries, particularly India, China, Pakistan, Indonesia and Bangladesh, as well as Sub-Saharan Africa and Latin America.

India is going digital under the various government projects such as Smart Cities and BharatNet. BharatNet is unique as it aims to connect 2.5 lacs Gram Panchayats with fiber. This will help realize the government’s agenda of Broadband for all. The services offered under these various government programs will give a fillip to the increasing digitally savvy Indian population.

The growth and adoption of internet services is exponentially increasing globally. According to research reports, the global mobile data traffic for all devices will increase eight-fold between 2017 and 2023, reaching 110 exabytes per month. Smartphones will continue to evolve and account for close to 95% of the total mobile data traffic by 2023. Technologies like AI, VR, AR, M2M, IoT and 5G will be the key drivers for growth in data services.

Globally, smart cities have been gaining momentum as initiatives to transform cities to smart cities are on a rise across major metropolitan areas in the US and in other regions such as China (part of the 13<sup>th</sup> five-year plan), Singapore (Smart Nation), India (100 Smart Cities) and Qatar (2022 FIFA World Cup).

The future of cities will be built on a network of fiber-ready infrastructure. The presence of a robust fiber network is essential for providing the network and coverage to meet the demands in smart cities which would be connected through millions of devices that are able to seamlessly communicate with each other.

Smart cities are the future and necessary to provide citizens

<b>What is a Smart City?</b>	
<b>City equipped with basic infrastructure to give a decent quality of life, a clean and sustainable environment through application of some smart solutions.</b>	
<b>Key Parameters of Smart cities</b>	
<b>Parameter</b>	<b>Definition</b>
Smart energy	Smart energy uses digital technology through advanced meter infrastructure (AMI), distribution grid management, and high-voltage transmission systems
Smart building	Smart buildings are green, energy efficient, and intelligent, with advanced automated infrastructure that controls and manages aspects such as lighting and temperature, security, and energy consumption independently
Smart mobility	Smart mobility enables intelligent mobility through the use of innovative and integrated technologies and solutions, such as low emission cars and multimodal transport systems
Smart technology	Smart technology will connect the home, office, mobile phone, and car on a single wireless IT platform.
Smart healthcare	Smart healthcare is the use of eHealth and mHealth systems and intelligent and connected medical devices.
Smart infrastructure	Smart infrastructure includes intelligent and automated systems that manage, communicate with, and integrate into different types of intelligent infrastructure
Smart governance and smart education	Smart governance and smart education includes policies and digital services from the government that help and support the adoption of green and intelligent solutions
Smart security	Smart security includes technology and solutions such as video surveillance, public safety LTE, and managed security services that are designed to protect people, property, and information

with the state-of-the-art solutions. 90% of the world’s urban population growth will take place in developing countries, with India taking a significant share of that. Urban areas also contribute a higher share of GDP. The share of GDP from urban areas in India has been growing and is expected to contribute nearly 75% by 2030.

In India, urban population is around 31% of the total population and contributes over 60% of India’s GDP. It is for this reason that cities are referred to as the ‘Engines of Economic Growth’. India is at place of transition, where the pace of urbanization will speed up and there is a critical need to plan our urban areas well.

With the increase pace of migration of people from rural to urban areas in India, a new middle class is emerging which aspires of better living standards. Unless, new cities are developed to accommodate the growing number of people, the existing ones will soon become unliveable. The Hon’ble PM of India has a vision of developing ‘100 Smart Cities’ as satellite towns of larger cities and by modernizing the existing mid-sized cities.

Any smart city will have a mix of ICT and Advanced technologies for providing various services making the network architecture to be technology centric. The implementation strategy and framework could be different depending on the mix of services provided and the mix of focus attributes of the city, whatever framework is selected, whether Technology or Human, it should lead to sustainable and harmonious growth.

Globally, all smart city programs and projects pursue many common goals including sustainable development, better efficiency, resilience, safety and wider support for citizen’s engagement and participation. Key trends that are shaping up the smart cities globally include:

- a. Internet+ becomes the new step forward in smart cities
- b. Social value of Data mining continues to catch momentum
- c. Mobile and other connected devices bringing greater convenience to urban services
- d. Smart communities are increasingly becoming ‘playground’ for smart city construction (such as smart homes, smart ecologic community, etc.)
- e. Information security is the new foundation of smart city infrastructure
- f. Intelligent services using emerging technologies supporting the on-going and future urban development processes.

Sustaining and enhancing this economic growth, while bridging the digital divide between various sections of the society are the key national objectives for India today. The government has also initiated several ambitious programs such as Digital India, Smart Cities, BharatNet and Skill India to realize these national

objectives, which will require penetration of digital services. Rise in broadband penetration to 60% in India is expected to translate into a 5-6% increase in the country’s GDP; to the tune of ~\$135 billion.

#### IV. FIBERIZATION

Fiberization of existing telecom infrastructure has the potential to bring substantial social and economic benefits to governments, citizens, end-users and businesses through increase in productivity and competitiveness, improvements in service delivery, and optimal use of scarce resources like Spectrum. The upcoming cities will be built based on readily available optical fibre cables, next generation telecom infrastructure and technologies. The deployment of small cells required to cater to the next generation of technologies like 5G would also double.

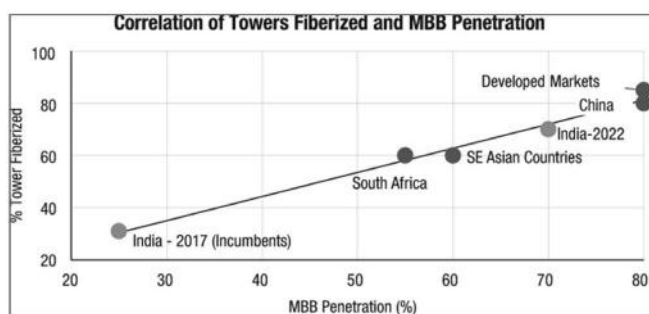


Figure 3. Mobile broadband penetration in urban and rural communities requires towers to be connected via optical fibres.

Fibre is necessary to enhance the broadband penetration in the country which still lags when compared to its global counterparts. Fibre is critical to drive various broadband technologies and future telecom solutions. Currently, less than 25% of the telecom towers are fiberized as compared to the global counterpart such as China, USA and Japan wherein more than 80% of the telecom infrastructure is fiberized.

Fiber would be crucial to transform cities to smart cities. The Industry regulator also realized this and launched a ‘Common Duct Policy’. The common duct policy is being formulated under the concept of ‘Dig-Once’ wherein the concessionaire / selected private entity would lay the common duct and share it with the stakeholders on a non-discriminatory basis. This is expected to accelerate the laying of fiber by overcoming the barrier of digging frequently to lay fiber which is not only time-consuming due to various regulatory barriers but also causes inconvenience to public at large.

We are now at the threshold of a digital revolution with focus on delivering quality broadband to the masses and leveraging its significant potential for economic growth and social inclusion. This will require deployment of fibre to facilitate improved data access to the citizens. ‘Access to Broadband’ has become a priority for the government and the industry which can be

achieved by laying OFC, connecting the towers to fibre and through common duct.

The government is also in discussion with the stakeholders for formulating a common duct policy which will play a key role in laying of fiber and connecting the unconnected.

While India has 5 lac towers and 20 lac BTSs, only 25% of them are fiberized. The national Digital Communications Policy have also emphasized on fiberization of 60% of the telecom towers by 2022 which would require streamlining of issues and challenges currently faced by the telecom infrastructure industry.

The industry faces multitude of regulatory and operational bottlenecks. These challenges have so far restricted the laying down of fiber in the far-flung regions of the country. However, it has now become increasingly essential to roll-out fibre and provide people with better quality of services

**V. BOTTLENECKS**

*Regulatory:* The regulatory bottlenecks that are being faced by the industry include:

- Alignment of policy at the State level
- Implementation of the policies and procedure
- Lack of Online Single Window Clearance
- Difficulties and Inordinate delays in obtaining RoW permissions
- Exorbitant RoW Charges – For instance in case Delhi the cost of obtaining RoW permissions ranges from Rs. 5 lac to Rs. 7 lac (over half a million Rs. for just one km)

*Operational:* The operational bottlenecks faced by the industry includes:

- Thefts and vandalism such as fiber cuts.

The ambitious programs of Digital India and Smart Cities aims to transform India into a knowledge economy and digital society which will require services to be delivered in real time such as remote education, health services, banking, etc. For achieving growth, knowledge and economic progress connectivity to internet through broadband is mandatory.

**VI. CONCLUSION**

For realising bandwidth of the order of Gbps to deploy essential broadband services, radio technology is inadequate to meet these needs due to spectrum scarcity. The most suitable option is optical fibre connectivity.

Thus, fiberization becomes essential to meet the demands and improve performance over existing wireless services. More fibres will be required to make network smarter to deliver smart solutions.



**Tilak Raj Dua**, FIETE is the Director General, TAIPA and Chairman ITU-APT. He has over 35 years experience in the telecom sector. His experience includes all facets of telecom be it Product Development, Business Development, Telecom Licensing, Regulatory issues with respect to interconnection / roaming / unified licensing and infrastructure sharing / Mobile Number Portability, Spectrum Management, Spectrum Related Issues Like Spectrum Pricing, Efficient Utilization and Spectrum reframing, finalization of joint ventures, Technical collaboration, Introduction of new product, Launch of cellular services in India and finalization of licence agreements / interconnect agreements etc.

Over the years in the industry, Mr. Dua held prestigious positions as Director in leading telecom companies like Bharti Airtel Ltd., Shyam Telecom Ltd., Cellular Operators Association of India (COAI), Vice Chairman Global ICT Standardization Forum for India.

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