



Telecom Regulatory Authority of India



Recommendations

on

Roadmap to Promote Broadband Connectivity and
Enhanced Broadband Speed

New Delhi, India

31.08.2021

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CHAPTER 1

INTRODUCTION

- 1.1 Broadband is a basic infrastructure essential for improving the socio-economic development, job creation, civic engagement, global competitiveness, and a better quality of life. For developing countries in the low- and middle-income brackets, broadband is a key driver of economic growth. *According to a study by the World Bank, every 10-percentage-point increase in broadband penetration provides a boost of 1.38 additional percentage points to GDP growth — higher than any other telecommunication service*¹. The positive effect of increase in internet subscriptions on GDP is higher in developing countries than in the developed countries as it helps developing countries in leapfrogging the scarcity of physical infrastructure.
- 1.2 Access to secure, reliable, and affordable high-speed broadband services is a clear and urgent priority for every Indian citizen. Proliferation of high-speed broadband across the country requires fiberisation and densification of networks. Investing in the expansion of broadband is becoming more and more vital just to make sure that everyone is connected. Accordingly, the objective of these Recommendations is to recommend a roadmap to the Government for infrastructure creation, fiberisation and densification of networks, and proliferation of high-speed broadband services in the country.
- 1.3 It needs to be emphasized that the policy measures suggested in these recommendations are closely linked with one another; and therefore, a coordinated and integrated approach is required towards implementation of these recommendations. It is expected that to ensure

¹ Broadband: A Platform for progress, A report by the Broadband Commission for Digital Development

an overall positive impact on the digital infrastructure and broadband landscape of the country, these recommendations would be considered by the Government in entirety. Further, keeping in view the Government's declared policy objective regarding Ease of Doing Business for attracting investment in infrastructure development and facilitating growth of the sector, the Authority is proposing the timelines for certain activities like time bound settlement of claims of licensees, development of national RoW portal etc.

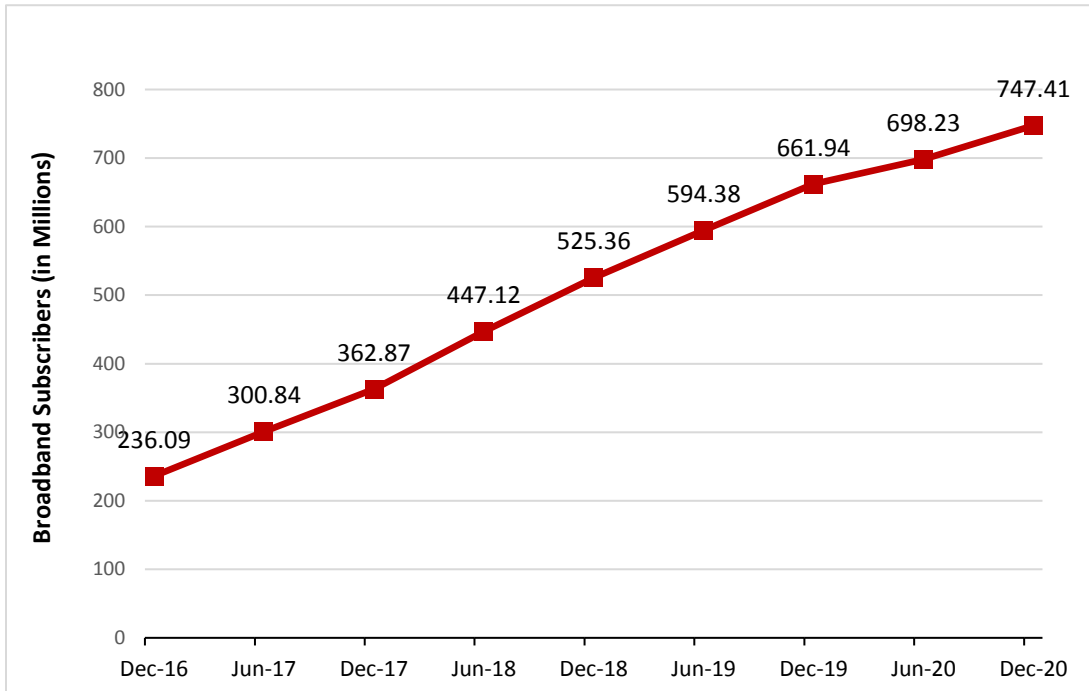
1.4 The COVID-19 pandemic has introduced new challenges to our way of life forcing an unprecedented number of people all over the world to change their workplace from office to home and causing widespread disruptions in everyday life. There was never a better time to understand the importance of broadband than now. Whether it is working from home or a child studying from home, live video conferencing or communicating with friends and relatives in different parts of the world or accessing entertainment programs through OTT platforms, broadband has emerged as basic requirement for the Indian households. As new digital behaviors are forming, the critical role of broadband service providers to support the society with flawless pan India internet connectivity in times of crisis has become all the more important.

I. Broadband in India

1.5 The first step in addressing our country's broadband needs is to understand the status of broadband that is where broadband is available and where it is not and what are the barriers in adopting and leveraging the technology. The broadband subscriber base in India has been growing at an accelerated pace over the last 4-5 years. There has been a 33% Compounded Annual Growth Rate (CAGR) between 2016 and 2020. As of December 2020, there are approximately 747 Million

broadband subscribers in the country. Figure 1.1 depicts the growth of broadband subscribers on a half-yearly basis².

Figure 1.1: Broadband growth in India (half-yearly basis)



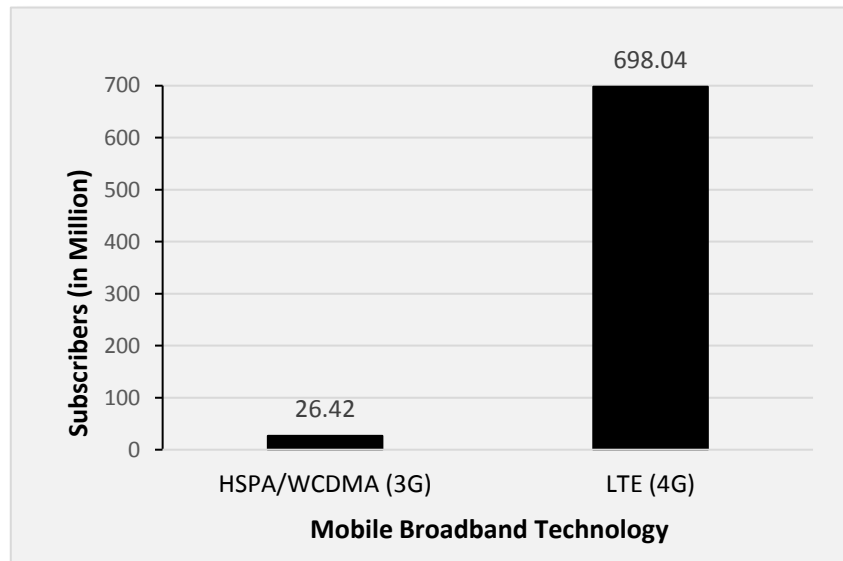
Source: TRAI

1.6 The following is a snapshot of India's broadband landscape:

- i. As per Nokia MBit 2021 report, overall average data usage per month registered a CAGR of 76% from 2015 to 2020 reaching 13.5 GB in December 2020. This could happen due to continued upgradation of mobile networks to 4G which facilitated increased online education, remote working for professionals and higher OTT viewership.
- ii. There was total of 724.46 million mobile broadband subscribers at the end of December 2020, which is around 97% of total broadband connections.
- iii. More than 96% of these mobile broadband subscribers were having 4G connectivity. As per Nokia MBit 2021 report, 4G constituted 98.7% of total data traffic consumed across the country.

² TRAI Performance Indicator Reports

Figure 1.2: Mobile Broadband Subscribers (technology-wise)



- iv. India's digital revolution continues to be propelled by the rural masses with rural India comprising a sizeable 38% of broadband users in 2020. There are 284.64 million broadband users in rural India. Rural data consumption accounts for around 45% of overall mobile data usage.³
- v. However, at the end of December 2020, there were 22.94 million fixed broadband connections. In terms of penetration, it implies that only 9.1 per 100 households⁴ have access to fixed broadband.
- vi. Also, there were only 6.89 million FTTH broadband connections at the end of December 2020, which is only about 30% of the total fixed broadband connections in the country.
- vii. Despite the rapid spread of broadband, and the increasing agreement on the opportunities it brings, nearly 45% of the India's population still does not have access to broadband.
- viii. As far as speed is concerned, as per Ookla speed test global index March 2021 report⁵, India is experiencing download speeds of 12.15

³ Nokia MBit 2021 report

⁴ Based on census 2011, India has 249.5 Million households

⁵ <https://www.speedtest.net/global-index>

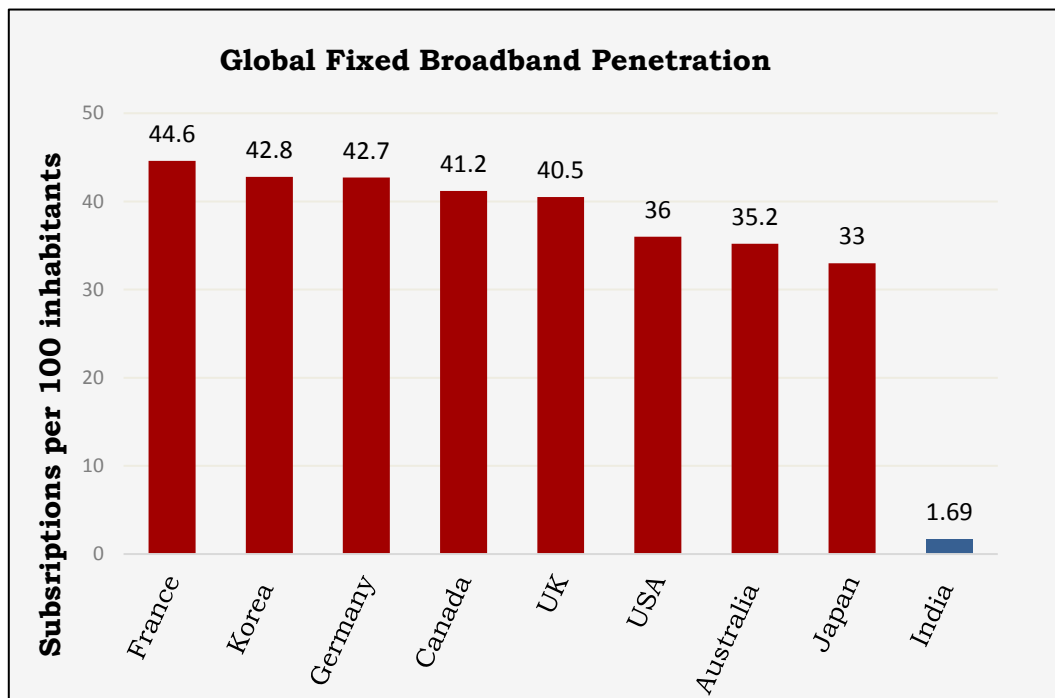
Mbps in case of mobile broadband and around 56.1 Mbps in case of fixed broadband.

- ix. As per this global index, India ranked 131st among 140 nations in terms of mobile broadband speed and 66th among 177 countries in fixed broadband.

II. Broadband across the globe

- 1.7 The current broadband penetration in India is at around 55%, which is significantly lower as compared to that of China at 95%, and other European nations at around 95-115%⁶. Fixed broadband penetration in India is among the lowest in the world at only 1.69 per hundred inhabitants.⁷ Fixed broadband subscriptions per 100 inhabitants across major countries of the world is depicted in Figure 1.3:

Figure 1.3: Global Fixed Broadband penetration (per 100 inhabitants)



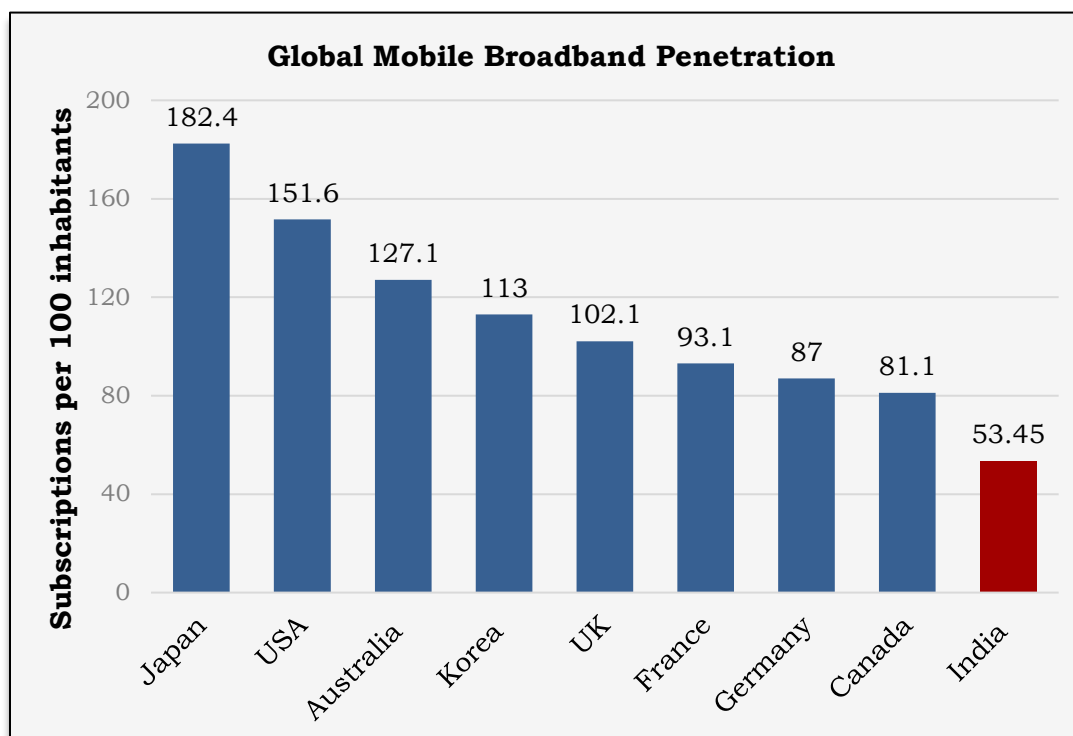
Source : OECD statistics for June 2020, TRAI Dec2020

⁶ TRAI Performance Indicator Report October - December, 2020, Nokia MBit 2020 Report.

⁷ Indian population 1358.97 Million as per TRAI's Performance indicator reports

1.8 Despite rapid growth of mobile broadband subscribers during last 4-5 years, India's global ranking is again not so encouraging. Mobile broadband subscriptions per 100 inhabitants across major countries of the world are depicted in Figure 1.4:

Figure 1.4: Global Mobile Broadband penetration (per 100 inhabitants)

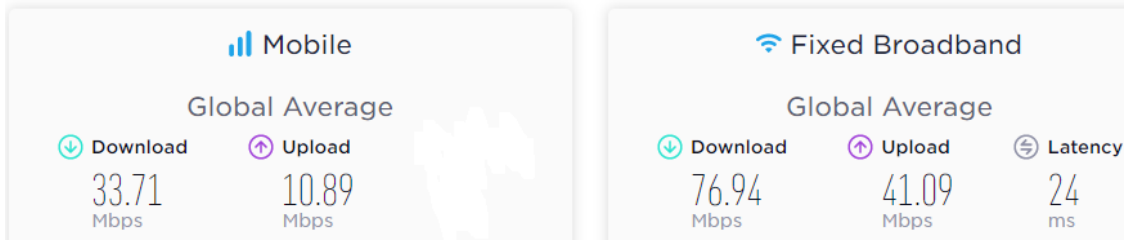


Source : OECD statistics for June 2020, TRAI Dec 2020

1.9 Reliable and high-speed broadband connectivity is a pre-requisite for its effective commercial and economic use. The highest mobile broadband speed, experienced in South Korea, is around 100Mbps. Whereas, for fixed line broadband, highest speed reported is that of Singapore at 205 Mbps. Global average speed in case of mobile and fixed broadband is depicted in Figure 1.5 below:

Figure 1.5: Global Average Broadband speed

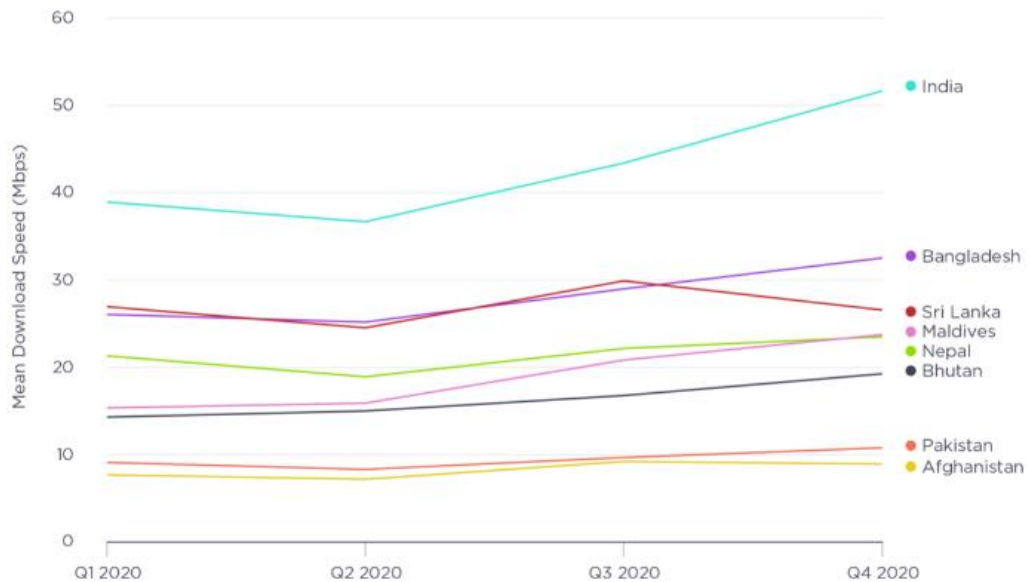
Global Speeds May 2020



Source: Speedtest.net global index

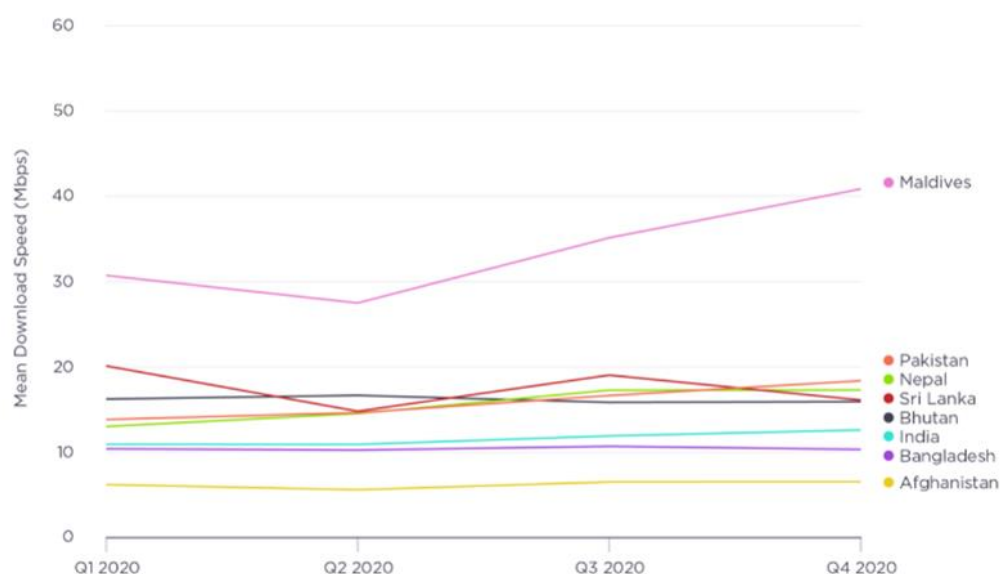
1.10 Another comparison of fixed and mobile broadband speeds among SAARC countries during last one year is depicted in Figures 1.6 and 1.7 below:

Figure 1.6: Comparison of Fixed broadband speeds among SAARC countries



Source: Ookla Speedtest.net

Figure 1.7: Comparison of Mobile broadband speeds among SAARC countries



Source: Ookla Speedtest.net

- 1.11 The above comparisons suggest that India is fairly placed among SAARC countries as far as fixed broadband speed is concerned, but lags much behind other similarly placed countries in terms of mobile broadband speed.
- 1.12 In the ICT Development Index of ITU, India ranked 134 in 2017. The ICT Development Index (IDI) in 2017 was a composite index that combined 11 indicators into one benchmark measure. It is used to monitor and compare developments in information and communication technology (ICT) between countries and over time⁸. The main objectives of the IDI are to measure:
- the *level and evolution over time* of ICT developments within countries and the experience of those countries relative to others;
 - progress in ICT development *in both developed and developing countries*;

⁸<https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis2017/methodology.aspx>

- the *digital divide*, i.e. differences between countries in terms of their levels of ICT development; and
- the *development potential* of ICTs and the extent to which countries can make use of them to enhance growth and development in the context of available capabilities and skills.

1.13 The IDI is divided into the following three sub-indices:

- (i) **Access sub-index:** This sub-index captures ICT readiness and includes five infrastructure and access indicators (fixed-telephone subscriptions, mobile-cellular telephone subscriptions, international Internet bandwidth per Internet user, households with a computer, and households with Internet access).
- (ii) **Use sub-index:** This sub-index captures ICT intensity and includes three intensity and usage indicators (individuals using the Internet, fixed broadband subscriptions, and mobile-broadband subscriptions).
- (iii) **Skills sub-index:** This sub-index seeks to capture capabilities or skills which are important for ICTs. It includes three proxy indicators (mean years of schooling, gross secondary enrolment, and gross tertiary enrolment). As these are proxy indicators, rather than indicators directly measuring ICT-related skills, the skills sub-index is given less weight in the computation of the IDI than the other two sub-indices.

1.14 India's performance snapshot in 2017 on these three sub-indices and 11 indicators of IDI is depicted in Figure 1.8:

Figure 1.8: India's Performance in ICT Development Index in 2017



Source: ITU

1.15 It is clearly visible from this snapshot that the India's rank on this index is poor primarily because of poor internet access and use. While in last four years after publishing of this index, India's performance in mobile broadband access and use have improved considerably, the access and use of fixed-line broadband is still a challenge. The NDCP-2018

envisages for providing universal broadband connectivity at 50 Mbps to every citizen and to propel India among the top 50 nations in the ICT Development Index of ITU. This would require a well thought strategic policy interventions and substantial investment in fiberisation, fixed-line broadband networks and associated digital infrastructure to achieve these objectives of the NDCP-2018.

III. National Digital Communications Policy 2018 (NDCP-2018)

1.16 NDCP-2018 seeks to unlock the transformative power of digital communications networks to achieve the goal of digital empowerment and improved well-being of the people of India; and towards this end, attempts to outline a set of goals, initiatives, strategies and intended policy outcomes. Some of the strategic objectives of the NDCP-2018 to be achieved by 2022 are (1) provisioning of Broadband for all and (2) propel India to the top 50 nations in the ICT Development Index of ITU from 134 in 2017. The following goals have been laid down for 2022 under Connect India Mission of the Policy:

- a. Provide Universal broadband connectivity at 50Mbps to every citizen
- b. Provide 1 Gbps connectivity to all Gram Panchayats of India by 2020 and 10 Gbps by 2022
- c. Enable 100 Mbps broadband on demand to all key development institutions; including all educational institutions
- d. Enable fixed line broadband access to 50% of households
- e. Achieve 'unique mobile subscriber density' of 55 by 2020 and 65 by 2022
- f. Enable deployment of public Wi-Fi Hotspots; to reach 5 million by 2020 and 10 million by 2022
- g. Ensure connectivity to all uncovered areas

IV. Reference received from DoT

- 1.17 DoT, through its reference dated 26th April 2019 (Annexure A) requested the Authority to furnish its recommendations as per Section 11(1)(a) of TRAI Act 1997, as amended, on the following points:
- (a) *“Different speeds for different categories i.e. fixed vs Mobile with upload/download speeds defined;*
 - (b) *How different categories of broadband speeds such as basic broadband, high broadband & Ultra-High Broadband etc. can be defined as in Europe; and*
 - (c) *The roadmap to enhance Broadband speed to achieve the NDCP-2018 objective of 50 Mbps.”*
- 1.18 DoT, through another reference viz. No.20-281/2010-AS-I Vol.XII (pt.) dated 8th May 2019 (Annexures B) has sought the recommendations of the Authority for implementing NDCP-2018 strategy *“By encouraging innovative approaches to infrastructure creation and access including through resale and Virtual Network Operators (VNO)”*. Through one more reference No..4-27/NDCP2018-NT dated 6th June 2019 (Annexure C), DoT has sought the recommendations of the Authority for implementing NDCP-2018 strategy *“Promoting broadband connectivity through innovative and alternative technologies”*, respectively.
- 1.19 DoT through another reference dated 12th March 2021(Annexure D), while referring to an earlier recommendation i.e. *“To promote fixed line BB [Broadband], the license fee on the revenues earned on fixed line BB should be exempted for at least 5 years.”* recommended vide Authority’s Recommendations dated 17th April 2015 to the Government on *“Delivering Broadband Quickly: What do we need to do?”*, has sought

fresh recommendations of the Authority on incentives to promote fixed-line broadband.

V. Present Consultation

- 1.20 DoT has sought the Authority's recommendations on certain issues as deliberated in section IV of this chapter. Accordingly, a Consultation Paper (CP) was issued on 20th August 2020 to solicit stakeholders' views on points raised by DoT in its reference on the context of reviewing Broadband definition and promoting broadband connectivity through innovative and alternative technologies. Inputs of stakeholders were also sought regarding categorization of broadband speeds for fixed line and mobile broadband. Other items highlighted in this CP on which stake holder's inputs were invited include the technology and infrastructure roadmap to enhance the broadband speed, so that NDCP-2018 objectives are achieved.
- 1.21 Subsequently, a supplementary Consultation Paper was issued on 19th May 2021 to solicit the views of the stakeholders on the issues raised in the DoT's letter dated 12th March 2021. The purpose of supplementary CP was to analyze whether exemption of license fee can be used as an incentive for promotion of fixed line broadband. The likelihood of misuse of the exemption by the licensees was also deliberated upon in this CP. The feasibility of promoting proliferation of fixed-line broadband by providing direct benefit to consumers for usage of fixed-line Broadband services was also discussed.
- 1.22 Further, while in the CP dated 20th August 2020, the issues relating to cross-sector collaboration for infrastructure creation and sharing, use of electric poles for aerial fibre installation, RoW permissions for erection of telecom infrastructure, and sharing of electric poles for hosting 5G small cells infrastructure have been discussed at length, there was no explicit reference for using Street Furniture to rollout 5G

networks. Therefore, a section on this issue was also added in this supplementary CP.

1.23 In response to the CP and supplementary CP, TRAI received comments and counter comments from stakeholders. These were placed on the TRAI's website: www.trai.gov.in. Two Open House Discussions (OHDs) with stakeholders in respect of the CP and supplementary CP were organized on 18th February 2021 and 23rd June 2021, respectively. After analysing the various issues involved and considering the comments received from stakeholders in their written responses and during the OHDs, the Authority has finalized these recommendations.

1.24 These recommendations intend to address the following:

- i. Defining fixed and mobile broadband and their speed-based categorisation,
- ii. Broadband proliferation issues,
- iii. Broadband speed issues,
- iv. Innovative approaches for infrastructure creation for increasing broadband proliferation and enhancement of broadband speed, and
- v. Incentives for proliferation of fixed-line broadband.

1.25 Chapter 2 of these Recommendations deals with the broadband definition and categories of Broadband. Chapter 3 discusses various issues related to the proliferation of fixed broadband, mobile broadband, and Fixed Wireless Access (FWA) broadband. Chapter 4 brings forward the issues related to fixed broadband and mobile broadband speed enhancement. Chapter 5 delves into infrastructure deployment challenges and the Authority's recommendations related to formulation of roadmap. Chapter 6 discusses the issues related to financial incentives for fixed line broadband proliferation. Finally, Chapter 7 summarizes the various recommendations.

CHAPTER 2

REVIEW OF BROADBAND DEFINITION

2.1 Generally, the term broadband identifies Internet connections that are significantly faster. However, as such there is no universally accepted definition of broadband. As discussed in the CP, different organisations and countries have followed different approaches for defining broadband.

I. Broadband Definition in India

2.2 The prevailing definition of Broadband in India as notified by DoT on 18th July 2013 is as follows:

“Broadband is a data connection that is able to support interactive services including Internet access and has the capability of the minimum download speed of 512 kbps to an individual subscriber from the point of presence (POP) of the service provider intending to provide Broadband service.”

2.3 The Authority vide its Report on “Need for Reviewing Definition of Broadband” dated 24th May 2016 reiterated its Recommendations dated 8th December 2010 on “National Broadband Plan” and said that that the current definition of broadband in the country be reviewed and minimum download speed be increased to 2 Mbps. (emphasis added) However, this definition recommended by the Authority was not adopted by DoT.

II. NDCP-2018 objectives related to Broadband Speed

2.4 Some of the strategic objectives of the NDCP-2018 to be achieved by 2022 are Broadband for all by 2022 and to propel India to the top 50 nations in the ICT Development Index of ITU from 134 in 2017. The

following goals related to broadband speed have been laid down for 2022 under Connect India Mission of the policy:

- i. Provide universal broadband connectivity at 50 Mbps to every citizen
- ii. Provide 1 Gbps connectivity to all Gram Panchayats of India by 2020 and 10 Gbps by 2022
- iii. Enable 100 Mbps broadband on demand to all key development institutions; including all educational institutions

2.5 In view of the above noted NDCP-2018 objectives and the reference received from DoT regarding review of fixed and mobile broadband definitions and categorisation based on broadband speeds, issues were raised in the CP.

A. Broadband definition review

2.6 To solicit stakeholders' views in the context of reviewing Broadband definition, following issues were raised in the CP:

- i. *“Should the existing definition of broadband be reviewed? If yes, then what should be the alternate approach to define broadband? Should the definition of broadband be:*
 - a. *Common or separate for fixed and mobile broadband?*
 - b. *Dependent or independent of speed and/or technology?*
 - c. *Based on download as well as upload threshold speed, or threshold download speed alone is sufficient?*
 - d. *Based on actual speed delivered, or on capability of the underlying medium and technology to deliver the defined threshold speed, as is being done presently?*

Please suggest the complete text for revised definition of the broadband along with the threshold download and upload speeds, if required for defining broadband. Kindly provide the reasons and justifications for the same.

- ii. *If you believe that the existing definition of broadband should not be reviewed, then also justify your comments.*
 - iii. *Is there a need to introduce the speed measurement program in the country? If yes, please elaborate the methodology to be implemented for measuring the speed of a customer's broadband connection. Please reply with respect to fixed line and mobile broadband separately."*
- 2.7 Comments received from the stake holders and analysis of the above-mentioned issues are presented in the following sections.

Comments from the stakeholders

- 2.8 Majority of the Telecom Service Providers (TSPs) and one association are of the opinion that there is no need to review the present definition. They have stated that the first and foremost focus should be to enhance broadband availability and affordability via various available media. According to these stakeholders, the existing definition of broadband is working fine and should be continued with for the next few years till the broadband infrastructure becomes omnipresent.
- 2.9 One of the stakeholders having the opinion against any review has said that many countries still follow the definition of broadband provided by Organisation for Economic Co-operation and Development (OECD) which considers the threshold download speed for broadband as 256 Kbps. Further multilateral international institutions such as ITU and World Bank seek the data related to broadband connections with speeds from 256 kbps onwards. The stakeholder further commented that one of the key objectives of NDCP- 2018 is *"Propelling India to the top 50 Nations in the ICT Development Index of ITU from 134 in 2017"*. Increasing the threshold of broadband speed, as well as changes in other principles making the definition of broadband more stringent and/or more narrow by definition, will result in under reporting actual broadband growth in India and thus impacting perception about

India's broadband penetration as well as India's ranking in the ICT Development Index of ITU.

- 2.10 A few stakeholders agreed with the approach of defining broadband based on core concepts like always-on, high-speed, etc. without going into the aspect of speed. As per one such stakeholder, this mode of defining Broadband is also successfully implemented in many countries across the world without much adverse impact.
- 2.11 Many associations, organisations, companies and a few TSPs are of the opinion that since the current definition of broadband captures neither the development of the technology nor the Indian consumers' appetite for high speed broadband services; it must be reviewed and redefined. One such stakeholder stated that communications technology has transformed radically, and entirely new markets for data services have emerged across the nation. Therefore, the definition of broadband must be based on a review of current state of technology as well as a desirable Quality of Experience (QoE). Numerous modern internet applications and use cases now require higher speeds than prescribed by the present definition.
- 2.12 While advocating for review of broadband definition, some of them have suggested common definition for fixed and mobile broadband, others have suggested separate definitions. Some of the common definitions proposed by stakeholders are as follows:
- i. Broadband is an always-on data connection, provided over fixed or wireless infrastructure, that is able to support multiple information and interactive services such as Internet access and on demand video, and offers a minimum downlink and uplink speed of 2 Mbps to an individual subscriber from the point of presence (POP) of the service provider intending to provide the Broadband service.
 - ii. Broadband should be defined as a data connection that is able to support interactive services including internet access and has the

- capability of minimum download speed of 20 Mbps and minimum upload speed of 10 Mbps, to an individual subscriber from the POP of the service provider intending to provide broadband service.
- 2.13 The stakeholders supporting separate definitions for fixed and mobile broadband again have widely varied opinions. Some of them are of the view that the definition of broadband must be based on speed and should be independent of technology. In recent times, especially during the Work from Home and School from Home scenarios where usage of peer to-peer applications such as video conferencing and social media have increased, the upload speed has also become significant. Hence, the definition should include both download and upload speeds. The definition needs to be independent of the capability of the underlying medium or technology adopted by each service providers and has to be based on actual speed delivered through fixed and mobile broadband services. They have suggested different threshold upload and download speeds for fixed and mobile broadband. One such stakeholder proposed the threshold upload and download speed as 25 Mbps for fixed broadband and 5 Mbps for mobile broadband. Another stakeholder suggested this threshold as 5 Mbps and 2 Mbps for fixed and mobile broadband respectively.
- 2.14 Some stakeholders are of the view that when compared to fixed broadband services, the mobile broadband based service depends on multiple aspects like available access and backhaul spectrum, the technology used, subscriber density and many other variable factors around the cell-sites like clutter of buildings, environments etc. Since deliverable speed depends on various spatial and time-dependent factors, it is not possible to deliver a sustained download or upload data speed. There could be range of experienced speeds even at the same location of the subscriber. Hence, definition of mobile broadband should be based on the capability of technology used to deliver the

broadband. Whereas the definition of fixed broadband should be based on various speed tiers instead of minimum speed.

Analysis of the issue and views of the Authority

- 2.15 There is a wide variation among the comments received from the stakeholders. Some of them are completely against any review so as to focus on proliferation and affordability of broadband services, while others are of the opinion that review of the broadband definition must keep in view the technological developments and demand of various applications. Some stakeholders advocated for download (DL) and upload (UL) speed linked definition for both fixed as well as mobile broadband, whereas others are of the view that speed linked definition for fixed broadband and technology dependent definition for mobile broadband would be more appropriate.
- 2.16 As discussed in paragraphs 3.10 to 3.18 of the CP and the summary of which is presented in Table 2.1 below, there is no universally accepted definition of Broadband.

Table 2.1: Global Broadband definitions

Country	Dependent on speed and/or technology	Broadband definition
USA	Speed	Minimum DL speed of 25 Mbps and UL speed of 3 Mbps
Canada	Speed	Minimum internet DL speed of 1.5 Mbps
Bangladesh	Speed	Always-on internet access, faster than traditional dial-up with bandwidth above 5 Mbps
United Kingdom	None	Always-on data service or connection providing a bandwidth greater than narrowband connections
Europe	None	High-speed internet access that is always-on and faster than the traditional dial-up access

Country	Dependent on speed and/or technology	Broadband definition
Brazil	None (Fixed broadband)	Fixed telecom and internet services with capability of transmission, emission and reception of multimedia data, regardless of speed
	Technology (Mobile broadband)	Access through mobile phones with 3G or 4G technology
Germany	Speed (Fixed broadband)	Capacity equal to or higher than 144 Kbps DL speed
	Technology (Mobile broadband)	3G and higher speed mobile technologies (HSPA or LTE) excluding GSM/GPRS technologies
ITU-T	Speed	Transmission capacity that is faster than primary rate ISDN, at 1.5 or 2.0 Mbps
OECD	Speed	Services enabling at least a 256 Kbps advertised DL internet access

2.17 Different organisations and countries have followed different approaches for defining Broadband. Some countries like Germany and Brazil follow separate definitions for fixed broadband and mobile broadband. Germany follows a speed linked definition for fixed broadband and technology dependent definition for mobile broadband. Brazil has not linked its fixed broadband definition with speed, whereas for mobile broadband it follows a technology dependent definition.

2.18 Some countries believe that the definition should not be dependent on technology or speed. This could be a possible approach for defining broadband as by following this approach it will not be required to revise the definition frequently. However, the Authority is of the opinion that in absence of any such benchmark in terms of threshold download

- speed, it would be difficult to assess the availability of adequate broadband connectivity, particularly in unserved and underserved areas. Further, absence of any benchmark speed in defining broadband may go against the interest of consumers. Hence, this approach may not be suitable for a developing country in India, where the broadband penetration is far less than ubiquitous.
- 2.19 Also, the terminology “Always on” may not sometimes be suitable for mobile broadband as in some older 3GPP releases, the network used to detach the user equipment from the network, if the equipment won’t transmit packets for a considerable amount of time.
- 2.20 India follows a speed linked common definition for fixed and mobile broadband both with a threshold download speed of 512 kbps. Internet access provided by any technology having the capability of delivering the minimum download speed of 512 kbps to an individual subscriber from the point of presence (POP) of the service provider is treated as broadband.
- 2.21 In rest of the world, Fixed Wireless Access (FWA) technology is also being used to provide fixed broadband connections. FWA technology uses mobile networks to deliver services. It could be used in India also for providing fixed broadband connections. Having two separate definitions for fixed and mobile broadband may create misunderstanding in the minds of users that whether the fixed or mobile broadband definition would be applicable for fixed broadband connections delivered using FWA technology which uses mobile networks.
- 2.22 In such conditions, keeping in view the fact that the level of digital literacy in the country is still not very high, the Authority is of the view that the common definition for fixed and mobile broadband should be continued at this stage.

- 2.23 The Authority is of the view that since 2013 when the extant broadband definition was adopted in India, there has been a major transformation in the technology, consumption of data, availability of throughput and applications.
- 2.24 In today's technological world, people are becoming more and more dependent on their broadband connection to access applications like messaging, conferencing, education, social media, entertainment, shopping, payments etc. For this, a fast, reliable, and responsive broadband connectivity is essential that enables to access all kind of applications whenever and wherever people want. Hence, the Authority considers speed as a major criterion for defining broadband.
- 2.25 Earlier broadband was mainly used for elementary applications like web browsing, email, voice chatting and text information. For these applications, download speed of 512 Kbps was considered enough. Now, broadband is used to access wide range of applications like video streaming, conferencing, gaming, video on demand, multimedia based distant learning etc. With increasing demand for data intensive applications and changing usage patterns, the speed requirements have also increased. These applications require a broadband connectivity with a speed above a certain threshold to enable the users to have a decent uninterrupted experience.
- 2.26 The Authority agrees with some of the stakeholders' view regarding the significance of broadband upload speed as well in the present scenario. The pandemic has forced unprecedented number of people to learn and work from home. Growing usage of both-way applications such as video conferencing and social media have increased importance of upload speed also. Accordingly, with the advent of new technologies an improvement in both download as well as upload speed of a broadband connectivity is observed simultaneously. Therefore, the Authority is of the view that upload threshold speed automatically gets upgraded with

an upward revision in threshold download speed and hence it is not required to include the upload threshold speed separately in the broadband definition.

- 2.27 In view of the above, the Authority is of the opinion that there is a need to revise the threshold download speed of data connection from the existing 512 Kbps to qualify as broadband.

How much should be the threshold Download Speed?

- 2.28 The Authority considered the following factors before arriving to a conclusion on the issue of threshold download speed to qualify as a broadband connection.

- i. While deciding the threshold download speed of a data connection which would be recognised as broadband, affordability of broadband is an important factor as a major chunk of the population is still off-line. There is no doubt that higher speed broadband can support more data intensive applications, but users of such data intensive applications are limited. Such data intensive applications are generally accessed through fixed-line broadband where different categories of broadband based on speed are possible. To categorise a data connection as broadband, the threshold download speed should be defined at a level which can meet needs of majority of broadband users. Revising the download speed threshold to over ambitious level may not be a prudent idea.
- ii. The threshold download speed for broadband definition should be such that it allows access to common applications, is comparable with global norms, and allows for optimal utilization of the existing infrastructure. Therefore, while defining broadband, in addition to affordability, more emphasis should be on inclusivity and meeting the requirements of common users.

- iii. Speed requirement varies depending upon the type of applications. Table 2.2 gives a tentative speed requirement for various applications⁹

Table 2.2: Download speed for various applications

Application	Level	Minimum Download Speed (Mbps)
General Usage		
General Browsing and Email	Basic	1
Streaming Online Radio	Basic	Less than 0.5
VoIP Calls	Basic	Less than 0.5
Social Media	Basic	1
Telecommuting	Advanced	5 - 25
File Downloading	Advanced	10
Watching Video		
Streaming Standard Definition Video	Mid-range	3 - 4
Streaming High Definition (HD) Video	Advanced	5 - 8
Streaming Ultra HD 4K Video	Advanced	25
Video Conferencing		
Standard Personal Video Call (e.g., Skype)	Basic	1
HD Personal Video Call (e.g., Skype)	Basic	1.5
HD Video Teleconferencing	Mid-range	6
Gaming		
Game Console Connecting to the Intern	Mid-range	3
Online Multiplayer	Mid-range	4

- iv. Hence, speed of 512 kbps is inadequate for accessing even some basic applications. From Table 2.2, it is apparent that for accessing basic internet applications, which are used by common users, threshold download speed of 2 Mbps is adequate.

⁹ FCC Broadband speed guide - updated Aug.2019

- v. Keeping in view the above, the Authority is of the view that upward revision of the threshold download speed to 2 Mbps in broadband definition would be appropriate.
- vi. At the end of 2020, there were 747.4 million broadband subscribers, out of which 724.46 million were mobile broadband subscribers and 22.94 million were fixed broadband subscribers. Mobile broadband is being delivered using 3G and 4G technologies, which are already capable of delivering download speed of 2 Mbps and above. Similarly, the technologies used to provide fixed broadband in India like DSL, Cable modem, and FTTH are also capable of supporting a download speed of 2 Mbps and above. It indicates that the technologies in use for broadband connections are capable of supporting threshold download speed of 2 Mbps. Therefore, revising the threshold download speed to 2 Mbps seems to be very much appropriate as it can take care of the optimal utilisation of the existing infrastructure and simultaneously can also serve the requirement of all basic modern internet applications. The proposed upward revision of the threshold download speed of broadband will encourage ISPs and TSPs to upgrade their existing broadband networks so that their existing data connections could qualify into broadband category. It will also enable users to have a better quality of experience.
- vii. ICT Development Index (IDI), which has been published annually since 2009, is a composite index used to monitor and compare developments in ICT among countries. The IDI is calculated via indicators capturing the ICT intensity, individuals' access, and usage (individuals using the Internet, fixed broadband subscriptions, and mobile-broadband subscriptions). One of the strategic objectives of the NDCP-2018 is "to propel India into the top 50 nations in the ICT Development Index of ITU from 134 in 2017." Keeping in view the existing broadband subscribers mix, the proposed upward revision in the threshold speed

for defining broadband would not adversely affect this objective of the NDCP-2018 also.

- 2.29 Considering the above, the Authority recommends the following definition for broadband:

Broadband is a data connection that is able to support interactive services including Internet access and has the capability of the minimum download speed of 2 Mbps to an individual subscriber from the point of presence (POP) of the service provider intending to provide Broadband service.

B. Categories of Broadband

- 2.30 Internet speed is one of the main decision drivers when choosing a broadband plan or evaluating a broadband service. High speed Internet is practically a necessity for today's average household. Consequently, broadband in many countries is categorised in terms of upload and download speeds. To solicit stakeholders' views in the context of categorisation of Broadband, the issue raised in the CP was as follows:

“Depending on the speed, is there a need to define different categories of broadband? If yes, then kindly suggest the categories along with the reasons and justifications for the same. If no, then also justify your comments.”

Comments from the stakeholders

- 2.31 Majority of the stakeholders are of the view that at this stage there is no requirement to categorize broadband in different categories and the key focus should be towards ensuring availability of broadband throughout the country. Few such stakeholders have stated that India should focus on broadband penetration to more households, offices, enterprises, and buildings rather than the broadband connection capacity. This would help in broadening digital connect for end

customers. As per one such stakeholder, throughput speed of more than 512 Kbps on broadband connection is sufficient to carry all data services, including video conferencing, e-commerce, digital financial services, and any other peer to peer services.

2.32 Few other stakeholders having similar opinion have stated that speed-based differentiation in fixed line points is already available and all service providers are offering the same, therefore, defining different speed based categories of broadband would be just a nomenclature change, which is feasible in wireline segment. However, in wireless, the speed-wise differentiation is technically not possible. Thus, only feasible differentiation in wireless is based on technology, which is already implemented. As per these stakeholders, TRAI in its direction dated 31st October 2016 on “Delivering Broadband services in a transparent manner by providing adequate information to broadband consumers” has mandated that for the Fixed Broadband services the TSPs should provide the speed of connection for data allocation under a plan and for Wireless services it should inform the technology used for data usage entitlements. Thus, they do not see any need for further modification by means of nomenclature change for wireline subscribers.

2.33 Very few TSPs, one association and few companies / organisations are in favour of speed-based categorisation of broadband. Some of them are of the view that categorisation depending on speed may be done for fixed wireline broadband whereas there should be no such categorisation for mobile broadband. They have proposed to categorise wireline broadband based on download speed as follows:

Broadband category	Stakeholder I	Stakeholder II
Basic Broadband	2-30 Mbps.	2-10 Mbps.
High Speed Broadband	30-100 Mbps	10-100 Mbps
Ultra-High-Speed Broadband	above 100 Mbps	Up to 1 Gbps

These stakeholders are of the opinion that categorisation of the broadband service will help the customer in choosing the appropriate plan. Moreover, it will help the Government, the TSPs and the Regulator to know the penetration of different categories of the broadband connections in the country. This will facilitate the future planning and roll-out of the networks.

2.34 In support of categorisation of broadband another stakeholder has argued that the pandemic has significantly changed the consumers need and the usage of Broadband services. Hence, there is a need for categorization of broadband services based on speeds so as to enable common customers to make an informed decision and differentiate High Speed broadband service providers. This stakeholder also stated that the Broadband speeds (both upload and download) can be categorised in the manner suggested below as followed in the European countries

‘Basic broadband’ for speeds starting from 2 Mbps up to 10 Mbps;
‘Fast broadband’ for speeds starting from 10 Mbps to 100 Mbps;
‘Ultra-fast broadband’ for speeds higher than 100 Mbps

2.35 One of the associations supporting the idea of categorisation is of the view that different categories of broadband e.g. Basic, Fast, and Ultra-Fast would help set optional thresholds that can serve distinct use cases. It has recommended a compliance definition of (basic) broadband as a network connection that provides at a minimum 2 Mbps download and upload connectivity, which is in line with the goals set forth in the National Telecom Policy, 2012, as well as with the definition adopted by the ITU. This stakeholder has defined Fast broadband and Ultra-Fast broadband as an always on data connection that possesses all the characteristics of basic broadband but offers a

minimum downlink and uplink speed of 15 Mbps and 30 Mbps respectively.

Analysis of the issue and views of the Authority

- 2.36 As per “ITU – UNESCO Broadband Commission’s State of Broadband 2018 Report”, many countries still follow the OECD definition for broadband, which considers the threshold download speed as 256 Kbps. Periodically, OECD member countries suggested that the threshold speed may be raised, but without consensus on a new baseline, these countries instead decided to introduce speed tiers for reporting broadband subscriptions like 256 Kbps to 1.5/2 Mbps, 1.5/2 Mbps to 10 Mbps and so forth with increasing tiers of service up to 1 Gbps.
- 2.37 The ICT Development Index (IDI), which has been published by ITU annually since 2009, is a composite index that combines 11 indicators into one benchmark measure. It is used to monitor and compare developments in information and communications technology (ICT) between countries and over time. The methodology of computation of IDI was revised by ITU in 2018 and some new indicators were included after dropping some old indicators. One such newly introduced indicator was Fixed-broadband subscriptions by speed tiers, i.e., percentage of total fixed broadband connections in the speed tiers 256 kbit/s to 2 Mbit/s, 2 to 10 Mbit/s and Equal to or above 10 Mbit/s.
- 2.38 The European Commission has defined three categories of fixed broadband in terms of download speeds¹⁰ –
- (a) ‘Basic broadband’ for speeds between 144 Kbps and 30 Mbps;
 - (b) ‘Fast broadband’ for speeds between 30 and 100 Mbps; and
 - (c) ‘Ultra-fast broadband’ for speeds higher than 100 Mbps.

¹⁰ European Court of Auditors special report: Broadband in the EU Member States 2018

In 2010 the EU launched its Europe 2020 strategy, which included targets to provide all Europeans with access to fast broadband with speeds in excess of 30 Mbps by 2020; and more than half of European households with access to ultra-fast connections of more than 100 Mbps. Defining such levels of access by the EU Digital Strategy and these tiered definitions have led to increased competition within and among EU nations to maximize the reach of better, faster and more reliable broadband infrastructure and access¹¹. These targets have become a reference for public policy throughout the EU and provided direction to public and private investment.

2.39 Fixed broadband services in the UK are categorized based on download speed¹² as follows-

- (a) Decent – offers download speed at least 10Mbit/s and upload at least 1Mbit/s
- (b) Superfast – offers download speed of at least 30Mbit/s
- (c) Ultrafast – offers download speed greater than 300Mbit/s
- (d) Full fiber – offers download speeds of 1 Gbit/s.

For mobile broadband no such categorisation based on download or upload speeds have been observed.

2.40 The UK Government's policies are formulated to support the roll-out of the category wise broadbands. The broadband categories also have enabled the UK Government to launch a variety of programs achieving broadband access based on the speeds to the targeted customers. As of December 2020, the category wise broadband coverage achieved in the UK¹³ is as follows:

¹¹ <http://point-topic.com/germany-leads-europe-in-superfast-broadband/>

¹² UK report: Connected Nations 2018

¹³ U.K. Connected Nations 2020 Report

- 99.4% of UK premises were able to access a decent broadband download speed of 10 Mbps and an upload speed of 1 Mbps.
- 96% of UK premises had access to superfast connections (30 Mbps and above)
- 53% of UK premises had access to ultrafast broadband (>300 Mbps).
- 18% of the UK homes (5.1 million homes) had access to Full-fibre broadband

2.41 Hence, categorisation of fixed broadband based on speed tiers has helped the nations in defining their targets and assessing their achievements more objectively. Moreover, this has helped the Government, Service Providers, and the Regulators to analyse the penetration levels of different categories of the broadband connections in the country. This has facilitated their future planning and roll-out of the networks. Given these facts and the fast pace of change in consumer and business needs from broadband, the Authority is of the opinion that categorisation of fixed broadband should be introduced.

2.42 The Authority agrees with the view of some of the stakeholders that improving the broadband proliferation should be the foremost priority at this juncture, but if this proliferation is accompanied with good speed as well, that will be an added advantage for the customers. It will also encourage the service providers to upgrade their broadband infrastructure and while recommending any such categorisation, the inherent limitation of mobile broadband also needs to be taken care of and therefore the Authority feels that any such categorisation in terms of download speed shall be appropriate for fixed broadband only and not for mobile broadband. European Commission and the United Kingdom have also defined the categorisation for fixed broadband only.

Suitable speed tiers for categorisation of fixed broadband in India

- 2.43 Some online activities need faster connection speeds than others to work well. For example, streaming an HD film requires a faster speed than surfing the web or accessing emails. Now a days, several educational and infotainment content are being streamed in HD formats. As market's shift towards streaming of HD or more superior video content, download speed requirements become a bigger issue. If a user wants to stream 4K content, he or she will need a connection of at least 25 Mbps. Even streaming 1080p HD video will require a 10 Mbps download speed for smooth performance. Table 2.2 gives a tentative speed requirement for various online activities. In this digital age, increasing use of cloud computing, AI, AR, and VR by individuals will further increase demand for super-fast and reliable broadband connectivity.
- 2.44 An Indian household may have 2 to 10 devices connected to a fixed broadband connection simultaneously for accessing the various internet enabled services and applications like web browsing, e-mails, social media applications, video calling, online gaming, streaming music, video streaming etc. As the number of connected devices (PCs, laptops, tablets, gaming consoles, mobiles etc.) per household increases, so will be the requirement of higher speed broadband. The speed requirements vary based on the applications, location, and number of users, and these needs will continue to change as technology advances. The Table 2.3 represents the download speed requirement for various usage scenarios in Indian households.

Table 2.3: Download Speed for Light, Moderate and High use cases

No. of devices	Light Use cases (Web surfing, email, social networking, audio streaming)	Moderate Use cases (Light use cases plus online schooling, multiplayer gaming, video conferencing, video streaming)	High Use cases (Moderate use cases plus concurrent 4K and 8K streaming, faster downloading of game updates, faster downloading and uploading of large files)
1 to 2	2 Mbps to 10 Mbps	10 Mbps to 50 Mbps	50 Mbps to 300 Mbps
3 to 5	10 Mbps to 50 Mbps	50 Mbps to 300 Mbps	More than 300 Mbps
More than 5	50 Mbps to 300 Mbps	More than 300 Mbps	More than 300 Mbps

2.45 Institutions like hospitals, schools, business establishments, etc. use applications such as sharing of health records and educational materials, performing virtual consultations, online classes, and online testing. Other than this, in a pandemic induced work from home scenarios, large number of IT professionals are heavily dependent on cloud-based computing and storage resources. Speeds beyond 300 Mbps are good for AI or Machine Learning (ML) workloads, and one can leverage the speed and power of GPUs for training without the hardware investment. All these applications have a requirement of broadband connectivity with speed beyond 300 Mbps with very high reliability and very low latency.

2.46 Keeping in view the above, the Authority is of the view that fixed broadband connections should be classified into 3 different categories as follows:

- i. Basic Broadband which is suitable to serve up to five online individuals simultaneously who are accessing light applications with a download speed from 2 Mbps to 50 Mbps.

- ii. Fast Broadband which is suitable to serve up to five online individuals simultaneously who are accessing moderate level applications with a download speed from 50Mbps to 300 Mbps.
- iii. Super-Fast Broadband which is suitable to access high-use applications with a download speed greater than 300 Mbps. It would also be suitable for institutions like hospitals, schools, business establishments, and IT professionals working from home using cloud-based resources.

2.47 Such categorization of fixed-broadband connections in terms of download speed would provide a much needed transparency to subscribers and help in fulfilling the demand of different segments of consumers at competitive prices. Service providers can launch different subscription plans for different categories of fixed broadband and consumers would have a choice to select a particular plan like basic, fast, or super-fast broadband depending upon affordability and their requirement. The consistent service and customer empowerment in choosing appropriate broadband categories are key for ISPs to give themselves an edge over their competitors and further strengthens the broadband market.

2.48 Hence, the Authority recommends that:

Fixed broadband should be categorized as follows:

- (a) 'Basic Broadband' – A broadband connection having capability of delivering download speed equal to or greater than 2 Mbps and less than 50 Mbps to an individual subscriber.**
- (b) 'Fast Broadband' – A broadband connection having capability of delivering download speed equal to or greater than 50 Mbps and less than 300 Mbps to an individual subscriber.**

(c) ‘Super-fast Broadband’ – A broadband connection having capability of delivering download speed equal to or greater than 300 Mbps to an individual subscriber.

C. Measuring Broadband Speed

2.49 Measurement of broadband speed helps in assessing the performance of broadband services being delivered by TSPs/ ISPs. It aims to increase transparency for subscribers and encourage performance-based competition. However, the speed measurement methodologies suffer from various challenges as discussed in the CP. Through the CP, the stakeholders were requested to provide their inputs on “*need to introduce the speed measurement program along with the methodology to be implemented for measuring the speed of a customer’s broadband connection for fixed line and mobile broadband separately.*” Comments received from the stake holders and analysis of the above-mentioned issues are presented in the following sections.

Comments from the stakeholders

2.50 Majority of the service providers and their associations, organisations, and companies are of the opinion that there is no need to introduce speed measurement program in the country. As per these stakeholders, currently, the Authority already has its mobile app (MySpeed App) that allows users to measure the QoS parameters such as speed and packet loss of wireless data networks and report these back to the Authority. Further, the consumers also have the option to use mobile apps of other private agencies to measure the achieved broadband speed. Thus, the customers already have enough choices in terms of tools and applications to measure the speed of broadband, and no mandate on the methodology needs to be given.

- 2.51 One such stakeholder is of the view that introducing a single national level speed measurement program to cover various services is not practically feasible. At the same time the independence and effectiveness of such measurements is questionable. As per this stakeholder, it will be an additional financial burden on the sector without bringing any additional benefits.
- 2.52 Few stakeholders are in favour of introducing the speed measurement program in the country for measurements of both uplink and down link speeds. As per one such stakeholder, such programs can accurately assess and improve network performance across the nation. This stakeholder has recommended fixed broadband measurement to be carried out at customer's router or the nearest / last POP. On the other hand, for mobile broadband it has suggested measurements based on a combination of the median of data submitted by operators, crowdsourced speed measurement apps such as Ookla, actual results from periodic drive tests, and customer surveys.
- 2.53 Other stakeholders having similar opinion have suggested that the speed tester should be hosted by each ISP/TSP in such a way that the speed measurement application measures the speed through its own access network up to Internet Gateway (IGW) and does not require any third-party tools. Speed test tools hosted in ISP premises should be checked regularly by independent bodies nominated by TRAI for avoiding any misleading of information by ISP/TSP to customers.

Analysis of the issue and views of the Authority

- 2.54 As brought out in the CP, broadband measurement programs have been launched in developed countries like US, UK and Australia for monitoring consumer broadband performance as a part of their National Broadband Plans. All these countries have quite high broadband proliferation and speed, and these measurement programs

aim to increase transparency and encourage performance-based competition in these countries.

- 2.55 As pointed out by the stakeholders, speed measurement of mobile broadband is being done through TRAI MySpeed App. This is a crowd-sourced app allowing users to measure the QoS parameters of mobile broadband and report it back to the Authority. Test results collected from App users are processed and the analysis of the results are published on the portal <https://myspeed.trai.gov.in/>. The analysis also provides a comparative picture of the mobile broadband speeds achieved on various Telecom Service Providers (TSPs)' networks. The Authority agrees with the stakeholders that in addition, mobile broadband consumers also use mobile apps of other private agencies like Ookla, Open signal, etc. to measure the achieved broadband speed.
- 2.56 Unlike mobile broadband speed measurement App of TRAI, presently no uniform mechanism is available in the country for speed measurement of fixed broadband connections. This becomes especially more relevant when the fixed broadband connections are going to be categorised based on speed. Therefore, the Authority does not agree with views of service providers that there is no need to introduce speed measurement program in the country. In fact, on this issue, the Authority agrees with the view of some of the stakeholders that speed measurement programs are essential to ensure Quality of Service (QoS) of a fixed broadband connectivity. It helps in increasing the transparency to consumers and assessing the performance of broadband services being delivered by TSPs/ ISPs. The Authority is of the opinion that such type of measurement programs is also very much required to assess achievement of national broadband speed goals set by NDCP-2018. As this exercise relates to QoS regulation, the Authority, in consultation with stakeholders would finalise the specifics of measurement methodology for fixed broadband also.

CHAPTER 3

BROADBAND PROLIFERATION ISSUES

- 3.1 The benefits of today's information-based economy depend on ubiquitous broadband connectivity. Broadband connectivity initiatives should focus on bringing better technologies and services to those already connected, and to connect the unconnected. The focus should be not only on infrastructure and supply-side initiatives, but also on thoughtful approaches to demand-side issues, meeting the needs and expectations of those who are not connected, while ensuring individuals who are already online continue to see value in continued participation.
- 3.2 The current broadband penetration in India is at around 55%, which is at a much lower level compared to China at 95%, and other European nations at around 95 to 115%¹⁴. Mobile broadband penetration has grown strongly in India over the past few years, driven by a strong and growing mobile subscriber base and adoption of 4G LTE services. Although the proliferation of mobile broadband has improved a lot, it still has much room for improvement. Fixed line broadband coverage on the other hand is not much encouraging. At the end of December 2020, there were 22.94 million wired or fixed broadband connections, which implies that only 9.1 per 100 households¹⁵ have access to fixed line broadband. Addressing the issues involved in the broadband proliferation would give a big boost to our GDP growth rate and improve the quality of life of our citizens.

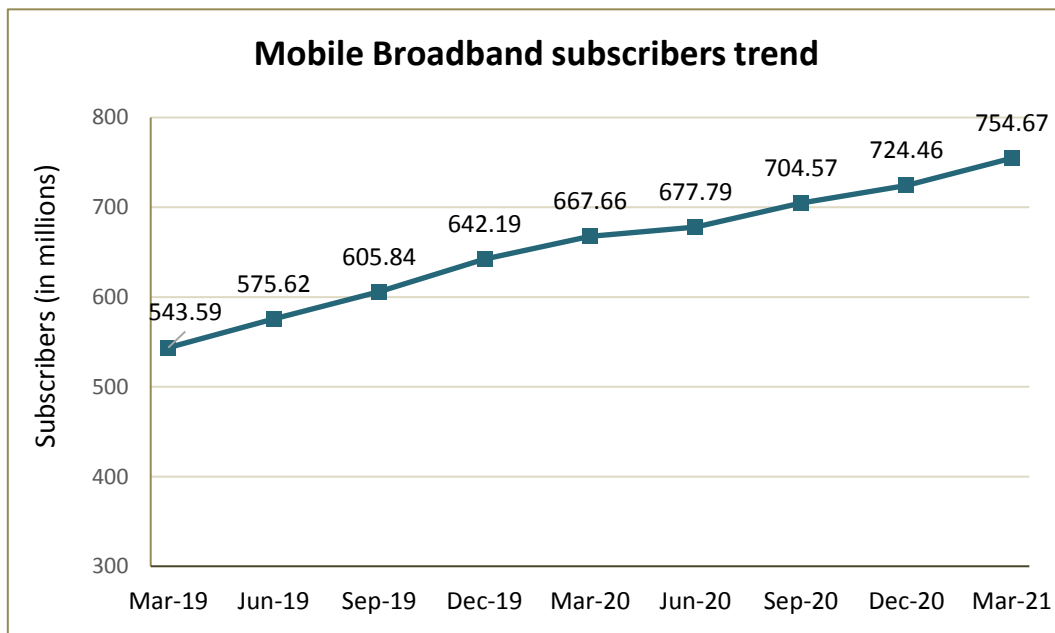
¹⁴ TRAI Performance Indicator Report October - December, 2020, Nokia MBit 2020 Report.

¹⁵ Based on census 2011, India has 249.5 Million households

I. Mobile Broadband proliferation

3.3 Mobile broadband has brought unprecedented convenience to our daily life, work, and learning. Internet access anytime and anywhere has become a basic necessity for us, as a result of which total data traffic in India has increased by almost 44 times during the last four years¹⁶, which is one of the highest in the world. This could happen due to rapid adoption of 4G. Quarterly growth trend of mobile broadband subscribers can be seen in Figure 3.1. Video viewership fuelled by growth in number of OTT platforms, increased streaming of regional language content, and cheaper subscription plans have continued to drive monthly mobile broadband usage growth in the country. Only 9.1% of households have fixed broadband, which shows that mobile broadband is a popular way to access the internet for majority of the Indian residents.

Figure 3.1: Mobile broadband subscribers growth trend



¹⁶ Nokia MBiT 2020 Report

3.4 Even though the growth in mobile subscribers and mobile broadband traffic has been unprecedented, nearly 45% of the population is still unconnected. Those that are not connected can be split into two groups – the ‘uncovered’ and the ‘covered but not connected’. The ‘uncovered’ are those who do not have access to mobile broadband network coverage. This is referred to as the coverage gap. The ‘covered but not connected’ are those who live within the footprint of a mobile broadband network but are not using mobile internet services. This is referred to as the usage gap. This issue was raised in the CP as follows:

“Even though mobile broadband services are easily available and accessible, what could be the probable reasons that approximately 40% of total mobile subscribers do not access data services? Kindly suggest the policy and regulatory measures, which could facilitate increase in mobile broadband penetration.”

Comments from the stakeholders

3.5 The stakeholders have divided opinions on this issue. Some of them consider factors such as lack of digital literacy, affordability of smartphones, lack of digital content in local language, etc. responsible for the limited adoption of mobile broadband. As per these stakeholders, adoption of web-based devices and use of internet requires a basic level of literacy. However, because of lack of primary education and relatively high rate of illiteracy, large sections of the population are not familiar with the method to access and use data services. While availability of multilingual keypads of mobile devices in Indian languages has reduced the language barrier there is still a large gap between availability and usage due to the high digital illiteracy.

3.6 These stakeholders have also emphasised that due to many different socio-cultural profiles in India, there is a need for relevant content

in local languages. However, currently most of the content available on the internet is in English language which makes it difficult for users with English language limitations to find anything useful. They have further suggested that Government initiatives to digitise services and enable access to Government services can significantly help in demand generation. As per these stakeholders, cheaper Smartphones can be a big enabler for use of broadband services. They have suggested that Government can consider incentives for local manufacturing of devices which can further result in device price reduction.

3.7 Whereas few other stakeholders think that many mobile subscribers are still using 2G, which does not support broadband. According to them, the main reason of consumers still not opting for the wireless broadband is the intentional trapping of consumers in 2G incoming plans by some TSPs in order to provide longevity to their out-of-date 2G equipment. They have requested the Authority to revisit this issue and take active measures to stop subsidization of 2G technology and ensure that migration to the newest technology is facilitated in all manners, including use of USO fund for necessary upgradation of consumer devices. This will automatically move all consumers to data-based technologies and would improve the penetration.

3.8 For improving the broadband adoption, these stakeholders have suggested the incentives such as reduction in USO levy from 5% to 2% of AGR, License Fee reduction from 3% to 1% of AGR, Spectrum Usage Charge of < 1% for all future auctions, wireline revenue to be exempted from License fee, exemption of GST on Government Payments such as Spectrum Auction payment, LF, SUC payment; refund of accumulated input GST credit, waiver of custom duty for all CPEs and network elements involved in provisioning of the

broadband and a further 0.5% reduction in SUC rate for next two years to operators having 4G/5G BTSs at more than 90% of their total BTS.

3.9 Some stakeholders have also emphasized on increasing the availability of access and backhaul spectrum for mobile networks and streamlining procedures for establishment of towers.

3.10 Many stakeholders are of the view that the unviable business model is largely responsible for the poor proliferation of broadband. According to these stakeholders, the following measures need to be taken immediately to ensure swift proliferation of broadband services:

i. Reviewing of Levies and Taxes:

The levies and taxes in India on the Indian telecom sector are one of the highest in the world. There is an urgent need of reforming the licencing and regulatory regime to catalyse investments and innovation and promote Ease of Doing Business through review of levies and fees including License Fees, Spectrum Usage Charges, and exemption / reduction in GST to allow the operators to have additional funds that can be ploughed back in the network.

ii. Review of Definition of Adjusted Gross Revenue (AGR):

DoT must revisit the definition of Gross Revenue and Adjusted Gross Revenue. The new definition should be fair, rational, proportionate, and based on global industry best practices. It should include only telecom revenues.

iii. Rationalization of Spectrum prices – both access and backhaul spectrum:

Instead of setting very high reserve prices, the spectrum price should be rationalized and lowered. Reasonable spectrum pay-outs will incentivize the operators to buy more spectrum rather than rely on

network densification to meet the growing customer demand. To cater to the access network's capacity, the assignment of adequate microwave carriers, including spectrum in the E and V band at a reasonable price, be done to meet the requirements of backhaul. The above provisions will result in lesser interference and better speed and quality.

iv. Right of Way (RoW) permissions:

There should be a single window for RoW permissions for laying fiber and installation of the tower. The RoW charges should not be exorbitant and should be commensurate only with the restoration charges to ensure the viability and affordability of services.

Analysis of the issue and views of the Authority

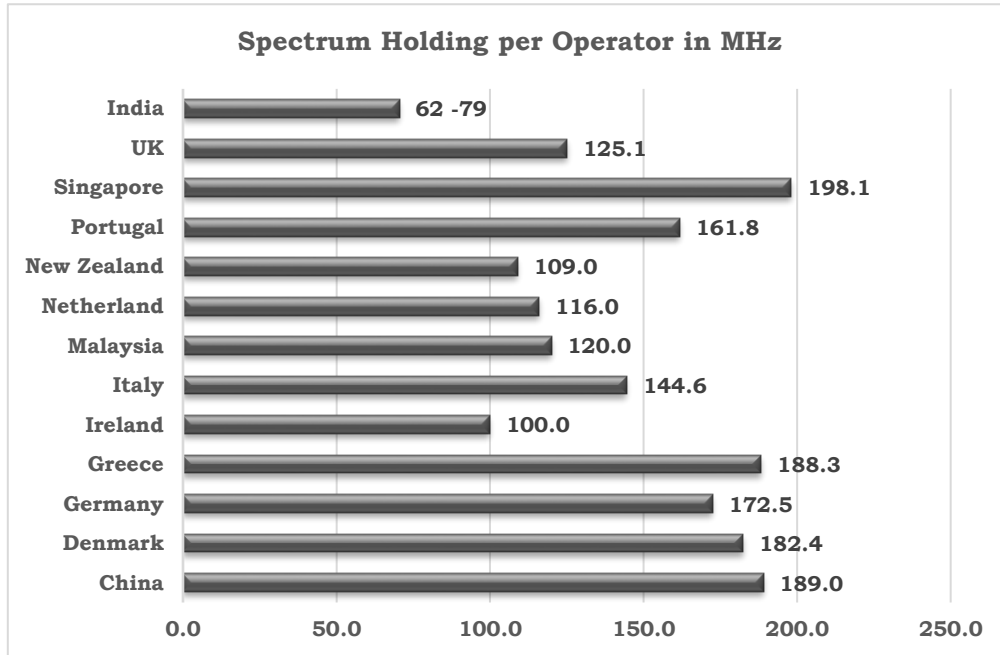
- 3.11 The Authority disagrees with the view that consumers are trapped in 2G by some service providers. In fact, individual subscribers of mobile services are free to choose technology and operator of their choice. Subscribers can switch operators without changing mobile number using Mobile Number Portability (MNP) facility. Further, as demanded by some of the stakeholders, review of levies and fees including License Fees, Spectrum Usage Charges, and exemption/reduction in GST are beyond the scope of these recommendations.
- 3.12 The Authority agrees with the stakeholder's opinion that from a consumer point of view non-affordability, low levels of literacy and digital skills, a perceived lack of relevance, and safety and security concerns could be the barriers to mobile broadband adoption. Addressing these barriers is critical to further reduce the usage gap and drive digital inclusion.
- 3.13 Increasing availability of Government and financial services through internet; and use of online platforms for education and

entertainment is helping in overcoming some of these barriers like literacy, digital skills, and relevance. As per the international standards, mobile data continues to be affordable in India costing less than 1% of per capita Gross National Income (GNI). Further the Government has already implemented the Production Linked Incentives (PLI) scheme for mobile manufacturing in the country which may further improve the mobile handsets affordability.

- 3.14 To address concerns relating to digital literacy and skills, the Government has already implemented the Digital Saksharta Abhiyan (DISHA) or National Digital Literacy Mission (NDLM) to impart IT training to 52.5 lakh persons¹⁷, including Anganwadi and ASHA workers and authorized ration dealers in all the States/UTs across the country so that the non-IT literate residents are trained to become IT literate so as to enable them to actively and effectively participate in the democratic and developmental process and also enhance their livelihood.
- 3.15 A comparison of average spectrum held by service providers in India vis-à-vis other countries in sub 3GHz range is given in Figure 3.2.

¹⁷ <https://vikaspedia.in/e-governance/digital-india/national-digital-literacy-mission>

Figure 3.2: Spectrum holding per operator in various countries¹⁸



From the above chart it can be seen that spectrum holding per telecom operator in India is still very less as compared to other countries. The Authority agrees with the stakeholders' view that total spectrum assigned for commercial telecom operation in India is less as compared to other countries. But, at the same time it has also been observed that even spectrum put to auction remains unsold in many frequency bands. Hence, the willingness of TSPs to increase the spectrum resources is also an issue. However, the Authority is of a considered view that auction of globally harmonized spectrum should take place at regular intervals. These issues have been deliberated in more detail in the "mobile broadband speed enhancement" section in Chapter 4 of this Recommendation.

¹⁸<https://www.desktopsdr.com/worldwide-frequency-allocation-tables> & other websites

- 3.16 Tower infrastructure is a key enabler for delivering wireless broadband to the masses. However, the rollout of this infrastructure is faced with challenges across various areas such as availability of power, RoW issues as pointed out by the stake holders. These issues have been dealt with in detail in Chapter 5 of this Recommendation.
- 3.17 Backhaul networks connect the radio access network (RAN) to the core network. Fibre is often considered the most suitable type of backhaul for mobile networks due to its longevity, high capacity, higher reliability, and ability to support very high-capacity traffic. However, fibre network coverage is not ubiquitous in all cities – and even less so in suburban and rural areas. As per the details provided by TSPs about 34% of Base Transceiver Station (BTS) sites have been connected to fibre network in the country. This issue has been deliberated in detail in speed enhancement part of the Recommendations.
- 3.18 To complement the fibre backhaul, MWA carriers are required. In its Recommendations of August 2014 and November 2015 on ‘Allocation and Pricing of Microwave Access (MWA) and Microwave Backbone (MWB) RF carriers’, the Authority recommended that *“in order to increase broadband penetration in India, the usage of high capacity backhaul E-band and V-band may be explored for allocation to the telecom service providers. The Authority recommended that these bands should be opened with ‘light touch regulation’ and allotment should be on a ‘link to link basis’ at a nominal fee.* The same were reiterated by the Authority in its Recommendations “Delivering broadband quickly: What do we need to do?” dated 17th April 2015.

II. Wi-Fi Proliferation

- 3.19 Wi-Fi has become increasingly important in connecting people and devices everywhere. Hundreds of millions of people rely on Wi-Fi to connect billions of devices every day, and studies show that this is

increasing rapidly.¹⁹ This role will only increase in the future, since Wi-Fi technology will be an essential complement to 5G networks, as highlighted by the recently released Cisco VNI Mobile Report showing that mobile traffic offloaded to Wi-Fi increases with each successive technology generation.²⁰ Using Wi-Fi hotspots to fill the gap in cellular coverage is a widely adopted trend globally. In fact, as per industry reports, in most of the major economies, for 50 to 70 % of their total usage time, mobile users use Wi-Fi technology to communicate. In case of India, this figure is less than 10%. This is mainly due to the inadequate proliferation of public Wi-Fi hotspots.

3.20 While during the last decade, the proliferation of public Wi-Fi hotspots registered an exponential growth globally in India the figure is not so encouraging. For example, in comparison to millions of public Wi-Fi hotspots operating in the USA and European countries, we have less than 0.5 million public Wi-Fi hotspots²¹ in the country. The Authority noted several constraints in provisioning of Wi-Fi Networks and, therefore, issued a Consultation Paper on 13th July 2016 entitled “Proliferation of Broadband through Public Wi-Fi Networks”. After receiving several comments and suggestions from the stake holders, the Authority issued its Recommendations on 9th March 2017²² on this subject.

3.21 Based on this recommendation, the Government has recently approved the establishment of public Wi-Fi networks across the country. These would be provided through Public Data Offices (PDOs). This Central Government's scheme is called the Prime Minister Wi-Fi Access Network Interface (PM-WANI) and is being seen

¹⁹<https://www.abiresearch.com/press/wi-fi-celebrates-20-years-more-20-billion-anticipated-device-shipments-over-next-six-years/>

²⁰ Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017–2022

²¹ <https://vikaspedia.in/e-governance/digital-india/public-wifi-hotspots>

²² https://traigov.in/sites/default/files/WiFi_Recommendation_09032017.pdf

as an attempt by the Government to elevate wireless internet connectivity in the country. As per this scheme, Public Data Offices (PDOs) will be established on the lines of Public Call Offices (PCOs). These PDOs will establish, operate, and maintain only the WANI compliant Wi-Fi access points to deliver broadband services to its subscribers. Under the scheme, PDO Aggregators (PDOAs) will also be set up. These will perform the function of authorisation and accounting of users. App Provider will develop an application to register users and discover and display PM-WANI compliant Wi-Fi hotspots in the proximity for accessing the internet service and also authenticate the potential Broadband users. The potential user who wants to access Broadband through Public Wi-Fi will need to download the relevant App, get authenticated, and thereafter access Broadband at any Public Wi-Fi Hotspot. When the user reaches a Public Wi-Fi Hotspot, the App on the mobile phone will show various available networks. The user can then choose the Public Wi-Fi network of choice, pay an amount – either online or through voucher – and use the network till the balance is exhausted.

- 3.22 A central registry has already been setup which will maintain the details of App Providers, PDOAs, and PDOs. To facilitate ease of doing business and encourage local shops and small establishments to become Wi-Fi providers, it has been approved that the last-mile Public Wi-Fi providers require no license, no registration, and will not need to pay any fees to DoT. In fact, PDOAs, who will aggregate PDOs will also not require any license. These PDOAs will only have to register, for which no fees will be charged. The registration process will be completed within 7 working days of the receipt of applications.

3.23 Since the launch of PM-WANI on 7th January 2021, 89 registrations²³ for PDOAs and 43 registrations for App provider have been issued. It is expected that with public Wi-Fi Broadband, the user experience and Quality of Service for Broadband will be improved significantly. This service will be especially useful in rural areas where Public Wi-Fi Hotspots are also being created under BharatNet. Proliferation of Public Wi-Fi Hotspots will lead to increased employment for small and micro entrepreneurs and provide them with an additional source of income. The telecom and internet service providers will also be benefitted due to the sale of bandwidth to PDOs.

Comments from the stakeholders

3.24 As per some of the stakeholders, wireless communications have become a lifeline for connecting people when social distancing and physical isolation have become imperative due to the global pandemic caused by the COVID-19. As per these stakeholders Wi-Fi already carries more than half of the internet's traffic and offloading mobile data traffic to Wi-Fi has been a critical support for our mobile cellular networks from being overwhelmed but is getting choked due to limited spectrum. Few stakeholders have stressed upon the need to make more spectrum available for Wi-Fi for improving wireless broadband proliferation.

3.25 As per these stakeholders, the existing Wi-Fi spectrum footprint, divided into 2.4 GHz, the lower part of 5 GHz and a separate portion of 5 GHz in the upper part of the band does not have a sufficient number of 80 and 160 MHz wide channels to serve current generation 802.11ax / Wi-Fi 6 standards. Nor will the existing 5 GHz spectrum be able to address future 802.11be / Wi-Fi 7 standards which rely on 320 MHz wide channels. They expect that the existing

²³ <https://saralsanchar.gov.in> accessed on 13.08.2021

spectrum will become more crowded and congested as demand grows. Additional spectrum in 6 GHz band is needed if Wi-Fi is to continue to play its critical role in the broadband ecosystem.

- 3.26 These stakeholders are of the view that opening up the full 6 GHz band for license-exempt use will have tremendous benefits for connectivity in India. 6 GHz Wi-Fi (Wi-Fi 6E) will support popular 5G use cases, such as high definition (HD) video streaming, Wi-Fi calling, smart home devices, hotspot access, automation of city-wide services, augmented reality and virtual reality (AR/VR) applications, health monitoring devices, wearables, and seamless roaming. 5G and Wi-Fi 6 together will deliver dramatically better performance to consumers, remote workers, and organizations.

Analysis of the issue and views of the Authority

- 3.27 The Authority agrees that Wi-Fi could be a suitable technology to take last mile broadband connectivity to rural and uncovered areas. International standards development bodies see Wi-Fi as a highly complementary technology to 5G. This further reinforces the business case for large scale Wi-Fi hotspots deployments in future. However, in India the existing spectrum bands for Wi-Fi i.e. 2.4GHz and 5GHz have still not been fully utilised. Therefore, the Authority is of the view that at this stage the stakeholders should focus on increasing the Wi-Fi hotspots proliferation and offloading of cellular traffic to Wi-Fi. This would ensure optimal utilisation of the available spectrum resources. The need for de-licensing of additional spectrum, which could be used for Wi-Fi, should be examined subsequently at a later date.

III. Fixed Line Broadband proliferation

3.28 The Fixed broadband penetration in India is among the lowest in the world at only 1.69 per 100 inhabitants or 9.1 per 100 households²⁴. Government initiatives for increasing broadband coverage were aimed at improving fixed broadband infrastructure and access over the last few years. Schemes using Universal Service Obligation Fund (USOF) for proliferation of the broadband have been launched for improving internet access to common people. Also, fixed broadband penetration is closely linked with infrastructure expansion. In India, underdevelopment of fixed broadband market is because of the dominance of the mobile telephony and lack of availability of wireline infrastructure.

3.29 Mostly three types of access technologies are used for providing fixed line broadband connections, i.e. DSL over copper cable, Cable TV broadband and FTTH broadband.

DSL Broadband over Copper:

3.30 DSL broadband subscribers constitute about 30% of total wireline broadband subscribers. Though affordable and widespread available, DSL broadband is not in much demand and connections are declining, because of its technical constraints limiting its performance. Its count has come down from 12 million in March 2019 to 7.5 million in March 2021. Newer copper-based technologies (e.g. Vectoring, G.fast) can deliver higher speeds, but suffer from the distance limitations. Further, the available underground copper cables are outdated now which causes additional constraints. Therefore, in India, there is limited scope for growth of the fixed broadband using DSL technology.

Cable TV (CATV) Broadband/ HFC access:

²⁴ Based on census 2011, India has 249.5 Million households

- 3.31 Globally, cable broadband has become very popular as it is less expensive, quick to deploy and easier to handle. CATV broadband is usually offered to customers via the existing CATV network. This infrastructure can deliver higher broadband speeds with reliability as compared to DSL. Using this technology super-fast speeds are possible if the infrastructure is properly upgraded and distances are kept short. However, in case of CATV broadband bandwidth is shared among several users reducing its availability during peak traffic periods of the day.
- 3.32 Hybrid fibre-coaxial (HFC) networks have been commonly deployed globally by cable television operators. In an HFC network, the subscribers are connected to the cable operator's serving nodes on one end via coaxial cables, whereas the other end of the nodes is connected to the cable system's distribution centre (called the headend) through an optical fibre cable. The HFC network offers cable TV and internet services. Data Over cable Service Interface Specification (DOCSIS) is an international telecommunications standard which enables the addition of high-bandwidth data transfer to the existing HFC network. DOCSIS makes use of the unused available bandwidth within the cable to provide broadband connection at enhanced data rate. The implementation of new standards i.e., DOCSIS 3.1 and 3.1 full duplex allows for higher bandwidths to end-users of up to 10 Gbps.
- 3.33 In India, cable TV industry has tremendous reach of around 100 million households, deep into urban and rural areas. These cable TV networks are operated by more than a lakh Cable Operators. Because of its affordability and ubiquity, cable broadband could be, for India, a super-fast highway for broadband communications for most homes and businesses in the foreseeable future. However, this powerful resource for broadband delivery has not been tapped

adequately in our country. The following issue related to the slow uptake of cable broadband was raised in the CP:

“What is holding back Local Cable Operators (LCOs) from providing broadband services? Please suggest the policy and regulatory measures that could facilitate use of existing HFC networks for delivery of fixed broadband services.”

Comments from the stakeholders

- 3.34 According to a stakeholder, the factors responsible for inhibiting the use of LCOs’ network for provision of broadband include quality of infrastructure, delayed response in resolution of consumer complaints and lack of new technology upgrades. This stakeholder is of the opinion that the HFC network used by the cable operators has issues of quality and stability due to frequent and numerous fiber cuts and unorganized network design. This limits the use of the existing network for the provision of quality broadband services. As per this stakeholder, there is no definitive response time for the resolution of complaints arising due to frequent fiber cuts, unorganised network design, and unavailability of skilled manpower.
- 3.35 Few other stakeholders having similar view have stated that most LCOs in India use an older DOCSIS standard that does not support high-speed requirements typically desired in large areas. LCOs also primarily use unstructured OFC and Coaxial cable deployment which are fault prone. Additionally, DOCSIS also requires amplification of power at regular interval and power unavailability can also cause faults. As per these stakeholders, only a few LCOs use fiber broadband technology like GPON or Ethernet LAN but do so using poor quality of hardware and elements result in poor customer experiences. Hence, these stakeholders have suggested that instead of salvaging existing outdated HFC networks, the

Government should encourage adoption of Fiber based technologies like GPON in the network. They are of the opinion that for implementation of last mile network by LCOs, Government can consider tax incentives to them to make their offering more competitive. Also, initiatives to create synergy for infrastructure creation will encourage LCOs to adopt planned infrastructure rather than using unreliable infra like Trees, Poles and building etc. This will help reduce OPEX, make them more professional and improve end user experience. This ultimately will lead to better customer retention for LCOs.

- 3.36 Some stakeholders have considered the imposition of a license fee, as a percentage of Adjusted Gross Revenue (AGR) and including revenues from broadcasting in AGR as a primary disincentive for local cable operators, who by definition operate small businesses. In addition to this, one ISP has commented that prohibitions on sharing of active infrastructure further disincentivize participation from LCOs. Few stakeholders have proposed a special category of light licenses to be created and applied on such entities to permit provision of Fixed broadband with a token license fee as entry fee and Nil revenue share on AGR, as was done for ISPs.

Analysis of the issue and views of the Authority

- 3.37 On analysing the above comments, the Authority agrees that there are certain challenges involved in using existing cable TV networks for delivery of broadband services which needs to be addressed. Cable Operators have an inherent strength in providing last mile access. The sheer reach of the cable network to large number of households renders this infrastructure both amenable and ideally suited to the delivery of broadband to a large segment of the population very quickly. Internationally, the growing convergence of cable broadcasting and broadband networks is being recognized. In

many developed countries broadband is, in effect, mainly delivered through the cable system. In India also, Cable Operators can play an important role in the delivery of broadband if an appropriate policy framework is put in place. For accelerated growth of cable broadband, a harmonised effort is required by the industry and the Government.

- 3.38 The Authority agrees with the stakeholders view that in addition to the requirement of re-skilling Cable Operators for better customer service and upgradation of existing cable networks, issue relating to inclusion of revenues from broadcasting for levy of LF need to be addressed as it is acting as a major deterrent for cable operators in providing broadband services. In this digital age, when linear TV is giving space for the online video streaming, cable operators are looking to become ISP and upgrade their networks to deliver broadband services also. However, when a cable operator decides to become ISP, it is required to pay the license fee on revenues earned from cable TV services also which otherwise is exempted from license fee. This acts as a stumbling block in cable operators becoming ISP. Once this issue is resolved, many cable operators may acquire ISP license; and they will automatically invest and upgrade their access network infrastructure and technology. The issue relating to payment of the license fee on adjusted gross revenue, which includes the revenue accrued from cable TV services also, have been addressed by the Authority in its Recommendations to the Government on “Definition of Revenue Base (AGR) for the Reckoning of Licence Fee and Spectrum Usage Charges” dated 6th January 2015. The Government’s decision on the matter is still awaited.

3.39 In view of the above, the Authority reiterates that:

In order to encourage Cable Operators, registered under Cable Television Networks (Regulation) Act, 1995, to provide broadband services, issues relating to computation of Adjusted Gross Revenue (AGR) for Cable Operators need to be addressed on priority. To address this issue, the Authority has already given its recommendations to the Government vide its recommendations dated 6th January 2015 on “Definition of Revenue Base (AGR) for the Reckoning of Licence Fee and Spectrum Usage Charges”. The relevant recommendation is reproduced below:

“Applicable Gross Revenue (ApGR) should be equal to total Gross Revenue of the licensee as reduced by:

(i) revenue from operations other than telecom activities/ operations as well as revenue from activities under a licence/ permission issued by Ministry of Information and Broadcasting;

(ii) Receipts from the USO Fund; and

(iii) items of ‘other income’ as listed in the ‘positive list’ (Table 2.1).”

Fiber/ FTTH:

3.40 In terms of FTTH penetration, India is far behind its global counterparts. The Authority has put a lot of emphasis on fibre-based networks, which are capable of providing near-limitless capacity; offer the most future-proof approach in meeting broadband demand over the long term. The major challenges of fixed broadband penetration are directly related with infrastructure issues of fiber laying, duct availability, and sharing of passive and active infrastructure. In India, multiple challenges relating to delayed and

costly permissions for RoW, prohibitive costs for laying new OFC especially in urban areas, non-optimal utilisation of available wireline infrastructure, non-availability of efficient marketplace for sharing, leasing and trading of fibre, etc. could be some of the factors which may be impeding the growth of fixed line broadband. Keeping in view these concerns following issues were raised in the CP for soliciting stakeholder's opinion:

- i. *“Even though fixed broadband services are more reliable and capable of delivering higher speeds, why its subscription rate is so poor in India?”*
- ii. *“What could be the factors attributable to the slower growth of FTTH subscribers in India? What policy measures should be taken to improve availability and affordability of fixed broadband services? Justify your comments.”*

Comments from the stakeholders

3.41 As per majority of the stakeholders, factors responsible for poor proliferation of fixed broadband in the country are RoW issues, high cost involved in installation and maintenance of infrastructure, lack of promotion of dig once policy, restricted access to residential complexes, and financial burden of license fees of 8% on AGR. As per these stakeholders, institutional roadblocks in the form of delay and denial of RoW permissions and exorbitant charges have prevented the laying for Fiber/copper cables in major parts of the country. They are of the opinion that the RoW rules lack teeth and need many improvements along with a statutory backup to be more effective. However, till such reforms are carried out, fast paced growth in FTTH segment will remain a challenging task.

3.42 Another major bottleneck in fixed broadband proliferation as identified by the stakeholders is the access into the buildings. They have suggested that mandatory access without charge to each

building including households for fibre/copper needs to be ensured and this should be a prerequisite for issuing NOC for the building. They have suggested that the Authority should engage with the Ministry of Housing and Urban Affairs to ensure appropriate changes in building code to mandate the RWAs to provide free of cost access to lay Broadband infrastructure in societies and residential complexes. As per them, there have been multiple instances including during the current pandemic, where the building owners have not allowed equal access to all operators.

3.43 One ISP is of the opinion that the subscription rate of fixed broadband is not low but reach of the OFC network within the country is very low. As per this stakeholder, wherever the fixed broadband is available, it has been the most preferred mode of broadband access by the consumers and has opined that addressing the ROW permission issues will pave the way for proliferation of wired Broadband services.

3.44 This ISP has suggested that few relaxations in the ISP License conditions may encourage better proliferation of Broadband services and specifically attract more investments into wired broadband services which is the need of the hour. These relaxations include waiver of license fee on the wired broadband revenue, permission for resale of bandwidth between two ISPs and liberalization of terms and conditions for the Internet Telephony and exemption from the requirement of e-numbering for the same to enable ISPs to provide convergence of services in a better manner.

3.45 Few stakeholders are of the opinion that from a user perspective, mobile has been an effective substitute to fixed services in India. It has brought ease of use, mobility and almost similar if not better, levels of service quality for the consumer. Furthermore, mobile has been cost effective and affordable for the user, has allowed tariff and

service innovations (pre-paid/post-paid, converged services and live content), giving the consumer flexibility to go for highly customised and need based plans. This can be one of the major reasons why fixed broadband subscription has remained poor as compared to mobile.

Analysis of the issue and views of the Authority

- 3.46 Most of the stakeholders have opined that primarily the reasons for poor proliferation of fixed-line broadband in the country are challenges in establishment of fiber infrastructure along the public ways and inside the buildings. Some of the stakeholders have also commented about the higher cost of rolling out fixed-line networks and the need for incentives to proliferate fixed-line broadband. The infrastructure roll-out issues have been dealt with in detail in Chapter 5. For addressing the issues like financial incentives for promoting fixed-line broadband connectivity, affordability etc. a supplementary consultation paper was issued, and the recommendations about this have been discussed in Chapter 6. In respect of stakeholders' comments regarding liberalization of terms and conditions for the Internet Telephony it is to note here that the Authority has received a separate reference on strategy relating to convergence envisaged in the NDCP-2018. Accordingly, the same shall be dealt separately.
- 3.47 As far as the issue of permitting resale of bandwidth between ISPs is concerned, it has already been addressed by the Authority in its Recommendations on "Proliferation of Broadband through public Wi-Fi networks" dated 9th March 2017. The Authority recommended that *"The Department of Telecommunication (DoT) may amend the terms of the ISP license to allow for sharing of active infrastructure, in line with the Unified License (UL). Further, the Authority recommends*

that a clarification be provided in respect of all license categories, that sharing of infrastructure related to Wi-Fi equipment such as Wi-Fi router, Access point, and backhaul is also allowed". DoT on 31st March 2021, has amended the terms and conditions of ISP licenses to permit active infrastructure sharing. Through this amendment dated 31st March 2021, a new condition has been inserted in the ISP licenses stating that *"Sharing of Active infrastructure amongst Service Providers based on mutual agreements entered amongst them is permitted. **Active infrastructure sharing will be limited to Wi-Fi equipment such as Wi-Fi router, Access Point etc. Sharing of backhaul is also permitted.**"* (emphasis provided) From the plain reading of this newly inserted condition, contrary to the Authority's recommendations dated 9th March 2017, it appears that permission to share active infrastructure amongst service providers has inadvertently got limited to backhaul and Wi-Fi equipments. Limiting active infrastructure sharing to backhaul and Wi-Fi equipments may not yield the expected benefits. **Therefore, the Authority reiterates its earlier recommendation issued in the context of "Proliferation of Broadband through public Wi-Fi networks" dated 9th March 2017 that similar to the Access Service authorisation, passive as well as active infrastructure sharing should be allowed under the Internet Service Licence, and Internet Service authorisation under the Unified License (UL) and UL(VNO) licenses.**

- 3.48 In respect of the stakeholders' comments regarding challenges in getting access inside the buildings and establishing broadband infrastructure there, the Authority is of the opinion that for accelerating the fixed-line broadband proliferation in the country, this issue needs to be addressed on priority. Despite the fact that the Authority has repeatedly issued its recommendations to address

this issue, no significant success has been noted till now. The Authority through its recommendations²⁵ dated 17th April 2015 on “Delivering Broadband Quickly: What do we need to do?” recommended to change building by-laws for the issue of completion certificate and making mandatory inclusion of either duct/optical fibre with well-defined access mechanisms in all upcoming office complexes, commercial spaces, and residential complexes. It would have a significant and measurable net positive impact on broadband penetration. Again in 2017, the Authority vide its recommendations on “In-Building Access by Telecom Service Providers”, further stressed that *‘The telecom ducts to access the buildings from outside should be part of the Common Telecom Infrastructure (CTI), which could be used by TSPs/IP-Is for putting cables’*; and *‘No building plan should be approved without having a plan for creation of CTI including the duct to reach to the telecom room inside the building. Completion certificate to a building to be granted only after ensuring that the CTI as per the prescribed standards is in place.’*

- 3.49 Recently, Town and Country Planning Organization of Ministry of Housing and Urban Affairs has started the process for issuing an addendum to Model Building Byelaws (MBBL) - 2016 to include provisions for In-Building Solutions (IBS). As per this draft addendum shared with the Authority, Bureau of Indian Standards (BIS) has framed National Building Code of India which has the provision of Common Telecom Infrastructure (CTI) housed inside the buildings for convenient provisioning of telecom services. The proposed addendum mandates incorporation of suitable provision for creation of CTI inside newly constructed public places such as Airports, commercial complexes, and residential complexes, in

²⁵ <https://traf.gov.in/sites/default/files/Broadband%3D17.04.2015.pdf>

State/ UT Building Bye Laws. It also contains the provision of issue of Occupancy-cum-Completion certificate to a building only after ensuring that CTI as per the prescribed standards is in place. The Authority expects that the implementation of addendum to provisions of MBBL-2016 will be done by all the states/ UTs in true spirit and will help in resolving the issues of access to the buildings raised by the stakeholders. Further, the Authority is also in the process of identifying and addressing all issues afresh relating to Common Telecom Infrastructure inside the buildings. The consultation with stakeholders on these issues would be carried out separately.

IV. FWA proliferation

3.50 Presently, despite the rapid growth in mobile broadband services, there is a large underserved and unserved market for fixed broadband. This market can, to a very large extent, be served cost-efficiently with FWA, when it would be built on the huge installed base of cellular systems and global reach of mobile technologies such as LTE and 5G. FWA can also provide a cost-effective alternative to offer broadband connectivity to regions where good quality wireline infrastructure is not present. Accordingly, FWA technology is deliberated in the CP as an alternative to FTTH in those regions where fiber could not be laid. While many developing countries are using FWA technology for provisioning of fixed broadband, this technology has not been implemented by service providers in India. Comments from stakeholders were solicited in the CP regarding regulatory measures and policy initiatives required for facilitating the use of FWA technology for delivery of fixed broadband services in India.

Comments from the stakeholders

- 3.51 Majority of the stakeholders are of the opinion that FWA has not become popular in India due to unavailability of sufficient licensed spectrum and high cost of end device ecosystem such as outdoor CPEs. As per these stakeholders, to deploy 4G-LTE based FWA, operators would need excess spectrum in addition to the spectrum needed for catering to the mobile broadband traffic from the same sites. They are of the view that it would be challenging, especially in the urban or highly loaded cell-sites for operators to use the existing 4G spectrum. According to them, FWA services in mm Wave bands (26 GHz and 28 GHz) can offer very high-speed broadband in the order of Gbps. However, they have suggested that in case of rural areas, under-utilized 4G spectrum can also be used to provide 4G LTE based Fixed Wireless Access.
- 3.52 Stakeholders have suggested to take appropriate policy measures to enable operators to deploy mm Wave spectrum (26Ghz and 28GHz) which is globally being used for implementing FWA technology. This will help TSPs to plan and prepare for the fixed broadband services along with the mobile broadband. They are of the opinion that access sites where there is a limitation of fiber backhaul, sufficient wireless backhaul need to be provisioned. The policy measures should also consider this aspect for availability and licensing of the backhaul spectrum for FWA deployment planning.
- 3.53 As per an association for last mile linkage, complementing fiber, V-band devices can be used to provide gigabit internet access to people and businesses at a fraction of the cost of buried fiber. As per this stakeholder, the V-band spectrum has extremely high oxygen absorption, which makes it nearly interference-free, especially when combined with other interference mitigation techniques. According to the stakeholder, V-band devices can also serve as backhaul links

for 3G/4G/5G cellular, and potentially lower the cost of delivering mobile coverage and capacity.

Analysis of the issue and views of the Authority

- 3.54 Many operators worldwide consider FWA and fiber as their future replacement of legacy fixed broadband technologies as well as for bringing access to unconnected homes and businesses. FWA deployments have three main advantages - time to market, financial investment profile and sustainability. FWA leverages existing mobile network infrastructure, utilizing spare capacity and already acquired but under-utilised spectrum. FWA also has a lighter investment profile, with lower initial investment and investment scaling in line with subscriber growth. Moreover, capacity investments for FWA can be shared with other mobile network services resulting in lower risk. Even if there is no uptake of FWA services, the operator can still use that capacity for Mobile Broadband and IoT. FWA deployments are more sustainable and environment friendly as most of the infrastructure is reused. FWA reuses main sites and towers that are already built, with most upgrades performed without the need for site visits unless new hardware is required.
- 3.55 In view of the above, the Authority believes that for mobile-only operators, FWA provide an opportunity to tap fixed broadband market. For converged operators, FWA also offers a new revenue opportunity in areas and segments that are not cost-efficiently addressed or reached by their existing fixed broadband offerings. FWA can also be of interest to converged operators trying to shut down their legacy xDSL services, which are getting increasingly outdated and costly to maintain. By replacing their xDSL service with FWA, built on existing mobile infrastructure, converged

operators can find significant cost savings and efficiencies, strengthening the business case for FWA.

- 3.56 The Authority is of the view that beyond retail consumers, there is an opportunity for operators to meet demand of enterprises, in particular the micro, small, and medium enterprises (MSME) operating in rural and remote areas, for high-speed broadband. Many MSMEs are located in underserved areas with low speeds, lack of broadband alternatives or no connectivity whatsoever. In addition, some MSMEs could be located in buildings and business parks that lack in-building cabling to reach their facilities. FWA technology should be used to meet the demand of such MSMEs.
- 3.57 As the FWA is to be provisioned on the access spectrum available for cellular mobile technologies, capacity needs to be carved out from the existing mobile network, which may not be practically feasible in dense urban areas considering the high usage of the wireless network. Hence, the Authority agrees that any use of the access spectrum for FWA in dense urban localities requires the allocation of a sufficient licensed spectrum to the operators. The issue of assigning access spectrum in mid-band and mm wave frequency bands has been discussed in detail in mobile broadband speed enhancement section in the next chapter. However, in the sparse suburban and rural areas where the access spectrum is underutilised, FWA can be a viable alternative to fixed line broadband even with the currently available spectrum resources.
- 3.58 In respect of assignment of V-band spectrum, the Authority has already given its recommendations in August 2014 and November 2015 on “Allocation and pricing of Microwave Access (MWA) and Microwave Backbone (MWB) RF carriers”^{26,27}. Vide these

²⁶<https://tra.gov.in/sites/default/files/MW%20Reco%20Final29082014.pdf>

²⁷https://tra.gov.in/sites/default/files/Response%20to%20back%20reference%20on%20Microwave_

recommendations the Authority emphasized on the usage of the high-capacity E-band and V-band spectrum to increase broadband penetration and speed in India. The Authority recommended that these bands should be opened with 'light-touch regulation'; and for backhaul purpose, allotment should be on a 'link-to-link' basis at a nominal fee. In line with other countries, through these recommendations, the Authority further recommended that V-band spectrum should be license-exempt band for indoor and outdoor based access applications like Wi-Fi hotspots etc.

3.59 The Authority agrees with the view of the stakeholders that access sites having insufficient backhaul is another area which requires attention for success of FWA. All such access sites need to be backhauled preferably through fiber or through high-capacity wireless backhaul to enable them to cater to the additional traffic generated by the FWA broadband services. Therefore, there is an urgent need to strengthen the backhaul of cellular networks and this issue has been dealt in detail in mobile broadband speed enhancement section of the Recommendation.

3.60 As far as the cost of the outdoor CPEs for FWA is concerned, the Authority believes that with proliferation, this cost too can come down. Hence, to facilitate the use of FWA technology for the delivery of fixed broadband services, sufficient access and backhaul spectrum should be made available at affordable prices to the operators and the service providers should be encouraged to fiberize the backhaul as far as possible. The access spectrum issues have been deliberated in detail in mobile broadband speed enhancement section in the next chapter.

CHAPTER 4

BROADBAND SPEED ENHANCEMENT

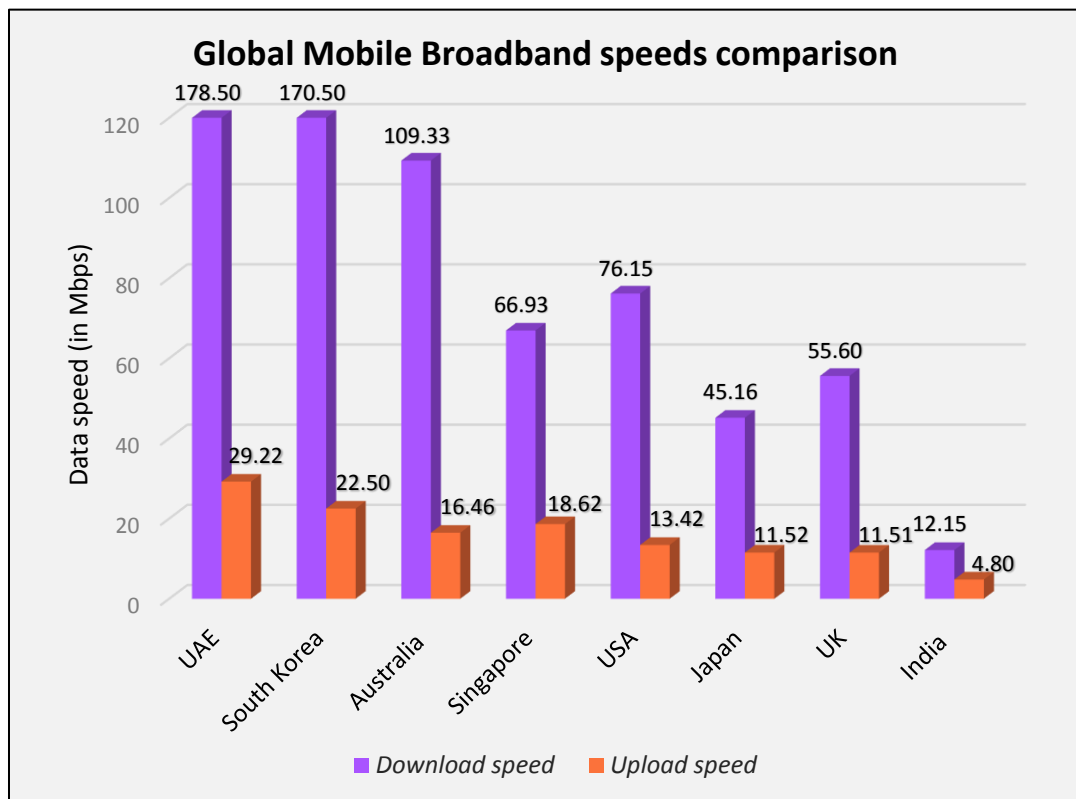
- 4.1 Currently, India has the second highest number of online population in the world, accounting for more than 10% of the world's internet population. By defining an aspirational goal of 50 Mbps universal access, NDCP-2018 has set ambitious targets for broadband penetration and speeds. NDCP-2018 has laid down the following goals related to broadband speed for 2022 under Connect India Mission:
- i. Provide Universal broadband connectivity at 50Mbps to every citizen
 - ii. Provide 1 Gbps connectivity to all Gram Panchayats of India by 2020 and 10 Gbps by 2022
 - iii. Enable 100 Mbps broadband on demand to all key development institutions, including all educational institutions
- 4.2 High-speed internet access has opened doors to new paradigms in all sectors of the economy whereby the common man at the bottom of the pyramid is served more efficiently and at a fraction of cost as compared to earlier days. Government of India is doing huge investments in e-governance through many mission-mode projects. Various citizen centric services like eSign, Digital Locker, UPI, eKYC, DBT, CoWIN etc. have been launched. Success of all these digital initiatives largely depends on the availability of robust and high-speed broadband infrastructure in the country.
- 4.3 Broadband reliability and speed are the key differentiating factor for customers while narrowing down to an Internet Service Provider (ISP). Speed must be enough to enable users to access the desired applications such as video viewing or gaming. Several elements that affect broadband speed include distance from servers, network equipment, and end-user computer configuration. Speed is a major

criterion for defining broadband and setting the national broadband goals.

I. Broadband Speed in India

4.4 India has registered a rank 131 out of 140 nations on Ookla's Speedtest Global Index for mobile broadband speeds in March 2021. The average mobile broadband download speed in the country was 12.15 Mbps during March 2021 while the average upload speed was registered to be 4.8 Mbps for the same period.

Figure 4.1: Global Mobile Broadband Speeds Comparison



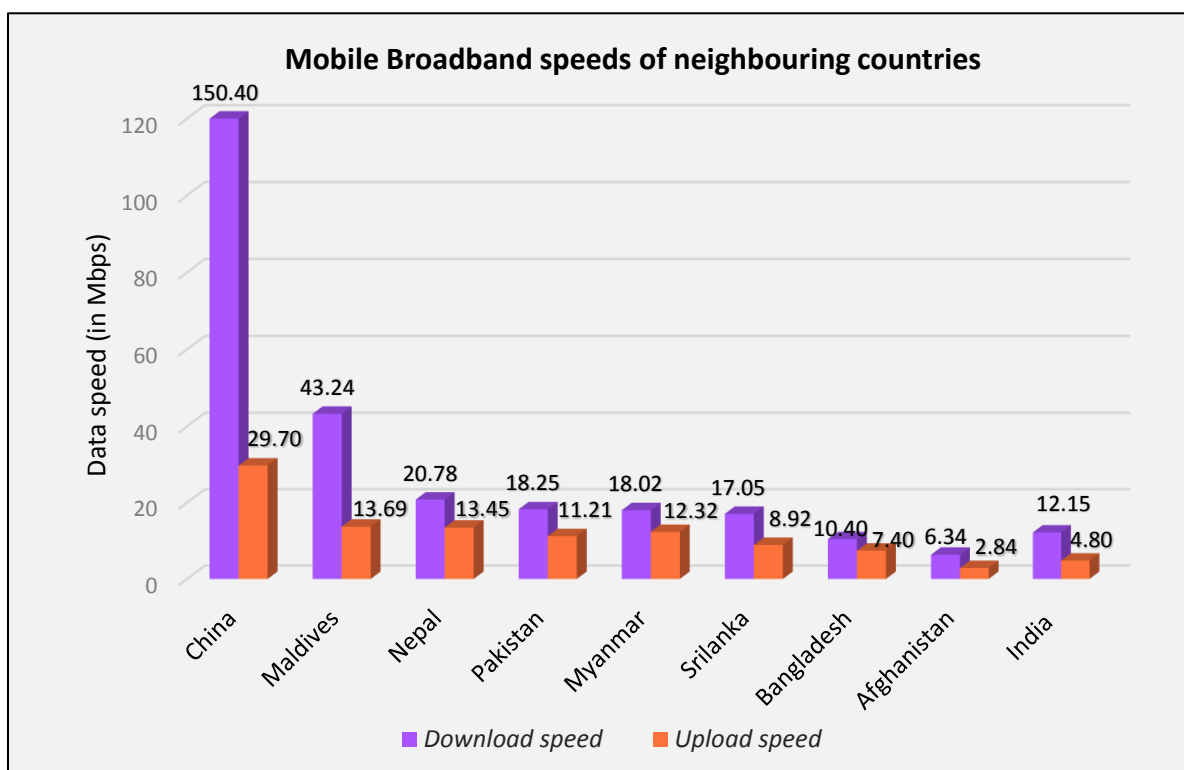
Source: Speedtest Global Index – March 2021

4.5 As per the Speedtest Global Index, the global average mobile broadband download speeds in March 2021 were registered at 48.4 Mbps while the global average upload speed was at 12.60 Mbps. The list was topped by United Arab Emirates with an average mobile

broadband download speed of 178.50 Mbps and the last 140th position was held by Turkmenistan (4.18Mbps). A global mobile broadband speed comparison is shown in Figure 4.1.

4.6 As per the latest ranking released by Ookla, India showed the third slowest mean download speed over mobile among its neighbouring countries in March 2021. A chart depicting a comparison of mobile broadband speed with neighbouring countries is shown in Figure 4.2.

Figure 4.2: Mobile Broadband speeds of neighbouring countries

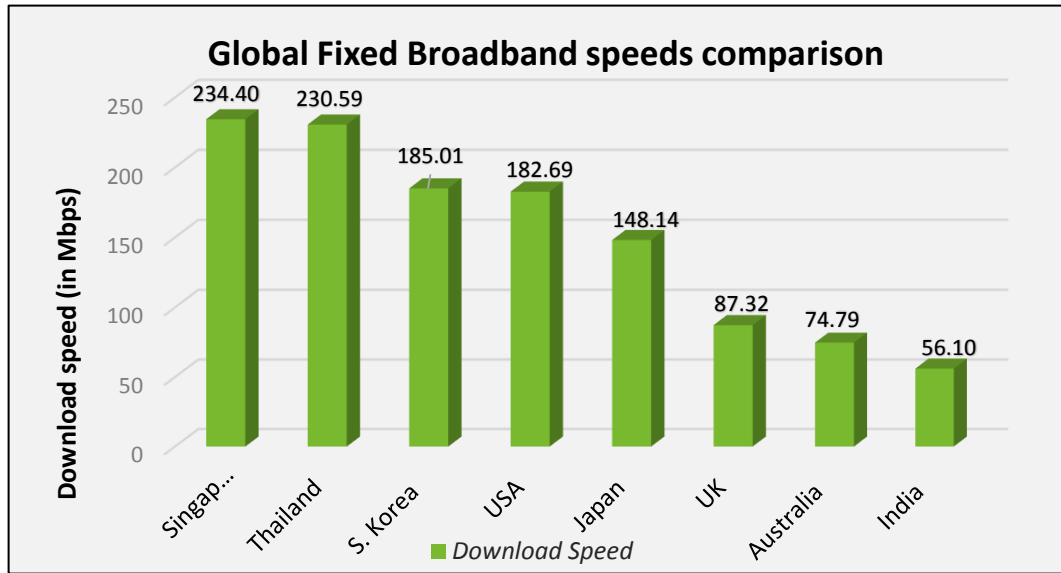


Source: Speedtest Global Index – March 2021

4.7 In terms of the fixed broadband performance, as per Ookla, India is positioned at 66th place among 177 nations. India's average fixed broadband download speed was 56.1 Mbps in March 2021 while the average upload speed is said to be at 53.68 Mbps for the same period. The top spot in Ookla's Fixed Broadband Speed Index was held by

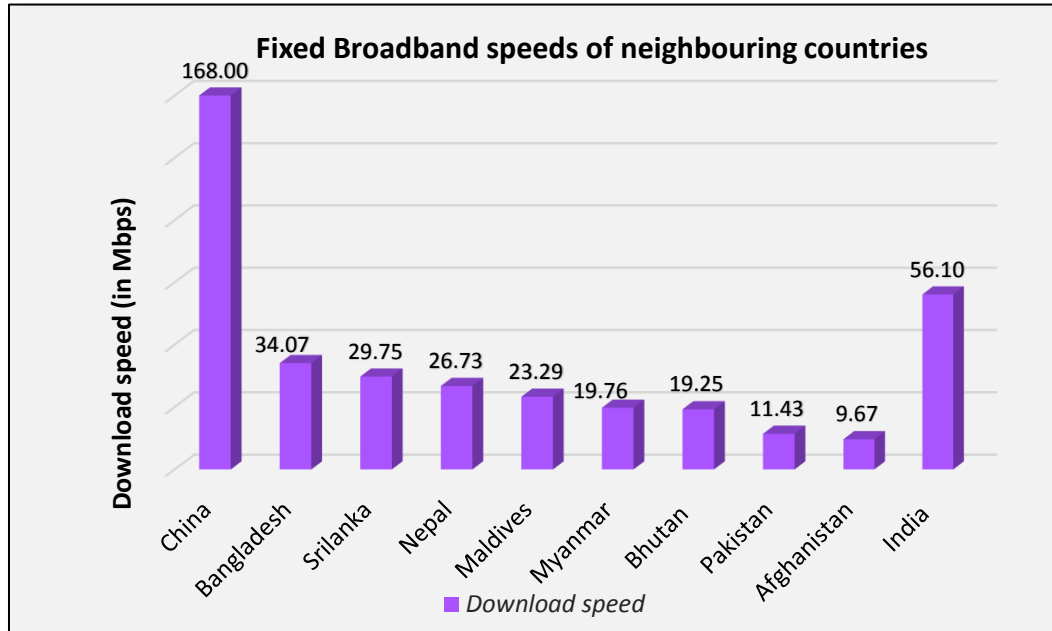
Singapore with an average download speed of 234.4 Mbps. It was followed by Thailand (230.59Mbps), Hong Kong (224.73Mbps), Romania (210.82Mbps) and Monaco (205.44Mbps). A comparison of fixed broadband speed available in India with some important countries around the globe and that with its neighboring countries is shown in Figures 4.3 and 4.4, respectively.

Figure 4.3: Global Fixed Broadband Download Speeds



Source : Speedtest Global Index – March 2021

Figure 4.4: Fixed Broadband speeds of neighbouring countries



Source : Speedtest Global Index – March 2021

II. Mobile Broadband Speed Enhancement

4.8 From the above comparisons it is obvious that as far as mobile broadband speed is concerned our country is not positioned well either globally or among its neighbours. Globally we stand at 131st position among 140 countries as per Ookla's Speedtest Global Index. Even India is lagging behind almost all its neighbours in mobile broadband speed. This concern was raised in the CP in the form of following questions:

- i. *“What could be the probable reasons for slower mobile broadband speeds in India, especially when the underlying technology and equipment being used for mobile networks are similar across the world? Is it due to the RAN design and capacity? Please provide the complete details.*
- ii. *Is there a need of any policy or regulatory intervention by way of mandating certain checks relating to RAN user plane congestion? What should be such checks? If yes, then suggest the details,*

including the parameters and their values. If no, then specify the reasons and other ways to increase performance of RANs.

- iii. Should it be mandated to TSPs to declare actual congestion, average across the LSA, recorded during the previous month over the air interface (e.g., LTE Uu), in the radio nodes (e.g., eNB) and/or over the backhaul interfaces between RAN and CN (e.g., S1-u), while reaching out to or enrolling a new customer? If so, then suggest some parameters which can objectively determine such congestions. If no, then specify the reasons and other ways to increase performance of the RAN.”*

Comments from the stakeholders

- 4.9 All major TSPs and associations are of the opinion that mobile broadband networks are most innovatively designed and configured for parameters such as spectral efficiency and users' concurrency. Some of the key bottlenecks highlighted by them for lower throughput per subscriber in India are lower spectrum availability for access as well as backhaul, lower fiberisation of towers, power outages, etc. They have said that India has only 165 MHz of the spectrum (FDD equivalent) for four operators compared to 300MHz to 400MHz of spectrum in other countries. As per the stakeholders, less than 25% of mobile towers are fiberized in India as compared to more than 70% of fiberized towers in other countries. As per these stakeholders, lower microwave spectrum availability for backhaul becomes more critical, especially in the absence of fiber assets. They are of the view that grid power is mostly unreliable in the far-flung rural areas. They have also commented that a higher amount of fiber cuts than any other markets lead to degradation in service availability and quality of fiber over its lifecycle.
- 4.10 One TSP has said that the technology and equipment used for wireless broadband are standardized across all operators in the

world. The main differentiating factor is the quantity of spectrum with major operators. This TSP is of the view that the unavailability of additional spectrum can be managed to some extent by deploying new towers, however, this is not a long-term or permanent solution as the spectral efficiency is drastically reduced after certain densification of towers, due to interference and increase in overall noise floor. In such a scenario, and in absence of spectrum auctions, it would not be prudent to expect the wireless broadband speeds to keep pace with the rest of the world.

4.11 Regarding the issue of mandating certain checks relating to RAN user plane congestion almost all major TSPs and associations have unanimously disagreed with the need of any such policy or regulatory intervention. They are of the view that the infrastructure issues need to be handled on an urgent basis rather than the radio network's design, which would only work once infrastructure issues are taken care of.

4.12 These stakeholders also do not foresee any need for mandating the TSPs to declare actual congestion, the average across the LSA, recorded during the previous month over the air interface, in the radio nodes, and/or over the backhaul interfaces between RAN and CN, while reaching out to or enrolling a new customer. They have said that the new customers are already provided sufficient information for making an informed decision and piling on more such information that too highly technical will not help the consumer in anyway. As per them, more such additions will only make the offering complicated. They are of the opinion that congestion over air interface or backhaul is beyond network design. This is due to a shortage of assets such as spectrum in the access and backhaul network, fiber reach, quality of fiber, etc., which need to be taken care of to improve the user experience in the mobile broadband network.

4.13 However, one individual stakeholder is of the opinion that TRAI needs to setup strong Quality of Service Rules. He has also suggested that TRAI must setup telecom ombudsman to stop ISPs bullying consumers by closing complains without solving them. Another suggestion from this stakeholder for the Authority is to force mobile ISPs to adopt area wise colour coding to portray their performance:

- Green (good network strength, above minimum stipulated speed)
- Yellow (good / ok network but congestion forcing below minimum stipulated speed)
- Red (poor or no coverage network, internet may not work)

4.14 Another individual consumer has submitted that there are many use cases wherein network congestion is caused due to single app throttling network capacity leading to decrease in experience for other apps. This stakeholder has suggested that there are network traffic management solutions through which network can be monitored and controlled better, however this area falls under already open consultation of network traffic management. As per this stakeholder, other technical parameters should also be analyzed for root cause analysis of this problem.

Analysis of the issue and views of the Authority

4.15 Broadband subscriptions are dominated by mobile broadband in the country over the past few years. It is important to note that the overall mobile broadband penetration in India might have improved, but the mobile internet speed continues to remain sluggish. The overall availability of 4G services has increased for all major 4G providers. However, the 4G download speed of most operators improved only marginally and is hovering at around 12 Mbps. This

is way below the NDCP-2018 objective of universal broadband speed of 50 Mbps. A holistic effort is required from all the stakeholders to achieve this target.

4.16 Mobile broadband networks have certain limitations due to number of parameters that define data speeds. First is the amount of radio spectrum the operator has in the service area—larger the amount of spectrum, more is the capacity of the radio access network that results in higher data speeds. Second is the technology used. Data speeds of 4G are about 10 times more than 3G. Adoption of 4G technology is not at all an issue as it has already been deployed at large scale by the TSPs. As shown in Figure 1.2, more than 95% of mobile broadband subscribers are using 4G technology. The third factor is the infrastructure such as cell towers with the evolved Node B (eNodeB) deployed by the operator. Generally, in case of mobile broadband it is observed that nearer the cell tower from a mobile device, better is the signal quality and consequently higher data speed. Data speeds also depend on the number of subscribers in a specific area—more subscribers in a given area consume more network capacity, resulting in network congestion, which, in turn, reduces speeds. Constraints in any of these segments could result into network congestion and adversely affect the mobile broadband speed.

4.17 Most of the service providers and associations are not in favour of communicating congestion parameters of radio networks to customers, because in their opinion it would be too technical for a consumer to understand. But, in contrary, the comments of individual consumers show their interest in knowing the performance of broadband connectivity and coverage in their respective localities. The Authority disagrees with the views expressed by the service providers and their associations on this issue as ensuring quality of service of mobile broadband network is

priority of the Authority and users have the right to know the performance of mobile networks. TSPs should declare the network performance parameters e.g. average download and upload speed, latency, jitter, and packet loss transparently. As these performance parameters change dynamically over time and space, for each cell, TSPs should declare monthly summary of performance parameters statistics on a GIS map. Users can identify individual networks' performance in their area and take an informed decision. And also, it will facilitate a healthy competition in the mobile broadband market.

4.18 It may encourage TSPs to increase investment in RAN infrastructure which include additional spectrum acquisition, fiberisation of base stations, and installation of new base stations in areas facing congestion. Accordingly, the Authority shall initiate an exercise to improve transparency in declaring network performance parameters by TSPs to users and amend broadband QoS regulations accordingly.

4.19 The Authority has also analysed the problem areas highlighted by the stakeholders, such as scarcity of spectrum in access and backhaul, insufficient fiberisation of towers, tower installation hurdles, etc. The analysis and the way forward are discussed below.

Radio Resources

4.20 As discussed in the CP and pointed out by the stakeholders, average access spectrum holding per operator in our country is not at par with other countries in the world. Table 4.1 shows the status of LSA wise average spectrum holding per operator after the recently concluded auction in February 2021.

Table 4.1: LSA wise Spectrum holding per Operator after auction 2021

Sl. No.	LSA	Total Spectrum²⁸ (In MHz)	No. of operators	Average spectrum holding per operator (In MHz)
1.	Andhra Pradesh	254	4	63.50
2.	Assam	306.9	4	76.73
3.	Bihar	296	4	74.00
4.	Delhi	249.6	4	62.40
5.	Gujarat	304.4	4	76.10
6.	Haryana	326	4	81.50
7.	Himachal Pradesh	273.2	4	68.30
8.	Jammu & Kashmir	272.4	4	68.10
9.	Karnataka	267.6	4	66.90
10.	Kerala	324	4	81.00
11.	Kolkata	250.4	4	62.60
12.	Madhya Pradesh	312	4	78.00
13.	Maharashtra	315.2	4	78.80
14.	Mumbai	275.6	4	68.90
15.	North East	301.6	4	75.40
16.	Odisha	305.2	4	76.30
17.	Punjab	293.6	4	73.40
18.	Rajasthan	307.2	4	76.80
19.	Tamilnadu	272.8	4	68.20
20.	Uttar Pradesh (East)	325.6	4	81.40
21.	Uttar Pradesh (West)	312.6	4	78.15
22.	West Bengal	317.6	4	79.40

Source: TSPs

4.21 It may be seen that the average access spectrum holding per operator in different LSAs is in the range of 62 to 81 MHz, which is much lower as compared to many other countries in the world. Quantum of access spectrum in < 3GHz frequency range in some countries is given in Table 4.2.

²⁸ Spectrum holding by telecom operators undergoing CIRP has been excluded

Table 4.2: Spectrum Holding per Operator in Various Countries

Country	Total Spectrum in MHz*	No. of Telecom Operators	Spectrum Holding per Operator in MHz
China	567	3	189.0
Denmark	729.6	4	182.4
Germany	690	4	172.5
Greece	565	3	188.3
Ireland	400	4	100.0
Italy	578.4	4	144.6
Malaysia	600	5	120.0
Netherland	580	5	116.0
New Zealand	545	5	109.0
Portugal	485.4	3	161.8
Singapore	594.2	3	198.1
UK	629.4	5	125.9
India	~ 250 - 325	4	~ 62-79

From the above table it can be seen that spectrum holding per telecom operator in India is less as compared to other countries. The Authority agrees with the stakeholders' view that total spectrum assigned for commercial telecom operation in India is less as compared to other countries. But, at the same time it has also been experienced that in certain frequency bands available spectrum put to auction remained unsold. It shows that TSPs are not interested in purchasing additional access spectrum when it is made available to them through auction. The Authority is of the view that offer for assignment of available spectrum at regular intervals and simultaneously increasing transparency in declaring network performance parameters by TSPs to users should be able to increase

the average access spectrum holding per operator in the country.

4.22 The term International Mobile Telecommunications (IMT) is the generic term used by the ITU community to designate broadband mobile systems. It encompasses IMT-2000 (3G), IMT- Advanced (4G) and IMT-2020 (5G) collectively. ITU-R develops and adopts the international regulations and global standards which, through their worldwide application, enable the harmonization of spectrum and implementation of broadband mobile networks (3G, 4G and now 5G) throughout the world. The Authority is of the view that IMT spectrum assignment should take place at regular intervals at least annually as per the established procedures. An annual calendar to offer the available IMT spectrum for assignment to service providers should be published in advance. Assignment of International Mobile Telecommunications (IMT) spectrum at regular intervals shall facilitate in enhancement of mobile broadband speed. It will also ensure efficient utilisation of the available spectrum as the spectrum is a natural resource and any delay in its assignment is immediate loss.

4.23 Keeping in view the above, the Authority recommends that:

In order to ensure efficient utilisation of available spectrum and support mobile broadband speed enhancement, entire spectrum allocated for International Mobile Telecommunications (IMT) purposes should be assigned as per the established procedures on regular basis. For this purpose, an annual calendar to offer the available IMT spectrum for assignment to service providers should be published in advance.

Strengthening the Backhaul

4.24 To achieve the desired enhancement in mobile broadband speed the increase in radio resources must be accompanied and supported by an equally strong backhaul. Without strengthening the backhaul the full

potential of RAN cannot be exploited. Fiber is often considered the most suitable type of backhaul medium due to its longevity, high capacity, high reliability, and ability to support very high-capacity traffic. Internet speed of a system built on fiber is considerably faster than what can be achieved on a wireless network. However, fibre backhaul at present is not up to the mark. As per the details provided by TSPs about 34% of Base Transceiver Station (BTS) sites have been connected to fibre network in the country. Table 4.3 below presents the status of fiberisation of BTSs across the country.

Table 4.3: Fiberisation of BTSs as on 31.05.2021

SN	Name of State/UTs	Name of respective LSAs	Percentage of BTSs connected on fibre
1	Andhra Pradesh	Andhra Pradesh	36.13
2	A&N (UT)	West Bengal	64.83
3	Arunachal Pradesh	North East	34.34
4	Assam	Assam	33.28
5	Bihar	Bihar	30.30
6	Chandigarh	Punjab	38.36
7	Chhattisgarh	Madhya Pradesh	27.69
8	DNH & DD	Gujarat	30.71
9	Delhi	Delhi	42.38
10	Goa	Maharashtra	36.76
11	Gujarat	Gujarat	35.50
12	Haryana	Haryana	32.46
		Punjab (For panchkula town)	30.36
		Delhi	39.42
13	Himachal Pradesh	Himachal Pradesh	26.28
14	J&K (UT)	J&K	40.60
15	Jharkhand	Bihar	32.85
16	Karnataka	Karnataka	34.59
17	Kerala	Kerala	32.47
18	Ladakh	J&K	58.44
19	Lakshadweep	Kerala	0.00
20	Madhya Pradesh	Madhya Pradesh	33.38

SN	Name of State/UTs	Name of respective LSAs	Percentage of BTSs connected on fibre
21	Maharashtra	MH	32.18
		Mumbai	36.90
22	Manipur	North East	29.59
23	Meghalaya	North East	33.34
24	Mizoram	North East	28.67
25	Nagaland	North East	26.09
26	Odisha	Odisha	31.96
27	Puducherry	Tamilnadu	42.53
		Kerala	40.26
28	Punjab	Punjab	32.30
29	Rajasthan	Rajasthan	34.16
30	Sikkim	WB	33.60
31	Tamilnadu	Tamilnadu	37.80
32	Telangana	AP	35.59
33	Tripura	North East	35.58
34	Uttarakhand	UPW	31.56
35	UP	UPE	29.39
		UPW	26.99
		Delhi	40.25
36	West Bengal	WB	30.18
		Kolkata	42.10
LSA-wise Average			34.47

Source: TSPs

Tremendous efforts are required by the TSPs for increasing the fibre backhaul. Of course, RoW permission is one of the hurdles in this, which will be deliberated in detail in Chapter 5 of this Recommendation.

4.25 In rural areas the dependence on mobile broadband is much higher due to negligible proliferation of fixed-line broadband and hence the necessity of connecting mobile towers using optical fiber is even more. Government is already implementing BharatNet project to connect all Gram Panchayats (GPs) using optical fiber in a phased manner. The project, financed mainly through the Universal Service Obligation Fund (USOF), would provide connectivity to all the 2.5 lakh Gram Panchayats

(GPs) in the country. By the end of May 2021, a total of 1,72,136 GPs has been connected by laying 5,21,322 km underground OFC and 1,59,250 GPs have been made Service Ready. In the remaining GPs the project is under implementation. These fiber assets are national assets and the same should be efficiently utilised to improve the performance of broadband services in rural and remote areas. This will facilitate in bridging the digital divide and increasing access for rural population to education and other government services efficiently in these difficult times because of Covid-19. Efficient use of BharatNet is absolutely possible if the network is made available for fiberisation of the backhaul connectivity of cellular networks with guaranteed Service-Level Agreements (SLA). It will not only increase the mobile broadband speed in rural and remote areas but also ensure gainful utilisation of the national asset and provide required boost to the rural economy.

4.26 In view of the above, the Authority recommends that:

In order to enhance mobile broadband speed in rural and remote areas, using BharatNet network, optical fiber connectivity with Service Level Agreements (SLA) should be made available to service providers for fiberisation of the cellular networks backhaul connectivity.

4.27 As per the information available with the Authority, there are unassigned Microwave Access (MWA) carriers lying with DoT, which needs to be assigned to the TSPs for strengthening their backhaul. In India, MWA carriers are assigned in 13 GHz, 15 GHz, 18 GHz, and 21 GHz spectrum bands for backhauling purpose. While finalizing the Recommendations on Allocation and Pricing of Microwave Access (MWA) and Microwave Backbone (MWB) RF Carriers dated 29th August 2014, as per the data provided by WPC Cell of DoT, many carriers were available in 13/18/21 GHz bands as follows:

Table 4.4: Status of available MW Access Carriers

Sl. No.	Service Area	Availability status of MW Access carriers in 13/18/21 GHz Bands		
		Total number of carriers available	Total allotted carriers	Balance available carriers
1.	Delhi	95	41	54
2.	Mumbai	95	52	43
3.	Kolkata	95	41	54
4.	Maharashtra	95	43	52
5.	Gujarat	95	41	54
6.	Andhra Pradesh	95	39	56
7.	Karnataka	95	41	54
8.	Tamil Nadu	95	41	54
9.	Kerala	95	35	60
10.	Punjab	95	36	59
11.	Haryana	95	33	62
12.	UP (West)	95	37	58
13.	UP (East)	95	37	58
14.	Rajasthan	95	37	58
15.	Madhya Pradesh	95	31	64
16.	West Bengal	95	30	65
17.	Himachal Pradesh	95	34	61
18.	Bihar	95	36	59
19.	Orissa	95	30	65
20.	Assam	95	32	63
21.	North East	95	32	63
22.	Jammu & Kashmir	95	31	64
	Total	2090	810	1280

Source: TRAI

4.28 The above table indicates that there is no shortage in the availability of MWA carriers. As noted earlier, spectrum is a natural resource; and any spectrum which is available but lying unassigned is in a way loss of opportunity. Therefore, in view of the Authority, as per requirement of individual service providers, the assignment of MWA carriers should be expedited as that would strengthen the backhaul of mobile networks and enhance mobile broadband speed for the customers.

4.29 In view of the above, the Authority recommends that:

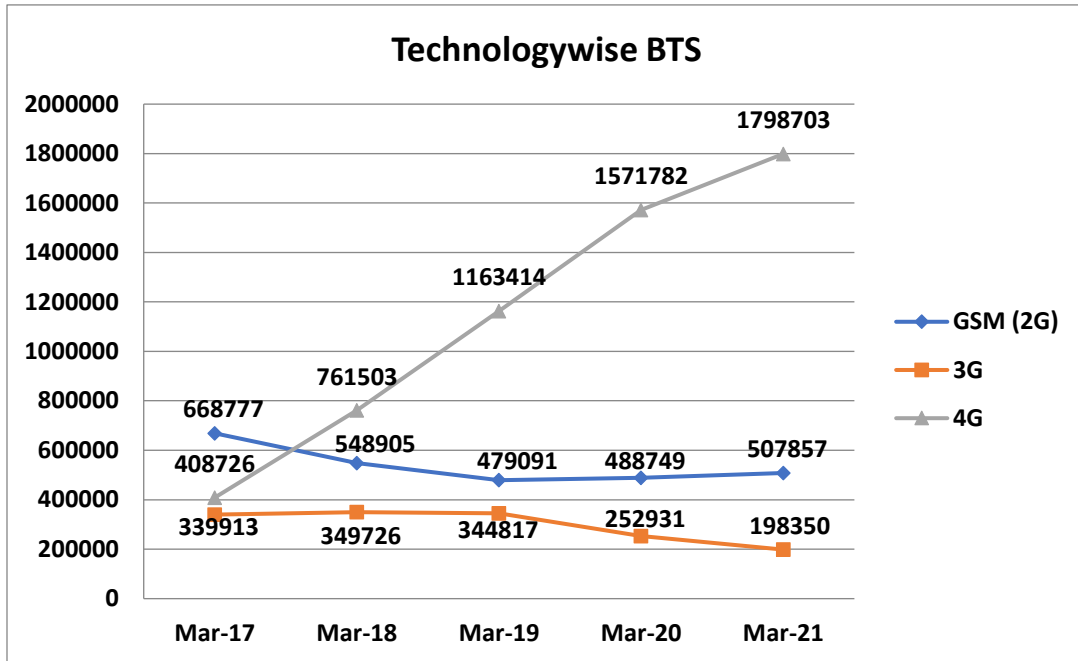
In order to overcome the capacity constraints in the backhaul connectivity of cellular networks, radio spectrum used for

backhauling purpose should be assigned to service providers on demand and in time bound manner.

Early 5G Deployment

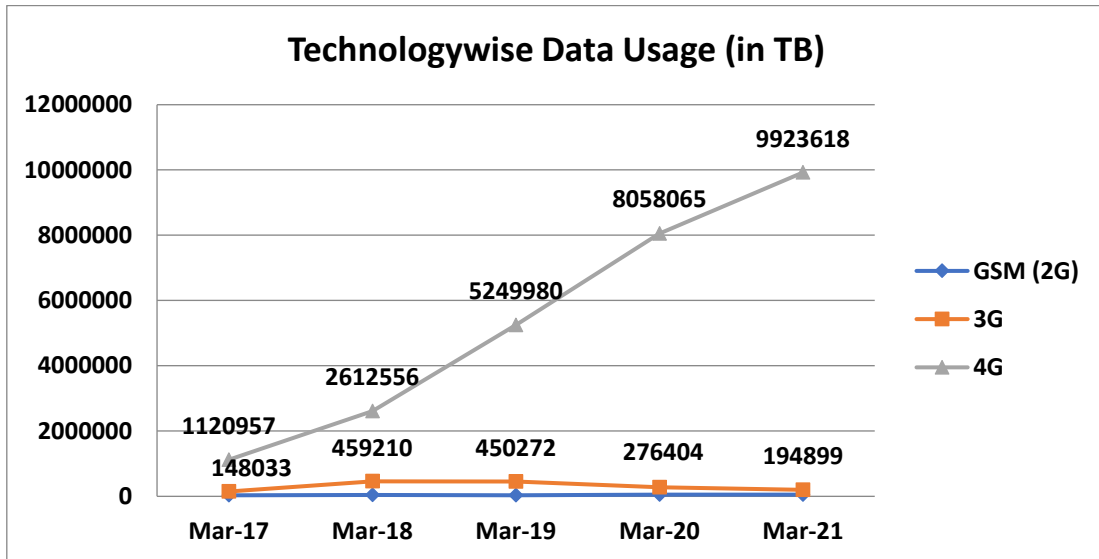
4.30 Figures 4.5 and 4.6 depict a year-on-year trend of technology wise BTSs and data usage in the country.

Figure 4.5: Year-on-Year Trend of Technology wise BTSs



Source : TSPs

Figure 4.6: Year-on-Year Trend of data usage of Mobile Subscribers



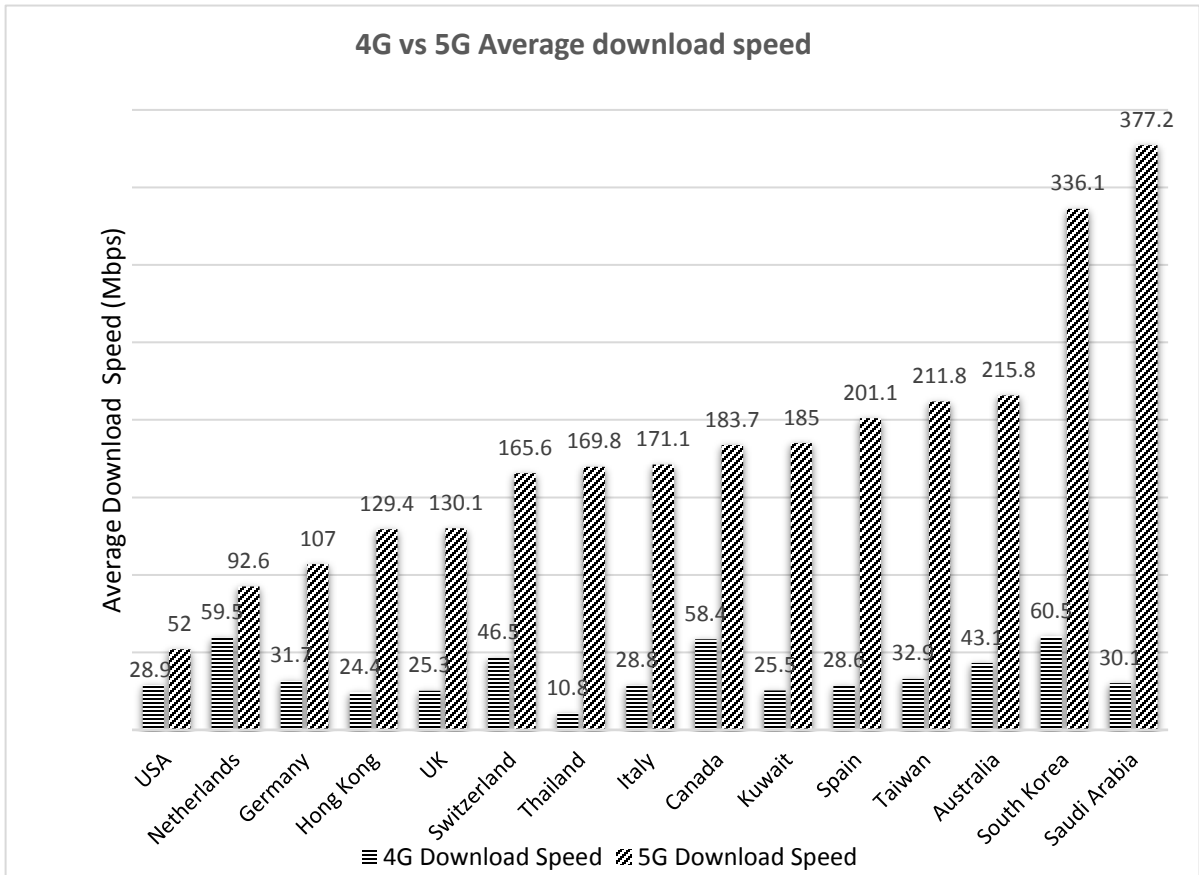
Source: TSPs

- 4.31 The above charts clearly indicate that there is a downward trend in the growth of 2G and 3G BTSs as well as data usage. Only 4G data usage and BTSs are showing an upward growth trend. A close look at the growth trends of 4G BTSs and 4G data shows that the rate of growth of BTS, whether it is percentage annual growth rate or absolute incremental growth, is not keeping pace with the data usage growth rate. It appears that the investment in 4G RAN is slowing down in the country because of the stated plans of service providers to invest in 5G technology networks. Investment in 5G RAN is constrained presently due to non-assignment of mid-band and high-band spectrum.
- 4.32 Enhancement in existing mobile networks capacity and broadband speed to some extent is possible with the use of additional spectrum, and deployment of spectral efficiency enhancing technologies such as MIMO. However, to provide congestion free broadband services to increasing subscribers' continuous investment in RAN is required. Technology upgradation of mobile networks in terms of an early rollout of 5G networks would certainly be an imperative for enhancing the mobile broadband speed.

- 4.33 5G is characterised by greater peak data rates, higher throughput, lower latency, and high connection density as compared to 4G networks, thus is expected to result in improved user experience. Data speed in 5G is expected to be around 10 Gbps. With such speeds, 5G will not only provide rich user experience but also revolutionize the mobility content available online. 5G is also likely to strengthen the suite of enterprise services for TSPs by providing a more agile and efficient network with the ability to meet on demand requirements through network slicing, virtualization, software defined networking, mobile edge computing and cloud. Transition towards 5G is gaining momentum globally.
- 4.34 5G is radically changing the speeds and capabilities of mobile networks around the world. According to a recent data published by OpenSignal²⁹ based on users experience across fifteen leading 5G markets, 5G users see average download speeds many times faster than 4G. The improvement in 5G speeds ranges from 15.7 times faster than 4G in Thailand to 1.6 times faster in the Netherlands.

²⁹ Opensignal-benchmarking the global 5G user experience October 2020 update

Figure 4.7: Download speed comparison of 4G and 5G users



Source : Opensignal – Oct.2020

4.35 According to the latest market survey by mobile phone performance testing firm Ookla³⁰, there were 99 countries and 14,643 cities worldwide with 5G deployments at the end of Q3 2020. The US had the most cities with 5G deployments at the end of Q3 2020 with 7,583. Germany was second, Austria third, the Netherlands fourth and Switzerland fifth. Most early trials and commercial deployments of 5G spectrum allocations around the world have been centred on the mid-band (3.3 GHz - 4.2 GHz) spectrum. In the United States, early deployments leveraged millimetre wave frequency bands in the 28 GHz and the 39 GHz, which delivered impressive speeds in a very constrained footprint. The rapid 5G deployment in the 600 MHz band

³⁰ Speedtest.net world-5g-report-2020

- has added a substantial nationwide 5G footprint and with that a much wider 5G availability for many more Americans.
- 4.36 The modest 5G Download Speeds in the U.S. as shown in Figure 4.7 are due to the combination of a limited amount of new mid-band 5G spectrum available now and the widespread use of low-band spectrum by operators. For example, T-Mobile's 600MHz and AT&T's 850MHz offer excellent availability and reach but lower average speeds than the 3.5GHz mid-band spectrum used as the main 5G band in every country outside of the U.S. However, in Opensignal's recent U.S. report it found that Verizon's mm wave-based 5G service offers considerably faster average 5G Download speed of 494.7 Mbps, which is faster than the average 5G download speeds experienced by any operator, or in any country to date, including Saudi Arabia.
- 4.37 In view of the above discussions, it can be said that 5G needs spectrum across low, mid, and high spectrum bands to deliver widespread coverage and support a wide range of use cases. All three ranges have important roles to play:
- i. Low-bands (e.g. sub-1 GHz) support widespread coverage, including indoors, across urban, suburban and rural areas. Increased low-band capacity is required to create greater equality between urban and rural broadband connectivity and address the digital divide.
 - ii. Mid-bands typically offer a good mixture of coverage and capacity benefits. The majority of commercial 5G networks are relying on spectrum within the 3.3-3.8 GHz range.
 - iii. High-bands (e.g. 26/28/40/66-71 GHz) support the ultra-high broadband speeds envisioned for 5G.
- 4.38 Keeping in view the above analysis, achieving an aspirational goal of universal access at 50 Mbps would be possible with technological upgradation of mobile networks from 4G to 5G. It would require allocation and assignment of spectrum which is suitable for 5G technology at the earliest.

4.39 In view of the above, the Authority recommends that:

- i. **With increasing data consumption, in order to sustain pace of investment in the cellular networks and in-turn support enhancement of mobile broadband speed, the Government should expedite auction of available mid band spectrum i.e. 3300 MHz to 3600 MHz.**
- ii. **For further enhancement of mobile broadband speed, allocation of spectrum in mm-wave range for IMT-2020 purpose should be expedited.**

4.40 However, provisioning of spectrum alone won't be enough to make 5G in India a success story. It would also require investment in network densification heavily through provisioning of fibre, small cells, and posts. Fibre-based backhaul is still in infancy in India. The Government has recognized it as the strategic element for achieving the objective of high-speed broadband and has put a huge thrust through the NDCP-2018 and aims to fiberize at least 60% of telecom towers by 2022, eventually accelerating migration to 5G. Densification of radio networks is another important area which needs attention. The existing tower density is 0.42 towers per thousand population with around 6.45 lakh towers. To take it to global standards, this needs to be increased by setting up of an additional 10 to 11 lakh towers. Installation of towers and creation of OFC infrastructure requires coordination and alignment of work of multiple stakeholders and agencies across the Central Ministries/Departments, State /UT Governments, local authorities, industry, and user communities. These issues shall be deliberated in the next chapter on infrastructure creation in detail.

III. Fixed Line Broadband Speed Enhancement

4.41 From the comparison of fixed line broadband speeds presented in Section-I it is obvious that our country fares comparatively better as compared to mobile broadband speed. Globally we stand at 66th position among 177 countries as per Ookla's Speedtest global index. India is ahead of almost all its neighbours except China in fixed line broadband speed. But still the fixed line broadband download speed achieved in our country is only 56 Mbps, which is way below the global average download speed of 98.67 Mbps. For the countries acquiring the top slots in the Speedtest global index it is more than 200Mbps, whereas in countries like USA, Japan, South Korea etc. the fixed line broadband download speed is greater than 100 Mbps. Hence, there is a lot of scope for improvement. This concern was raised in the CP in the form of the following questions:

- i. *“What could be the probable reasons for slower fixed broadband speeds, which largely depend upon the core networks only? Is it due to the core network design and capacity? Please provide the complete details.*
- ii. *Is there a need of any policy or regulatory intervention by way of mandating certain checks relating to contention ratio, latency, and bandwidth utilisation in the core network? If yes, please suggest the details. If no, then specify the reasons and other ways to increase the performance of the core networks.*
- iii. *Should it be mandated for TSPs and ISPs to declare, actual contention ratio, latency, and bandwidth utilisation achieved in their core networks during the previous month, while to their customers while communicating with them or offering tariff plans? If no, state the reasons.”*

Comments from the stakeholders

- 4.42 Majority of the stakeholders consider legacy last mile delivery technologies being used by many operators responsible for slow broadband speeds in the country and not the core network. As per these stakeholders many technologies such as ADSL, VDSL, DOCSIS have limitation in terms of speeds. Another reason cited by them is lack of proper ducting in old buildings hampering the cables at many instances, exposing them to external factors, thereby impacting the last mile connectivity and consequently the average speeds of fixed broadband.
- 4.43 One TSP having similar view has stated that utilization of the core network and the links connecting the core network are being monitored constantly, and due enhancements are made by the operators to ensure that the peak utilization of both the core network and the connecting links is less than 80%. Therefore, as per this TSP, core networks are not the bottlenecks for slower fixed broadband speeds, as these are easily scalable.
- 4.44 However, one forum is of the opinion that that the performance of core networks affects the performance of the fixed and mobile broadband together. As per this stakeholder, for matching the global average broadband speed, delivery of maximum content to users at the edge of the network becomes a necessity. This delivery however is dependent on the design and resilience of core networks as well as how much of the traffic originates outside the nation. Another stakeholder having similar opinion has expressed its concern regarding frequent congestion of National Internet Exchange of India (NIXI) ports for some TSPs and has suggested stepping up of investment in NIXI and increase in capacity at peering sites to avoid latency and give a boost in the domestic traffic.

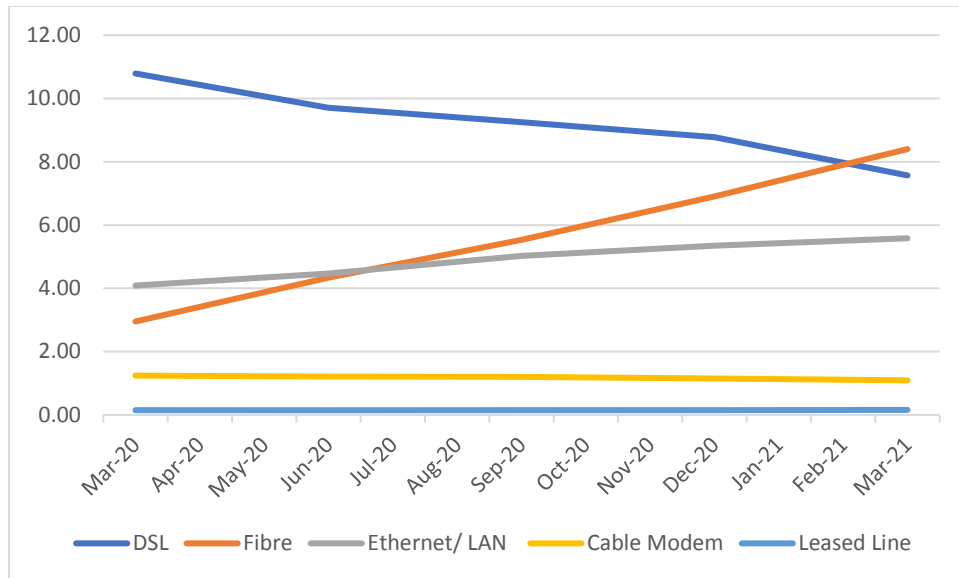
- 4.45 As majority of the stakeholders have expressed their disagreement with core network's performance being responsible for the lower throughput for the end customer, they feel that any checks relating to the core network performance is unwarranted. According to them, the Indian market is the most competitive globally, with the choice of many service providers available to the end customers. If the user is not satisfied with the performance, one can choose to change the operator without breaching any commitments. Therefore, they do not agree with any policy or regulatory intervention by way of mandating certain checks in the core network. As per these stakeholders, there should be no mandate for TSP's and ISPs to declare actual contention ratio, latency, and bandwidth utilization achieved in their core networks during the previous month to their customers while communicating with them or offering tariff plans. They have stated that from the customer perspective also there is no use of declaring contention ratio, latency, bandwidth requirement, etc. as these would only make the offering complicated.
- 4.46 One such TSP has suggested that to improve the performance of core networks the better approach would be to persuade and incentivize the legacy networks to migrate to new fixed broadband technologies. Another suggestion given by this TSP is that the Authority should also give a focused attention to the implementation of ROW Rules, and it should also collaborate with other Government agencies to ensure the common ducts, and mandatory provision and access for ducting in new buildings and housing complexes. These measures will have long term impact on the Broadband speeds in the country.
- 4.47 One association is of the view that to provide good quality and reliable internet, there is a need of regulatory intervention by way of mandating certain checks relating to contention ratio, latency, and bandwidth utilization in the core network. As per this stakeholder, the TSPs and ISPs should also be mandated to declare on a monthly basis the actual

contention ratio, latency, and bandwidth utilisation achieved in their core networks during the previous month to the customers and such data should be submitted to TRAI or to DoT as well.

Analysis of the issue and views of the Authority

- 4.48 The Authority is aware of the concerns expressed by the stakeholders regarding restricted access to residential societies and complexes. This issue has been addressed to some extent by amending the National Building Code of India to make telecom installations and associated cabling mandatory for all commercial and residential buildings. As noted earlier, to address this issue in totality, the Authority is intending to have consultation with stakeholders separately. The Authority agrees with the concerns expressed by stakeholder regarding frequent congestion of NIXI ports and suggestion of stepping up of investment in NIXI to increase capacity at peering sites to avoid latency. A separate consultation on the issue of Internet Exchange Point (IXP) along with content delivery networks and data centers will be done with the industry and recommendations will be issued.
- 4.49 The Authority agrees that the legacy last mile technologies being used in the fixed line broadband network are not able to deliver high speed broadband due to their inherent limitations. However, a close look at technology-wise fixed broadband subscription during last one year as depicted in Figure 4.8 shows a downward trend in the broadband connections provided using legacy last mile broadband technologies.

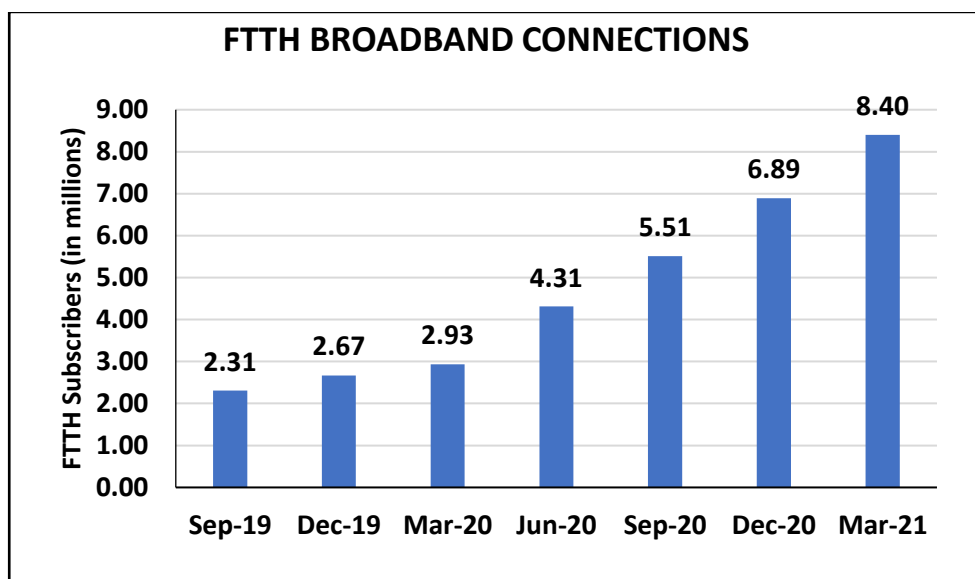
Figure 4.8 : Technology wise fixed broadband growth trend



Source : TRAI

- 4.50 Based on this trend, it can be expected that as time progresses FTTH broadband connections will dominate in the fixed broadband market segment.
- 4.51 Optical Fiber is the most promising last mile technology as on date as it has the capability to provide high-speed, low latency, and reliable broadband connectivity to the subscribers. It allows very high transmission rates of 100 Gbps and more within very wide (10 to 60 km) range and can meet the demand of multi-person households. This is the most future-oriented solution but requires high investment in passive infrastructure. Fiber has the least down time, lowest cost per GB, and can provide services to very high data usage customers. FTTH deployments are gaining traction in India also as it is obvious from the quarter-on-quarter trend of the FTTH connections presented below in Figure 4.9.

Figure 4.9: FTTH Broadband growth in recent past



Source : TRAI

This trend of FTTH needs to be accelerated further to match the surge in data consumption as well as to meet the aspirational goal of universal 50 Mbps speed set by NDCP-2018.

- 4.52 As per an E&Y study quoted in the Financial Express³¹, India's construction cost to reach a FTTH household is among the highest in the world at \$1,580 against \$200 in China, \$307 in Thailand, \$334 in Indonesia, and \$432 in Malaysia. The reasons for high FTTH rollout cost in India include exorbitant cost of RoW, high lead time for approval, non-cooperative residential societies, unorganised/expensive fibre construction services, high fibre maintenance cost, etc. These issues shall be addressed in detail in subsequent recommendation on infrastructure creation.
- 4.53 Until the birth of telecom infrastructure providers in the form of independent tower companies, India's mobile broadband penetration

³¹<https://www.financialexpress.com/opinion/fibre-to-the-home-shared-fibre-infrastructure-is-key/1736692/>

was limited. It reduced the entry barrier for cellular players, enabling quick expansion of coverage through shared infrastructure without individual operators having to bear the CapEx burden of setting up their own towers. Similarly, Infrastructure providers i.e., IP-Is should be encouraged to install and share Fibre Infrastructure to ensure fibre availability across the country. Passive Optical Network (PON) architecture already provides fibre sharing between many service providers through either Time Division Multiplexing or Wavelength Division Multiplexing. Hence, there is a requirement to formulate policies to permit IP-Is to install and share optical fibre network along with the transmission equipment to support growth of fibre infrastructure if the vision of universal broadband speed of 50Mbps is to be realized. Multiple tenancies will enable these companies to spread the infrastructure cost over many operators and cost to FTTH providers will come down reasonably, which will in turn increase the affordability for end consumers.

4.54 The Authority considers overhead optical fiber deployment as a cost-effective alternative. Overhead optical fiber deployment is done either as OF deployed in OPGW cables or as OF deployed in ADSS cables. OPGW refers to Optical Ground Wires that are used in high voltage power transmission lines, while ADSS refers to All-Dielectric-Self-Support cables that are strung along poles used for distribution of low voltage power. Although both methods are used globally, underground deployment is more prevalent due to long life, reliability, and low total cost of ownership. Service providers can have a mix of underground deployment and overhead deployment along transmission/distribution lines. The issues related to RoW and sharing of infrastructure for laying overhead cables have been deliberated and addressed in the next chapter on infrastructure creation.

4.55 Apart from these issues, core networks are also responsible for the performance of the fixed and mobile broadband together. The Authority

agrees with the views expressed by some of the stakeholders that for a high speed and reliable fixed broadband connectivity there is a need to monitor contention ratio, latency, and bandwidth utilization in the core network. As discussed in the CP, these parameters are affecting the end user experience of the fixed broadband customers as they are accessing more video centric applications than ever before. The Authority is of the view that peak bandwidth utilization monitoring of both the core network and the connecting links may necessitate operators to augment the core network resources from time to time. This will result in enhanced fixed broadband speed and an improved quality of experience for the customers.

- 4.56 Keeping in view the above facts, the Authority is of the opinion that TSPs and ISPs need to declare core network performance parameters like contention ratio, latency, and peak bandwidth utilization. This would require further consultation with stakeholders to arrive at specific technical parameters and amendments in the broadband QoS regulations. This exercise would be taken up separately in consultation with stakeholders.

IV. Consumer Devices

- 4.57 As discussed in the CP, speed of broadband to some extent also depends on consumer devices. In case of mobile broadband, even the network performance may get affected because of the quality of mobile devices attached with the network due to unfair utilisation of network resources. To address these concerns stakeholders' comments were solicited on the following issues raised in the CP.
- i. "Is there a need of any policy or regulatory intervention by way of mandating certain checks relating to consumer devices? If yes, then please suggest such checks. If no, then please state the reasons.
 - ii. To improve the consumer experience, should minimum standards for consumer devices available in the open market be specified? Will any

such policy or regulatory intervention have potential of affecting affordability or accessibility or both for consumers? Please justify your comments.”

Comments from the stakeholders

- 4.58 Stakeholders have mixed opinion regarding this issue. Majority of the stakeholders are in favour of a policy or regulatory intervention in form of some minimum standards. They have highlighted certain deficiencies of the smartphones due to which users experience a degradation in the quality of broadband services. Some of the deficiencies mentioned are availability of only one 4G slot in dual sim smartphones, lack of support of - location based information, lower frequency bands resulting in poor in-building coverage, non-availability of technologies like VoLTE, VoWiFi, enhanced codecs etc. These stakeholders are of the opinion that it is important to have globally harmonized standards to allow interoperability and economies of scale and have suggested that India should adopt globally harmonized 3GPP standards. These stakeholders are of the opinion that mandating of such standards should not have an impact on the affordability of handsets in a price sensitive market like India.
- 4.59 Few stakeholders are not in favour of any regulatory intervention in the sphere of consumer mobile devices. These stakeholders are of the view that consumers purchase mobile/telecom/ICT devices based on their use-case and willingness to spend. Affordability is a major factor that has helped in the strong telecom penetration in the country and made telecom connectivity affordable for all. One such stakeholder has suggested that apart from the existing minimum standards from a safety and a consumer protection point of view, enforcing any other standards for quality or performance may make such devices unaffordable for the end consumer in certain cases. It has been suggested that device affordability and quality is governed by market forces,

mainly consumer and competition and it should continue to do so. Another stakeholder having a similar opinion has stated that the Authority, in quest for better Broadband speeds, should not lose focus from the fact that competition and consequent lower prices and availability of super low-cost devices has played a major role in increasing mobile penetration and this was fostered by minimal regulations and policy of non-interference barring ensuring that the SAR value is within the Internationally accepted benchmarks.

Analysis of the issue and views of the Authority

- 4.60 The deployed radio network is only half of the equation. Devices from different manufacturers and release dates have very different characteristics like CPU speeds and core counts, amount of available memory, storage capacity, GPU etc. Each of these factors affect the overall performance of the device and the applications running on it. However, even with all of these variables accounted for, when it comes to network performance, there is one more factor that is often overlooked, i.e. radio capabilities. Specifically, the user device must also be able to take advantage of the deployed radio infrastructure. The carrier may deploy the latest LTE infrastructure, but a device designed for an earlier release may simply not be able to take advantage of it, and vice versa.
- 4.61 Both the 3GPP and 3GPP2 standards continue to evolve and enhance the radio interface requirements: modulation schemes, number of radios, and so on. To get the best performance out of any network, the device must also meet the specified user equipment (UE) category requirements for each type of network. In fact, for each release, there are often multiple UE categories, each of which offer very different radio performance. Availability of multiple categories of devices enables device differentiation, various price points for price-sensitive users, and ability to adapt to deployed network infrastructure on the ground. The

LTE standard defines its own set of user equipment categories as shown in Table 4.5.

Table 4.5: LTE user equipment (UE) categories

3GPP release	Category	MIMO	Peak downlink (Mbit/s)	Peak uplink (Mbit/s)
8	1	1x	10.3	5.2
8	2	2x	51.0	25.5
8	3	2x	102.0	51.0
8	4	2x	150.8	51.0
8	5	4x	299.6	75.4
10	6	2x or 4x	301.5	51.0
10	7	2x or 4x	301.5	102.0
10	8	8x	2998.6	1497.8

Source : [High Performance Browser Networking](#); O'Reilly

A high-end smartphone for 3GPP release 8 is likely to be a category 3–5 device, but it will also likely share the network with a lot of cheaper categories 1–2 neighbours. Higher UE categories, which require 4x and even 8x MIMO, are more likely to be found in specialized devices. Because powering so many radios simultaneously consumes a lot of power, which may not be very practical for a handheld device.

4.62 In majority of the cases, users owning an LTE or an HSPA+ device don't know its category classification. And once they figure that out, they are not aware about which 3GPP release their network operator is running. To get the best performance, the two must match. Otherwise, user experience will be limited either by the capabilities of the radio network or the device in use. Hence, there is a need to make the users aware

about user equipment category best suited for a radio network deployed by the operator.

- 4.63 The Telecom Engineering Centre (TEC) has released Essential requirements (ERs) for different product categories. The finalized ERs for Mandatory Testing and Certification (MTCTE scheme) of Mobile Phones have been available since July 2020, which includes Mobile Handsets – covering Smartphones, Tablets and Dongles. The products in ER for Mobile User Equipment³² are under Mobile Phone and Data Cards category, including 2G Mobile Phone, 3G Mobile Phone, CDMA Mobile Phone, 4G Mobile Phone, 3G Data Card, CDMA EVDO Data Card and 4G Data Card. These are as per the globally harmonized 3GPP and 3GPP2 standards.
- 4.64 The ERs for mobile equipment specify parameters like frequency of operation of the device, safety requirements, functional parameters (emergency support, language support, SAR value etc.), radio conformance, IP and IPv6 conformance parameters for both feature phones and smartphones. The operating frequency of each individual device (2G/3G/4G) to connect to cellular networks is defined in the ER for mobile devices. This handset specific parameter in some manner complies with the ability to connect to the frequency bands (carrier aggregation) which can affect the network performance as per OpenSignal report³³. Compliance of IPv6 header parameters for the device (header version, traffic class, flow, payload length, hop limit etc.³⁴), in a way conforms/indicates for faster packet processing during network routing and so improving throughput in the data transmission. These frequency, throughput and latency related parameters on which speed/experience directly depends are already finalized in the ERs by

³² <https://www.tec.gov.in/essential-requirements>

³³ https://www.opensignal.com/smartphone_mobile_network_experience_august_2019.pdf

³⁴ https://www.mtcte.tec.gov.in/filedownload?name=downloadDocument_Annexures_to_ER.pdf

TEC and would typically ensure the quality of mobile devices attached with the network.

4.65 Keeping in view the above facts the Authority is of the opinion that there must be a mandate for mobile handset manufacturers and sellers to transparently declare the UE category to the customers, so that they may take an informed decision as per their affordability and performance of the device. There are TEC standards available for mobile devices. However, mobile handset at present has not been included in the list of equipment for mandatory testing and certification published by TEC. It is expected that along with other equipment, mobile device shall also be included in this list in phased manner after due consultation with the industry and approval of DoT.

4.66 Hence, in view of the above discussions, the Authority recommends that:

In order to increase customers' awareness about data communication performance of different models of mobile handsets available in the market, for each and every model of mobile handset, as per the international standards like 3GPP, the Government should mandate that manufacturers or marketers should declare the User Equipment's category mandatorily.

CHAPTER 5

BROADBAND INFRASTRUCTURE CREATION

- 5.1 With broadband access being a major issue in the country today, it is noteworthy that the NDCP-2018 policy has set out to create a robust digital communications infrastructure by 2022. NDCP-2018 recognizes digital communications infrastructure and services as the key enablers and critical determinants of India's growth and well-being. For meeting the NDCP-2018 objectives, facilitating infrastructure creation is imperative.
- 5.2 This CP has dealt with the present scenario, challenges, and approaches for broadband infrastructure creation in the country. To convert the NDCP strategies into actionable points several questions were raised to seek the inputs of the stakeholders on four important issues:
- a. Right of Way (RoW)
 - b. Common ducts policy
 - c. Cross-sector infrastructure development
 - d. Infrastructure sharing
- 5.3 Various comments have been received from the service providers, industry players, associations, and individuals on these issues. Analysis of these comments and the Authority's views have been presented in the following sections.

A. Right of Way (RoW)

- 5.4 Historically, rolling out of telecom infrastructure in India has been full of challenges. One such challenge is in getting permission for Right of Way, a term used to describe

“the legal right, established by usage or grant, to pass along a specific

route through grounds or property belonging to another”

- 5.5 As broadband connectivity emerges as a key component of socio-economic development, the ability of the networks to carry growing traffic requires deployment of more fiber in access as well as backhaul, installation of towers, and assignment of spectrum. The industry depends upon getting timely and affordable RoW permissions from authorities to accelerate infrastructure rollout. For several years, getting timely and affordable RoW permission has been the primary concern in expansion of the telecom infrastructure across the country.
- 5.6 Many times, RoW charges and levies imposed are arbitrary and at times exorbitant. There are wide variations in charging mechanisms and rates of RoW fees across various municipal corporations in cities and states. Time taken in granting RoW clearance is too long. Tedious application processes, delayed and denial of permissions by the authorities, site restrictions, arbitrary charges have adversely affected pace of development of telecom infrastructure in the country.
- 5.7 To address issues concerning RoW permissions, the Government had notified the Indian Telegraph Right of Way (RoW) Rules³⁵ (the rules) on 15th November 2016, with the aim of ensuring a uniform adoption of RoW rules across all the states and streamlining the process of RoW approvals for laying down of cables (underground) and setting up of telecom towers (overground). Its salient features include:
- a. An electronic application process has been provided for, which shall be developed within one year of the rules coming into force.
 - b. The concerned authority must not take more than 60 days from the date of application to either grant permission or deny it. The concept of *audi alteram partem* has been introduced in case of rejection of such an application.

³⁵ https://dot.gov.in/sites/default/files/2016_11_18%20RoW%20Policy.pdf

- c. The rules aim to rationalize the administrative expenses across the country to a maximum of Rs 1000 per km for fibre, and a maximum of Rs 10,000 per application for the overhead towers. This one-time fee must be paid in order to meet administrative expenses for examination of the application and the proposed work.
- d. Provision for the establishment of nodal agencies for the purpose of implementation of these rules.
- e. Also, the appropriate authority under the rules has the power to supervise the execution of work to ascertain if the conditions imposed in the grant of permission are observed by the licensee.
- f. It also provides for the right of appropriate authority to seek removal and alter such telecom infrastructure in case of expedient circumstances.
- g. The rules provide for both underground and overground telegraph infrastructure.
- h. The rules also provide for the dispute resolution by the officer designated by the Central Government within a fixed period of 60 days.

5.8 NDCP-2018 focuses on digital infrastructure development initiatives related to fibre deployment and Right of Way clearances, for both overground and underground infrastructure, that will form the bedrock of next generation technologies. The policy recognizes that creation of the infrastructure requires coordination and alignment of work of multiple stakeholders and agencies – the Central Ministries and Departments, State Governments, Local/Municipal authorities, industry, and user communities to achieve the intended objectives. The policy mentions that the cost of fiber rollouts remains high in India due to complicated and uncertain RoW policies across the country.

5.9 While some states have aligned their RoW policies either partially or fully with the rules, other states are yet to align their RoW policies and procedures with the rules. As a result, RoW permissions are delayed due

to varying and complex procedures across states and Central Government Departments, non-uniformity in fees, lack of coordination among the authorities and thus hindering infrastructure rollouts. Moreover, obtaining approvals from the different departments like forest, railways, and national highway authorities has greatly impacted planning and rolling out of towers and fibre across the country over the last few years.

5.10 It was expected to facilitate a transparent, economical, and rapid rollout of fiber in access as well as backhaul through uniform application of rules across the country. But a lot of states did not implement them in practicality including appointing nodal officers to facilitate clearances. Keeping all the above concerns in mind, the following questions were raised in the CP for seeking the response from the stakeholders:

- i. *“Whether the Indian Telegraph Right of Way (RoW) Rules 2016 have enabled grant of RoW permissions in time at reasonable prices in a non-discriminatory manner? If not, then please suggest further changes required in the Rules to make them more effective.*
- ii. *Is there any alternate way to address the issues relating to RoW? If yes, kindly elucidate.*
- iii. *Whether all the appropriate authorities, as defined under the Rules, have reviewed their own procedures, and align them with the Rules? If no, then kindly provide the details of such appropriate authorities.*
- iv. *Whether the RoW disputes under the Rules are getting resolved objectively and, in a time bound manner? If not, then kindly suggest further changes required in the Rules to make them more effective.”*

Comments from the Stakeholders

5.11 All the stakeholders have unanimously said that RoW Rules, 2016 have not enabled grant of RoW permissions timely, at reasonable prices in a fair manner. The common issues highlighted by the majority of the

stakeholders regarding grant of RoW permissions, alignment of rules and alternative suggestions are mentioned below.

5.12 Alignment of Rules by Center and States/UTs: While, the RoW Rules, 2016 aimed at expediting the building of telecom infrastructure, but its implementation across States have not been on the expected lines. Different central bodies (like railway, road, water, gas pipeline etc.) and different State Governments continue to operate with their rules for granting RoW permissions with very high timeframes and disproportionately higher charges than the prescribed rates in RoW 2016 policy. As per stakeholders, one of the reasons for the slow implementation of RoW rules on ground is the lack of its legal enforceability on the States and other Central and Government Ministries. The grant of RoW permissions is a multi-stakeholder issue. Despite the passage of these rules for about four years, only a few States have come out with their own RoW rules, and even in such states, the enforceability of such rules is a huge challenge since different local bodies follow their own rules. According to the RoW policy implementation status submitted by one of the associations, till the current date only 24 states (out of 36 States/UTs) have their RoW/ telecom infrastructure policies framed, notified and aligned with the clauses of DoT's RoW Rules. Further, states like Karnataka and Haryana are not in complete alignment and still require certain amendments in their state policies. Northeast and Eastern States, though notified and aligned with RoW rules, are not getting implemented down the line and permissions are getting delayed, which is impacting the overall broadband penetration in the respective states.

5.13 The stakeholders have also stated that issues are being continuously faced in terms of getting the rules followed by local municipalities and Self-governing bodies like Nagar Palikas, Nagar panchayats, Zilla panchayats, Gram panchayats, Municipal Corporation. They have their

own bye laws to follow which defeats the very purpose of having these Rules. One association stated an instance in Maharashtra in which the Municipal Corporations of Nagpur, Bhiwandi, Nizampur and Pimpri Chinchwad have not adopted the new Policy as notified by the Maharashtra Government³⁶ on 17th February 2018, and following their own procedures, administration fee etc. like in various other states. Some of the associations stated that RoW is being considered a revenue opportunity and some states/ local bodies are still showing reluctance to adopt the RoW Rules and institutionalized their own framework to charge exorbitantly for granting permissions, despite the fact that telecom is a central subject and telecom services fall under the critical services due to COVID-19's impact.

- 5.14 Citing the core issues, stakeholders have suggested for a standard Uniform RoW Policy that guides RoW rules alignment, permissions, charging mechanism/rates, across all the central and state bodies. According to few service providers, the current RoW Rules, 2016 falls short of recommended procedures and rules, key Central Government bodies are missing (like Gas pipeline network, Railway, Coastal area road) and an adequate Policy in this regard can address the different variations in policies followed by different bodies, to administer a standard aligned guideline. Moreover, a uniform National RoW Policy resolves the RoW issue in the non-implemented states, which is jeopardising the rolling out of telecom infrastructure which is gravely affecting the quality of services.
- 5.15 Single window clearance: As per the inputs provided by few associations, most of the states though have aligned single window clearance clause in their notified rules, in reality RoW procedure is complex and requires multiple NOCs, permissions from various authorities including

³⁶ Maharashtra Telecom Infrastructure Policy 2018:
https://maitri.mahaonline.gov.in/PDF/Telecom_English_201802172211352211.pdf

electricity, gas, sewerage, Railways, NHAI, forest authority causing delays and cost inefficiencies. In states like Andhra Pradesh and Chhattisgarh, RoW is applied for multiple departments at different levels starting from local/municipal committee to district telecom committee to electronics and IT department. The documentation for the permit is bulky and non-standardized and is therefore time-consuming at each level. The permissions are not granted quickly as the approvals take considerable time.

5.16 Appointment of Nodal officers: Rule 4(1) of the RoW rules provisions for appointment of nodal officers to be designated by every appropriate authority, for the purposes of these rules and to facilitate clearances from various local authorities. As per the inputs received from an association, the States who have notified their RoW/infrastructure policies have designated and appointed officers from IT departments or Deputy/Municipal Commissioners of respective districts of the State, as the nodal officers in line with the Rules. But some of the stakeholders have submitted that in practice most of the states do not have nodal officers at the level of local/district authorities for deemed approvals, even if appointed, the corresponding officers are not functioning as nodal officer for RoW and the applications are still being submitted at different levels for different departments.

5.17 Online portal for applications: The single window clearance mechanism is further supported by Rule 4(2) of the RoW rules, which envisages that the State Governments may establish a single electronic application process for submission of applications to all the appropriate authorities. Stakeholders have pointed out that many states lack a single window based online portal for RoW clearances. Further, in the implemented states, the portal is still in developmental stage or under discussions. As per these stakeholders, web-based portal is not available in all the States/UTs and authorities follow complex physical documentation

processes, moreover, the documentation/application process is different for different authorities leading to delay in permissions.

- 5.18 Non-uniform charges and exorbitant fees: One-time nominal administrative charges stipulated in the Rules are not more than Rs.10,000 for laying overground (OG) infrastructure and not more than Rs.1000/km for underground (UG) fiber cabling. Most of the stakeholders have submitted that RoW is seen as a revenue generator by many municipal/local authorities and hence excessive fees are being collected in lakhs of rupees per tower and variable fees in thousands per km for OFC depending on the sites in some States. In absence of a holistic policy alignment within states, these charges vary even within the state from city to city based on jurisdiction for granting permissions. Table 5.1 gives a view of non-uniformity and excess charges being levied in the states as submitted by an association. As per this stakeholder, in some urban settings or major metropolitan areas the permission fee is more than the cost of the infrastructure itself, which is discouraging the service providers to invest in expansion of fixed broadband services.

Table 5.1: Non-uniformity and excess one-time fees levied by the states

State	Per Tower charges	Per Km OFC charges
Andhra Pradesh	Corporations – Rs 1,00,000; Special & 1st Grade Urban Local Body – Rs 75,000; 2nd & 3rd Grade Urban Local Body – Rs 50,000; Nagar Panchayat – Rs 30,000, GP – Rs 20,000 to Rs 25,000	No uniform charges
Jharkhand	Rs 10,000 - Rs. 20,000	No uniform charges
Kerala	Rs. 50,000/- for Govt. lands & buildings. Additional Rs 50,000/- per sharing.	Rs 75,000/Km
Chhattisgarh	Municipal Corp: Rs 1,50,000; Municipal council: Rs 1,00,000; Nagar Panchayat: Rs 50,000; Gram panchayat: Rs 25000	No uniform charges
Karnataka	Rs.15,000 to Rs.1 Lakh based on jurisdiction	No uniform charges
Delhi	Rs. 10,000	Ranging upto Rs 25 lakhs / km

Source: Stakeholder comments

5.19 Exorbitant Restoration charges: The stakeholders also commented that exorbitant charges are being levied by local and municipal authorities under heads of renewal fee, digging and restoration fee, developmental charges which vary significantly across states. One service provider gave few instances of arbitrary restoration rates in selected locations as detailed below -

- Karnataka: ~ 8.40 Crore per km in Nagar Palika area; ~ 7.88 Cr per km in other cities and ~ 7.30 Cr per km in Town /Panchayat
- Mumbai: ~1.2 Cr per km
- Delhi: ~ 6.8 Lakhs per Km

- 5.20 Dispute Resolution: Section 10 of the Indian telegraph Act, 1885, (the Act) grant 'Power for telegraph authority to place and maintain telegraph lines and posts', and Section 14 of the RoW Rules provides the mechanism for resolution of 'Disputes between telegraph authority and local authority'. As per the said Rules, any dispute arising between a licensee (the telegraph authority) and the appropriate authority (as defined in the Rules) in consequence of the Rules shall be referred to the officer designated by the Central Government. The Central Government through two separate amendments dated 19th June 2017³⁷ and 8th January 2021³⁸ has designated the officers under the Sub-rule (1) of Rule 14 of the RoW Rules, at the level of Secretary/ Principal Secretary for dispute resolution for each State/UT.
- 5.21 The Authority was concerned whether the disputes are getting resolved objectively and being referred to the designated officers timely. Issue raised in this regard is 'Whether the RoW disputes under the Rules are getting resolved objectively and in a time bound manner? If not, then kindly suggest further changes required in the Rules to make them more effective.' According to an association, the nominated officers by States are neither well equipped nor aware of their roles and responsibility for resolution of disputes related to RoW.
- 5.22 Provisions for laying of Aerial OFC and use of Street Furniture: Few of the stakeholders are of the opinion that RoW Rules, 2016 is not equipped to support upcoming technologies. These rules are silent on Aerial Fiber laying and do not have provision related to street furniture, small cells, use of electric poles for deployment of aerial cable and low power 4G/5G BTS etc. to facilitate rollout of new and emerging technologies. One association has suggested that street furniture should be made available across the country at very low or no cost at

³⁷ <https://dot.gov.in/sites/default/files/19June2017.pdf?download=1>

³⁸ https://dot.gov.in/sites/default/files/2021_03_01%20RoW%20Policy.pdf

places such as bus stop shelters, lampposts, or traffic lights, owned by municipalities, to help small cell site deployment for 5G rollout.

5.23 Other common issues: Some stakeholders have stated that coercive action is taken on telecom infrastructure by local/municipal/state authorities like arbitrary sealing of towers or fiber cuts or electricity disconnection impacting downtime and degrading the Quality of Services in states of Odisha, West Bengal etc. One service provider is concerned about the instances where the authorities remove, damage, or threaten to remove telegraph lines citing nonproduction of decades back RoW documents, without prior intimation to the affected party.

5.24 Few associations have commented that State Govts are imposing restrictions on tower locations like schools/hospitals/public properties. Some local authorities are imposing restrictions on location of towers due to prevailing myths related to Electric and Magnetic Fields (EMF) radiation in States like Odisha, Bihar, Sikkim etc. Regularization of existing Mobile towers is a big challenge being faced by all the TSPs as referred by a service provider. The same service provider commented that a number of states are charging commercial rates for electricity whereby pushing up the cost of operations.

Measures suggested by the Stakeholders

5.25 Opinions of the stakeholders were also solicited through the CP on measures for addressing the prevailing issues, changes required and alternative ways to make the Rules more effective. For single window clearance, alignment of rules, and dispute resolution issues, similar measures are suggested by majority of the stakeholders in their written submissions, which are enlisted below –

- a. Mandatory implementation of the RoW 2016 Rules by all States and uniform adoption of the Rules by all central ministries, state and local authorities in totality.

- b. Adoption of a single-window clearance, creation of a portal by all the States/UTs and ensuring quick permissions via mandatory timelines (15 or 30 or 45 days) are prescribed.
- c. A common central portal for RoW and other permissions can be adopted by DoT to improve efficiency and increase the ease of doing business in the sector.
- d. Nodal officers should be appointed by concerned authorities in all the states/UTs.
- e. Uniform one-time nominal fees across the states, waiving off excess RoW charges like recurring charges, sharing charges, charges on Govt. land and buildings, and collection of reasonable charges should be restricted to restoration charges only.
- f. Detailed grievance redressal mechanism should be framed for quick dispute resolution by the dispute resolution officers with role and responsibilities clearly mentioned.
- g. Access should be given to use Govt. lands, buildings, electric poles etc. by TSPs/ licensee at nominal rates. Existing towers should be regularized, and tower restrictions should be eliminated, waive off NOCs.
- h. Revamping existing RoW Rules 2016 to include the missing key areas like overhead infrastructure along with UG and OG infrastructure, provisions related to street furniture, small cells, use of electric poles.
- i. Inclusion of provisions for common duct and dig once policies, change in construction design policy and building bye-laws to have duct/ trench/ fibre compulsory to get a completion certificate.
- j. Additional clauses in the Rules for no coercive action to be taken on telecom infrastructure by any local/municipal/state authority or any third party and also another clause for punishment against offences of vandalism, sabotage, wilful damage, tampering etc.

- 5.26 One of the stakeholders has shared international practices related to RoW as follows:
- i. The **IMDA in Singapore** has required “mobile installation spaces”—typically rooftop spaces reserved for telecommunication equipment be provided to network operators by building developers and owners free of charge.
 - ii. In **Japan**, operators can install 5G base stations on 208,000 traffic lights across the country. Moreover, the Japanese Government has proposed that the costs of using the traffic lights for 5G deployments be shared between operators and local administrations.
 - iii. In **Australia**, the Telecommunications companies have some powers to enter land and install and maintain some types of telecommunications facilities and some immunities from some state and territory legislation. These laws are designed to strike the right balance between the community's need to access reliable, affordable telecommunications services and ensuring that property owners, local Governments and communities have a say in the deployment of infrastructure that affects them.
 - iv. **Spain's** FTTH strategy (established in 2012) has become a model for cost-effective and fast FTTH deployment in Europe. Policies of the Spanish Government have contributed to this success. Since 1998, the Spanish Government has required that communications pipelines to be constructed for each new building, to provide the communication service. Since 2000, the Government has stipulated a legal framework for cooperation between public utility companies and operators in terms of pipelines.
 - v. **Austria** has a very good approach to RoW, termed as Wayleave Right under the Telecommunications Act 2003. Under the Act, the providers of a communications network can exercise wayleave rights on public property, such as streets, footpaths, public places and the airspace

above, free of charge and without special authorisation. The specific exercise of this right must be coordinated with the administrator of the public good (e.g., the municipality). Since the end of 2015, it has also been possible to apply for a decision from the Telekom Control Commission if no agreement can be reached. Importantly, the providers of public communication networks shall have the right to claim wayleave rights to private property subject to certain conditions.

- vi. The **German Telecommunications Act** entitles operators of public telecom to use (a right of use) Trafficways free of charge. Further, under the Act, the owner of a property cannot prohibit the setting-up, operation and renewal of telecommunications lines on his property subject to certain conditions.
 - vii. The **United Kingdom** last year consulted to permit development rights to support the deployment of 5G and extend mobile coverage. The result of the consultation published in July 2020 validates the importance of mobile infrastructure and takes forward certain in-principle proposals (primarily, changes pertaining to deployment of taller and wider masts, building-based masts located nearer to highways etc.) which will be codified in various town and country planning Orders and legislations. The outcome also shows the coordinated Whole of Government approach taken among various regulators, Governments and agencies to achieve the outcome.
 - viii. In **USA**, the US House of Representatives, Democrat Anna Eshoo of California and Republican David McKinley of West Virginia have proposed a Nationwide Dig Once Act of 2020. As per some reports, this "...will reduce costs drastically and increase access for communities across the country," making it "easier for states and broadband providers to enter new and underserved markets...".
- 5.27 Institutional Mechanism: One key strategy to address the complex issues of RoW is through better coordination amongst appropriate authorities. The creation of the passive infrastructure and grant of RoW

permissions is a multi-stakeholder issue involving multiple authorities like Local Bodies, Railways, Roadways, Forest departments, Electricity distribution etc. Effective coordination among these appropriate authorities may help in timely permissions from all concerned and speedy execution of infrastructural projects. Presently there is no institutional or coordination mechanism either at the State or Central level to appreciate the requirements and concerns of each other. For establishment of a National Digital Grid, NDCP emphasises on '*Creating a collaborative institutional mechanism between Centre, States, and Local Bodies for Common Rights of Way, standardisation of costs and timelines; and removal of barriers to approvals*'. Thus, a need was felt to establish such collaborative institutional mechanisms urgently and contours were sought from stakeholders.

5.28 To address the common RoW issues the Authority felt that there could be a standing coordination-committee constituted at each Licensed Service Area (LSA) level, including the State-level representative from each appropriate authority and the telegraph authority. On this note, for suggestions regarding institutional mechanism for monitoring and enforcement of the Rules both at State/Central level, the issues raised in the CP are:

- i. *What could be the most appropriate collaborative institutional mechanism between Centre, States, and Local Bodies for*
 - a. *common Rights of Way,*
 - b. *standardization of costs and timelines, and*
 - c. *removal of barriers to approvals? Justify your comments with reasoning.*
- ii. *Should this be a standing coordination-committee at LSA level to address the common issues relating to RoW permissions? If yes, then what should be the composition and terms of reference of this committee? Justify your comments with reasons.*

- 5.29 Mixed opinions are received from the stakeholders on the above issues. Every individual service provider, association and company has provided its own perspective on collaborative institutional mechanisms and proposed compositions of committees with proper justifications. Some have agreed with the development of LSA level committees while some have disagreed and preferred state level committees. Some have suggested that either the existing committees of the telecom sector or the committees proposed for achieving National broadband initiatives can be considered for dealing with RoW issues. Instead of the LSA level committees or existing telecom/telegraph/broadband related committees, some of them have given unique suggestions.
- 5.30 A service provider, an association and few companies are of the view that already existing committees of the sector will be appropriate to handle RoW in the country. These stakeholders have brought to the attention of the Authority the institutional set-up of National and State Level Broadband Committees proposed by the Government in the National Broadband Mission (NBM). The NBM³⁹ i.e., Rashtriya Broadband Abhiyan was developed in December 2019 to operationalize the 'Broadband for All' objectives of NDCP. The committees are composed of officials from the DoT HQ, DoT-LSAs and State (PWD/Urban development/Forest and Environment/IT) together. As the Government has already taken action to constitute these broadband committees across various LSAs, they are expected to cater to the need for a collaborative institutional mechanism between Centre, States, and Local Bodies for addressing all RoW related Policy and execution issues. These stakeholders believe that an appropriate collaborative institutional mechanism is already in place and only needs to work as per its laid-out objectives.

³⁹ <https://dot.gov.in/sites/National%20Broadband%20Mission>

- 5.31 Some stakeholders have proposed that the establishment of National Fibre Authority for setting up of National Digital Grid would be critical for the timely resolution of legacy as well as future IP-I issues. One service provider is of the opinion that State level Coordination committees already exist where the TSPs/ IPs deliberate common issues being faced at the local level, in order to decide on the joint course of action for redressal with the concerned Authorities. They have suggested that these coordination committees can be institutionalized and brought under a proper legal forum by including State Nodal Officer, DDG-LSA, Dispute Committee members etc. with Nodal Officers chairing the Committee.
- 5.32 One of the leading service providers has suggested that a GST type council would be an appropriate collaborative mechanism for enforcing common RoW across the country. Goods and Services Tax Council (GST Council) is a constitutional body which make recommendations to the Union and State Governments on issues related to Goods and Service Tax. The Union Finance Minister chairs the GST Council, the Indian model of the GST Council is unique in the world and represents a paradigm of a partnership between Central and State Governments. It further suggested that a Council similar to GST Council should be created comprising members from Central, all State Governments/Union Territories, and other relevant stakeholders such as Railways, etc. to ensure that all the States are on board in framing the RoW policy.
- 5.33 One association has opposed committee at LSA level justifying that there could be two or more States falling under one LSA and as per the association, committee at State level is more viable mechanism to address the RoW issues which should be chaired by the Principal Secretary-IT of the respective State with other department such as the UDD, Energy, Environment and Forest as members while the Advisor/

Sr DDG of DoT LSA may act as a Vice-Chair of the committee and should also have representatives from TSPs/IP-I companies. While another service provider agreed with LSA level committee and proposed composition with senior representatives from the concerned TERM Cell/LSA office, Secretary level official from Dept of IT, Dept of Urban and Rural Development, representatives from telecom companies/IP-1s, respective local authority/municipal corporation on a case-to-case basis, and meetings of this LSA committee should be convened monthly.

5.34 Apart from the above comments, diverse options proposed by one service provider, few associations and companies for appropriate collaborative mechanism are as follows:

- a. Formation of an '*Optic Fiber Regulatory Authority*' for fiber rollout, coordination among various entities involved in fiber deployment, bridging differences, review of progress, determining RoW charges, RoW application portal, facilitating infra sharing, infra security, Transco formation and forming utility duct sharing rules.
- b. A co-ordination committee consisting of representatives from State Departments - IT, Urban Development Department (UDD), and DoT LSA units should be formed. Regular meetings (on monthly basis) required for necessary action on the complaints filed by IP-I/TSPs regarding RoW.
- c. DoT itself should oversee RoW or may constitute special working committees at three levels (centre, state, and local bodies) for the same.

Analysis of the issue and views of the Authority

5.35 It has been observed by the Authority that the key impediments of RoW Rules are (i) non-alignment of rules notified by other central ministries and states with RoW Rules, 2016, (ii) institutional mechanism to make the rules most effective across the country (iii) lack of a single window clearance mechanism which is causing inordinate delays in obtaining

the permissions, (iv) non-uniformity in charges levied and (v) lack of a well-defined dispute resolution mechanism and other diverse issues. Based on the questions raised in CP and the comments received, above five issues are analysed one by one for deriving the suitable approach for the recommendations.

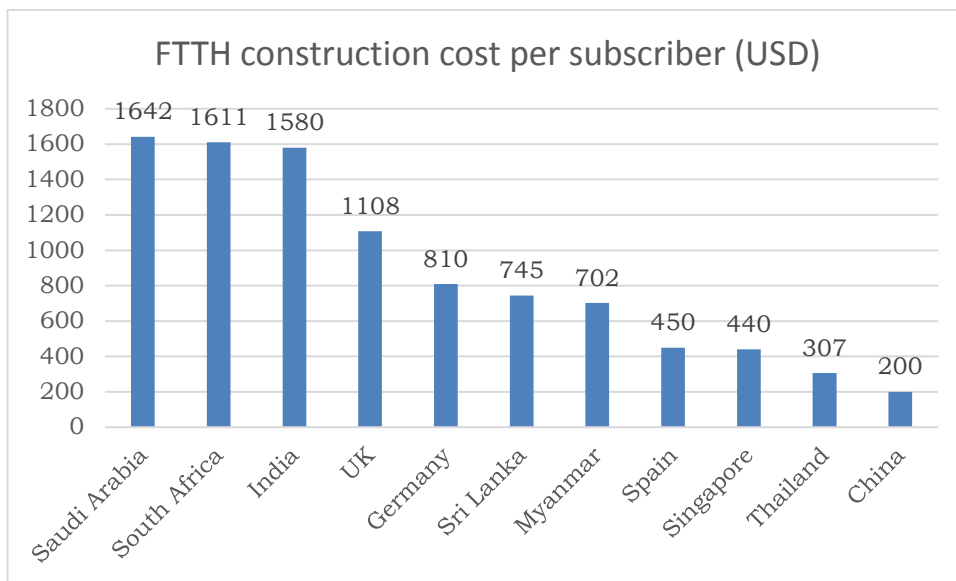
Alignment of the RoW Rules

- 5.36 After analysing the comments from the stakeholders, it is noted that the major impediment in getting RoW permissions is non-uniformity of the Rules across the central ministries, state Governments, and local bodies. While most of the States have either aligned or started aligning their RoW policies for digital communication infrastructure with the Indian Telegraph RoW Rules 2016, there are challenges concerning central authorities such as Indian Railways, Airports Authority of India, Ministry of Urban Development, Ministry of Defence, Metro Rail, etc. that do not follow these telegraph RoW rules citing differences with their Departmental Rules. In view of the Authority, there is an urgent need to streamline RoW framework at the Central level. In absence of holistic policy framework, the RoW charges vary even within the state from city to city and department to department. As pointed out by the stakeholders, some states take one-time charge, some recurring and some both. Basis of charging is also unclear. These RoW charges are a significant input cost towards digital connectivity. A 2016 ITU White Paper⁴⁰ highlights the cost implications for FTTH capex for Indian subscriber as compared to other countries, which is depicted in Figure 5.1 below.

⁴⁰ Broadband Regulation and Policy in Asia Pacific Region – Facilitating Faster Broadband Deployment,

https://www.itu.int/en/ITU-D/Regional-Presence/AsiaPacific/Documents/Events/2016/APAC-BB-2016/Final_White_Paper_APAC-BB.pdf

Figure 5.1: FTTH Construction Cost



The same paper compares some countries' costs of various components for rolling out broadband infrastructure. It shows India having high to very high cost on account of RoW and civil work.

5.37 The Authority agrees that RoW fees or charges applied should not be seen as a source to raise revenue for the local/state Governments rather than a means for supporting the development of local economy or ease of living of local community. This short-sighted approach needs to be transformed radically with the help of a holistic National RoW Policy framework. In order to entrust an environment that provides objective, fair and timebound RoW permissions, the Authority believes that there is a need for the 'National RoW Policy' to be applied and administered countrywide within the ambit of the law. After the economic reforms started in 1991, in this age of Liberalisation, Privatisation, and Globalisation (LPG), many public infrastructure projects, where development of digital communication infrastructure is vital for the nation, are developed by concessionaires under the agreement with the respective Government Authorities and agencies. It is important that in the National RoW policy, strategies to develop digital communication

infrastructure in such areas are clearly spelt out. The access to this digital communication infrastructure should be ensured to service providers in non-discriminatory manner and at reasonable prices. The National RoW Policy further could become a legal framework or a model law to be adopted by all the Appropriate Authorities.

- 5.38 Here it is pertinent to note that the Appropriate Authority has been defined in the Indian Telegraph RoW Rules 2016. As per the Indian Telegraph RoW Rules 2016 *“appropriate authority” means the Central Government, respective State Governments, local authority or such authority, body, company or institution incorporated or established by the Central Government or the State Government, in respect of property, under, over, along, across, in or upon which underground or overground telegraph infrastructure, is to be established or maintained, vested in, or under, the control or management of such appropriate authority.*
- 5.39 The process of policy making is lengthy process, which involves crucial steps of multi-stakeholder consultation, identifying issues, strategy formulation, implementation and assessment. As RoW permissions are required by all types of utility service providers, i.e. telegraph, electricity, water, gas etc., from Appropriate Authorities for establishment and maintenance of utility infrastructure, the National RoW Policy has to be comprehensive. The National RoW policy is required to be framed by an inter-ministerial committee or council or defined body considering all the key inputs of relevant stakeholders carefully. Below is the analysis on the institutional set-up which simultaneously addresses the policy making problem.
- 5.40 As noted above, keeping in view the fact that formulating National RoW Policy is a time-consuming process, in the interim, as most of the States/UTs have already aligned or started aligning their RoW permissions policies with the Indian Telegraph Right of Way Rules, 2016, immediate action is required to be taken to ensure that the

Central Government departments and agencies also align their RoW permissions policies with the Indian Telegraph Right of Way Rules, 2016.

Institutional Mechanism

5.41 The diverge inputs from the stakeholders gave insights to consider a wide range of factors for proposing the most appropriate institutional mechanism for enforcing and dealing RoW in the country. After reviewing the options and compositions as discussed by the stakeholders, the Authority has deduced the following approaches to proceed for suggesting collaborative institutional mechanisms:

- **Approach 1:** Committees can be formed at the State and District level by the State Governments, whose composition can be suggested based on experiences of existing state and district level telecom committees of some states. *or*
LSA level committees may be constituted with senior representatives from the concerned local departments headed by DoT officers, additional District/ local level committees can be suggested.
- **Approach 2:** Creation of a council akin to the GST type of council comprising members from Center, all State/UT Governments and other relevant infrastructural stakeholders.
- **Approach 3:** The Broadband Committees at the National, State and District levels already envisaged under the National Broadband Mission (NBM) can be empowered to take up all RoW related Issues.

5.42 Pertaining to the first approach, DoT in 2014, has advised⁴¹ the states for the formation of State Level Telecom Committees (STCs) and District Level Telecom Committees (DTCs) for effectively addressing the public grievances related to installation of towers and issues related to telecom infrastructure, with the compositions prescribed as below:

⁴¹ <https://dot.gov.in/sites/default/files/Advisor%20STC%20DTC.pdf>

- a. STC consisting of officers from TERM Cells of DoT, State Administration, representative(s) of concerned TSP(s) and eminent public persons etc.
- b. DTC consisting of officers from District Administration, representative(s) of concerned TSP(s) and eminent public persons etc.

Very few states like Haryana⁴², Nagaland⁴³, Tripura, Assam⁴⁴, Kerala etc. have formed STCs and DTCs with all the appropriate authorities and notified them in their State RoW policies for monitoring and enforcing their respective State RoW guidelines and dealing with the issues. It has been several years and there is no clear information on the committees in other states. There are few shortcomings in this approach like time constraints in the formation of STCs and DTCs uniformly in all the States/UTs, specifying the compositions and terms of reference of the committees along with defining the roles and responsibilities. It has been pointed out by the stakeholders that these issues have been addressed by the Government in the National Broadband Mission of December 2019.

- 5.43 For inter-sector collaborative regulations which are the need of the hour, the Authority has thought of LSA level committees headed by the senior officers of DoT, along with state level representatives from each appropriate authority. The senior officers of the DoT in each LSA are expected to coordinate with the State Governments to solve common issues of RoW. The Authority agrees with the stakeholders' view that LSA level committee would not be efficient in case of LSA covering two or three states, further would require a separate state level representation. Additionally, when local or district level committees are formed the LSA committee has to handle many districts and local

⁴² <https://cdnbbsr.s3waas.gov.in/uploads/2020/11/2020111641.pdf>

⁴³ <https://ditc.nagaland.gov.in/downloadDocuments/1594574100.pdf>

⁴⁴ https://it.assam.gov.in/sites/default/files/swf_utility_folder/departments/it_dept_webco_mindia_org_oid_2/menu/document/Right%20of%20Way%20%28RoW%29.pdf

bodies. Hence, approach number 1 does not seem to be a legitimate collaborative mechanism for RoW enforcement in the country.

5.44 The Goods and Services Tax (GST), introduced in India on 1st July 2017, replaced a host of indirect taxes being levied by the central and state Governments, which has changed the taxation landscape. The underlying theme was to have a 'one nation one tax' which would improve ease of doing business for taxpayers, bring in transparency, ensure timely compliance and ultimately reduce the tax burden for the common man. The successful experiment of GST Council, which is a constitutional body for making recommendations to the union and state Governments on issues related to goods and service tax, needs to be replicated for resolving RoW issues also. A coordination body on a non-statutory basis like the GST Council, as a federal institution, can enable smooth and efficient administration of RoW through cooperation and coordination between the centre and the states. Therefore, the second approach of a GST type of council i.e., setting up of a National RoW Council to formulate and lay down the National RoW Policy seems to be an appropriate way forward for uniform RoW policy across India. The vision of the National RoW Council should be to facilitate time-bound and cost-efficient creation of utility infrastructure for the nation building.

5.45 The NBM has a four-level implementation structure of committees to steer, drive, and achieve the Mission's objectives —

- i. Governing Council for Broadband
- ii. Broadband Steering Committee at the National level
- iii. State Broadband Committees in every State/ UTs
- iv. District/ Municipal Monitoring Committee

The top-level Governing Council for Broadband, chaired by the Minister of Communications is defined with members from all the Ministries/ Departments associated with communications infrastructure, whose

functions is to provide overall guidance and policy direction; decide on forming sub-missions in high priority areas and review the progress and development of mission activities.

5.46 The Broadband Steering Committee at National level, headed by Secretary (Telecom) has the representatives from Ministries/ Departments of Electronics and IT, Road, Railway, Petroleum, Environment and Forest, Power, Housing and Urban Affairs and Department of Space etc. This committee has the role to facilitate implementation of mission activities, set targets, review and monitor progress, address inter-departmental and State related execution issues. For effective implementation of the mission and proliferation of broadband in the States, State Broadband Committees have been proposed with the following composition:

- Chief Secretary of the State Government as Chairman
- Secretary (IT)
- Secretary (Urban Development)
- Secretary (PWD)
- Secretary (Forest and Environment)
- Advisor/ Sr. DDG of DoT working in the LSA

5.47 The State level committees can advise, facilitate implementation of the guidelines issued by the Governing Council or Steering Committee for expansion of broadband services of the State and functions of monitoring and evaluation of the work of missions pertaining to the State, the committee is subjected to meet once every quarter. Further, the States/UTs are provisioned to set up a District/Municipal Monitoring Committee within the District /Municipal area to monitor the progress on a monthly basis and submit reports to the State Committee. It seems relevant that these broadband committees of NBM may also be empowered to take up all RoW related issues. Further, for RoW permissions in rural areas, the role of panchayat department

becomes quite critical, and similarly for RoW permissions in industrial estates, the role of industries department becomes quite critical, therefore the Authority is of the view that in the State Broadband Committees, Secretaries in charge of panchayat and local self-governments, and industry departments should also be included. Many times, there is need for RoW permissions in areas which are controlled by the Central agencies like defence estates, ports, airports, railways etc.. To expedite such permissions, , the Chairman of the State Broadband Committees may coopt the state level representative of such central agencies on need basis in the meeting to resolve the issue. Moreover, to accelerate fiberisation, one of the strategies laid out by NBM, is to work with the States/UTs to have their RoW policy aligned with the Right of Way Rules notified by the Central Government.

- 5.48 In view of the above facts, the Authority is of the considered view that these institutional frameworks, already put-in-place under the NBM, should be used to address all RoW related issues. The Governing Council, which comprises of Secretaries of most of the Central Departments relating to infrastructure, can stipulate the principles for RoW permissions that can be adopted by all the Central Departments like Railway, Forest, Urban development, Electricity, Metro Rail, etc. The Governing Council for Broadband should handle RoW and lay down directive principles for granting RoW permissions to all the Central Government Ministries/Departments until the National RoW policy is formulated and notified. The NBM committees can oversee alignment by the local/state/central authorities, single window permissions, deemed approvals, appointment of nodal officers, monitoring of timelines, uniformity in fees and dispute resolution etc. The Authority wants to further emphasize that although the district-level monitoring committee are provisioned as optional in the NBM, but for the RoW issues it should be made mandatory as it can work more closely with the local bodies

like municipal corporations and Gram Panchayats etc. The district level committee should have DoT representative as its convenor and executive engineer from PWD as co-convenor. Formation of committees will facilitate an effective coordination for RoW issues in the country. The Authority is of the view that proper timelines are required for the committee's formation in all the States/UTs and in Districts.

5.49 In view of the above discussions, the Authority recommends that:

- i. As RoW permissions are required by all types of utility service providers, i.e. telegraph, electricity, water, gas etc., from Appropriate Authorities for establishment and maintenance of underground and overground utility infrastructure and presently such permissions are regulated under different Laws, Rules and Regulations, it leads to cost inefficient and delayed establishment of utility infrastructure. To overcome all these inefficiencies, the Central Government should come out first with the National RoW Policy, and subsequently it should also enact a model law for RoW permissions which should be adopted by all Appropriate Authorities. For this purpose, the Central Government in coordination with the State Governments should consider constitution of a National RoW Council so that in time-bound manner the policy and legal framework for RoW permissions could be put-in-place.**
- ii. Till the time the National RoW Policy is notified, the Governing Council for Broadband, already set-up under the National Broadband Mission (NBM), should lay down directive principles for granting RoW permissions to all the Central Government Ministries/ Departments so that the NDCP-2018 objective of efficient establishment of infrastructure is achieved.**

5.50 **The Authority recommends that the following institutional arrangements for streamlining RoW permissions framework should be put in place:**

- i. Under the National Broadband Mission (NBM), the Central Government has put-in-place the institutional mechanism, in form of the Governing Council for Broadband, the Broadband Steering Committee, and the State Broadband Committee, for inter-ministerial coordination at Center and State level. The objective of the Council and the Committees should be broadened to streamline RoW permissions framework for all utilities by inclusion of additional members nominated from other utility departments/ service providers.**
- ii. In the State Broadband Committees, Secretaries in charge of panchayat and local self-governments, and industry departments should also be included. Further, the Chairman of the State Broadband Committees may coopt the state level representative of the central agency(ies) on need basis in the meeting to resolve the RoW issues in time.**
- iii. Additionally, District Level Committees, with District Magistrate as Chairman, a representative from LSA unit of DoT, and Superintendent Engineer (SE)/Executive Engineer (Ex. Eng.) of Public Works Department (PWD), be set up to streamline RoW permissions framework at district level. The District Level Committees could necessarily include representatives from:**
 - a. Irrigation Department,**
 - b. Forest Department,**
 - c. Rural Development Department,**
 - d. Local Bodies like Municipal Corporation, Municipality etc.**
 - e. Utility service providers like telegraph, electricity, water, gas etc.**

Single Window Clearance mechanism

- 5.51 The Authority agrees with the views of the stakeholders that for ensuring time-bound RoW permissions and uniformity of processes, a single online portal for RoW permissions is necessary. The Authority is of the opinion that clearance mechanisms at various levels should be compulsively backed by the electronic application processes for faster permissions. A single window clearance mechanism across all the states will only be sustained by the creation of online portals for time-bound clearances. Obtaining single RoW permission currently involves two or more appropriate authorities and the voluminous submission to such authorities separately, which is time consuming. The Authority agrees that the appointment of nodal officers by various local authorities is very much required as per sub-rule 4(1) of the RoW Rules 2016 and the details of which should be published on state RoW portal. According to Rule 4(2) of the Rules; State Governments are allowed to establish a single electronic application process at their choice. However, in most of the states the single window clearance portal is not yet operational.
- 5.52 Single-window clearance by creation of an online application process is an imperative for all RoW proposals at the level of the states/UTs as well as in the Central Government/Departments. Therefore, the Authority is of the opinion that a National RoW online portal is required to be created. Development of such centralised portal basically requires connecting all the appropriate authorities to the electronic platform and the platform must allow the licensee/applicant to submit all the required documentation to different authorities at one place. The electronic circulation of the dossiers save time for both the service/infrastructure providers and public administration and would make the RoW process more effective. This will also result in the reduction of costs, as submitting of voluminous documentation to centralized agencies is done electronically rather than by multitude of

authorities. The operators through an easy to navigate and user-friendly interface can track the status of their application. It would help to identify the bottlenecks in the procedure and to find out where the delays are most significant so that authorities can adjust the process accordingly with minimum physical interference.

- 5.53 The portal should be fully automated starting from filing an application and must have features like online payment of application fee, fixed timelines, use of digital signatures, applicant's dashboard with real-time status of the application, section for queries in case of rejection and final issuance of electronic permission documents etc. Dispute resolution via litigation or civil courts is time consuming and has to be discouraged. An alternative online dispute resolution (ODR) mechanism⁴⁵ needs to be adopted, for which the national RoW portal should have provision for filing of disputes as well.
- 5.54 All the existing and upcoming state RoW portals can be integrated with this centralized portal as an umbrella. The unified national portal integrated with states, will eventually eliminate the need to visit multiple platforms/portals to gather information and obtain clearances from different stakeholders/authorities of various States. For the states where creation of state clearance portal is challenging and time-consuming, the National Portal could be their main portal to serve the purpose. Centralised RoW portal can solve the issues which are diversified across the states – uniformity of charges, processes, document requirement, timelines, deemed approvals etc., and will also help in attracting the much needed investments.
- 5.55 For single window clearances of Environment, Forests and Wildlife and Coastal Regulation Zone (CRZ) Clearances, the Ministry of Environment,

⁴⁵ ODR is an online form of Alternative dispute resolution (ADR) utilizing information technology to carry out dispute resolution, provisioned under Section 89 of the Code of Civil Procedure, 1908.

Forests and Climate Change has initiated and developed PARIVESH portal (parivesh.nic.in) which is a Pro Active Responsive facilitation by Interactive and Virtuous Environmental Single Window Hub. This web based, role-based workflow application has been developed for online submission and monitoring of the proposals submitted by the proponents for seeking clearances from Central, State and district level authorities. It automates the entire tracking of proposals which includes online submission of a new proposal, editing/updating the details of proposals and displays status of the proposals at each stage of the workflow.

5.56 PARIVESH enables project proponents, citizens to view, track and interact with scrutiny officers, generates online clearance letters, online mailers and alerts to state functionaries in case of delays beyond stipulated time for processing of application. This single window interface model can be adopted by the DoT to facilitate easier and efficient clearances countrywide through National RoW Portal that can be developed in collaboration with the states, industry, and NIC. The involvement of NIC can help in onboarding of states as already some NIC state units have created the state clearance portals. Thus, the Government should develop a web-based national portal with role-based workflow for RoW permissions in line with the PARIVESH model.

5.57 Sub-rule (2) of Rule 4 of the Right of Way Rules indicates that *‘The appropriate authority shall develop an electronic application process within a period of one year from the date of coming into force of these rules for submission of applications:*

Provided that the State Government may at its discretion establish a single electronic application process for all appropriate authorities under its control.’

The creation and establishment of a National RoW Portal can be backed by amending the above Rule (4) to enable such provision. As the

electronic application process i.e., portals are not mandatory for the States, there must be a second provision in the above Sub-rule (2) that the Central Government should establish a single web-based national portal with role-based workflow for RoW permissions.

5.58 The National RoW Portal should have a scope to be expanded for other utility providers also. It would enable cross-sector infrastructure creation. Cross-sector collaboration with other utility providers like water, electricity, gas, etc. for RoW permissions using the proposed portal would facilitate efficient infrastructure creation but requires certain efforts and time. Until all the utilities are provisioned for RoW permissions in the National RoW portal, for cross-sector collaboration, manual process needs to be put in place. As this issue involves with the co-deployment, dig once and cross-sector collaboration, these recommendations are covered in detail in the Cross-sector infrastructure development section. Similar to the PARIVESH portal, the national portal should have minimal physical involvement with provision for online submission, dashboard to provide real time status update of the applications, online payment of fee and restoration charges, issue of electronically signed permissions and issue of deemed permission letter if the authority fails to grant permission within specified timelines. The portal should also have a module to raise dispute between licensee and appropriate authority. As this portal would be used across Indian States, UTs and local bodies, multilingual portal with provision for vernacular languages would increase its acceptability and use. Simultaneously, an online training module supported with video-based guidance system in vernacular languages would facilitate its immediate implementation in the field offices.

5.59 Based on the above discussions, the Authority recommends that:

- i. **Sub-rule (2) of Rule 4 of the Indian Telegraph Right of Way Rules, 2016 should be amended to include a second provision as:**

“Provided further that the Central Government shall establish a single web-based national portal with role-based workflow for RoW permissions.”

- ii. In order to streamline Right of Way (RoW) permission processes, and to facilitate establishment of a single window electronic process (online) for RoW permission applications, the Central Government should develop a web-based national portal with role-based workflow. It should have clearly roles defined for the Central, State, and Local Body authorities. This portal should be developed within one year.**
- iii. In order to facilitate cross-sector collaboration for RoW permissions with other utility providers like water, electricity, gas etc. and co-deployment of telegraph lines with other utility infrastructure creation, at later date, it should be possible to expand the scope of the proposed national portal to grant RoW permissions to other utility providers also.**
- iv. Wherever Appropriate Authorities, i.e. different Central Government Departments, States, Union Territories, Local Authorities and their agencies, have already established the web-based portals for grant of RoW permissions, the same should be integrated with the proposed national portal for RoW permissions.**
- v. The proposed national portal for RoW permissions should have:
 - a. facility to submit application in the prescribed format;**
 - b. dashboard to provide real time status update of the applications;**
 - c. provision to make online payment of fee and charges;**
 - d. facility to issue electronically signed RoW permission, communicate reasons for rejection, if any, to the applicant as per the Indian Telegraph Right of Way Rules, 2016, in advance****

- so that the applicant can submit its contentions before rejection of the application; and**
- e. issue deemed permission letter if the appropriate authority fails to either grant permission or reject the application as per specified timelines in the Indian Telegraph Right of Way Rules, 2016.**
- vi. The proposed national portal for RoW permissions should also have facility to raise dispute between a licensee and the appropriate authority for referring to the dispute resolution officer designated by the Central Government.**

Uniform RoW Charges

- 5.60 For grant of RoW permissions to establish underground infrastructure, the Rule 6(2)(a) of these rules provides that the restoration charges maybe specified by the appropriate authority as under:

Rule 6. Grant of permission by appropriate authority-

(2) The appropriate authority shall within a period not exceeding sixty days from the date of application -

(a) grant permission on such conditions including, but not limited to, the time, mode of execution, measures to mitigate public inconvenience or enhance public safety and payment of restoration charge, as may be specified, subject to the provisions of the Act and these rules;

- 5.61 To resolve the issues of non-uniform and arbitrary restoration charges collected by the authorities which are random and varying based on the area and jurisdiction, can be homogenised through the involvement of States. The Authority is of the view that uniform charges for restoration of trenches/pits and compensation for damaged posts can be decided at State level for three categories of urban areas i.e., Municipal Corporations, Municipalities, and Nagar Panchayats based on different land strata and type of soil. The State/UT Governments can direct the

local bodies and municipalities to not charge any fee other than prescribed in the RoW Rules. Moreover, the digging activities can be permitted through a timeline-based plan or framework that notifies the interested licensees beforehand. This can be achieved through the co-ordination of municipal authorities, local bodies, central agencies/ authorities to prepare an annual plan for permitting digging, which can be notified on the National RoW Portal.

5.62 Horizontal Directional Drilling (HDD): Directional boring, also called horizontal directional drilling, is a form of trenchless drilling, involves installing a cable or pipe through a drilled path. This underground drilling is popular because of its safety, efficiency, and cost-effectiveness. Laying underground infrastructure through HDD eliminates the requirement of digging open trenches. The Authority was concerned whether the restoration charges are the same in the case of open trench laying and HDD or different? As per the inputs received from the stakeholders, a disparity in charges is observed in HDD restoration and open trench restoration across the states, which is totally irrational as the HDD operations require only few pits. To alleviate the non-uniformity and arbitrary imposition of preservation/restoration/reinstatement fees by different agencies/municipal authorities owning the RoW, only restoration charges for pits defined by the State should be paid to the local authorities in case of HDD operations.

5.63 Considering the discussions above, the Authority recommends that:

- i. In order to remove adhocism, bring predictability, attract investment and to accelerate establishment of underground and overground telegraph infrastructure, the Central Government should work out the uniform restoration charge for open trench and pit with the respective State Government/ UT.**

Provided that the restoration charges could be different for different categories of urban areas, i.e., Municipal Corporations, Municipalities and Nagar Panchayats, and different types of soil found in a State/ UT. Further, the respective State Government/ UT Administration should direct Local Bodies to not to charge any other fee or charge for RoW permission other than what fee or charges are prescribed in the Indian Telegraph Right of Way Rules, 2016.

- ii. In cases where Horizontal Directional Drilling (HDD) technology is used for establishing underground telegraph lines, only restoration charges for pit should be demanded by the appropriate authority as using this technology open trenches are not required to be dug to establish underground telegraph lines.**

Aerial Fiber Proliferation

- 5.64 The overhead telegraph infrastructure i.e., aerial OFC is a feasible and reliable prospect; and in certain geographies it has many advantages as compared to laying down of the underground OFC. The aerial OFC deployment broadly includes optical fiber cable placed over poles. Either existing electricity poles or dedicated poles erected overground for this purpose could be used for laying aerial OFC. Access to these utility poles as well as commercial or residential buildings is also required for installing small cells and in building solutions for broadband proliferation and enhancing the speed of mobile broadband services. RoW permission for aerial OFC plays a prominent role in advent of the cross-sector infrastructure development and sharing with other utility sectors like transport, power, broadcasting, railways, water etc.

5.65 The Authority has noted that the definitions of the ‘underground’ and ‘overground’ infrastructure as defined⁴⁶ in the preliminary chapter of RoW Rules, 2016 are sufficient and applies for aerial OFC and all other related infrastructure as well. But the restriction is observed at GSR part of the rules which included just optical fiber as part of the underground infrastructure and just mobile towers as part of the overground infrastructure, which is reproduced here:

G.S.R. 1070(E)—*In exercise of the powers conferred by sub-section (1) and clause (e) of sub-section (2) of section 7 read with sections 10, 12 and 15 of the Indian Telegraph Act, 1885(13 of 1885), the Central Government hereby makes the following rules to regulate underground infrastructure (optical fibre) and overground infrastructure (mobile towers), namely*

Amending the above GSR part by deleting the restrictions would broaden the scope of the rules and solve the issues raised by stakeholders for inclusion of Aerial OFC on poles and installation of small cells on street furniture etc. for rollout of emerging technologies.

5.66 Therefore, the Authority recommends that:

To make it explicitly clear that the Indian Telegraph Right of Way Rules, 2016 are applicable for establishment and maintenance of all kinds of underground and overground telegraph infrastructure; and not limited to optical fiber and mobile towers, the first

⁴⁶ **Definitions-** (1) In these rules, unless the context otherwise requires-

(e) overground telegraph infrastructure—means a telegraph or a telegraph line established over the ground and includes posts or other above ground contrivances, appliances and apparatus for the purpose of establishment or maintenance of the telegraph or the telegraph line;

(g) underground telegraph infrastructure—means a telegraph line laid under the ground and includes manholes, marker stones, appliances and apparatus for the purposes of establishment or maintenance of the telegraph line.

paragraph of the Indian Telegraph Right of Way Rules, 2016 should be amended as:

“G.S.R. 1070(E).—In exercise of the powers conferred by sub-section (1) and clause (e) of sub-section (2) of section 7 read with sections 10, 12 and 15 of the Indian Telegraph Act, 1885(13 of 1885), the Central Government hereby makes the following rules to regulate underground infrastructure and overground infrastructure, namely:-”

Dispute Resolution

5.67 For the sake of timely and effective resolution of disputes relating to RoW permissions, though the dispute resolution officers are nominated by the Central Government for every State/UT. As per the comments of stakeholders, they are not even aware of their roles and responsibility for resolution of disputes related to RoW. As per the stakeholders, most of the matters are being resolved at the local level in alignment with the local law and disputes are being taken to the civil courts. Stakeholders are expecting a detailed mechanism for dispute/grievance resolution for telecom infrastructure with role and responsibilities of the dispute resolution officer clearly defined. The Authority agrees to have an alternate arrangement and opines that DoT should undertake dispute resolution responsibility at each LSA level with the LSA unit heads as dispute resolution officers. The findings of the dispute resolution officer should be deliberated and finalised in the State Broadband Committee meeting.

5.68 Therefore, the Authority recommends that:

For timely and effective resolution of disputes relating to RoW permissions, as per Section 15 (1) of Indian Telegraph Act, 1885, the Licensed Service Area (LSA) unit head of DoT should be appointed as dispute resolution officer. The findings of the dispute resolution officer, to be finalised within 30 days, should be

presented to the State Broadband Committee, as constituted under the NBM, so that after detailed deliberations in the committee, necessary written instructions are passed on to the concerned authority for implementing the decision of the State Broadband Committee.

B. Common Ducts

- 5.69 One of the innovative solutions for the faster infrastructure rollout is laying out common ducts for OFC. Creation of passive infrastructure of duct space, fiber, and towers is capital intensive and time-consuming activity for the service providers (TSPs/ ISPs) as well as infrastructure providers (IP-1). The passive infrastructure available in time and on a reasonable price ensures the proliferation, availability, affordability of both mobile and fixed broadband services. But the creation of passive infrastructure incurs the hassles of RoW permissions, trenching, and ducting.
- 5.70 For faster development of fiber infrastructure, in the recommendations on “Delivering broadband quickly: what do we need to do?” dated 17th April 2015, the Authority recommended that *“All infrastructure sectors such as road construction authorities/ agencies like NHAI/SH/PP Projects must include, in their construction design policy, a provision for a utility duct to enable laying of OFC for all new infrastructure and also adopt similar measures in existing projects in a ‘Dig Only Once’ policy approach.”* Though the concept of utility ducts has been actively advocated by the Authority to mitigate the problems of fiberisation, it still has not been implemented effectively.
- 5.71 Subsequently, in the NDCP-2018, under the ‘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, has recognized the need for development of common ducts and emphasizes

on *“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”*. Under the NDCP-2018, establishment of a National Digital Grid is also proposed, which includes *“Establishing Common Service Ducts and utility corridors in all new city and highway road projects, and related elements.”* Further, to accelerate fiberisation, NBM has also laid out one of the strategies as *“To work with States/UTs and their agencies for supporting viable financial models for common duct.”*

5.72 In the CP, the Authority has taken up the subject in detail and laid out the possibilities for development of the common ducts (CD) from existing examples. Considerable amount of investment from the duct laying/utility company and RoW permissions from Land Owning Agencies (LOAs) would be required for developing the common ducts with multiple micro-ducts that could be leased/sold to service providers. Likewise, the possible approaches discussed in the CP is:

- a. Common ducts could be developed, managed, and maintained by the LOAs; and they can lease/sell them on commercial terms to the service providers, which would optimise the cost of construction.
- b. The Land-Owning Agency (LOA) can grant one-time, long-term RoW to a utility company, and the utility company can develop and maintain the common ducts. In lieu of the RoW permissions, the land-owning agency can have several options like:
 - i. LOA can charge a one-time fee from the utility company intending to develop common ducts, the ownership of infrastructure would lie with the utility agency or;
 - ii. Enter into a public-private partnership arrangement (PPP model) with the developer of common ducts, the LOA provides RoW while the PPP partner may invest in development of the infrastructure.

5.73 If the common duct infrastructure gets developed under exclusive arrangement, the risk of monopoly would always be there; and it is possible that different States and Local Bodies may adopt different models. Accordingly, there would be a need to put in place an institutional mechanism to address such concerns relating to monopoly. Keeping all these factors in mind, the following issues were raised in the CP for soliciting the comments of the stakeholders:

- i. *“Is there a need to develop common ducts along the roads and streets for laying OFC? If yes, then justify your comments*
- ii. *How the development of common ducts infrastructure by private sector entities for laying OFC can be encouraged? Justify your comments with reasoning.*
- iii. *Is there a need to specify a particular model for development of common ducts infrastructure or it should be left to the land-owning agencies? Should exclusive rights for the construction of common ducts be considered? Justify your comments with reasoning.*
- iv. *How to ensure that while compensating the land-owning agencies optimally for RoW permissions, the duct implementing agency does not take advantage of the exclusivity? Justify your comments with reasoning.”*

Comments from the Stakeholders

5.74 All stakeholders agreed with the Authority’s initiative to develop a common duct infrastructure due to its various benefits. Majority of them have supported creation and adoption of a Common Duct policy and Dig Once policy to mitigate the RoW issues faced in the country. These stakeholders are of the opinion that sharing of ducts needs to be made mandatory with a clear policy and procedures defined by the Government. They have highlighted that common duct infrastructure

will help in speedy infrastructure deployment at a very marginal cost, with the daunting concerns of approvals and restoration addressed beforehand. As per these stakeholders, this will help in bringing more investment in the infrastructure sector.

- 5.75 One service provider has stressed that installation of common duct for OFC should be part of construction design policies and should be a mandatory requirement for issuance of completion certificate for a building. This stakeholder has proposed that a National Optical Fiber Authority should be instituted to formulate guidelines for build, operation, and sharing arrangements. Regarding the institutional mechanism for CD development, a service provider mentioned that the Government should form a committee under the Government's Smart Cities project for developing shared telecom infrastructure like common ducts, while another service provider replied that a Special purpose vehicle may be formed for developing such infrastructure for use by all the TSPs/ISPs on commercial terms.
- 5.76 For the success of common duct policy and for proliferation of broadband, one service provider and few associations particularly commented that any vision for a common duct must take into consideration the interests of existing TSPs/ISPs who have already incurred considerable expenses to lay their infrastructure. These stakeholders have suggested that the commercial terms for using the Common Duct should be reasonable and a standard ceiling rate may be prescribed by the Authority. As per these stakeholders, already many cases are coming up where the local authorities are demanding exorbitant charges for laying UG cables in terms of RoW and using common ducts and according to them such anti-consumer actions need to be prevented at source.

a. Encouraging Private sectors for CD development:

- 5.77 To encourage private sector participation to invest in ducts, various measures/suggestions are received from the stakeholders. Some of them mentioned that investing in CD infrastructure is based on commercial viability and promoting such infra readiness should be linked with financial incentives to encourage private entities participation. Few service providers and the infrastructure-providers associations have submitted that suitable financial incentives such as finance at cheaper interest rates, tax breaks, subsidy schemes, waiver of RoW charges in lieu of ownership of part of the common ducts infrastructure proposed to be developed by the implementing agency or grant of leasing rights for a specified period of time based on non-discriminatory terms, etc. are essential for attracting private sector entities for investments.
- 5.78 An association has mentioned that the development of common ducts comes within the ambit of IP-1 registration and has suggested following provisions to encourage private sector participation:
- IP-1 should be the first to be offered common duct development.
 - Exclusive rights of laying ducts should be given to ensure some long-term business viability or visibility.
 - Common Duct, through the provisioning of micro ducts should be permitted, to enable sharing with other utilities as well.
 - The commercial arrangements with the seeker should be left on mutual consent or bilateral basis.
- 5.79 According to a service provider, the development of CDs would enable availing of infrastructure at much lower costs resulting in more efficient use of collective CapEx across service providers for reaching out to a much larger geography with the same collective funds. This provider is of the view that private entities can partner with State Governments to develop common ducts especially in metro cities like Bangalore,

Mumbai, Pune, Hyderabad, and Kolkata, etc. For this purpose, State Government/local authorities should publish clear policies or procedures and there must be a certainty in the terms of the contract. Selection of the private entities should be done through RFP and linked to eligibility conditions to ensure entry of serious players only as is being done in case of development of smart city projects. Private players should be encouraged by waiving off charges in lieu of sharing of duct with the Government bodies, and this will enable participation of private sector entities to lay common ducts.

b. Common duct development models:

5.80 Pertaining to the need for specifying a model for common ducts, majority of the stakeholders are in favour of requirement of a model for successful development of CD in the country, while one or two stakeholders have said that there is no requirement of a model, and the development should be left with the landowners. Few service providers opined that there must be some sort of institutional mechanism to lay down the required policy/model/procedures and create a coordinated framework for the development of common ducts in the country.

5.81 The stakeholders have proposed following viable models for development of common ducts:

- i. **SPV owned model:** A Special Purpose Vehicle (SPV) should be formed by the Government, or a third-party agency chosen on the basis of an open tender to build common ducts. Such SPV or the private agency can partner with the local municipality and the State Governments to build the common infrastructure like Duct/Fibre/Cable which can be utilized by all TSP/ISPs on commercial terms.
- ii. **Government owned model:** For private duct implementing agencies, common duct is a commercial activity, and they may not be able to appreciate the larger goal of increasing broadband penetration

therefore Land-Ownning Agencies (LOAs) should be responsible to take control of sharing infrastructure. As a long-term solution, land owning agencies like NHAI can invest in the creation and maintenance of common ducts and then it can be leased to the utilities and other interested parties on commercial terms. LOA like NHAI can own the entire fibre network along the highways and outsource other activities such as the network build, network infra marketing and network management. Subsequently, it can lease the fibre network to the end customers such as the TSPs, ISPs, OTTs etc., who can then pay monthly rentals to the LOA (based on rate per fibre pair per km). Similar business cases can be made for other utilities through partnership with LOA.

- iii. **Consortium model:** Whenever Central or State Governments undertake any major expansion, there is a need for development of telecom corridors along the National/State highway for common utility ducts in a consortium model of interested utility provider/IP-1/TSPs for better governance. Also, the common duct banks created should be updated in the records by NHAI/State Highways/IP-1s for TSPs/ISPs to avail the services when required.
- iv. **Co-investment or PPP model:** In this model suggested by the stakeholders, Land-owning agencies could grant one-time, long-term RoW to utility companies, which could in turn develop, maintain and operate common ducts infrastructure. Land-owning agencies should in such cases either be allowed to charge a one-time fee or enter a public-private partnership arrangement with the developer of common ducts infrastructure.

In the first case, where the land-owning agency intends to charge a one-time fee, it can make public its intent to grant a one-time, long-term RoW for developing common ducts infrastructure under a

competitive bidding process. The ownership of infrastructure would lie with the utility company. In the second case, where the land-owning agency intends to enter public-private partnership arrangements with the developer of common ducts infrastructure, it may partner with the private sector through a transparent process. Under such a model, the land-owning agency may provide RoW for developing common ducts infrastructure while the private sector partner may invest in the development of the infrastructure. RoW charges may be waived off in lieu of part ownership of the common ducts' infrastructure proposed to be developed by the implementing agency.

- v. One service provider which is against any kind of model stated that development of CD infrastructure should be left to the discretion of LOAs. According to this provider, different states and local bodies should be free to adopt any suitable model, the infrastructure so developed should be available to all TSPs/ISPs on non-discriminatory terms and at reasonable charges that may be fixed by the Authority or DoT based on a proper study of the costs incurred and the ROI aspects. It has further deliberated that TRAI, or DoT can lay down the contours of basic guidelines and terms and conditions for leasing of common ducts by the developer to be incorporated as part of the agreement between the LOA and the developer for all such infrastructure projects.

c. Comments on Exclusive arrangement:

- 5.82 On the issue of preventing the duct implementing agency from taking any advantage of the exclusivity while compensating the LOAs for RoW permissions, the stakeholders have put forward certain measures/mechanisms in the view that cost for accessing common ducts should be reasonable considering the telecom services being an essential service. Some of them suggested intervention of the Authority or the DoT for appropriate revenue sharing among land holding agencies. Some of

them stated that LOA should plan to create common ducts on chargeable basis at a justified price so that no monopoly is encouraged.

- 5.83 The service providers who proposed the SPV model shared that TRAI or DoT should regulate by forming guidelines for commercial charges from time to time which will avoid any ambiguities in pricing/compensations/revenue sharing. Similarly, an association has submitted that the Authority should formulate regulatory provisions to prevent exclusive arrangements and to control abuse of market dominance. These provisions if properly implemented will ensure that the implementation agency even if it has the exclusive rights for construction of common ducts for a certain project does not end up misusing its monopoly over the infrastructure. Since this is a critical subject and requires detailed discussions, a service provider has requested the Authority to carry out a separate Consultation on this issue so that the various pertinent aspects can be looked at holistically and a way forward decided on the same.
- 5.84 Another service provider is of the opinion that a neutral host like IP-1 can be the implementing agency and it should be mandated for infrastructure sharing in a transparent and non-discriminatory manner with all users of the facility for eliminating the issue of monopoly. Few companies believed that fees/leasing charges paid by the TSPs to duct implementing agencies for utilizing the ducts should be regulated by the Government. One major telco persuaded for a standardized common duct design agreed upon by all stakeholders along with clear guidelines of execution under a common duct policy are required and exclusive rights for construction should not be considered. The telco suggested fixing utilization fees of ducts along the road at Rs.1000 per Km per annum for laying OFC.

Analysis of the issue and views of the Authority

5.85 From the responses received, it is clear that establishment of common ducts, sharable on non-discriminatory basis, for establishing telegraph lines (OFC) is vital to expedite proliferation of fixed-line broadband and fiberisation of backhaul connectivity of cellular networks. The need for establishment of common ducts has been emphasised in the NDCP-2018 also. Further as establishment of common ducts is vital for fiberisation of networks, establishment of common posts is vital for densification of wireless networks – a must for rollout of 5G services. Readily available passive infrastructure for establishing telegraph will facilitate competition and promote efficiency in the operation of telecommunication services so as to facilitate growth in such services. Keeping in view the economic benefits of readily available shared passive infrastructure, already established through multiple studies, to establish telecommunication networks, the Authority agrees with the views of stakeholders that there is a need to incentivise establishment of common ducts and posts.

5.86 Hence, the Authority recommends that:

The Central Government should incentivise establishment of common ducts and posts, to be shared on non-discriminatory basis with service providers and infrastructure providers, for establishing telegraph and telegraph lines.

5.87 Expeditious rollout of common ducts and posts, shareable on non-discriminatory basis, which are required to establish telegraph lines and telegraphs (i.e., underground and aerial optical fiber, small cells equipment, etc.), is crucial to accelerate proliferation of fixed-line broadband, fiberisation of backhaul connectivity of cellular networks, and densification of wireless networks. As per the comments and counter-comments of the stakeholders, the biggest challenges in

creating the passive telecom infrastructure are delays in granting RoW permissions and arbitrary RoW charges. Therefore, to incentivise establishment of common ducts and posts, there is a need to implement RoW policies that can stimulate the faster network rollouts as has been done for BharatNet.

5.88 Rollout of common ducts and posts will also reduce the requirement of frequent diggings to establish telegraph lines and telegraphs; and in-turn reducing damages to the existing underground infrastructure due to frequent diggings and minimizing inconvenience to the public at large. Laying of common ducts and posts will facilitate competition and promote efficiency in the operation of telecommunication services so as to facilitate growth in such services. By now, it is an indisputably accepted fact that the availability of digital communication services at affordable prices is must for socio-economic growth of any city, State, or the Country.

5.89 The Authority in its 2016 Recommendation on “Implementation Strategy for BharatNet” has suggested that guaranteed provision of free RoW is necessary for successful deployment of BharatNet. In this context the Authority has recommended that

“...Guaranteed provision of free RoW is a necessary and non-negotiable precondition to successful deployment of BharatNet, subject to the reinstatement of public property to its original condition.”

5.90 For expeditious rollout of BharatNet network, on request of DoT, other Central Government departments and agencies/State Governments/UT Administrations exempted RoW charges. In line with RoW charges exemptions granted by the Central Government departments and agencies/State Governments/UT Administrations for BharatNet project, the Authority is of the view that the Central Government should coordinate with the respective State Governments/UT Administrations to exempt RoW charges for next five years (i.e. from FY 2022-23 to FY

2027-28) for expeditious laying of common ducts and posts also. As the Authority is recommending RoW charges exemptions for expeditious laying of common ducts and posts, to establish telegraph lines and telegraphs, such common ducts and posts shall be obligatorily leased to or shared with service providers and infrastructure providers on non-discriminatory basis. This will provide an impetus for the growth of fixed-line broadband across the country when the nation is stepping into its 75th year of Independence.

5.91 Accordingly, the Authority recommends that:

In line with RoW charges exemptions granted by the Central Government departments and agencies/State Governments/UT Administrations for BharatNet project, the Central Government should coordinate with the respective State Governments/UT Administrations to exempt RoW charges for next five years (i.e. from FY 2022-23 to FY 2027-28) for expeditious laying of common ducts and posts. Simultaneously, the Central Government should ensure that during these five years RoW charges for laying common ducts and posts shall be exempted by the Central Government departments and agencies also.

5.92 *“To promote ‘Broadband for All’ as a tool for socio-economic development while ensuring service quality and environmental sustainability”* is one of the missions identified in the National Digital Communication Policy-2018. To accomplish this mission, creation of robust digital communications infrastructure in the country is necessary. Delays in RoW permissions and exorbitant cost of RoW are key stumbling blocks in creation of robust digital communications infrastructure in the country. The Authority is of the view that a reform-based and results-linked central sector scheme to incentivise States/UTs for promoting RoW reforms should be formulated by the Central Government so that a time bound outcome may be achieved. The Government is already in

the process of finalising the Broadband Readiness Index (BRI) of the States/UTs which would comprise important enablers like online portal for RoW permissions, existence of a policy on RoW etc. and outcomes like mobile tower density, fiber density, fiberisation of towers etc.

5.93 BRI is intending to facilitate the development of digital infrastructure and attract investments in ICT sector. Therefore, the Authority is of the view that the quantum of incentive for RoW reforms undertaken by a State/UT should be linked to the net improvement in the Broadband Readiness Index (BRI) score of that State/UT. It will also help in persuading State Governments/UT Administrations to establish single electronic process (online web-based portal) for RoW permissions, and exempt RoW charges for next five years to accelerate common ducts and posts infrastructure creation.

5.94 Accordingly, the Authority recommends that:

A Centrally Sponsored Scheme (CSS) to incentivise States/ UTs for RoW reforms should be formulated by the Central Government. The quantum of incentive for a State/ UT should be linked to the net improvement in the Broadband Readiness Index (BRI) score of that State/ UT.

5.95 As per the existing licensing framework posts and ducts for establishing telegraph and telegraph lines could be established by Service Providers as well as Infrastructure Providers (IP-I). The Authority is of the view that Common Ducts and posts with exclusive RoW for specified period can mitigate the hurdles faced by the service providers and infrastructure providers in getting RoW permissions at multiple occasions. It will be beneficial for the customers in terms of increase in supply of fixed-line broadband services, improvement in wireless coverage and fiberisation of networks leading to improved quality of experience and decrease in telecom services costs leading to increase in affordability. When along the pathways such as roads and rails,

common ducts would be available for laying OFC, road digging and re-instatement activities will reduce considerably resulting in less traffic congestion as well as increased infrastructure lifespans, which are often diminished due to repeated excavation and re-instatement. In order to ensure effective utilisation, the common duct infrastructure thus created should be made available to seekers on non-discriminatory manner. This can be ensured by incorporating suitable terms and conditions in contract agreement signed with the ducts or posts creation agency.

5.96 Keeping in view these facts, the Authority recommends that:

In order to incentivise and accelerate creation of common ducts and posts, which would accelerate establishment of telegraph lines (i.e. optical fiber cables) and telegraphs (i.e. small cell equipment), on any route, exclusive Right of Way permission for at least 5 years should be given to the provider of such common ducts and posts on that route. Such exclusive Right of Way permission should be subject to the condition that common ducts or posts would be made available on demand and in non-discriminatory manner to seekers. The Government may review such exclusive arrangement in the fifth year for further extension by 5 years if felt necessary at that point of time.

5.97 Governments in most developing countries face the challenge to meet the growing demand for new and better infrastructure services. As available funding from the traditional sources and capacity in the public sector to implement many projects at one time remain limited, the Governments have found that partnership with the private sector is an attractive alternative to increase and improve the supply of infrastructure services. The PPP collaboration or partnership is built on the expertise of each partner that meets clearly defined public needs

through the appropriate allocation of resources, risks, responsibilities, and rewards.

- 5.98 Although many long-distance highways and railways in India have OFCs running alongside, these have been deployed by public and private sector TSPs after the construction of the highways and railway tracks. Besides the huge cost of laying OFCs, there are several issues that TSPs encounter while laying the OFCs post-construction of roads that range from planning networks to obtaining multiple RoW permissions for such deployment. Of late, some new road construction projects in states like Chhattisgarh have included ducts installation at the time of road construction and are now available to TSPs on rent. However, there are large number of publicly funded projects, along which the common ducts could be laid for laying OFC, but inspite of the cost advantages, the same is not happening. It could be because of lack of telegraph infrastructure expertise with the project implementing agency or lack of understanding of passive infrastructure market. Infrastructure Providers (IP-I), who are registered with DoT to establish passive infrastructure which include common ducts and posts and have invested across the country in creation of shared passive infrastructure for cell sites, have not invested in creation of common ducts infrastructure. During the discussions, while IP-I emphasizes on the need of common ducts, for lack of investment till now they indicate towards the lack of readily available market for common duct infrastructure. To bridge such market gaps and provide the initial fillip to common ducts infrastructure creation in the country, a Central Government owned Special Purpose Vehicle (SPV), on non-exclusive basis, is required who can coordinate and collaborate with providers as well as seekers of common ducts and posts; and take responsibility for market making. After initial success of SPV and unforeseen risks reduces, private entities may also start investing in the common ducts.

Once the market is developed and functional; and private sector find it viable and start investing in creation of common duct infrastructure, at an appropriate time, ownership in the SPV also can be divested to private sector.

5.99 Accordingly, the Authority is of the opinion that an entity, namely 'Common Ducts and Posts Development Agency' (CDPDA), initially under the direct control of the Central Government, is required which will coordinate and collaborate with providers as well as seekers of common ducts and posts for creation of common ducts in the country. This agency shall work on non-exclusive basis, meaning thereby if simultaneously private entities develop interest in establishment of common ducts than such entities should also be permitted after necessary registration. The Authority is of the view that CDPDA should undertake all the key roles and responsibilities like Planning , development and management of sharable common ducts for laying underground optical fiber cables, laying down terms and conditions of leasing of common ducts in non-discriminatory manner to service providers and infrastructure providers, coordinate with appropriate authorities to identify an exclusive strip of land of about 0.5 Meter width along public pathways for laying common ducts, cross-sector collaboration with other utility service providers, i.e. water, electricity, gas etc., for co-deployment of common ducts etc.

5.100 Hence, the Authority recommends that:

For planning and development of common ducts and posts infrastructure across the country, a central entity, namely 'Common Ducts and Posts Development Agency (CDPDA)', on non-exclusive basis, should be established by the Central Government with the following functions: —

- i. Planning, development, and management of sharable common ducts for laying underground optical fiber cables;**

- ii. Planning, development, and management of sharable common posts for laying overground aerial optical fiber cables and hosting of small cells equipments;**
- iii. Coordinate with Appropriate Authorities to identify an exclusive strip of land of about 0.5 Meter width along public pathways for laying common ducts;**
- iv. Formulating and implementing schemes, including in Public-Private Partnership (PPP) mode, for development of sharable common ducts and posts;**
- v. Coordinate with Appropriate Authorities to exempt RoW charges for development of sharable common ducts and posts;**
- vi. Cross-sector collaboration with other utility providers i.e. roadways, railways, water, electricity, gas etc. for co-deployment of common ducts;**
- vii. Declare terms and conditions of sale/ leasing of common ducts and posts in non-discriminatory manner to service providers and infrastructure providers;**
- viii. Developing and providing consultancy and construction services for common ducts and posts on a national and international level.**

5.101 As discussed in the CP, there is always a risk of monopoly behavior from common duct implementing agency if it is granted exclusive Right of Way. The Authority agrees with the stakeholder's submissions regarding formulation of regulatory provisions to prevent exclusive arrangements and to control abuse of market dominance. These provisions if properly implemented will ensure that the implementation agency even if it has the exclusive rights for construction of common ducts for a certain project does not end up misusing its monopoly over the infrastructure. It is important to address this concern and keep the cost of utilization

of this infrastructure at a reasonable level for all service providers and infrastructure providers on a non-discriminatory basis. As per the Section 11(1)(d) of TRAI Act 1997, the Authority can perform such administrative and financial functions, if entrusted to it by the Central Government.

5.102 In view of the above discussions, it is recommended that:

As granting the exclusive Right of Way permission for at least 5 years on a particular route to a common ducts and posts provider has risk of monopoly behaviour, the power to regulate arrangements between lessor (common duct or post provider) and lessee (duct or post user) should be given to TRAI under Section 11(1)(d) of TRAI Act 1997.

5.103 The Authority agrees with the stakeholders that a meticulous planning and standardisation of ducts and posts is an important pre-requisite for successful development of common ducts and posts. As the common ducts and posts shall be built by one agency and used by another agency, standardisation of ducts and posts would ensure better utilisation of the common ducts and posts so created. At design stage, all flexible points like joint chambers, branching points etc. should be very well defined. Effective design helps in better operational coordination during O&M while ensuring longer life of the network. This also helps improve the monetization potential of the network. Therefore, the Authority is of the view that TEC should notify design and standards for development of common duct and posts infrastructure along public pathways. Such standards are very much required to promote sharing of common duct and posts infrastructure among service licensees and infrastructure providers. Therefore, it is recommended that:

In order to facilitate sharing of ducts and posts infrastructure, Telecom Engineering Center (TEC) should notify design and

standards for common ducts and posts infrastructure to be established along public pathways.

C. Cross-sector infrastructure development

5.104 A holistic approach to the telecom infrastructure creation will help to counterbalance the developmental costs whose eventual burden falls upon the end consumers. One such innovative approach discussed in the CP for infrastructure creation is the cross-sector infrastructure development. Collaboration among various sectors could either be in the beginning of the infrastructure development itself or at later stage by leveraging the existing assets of other sectors.

5.105 Keeping in mind the hassle of trenching as one of the primary causes for low fiber deployment across the country, alternative solutions were proposed by the Authority during consultation. Dig Once policy is one such solution to lower the cost of broadband deployment by providing infrastructure providers access to state or city owned RoW. This is complemented by the mandatory installation of common ducts for fiber-optic cable during constructions. Most of the American states are promoting this policy and have enacted its lean towards providing coordination guidelines.

Dig Once Strategies: There are various practices related to Dig Once that have been put into effect by different states in the US:

- i. Joint-trench agreements⁴⁷ to improve coordination between the various telecommunication providers when plans are made for digging or road expansion. Joint use means requiring that all providers of utilities install their infrastructure at the same time, in the same trench, or in the same conduit, and in most cases, share the cost of installing the infrastructure.

⁴⁷ Boston's 'Joint-Build' dig once policy

- ii. Moratoriums on street excavation to preserve new roadway construction.
 - iii. Installation of empty conduits in RoW during new construction to prepare for future needs.
 - iv. Trenchless technologies such as horizontal directional drilling or micro-trenching which involves digging a small trench just inches under the road surface along the curb line to install fiber are used.
- 5.106 Voluntary joint trenching or coordinated trenching are explored as feasible options of infrastructure development in collaboration with the transportation and power sectors in the CP. Voluntary joint trenching requires that two public utility companies like electricity and telecom or water and telecom licensees formulate joint construction plans and receive approval to excavate in public RoW simultaneously. Whereas, coordinated trenching requires informing interested excavators, such as broadband providers, in advance when underground work or road construction is going to happen so that they can plan their cable laying in conjunction with scheduled excavations.
- 5.107 The Authority through the CP has raised issues on how and what can be achieved and explored with the idea of cross-sector infrastructure creation, dig once strategies, and joint or coordinated trenching. Pertaining to the cross-sector infrastructure development, the following issues were raised to solicit the opinion of stakeholders:
- i. *“What could be the cross-sector infrastructure development and sharing possibilities in India? Justify your comments with examples.*
 - ii. *Whether voluntary joint trenching or coordinated trenching is feasible in India? If yes, is any policy or regulatory support required for reaping the benefits of voluntary joint trenching and coordinated trenching? Please provide the complete details.*

- iii. *Is it advisable to lay ducts for OFC networks from coordination, commercial agreement, and maintenance point of view along with any other utility networks being constructed?*
- iv. *What kind of policy or regulatory support is required to facilitate cross-sector infrastructure sharing? If yes, kindly provide the necessary details.”*

Comments from the Stakeholders

5.108 Majority of stakeholders have appreciated bringing the concept into consultation and suggested sharing possibilities with the various sectors and are of the opinion that the Government should actively encourage the cross-sector infrastructure initiative. Below are the possibilities for cross-sector infrastructure development and sharing as suggested by the stakeholders:

- i. Partnership with Power Distribution Sector – Transmission Line network entities (electricity lines, power ducts, conduits, towers, and poles)
- ii. Partnership with Public works departments – Civil Road and Highways (Land corridors, access shafts and manholes in or along the roads)
- iii. Synergies with Railways, Metros, State Fiber Grids and Bridges.
- iv. Inside the pipes of water, sewer, steam or gas transport.
- v. Excess dark fiber in internal networks installed by utilities.

5.109 The stakeholders have divided opinions on the issue of regulatory support, like the need of a cross-sector sharing policy or framework, institutional/coordinated mechanism, financial support etc. Few other stakeholders have submitted that the Government needs to extend special benefits to cross-sector infrastructure sharing entities in the form of tax benefits, pass-through benefits or lower license fees. Another association having a similar view has said that DoT may consider

allocation of partial CapEx to utility and infrastructure-agencies with the right to leverage some of the assets for programs like BharatNet and active infrastructure sharing should be allowed and incentivized. An associations submitted that the Authority should pursue the acceptance and implementation of its past recommendations on “Enhancement of Scope of Infrastructure Providers Category-I (IP-I) Registration” which is seen as a preferred approach in expanding the broadband connectivity.

- 5.110 Mixed opinions are received on the query on voluntary joint or coordinated trenching. Some of them replied that joint or coordinated trenching is not feasible, whereas others are of the view that both are feasible options in India but with proper regulatory mechanism and RoW issues should be addressed for the same. Majority of associations who are in favour stated that joint or coordinated trenching is feasible but laying of Common Duct will be a better solution. One stakeholder has submitted that there is no policy for voluntary and shared trenching at present and has suggested that the Government should encourage common trenching by publishing open RoW permission for utilization by TSP/IP-1, for this purpose city-based portal is needed for advance reporting, coordinating of trenching activities by all the Civic Authorities.
- 5.111 The stakeholders who are not in favour of voluntary joint trenching or coordinated trenching in India have justified their view as follows:
- i. Voluntary joint or coordinated trenching has not yielded desired results in other countries.
 - ii. Various sectors and infrastructure agencies will have varying levels of digging requirements.
 - iii. Each sector has to check on specification compliance/ noncompliance of other sectors.

- iv. The coordinated trenching requires information exchange, which is difficult because there is no automation or digitalization of processes at present.
 - v. Network planning and design of different TSPs and IP-Is in the telecom sector may not match with other sectors, the concerned area would be who will take a lead in such coordination when each stakeholder is having a separate timeline for processes.
 - vi. Non practical in terms of speed, cost effectiveness and maintenance.
- 5.112 Majority of the stakeholders have advocated for adoption of Dig Only Once policy in the country, which should be incorporated with the design of utility ducts with implied RoW permission. A common utility duct policy with dig once approach for the nation is highly desirable with extensive use of digital tools and technologies combined with coordinated process and control as per one stakeholder. While some stakeholders have requested guidelines in the form of a brief manual for circulation to project engineers which guide them in including ducts for OFC networks. For coordination, commercial agreement, and maintenance point of view, one stakeholder has suggested to appoint nodal officers by each utility service provider to facilitate faster rollout and seamless services to all the utility service providers.

Analysis of the issue and views of the Authority

- 5.113 The dream of digital connectivity as perceived by NDCP-2018 can only be achieved if both the central and state Governments actively encourage the cross-sector infrastructure creation initiatives. Such collaboration could either be in the beginning of the infrastructure development itself or at later stage by leveraging the existing assets of other sectors such as Power, cable TV, NHAI, Metro Rail etc., which will provide improved connectivity, affordability, and sustainability. A clear roadmap is required for cross-sector infrastructure sharing along with

setting up of an institutional framework to build synergies among the sectors.

a. Co-deployment of Infrastructure

5.114 Co-deployment of new infrastructure by two or more individual utility providers is the most effective way of optimizing costs. Fiber cables when co-deployed along highways, railways, power transmission, gas pipelines etc. leads to the development of high-speed broadband infrastructure networks providing cost-effective access to information and socio-economic services to un-served and under-served groups. The following table describes the co deployment of infrastructure across various countries:

Table 5.2: Co-Deployment of OFC along various infrastructure⁴⁸

Infrastructure	Country	Initiative
Roads and Highways	China	In 1993, an Expressway communication system using coaxial cables was designed in the Beijing-Tianjin-Tanggu Expressway. Communication pipelines along the expressway have 6 ducts (4 ducts in a few sections) and 2 pipes are used for Expressway Applications.
	Korea	Korea Expressway Corp. (KEC) permitted Korea Telecom to lay OFC and was leasing its network facilities to meet internal High-speed Communication requirements, respond to new communication needs and to diversify KEC's business areas. KEC presently operates 4,700 Kms of Backbone Network along the Expressway and another 7,700 Kms of along the major Arterial Highway and Urban Roads.

⁴⁸ UNESCAP- Co-Deployment of Fibre Optic Cables along Transport Infrastructure for SDGs, 2018

Infrastructure	Country	Initiative
	Russia	Rostelecom owns an extensive backbone digital network running to a length of 500,000 kms of widespread intercity roads, consisting of trunk communication lines connected via international and intercity transit nodes with national and foreign networks.
	Bangladesh ⁴⁹	Roads and Highways Dept. Bangladesh permitted several Government organizations, such as the ICT Division and the Bangladesh Telecom Company Ltd. (BTCL), as well as some private companies (e.g., Grameenphone, Banglalink, and Fibre Bangladesh), to install OFCs along highways after their construction.
	Thailand	Co-deployment/Co-habitation of OFC is done along RoW running in parallel with Roads and Highway Routes under the control of the Transportation Ministry of Thailand.
Railways	Korea	Korean National Railroad and Korea Electrical & Telecom Corporation signed the agreement on Co-deployment of Tracksideside OFC in 1986. The OFC network continues to be expanded under the Mid/Long Term Railway Optical Network Plan formulated and implemented by Korea Rail Network Authority.
	Bangladesh	Bangladesh Railway has about 2,300 km out of the total 2,877km of railway route co-deployed with OFCs, part of which have been leased out to private companies Grameenphone Ltd and Robi Axiata Ltd, now operating commercially. OFCs are being laid along 380 km of new railway tracks under different projects and it is expected that within the next 2 or 3 years, OFCs will be co-deployed along all the railway tracks in Bangladesh making it a robust telecom network.

⁴⁹ UNESCAP- Asia-Pacific Information Superhighway (AP-IS) Working Paper, 2018
<https://www.unescap.org/resources/co-deployment-optical-fibre-cables-along-asian-highways-and-trans-asian-railways-e>

Infrastructure	Country	Initiative
	Thailand	National policy and plans for OFC are finalized by the Ministry of Transport to be deployed along highway, railway, and aeronautical, maritime transportation and by the Ministry of Digital Economy and Social for national broadband network. Multiple public-sector entities are involved in co-deployment projects, State Railway of Thailand (SRT) along with TOT Public Company has experience in Co-deployment of OFC along Railways under the Com-link Project.
Telegraph Posts	Thailand	Overhead OFC lines are laid by the operators who acquire type three licenses from National Broadcasting and Telecom Commission along the existing 7,500 telegraph poles along the railway network owned and maintained by SRT.
Power Transmission ⁵⁰	Kenya	KETRACO (Kenya Electricity Transmission Company) was granted network provider license in 2017 by the Communications Authority of Kenya to lease excess fiber to licensed operators in Kenya and East Africa. KETRACO has partnered with Liquid Telecom company to co-deploy OFC to meet the rising demand for high-bandwidth, video and internet services for businesses and individual consumers.
	Tanzania	TANESCO (Tanzania Electric Supply Company) deployed OFC network serving 10 regions of Tanzania covering 2,050 kilometers as Phase 1 of a broader fiber rollout plan.
	Zimbabwe	The public data network operator 'Powertel Communications' - subsidiary of ZESA (Zimbabwe Electricity Supply Authority) is fully licensed by the Postal and Telecom Regulatory Authority of Zimbabwe (POTRAZ) to provide data communications services.

⁵⁰ Innovative business models for expanding OFC networks and closing access gaps–WorldBank Report 2018
<https://documents1.worldbank.org/curated/en/674601544534500678/pdf/Main-Report.pdf>

5.115 Recently, as reported on www.datacenterdynamics.com⁵¹, the UK Government has launched a £4 million (\$5.6m) project to use water mains to deploy broadband in remote locations. Through an open competition known as Fibre in Water (FiW), the UK Government will allocate R&D funding to projects around the delivery of broadband and mobile services via drinking water mains, especially in rural areas, and deploying new water infrastructure monitoring solutions. “The project will look to demonstrate how vital infrastructure (water and telecoms) can be delivered together while delivering savings to customers,” according to the Department for Digital, Culture, Media & Sport of the UK Government. Civil works such as installing new ducts and poles, can make up as much as four-fifths of the costs to industry of building new gigabit-capable broadband networks, and this project aims to reduce costs and disruption of fiber roll-out. Goals of the pilot are to deploy a FiW pilot “at sufficient scale” to explore the technical, security, operational, regulatory, and commercial requirements, and explore if it can be scaled nationally. “The cost of digging up roads and land is the biggest obstacle telecoms companies face when connecting hard-to-reach areas to better broadband, but beneath our feet there is a vast network of pipes reaching virtually every building in the country,” said Digital Infrastructure Minister Matt Warman. “So we are calling on Britain’s brilliant innovators to help us use this infrastructure to serve a dual purpose of serving up not just fresh and clean water but also lightning-fast digital connectivity.”

5.116 Since, the optical fibres and common ducts are laid best along the roads; the upcoming projects need to make provision for the same for the benefit of the telecom sector. The cost of laying OFC primarily consists

⁵¹ <https://www.datacenterdynamics.com/en/news/uk-gov-to-fund-4-million-fiber-deployment-via-water-mains-project/>

of digging the trenches, cost of OFC and HDPE pipe and other equipment. The Authority had previously shown that the material accounts for 42% of the cost while around 58% is the unskilled labour cost primarily on the digging of the trenches⁵². If a utility duct is placed along the roads, it will not only avoid unnecessary damage to the newly laid roads but also saves the cost of the operators. These ducts should comply with the design and standards of common duct infrastructure to be finalised by TEC.

5.117 Some examples of co-deployment in the country include:

- i. Concrete Utility Duct provided by NHAI as part of the Delhi - Meerut Highway has been included in the Composite Contract for Construction of the Highway for a length of 27 kms. The utility duct is constructed in RCC and is 2M X 2M.
- ii. Indian Railways laid 53,655 Kms of OFC till May 2018 along its RoW of Railway Tracks. Substantial portion of the OFC Network is taken over by RailTel for its Maintenance, Upgradation and Commercial Usage. In FY 2018-19, to ensure complete coverage, OFC work has been sanctioned in the remaining sections. In addition to this, all New Railway Line Sections are commissioned along with fiber by Zonal Railways as matter of policy.
- iii. PGCIL has about 48,500 kms of OFC network across the country by 2018; it has used OPGW technology to roll out its fibre on a live-line environment on the existing transmission lines. PGCIL is also part of the BharatNet project in Telangana, Himachal Pradesh, Jharkhand and Odisha, covering about 35,791 GPs on deposit work basis.
- iv. Utility Ducts provided by Tamil Nadu Road Development Company limited (TNRDC) along the Rajiv Gandhi Salai Road includes construction of service Trenches/Ducts for carrying utility lines

⁵² Consultation paper on 'National Broadband Plan'

including Electrical, Telephony and Optic Fibre Cables/Wires so as to avoid re-digging in future.

- v. Gujarat International Finance Tec-City (GIFT-City) near Gandhinagar developed the vision of “Digging Free City” for placing utilities in a Tunnel so that there is no need to excavate the roads in future for any utility.
- vi. New Raipur Smart City has planned Utility Ducts covering the entire City in different phases for various utilities. No Digging Policy is being enforced.

5.118 When a policy framework for co-deployment is created in agreements with the large investment sectors like roads, water, gas, and railway sectors, all the Greenfield public projects could be leveraged by the telecom industry players to proliferate the services. All the upcoming projects should start including common ducts. The local bodies and utility providers should also be encouraged to create and provide common ducts to TSPs/ISPs which would reflect in the co-deployment opportunities. As discussed earlier, such common ducts could either be developed and managed by the infrastructure development agency itself or it can enter into agreement with CDPDA for development and management of common ducts.

5.119 Therefore, it is recommended that:

As per the design and standards to be finalised by TEC for establishment of common ducts infrastructure, a policy should be formulated that mandates co-deployment of common ducts during the construction of any roadway, railway, water pipelines, and gas pipelines receiving public funding. Co-deployment of such common ducts could be managed by CDPDA.

5.120 The Government of India has launched the Smart Cities Mission on 25th June 2015, to promote sustainable and inclusive cities that provide core infrastructure and give a decent quality of life to its residents. Some of

the core infrastructure elements in a Smart City would include adequate water supply, assured electricity supply, sanitation including solid waste management, efficient urban mobility and public transport, affordable housing, robust IT connectivity and digitalization, good governance, sustainable environment, safety and security of citizens, health, and education. For robust IT connectivity and digitalization, fiberisation of cities is must. Fiberisation could be expedited if the common ducts become readily available. Therefore, creation of common ducts should be made mandatory for all the ongoing and future Smart City development plans. Besides, special economic zones or cities can also be identified for development of common utility ducts in a phased manner.

5.121 Hence, the Authority recommends that:

Establishment of common ducts for optical fiber cables should be made integral part of Smart City development plans.

5.122 AMRUT mission (Atal Mission for Rejuvenation and Urban Transformation) was launched in 2015, by the Ministry of Housing and Urban Affairs to ensure that every household has access to a tap with the assured supply of water and a sewerage connection and set targets for urban renewal in 500 cities. Incorporating fiber in this huge project can set an example for planning and co-deployment of OFCs in the new public projects. Therefore, it is recommended that:

The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) aims to provide basic civic amenities like water supply, sewerage, urban transport, parks so as to improve the quality of life for all especially the poor and the disadvantaged. It includes that every household has access to a tap with assured supply of water and a sewerage connection. Along with water and sewerage connections, connecting every household with a duct for laying

optical fiber should also be included in the aims of the ongoing AMRUT Mission of the Government.

b. Aerial Fiber deployment:

5.123 Aerial fiber is a method of overhead fiber cable deployment, benefits the use of existing pole infrastructure to link customers, avoiding the need to dig roads to lay cables or to create new ducts. Developed countries like Japan and Europe have rolled out aerial fibres as part of their broadband plans due to its relatively quick and easy installation characteristics.

5.124 The geography of the area plays a vital role in determining whether buried or aerial fiber deployments are most suitable for the last mile. In the country with the majority of population residing in Tier 2/Tier 3/ Rural areas, the overhead fibres will be the best option for rolling out the last mile FTTH connections. The poles to which the optical cable is going to be attached already exist and have other cables already attached to them, this pre-existence of the pole-route could be a key reason for the choice of this type of infrastructure where ducts or fiber laying is not possible. Currently, optical fiber cable can be integrated into an overhead power transmission line in the following ways:

- Encased within the Ground Wire (OPGW)
- Wrapped around the Phase Conductor or the Ground Wire (WRAP)
- Contained in an All-Dielectric-Self-Supporting Cable (ADSS)

All High and Low voltage power transmission towers are viable for OPGW fiber deployment. These towers are suitable in dense and difficult to reach city areas and distribution poles can be leveraged to expand last mile coverage.

5.125 Electric utilities already have certain inherent advantages in enabling smart cities. The new power lines and utility poles which will be laid;

can be made viable for aerial fiber, so that the pole or the line can be used to deploy fiber whenever needed. The permissions are required from the Government for erecting the new poles along with public RoW or for use of existing poles to deploy aerial fiber. In one way, the RoW charges of using the electrical poles could be reduced so that it can boost the deployment of aerial fiber. Or the local authorities could lease or rent out their existing infrastructure which in turn for them can generate extra revenue along with increasing the fiber coverage.

5.126 Empirical evidence is discussed in the CP suggesting that cross-sector infrastructure sharing has lowered deployment costs and has increased market entry thereby making markets more competitive. For example, the project's cost of laying a 22,500 km long Internet fiber network in Andhra Pradesh, came down to 333 crores from the initial estimate of 4,700 crores because the Government opted for an aerial fiber network, wherein optical fiber lines were laid over existing infrastructure such as electric poles to save costs in the State.⁵³ The overhead fiber infrastructure is a feasible and reliable prospect and has many advantages as against laying down of the OFC. It has over 40 years of life expectancy if installed and maintained properly and is less susceptible to outages and the maintenance cost and issues are very less as compared to underground infrastructure. Therefore, the Government should give a boost to the aerial infrastructure.

5.127 Overhead transmission power line corridors provide the telecom sector with cost-effective alternative routes and at the same time benefit the electric utilities by generating additional revenues. One possible case is POWERGRID Corporation which has around 2.5 Lakh EHV transmission towers across the country, most of which are located in

⁵³ <http://www.apedb.gov.in/gallery/2016/august/020816/cisco-to-lay-22500-km-long-internet-fiber-network-in-andhra-pradesh-print-view-livemint.pdf>

rural and remote areas. These transmission towers can be used for mounting OFC and other associated telecom equipment.

- 5.128 The Authority has recently taken an initiative for cross-sector collaboration between the Telecom and Power sectors. A Forum of Indian Regulators (FOIR) working group was created which has representation of TRAI, Central Electricity Regulatory Commission (CERC), State Electricity Regulatory Commissions (SERCs), DISCOMs, IP-I and has a provision to co-opt experts from other organizations as well. The Authority will finalise a model framework for aerial fiber rollout along the electricity poles in collaboration with the electricity regulators and DISCOMs. Such collaborative framework will also help in the 5G technology rollout in the country.

Dig-Once Policy

- 5.129 It is observed that a coordinated mechanism combined with a digital information module can make the joint trenching and dig once strategies a possibility. With respect to this, the 'Dig-once' policy of the Obama administration can be taken as a standard. As per the Federal Communications Commission (FCC), the biggest cost in deployment of the infrastructure is the burying of cables and the associate conduits underground. Around 90% of the cost is when the deployment requires significant excavation of the roads⁵⁴. Coordinating highway construction projects with the installation of OFC may save on costs incurred by repeated excavation in areas. Also, coordination helps to reduce the time by preventing the need to acquire the duplicative permits for the work done at the same location.
- 5.130 Dig Once policies attempt to lower the cost of broadband deployment by providing service providers access to state- or city-owned RoW. This is complemented by the mandatory installation of common ducts for fiber-

⁵⁴ https://www.fhwa.dot.gov/policy/otps/policy_brief_dig_once.pdf

optic cable during constructions. Most of the American states are promoting this policy and have enacted its lean towards providing coordination guidelines. It also reduces the long-term cost of building communications facilities by capitalizing on significant economies of scale through the coordination of fiber and conduit construction with utility construction and construction of spare conduit capacity where multiple service providers or entities may require infrastructure.

5.131 Another approach that has been implemented on the municipal level is called ‘Trench Once,’ which is used in San Francisco. This approach allows for a roadside trench to be left open after construction ends. This trench is later used to bury conduit and is shared among broadband providers, if possible, to avoid the costs associated with additional excavation in areas where the entire right of way is paved. As per a result of the comparative study in Myanmar, the co-deployment of the broadband network (compared with the separated deployment) has been estimated to save at least USD 7,379 per kilometer, and the percentage of cost savings has been calculated at 56.83 percent⁵⁵. Most of the cost saving in co-deployment is derived from eliminating overlapping civil works such as excavation, backfilling and reinstatement during highway construction.

5.132 The Authority in its recommendations dated 17th April 2015 to the Government on “Delivering Broadband Quickly: What do we need to do?” has already recommended for adopting dig once strategy for expansion of fiber based networks as

“All infrastructure sectors such as road construction authorities/ agencies like NHAI/SH/PP Projects must include, in their construction design policy, a provision for a utility duct to enable laying of OFC for

⁵⁵ UNESCAP 2018 report: A Study on Cost-Benefit Analysis of Fibre-Optic Co-Deployment with the Asian Highway Connectivity

all new infrastructure and also adopt similar measures in existing projects in a “Dig Only Once” policy approach.”

5.133 The dig only once needs to be supported by an information system like online portal that can help the operators to plan better, through which all relevant infrastructure developers and utility agencies will be timely notified regarding the excavation/trenching timelines and related details. In case of shared resource projects when the duct planning shall be done for all the new roads, water projects, rails, metros, there must be proactive intimation and sharing of plans before undertaking any trenching. The National RoW portal can be utilized for this purpose. As discussed in RoW section, the proposed National RoW portal has the scope to expand for all other infrastructure utilities. However, till the time this portal is operational, the local authorities should notify an annual plan for permitting the digging operations by utility service providers to establish infrastructure so that each utility provider can finalise their plans in advance. Similarly, Dig Once approach also requires communication of digging plans of each utility providers to others before submitting application for RoW permissions. This arrangement will ensure minimal interruption in services as accidental damages of underground infrastructure can be avoided.

5.134 Therefore, it is recommended that:

Till the time, the proposed national portal become available for cross-sector collaboration with other utility providers like water, electricity, gas etc. for RoW permissions and co-deployment of telegraph lines:

- i. The appropriate authorities should notify an annual plan for permitting the digging operations by utility service providers to establish underground infrastructure so that each utility provider could finalise their plans in advance.**

- ii. **To implement dig once policy and avoid frequent interruptions in services due to accidental damages of underground infrastructure, each utility provider should communicate its digging plans in an area to other utility providers operating in that area before submitting application for RoW permission to the appropriate authority. This would enable cross sector collaboration for co-deployment of telegraph lines; and while the digging operations are in progress utility providers could protect their underground infrastructure also.**

D. Infrastructure Sharing

- 5.135 The population explosion combined with the limitation of resources makes it necessary for the Government to facilitate the sharing of infrastructure resources to ensure the proliferation of broadband services to every nook and corner of the country. Public utilities like water pipelines, gas pipelines, and electricity pipelines (power cables, lighting cables) have a somewhat similar structure to a traditional telecom network and specific infrastructure that is used for communication purposes could be shared. By sharing infrastructure, these sectors can help each other to achieve access and service quality goals while sharing the development costs.
- 5.136 For 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; NDCP-2018 emphasizes on *‘Leveraging existing assets of the broadcasting and power sector to improve connectivity, affordability, and sustainability’*. In the broadcasting sector, the RoW permissions available with cable operators for establishing coaxial cable network and the transmission and distribution networks of power sector

could be used for laying aerial OFC and to improve the proliferation of wireline as well as wireless broadband services.

5.137 The Authority has been advocating infrastructure sharing for the sector growth and submitted several recommendations over many years. Infrastructure sharing enables economies of scale, improves affordability, and avoids duplication of networks where possible. It allows faster roll out of networks and services. Most recently, the Authority issued its Recommendations⁵⁶ dated 13th March 2020 to the Government on “Enhancement of Scope of Infrastructure Providers Category-I (IP-I) Registration”, vide which it has recommended that:

- i. The scope of Infrastructure Providers Category – I (IP-I) Registration should be expanded to satisfy the present need for telegraph in the country.
- ii. The expanded scope of the IP-I registration should include to own, establish, maintain, and work all such infrastructure items, equipment, and systems which are required for establishing Wireline Access Network, Radio Access Network (RAN), and Transmission Links. However, it shall not include core network elements such as Switch, MSC, HLR, IN, etc. The scope of the IP-I Registration should include, but not limited to, Right of Way, Duct Space, Optical Fiber, Tower, Feeder cable, Antenna, Base Station, In-Building Solution (IBS), Distributed Antenna System (DAS), etc., within any part of India.

5.138 Passive infrastructure sharing of Duct space, Dark Fibre, and Mobile Towers, would enable operators to divert the investments towards innovations in services. Savings on CapEx and OpEx will incentivize TSPs to improve service quality and ensure faster network rollouts. Infrastructure sharing drives reduction in long-term Opex costs. The

⁵⁶ https://www.trai.gov.in/sites/default/files/Recommendations_13032020.pdf

cost-savings can further be utilized to increase reach, provide innovative services, and improve customer satisfaction. For a successful market operation in the passive infrastructure segment, the Authority persuaded for an e-marketplace which could register the details of demand and supply for passive infrastructure, and the same could also be used for leasing/trading of passive infrastructure integrated along with a common GIS platform for the management of utilities.

5.139 Following issues were raised in the CP for seeking inputs on infrastructure sharing, utilizing existing assets and the need of an e-market place:

- i. *“In what other ways the existing assets of the broadcasting and power sector could be leveraged to improve connectivity, affordability, and sustainability.*
- ii. *For efficient market operations, is there a need for an e-marketplace supported by GIS platform for sharing, leasing, and trading of Duct space, Dark Fibre, and Mobile Towers? If yes, then who should establish, operate, and maintain the same? Also, provide the details of suitable business models for establishment, operations, and maintenance of the same. If no, then provide the alternate solution for making passive infrastructure market efficient.”*

Comments from the Stakeholders

5.140 As per a service provider and few associations, coordination with State Electricity Boards (SEBs) and DISCOMS is required to share their existing infrastructure of poles for aerial cabling for creation of Telecom Infrastructure in Type2/Type3 cities. Reciprocal sharing of existing infrastructure can also be offered, wherever feasible to such agencies. These stakeholders are of the opinion that policy guidelines at a standardized minimal cost that would suit all stakeholders are needed. Commercial parameters including licensing conditions should be clearly

defined in the sharing guidelines and TSPs should be allowed to claim pass through charges paid to other TSPs for leasing of infrastructure. Another association mentioned that in the broadcasting sector, the RoW permissions available with cable operators for establishing coaxial cable networks could be used for laying aerial fiber networks.

- 5.141 A well-defined policy with inbuilt incentives for the sharing entities could promote use of existing assets of the said sectors and sharing as stated by a major service provider and indicative costs that suit both the sides and equitable costing can be worked out. Another service provider submitted that the NDCP's National fiber authority should be created, both the power and broadcasting sector's existing assets should be made available for sharing at affordable rates. A service provider has proposed that it should be made mandatory to share already built pathways, ducts, fiber infrastructure and framework may be defined by the NDCP proposed National fiber authority to make a balanced environment for safeguarding interests, investments of the concerned entities. This stakeholder has also suggested that digital map-based permissions should be given for sharing the existing assets.
- 5.142 Stakeholders are having multitude points of view on e-marketplace issue where most of them are in favour and prescribed various entities for establishment of an e-marketplace. A service provider has suggested that National fiber exchange may be created and governed by the National Fiber Authority as per NDCP-2018 to trade on available and utilized capacities. Besides trading, this Authority should see for underutilized resources, should make them available for larger usage, protecting the investments. As per this stakeholder, E-marketplace can start with listing all Govt and PSU owned infrastructure including the BharatNet inventory and based on the adoption, can further determine the usefulness and efficacy of this platform; accordingly paving a way for private players to onboard their inventory for sale.

- 5.143 Few stakeholders have proposed for an e-marketplace established by the Government or in a PPP mode with a private sector entity which does not have any interest in the telecom sector, to ensure transparency and fair play. This e-marketplace could register details of demand and supply for passive infrastructure, details of available ducts, OFC, and towers can be mapped using the GIS platform. One stakeholder is of the opinion that an upper cap is needed on both price and capacity holding by the company or entity participating in the E- marketplace to prevent monopolies and exploitation.
- 5.144 Majority of the TSPs and few associations not in favour of the idea of e-marketplace or GIS platform have stated that broadband penetration should be increased at a faster pace and setting up any mechanism like e-marketplace will require a lot of effort and time. They are of the opinion that with a handful of users and limited providers, there is no dearth of information in this space and all stakeholders are aware of infrastructure availability with others, so the need of the hour is to support telecom infrastructure implementations. One association has commented that GIS platforms may not yield any benefits until IP-Is are allowed to share its telecom infrastructure with other service providers in addition to the licensed TSPs, the Authority's recommendations on "Enhancement of Scope of Infrastructure Providers Category – I (IP-I) Registration" to be taken up with DoT for completion of review at the earliest.

Analysis of the issue and views of the Authority

- 5.145 LCO's last mile optical fibre access network can be shared with TSPs/ ISPs for providing FTTH broadband connections. Recently in November 2020, one major TSP has entered into a revenue share agreement with LCOs for laying and maintaining the last mile fibre and everything else like provisioning of service, billing, charging etc. is taken care of by the

TSP⁵⁷. The same model can be replicated by other TSPs/ISPs to improve affordable connectivity. TSPs/ISPs/IP-1s can be given the advantageous RoW permissions available with LCOs to utilize their cable network, poles, and street furniture infrastructure for laying of fiber.

- 5.146 The power sector companies and various DISCOMs can allow usage of the electricity poles for laying of aerial OFC as the same is cost effective and easy to manage when compared to underground infrastructure within the city limits. From the data collected by the Authority, it has been observed that some of the DISCOMs of Rajasthan and Punjab are already under agreements with Cable and Telecom operators and granted permissions for sharing of their poles and are charging per pole per Km rentals. This can be made mandatory for all the DISCOMs and LCOs across all the states and UTs to share their poles and street furniture with the TSPs/ISPs/IP-1s. From the above two instances it is clear that the existing assets of power and broadcasting sectors can be utilized for aerial fiber deployments to increase the fixed broadband connectivity in rural areas.
- 5.147 Simultaneously, to promote the mobile broadband connectivity street furniture can be a highly effective tool in expanding the coverage of existing 4G as well as upcoming 5G networks. Moreover, there is a close relationship of street furniture access with aerial fiber deployments. In India, the power and broadcasting sector contributes for accessible street furniture like electric poles/lines/supply pillars/cabinets/posts. Since there was no explicit reference to use of Street Furniture for rollout of 5G networks in the CP, the Authority decided to have consultation on the issues related to 'access to Street Furniture for installation of small cells' and issued a Supplementary CP for the purpose, which will be discussed in the next section in detail.

⁵⁷ <https://www.ultra.news/s-e/51590/airtels-cable-operator-tie-up-expands-to-48-cities>

5.148 To meet the universal broadband access objectives of the NDCP-2018, densification of wireless as well as wireline access networks is an immediate challenge. Further, the fiberisation of radio access network has become critical to provide next generation services. The Authority agrees with the stakeholders that IP-Is can play a significant role in meeting these challenges. Accordingly, the Authority agrees with the views of some stakeholders that its Recommendations on “Enhancement of Scope of Infrastructure Providers Category – I (IP-I) Registration” needs to be implemented for improving the proliferation of the broadband services. Therefore, it is reiterated that:

The Authority’s earlier recommendations on ‘Enhancement of Scope of IP-I Registration’ dated 13th March 2020 should be decided by the DoT and implemented at the earliest. The global trend is to move towards infrastructure sharing and this matter needs to be finalized within the next 3 months.

5.149 An interactive marketplace and online mapping application for broadband infrastructure built on reliable and trustworthy data will aggregate and visualize various dimensions for demand-supply management of infrastructure to enhance the broadband network connectivity. A direct communication chain will be facilitated by the creation of a centralized market for passive infrastructure that offers fair pricing to the providers corresponding to the demands and matching with the actual infrastructure supply. GIS mapping platform is one of the crucial instruments to assess and monitor the achievement of the connectivity and speed goals as described in the NDCP. Considering the demand for fast-paced infrastructure rollout, the Authority believes that an e-marketplace supported by GIS platform is a must for registering the details of demand and supply for passive infrastructure, like available ducts, OFC, and towers.

- 5.150 Recently, in December 2020, BSNL launched an e-marketplace platform that facilitates franchisees to purchase telecom products from verified vendors⁵⁸. BSNL marketplace facilitates trade between BSNL franchisees/LCOs/MSOs as buyers and Product vendors as suppliers as a one-stop solution. Likewise, it is necessary to accelerate the development of e-marketplace for passive infrastructure supported by a GIS platform to help facilitate sharing, leasing, and trading of passive infrastructure. To ensure transparency and fair play, the Authority agrees with the stakeholder's suggestion that e-marketplace should be developed by the Government, which should be able to access the details of the passive infrastructure of individual TSPs/ISPs and IP-Is which are delineated for sharing and selling on the common GIS platform.
- 5.151 GIS mapping for broadband services and infrastructure is already prevalent in several developed nations. ITU broadband maps include Interactive Transmission Network Maps⁵⁹ that are geospatial platforms taking stock of backbone connectivity like OFC, microwave links, satellite earth stations, and IXPs as well as mobile coverage. European Commission has also launched two major projects for mapping of broadband data on a European scale⁶⁰ – Mapping of fixed and mobile broadband services and Broadband infrastructure mapping. A number of European Countries have performed infrastructure mapping as a detailed, georeferenced, processing and visualization of data about infrastructure, creating transparent access to relevant information, aimed to reduce costs of broadband deployment and coordinate the measures as well as the possibility of synergy use in the deployment of broadband networks. In 2017 a study to complement the deployment of the EU broadband mapping platforms has mentioned a need to define common standards for the delivery of the new digital infrastructure that

⁵⁸ <http://210.212.215.93/marketplace/>

⁵⁹ <https://www.itu.int/itu-d/tnd-map-public/>

⁶⁰ <https://ec.europa.eu/digital-single-market/en/broadband-and-infrastructure-mapping-project>

consumers and business will need over the next decade⁶¹. A standardized mapping of broadband infrastructure will help identify gaps of broadband coverage and QoS level and identify suitable areas for investment.

5.152 Based on the Indian geographical, economical, technical concerns and EU experience, it is viewed that a set of uniform standards for mapping must be defined for smooth development of GIS map for infrastructure. The uniform standards should be developed and notified by TEC for this purpose. The passive infrastructure available can be mapped by each TSP/ISP/IP-I using the GIS standardized by TEC. After the mapping of the passive infrastructure details by individual service providers and infrastructure providers, the same should be aggregated on the common GIS, which should be maintained by the Government. Further, passive infrastructure (OFC, ducts, towers, etc.) of individual TSP/ISP/IP-I which is available for sharing and selling should be clearly delineated on this system.

5.153 Based on the above discussions, the Authority recommends that:

To facilitate the sharing of passive infrastructure such as ducts, optical fibres, posts etc. the Authority recommends that:

- i. In order to ensure common standards for mapping of available passive infrastructure using the Geographic Information System (GIS), Telecom Engineering Center (TEC) should notify the standards for this purpose.**
- ii. The passive infrastructure available in the country should be mapped by each service provider and infrastructure provider using the GIS standardised by TEC.**
- iii. After mapping of the passive infrastructure details by individual service provider and infrastructure provider, the**

⁶¹<https://joinup.ec.europa.eu/collection/rolling-plan-ict-standardisation/broadband-infrastructure-mapping>

same should be aggregated on the common GIS, which should be maintained by the Central Government or the Regulator. Passive infrastructure of individual service provider and infrastructure provider which is available for sharing and selling should be clearly delineated on this system.

- iv. To facilitate leasing and trading of passive infrastructure in an efficient manner, the Central Government should enable establishment of e-marketplace(s) for this purpose. Such e-marketplace should be able to access the details of the passive infrastructure of individual service provider and infrastructure provider which is delineated for sharing and selling on the common GIS platform.**

E. Access to Street Furniture

- 5.154 Based on the DoT references received and the NDCP strategic objectives to expand the digital infrastructure, issues relating to cross-sector collaboration for infrastructure creation and sharing, use of electric poles for aerial fibre installation, RoW permissions for erection of telecom infrastructure, and sharing of electric poles for hosting 5G small cells infrastructure have been discussed at length in the CP released on 20th August 2020. Subsequently, the Authority has received a reference dated 12th March 2021 from DoT seeking consolidated and updated recommendations regarding proliferation of Fixed line Broadband Services in the Country. Also, there was no explicit reference to use of Street Furniture for rollout of 5G networks in the CP. So, the Authority decided to have consultation on the issues related to '*access to Street Furniture for installation of small cells*' along with the issues raised by DoT. Therefore, a supplementary consultation paper on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' was released on 19th May 2021.

5.155 Street furniture is a term used to define objects in public spaces that—in the context of wireless infrastructure—house small-cell units in boxes and are considered visually commonplace and acceptable to the public. Street furniture must have a power source for the wireless equipment to function. Common examples of street furniture used for small-cell networks include utility poles, billboards, lamp posts, lit signage, mailboxes, park benches, information kiosks, traffic signals and other structures that have a nearby power source. Small cell architectures will become increasingly relevant as mobile networks evolve to 5G technology. According to the ‘Making India 5G Ready’ report developed in August 2018, by the 5G High-Level forum constituted by DoT:

"5G will require massive addition of both above and below the ground infrastructure, both in passive and active categories. These include backhaul radios, antennas, towers, street furniture, and ducts, etc. In the long term, 5G infrastructure densification can exceed 1,000 Base Stations per Sq. Km."

5.156 Small cells are low powered radio access nodes or base stations operating in licensed or unlicensed spectrum that have a coverage range from a few meters up to a several hundred meters. They can be deployed to facilitate connectivity, increase the network capacity and coverage in localized areas whether inside buildings or in outdoor spaces. The term ‘small cells’ covers femtocells, picocells, microcells and metro cells that are used in residential (Home Base Station (BS)), enterprise (Local Area BS), urban and rural environments (Medium Range BS). Small cell deployments that are interconnected are also termed distributed antenna systems (DAS) or inbuilding systems (IBS) where they provide service within an existing structure. Local Areas BS are typically deployed in indoor environments accessible to the general public such as stations, airports, commercial centres. Medium range BS are typically deployed in outdoor environments, often embedded in street

furniture such as lighting fixtures, advertisement panels, bus shelters or street signs.

5.157 While rolling out 5G networks, street furniture would play a significant role in offering good quality services by expanding the network coverage and going closer to the consumers. Granting access to public places like Government buildings/railway stations/metro rail stations/airports/stadiums etc. and street furniture, such as bus stop shelters, utility poles, lamp posts or traffic lights, owned by municipalities, at reasonable cost could remove a significant hurdle in 5G small cell deployment in the country. Since they are relatively small in volume, it is important that local authorities allow for small cell deployments with minimal administrative hurdles or delays. The present system of granting access to public spaces/structures for installing small cells may not be uniform across the States or Local Bodies. Exact issues and challenges in getting access to street furniture may also not be available with any one central agency as it may vary from state to state or city to city. Putting in place a uniform, simple, and efficient process for granting access to street furniture for installing small cells is need of the hour.

5.158 Therefore, the Authority has sought the views of stakeholders on how to permit the use of public places and street furniture for effective rollout of 5G networks. It is also pertinent to understand the process which can be used by local bodies to grant permissions for use of street furniture and the associated policy and regulatory interventions, so the following issues were raised in the supplementary CP:

- i. *“What are key issues and challenges in getting access to public places and street furniture for installation of small cells? Kindly provide the State/City wise details.*
- ii. *How to permit use of public places and street furniture for the effective rollout of 5G networks? Kindly suggest a uniform, simple, and efficient*

process which can be used by States/Local-Bodies for granting access to public places and street furniture for installing small cells. Kindly justify your comments.”

Comments from the Stakeholders

- 5.159 Majority of the stakeholders submitted similar kind of issues and challenges faced while getting access to public places and street furniture for installation of small cells –
- i. Right of Way: RoW is the most important issue hampering proliferation of small cells as the Rules do not have provisions for aerial OFC, IBS, small cells or the street furniture. RoW permissions/charges will remain biggest roadblock in early deployment of 5G in the country, if not resolved timely.
 - ii. Local body permissions: Granting access to public spaces/structures for installing small cells varies by state and the local body/agency. No specific provisions are present for seeking permissions and applicable charges for deployment of small cells at public places in majority of the Tower Infrastructure policies of various States/UTs.
 - iii. Excessive fees: Small cell deployment requires approval for site acquisition, negotiation of fees with municipal corporations or other Government bodies and availability of suitable backhaul and power at site. Few states are collecting variety of permission charges for IBS/ Small cells based on jurisdiction area.
 - iv. Prohibitions on small cells: Current regulations do not allow deployment of small cells using existing street furniture due to restrictions imposed by local bodies on the DISCOMs as they are not allowed to realize commercial revenue using existing public infrastructure.
 - v. Availability of power: Street furniture must have a continuous power source for the wireless equipment to function and the small cells would

typically leverage urban infrastructure where it would be challenging to ensure availability of power and backhaul to large number of small cells in a cost-effective manner.

- vi. Access to RWAs: One of the major bottlenecks is restrictions imposed by Resident Welfare Associations (RWAs) on IP-Is/TSPs and exorbitant charges that are imposed by the resident associations for getting access to societies/colonies.

5.160 Measures suggested by the stakeholders to permit use of public places and street furniture for the effective rollout of 5G networks are summarized below:

- i. Inclusion of small cells under the scope of RoW policy in addition to telecom towers and OFC. Easy and uniform RoW access to be granted across state and the local bodies for small wireless equipment/small cells on existing street furniture (viz. poles, towers, buildings and other structures), electrical power and fibre/wireless backhaul.
- ii. Permission costs should be reduced for small cells relative to those for macro cells. Charges are to be only levied in case of any defacement of such structures and must not be limited to more than restoration charges.
- iii. To make street furniture suitable for small-cell networks, there is a need to accommodate power, antenna, and associated cabling equipment. Establish norms/guidelines related to the size and number of small cells on any single street furniture and to facilitate acquisition of new sites. Power requirements may also be specified to ensure only authorized equipment is deployed over shared street furniture.
- iv. Adopting simplified rules for a faster and streamlined approval process in place of present practice of multiple approvals for building/ street furniture permits for small cell sites and related equipment at public places based on standardized size, installation requirements and radio

- characteristics. The local authorities should adopt measures such as exemptions or a simplified bulk approval process for small cells.
- v. Exempt small cell installations from location registration requirements unless necessary for other reasons.
 - vi. One of the measures that the stakeholders have suggested is sharing of the small cell sites be permitted along the lines with the active infrastructure sharing. They have proposed that the Government should consider expanding the scope of the IP-I Category Registration to include sharing of active infrastructure by the service providers who deploy small-scale architecture in these infrastructure elements. As per these stakeholders, the use of shared macro cell sites is a commonly accepted business practice worldwide.
 - vii. Access to spectrum and provision of adequate spectrum bands for backhaul with wider channel sizes in millimetre wave (e.g., E-Band) to augment capacities and improve site planning.
 - viii. Stringent EMF norms with conservative thresholds will put restrictions on the densification of networks through use of small cells. The EMF guidelines also needs simplification and relaxation w.r.t. assessment criteria for small cell deployments. Follow the International Commission on Non-Ionizing Radiation Protection (ICNIRP) Standards for EMF radiation for small cell power classes when developing regulations related to compliance with radiofrequency exposure limits.
 - ix. Instructions need to be given to State electricity boards/distribution companies to ease permits for usage of their poles for deployment. State DISCOMs, through a central agreement can allow Telecom operators to use their LT Poles for aerial OFC and mounting low power 4G/5G BTS, small cells.
 - x. Need to create awareness among municipal/local body officials, approving authorities like electricity board, environment body, other crucial stakeholders like RWAs etc. on the opportunities, benefits of 5G

and role of street furniture in transforming our economy and society, and hence, seek support.

- xi. Unrestricted access to RWAs and addressing charges imposed by the resident associations. Efforts should be made to ensure through local Municipal authorities that no fees/onetime charges should be levied, and unrestricted access should be allowed to TSPs. The concept of deemed approval may be mandated by the local Authorities.
- 5.161 An association has submitted that there is a need to assess deeper collaboration/sharing methods, though the telcos are practicing some form of sharing today. This stakeholder has proposed active sharing in the form of RAN sharing solutions like MOCN (Multi-Operator Core Network) and MORAN (Multi Operator RAN), antenna sharing, etc. can be mixed among the operators, citing various global experiences for the same
- 5.162 An association has suggested that the Government should work towards formulating a national-level policy framework for the installation of street furniture. A central agency may be established to coordinate communications between different Government departments and stakeholders. This stakeholder believes that these initiatives would help bring a certain degree of uniformity and ease processes to adopt street furniture. It also mentioned that Government can also consider earmarking certain public infrastructure (municipality buildings, post offices, bus, and railway stations, etc.) to have dedicated spaces that allow service providers to deploy small-scale architecture, similar to the Japanese and South Korean models, traffic signals, metro lines, etc. can be identified as effective street furniture in regions where they are concentrated such as metropolitan areas. The Government may also consider expanding the scope of the IP-I category registration to include sharing of active infrastructure to no licensed service providers who deploy small-scale architecture in these infrastructure elements.

5.163 Another association is of the opinion that much like the European Union has to contend with multiple member countries, India has to deal with multiple states and UTs, therefore, to consider the simplified solution suggested by the European Commission on small cell implementation. Further it has submitted that the Government and the policymakers should identify and catalogue a diversity of suitable street furniture across the country for deployment of small network infrastructure. As per this stakeholder, this street furniture would also support other small network element deployments such as those associated with the rollout of hyperlocal Wi-Fi networks under the PM-WANI scheme.

International Experience

5.164 Few associations have enclosed international best practices for the use of street furniture for boosting 5G small cell deployments. Same is discussed below –

- i. **United States** regulator Federal Communications Commission (FCC) has released a ‘Declaratory ruling and Third report and Order⁶²’ in September 2018 in the matter of ‘Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment’ and has arrived at far reaching decisions for all the States for removing restrictions to rollout of small cells required for 5G penetration in the States. The FCC has framed rules about the administration fee, timelines for approving permit applications (shot clocks) in this small cell order.
- ii. In 2020, the **European Union** has adopted regulations⁶³ to accelerate 5G installation by simplifying the deployment of small cell antennas that provide the last mile for 5G networks. The Regulations –
 - specifies the physical and technical characteristics of small cells;

⁶² FCC Policy document: <https://docs.fcc.gov/public/attachments/FCC-18-133A1.pdf>

⁶³ <https://digital-strategy.ec.europa.eu/en/news/commission-adopts-implementing-regulation-pave-way-high-capacity-5g-network-infrastructure>

- facilitates a permit-exempt deployment regime;
 - provides national authorities to oversee deployment of small cells;
 - allows for broader national measures in support of straightforward small cell deployment and
 - foresees future amendments to incorporate the latest technological advances.
- iii. **Singapore** regulator Infocomm Media Development Authority (IMDA) provides a Code of Practice for Info-communication Facilities in Buildings (COPIF) specifying the duties of building owners/ developers to provide adequate space, facilities, and access for telecom licensees to provide their services. COPIF⁶⁴ allows ‘mobile installation spaces’ typically the rooftop spaces reserved for telecom equipment be provided to network operators by building developers and owners free of charge.
- iv. The **Japanese** Government had approved 2,08,000 traffic signals to be used to deploy 5G small-cell architecture across the country, while the costs of using the traffic lights for 5G deployments be shared between operators and local administrations⁶⁵.
- v. **United Kingdom’s** Electronic Communications Code facilitates operators’ access to macro and small cell infrastructure on public and private land. The Government in 2020 also proposed some changes to the law⁶⁶ for speeding up 5G roll out and allowed the providers to put more equipment on masts, making it possible to share mobile masts.
- vi. In Seoul of **South Korea**, 5G networks were established on subway lines being used as street furniture⁶⁷.

⁶⁴ <https://www.imda.gov.sg/Regulations/Codes-of-Practice-Infocomm/COPIF/COPIF-Overview.pdf?la=en>

⁶⁵ <https://www.japantimes.co.jp/news/2019/06/14/business/tech/japan-install-5g-network-relay-devices-traffic-signals/>

⁶⁶ <https://5g.co.uk/news/government-law-changes-speed-5g-rollout/5364/>

⁶⁷ <https://seoulz.com/a-comprehensive-guide-to-5g-in-south-korea-outlook-for-2021/>

- vii. **Hong Kong** Government has issued guidelines⁶⁸ on the use of street furniture such as sheltered bus stops, public payphone kiosks and smart lampposts for installation of 5G Radio Base Stations. The guidelines facilitated applications by mobile network operators and allowed them to conduct trials on that street furniture.
- viii. The **Australian** Communications and Media Authority and the Department of Communications have put several policies to facilitate 5G infrastructure like reductions in planning requirements for small-cell deployments in the public space⁶⁹.
- ix. Small cell infrastructure has also been deployed in ‘smart lampposts’ which also serve as electric vehicle charging stations⁷⁰ in city of Guimarães in **Portugal**.
- x. The Government of **Spain** has supported many private entities for deploying small cell infrastructure in public buildings such as in the city council of Barcelona⁷¹, to enable video transmissions of official proceedings.

Analysis of the issue and views of the Authority

- 5.165 After thoroughly analysing the inputs from stakeholders, the Authority has identified four primary concerns in getting access to public places and street furniture for installation of small cells, namely,
- i. Access to Rights of way
 - ii. Electrical power
 - iii. Backhaul and
 - iv. Sharing of small cells
- 5.166 Significant challenges with regards to RoW access are acquiring permits, prolonged application process, different laws adopted by states and local

⁶⁸ <https://www.coms-auth.hk/filemanager/statement/en/upload/552/gn112020.pdf>

⁶⁹ <https://www.apf.gov.au/DocumentStore.ashx?id=a3ec5b3d-73a7-4c76-a6d3-603d17c70f25&subId=672949>

⁷⁰ <https://www.5gcity.eu/2019/07/04/ubiwhere-accelleran-league-finals/>

⁷¹ <https://accelleran.com/553/>

bodies, bearing charges to deploy or rent the street furniture, and permissions needed for power supply under state electricity laws. The issues of access to Rights of Way are getting addressed by RoW recommendations and do not require any further deliberations. The issue of access and backhaul spectrum has already been deliberated in “mobile broadband proliferation” and “mobile broadband speed enhancement” sections of this Recommendation and the way forward has been suggested.

- 5.167 Unlike the 4G macro base stations, huge densification of small cell sites is required in case of 5G to achieve the same amount of coverage and capacity. This leads each individual operator to deploy their own small cell equipment over the street furniture to have complete control over its cell sites, differentiating on quality and depth of network coverage. Due to which there would be a situation of multiple number of small cell installations on the street furniture which may raise aesthetics issues, permission issues, power supply issues, etc. The aesthetics concern of small cells is also brought up in ITU’s 2018 paper⁷² on ‘Setting the Scene for 5G: Opportunities & Challenges’
- 5.168 Considering all the arguments that justify the sharing, the Authority agrees with the stakeholders that some level of small cell sharing should be encouraged. While formulating standardized guidelines for small cell size, power, space, quantity, etc., the small cell network also should be designed in a way that multiple operators can use it considering Indian geographical scenarios. Shared infrastructure solutions should be explored to reduce unnecessary equipment redundancy, for consistent 5G coverage, and maximize the benefits for customers. Though sharing of the active infrastructure among TSPs is permitted, it is not very effective because the TSPs are not willing to share their resources with

⁷² https://www.itu.int/pub/D-PREF-BB.5G_01-2018

their competitors. Keeping in view these facts, the Authority vide its Recommendations dated 13th March 2020 on “Enhancement of Scope of Infrastructure Providers Category-I (IP-I) Registration” has recommended that:

“ that the expanded scope of the IP-I registration should include to own, establish, maintain, and work all such infrastructure items, equipment, and systems which are required for establishing Wireline Access Network, Radio Access Network (RAN), and Transmission Links”

An early action is required by the Government to implement the above recommendation as discussed earlier in infrastructure sharing section. This will pave the way for sharing of small cells as well as backhaul also.

- 5.169 Uninterrupted power is must for the small cells deployed on the street furniture to function. As there will be hundreds of thousands of small cells to be deployed on the available street furniture during initial stages of 5G in the country, ensuring power supply to the installed equipment in a cost-effective manner will be the most challenging part. The Authority views that sharing of nearby power sources and generation units would solve the problem of ensuring sufficient power supply to the small cell sites. Sharing of Power Connection is in the domain of electricity regulations, as discussed in the cross-sector infrastructure development and sharing sections. The Authority has recently taken an initiative for cross-sector collaboration between the Telecom and Power sectors. A Forum of Indian Regulators (FOIR) working group was created which has representation from TRAI, Central Electricity Regulatory Commission (CERC), State Electricity Regulatory Commissions (SERCs), DISCOMs, Infrastructure Providers and has a provision to co-opt experts from other organizations as well. The collaborative framework is expected to help in the 5G technology rollout in the country. Thus, this

issue of power at site for 5G small cells could be worked out by the working group together with the model framework for aerial fiber rollout along the electricity/dedicated poles.

5.170 The Authority agrees with the stakeholders that high RoW charges levied for the street furniture will make the rollout of 5G small cells un-viable and hence will become the biggest roadblock in early deployment of 5G in the country, if not resolved timely. In addition to this, the administrative difficulty in applying for permission for individual street furniture is also an area of concern. To address this a mechanism for simplified bulk approval is required to be developed. Most of the street furniture are established and owned by the electricity authorities only and therefore the rental, RoW charges and approval of permission for using street furniture shall fall in their jurisdiction. Therefore, these issues can also be deliberated by the FOIR working group and an economically viable and user-friendly mechanism can be worked out.

5.171 Evolving a proper regulatory framework to support the deployment of small cells will enable the industry and the Government to deliver the digital connectivity expectations of citizens and paves the way for 5G deployment. The policy/framework regarding the use of public places and street furniture should be fair, transparent and effective, ensuring standardized guidelines for small cell size, power, space, quantity etc. are defined to make street furniture ready to deploy small cells. Many countries have adopted criteria for exemption that can be used for deployment of new antennas. For instance, the height of the installed antenna and the Effective Isotropic Radiation Power (EIRP) metric are being used as criteria for frequency exposure certification exemption and simplification of approval process for permission. The International Electrotechnical Commission (IEC) has developed detailed classes of small cell products and installations, which are also reflected in ITU recommendations. As per GSMA, where small cell installations comply

with the power and installation parameters provided therein, they should be deemed to comply with the frequency exposure limits without further requirements⁷³. This exercise requires a detailed consultation for recommendations on standardization and exemptions of the small cells from permissions required from different authorities like exemption criteria based on height of antenna and EIRP and hence can be taken up separately by the Authority.

- 5.172 As per the GSMA report on Small Cell deployment, a nationally standardised procedure and criteria is much required based on international best practices/recommendations that benefits the operators through simplified administration and help deploy small cells more efficiently for gaining improved connectivity. The stakeholder comments based on the policies adopted by the US, EU, UK, Japan, Australia, etc. specific to these countries could be taken as pre-consultation inputs by the Authority and the same required to be further deliberated through a dedicated consultation process keeping in view the Indian laws and Rules.

⁷³ GSMA Report on “Improving wireless connectivity through small cell deployment”

CHAPTER 6

INCENTIVES FOR PROLIFERATION OF FIXED LINE BROADBAND

Background

- 6.1 The COVID-19 pandemic which started last year is an unprecedented event in the recent history of the mankind. World over people faced unimaginable challenges, which forced changes to our daily life and the way we transact and interact. When schools and offices closed owing to the nationwide lockdown to slow the spread of the virus, the importance of broadband connections was realized. People who lacked adequate broadband access were at a stark disadvantage. The restrictions imposed because of COVID-19 has required large swathes of the population to rely on remote working, e-health, e-learning solutions, e-banking and e-commerce alongside cloud usage and video conferencing for business and social engagement.

- 6.2 It is expected that changes in working practices and delivery of public services would persist following the outbreak, providing an opportunity for digital transformation to provide a route out of the likely economic recession , post pandemic. We have become more dependent than ever on our broadband connections, be it for our daily jobs or education or entertainment or to even attend social functions. In this period, the importance of augmenting and incentivizing the fixed line broadband networks has also been realized. Fixed line broadband lacks mobility but it has the advantage of high bandwidth, low latency, high speed, and high reliability. The massive ‘work from home’ and ‘learn from home’ shift in last one year have become possible to some extent due to fixed line broadband networks that provided the reliable internet services.

6.3 TRAI received a letter dated 12th March 2021 from DoT, appended as **Annexure D**, wherein a reference has been made to the TRAI's recommendations on '*Delivering Broadband Quickly: What do we need to do?*' dated 17th April 2015. The letter refers to one of the action points of these recommendations i.e., "*To promote fixed line BB [Broadband], the license fee on the revenues earned on fixed line BB should be exempted for at least 5 years*". In this letter, certain issues have been raised based on the deliberations held while considering the aforesaid recommendation. The issues raised are the exemption of the license fee on the revenues earned from fixed-line broadband keeping in view the current factual matrix and relevant issues, likelihood of misuse by the licensees through misappropriation of revenues due to the proposed exemption of the License Fee on the revenues earned from fixed-line broadband services, and the feasibility of promoting proliferation of fixed-line broadband by providing direct benefit to consumers for usage of fixed-line broadband services. These issues were neither explicitly consulted with the stakeholders during the consultation process leading to the recommendations on '*Delivering Broadband Quickly: What do we need to do?*' dated 17th April 2015 nor in the CP on '*Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed*' dated 20th August 2020. The Authority decided to issue a supplementary CP on the above issues to provide its consolidated and updated recommendations for proliferation of fixed-line broadband services after following the due consultation process.

6.4 Fixed-line broadband is an always-on and high-speed data connection provided at the customer's premises. Here it is pertinent to note that for the purpose of these recommendations fixed-line broadband refers to the end-to-end wireline connections only. However, in few cases, last mile connectivity, due to technical non-feasibility or non-availability of wireline medium, on temporary basis, it could be extended on dedicated

point-to-point radio link. Such dedicated connectivity facilitates high speed and highly reliable data connectivity. Fixed-line broadband can be provided using Unshielded Twisted Pair (UTP) of copper cable or Optical Fiber Cable (OFC) or Coaxial copper cable or Hybrid Fiber Cable (HFC) networks. The cable connects to a modem, which can then be connected to the customer's devices using either Wireless Local Area Network (WLAN) or an Ethernet cable. Other types of fixed broadband connections are delivered through Fixed Wireless Access (FWA) and satellite networks. FWA broadband connections use shared Radio Access Network (RAN) established for cellular mobile networks. These modes of connection make use of spectrum for last mile connectivity. However, FWA and satellite broadband were not under consideration in this consultation.

6.5 Fixed-line broadband characteristics such as higher reliability, low latency, and higher speed makes it suitable for accessing cloud-based enterprise applications, data communications, video streaming, online gaming, video conferencing, online education, tele-health etc. It can deliver symmetric download and upload speed of up to Gigabit per second. However, provisioning of fixed-line broadband services is capital and manpower intensive activity, and its maintenance is also challenging. Although mobility is the greatest advantage of mobile broadband, it is fixed-line broadband service which stands out when it comes to cost per GB of data consumption. Hence, it is economical to use fixed-line broadband to access data heavy applications.

6.6 As per the existing licensing framework for telecommunication services, Access Service Providers and Internet Service Providers can provide fixed-line broadband services. Here "Access Service Providers" implies licensees holding UASL (Unified Access Service License)/ UL (Unified License) with Access Service authorization/ UL (VNO) with Access

Service authorization/ UL(VNO) with Access Service Category B authorisation. Similarly, “Internet Services Providers” here implies licensees holding ISP license/ UL with Internet Service authorization/ UL(VNO) with Internet Service authorisation.

License fee regime

- 6.7 As per the UASL/ UL/ UL(VNO)/ ISP licensing framework for telecommunication services, in each service-area, License Fee (LF), as a percentage of Adjusted Gross Revenue (AGR), is required to be paid by the Licensee, for each authorized service from the effective date of the respective authorization. Presently, the license fee is fixed at the rate of 8% of the AGR, inclusive of Universal Service Obligation (USO) Levy, which is presently 5% of AGR.
- 6.8 A brief description of the licensing regime for the Internet Service Providers in India is provided in the Annexure attached with the DoT reference dated 12th March 2021. The same is summarized here to provide the necessary perspective to the issues under consideration.
- 6.9 In 1998, Internet service sector was opened for private participation with a view to encourage growth of Internet and increase its penetration. Initially, there was no license fee for the ISP licenses issued under 1998 guidelines. In 2002, ISPs were allowed to offer Internet Telephony (IT) service after signing amended ISP license (referred to as ‘ISP-IT license’) issued under 2002 guidelines.
- 6.10 Till 31st October 2003, there was no license fee for the ISP licensees (with or without Internet Telephony). A token license fee of Re.1 per annum was imposed on all ISP licensees (with or without Internet Telephony) with effect from 1st November 2003. Through an amendment dated 3rd March 2006, license fee as 6% of Adjusted Gross Revenue (AGR) was imposed on ISP-IT licensees with effect from 1st January

2006; revenue from pure Internet service (i.e., charges from Internet access, Internet content and Internet access related installation charges) was excluded from the Gross Revenue to arrive at the AGR.

- 6.11 In 2007, DoT issued revised guidelines for granting license for operating Internet services. In the ISP licenses issued under 2007 guidelines, a license fee of 6% of AGR was imposed; revenue from pure Internet service (i.e., charges from pure Internet service and activation charges from pure Internet subscribers) was excluded from the Gross Revenue to arrive at the AGR.
- 6.12 In 2012, to adopt a uniform license fee regime, DoT vide its letter dated 29th June 2012 revised the license fee on all ISPs @ 8% of Adjusted Gross Revenue (AGR) w.e.f. 1st April 2013. Before this, different category of ISP licenses had different provisions for license fee. As per the aforesaid DoT letter dated 29th June 2012, revenue for the purpose of license fee for ISP category shall provisionally include all types of revenue from Internet services, allowing only those deductions available for pass through charges and taxes/levies as in the case of access services, without any set-off for expenses.
- 6.13 In 2013, Unified License (UL) regime was instituted in the country. Internet Services authorization is one of the authorizations under the UL. License Fee at the rate of 8% of AGR is to be paid by a licensee under the UL regime; AGR for UL (Internet Service authorization) does not exclude revenue from pure Internet services.
- 6.14 As provided in DoT's reference dated 12th March 2021, the provisions of DoT's order dated 29th June 2012 were challenged by licensees and their association before TDSAT and the same were either set aside or made non-applicable. Accordingly, it appears that most of the ISPs while calculating the license fee, as per the erstwhile provisions of the ISP

licenses, were claiming the revenue earned from Internet services as pass through and paid negligible amount of license fee on other revenues only.

6.15 Through separate petitions filed before the Hon'ble TDSAT, Internet Service Providers Association of India and a few licensees having UL (Internet Service authorization) challenged the definition of AGR as provided in the UL (Internet Service authorization) on the plea of non-level playing field, in respect of license fee obligation, between them and licensees operating under the earlier ISP License regimes. They prayed before the Hon'ble TDSAT to exclude the revenue earned from pure Internet service for arriving at AGR for ISPs operating under the UL regime. Hon'ble TDSAT, on 18th October 2019 decided these matters in favour of the petitioners. DoT has filed a Civil Appeal against the said judgment before the Hon'ble Supreme Court of India.

6.16 Now, through two separate amendments to the ISP licenses, dated 31st March 2021, DoT has made applicable an annual license fee @ 8% of Adjusted Gross Revenue (AGR) inclusive of the USO levy fee which is presently 5%. These amendments have been made to both types of ISP licenses, i.e., the licenses granted as per the 2002 guidelines and the licenses granted as per the 2007 guidelines. After these amendments, the definition of AGR in the ISP licenses has become similar to what is provided in the Internet Service authorization under UL. As per the amended definition of AGR, the revenue from pure Internet services has not been excluded from the Gross Revenue to arrive at the AGR.

Growth of fixed-line broadband subscribers

6.17 Table 6.1 shows the numbers of Internet subscribers in the country as on 31st March 2021. It can be observed that at the end of March 2021, out of total 778.095 million broadband subscribers, there were only 22.749 million fixed-line broadband subscribers. The fixed-line

broadband subscribers are a small fraction of the total subscribers. In terms of penetration, only 9.1 per 100 households have subscribed to fixed-line broadband services.⁷⁴

Table 6.1: Internet Subscribers as on 31st March 2021

Segment	Mode of Access				Total Subscribers (in million)
	Fixed Line Subscribers (in million)	Wireless Subscribers (in million)			
		Fixed Wireless (Wi-Fi, Wi-Max, Radio & VSAT)	Mobile Wireless (Phone + Dongle)	Total Wireless	
Broadband	22.749	0.671	754.674	755.345	778.095
Narrowband	3.246	0.006	43.955	43.961	47.207
Total	25.995	0.677	798.629	799.306	825.301

6.18 During the last five years, while the wireless broadband subscribers have grown exponentially from 132.77 million (as on 31st March 2016) to 755.345 million (as on 31st March 2021), the fixed-line broadband subscribers have grown slowly from 16.98 million to 22.749 million only during the same period. The total wireline broadband subscribers per 100 population is much less in comparison to wireless broadband subscribers in all the LSAs as shown in the following Table 6.2. The Table 6.3 shows the distribution of urban and rural wireline broadband subscribers, as per which the percentage of rural subscribers is only 5.58% as on 31st March 2021.

Table 6.2: LSA-wise Broadband Density as on 31st March 2021

Sr. No.	Licensed Service Area	Total Wireless Broadband Subscribers	Wireless BB subscribers per 100 population	Total Wireline Broadband Subscribers	Wireline BB subscribers per 100 population
1	Andhra Pradesh	58147233	64.22	2712263	3.00

⁷⁴Based on 2011 Census, India has 249.5 million households

Sr. No.	Licensed Service Area	Total Wireless Broadband Subscribers	Wireless BB subscribers per 100 population	Total Wireline Broadband Subscribers	Wireline BB subscribers per 100 population
2	Assam	15201444	43.34	97916	0.28
3	Bihar	51035850	31.55	292876	0.18
4	Delhi	39217726	190.34	2517929	12.22
5	Gujarat	47173045	66.49	1681924	2.37
6	Haryana	17365435	58.84	356285	1.21
7	Himachal Pradesh	6345135	85.78	65659	0.89
8	Jammu & Kashmir	7702203	56.17	196375	1.43
9	Karnataka	45220510	67.61	2161763	3.23
10	Kerala	27411012	77.06	1477440	4.15
11	Madhya Pradesh	51357599	45.00	757042	0.66
12	Maharashtra	65571422	74.74	1992118	2.92
13	Mumbai	28656013		1695067	
14	North East	8547815	55.23	91794	0.59
15	Orissa	20191571	45.84	276917	0.63
16	Punjab	26337633	83.44	1008852	3.20
17	Rajasthan	42257171	53.25	602407	0.76
18	Tamil Nadu	51022693	65.42	2428188	3.11
19	UP (East)	56286447	39.25	579459	0.46
20	UP (West)	38900882		533252	
21	Kolkata	17039068	51.79	809602	1.23
22	West Bengal	34357256		414311	

Table 6.3: Wireline Broadband Rural Urban distribution

Sr. No.	Licensed Service Area	Mar-20			Mar-21		
		Rural	Urban	Total	Rural	Urban	Total
1	Andhra Pradesh	111548	2286121	2397669	73265	2638998	2712263
2	Assam	6679	84340	91019	2233	95683	97916
3	Bihar	15504	210269	225773	6603	286273	292876
4	Delhi	1429	2103538	2104967	2494	2515435	2517929
5	Gujarat	190195	1253513	1443708	255914	1426010	1681924
6	Haryana	25417	323117	348534	15566	340719	356285

Sr. No.	Licensed Service Area	Mar-20			Mar-21		
		Rural	Urban	Total	Rural	Urban	Total
7	Himachal Pradesh	8347	78460	86807	4512	61147	65659
8	Jammu & Kashmir	7880	92810	100690	4359	192016	196375
9	Karnataka	81060	1859542	1940602	73183	2088580	2161763
10	Kerala	196771	1049148	1245919	273248	1204192	1477440
11	Kolkata	25757	623274	649031	34130	775472	809602
12	Madhya Pradesh	36149	610841	646990	26965	730077	757042
13	Maharashtra	129471	1448003	1577474	162060	1830058	1992118
14	Mumbai	246	1428472	1428718	458	1694609	1695067
15	North East	5422	71742	77164	2143	89651	91794
16	Orissa	16188	202540	218728	13727	263190	276917
17	Punjab	48541	761432	809973	33809	975043	1008852
18	Rajasthan	38809	488823	527632	27545	574862	602407
19	Tamil Nadu	122080	2016938	2139018	134422	2293766	2428188
20	UP (East)	39414	413681	453095	36708	542751	579459
21	UP (West)	26273	374442	400715	17279	515973	533252
22	West Bengal	57142	204462	261604	69268	345043	414311
	Grand Total	1190322	17985508	19175830	1269891	21479548	22749439
	Percentage	6.21%	93.79%		5.58%	94.42%	

Broadband Promotion - International experience

6.19 In the United States, the “Internet Tax Freedom Act” was signed into law on October 21, 1998, by President Bill Clinton in an effort to promote and preserve the commercial, educational, and informational potential of the Internet. The law bars federal, state, and local Governments from taxing Internet access and from imposing discriminatory Internet-only taxes such as bit taxes, bandwidth taxes, and email taxes. It also bars multiple taxes on electronic commerce. The law was originally enacted as a ten-year moratorium. It was then extended multiple times by the United States Congress, including several short-term extensions in 2014 and 2015. Meanwhile, on 15th July, 2014, the United States House of Representatives voted to pass the Permanent Internet Tax Freedom Act, a bill that would amend the Internet Tax Freedom Act to make

permanent the ban on state and local taxation of Internet access and on multiple or discriminatory taxes on electronic commerce. On 9th June, 2015, the United States House of Representatives voted and approved by voice vote, the “Permanent Internet Tax Freedom Act” which makes permanent the ban on federal, state, and local taxation of email and Internet access originally enacted in the “Internet Tax Freedom Act”. The bill was then included in the Trade Facilitation and Trade Enforcement Act of 2015. The Internet Tax Freedom Act became permanent law when President Obama signed the Trade Facilitation and Trade Enforcement Act of 2015⁷⁵.

6.20 A review of demand side measures to improve broadband adoption employed across the world reveals a rich diversity of approaches suited to local considerations and conditions. Some of the demand side interventions are listed below:

Sr. No.	Country	Scheme
1.	U.S.A.	The Emergency Broadband Benefit (EBB) is an FCC program to help families and households struggling to afford Internet service during the COVID-19 pandemic. This new benefit will connect eligible households to jobs, critical healthcare services, virtual classrooms, and so much more. The Emergency Broadband Benefit will provide a discount of up to \$50 per month towards broadband service for eligible households and up to \$75 per month for households on qualifying Tribal lands. The Emergency Broadband Benefit is limited to one monthly service discount and one device discount per household. Participating providers will receive reimbursement from the EBB Program for the discounts provided. Eligible households can also receive a one-time discount of up to \$100 to purchase a laptop, desktop computer, or tablet

⁷⁵ <https://www.govinfo.gov/content/pkg/PLAW-114publ125/pdf/PLAW-114publ125.pdf>

		from participating providers if they contribute more than \$10 and less than \$50 toward the purchase price. ⁷⁶
2.	France	The Cohésion Numérique des Territoires “Digital Cohesion of Territories” scheme is a scheme developed by the French Government. It is intended for both individuals and companies. Under this scheme up to €100m subsidies were made available from 2019 to provide vouchers for households and businesses that do not have access to at least 30Mbit/s speeds and are not expected to be connected with high-speed broadband by 2020. It allows individuals and companies that are not covered by wired networks, to benefit from financial support of up to € 150 to allow them to equip themselves with broadband via wireless technologies. ⁷⁷
3.	Greece	The Superfast Broadband Voucher Project started in June 2018. It aims at stimulating demand for access to broadband services on ultra-high speed of at least 100 Mbps readily upgradable to 1 Gbps. This will be achievable with the subsidized “Superfast Broadband Voucher” that contributes to bridging the longstanding country’s digital divide and improving its digital performance in the EU “Digital Economy and Society Index” (DESI) related to connectivity as well as familiarizing citizens with next generation broadband networks. Under this project, €50m has been made available to provide vouchers which would cover a one-off connection fee of €48 and recurring broadband costs of €13 for a maximum of 24 months. ⁷⁸
4.	Italy	In 2020, a €200 million voucher scheme has been approved to help low-income families in Italy access high-speed broadband services. The Italian scheme

⁷⁶ <https://www.fcc.gov/broadbandbenefit>

⁷⁷ http://www.broadbanduk.org/wp-content/uploads/2020/06/WIK-report_BSG_02062020_final.pdf

⁷⁸ <http://nga.gov.gr/index.php/superfast-broadband-sfbb-voucher/?lang=en>

		aims at supporting low-income families by providing vouchers to purchase broadband services with download speeds of at least 30 Mbps, with a preference for the highest speed available to the extent that several suitable infrastructures are present in the relevant area. The vouchers will also cover the provision of the necessary equipment, such as a tablet or a personal computer. It provides €500 vouchers to qualifying low-income families to install broadband and acquire IT equipment for children. ⁷⁹
5.	United Kingdom	Through the Gigabit Broadband Voucher Scheme, the Government is providing up to £210m worth of voucher funding as immediate help for people experiencing slow broadband speeds in rural areas. Vouchers worth up to £1,500 for homes and £3,500 for businesses help to cover the costs of installing gigabit broadband to people’s doorsteps. Up to 10 homes may join with the business connection application to receive £500 subsidies each. In May 2019, through Rural Gigabit connectivity programme, new voucher scheme was introduced drawing funding from the £200m, to provide subsidies for connections in rural areas up to £3,500 for small businesses and £1,500 for residential. ⁸⁰
6.	Uruguay	In May 2011, Antel launched its “Servicio Universal Hogares” – or “Internet for All” - plan, aiming to bring Internet access to every home in Uruguay. For a one-time payment of US \$30 (the cost of a modem), all fixed line phone customers qualified for free ADSL service that offered a basic connection of 256 Kbps and targeted the low-income segment to which the price of broadband represented a barrier to connectivity. ⁸¹

⁷⁹ https://ec.europa.eu/commission/presscorner/detail/en/IP_20_1445

⁸⁰ <https://gigabitvoucher.culture.gov.uk/home/about-the-scheme/>,
<https://www.gov.uk/government/publications/rgc-programme-key-information>

⁸¹ <https://ddtoolkits.worldbankgroup.org/broadband-strategies/driving-demand/achieving-affordability>

7.	Brazil	In 2009, only one-third of households within the Brazilian state of São Paulo had access to a broadband connection. Of the remaining two-thirds, nearly 60% blamed that the high cost of Internet services. That year, the Governments of São Paulo, Pará, and Distrito Federal partnered together to offer low-income citizens in these districts' affordable broadband. The social inclusion program, dubbed Banda Larga Popular, provided Internet connections for US\$ 17 per month (35 reals, or 29 reals in those states where ICMS taxes did not apply). ⁸²
8.	Singapore	In April 2020, Singapore put into effect the latest edition of the “Home Access 3.0” programme which would increase the minimum broadband speed from 300Mbps to 500Mbps at no additional cost to eligible households with a gross monthly income of less than \$1,900. The new scheme was also extended to households with children attending school, where previously they were limited to subsidized broadband schemes that came bundled with a computer. Originally launched in 2014, the Home Access programme in Singapore has provided more than 14,000 low-income households with subsidized fibre broadband connectivity and the option to own devices. The scheme aims to benefit 10,000 more households over the next three years. ⁸³

6.21 A summary review of the international experiences indicates that for proliferation of high-speed broadband services, time-to-time countries have taken steps to address supply as well as demand side issues. While for addressing supply side issues, the US has enacted the necessary law

⁸²<https://ddtoolkits.worldbankgroup.org/broadband-strategies/driving-demand/achieving-affordability>

⁸³ <https://www.straitstimes.com/singapore/parliament-low-income-households-to-get-faster-internet-access-under-enhanced-home-access>

to provide tax certainty for Internet access providers, for addressing demand side issues many countries have provided subsidies to the targeted segments of their population.

Incentive in the form of LF exemption on fixed line broadband

- 6.22 The reason for poor penetration of fixed-line broadband in India may be either due to supply side constraints (non-availability of service) or demand side constraints (like affordability or perceived benefits issues). However, with the improvements in wireless technologies, the broadband speed delivered using 4G cellular mobile networks has also improved a lot. Moreover, with the rollout of 5G networks the reliability and latency characteristics of wireless broadband may further improve.
- 6.23 As noted earlier, fixed broadband could be delivered through Fixed Wireless Access (FWA) networks also. Keeping in view the technological developments, the fixed broadband services in the country may also be delivered very soon using the Low Earth Orbit (LEO) and Medium Earth Orbit (MEO) satellites. One can argue that any license fee exemption on the revenues earned from delivery of the fixed-line broadband services only may create a non-level playing field between the fixed-line and wireless broadband services.
- 6.24 As elaborated in the DoT reference letter dated 12th March 2021 and summarized earlier in this chapter, due to litigations and the judgments/orders of the Hon'ble TDSAT in respect of the license fee for ISPs,-many ISP licensees have not paid, for almost last eight financial years, the license fee on revenues earned from the delivery of pure internet services under the ISP licenses/ authorizations.
- 6.25 Based on the various arguments in favour of and against the exemption of licence fee on the revenues earned from delivery of fixed-line

broadband services the following question was raised in the supplementary CP to get the views of the stakeholders:

“What should be the approach for incentivizing the proliferation of fixed-line broadband networks? Should it be indirect incentives in the form of exemption of license fee on revenues earned from fixed-line broadband services, or direct incentives based on an indisputable metric?”

Comments from the Stakeholders

- 6.26 In response, most of the TSPs/ISPs who are providing fixed-line broadband services have suggested the exemption of license fee. They have advocated for the indirect incentives approach to ensure incentivizing all the service providers who have been instrumental in the proliferation of fixed-line broadband networks. They have stated that all the operators who have made huge investments to build the fixed line networks and related infrastructure should be given the exemption of license fee. Further, they are of the view that service providers who have already created the required infrastructure should also be equally treated while giving incentives for creation of new infrastructure. A few stakeholders have suggested that the license fee exemption should be based on the turnover of the ISP and only those with lower turnover may be given exemption. However, one of the stakeholders has stated that a blanket license fee exemption should not be extended to all the fixed line broadband providers and only serious players with substantial subscriber base should be exempted.
- 6.27 Some of the stakeholders have submitted in their comments that it is an acknowledged fact that installation and maintenance of fixed line broadband is capital intensive. Fixed-line broadband providers provide services by laying cable networks directly to the subscriber. They do not use scarce spectrum resources. In India, for fixed line broadband

connectivity, the higher constraints are on the supply side as compared to constraints on the demand side. The cost of fixed-line broadband provisioning is increasing due to factors other than technology costs that includes RoW charges and other costs.

- 6.28 Some of the stakeholders are of the view that a comparison of fixed-line services and wireless services is not justifiable as fixed line service does not provide mobility to the end-user and hence is not a substitutable service. Further, the fixed-line services do not use spectrum, which is a scarce natural resource, in fact it helps in conserving the same. Low return on capital employed on fixed-line broadband connectivity justifies the case for license fee exemption to the fixed line operators instead of direct incentives. The license fee waiver will give desired encouragement to the fixed line operators to increase the CapEx on fixed line network while achieving the target of increased penetration of fixed line broadband amongst the masses.
- 6.29 A few stakeholders have requested that license fee exemption should be given on pure Internet services and there should be withdrawal of license fee demands on revenue from services like Cable TV delivered on the same network. They have stated that MSOs and LCOs have presence in 150 million homes either through fibre or coaxial copper cables and they are best placed to provide broadband.
- 6.30 One of the stakeholders has suggested uniform lower license fee of 1% across all the network services. Another stakeholder has suggested that incentives should be provided to both wireline as well as wireless broadband to have a level playing field. The rollout of 5G would bring revolutionary changes and increase wireless broadband speeds thereby, further reducing dependency on fixed line broadband networks even in urban areas. A few stakeholders have suggested that the exemption of

license fee should be applicable on the revenue earned from Satellite based Broadband services also.

- 6.31 Some of the stakeholders are of the opinion that both direct as well as indirect incentives are required for the growth of fixed-line broadband. Some stakeholders are of the view that the license fee exemption should be supplemented by USO support for rural and remote infrastructure, Performance Linked Incentive scheme for fixed line infrastructure and by permitting the bandwidth and lease line charges as pass through while calculating Adjusted Gross Revenue. Some stakeholders suggested that direct incentives may be provided to local cable operators to upgrade their networks for the delivery of fixed line broadband.
- 6.32 Some stakeholders have submitted that exemption of licence fees is not recommended because despite all concessions, reliefs given to telecom operators, since their formation, they state that they are in financial stress. They are not able to provide fixed line connectivity, connect the unconnected especially in rural, hilly, and remote areas. One of the stakeholders has stated that indirect incentive in the form of license fee exemption may be used by TSPs/ISPs for servicing debt obligations. Hence, direct incentives linked with investment may provide a boost to growth in the sector.
- 6.33 One of the stakeholders has stated that no substantial growth in subscribers of some ISPs even after not paying the license fee under court orders should not be a justification for not giving license fee exemption. It has stated that the ISPs benefitted by license fee exemption through Hon'ble TDSAT order may not be in a position to pass on the benefits for developing infrastructure, as there is always a possibility of license amendment and adverse judgement by higher courts leading to retrospective costs.

Specifics for LF exemption

- 6.34 There are broadly two categories of service providers who are providing the fixed-line broadband services in the country (a) those having only ISP licenses/ authorizations, and (b) those having both Access Service and ISP licenses/ authorizations. Generally, while the first category service providers are providing broadband services alone, the second category of service providers are providing the bundled voice and broadband services. In case of bundled products, it may not be feasible to calculate the revenues earned from voice and broadband services separately. Further, nowadays, many service providers are also bundling content and other value-added services like IPTV, video streaming, video conferencing, music, security services, etc. along with broadband services. In such cases, the question arises that whether the exemption of the license fee should be limited to the revenue earned from the broadband services alone, or the license fee should be exempted on all kind of revenues earned by the licensees from fixed-line networks for supporting the growth of fixed-line networks.
- 6.35 Another kind of convergence is happening between the wireless and fixed-line services at network as well as product level. Many service providers have started offering bundled products consisting of wireless and fixed-line services. In such cases it is pertinent to decide that how the license fee exemption may be operationalized.
- 6.36 To ascertain the views of the stakeholders regarding the revenue component on which license fee exemption may be provided and the time period of exemption, the following questions were raised in the Consultation Paper
- i. If indirect incentives in the form of exemption of license fee on revenues earned from fixed-line broadband services are to be considered, then should the license fee exemption be limited to*

- broadband revenue alone or should it be on complete revenue earned from services delivered through fixed-line networks?*
- ii. In case of converged wireless and fixed-line products or converged services delivered using the fixed-line networks, how to unambiguously arrive at the revenue on which license fee exemption could be claimed by the licensees?*
 - iii. What should be the time period for license fee exemption? Whether this exemption may be gradually reduced or tapered off with each passing year?"*

Comments from the Stakeholders

- 6.37 In response, some of the stakeholders have submitted that the license fee exemption should be considered for both broadband revenue and fixed-line voice revenue as maintaining fixed-line services only for activities other than broadband is not fruitful for TSPs now a days. Besides the backhaul support and optical fibre as well as copper network used for both services is common and any basis for apportionment of cost would be far from accurate. Further, the promotion of the broad band penetration through fixed-line networks, which is not spectrum based, would go a long way in creating lesser pressure on scarce spectrum resources. Therefore, the license fee should be exempted for complete revenue earned from all the services delivered through fixed-line networks.
- 6.38 Some of the stakeholders have argued that the share of fixed-line network in the total telecom network is miniscule. There are very few fixed-line connections without broadband (i.e., pure voice service only). Hence, if license fee waiver on complete revenue from fixed line services is considered then it will have a miniscule impact on Government revenues, but it will save many compliance issues.

- 6.39 Some of the stakeholders have suggested that the license fee exemption be limited only to the revenues accruing out of broadband revenues or any other form of Internet access service provided using fixed line network. They have suggested that the any wireless broadband service which is not capable of mobility should be treated as equivalent to fixed-line broadband service and should be exempted from the imposition of license fee.
- 6.40 Some stakeholders have stated that exemptions in the form of license fee waivers for operators may prove difficult to administer without robust audit mechanisms and accounting separation. This would hold particularly true for operators offering converged mobile and fixed broadband services using common core networks. A license fee exemption, if granted, should apply to complete revenue earned from the access as well as from the services and apps which ride on fixed broadband.
- 6.41 One of the stakeholders has suggested that convergence of service should be encouraged. Segregation of revenue between fixed line and wireless for the purpose of Spectrum Usage Charges (SUC) is already being done and is well accepted by DoT/Auditors and CAG. Some stakeholders have commented that reporting of income through accounting separation from different services is already in place. Some of the stakeholders have suggested that in case of converged access service providers a fixed notional amount per fixed line broadband connection may be allowed for license fee exemption.
- 6.42 Some of the stakeholders are of the view that the services being offered using end to end fixed line network till last mile can be treated as fixed-line products while the converged services using licensed spectrum can be categorized as wireless service. In cases of bundled products involving a combination of converged services offered under different

licenses, the revenue for license fee exemption may be ascertained by the proportion of gross revenue/ call volume reported through individual services. Further, all TSPs claiming such exemption may be required to subject their accounts for the statutory audits, at least to the extent of such claims.

6.43 With regards to the duration of license fee exemptions, some of the stakeholders suggested durations varying from five to ten years followed by review based on the penetration of fixed line broadband. One of the stakeholders has suggested exemption initially for five years followed by a gradual tapering off subsequently. One of the stakeholders suggested 10 years in urban areas and 15-20 years in rural areas with the scope for subsequent review.

6.44 Some of the stakeholders commented that the license fee exemption should be on continual and permanent basis. A few stakeholders have suggested that the exemptions may be continued till the penetration reaches a certain percentage of household say 25% or 40%. One of the stakeholders suggested that this exemption should be continued till fixed line broadband becomes 50% of the total broadband connections.

Misuse by the licensees through misappropriation of revenues

6.45 The stakeholders were asked to comment on the likelihood of misuse by the licensee through misappropriation of revenues in case of license fee exemption. The following questions were raised in the Supplementary CP:

- i. *“Is there a likelihood of misuse by the licensees through misappropriation of revenues due to the proposed exemption of the License Fee on the revenues earned from fixed-line broadband services? If yes, then how to prevent such misuse? From the revenue assurance perspective, what could be the other areas of concern?”*
- ii. *How the system to ascertain revenue from fixed-line broadband*

services needs to be designed to ensure proper verification of operator's revenue from this stream and secure an effective check on the assessment, collection, and proper allocation and accounting of revenue. Further, what measures are required to be put in place to ensure that revenue earned from the other services is not mixed up with revenues earned from fixed-line broadband services in order to claim higher amount of incentive/exemption."

Comments from the Stakeholders

- 6.46 Most of the stakeholders are of the view that the system has sufficient checks and balances to deter any possibility of misappropriation of revenues. The fears of misappropriation are completely unfounded and differential levies are already in place and effectively implemented. They ruled out the possibility of any misappropriation and misuse of the license fee exemption under the current regulatory oversight with respect to telecom accounting. One of the stakeholders has stated that the Authority should not let the unproven possibility of minor revenue loss due to pilferages and innovative accounting, divert it from the primary objective i.e. to deliver broadband and take the national economy higher by overall and inclusive growth. On the other hand, few stakeholders have stated that allegations of misappropriation of revenues may lead to complicated situation in future unless the incentive is given to both wireless and wireline.
- 6.47 Some of the stakeholders have stated that for standalone ISPs there would not be an issue of misuse. However, the exemption of the license fee should not be given in case consumer subscribes to both types of broadband i.e., wireless and fixed-line broadband services from an integrated service provider as a bundled product. In such a case license fee should be imposed on the entire revenue earned from bundled services.

- 6.48 Some of the stakeholders suggested that in case of any misuse by the licensee through misappropriation of revenues due to the proposed exemption of the license fee on the revenue earned from fixed-line broadband services is established, appropriate penalty may be imposed on such defaulter licensee. Some of the stakeholders were of the view that to prevent misreporting of revenues, incentives awarded to operators by way of exemption of fees must be backed by robust audit systems and accounting separation standards.
- 6.49 A few stakeholders suggested that exemption from license fee should be limited to service providers who offer only exempted services like fixed-line broadband services. The big service providers who have other revenue sources like mobile services do not need to be incentivized. The small ISPs should be given incentives to enable them to compete with integrated access providers offering fixed-line broadband services. This will help pure fixed line broadband service provider survive leading to more competition and hence lower prices for ultimate consumers.
- 6.50 One of the stakeholders suggested that the segment reporting of income for various services can be the tool for considering license fee waiver. For the operators offering multiple services the billing is supposed to be separate for wireless and wireline operations. Further, all TSPs claiming such exemption may be required to subject their accounts for the statutory audits, at least to the extent of such claims.

Direct incentives to service providers

- 6.51 The stakeholders were asked to comment on the feasibility of any direct incentive to the service providers based on an indisputable metric. The following question was raised in the Supplementary CP:

“Is there any indisputable metric possible to provide direct incentive for proliferation of fixed-line broadband networks? What would be that indisputable metric? How to ensure that such direct incentives

will not be misused by the licensees?”

6.52 In response, some of the stakeholders who are in favour of direct incentives suggested that to ensure effective utilization of incentives, the pay out of incentives may be linked to performance targets. They suggested that for direct incentives the indisputable metric can be the subscribers on a fixed network, data carried on the fixed network and the kilometres of fiber laid by a licensee during a given period. Performance Linked Incentive scheme can be designed for fixed networks. Some of the stakeholders suggested that the incentives may be graded in accordance with the development of a region. Larger incentives may be provided to support services providers in establishing fixed line broadband infrastructure in rural and semi-urban areas than in urban areas. One of the stakeholders suggested that the deployment of a physical connection for fixed broadband access is necessary though not sufficient metric based on which direct incentives may be provided. In addition to confirming the deployment of a physical connection, frequent audits to ensure broadband speeds meet minimum specified thresholds may also be used as an additional metric to ensure compliance with the incentive.

6.53 Some of the stakeholders have suggested direct benefit in the form of incentives from USO fund can be given for rollout of Broadband network service. TSP may submit a self-certificate after the rollout of broadband network which may be used for determination of direct incentive.

Analysis of the issue and views of the Authority

6.54 Fixed-line networks can provide higher speeds and reliability in comparison to mobile services. High speed broadband leads to higher socio-economic benefits. Enhanced rollout of fibre rollout in the access network will also improve the availability of fibre as backhaul for mobile networks. It will indirectly help in deployment of dense radio networks

for 5G rollout. Proliferation of fixed-line broadband will also help in easing congestion in mobile networks if a substantial amount of Internet traffic is diverted to fixed line broadband networks. In that way fixed line broadband has positive externality. It also eases the pressure on the availability of spectrum which is a scarce resource.

6.55 The following Table 6.4 shows the growth rate of fixed line broadband connections for the last five years in the 22 Licensed Service Areas (LSAs) of the country. There is a spurt in the rate of growth during 2020-21 which is overall 18.64%. However, the CAGR (Compounded Annual Growth Rate) for these five years is 6.02%. There is a negative growth during 2017-18. During this period 4G mobile networks were rolled out across the country and this negative growth is probably due to perceived substitution effect of mobile broadband.

Table 6.4: Growth of Fixed line Broadband subscribers

Sr. No	LSA Service Area	March, 16	March, 17		March, 18		March, 19		March, 20		March, 21	
		Absolute no.	Absolute no.	Growth %	Absolute no.	Growth %	Absolute no.	Growth %	Absolute no.	Growth %	Absolute no.	Growth %
1	Delhi	1376900	1686346	22.47 %	1745211	3.49 %	1834768	5.13 %	2104967	14.73 %	2517929	19.62 %
2	Kolkata	524720	615837	17.36 %	589579	4.26 %	600144	1.79 %	649031	8.15 %	809602	24.74 %
3	Mumbai	1342545	1297150	3.38 %	1199735	7.51 %	1238570	3.24 %	1428718	15.35 %	1695067	18.64 %
4	Andhra Pradesh	1921361	2113530	10.00 %	2146172	1.54 %	2276545	6.07 %	2397669	5.32 %	2712263	13.12 %
5	Gujarat	1149678	1294672	12.61 %	1278005	1.29 %	1386998	8.53 %	1443708	4.09 %	1681924	16.50 %
6	Karnataka	1636915	1760709	7.56 %	1769501	0.50 %	1821046	2.91 %	1940602	6.57 %	2161763	11.40 %
7	Maharashtra	1393958	1482715	6.37 %	1457837	1.68 %	1540368	5.66 %	1577474	2.41 %	1992118	26.29 %
8	Tamil Nadu	1958046	2095234	7.01 %	2031837	3.03 %	2080297	2.39 %	2139018	2.82 %	2428188	13.52 %
9	Haryana	358732	368212	2.64 %	350053	4.93 %	353880	1.09 %	348534	1.51 %	356285	2.22 %
10	Kerala	1274112	1339370	5.12 %	1341802	0.18 %	1368858	2.02 %	1245919	8.98 %	1477440	18.58 %
11	Madhya Pradesh	704863	758040	7.54 %	718091	5.27 %	746509	3.96 %	646990	13.33 %	757042	17.01 %
12	Punjab	891316	926776	3.98 %	814358	12.13 %	820694	0.78 %	809973	1.31 %	1008852	24.55 %

Sr. No	LSA Service Area	March, 16	March, 17		March, 18		March, 19		March, 20		March, 21	
		Absolute no.	Absolute no.	Growth %	Absolute no.	Growth %	Absolute no.	Growth %	Absolute no.	Growth %	Absolute no.	Growth %
13	Rajasthan	527876	545296	3.30 %	498223	8.63 %	508338	2.03 %	527632	3.80 %	602407	14.17 %
14	UP (East)	402405	420923	4.60 %	419719	0.29 %	446737	6.44 %	453095	1.42 %	579459	27.89 %
15	UP (West)	394910	402681	1.97 %	399058	0.90 %	381754	4.34 %	400715	4.97 %	533252	33.08 %
16	West Bengal	270960	262020	3.30 %	244256	6.78 %	245194	0.38 %	261604	6.69 %	414311	58.37 %
17	Assam	96831	99474	2.73 %	89623	9.90 %	83309	7.05 %	91019	9.25 %	97916	7.58 %
18	Bihar	230835	229749	0.47 %	220664	3.95 %	219840	0.37 %	225773	2.70 %	292876	29.72 %
19	Himachal Pradesh	97090	99005	1.97 %	95550	3.49 %	93921	1.70 %	86807	7.57 %	65659	24.36 %
20	Jammu & Kashmir	87238	93763	7.48 %	84749	9.61 %	83085	1.96 %	100690	21.19 %	196375	95.03 %
21	North East	71748	74016	3.16 %	70956	4.13 %	71672	1.01 %	77164	7.66 %	91794	18.96 %
22	Orissa	271670	276313	1.71 %	253861	8.13 %	219692	13.46 %	218728	0.44 %	276917	26.60 %
	Total	16984709	18241831	7.40 %	17818840	2.32 %	18422219	3.39 %	19175830	4.09 %	22749439	18.64 %

6.56 Further, Table 6.5 shows the growth figures during the financial year 2020-21 of top 10 ISPs who are providing fixed line broadband services in the country. It can be seen from this data that many of these service providers are having either limited or nil presence in rural areas. Further, the growth in terms of fixed-line broadband subscribers of individual service providers varies considerably.

Table 6.5: Growth of top 10 ISPs in 2020-21

S.No.	Name of the Wired ISP (All India)	March 20			March 21			Growth
		Rural	Urban	Absolute no.	Rural	Urban	Absolute no.	
1	Bharat Sanchar Nigam Ltd.	755254	7320435	8075689	559911	6260263	6820174	-15.55%
2	Bharti Airtel Ltd.	0	2465179	2465179	0	3088972	3088972	25.30%
3	Atria Convergence Technologies Pvt. Ltd.	0	1607015	1607015	0	1848966	1848966	15.06%
4	Mahanagar Telephone Nigam Ltd.	0	678273	678273	0	561665	561665	-17.19%
5	You Broadband India Pvt. Ltd.	0	774179	774179	0	808217	808217	4.40%
6	Hathway Cable & Datacom Pvt. Ltd.	0	969112	969112	0	1074311	1074311	10.86%
7	GTPL Broadband Pvt. Ltd.	120461	234938	355399	190935	371059	561994	58.13%
8	Excitel Broadband Private Limited	0	350783	350783	0	537659	537659	53.27%
9	Reliance Jio Infocomm Ltd	3364	869949	873313	13845	2584827	2598672	197.56%
10	ONEOTT iNTERENTAINMENT LTD	0	247193	247193	0	616221	616221	149.29%

6.57 Based on the analysis of the comments, counter-comments, open house discussions with stakeholders and available data, the Authority is of the view that the low penetration of the fixed line broadband in the country is more of a supply side problem. In rural and remote areas, it could be both i.e., supply side and demand side constraints which are limiting the proliferation of fixed-line broadband in these areas. The impressive growth of mobile broadband is a case in point. Wide gap between wireless and fixed-line broadband subscriptions, approximately 755 million vs 23 million respectively, indicates that the demand for broadband services may not be the limiting factor. Fixed-line broadband providers provide services by laying cable networks up to an individual subscriber premises. However, mobile broadband can be provided by

using BTS towers at some specific locations to cover larger geographical areas. It is an indisputable fact that in comparison to mobile broadband fixed-line broadband is costlier to deliver and maintain. Both the CapEx and OpEx are higher for fixed line broadband in comparison to mobile broadband. Rollout of fixed-line broadband networks is more cumbersome and time consuming in comparison to the wireless networks.

6.58 The Authority is of the view that the best way to promote fixed-line broadband is by nudging the service providers to invest more in the fixed-line networks and achieve pre-defined targets while providing some relief in the form of exemption of license fee on specified revenues to eligible service providers. The target should be set in such a way that while it is aspirational, it is achievable also and simultaneously it should be measurable and verifiable. It is pertinent to note here that the Authority has always upheld the principle of uniform license fee as a higher order regulatory objective. However, exemption of license fee on a specific part of the revenue after achieving a specific target for a limited period is intended to accelerate the slow pace of growth of fixed line broadband. As the growth of fixed line broadband would be mostly using the FTTH technology, the OFC laid for this purpose would be used for fiberisation of the wireless networks also. Further the growth in fixed-line broadband should be widespread across service areas as well as in urban and rural areas. In view of the Authority, such targets could be set in the form of year-on-year growth in fixed-line broadband subscribers. It is in line with the objective, and it is measurable, verifiable, and auditable.

6.59 As mentioned earlier, due to litigations and the judgments/orders of the Hon'ble TDSAT in respect of license fee for ISPs, many ISP licensees have not paid the license fee on revenues earned from the delivery of pure

Internet services under the ISP licenses/authorizations for almost last eight years. Even after availing the exemption of license fee the rollout of fixed-line broadband networks is not very impressive. On this issue, the Authority agrees with the view of the stakeholders that due to the policy uncertainty about the LF on pure Internet service revenue in the past, not much investment in fixed-line networks might have happened because of the fear of retrospective payments on account of court orders at a later date. Any policy uncertainty affects investment in a negative way. Further there were no targets specified earlier.

- 6.60 Under the prevailing licensing framework, Internet Service and Access Service licensees are authorized to provide fixed-line broadband services to individual customers. The Authority is of the view that to accelerate the growth of fixed-line broadband services in the country, these categories of licensees should be eligible for incentives. In this context, “Access Service Providers” means licensees holding UASL (Unified Access Service License)/UL (Unified License) with Access Service authorization/UL (VNO) with Access Service authorization/UL (VNO) with Access Service Category B authorisation, and “Internet Services Providers” means licensees holding ISP license/UL with Internet Service authorization/UL(VNO) with Internet Service authorisation.
- 6.61 Keeping in view the 6.02 % CAGR of fixed-line broadband subscribers during the last five years and 18.64% growth rate during the last financial year, the Authority is of the view that a reasonable target of net increase of minimum 15% in fixed line broadband subscribers on year-on-year basis in the respective License Service Area should be the eligibility criterion for incentives. Last financial year growth was unprecedented mainly because of increase in demand due to COVID-19. This may not sustain on its own in the future. Therefore, keeping in view

the long-term CAGR at 6.02 %, while the recommended target is aspirational, it appears to be achievable also.

6.62 The Authority is also concerned about the poor penetration of fixed line broadband in the rural areas. Balanced economic development should also be a priority in any incentive scheme. So, the Authority is of the view that the eligibility for incentives should also be linked with the growth of fixed-line broadband subscribers in rural areas. Presently, only about 5.58% of total fixed-line broadband subscribers are working in rural areas. This proportion need to be increased as approximately 40% of total wireless broadband subscribers are working in rural areas. Keeping in view the demand and affordability factors in rural areas, the Authority is of the view that at least 20% of the targeted increase in number of working fixed-line broadband subscribers in a quarter in the respective License Service Area (LSA) should be achieved through net increase in the rural fixed-line broadband subscribers in that LSA. However, the condition regarding net increase in the rural fixed-line broadband subscribers above should not be made applicable in Delhi, Mumbai, and Kolkata service areas because these service areas have insignificant rural population. This condition will nudge the service providers to invest in fixed-line networks in rural areas also. This would also enable setting-up of PDOs in rural areas under the PM-WANI framework. PDOs will multiply the number of users who could be availing the benefits of fixed-line broadband.

6.63 Here LSA implies Telecom Circle/Metro for access service providers. In case of UL(VNO) Access Service authorization Category 'B' it implies the geographical area of district of a State/Union Territory. The licence/authorization for Internet Service are granted for three different categories namely Category 'A', Category 'B' and Category 'C'. The Service Area for Category 'A' authorization is the National area. In case

of Category 'B' it is the Telecom Circle/Metro area as defined in the license. It is the SSA (Secondary Switching Area) for ISP Category 'C'.

- 6.64 For ISP Cat A license, the Service Area is spread across the National Area. For all other types of licensees, the Service Area is spread across the Telecom Circle/Metro area/SSA (Secondary Switching Area) only. Having a single target for ISP Cat A licensee at national level may lead to concentrated growth in few pockets. Therefore, to avoid such situation, the Authority is of the view that to ensure a balanced growth in the entire country, to avail the proposed incentives a net increase of minimum 10% in fixed line broadband subscribers on year-on-year basis in each Telecom Circle/Metro area should also be ensured by ISP Cat 'A' licensee. This criterion should be an additional criterion for ISP Category 'A' licensees. Further, in case of ISP Cat 'A' licensee, minimum 20% of the targeted increase in number of working fixed-line broadband subscribers in a quarter in each Telecom Circle/Metro area should also be achieved through net increase in the rural fixed-line broadband subscribers in that Telecom Circle/Metro area. This would ensure the balanced growth across India as well as a reasonable level of growth in the rural areas.
- 6.65 To increase the supply of fixed-line broadband services in rural areas, under the BharatNet project, the Government is now extending the fibre based broadband infrastructure in all villages (approx. 6.4 lacs) of the country. Under the BharatNet project, the fibre based broadband infrastructure has already been extended to more than 1.5 Lakh Gram Panchayats (villages) till now. However, despite extending fiber up to the villages, provisioning of fixed-line broadband connections to individual households of such villages would require last mile linkage network.
- 6.66 As per the extant licensing framework, the Internet Service Licensee may provide internet service by using the Cable Network of authorized Cable

Operator, as last mile linkage. The registration as Cable Operator to establish Cable Network could easily be obtained by any person from the designated Post Office. Under the Cable Television Networks (Regulation) Act 1995, the registration granted to Cable Operators is on non-exclusive basis. Further, Bharat Broadband Network Limited (BBNL), a Special Purpose Vehicle (SPV) set up to create fibre based broadband infrastructure up to villages, already has the license to provide Internet Services. In considered view of the Authority, to increase supply of fixed-line broadband services in rural and remote areas, Cable Operators, who are keen to deliver broadband services, should be encouraged to establish last-mile linkage network. For this purpose, the Government should impart necessary skills to such Cable Operators and provide soft loans to them on easier terms for establishing last-mile connectivity network in rural and remote areas. As per the extant licensing framework these Cable Operators could work as franchisee of any ISP, including BBNL to provide broadband services.

- 6.67 As per the extant definition of MSME, most of the Cable Operators would fall in the Micro and Small enterprises categories. As per the latest definition, w.e.f. 1st July 2020, enterprises rendering services having not more than Rs.1 crore investment in Plant and Machinery or Equipment, and annual turnover not more than Rs. 5 crores are categorized as Micro Enterprises. Similarly, enterprises rendering services having not more than Rs.10 crore investments in Plant and Machinery or Equipment, and annual turnover of not more than Rs. 50 crores are categorized as Small Enterprises. To incentivize the initial investment in the last-mile linkage network and support broadband business operations initially, in considered view of the Authority, the Government should notify an interest subvention scheme for Cable Operators registered as Micro and Small size enterprises.

- 6.68 Similarly, as per the extant framework, IP-I registered with DoT can provide dark fiber in the access network on sharable basis to the service licensees. Further, the Authority has already recommended to the Government to expand the scope of IP-I registration which would enable IPs-I to establish wireline access network and share the same with service licensees to provide the service to end customers. Therefore, IP-I who are in the category of Micro and Small size enterprises may also be permitted to avail benefits of such interest subvention scheme. It will help in developing the competition in the service delivery to end consumers.
- 6.69 License Fee is payable to the licensor on a quarterly basis. The Authority is of the opinion that in-line with the License Fee (LF) payment obligations of the licensees, the eligibility of individual licensees for incentives should also be assessed on quarterly basis.
- 6.70 In IP (Internet Protocol) world, Broadband, Voice, Video and Value-added services move together on fixed line connections. And, in the considered view of the Authority, in the prevailing market conditions, segregation of revenue earned from fixed-line connections into Broadband, Voice, Video and Value-added services categories indisputably is not feasible. Further, the growth of fixed-line broadband services in the country is directly linked to increase in the availability of fixed-line connections. Therefore, the proposed incentives should be linked to the revenue earned from fixed-line connections provided to the subscribers. It would pose fewer interpretation challenges. This will also provide a boost to the overall growth of fixed line networks and fiberisation of wireless networks.
- 6.71 As per the existing licensing framework, service providers are required to declare the revenue in the specified format for each service authorisation. Accordingly, the same information could be used to arrive

at the revenues which would be exempted from the requirement of LF payment. As per the Access Service license/ authorisation, the licensees are required to divide 'Revenue from services' into four sub-segments i.e. Wire-line, WLL (Fixed), WLL (handheld), and Mobile services based on the medium and technology of the connectivity. The Authority understands that the Department of Telecommunication has already in place the robust mechanism to ensure that only the revenue accrued from wire-line (in these recommendations referred to as fixed-line) services is booked under "Particular 1 (A)" of the Format of "Statement of Revenue and License Fee" specified for Access Service Providers.

6.72 As per the Format of Statement of Revenue and License Fee for Access Service Providers, 'Revenue from wireline subscribers' is sub-categorized under "Particular 1A" (except for the UL/VNO Access Service authorisation Category 'B' which includes 'Revenue from wireline services' under "Particular 1"). Access service providers are authorized to provide voice, video, data, broadband, and IPTV. There could be some service providers who provide fixed-line broadband services under the Access Service license/ authorisation. So, the Authority is of the view that for an eligible Access Service Licensee in any LSA, who is providing fixed-line broadband services under the Access Service license/ authorisation, the license fee on the revenue booked under Particular 1 (A) of the Format of Statement of Revenue and License Fee should be exempted on meeting the eligibility criterion. To ascertain that the eligible licensee is providing the fixed-line broadband services under the Access Service license and to avoid misuse of the proposed incentives, simple checks like comparing the revenue per fixed-line broadband subscriber of this licensee with the industry average in the respective LSA would be useful. This is just an example and based on the vast experience of DoT of LF assessment, any additional checks as deemed fit could be introduced while settling the claims of licensees.

- 6.73 Under ISP license/ authorization, presently, only fixed line broadband services are delivered as no ISP has the right to use for mobile access spectrum. Therefore, unlike Access Service authorisation, where the 'Revenue from services' has been divided into four sub-segments i.e. Wire-line, WLL (Fixed), WLL (handheld), and Mobile services based on the medium and technology of the connectivity, there is no division of the 'Revenue from services' into different sub-segments based on the medium and technology in the Format of "Statement of Revenue and License Fee" specified for Internet Service Providers. As per the license conditions, the ISPs can provide IPTV and Internet Telephony services. Further, some ISPs are also providing bundled OTT subscriptions. However, they are not allowed to provide PSTN voice communication.
- 6.74 As per the Format of Statement of Revenue and License Fee for Internet Service Providers, 'Revenue from services' is categorized under "Particular 1". The Authority is of the view that for Internet service licensees, under the present factual matrix, the license fee on the revenue booked under 'Particular 1' of the Format of Statement of Revenue and License Fee should be exempted on meeting the eligibility criterion. However, later, if any Internet Service licensee starts providing broadband services using Fixed Wireless Access (FWA) or any other wireless technology, than in the changed conditions, the revenue eligible for exemption of license fee should also be reviewed keeping in view the circumstances prevailing at that point of time.
- 6.75 To ensure that the savings due to the proposed incentives become available to the licenses without any procedural delay and the same get invested in growth of fixed-line networks immediately, the Authority is of the view that the incentive scheme should be easy to administer and claim. The eligibility for incentives should be self-assessed by the concerned licensee as per the eligibility criterion. This could be achieved

to a large extent if an online module in the LF collection and management portal is developed for this purpose. Not only it will simplify the processes but also help in meeting the timelines on both sides. For this purpose, the licensee should submit the fixed-line broadband subscribers' details, in the 'Format of Statement of Fixed-line Broadband Subscribers' recommended at **Annexure-E**, by 15th of the next quarter. Since as per license conditions, licensees are required to pay the License Fee by 25th March for the last quarter of the Financial Year (FY) based on expected revenue, for the last quarter of the FY only, the licensee should be permitted to self-assess its eligibility on the basis of estimated growth in fixed-line broadband subscribers by the end of that quarter. In support of its self-assessment for the last quarter, the licensee should submit by 15th April the actual number of subscribers working as on 31st March in the 'Format of Statement of Fixed-line Broadband Subscribers' given at **Annexure-E**.

- 6.76 It is a fact that in the beginning of the last decade, to address the concerns of arbitrage among different service licenses, a decision was taken by the Government to have uniform LF rate across the service licenses. Therefore, in case a decision is taken for license fee exemption on specified revenue for a specified service to incentivize the growth of that service, the apprehension of misuse by the licensees through misappropriation of revenues cannot be ruled out completely. However, it is also a fact that despite having uniform LF rate across the service licenses, due to the various TDSAT orders/ judgements cited earlier, during the last decade, Internet Service Providers were not paying LF on pure Internet service revenue. It is understood that to tackle the non-uniform LF rate and AGR definition situation, which arose due to the various TDSAT orders/ judgements, for LF assessment of such licensees and stop misuse by the licensees through misappropriation of revenues, by now, a process must have been established by the Licensor. For this

period, payment by the licensees of the LF accrued on pure Internet service revenue depends upon the outcome of ongoing litigation. Further, as per the existing licensing framework, access service providers also apportion the total revenue from access services into various sub-categories – discussed earlier in detail – to arrive at Spectrum Usage Charges (SUC) payable by them. It indicates that despite having uniform LF rate across the service licenses a process must be already in place to ensure that the licensees correctly apportion the revenue across services and within the access service the licensees correctly apportion the revenue in different sub-categories. Misuse, if any, by the licensees through misappropriation of any revenues would be getting suitably investigated and penalized as per the existing system in place with the licensor. As review of the established rules and the processes for revenue apportioning among licenses and services are beyond the scope of these recommendations these were not consulted with stakeholders.

- 6.77 In case of bundled products, after implementation of IP based networks and services, it may not be practically feasible to calculate the revenues earned from voice and broadband services separately. Further, nowadays, many service providers are also bundling content and other value-added services like IPTV, video streaming, video conferencing, music, security services, etc. Some of these services are not licensed presently. It may not be possible to effectively segregate the revenue earned from different value-added services bundled with fixed line broadband plans delivered using wireline networks. In an era of convergence of services, bundled products should not be discouraged because they add value to the customer offerings and stimulate demand.
- 6.78 As the objective of the proposed incentives is to facilitate growth of fixed-line broadband services and the proposed incentives are linked to

revenue accrued from fixed-line connections only, licensees should not be allowed to misallocate revenue accrued from other licensed services like mobile and DTH connections into fixed-line (wireline) category. Specifically in case of the bundled offerings/ packages (i.e. consumer offerings/packages bundling fixed line broadband service, mobile phone service, DTH service, etc.), the exemption of license fee on revenue accruing from fixed line broadband services should be subject to the condition that the licensee shall declare upfront the policy of apportionment of revenue between each of such bundled services in the package prior to the claim for exemption, and further subject to filing a certificate from cost accountant that the policy of apportionment is broadly proportionate and in line with the costs associated with the provision of the different services that are bundled as a package.

- 6.79 The claim of exemption of revenue accruing from fixed line broadband services for the purpose of license fee, in the case of bundled service offerings/packages, shall be subject to due post verification by the Department of Telecommunications (DoT), including through a process of audit, specifically with respect to whether the policy of apportionment of revenue between each of such bundled services is broadly proportionate and in line with the costs associated with the provision of the different services that are bundled as a package, as certified by the cost accountant. Further, to ascertain that the licensee has reasonably apportioned revenue between each of such bundled services in the package and to avoid misappropriation of the revenues, simple checks like comparing such apportioned amount by a licensee for each service with the nearest standalone offer for such service by the licensees could be useful. This is just an example and based on the vast experience of DoT of LF assessment, any additional checks as deemed fit could be introduced while settling the claims of the licensees. Upon audit and verification in case the revenue shown against fixed line broadband

service in a bundled package is excessive/ disproportionate to the cost associated with providing the service, the claim of exemption of license fee shall be liable to be rejected.

- 6.80 It is a considered view of the Authority that a robust verification mechanism should be put in place to check the veracity of the working fixed-line broadband subscriber base declared by the eligible licensees. To ensure that each licensee would do the right self-assessment of its eligibility, it would be pertinent to clarify that here working fixed-line broadband subscribers would mean the subscribers who are active and regularly paying their post-paid bills or recharging their pre-paid accounts, as per the applicable tariff plan. For this purpose, test users should not be counted as working fixed-line broadband subscribers.
- 6.81 The eligible licensees, based on their self-assessment, should be permitted to claim license fee exemption on the specified revenues. The license fee exemption claim shall be subject to the verification by the Licensor as per terms and conditions of the license. The Authority is of the view that such verification and settlement of incentive claims should be completed within 6 months i.e. query(ies) if any in respect of a claim for license fee exemption should be raised by the Department within 3 months from the date of receiving the claim, one month time may be given to the respondent licensee for reply, and settlement should be completed in next two months. It is pertinent to clarify here that this settlement shall be subject to final assessment and audit of AGR. In cases where a licensee, based on the actual net increase in working subscriber numbers at the end of last quarter of FY fails to meet the eligibility criterion, then it should pay the LF amount duly payable for the last quarter of the FY by 15th April. For any delay, penal interest is to be levied as per the terms and conditions of the license.

6.82 The Authority is of the view that any incentive scheme should have a certainty about the time duration for which it should be applicable. The investors will be interested in investing only if there is a certainty regarding the validity of the incentive scheme. Initially, the proposed incentive, i.e., license fee exemption, to the eligible licensees should be allowed for a minimum period of five years. The need for incentives beyond initial five years may be reviewed in the fifth year keeping in view the policy priorities and technological developments at that point of time.

6.83 In view of the foregoing, **the Authority recommends that:**

- (i) Under the prevailing licensing framework, Internet Service and Access Service licensees are authorized to provide fixed-line broadband services to individual customers. Therefore, to accelerate the growth of fixed-line broadband services in the country, these categories of licensees should be eligible for incentives.**
- (ii) For any licensee to avail the proposed incentives, a net increase of minimum 15% in working fixed-line broadband subscribers on year-on-year basis in the respective License Service Area (LSA) should be the eligibility criterion.**

Provided that minimum 20% of the targeted increase in number of working fixed-line broadband subscribers in the current quarter in the respective License Service Area (LSA) should be achieved through net increase in the rural fixed-line broadband subscribers in that LSA.

Provided further that the condition regarding net increase in the rural fixed-line broadband subscribers mentioned above should not be made applicable in Delhi, Mumbai, and Kolkata service areas.

Provided also that in-line with the License Fee (LF) payment

obligations of licensees, the eligibility of individual licensees for incentives should also be assessed on quarterly basis.

- (iii) Further, in order to ensure that growth of fixed-line broadband services is spread across the country, Internet Service category 'A' licensee, whose Service Area is spread across the National Area, to avail the proposed incentives, in addition to the eligibility criterion prescribed in clause (ii) above, should also achieve a net increase of minimum 10% in fixed-line broadband subscribers on year-on-year basis in each Telecom Circle/Metro area (as defined in Annexure-V of the Unified License).**

Provided that minimum 20% of the targeted increase in number of working fixed-line broadband subscribers in the current quarter in the respective Telecom Circle/Metro area should be achieved through net increase in the rural fixed-line broadband subscribers in that Telecom Circle/Metro area.

Provided further that the condition regarding net increase in the rural fixed-line broadband subscribers mentioned above should not be made applicable in Delhi, Mumbai, and Kolkata service areas.

- (iv) The incentive for eligible licensees should be given in the form of License Fee (LF) exemption on the total revenue as specified in clause (vi) and (viii) below.**
- (v) In IP (Internet Protocol) world, Broadband, Voice, Video and Value-added services move together on fixed line connections. And, in the considered view of the Authority, in the prevailing market conditions, segregation of revenue earned from fixed-line connections into Broadband, Voice, Video and Value-added services categories indisputably is not feasible. Further, the growth of fixed-line broadband services in the country is directly linked to increase in availability of fixed-line connections.**

Therefore, the proposed incentives should be linked to the revenue earned from fixed-line connections provided to subscribers. It would pose fewer interpretation challenges.

- (vi) For an eligible Access Service licensee in any LSA, who is providing the fixed-line broadband services under the Access Service license/ authorisation, license fee exemption should be given on the ‘Revenue from Wireline Subscribers’ booked under “Particular 1 (A)” of the Format of “Statement of Revenue and License Fee” specified for Access Service Providers.**

(Note: It is pertinent to note here that as per the Access Service license/ authorisation, the licensees are required to divide ‘Revenue from services’ into four sub-segments i.e. Wire-line, WLL (Fixed), WLL (handheld), and Mobile services based on the medium and technology of the connectivity. While making these Recommendations, the Authority understand that the Department of Telecommunication has already in place the robust mechanism to ensure that only the revenue accrued from wire-line (in these recommendations referred to as fixed-line) services is booked under “Particular 1 (A)” of the Format of “Statement of Revenue and License Fee” specified for Access Service Providers. To ascertain that the eligible licensee is providing the fixed-line broadband services under the Access Service license and to avoid misuse of the proposed incentives, simple checks like by comparing the revenue per fixed-line broadband subscriber of this licensee with the industry average in the respective LSA would be useful. This is just an example and based on the vast experience of DoT of LF assessment, any additional checks as deemed fit could be introduced while settling the claims of the licensees.)

- (vii) Specifically in case of the bundled offerings/ packages (i.e. consumer offerings/packages bundling fixed line broadband service, mobile phone service, DTH service, etc.), the exemption of license fee on revenue accruing from fixed line broadband services**

should be subject to the condition that the licensee shall declare upfront the policy of apportionment of revenue between each of such bundled services in the package prior to the claim for exemption, and further subject to filing a certificate from cost accountant that the policy of apportionment is broadly proportionate and in line with the costs associated with the provision of the different services that are bundled as a package.

(Note: The claim of exemption of revenue accruing from fixed line broadband services for the purpose of license fee, in the case of bundled service offerings/packages, shall be subject to due post verification by the Department of Telecom (DoT), including through a process of audit, specifically with respect to whether the policy of apportionment of revenue between each of such bundled services is broadly proportionate and in line with the costs associated with the provision of the different services that are bundled as a package, as certified by the cost accountant. Further, to ascertain that the licensee has reasonably apportioned revenue between each of such bundled services in the package and to avoid misappropriation of the revenues, simple checks like comparing such apportioned amount by a licensee for each service with the nearest standalone offer for such service by the licensees could be useful. This is just an example and based on the vast experience of DoT of LF assessment, any additional checks as deemed fit could be introduced while settling the claims of the licensees. Upon audit and verification in case the revenue shown against fixed line broadband service in a bundled package is excessive/ disproportionate to the cost associated with providing the service, the claim of exemption of license fee shall be liable to be rejected.)

(viii) For an eligible Internet Service licensee in any LSA, license fee exemption should be given on the ‘Revenue from Services’

booked under “Particular 1” of the Format of “Statement of Revenue and License Fee” specified for Internet Service Providers.

(Note: It is pertinent to clarify here that presently under the Internet Service license/ authorisation, licensees are providing the broadband services using fixed-line networks only. And unlike Access Service authorisation, where the ‘Revenue from services’ has been divided into four sub-segments i.e. Wire-line, WLL (Fixed), WLL (handheld), and Mobile services based on the medium and technology of the connectivity, there is no division of the ‘Revenue from services’ into different sub-segments based on the medium and technology in the Format of “Statement of Revenue and License Fee” specified for Internet Service Providers. Accordingly, the Authority is recommending LF exemption on total ‘Revenue from services’ booked under “Particular 1” of the Format of “Statement of Revenue and License Fee” specified for Internet Service Providers. However, later, if any Internet Service licensee starts providing broadband services using Fixed Wireless Access (FWA) or any other wireless technology, than in the changed conditions, the revenue eligible for exemption of license fee should also be reviewed keeping in view the circumstances prevailing at that point of time.)

- (ix) The eligibility for incentives should be self-assessed by the concerned licensee as per the criterion prescribed in clause (ii) and (iii) above. For this purpose, the licensee should submit the fixed-line broadband subscribers’ details, in the ‘Format of Statement of Fixed-line Broadband Subscribers’ given at Annexure-E, by 15th of the next quarter. Since as per license conditions, licensees are required to pay the License Fee by 25th March for the last quarter of the Financial Year (FY) based on expected revenue, for the last quarter of the FY only, the**

licensee should be permitted to self-assess its eligibility on the basis of estimated growth in fixed-line broadband subscribers by the end of that quarter. In support of its self-assessment for the last quarter, the licensee should submit by 15th April the actual number of subscribers working as on 31st March in the 'Format of Statement of Fixed-line Broadband Subscribers' given at Annexure-E.

(Explanation: Let us assume that the working subscriber count in the reference year as on 30th June is 'P', as on 30th Sept is 'Q', as on 31st Dec is 'R' and as on 31st March is 'S'. Let us further assume the subscriber count in the target year be 'P1', 'Q1', 'R1', 'S1' respectively at the end of each quarter on the similar dates. For assessing the eligibility, the percentage growth in a quarter on year-on year basis will be computed as $[(P1-P)/P] * 100$, $[(Q1-Q)/Q] * 100$, $[(R1-R)/R] * 100$ and $[(S1-S)/S] * 100$ respectively for the 1st, 2nd, 3rd, and 4th quarters of the target year.)

(x) A robust verification mechanism should be put in place to check the veracity of the working fixed-line broadband subscriber base declared by the eligible licensees. To ensure that each licensee would do the right self-assessment of its eligibility, it would be pertinent to clarify that here working fixed-line broadband subscribers would mean the subscribers who are active and regularly paying their post-paid bills or recharging their pre-paid accounts, as per the applicable tariff plan. For this purpose, test users should not be counted as working fixed-line broadband subscribers.

(xi) The eligible licensees, based on their self-assessment, should be permitted to claim license fee exemption on the revenues specified in clause (vi) and (viii) above. The license fee exemption claim shall be subject to the verification by the Licensor as per terms and conditions of the license. Such

verification and settlement of incentive claims, subject to final assessment and audit of AGR, should be completed within 6 months.

- (xii) In cases where a licensee, based on the actual net increase in working subscriber numbers at the end of last quarter of FY fails to meet the eligibility criterion, then it should pay the LF amount duly payable for the last quarter of the FY by 15th April. For any delay, penal interest be levied as per the terms and conditions of the license.**
- (xiii) To increase supply of fixed-line broadband services in rural and remote areas, Cable Operators, who are keen to deliver broadband services, should be encouraged to establish last-mile linkage network. For this purpose, the Government should impart necessary skills to such Cable Operators and provide soft loans to them on easier terms for establishing last-mile connectivity network in rural and remote areas. As per the extant licensing framework these Cable Operators could work as franchisee of any ISP including BBNL to provide broadband services.**
- (xiv) To incentivise the initial investment in the last-mile linkage network and support broadband business operations initially, in considered view of the Authority, the Government should notify an interest subvention scheme for Cable Operators registered as Micro and Small size enterprises.**
- (xv) Initially, the proposed incentive, i.e. license fee exemption, to the eligible licensees should be allowed for a minimum period of five years. The need for incentives beyond initial five years may be reviewed in the fifth year keeping in view the policy priorities and technological developments at that point of time.**

(Note: Here “Access Service Providers” means licensees holding UASL (Unified Access Service License)/UL (Unified License) with

Access Service authorization/UL (VNO) with Access Service authorization/UL (VNO) with Access Service Category B authorisation, and “Internet Services Providers” means licensees holding ISP license/UL with Internet Service authorization/UL(VNO) with Internet Service authorisation).

Maintenance of waiting list

- 6.84 For the growth of fixed line broadband connectivity; availability, affordability, and accessibility of services are of considerable importance. In addition to these factors, demand for broadband services could be another significant parameter. Many subscribers who have experienced wireless broadband services, may be interested in subscribing to fixed-line broadband connectivity also. However, the question arises is whether the demand for fixed-line broadband is getting logged effectively with the service providers?
- 6.85 In this respect, it is pertinent to refer to the clause 30 of chapter V in the Unified License, which is reproduced below:

*“30.1 The LICENSEE shall register demand/request for telephone connection and or any other Telecom Service without any discrimination from any applicant, at any place in the service area for the service(s) authorized and provide the Service, unless otherwise directed by the Licensor. The LICENSEE shall not in any manner discriminate between subscribers and provide service on the same commercial principle and **shall be required to maintain a transparent, open to inspection, waiting list.** The LICENSEE shall clearly define the scope of Service to the Subscriber(s) at the time of entering into contract with such Subscriber(s). Licensor shall have right to impose suitable penalty, not limited to a financial penalty, apart from any other actions for breach of this condition. The LICENSEE shall commence the Service*

on commercial basis only after starting subscriber registration in the manner prescribed. **Before commencement of Service in an area, the LICENSEE shall notify and publicize the address where any subscriber can register demand /request for Telecom Service.** Any change of this address shall be duly notified by the Licensee.

Provided that nothing contained herein will affect or prejudice the rights of the LICENSEE to carry out check on credit worthiness of applicants for its services.

30.2 **The LICENSEE shall widely publicize provision of service and shall not refuse registration of demand in the service areas in which the Licensee has commenced services.** In case the provision of telephone connection or the requested telecom service to an applicant is not feasible for technical or other reasons beyond the control of Licensee, then the LICENSEE shall endeavour to make arrangement for providing connections/ Service in such cases within a reasonable time.” **(emphasis supplied)**

6.86 As per the license conditions cited above, licensees are required to maintain a transparent and open to inspection waiting list for authorized telecom services. The following question was raised in the Supplementary CP:

“Which all type of channels of communication should be standardized to establish uniform, transparent, and customer friendly mechanisms for publicizing provisioning of service and registration of demand by Licensees? “

Comments from the Stakeholders

6.87 Some of the stakeholders have suggested that the website of the service provider should offer a facility to register demand for its fixed broadband services and they may be contacted as and when there is an availability

in their location. One of the stakeholders suggested that after the commencement of services, the service providers should use website, mobile applications, or social media as a channel to inform the customers and also for registration of demand. One of the stakeholders has suggested that the present practices are good enough to handle demand. One of the stakeholders suggested that the traditional media such as newspapers and radio, both mainline and vernacular should be used for demand generation.

- 6.88 Some of the stakeholders have suggested that a common portal can be created to register the demand service including options for service providers. This portal can be widely publicized in all types of media for consumer awareness. One of the stakeholders suggested that demand generation and day to day marketing is the domain and responsibility of the service providers and no intervention is required.

Analysis of the issue and views of the Authority

- 6.89 The Authority feels that a proper assessment of demand cannot be done unless the demand is registered properly. So, it becomes necessary for the service providers to advertise their service offerings and maintain a waiting list for demand. The licensee should ensure that the license condition mentioned in clause 30 of chapter V in the Unified License, is adhered to in letter and spirit and the waiting list is maintained by the service providers.
- 6.90 The Authority is of the view that the licensee should declare the availability of fixed line broadband services in different geographic areas on GIS map accessible to public through its website. The service providers should use all verifiable means of communication like the Website, App, Interactive Voice Response (IVR) system, text message etc.

to register demand for fixed-line connectivity and maintain a transparent, open to inspection, waiting list.

6.91 In view of the foregoing, **the Authority recommends that:**

- (i) The licensee should declare the availability of fixed line broadband services in specific geographic areas on GIS map accessible to public through its website.**
- (ii) In each Telecom Circle/Metro area (as defined in Annexure-V of the Unified License), service providers should use all verifiable means of communication like the Website, App, Interactive Voice Response (IVR) system, text message etc. to register demand for fixed-line connectivity and maintain a transparent, open to inspection, waiting list.**

Direct Benefit Transfer

6.92 Unlike wireless broadband which can be made available to thousands of subscribers through a macro base station, ensuring availability of the fixed-line broadband requires laying of the network up to individual premises. Further, even in areas where subscription demand is low, the expansion of wireless networks in those areas could be justified in the name of roaming subscribers. This may not be possible in the case of fixed-line networks as the services of these networks could be utilized by the residents of those areas only. Therefore, it must be a business case on the basis of the demand in a particular area for service provider to rollout the fixed-line broadband network. In case of fixed-line broadband, in a way, supply is directly linked to the demand in a particular area.

6.93 It is an established economic principle that reduction in prices of goods or services generally increases the demand. Increased demand would translate into increase in supply and due to economy of scale principle, further reduction in prices. This virtuous cycle creates an environment

for healthy growth. We have already experienced this phenomenon in case of wireless broadband. During the last five years, due to reduction in prices and increasing affordability, the numbers of wireless broadband subscriptions have increased exponentially. Can this cycle of healthy-growth be induced for fixed-line broadband services also?

6.94 Someone can argue that in an environment where the need for broadband services, due to ongoing pandemic conditions, is at its peak and accessibility is not an issue, a nudge from the Government, may be in the form of subsidy in monthly rentals, could create the virtuous cycle for proliferation of fixed-line broadband services. This subsidy could be delivered in the form of Direct Benefit Transfer (DBT) to the subscribers.

6.95 DBT mission was started by Government of India on 1st January 2013 to reform Government delivery system by re-engineering the existing processes in welfare schemes for simpler and faster flow of information/funds and to ensure accurate targeting of the beneficiaries, de-duplication, and reduction of fraud.⁸⁴ This mission aims to transfer subsidies directly to the people through their bank accounts. DBT brings efficiency, effectiveness, transparency, and accountability in the Government system and infuses confidence of citizen in governance.

6.96 The stakeholders were asked to comment on the feasibility of DBT to promote the proliferation of fixed line broadband. The following questions were raised in the Supplementary Consultation Paper:

“(i) Whether proliferation of fixed-line broadband services can be better promoted by providing Direct Benefit Transfer (DBT) to subscribers of fixed-line broadband services? If no, elucidate the

⁸⁴<https://dbtbharat.gov.in/>

reasons.

(ii) If answer to above question is affirmative, then:

- i. Should DBT scheme be made applicable to all or a particular segment of fixed-line broadband subscribers? Kindly justify your comments.*
- ii. If you recommend supporting a particular segment of fixed-line broadband subscribers, how to identify such segment of the subscribers?*
- iii. How to administer this scheme?*
- iv. What should be the amount of DBT for each connection?*
- v. What should be the period of offer within which individuals need to register their demand with the service providers?*
- vi. What should be the maximum duration of subsidy for each eligible fixed-line broadband connection? “*

Comments from the Stakeholders

- 6.97 Most of the TSPs and ISPs have not supported the idea of Direct Benefit Transfer in their comments. They are of the opinion that the fixed-line broadband will not be a fit case to implement DBT for fixed-line broadband services due to the fact it is a supply side issue. The key challenge is the service provider's ability and financial viability to invest huge CapEx and OpEx to roll out, upgrade and maintain the fixed-line network for fixed-line broadband. One of the TSPs has stated that fixed line broadband cannot be compared with LPG distribution and this approach is unlikely to spur any meaningful investment into infrastructure creation. Instead of that, removal of 18% GST on the broadband bill is the best form of support to every customer.
- 6.98 Some of the stakeholders are of the view that DBT will be highly ineffective in creating a long-term sustainable demand for fixed-line

broadband in the country. DBT is effective in a situation when two factors are satisfied, viz. the segment of population requiring the subsidy/support is distinctly identifiable and the demand as well as supply is well established, but the affordability is a challenge; as is the case with food subsidy, LPG subsidy, etc. None of these two factors are met in case of fixed-line broadband. One of the stakeholders has submitted that demand side issues arise only when infrastructure is in place, competition is present, but the supplier is unable to serve the customer at the price at which the consumer is ready to buy due to cost factors.

- 6.99 Some of the stakeholders are of the view that the DBT will be prone to misuse in case of fixed-broadband services in terms of determining the eligibility criteria for providing the subsidy benefits. Some of the stakeholders have stated that there cannot be any benchmark/parameter based on which the target population may be decided who may get DBT benefit for utilizing the fixed-line broadband services. There is a probability that subscribers who can afford expenses of availing the services may also get benefits which were intended for eligible subscribers.
- 6.100 One of the stakeholders has commented that DBT in telecom sector has its own set of challenges because telecom operators do not retain Bank or Aadhar/KYC data which is must to initiate the scheme. Billing systems of Telecom operators may not have the provision to transfer the direct incentive. One of the stakeholders suggested that if the Government decides to go ahead with direct incentive to the selected class of subscribers, in that case, instead of following DBT formula/process for LPG subscribers, it could be provided in a way of subsidy being provided to electricity consumers in Delhi. For electricity consumers in Delhi, the subsidy is provided to the customer in the bill

by reflecting the exact amount of subsidy and the operator claims the subsidy amount so passed on to the customer from the Government.

- 6.101 Some of the stakeholders stated that a combination of demand and supply side incentives will be essential to justify a publicly funded push to enhance the reach and scope of fixed broadband services, and that a direct benefit transfer to subscribers is among the more appropriate and effective demand side mechanisms for the Indian market. Direct Benefit Transfers (DBT) to end consumers/subscribers is suitable for the Indian market – given its purchasing power and the prior success of such programs in other essential sectors. They emphasized that this would generate a demand pull for broadband services. The benefit should also be provided for a package of fixed-line broadband along with services because it is the applications and services which will help deliver socio-economic value to the end consumers.
- 6.102 Some of the stakeholders have suggested that DBT Scheme like LPG subsidy should be given to all fixed line broadband consumers –both in the urban and the rural areas and the duration may be three years. One of the stakeholders has suggested that it should be given to all new fixed broadband consumers in a fair, reasonable and non-discriminatory manner. One of the stakeholders has suggested that the DBT scheme should be available for all new subscribers indefinitely for a minimum speed and data usage that is entry level service, and when the subscribers shift to a higher speed and data usage the DBT scheme would cease to apply. The stakeholder suggested that based on the current market conditions it would be a maximum of Rs. 200 per subscriber for the entry level service.
- 6.103 One of the stakeholders has suggested that there should be a clearly defined eligibility criteria and a committee may be formed to determine the subsidy. One of the stakeholders has suggested that a ‘Fixed Line

Promotion Monitoring Cell' may be formed to monitor the implementation of DBT. The DBT amount should vary from 25% to 50% of the rental, based on the fixed line broadband penetration in the area.

Analysis of the issue and views of the Authority

- 6.104 As noted earlier, the international experiences indicate that many countries have used subsidies to increase broadband proliferation. However, the prevailing conditions vary from country to country. We need to find solution to the prevailing issues here. The Authority is of the opinion that in our country DBT could be beneficial for such individuals in whose area fixed-line broadband coverage is available, but they cannot afford fixed-line broadband. It may be beneficial to such individuals also in whose area fixed-line broadband coverage is presently not available as the additional demand may make business case for service providers to lay the network in such areas and provide fixed-line broadband services.
- 6.105 However, the present-day constraints are more on the supply side. It takes time and investments to create supply of fixed line broadband. If supply is not adequate, demand side measures like DBT may be counterproductive. The segmentation of population i.e., who will be considered eligible for DBT is also a challenging task. Digital literacy is an important factor while targeting the beneficiaries for such a scheme for fixed line broadband. It is also argued that mobile broadband which is cheaper and easily available on demand could be the first tool of digital inclusion instead of fixed line broadband. It is expected that with the incentives offered to the fixed line broadband providers and other policy initiatives the deployment of fixed line broadband will be accelerated and the supply will improve in the coming years.
- 6.106 The Authority is of the view that to evaluate the practicability of Direct Benefit Transfer (DBT) for accelerating growth of fixed-line broadband

services, a pilot DBT scheme for prospective fixed-line broadband subscribers should be launched at places in rural areas where adequate fixed-line broadband capacity is available but there is lack of demand for fixed-line broadband. It was observed that the basic entry level broadband plans of the major TSPs/ISPs vary from Rs 399/- to Rs 599/- per month (excluding GST). It is a considered view of the Authority that for the pilot scheme the Government should consider reimbursing 50% of the monthly fixed-line broadband subscription charges, subject to not more than Rs. 200 per month per subscriber, to each rural fixed-line broadband subscriber through the DBT platform. After ascertaining the practicability of the pilot DBT project in accelerating the growth of fixed-line broadband services; specifics of the DBT scheme like eligibility criteria for beneficiaries, reimbursement amount, period of the scheme etc. should be worked out subsequently.

6.107 Recently, the Authority has come to know that the National Payments Corporation of India (NPCI) in association with Department of Financial Services (DFS), National Health Authority (NHA), Ministry of Health and Family Welfare (MoHFW), and partner banks, has launched an innovative digital solution – ‘**e-RUPI**’. The users of this seamless one-time payment mechanism will be able to redeem the voucher without a card, digital payments app or internet banking access, at the merchants accepting e-RUPI. e-RUPI would be shared with the beneficiaries for a specific purpose or activity by organizations or Government via SMS or QR code. It is an innovative solution and during the pilot project the option of reimbursement through e-RUPI can also be explored.

6.108 In view of the foregoing, **the Authority recommends that:**

- (i) **To evaluate practicability of Direct Benefit Transfer (DBT) for accelerating growth of fixed-line broadband services, a pilot DBT scheme for prospective fixed-line broadband subscribers**

should be launched at places in rural areas where adequate fixed-line broadband capacity is available but there is lack of demand for fixed-line broadband.

- (ii) For the pilot scheme the Government should consider reimbursing 50% of the monthly fixed-line broadband subscription charges, subject to not more than Rs. 200 per month per subscriber, to each rural fixed-line broadband subscriber through DBT platform.**
- (iii) After ascertaining the practicability of the pilot DBT project in accelerating the growth of fixed-line broadband services; specifics of the DBT scheme like eligibility criteria for beneficiaries, reimbursement amount, period of the scheme etc. should be worked out subsequently.**

CHAPTER 7

SUMMARY OF RECOMMENDATIONS

7.1. Reliable and affordable high-speed broadband connectivity is very much essential to achieve the goal of digital empowerment and improved well-being of the people of India. The Authority has come out with these recommendations with an attempt to outline a set of policy initiatives required to boost the penetration of high-speed broadband across the country. While framing the recommendations the Authority has considered the issues referred by DoT and the barriers faced by the industry towards expanding the broadband infrastructure. The Authority wants to emphasize that the policy measures suggested here are closely linked with each other and therefore a coordinated and integrated approach is required towards its implementation. A fragmented approach and implementation of selected policy measures in silos will not yield the desired outcome. Hence, it is expected that these recommendations will be accepted by DoT in its entirety to have an overall positive impact on the broadband landscape of the country. Summary of recommendations are as follows:

A. Definition of Broadband

7.2. Broadband is a data connection that is able to support interactive services including Internet access and has the capability of the minimum download speed of 2 Mbps to an individual subscriber from the point of presence (POP) of the service provider intending to provide Broadband service.

[Para 2.29]

B. Categories of Broadband

7.3. Fixed broadband should be categorized as follows:

- a) ‘Basic Broadband’ – A broadband connection having capability of delivering download speed equal to or greater than 2 Mbps and less than 50 Mbps to an individual subscriber.**
- b) ‘Fast Broadband’ – A broadband connection having capability of delivering download speed equal to or greater than 50 Mbps and less than 300 Mbps to an individual subscriber.**
- c) ‘Super-fast Broadband’ – A broadband connection having capability of delivering download speed equal to or greater than 300 Mbps to an individual subscriber.**

[Para 2.48]

C. Broadband Proliferation

7.4. In order to encourage Cable Operators, registered under Cable Television Networks (Regulation) Act, 1995, to provide broadband services, issues relating to computation of Adjusted Gross Revenue (AGR) for Cable Operators need to be addressed on priority. To address this issue, the Authority has already given its recommendations to the Government vide its recommendations dated 6th January 2015 on “Definition of Revenue Base (AGR) for the Reckoning of Licence Fee and Spectrum Usage Charges”. The relevant recommendation is reproduced below:

“Applicable Gross Revenue (ApGR) should be equal to total Gross Revenue of the licensee as reduced by:

- (i) revenue from operations other than telecom activities/ operations as well as revenue from activities under a licence/ permission issued by Ministry of Information and***

Broadcasting;
(ii) Receipts from the USO Fund; and
(iii) items of ‘other income’ as listed in the ‘positive list’ (Table 2.1).”

[Para 3.39]

7.5. The Authority reiterates its earlier recommendation issued in the context of “Proliferation of Broadband through public Wi-Fi networks” dated 9th March 2017 that similar to the Access Service authorisation, passive as well as active infrastructure sharing should be allowed under the Internet Service Licence, and Internet Service authorisation under the Unified License (UL) and UL(VNO) licenses.

[Para 3.47]

D. Broadband Speed Enhancement

7.6. In order to ensure efficient utilisation of available spectrum and support mobile broadband speed enhancement, entire spectrum allocated for International Mobile Telecommunications (IMT) purposes should be assigned as per the established procedures on regular basis. For this purpose, an annual calendar to offer the available IMT spectrum for assignment to service providers should be published in advance.

[Para 4.23]

7.7. In order to enhance the mobile broadband speed in rural and remote areas, using BharatNet network, optical fibre connectivity with Service Level Agreements (SLA) should be made available to service providers for fiberisation of the cellular

networks backhaul connectivity.

[Para 4.26]

7.8. In order to overcome the capacity constraints in the backhaul connectivity of cellular networks, radio spectrum used for backhauling purpose should be assigned to service providers on demand and in time bound manner.

[Para 4.29]

7.9. (i) With increasing data consumption, in order to sustain pace of investment in the cellular networks and in-turn support enhancement of mobile broadband speed, the Government should expedite auction of available mid band spectrum i.e. 3300 MHz to 3600 MHz.

(ii) For further enhancement of mobile broadband speed, allocation of spectrum in mm-wave range for IMT-2020 purpose should be expedited.

[Para 4.39]

E. Consumer Device Standardisation

7.10. In order to increase customers' awareness about data communication performance of different models of mobile handsets available in the market, for each and every model of mobile handset, as per the international standards like 3GPP, the Government should mandate that manufacturers or marketers should declare the User Equipment's category mandatorily.

[Para 4.66]

F. Right of Way (RoW)

7.11. As RoW permissions are required by all types of utility service

providers, i.e. telegraph, electricity, water, gas etc., from Appropriate Authorities for establishment and maintenance of underground and overground utility infrastructure and presently such permissions are regulated under different Laws, Rules and Regulations, it leads to cost inefficient and delayed establishment of utility infrastructure. To overcome all these inefficiencies, the Central Government should come out first with the National RoW Policy, and subsequently it should also enact a model law for RoW permissions which should be adopted by all Appropriate Authorities. For this purpose, the Central Government in coordination with the State Governments should consider constitution of a National RoW Council so that in time-bound manner the policy and legal framework for RoW permissions could be put-in-place.

[Para 5.49]

- 7.12. Till the time the National RoW Policy is notified, the Governing Council for Broadband, already set-up under the National Broadband Mission (NBM), should lay down directive principles for granting RoW permissions to all the Central Government Ministries/ Departments so that the NDCP-2018 objective of efficient establishment of infrastructure is achieved.

[Para 5.49]

- 7.13. Following institutional arrangements for streamlining RoW permissions framework should be put in place:

- i. Under the National Broadband Mission (NBM), the Central Government has put-in-place the institutional mechanism, in form of the Governing Council for Broadband, the Broadband Steering Committee, and the State Broadband Committee, for inter-ministerial coordination at Center and State level. The objective

of the Council and the Committees should be broadened to streamline RoW permissions framework for all utilities by inclusion of additional members nominated from other utility departments/ service providers.

- ii. In the State Broadband Committees, Secretaries in charge of panchayat and local self-governments, and industry departments should also be included. Further, the Chairman of the State Broadband Committees may coopt the state level representative of the central agency(ies) on need basis in the meeting to resolve the RoW issues in time.
- iii. Additionally, District Level Committees, with District Magistrate as Chairman, a representative from LSA unit of DoT, and Superintend Engineer (SE) / Executive Engineer (Ex. Eng.) of Public Works Department (PWD), be set up to streamline RoW permissions framework at district level. The District Level Committees could necessarily include representatives from:
 - a. Irrigation Department,
 - b. Forest Department,
 - c. Rural Development Department,
 - d. Local Bodies like Municipal Corporation, Municipality etc.
 - e. Utility service providers like telegraph, electricity, water, gas etc.

[Para 5.50]

7.14. National RoW Portal

- i. Sub-rule (2) of Rule 4 of the Indian Telegraph Right of Way Rules, 2016 should be amended to include a second provision as:
“Provided further that the Central Government shall establish a single web-based national portal with role-based workflow for RoW permissions.”
- ii. In order to streamline Right of Way (RoW) permission processes, and to facilitate establishment of a single window electronic

- process (online) for RoW permission applications, the Central Government should develop a web-based national portal with role-based workflow. It should have clearly roles defined for the Central, State, and Local Body authorities. This portal should be developed within one year.**
- iii. In order to facilitate cross-sector collaboration for RoW permissions with other utility providers like water, electricity, gas etc. and co-deployment of telegraph lines with other utility infrastructure creation, at later date, it should be possible to expand the scope of the proposed national portal to grant RoW permissions to other utility providers also.**
 - iv. Wherever Appropriate Authorities, i.e. different Central Government Departments, States, Union Territories, Local Authorities and their agencies, have already established the web-based portals for grant of RoW permissions, the same should be integrated with the proposed national portal for RoW permissions.**
 - v. The proposed national portal for RoW permissions should have:**
 - a. facility to submit application in the prescribed format;**
 - b. dashboard to provide real time status update of the applications;**
 - c. provision to make online payment of fee and charges;**
 - d. facility to issue electronically signed RoW permission, communicate reasons for rejection, if any, to the applicant as per the Indian Telegraph Right of Way Rules, 2016, in advance so that the applicant can submit its contentions before rejection of the application; and**
 - e. issue deemed permission letter if the appropriate authority fails to either grant permission or reject the application as per specified timelines in the Indian Telegraph Right of Way Rules, 2016.**

- vi. **The proposed national portal for RoW permissions should also have facility to raise dispute between a licensee and the appropriate authority for referring to the dispute resolution officer designated by the Central Government.**

[Para 5.59]

- 7.15. **In order to remove adhocism, bring predictability, attract investment and to accelerate establishment of underground and overground telegraph infrastructure, the Central Government should work out the uniform restoration charge for open trench and pit with the respective State Government/ UT.**

Provided that the restoration charges could be different for different categories of urban areas, i.e., Municipal Corporations, Municipalities and Nagar Panchayats, and different types of soil found in a State/ UT. Further, the respective State Government/ UT Administration should direct Local Bodies to not to charge any other fee or charge for RoW permission other than what fee or charges are prescribed in the Indian Telegraph Right of Way Rules, 2016.

[Para 5.63]

- 7.16. **In cases where Horizontal Directional Drilling (HDD) technology is used for establishing underground telegraph lines, only restoration charges for pit should be demanded by the appropriate authority as using this technology open trenches are not required to be dug to establish underground telegraph lines.**

[Para 5.63]

- 7.17. **To make it explicitly clear that the Indian Telegraph Right of Way Rules, 2016 are applicable for establishment and maintenance of all kinds of underground and overground telegraph infrastructure;**

and not limited to optical fiber and mobile towers, the first paragraph of the Indian Telegraph Right of Way Rules, 2016 should be amended as:

“G.S.R. 1070(E).—In exercise of the powers conferred by sub-section (1) and clause (e) of sub-section (2) of section 7 read with sections 10, 12 and 15 of the Indian Telegraph Act, 1885(13 of 1885), the Central Government hereby makes the following rules to regulate underground infrastructure and overground infrastructure, namely:-”

[Para 5.66]

- 7.18. For timely and effective resolution of disputes relating to RoW permissions, as per Section 15 (1) of Indian Telegraph Act, 1885, the License Service Area (LSA) unit head of DoT should be appointed as dispute resolution officer. The findings of the dispute resolution officer, to be finalised within 30 days, should be presented to the State Broadband Committee, as constituted under the NBM, so that after detailed deliberations in the committee, necessary written instructions are passed on to the concerned for implementing the decision of the State Broadband Committee.

[Para 5.68]

G. Common Ducts

- 7.19. The Central Government should incentivise establishment of common ducts and posts, to be shared on non-discriminatory basis with service providers and infrastructure providers, for establishing telegraph and telegraph lines.

[Para 5.86]

7.20. In line with RoW charges exemptions granted by the Central Government departments and agencies/ State Governments/ UT Administrations for BharatNet project, the Central Government should coordinate with the respective State Governments/ UT Administrations to exempt RoW charges for next five years (i.e. from FY 2022-23 to FY 2027-28) for expeditious laying of common ducts and posts. Simultaneously, the Central Government should ensure that during these five years RoW charges for laying common ducts and posts shall be exempted by the Central Government departments and agencies also.

[Para 5.91]

7.21. A Centrally Sponsored Scheme (CSS) to incentivise States/ UTs for RoW reforms should be formulated by the Central Government. The quantum of incentive for a State/ UT should be linked to the net improvement in the Broadband Readiness Index (BRI) score of that State/ UT.

[Para 5.94]

7.22. In order to incentivise and accelerate creation of common ducts and posts, which would accelerate establishment of telegraph lines (i.e. optical fiber cables) and telegraphs (i.e. small cell equipment), on any route, exclusive Right of Way permission for at least 5 years should be given to the provider of such common ducts and posts on that route. Such exclusive Right of Way permission should be subject to the condition that common ducts or posts would be made available on demand and in non-discriminatory manner to seekers. The Government may review such exclusive arrangement in the fifth year for further extension by 5 years if felt necessary at that point of time.

[Para 5.96]

7.23. For planning and development of common ducts and posts infrastructure across the country, a central entity, namely ‘Common Ducts and Posts Development Agency (CDPDA)’, on non-exclusive basis, should be established by the Central Government with the following functions: —

- i. Planning, development, and management of sharable common ducts for laying underground optical fiber cables;**
- ii. Planning, development, and management of sharable common posts for laying overground aerial optical fiber cables and hosting of small cells equipments;**
- iii. Coordinate with Appropriate Authorities to identify an exclusive strip of land of about 0.5 Meter width along public pathways for laying common ducts;**
- iv. Formulating and implementing schemes, including in Public-Private Partnership (PPP) mode, for development of sharable common ducts and posts;**
- v. Coordinate with Appropriate Authorities to exempt RoW charges for development of sharable common ducts and posts;**
- vi. Cross-sector collaboration with other utility providers i.e. roadways, railways, water, electricity, gas etc. for co-deployment of common ducts;**
- vii. Declare terms and conditions of sale/ leasing of common ducts and posts in non-discriminatory manner to service providers and infrastructure providers;**
- viii. Developing and providing consultancy and construction services for common ducts and posts on a national and international level.**

[Para 5.100]

7.24. As granting the exclusive Right of Way permission for at least 5 years on a particular route to a common ducts and posts provider has risk of monopoly behaviour, the power to regulate arrangements between lessor (common duct or post provider) and lessee (duct or post user) should be given to TRAI under Section 11(1)(d) of TRAI Act 1997.

[Para 5.102]

7.25. In order to facilitate sharing of ducts and posts infrastructure, Telecom Engineering Center (TEC) should notify design and standards for common ducts and posts infrastructure to be established along public pathways.

[Para 5.103]

H. Cross-sector infrastructure development

7.26. As per the design and standards to be finalised by TEC for establishment of common ducts infrastructure, a policy should be formulated that mandates co-deployment of common ducts during the construction of any roadway, railway, water pipelines, and gas pipelines receiving public funding. Co-deployment of such common ducts could be managed by CDPDA.

[Para 5.119]

7.27. Establishment of common ducts for optical fiber cables should be made integral part of Smart City development plans.

[Para 5.121]

7.28. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) aims to provide basic civic amenities like water supply, sewerage, urban transport, parks so as to improve the quality of life for all especially the poor and the disadvantaged. It includes that every household has access to a tap with assured supply of

water and a sewerage connection. Along with water and sewerage connections, connecting every household with a duct for laying optical fiber should also be included in the aims of the ongoing AMRUT Mission of the Government.

[Para 5.122]

7.29. Till the time, the proposed national portal become available for cross-sector collaboration with other utility providers like water, electricity, gas etc. for RoW permissions and co-deployment of telegraph lines:

- i. The Appropriate Authorities should notify an annual plan for permitting the digging operations by utility service providers to establish underground infrastructure so that each utility provider could finalise their plans in advance.**
- ii. To implement dig once policy and avoid frequent interruptions in services due to accidental damages of underground infrastructure, each utility provider should communicate its digging plans in an area to other utility providers operating in that area before submitting application for RoW permission to the appropriate authority. This would enable cross sector collaboration for co-deployment of telegraph lines; and while the digging operations are in progress utility providers could protect their underground infrastructure also.**

[Para 5.134]

I. Infrastructure sharing

7.30. The Authority's earlier recommendations on 'Enhancement of Scope of IP-I Registration' dated 13th March 2020 should be decided by the DoT and implemented at the earliest. The global trend is to move towards infrastructure sharing and this matter needs to be finalized within the next 3 months.

7.31. To facilitate the sharing of passive infrastructure such as ducts, optical fibres, posts etc. the Authority recommends that:

- i. In order to ensure common standards for mapping of available passive infrastructure using the Geographic Information System (GIS), Telecom Engineering Centre (TEC) should notify the standards for this purpose.**
- ii. The passive infrastructure available in the country should be mapped by each service provider and infrastructure provider using the GIS standardised by TEC.**
- iii. After mapping of the passive infrastructure details by individual service provider and infrastructure provider, the same should be aggregated on the common GIS, which should be maintained by the Central Government or the Regulator. Passive infrastructure of individual service provider and infrastructure provider which is available for sharing and selling should be clearly delineated on this system.**
- iv. To facilitate leasing and trading of passive infrastructure in an efficient manner, the Central Government should enable establishment of e-marketplace(s) for this purpose. Such e-marketplace should be able to access the details of the passive infrastructure of individual service provider and infrastructure provider which is delineated for sharing and selling on the common GIS platform.**

J. Incentives for Proliferation of Fixed Line Broadband

7.32. The Authority recommends that:

- i. Under the prevailing licensing framework, Internet Service and Access Service licensees are authorized to provide fixed-line**

broadband services to individual customers. Therefore, to accelerate the growth of fixed-line broadband services in the country, these categories of licensees should be eligible for incentives.

- ii. For any licensee to avail the proposed incentives, a net increase of minimum 15% in working fixed-line broadband subscribers on year-on-year basis in the respective License Service Area (LSA) should be the eligibility criterion.**

Provided that minimum 20% of the targeted increase in number of working fixed-line broadband subscribers in the current quarter in the respective License Service Area (LSA) should be achieved through net increase in the rural fixed-line broadband subscribers in that LSA.

Provided further that the condition regarding net increase in the rural fixed-line broadband subscribers mentioned above should not be made applicable in Delhi, Mumbai, and Kolkata service areas.

Provided also that in-line with the License Fee (LF) payment obligations of licensees, the eligibility of individual licensees for incentives should also be assessed on quarterly basis.

- iii. Further, in order to ensure that growth of fixed-line broadband services is spread across the country, Internet Service category 'A' licensee, whose Service Area is spread across the National Area, to avail the proposed incentives, in addition to the eligibility criterion prescribed in clause (ii) above, should also achieve a net increase of minimum 10% in fixed-line broadband subscribers on year-on-year basis in each Telecom Circle/Metro area (as defined in Annexure-V of the Unified License).**

Provided that minimum 20% of the targeted increase in

number of working fixed-line broadband subscribers in the current quarter in the respective Telecom Circle/Metro area should be achieved through net increase in the rural fixed-line broadband subscribers in that Telecom Circle/Metro area.

Provided further that the condition regarding net increase in the rural fixed-line broadband subscribers mentioned above should not be made applicable in Delhi, Mumbai, and Kolkata service areas.

- iv. The incentive for eligible licensees should be given in the form of License Fee (LF) exemption on the total revenue as specified in clause (vi) and (viii) below.**
- v. In IP (Internet Protocol) world, Broadband, Voice, Video and Value-added services move together on fixed line connections. And, in the considered view of the Authority, in the prevailing market conditions, segregation of revenue earned from fixed-line connections into Broadband, Voice, Video and Value-added services categories indisputably is not feasible. Further, the growth of fixed-line broadband services in the country is directly linked to increase in availability of fixed-line connections. Therefore, the proposed incentives should be linked to the revenue earned from fixed-line connections provided to subscribers. It would pose fewer interpretation challenges.**
- vi. For an eligible Access Service licensee in any LSA, who is providing the fixed-line broadband services under the Access Service license/ authorisation, license fee exemption should be given on the ‘Revenue from Wireline Subscribers’ booked under “Particular 1 (A)” of the Format of “Statement of Revenue and License Fee” specified for Access Service Providers.**

(Note: It is pertinent to note here that as per the Access Service license/ authorisation, the licensees are required to divide ‘Revenue from services’

into four sub-segments i.e. Wire-line, WLL (Fixed), WLL (handheld), and Mobile services based on the medium and technology of the connectivity. While making these Recommendations, the Authority understand that the Department of Telecommunication has already in place the robust mechanism to ensure that only the revenue accrued from wire-line (in these recommendations referred to as fixed-line) services is booked under “Particular 1 (A)” of the Format of “Statement of Revenue and License Fee” specified for Access Service Providers. To ascertain that the eligible licensee is providing the fixed-line broadband services under the Access Service license and to avoid misuse of the proposed incentives, simple checks like by comparing the revenue per fixed-line broadband subscriber of this licensee with the industry average in the respective LSA would be useful. This is just an example and based on the vast experience of DoT of LF assessment, any additional checks as deemed fit could be introduced while settling the claims of the licensees.)

- vii. Specifically in case of the bundled offerings/ packages (i.e. consumer offerings/packages bundling fixed line broadband service, mobile phone service, DTH service, etc.), the exemption of license fee on revenue accruing from fixed line broadband services should be subject to the condition that the licensee shall declare upfront the policy of apportionment of revenue between each of such bundled services in the package prior to the claim for exemption, and further subject to filing a certificate from cost accountant that the policy of apportionment is broadly proportionate and in line with the costs associated with the provision of the different services that are bundled as a package.**

(Note: The claim of exemption of revenue accruing from fixed line broadband services for the purpose of license fee, in the case of bundled service offerings/packages, shall be subject to due post verification by the Department of Telecom (DoT), including through a process of audit, specifically with respect to whether the policy of apportionment of revenue

between each of such bundled services is broadly proportionate and in line with the costs associated with the provision of the different services that are bundled as a package, as certified by the cost accountant. Further, to ascertain that the licensee has reasonably apportioned revenue between each of such bundled services in the package and to avoid misappropriation of the revenues, simple checks like comparing such apportioned amount by a licensee for each service with the nearest standalone offer for such service by the licensees could be useful. This is just an example and based on the vast experience of DoT of LF assessment, any additional checks as deemed fit could be introduced while settling the claims of the licensees. Upon audit and verification in case the revenue shown against fixed line broadband service in a bundled package is excessive/ disproportionate to the cost associated with providing the service, the claim of exemption of license fee shall be liable to be rejected.)

viii. For an eligible Internet Service licensee in any LSA, license fee exemption should be given on the ‘Revenue from Services’ booked under “Particular 1” of the Format of “Statement of Revenue and License Fee” specified for Internet Service Providers.

(Note: It is pertinent to clarify here that presently under the Internet Service license/ authorisation, licensees are providing the broadband services using fixed-line networks only. And unlike Access Service authorisation, where the ‘Revenue from services’ has been divided into four sub-segments i.e. Wire-line, WLL (Fixed), WLL (handheld), and Mobile services based on the medium and technology of the connectivity, there is no division of the ‘Revenue from services’ into different sub-segments based on the medium and technology in the Format of “Statement of Revenue and License Fee” specified for Internet Service Providers. Accordingly, the Authority is recommending LF exemption on total ‘Revenue from services’ booked under “Particular 1” of the Format of “Statement of Revenue and License Fee” specified for Internet Service Providers. However, later, if any Internet Service licensee starts providing

broadband services using Fixed Wireless Access (FWA) or any other wireless technology, than in the changed conditions, the revenue eligible for exemption of license fee should also be reviewed keeping in view the circumstances prevailing at that point of time.)

- ix. The eligibility for incentives should be self-assessed by the concerned licensee as per the criterion prescribed in clause (ii) and (iii) above. For this purpose, the licensee should submit the fixed-line broadband subscribers' details, in the 'Format of Statement of Fixed-line Broadband Subscribers' given at Annexure-E, by 15th of the next quarter. Since as per license conditions, licensees are required to pay the License Fee by 25th March for the last quarter of the Financial Year (FY) based on expected revenue, for the last quarter of the FY only, the licensee should be permitted to self-assess its eligibility on the basis of estimated growth in fixed-line broadband subscribers by the end of that quarter. In support of its self-assessment for the last quarter, the licensee should submit by 15th April the actual number of subscribers working as on 31st March in the 'Format of Statement of Fixed-line Broadband Subscribers' given at Annexure-E.**

(Explanation: Let us assume that the working subscriber count in the reference year as on 30th June is 'P', as on 30th Sept is 'Q', as on 31st Dec is 'R' and as on 31st March is 'S'. Let us further assume the subscriber count in the target year be 'P1', 'Q1', 'R1', 'S1' respectively at the end of each quarter on the similar dates. For assessing the eligibility, the percentage growth in a quarter on year-on year basis will be computed as $[(P1-P)/P] * 100$, $[(Q1-Q)/Q] * 100$, $[(R1-R)/R] * 100$ and $[(S1-S)/S] * 100$ respectively for the 1st, 2nd, 3rd, and 4th quarters of the target year.)

- x. A robust verification mechanism should be put in place to check the veracity of the working fixed-line broadband subscriber base declared by the eligible licensees. To ensure that each licensee would do the**

right self-assessment of its eligibility, it would be pertinent to clarify that here working fixed-line broadband subscribers would mean the subscribers who are active and regularly paying their post-paid bills or recharging their pre-paid accounts, as per the applicable tariff plan. For this purpose, test users should not be counted as working fixed-line broadband subscribers.

- xi. The eligible licensees, based on their self-assessment, should be permitted to claim license fee exemption on the revenues specified in clause (vi) and (viii) above. The license fee exemption claim shall be subject to the verification by the Licensor as per terms and conditions of the license. Such verification and settlement of incentive claims, subject to final assessment and audit of AGR, should be completed within 6 months.**
- xii. In cases where a licensee, based on the actual net increase in working subscriber numbers at the end of last quarter of FY fails to meet the eligibility criterion, then it should pay the LF amount duly payable for the last quarter of the FY by 15th April. For any delay, penal interest be levied as per the terms and conditions of the license.**
- xiii. To increase supply of fixed-line broadband services in rural and remote areas, Cable Operators, who are keen to deliver broadband services, should be encouraged to establish last-mile linkage network. For this purpose, the Government should impart necessary skills to such Cable Operators and provide soft loans to them on easier terms for establishing last-mile connectivity network in rural and remote areas. As per the extant licensing framework these Cable Operators could work as franchisee of any ISP including BBNL to provide broadband services.**
- xiv. To incentivise the initial investment in the last-mile linkage network and support broadband business operations initially, in considered view of the Authority, the Government should notify an interest**

subvention scheme for Cable Operators registered as Micro and Small size enterprises.

- xv. Initially, the proposed incentive, i.e. license fee exemption, to the eligible licensees should be allowed for a minimum period of five years. The need for incentives beyond initial five years may be reviewed in the fifth year keeping in view the policy priorities and technological developments at that point of time.**

(Note: Here “Access Service Providers” means licensees holding UASL (Unified Access Service License)/UL (Unified License) with Access Service authorization/UL (VNO) with Access Service authorization/UL (VNO) with Access Service Category B authorisation, and “Internet Services Providers” means licensees holding ISP license/UL with Internet Service authorization/ UL(VNO) with Internet Service authorisation).

[Para 6.83]

7.33. The Authority recommends that:

- i. The licensee should declare the availability of fixed line broadband services in specific geographic areas on GIS map accessible to public through its website.**
- ii. In each Telecom Circle/Metro area (as defined in Annexure-V of the Unified License), service providers should use all verifiable means of communication like the Website, App, Interactive Voice Response (IVR) system, text message etc. to register demand for fixed-line connectivity and maintain a transparent, open to inspection, waiting list.**

[Para 6.91]

7.34. The Authority recommends that:

- i. To evaluate practicability of Direct Benefit Transfer (DBT) for accelerating growth of fixed-line broadband services, a pilot DBT**

- scheme for prospective fixed-line broadband subscribers should be launched at places in rural areas where adequate fixed-line broadband capacity is available but there is lack of demand for fixed-line broadband.**
- ii. For the pilot scheme the Government should consider reimbursing 50% of the monthly fixed-line broadband subscription charges, subject to not more than Rs. 200 per month per subscriber, to each rural fixed-line broadband subscriber through DBT platform.**
 - iii. After ascertaining the practicability of the pilot DBT project in accelerating the growth of fixed-line broadband services; specifics of the DBT scheme like eligibility criteria for beneficiaries, reimbursement amount, period of the scheme etc. should be worked out subsequently.**

[Para 6.108]

Annexure A (Chapter 1/Para no. 1.17)

DoT Reference I

No.4-1/2018-Policy-1
Government of India
Ministry of Communications
Department of Telecommunications

New Delhi-1, the 26th April, 2019

To

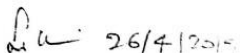
The Secretary
Telecom Regulatory Authority of India (TRAI)
Mahanagar Doorsanchar Bhawan
Jawahar Lal Nehru Marg (Old Minto Road)
New Delhi- 110002

Subject : Revision of definition of Broadband

Sir,

In continuation of this Section's letter of even number dated 02.04.2019 and TRAI's letter No. 4-3/2019/BB&PA dated 11.04.2019 on the subject mentioned above and to say that the recommendations may please be furnished under Section 11(1) (a) of the TRAI Act, 1997 on the following points:

- i). Different speeds for different categories i.e. fixed vs Mobile with upload/download speeds defined;
- ii). How different categories of Broadband speeds such as basic Broadband, High Broadband & Ultra-High Broadband etc. can be defined as in Europe; and
- iii) The roadmap to enhance Broadband speed to achieve NDCP objective of 50 Mbps


(Sandeep Bhardwaj)
Director (VBB)
Ph. 23036544

Annexure B (Chapter 1/Para no. 1.18)

DoT Reference II

Government of India
Ministry of Communications
Department of Telecommunications
Access Services Wing
Sanchar Bhavan, 20, Ashoka Road, New Delhi-110001

No: 20-281/2010-AS-I Vol. XII (pt.)

Date:08.05.2019

To,
The Secretary,
Telecom Regulatory Authority of India,
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg, Old Minto Road,
New Delhi-110002

Subject: Seeking recommendations of TRAI on strategies of National Digital Communications Policy, 2018 - reg.

The National Digital Communications Policy, 2018 (hereinafter, referred to as, the NDCP, 2018) of the Government of India envisages, *inter-alia*, the following strategies under its 'Connect India' and 'Propel India' missions:

"

1. Connect India: Creating a Robust Digital Communications Infrastructure

...

Strategies:

1.1 Establishing a 'National Broadband Mission – Rashtriya Broadband Abhiyan' to secure universal broadband access

...

- (j) *By Encouraging innovative approaches to infrastructure creation and access including through resale and Virtual Network Operators (VNO)*

2. Propel India: Enabling Next Generation Technologies and Services through Investments, Innovation, Indigenous Manufacturing and IPR Generation

Strategies:

2.1 Catalysing Investments for Digital Communications sector:

(b) *Reforming the licensing and regulatory regime to catalyse Investments and Innovation, and promote Ease of Doing Business by:*

v. *Enabling unbundling of different layers (e.g. infrastructure, network, services and application layer) through differential licensing*

(c) *Simplifying and facilitating Compliance Obligations by:*

v. *Reforming the Guidelines for Mergers & Acquisitions, 2014 to enable simplification and fast tracking of approvals*

viii. *Creating a regime for fixed number portability to facilitate one nation – one number including portability of toll free number, Universal Access Numbers and DID numbers*

2.2 Ensuring a holistic and harmonized approach for harnessing Emerging Technologies

(e) *Ensuring adequate numbering resources, by:*

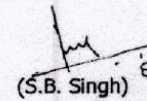
ii. *Developing a unified numbering plan for fixed line and mobile services*

2. Telecom Regulatory Authority of India is, hereby, requested to furnish recommendations, under the terms of the clause (a) of sub-section (1) of Section 11 of the Telecom Regulatory Authority of India Act, 1997 (as amended), in respect of the afore-mentioned items of the NDCP, 2018.

3. For sake of convenience, the strategies/ items under strategies of the NDCP, 2018, on which recommendation of TRAI are being sought, are summarized below:

- (a) Strategy 1.1 (j) of 'Connect India' mission,
- (b) Item (v) under Strategy 2.1 (b) of 'Propel India' mission,
- (c) Items (v) & (viii) under Strategy 2.1 (c) of 'Propel India' mission, and,
- (d) Item (ii) under Strategy 2.2 (e) of 'Propel India' mission.

4. This issues with the approval of the Secretary, Department of Telecommunications, Government of India.


(S.B. Singh) 01/5/19

Deputy Director General (AS)

Tel: 011-23036918

Annexure C (Chapter 1/Para no. 1.18)
DoT Reference III

F. No.4-27/NDCP2018-NT
Government of India
Ministry of Communications
Department of Telecommunications
(Networks and Technology Wing)

Dated: ^H6 June, 2019


To
The Secretary,
Telecom Regulatory Authority of India,
New Delhi.

Subject: Seeking recommendations of TRAI on NDCP-2018 provision related to Promoting broadband connectivity through innovative and alternative technologies – reg.

The National Digital Communications Policy, 2018 seeks to unlock the transformative power of digital communications networks-to achieve the goal of digital empowerment and improved well-being of the people of India; and towards this end, attempts to outline a set of goals, initiatives, strategies and intended policy outcomes.

2. In this regard, under Connect India Mission of NDCP-2018, various strategies have been laid out to accomplish the objectives. The strategy no 1.1 relates for Establishment a 'National Broadband Mission-Rashtriya Broadband Abhiyan' to secure universal broadband access.
3. **NDCP-2018 strategy provision no 1.1(k) envisages "Promoting broadband connectivity through innovative and alternative technologies."**
4. Accordingly, TRAI is requested to provide its recommendations under section 11 (1)(a) of TRAI Act, 1997 (as amended), in respect of the afore- mentioned provision no 1.1(k) of NDCP-2018.

This is issued with the approval of Secretary(T).


(Rajiv Sinha) 06/06/19
DDG (NT)
+91 11 23372606
ddgnt-dot@nic.in

Annexure D (Chapter 1/Para no. 1.19, Chapter 6/ Para no. 6.3)

DoT Reference IV

**Government of India
Ministry of Communications
Department of Telecommunications
Access Services Wing
Sanchar Bhawan, 20, Ashoka Road, New Delhi-110001**

No.: AS-15/1/2020-AS-V

Date: 12.03.2021

To,
The Secretary,
Telecom Regulatory Authority of India,
Mahanagar Doorsanchar Bhawan,
Jawaharlal Nehru Marg (Old Minto Road),
New Delhi-110002


Subject: Proliferation of Fixed-line Broadband Services in the Country

1. The Government received 'Recommendations on Delivering Broadband Quickly: What do we need to do?' dated 17.04.2015 from Telecom Regulatory Authority of India (TRAI). These recommendations covered a wide range of topics such as Spectrum Licensing, Right of Way (ROW), NOFN, Towers, Fixed-line Broadband, Cable TV, Satellite, Hosting of Contents in India, License Fee on ISPs, Infrastructure Sharing and Promoting Adoption of Broadband. One of the recommendations under serial number No. 6 on page No. 113 is given below:


"To promote fixed line BB, the license fee on the revenues earned on fixed line BB should be exempted for at least 5 years" (hereinafter referred to as **'the said recommendation'**).

2. The said recommendation has been considered by the Government. During deliberations, the following issues have emerged:

- (a) The said recommendation requires a review as the factual matrix and relevant issues may have undergone a change with the passage of time (from the year 2015 to 2021).
 - (b) Whether proliferation of Fixed-line Broadband services can be better promoted by providing direct benefit to consumers for usage of Fixed-line Broadband services?
 - (c) Whether there is a likelihood of misuse by the licensees through misappropriation of revenues due to the proposed exemption of the License Fee on the revenues earned from Fixed-line Broadband services? That is, whether the licensees are likely to claim the revenues earned from telecom services, on which higher license fee is applicable, as those earned from the Fixed-line Broadband services for which license fee is proposed to be exempted?
3. Further, it has come to the notice of the Government that TRAI has issued 'Consultation Paper on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed' dated 20.08.2020. Through the Q. 23 of the consultation paper dated 20.08.2020, TRAI has sought inputs of stakeholders on, *Inter-alia*, the question of "*What policy measures should be taken to improve availability and affordability of fixed broadband services?*".
4. In view of the above, **the said recommendation is being referred back to TRAI for its reconsideration under the terms of sub-section (1) of Section 11 of the Telecom Regulatory Authority of India Act, 1997 (as amended).**
5. TRAI is, hereby, requested to provide consolidated and updated recommendations in light of the afore-mentioned consultation paper dated 20.08.2020 after taking into consideration the issues mentioned in para 2 & 3 above.



6. For a ready reference, a brief description of the licensing regime for Internet Service Providers in India is enclosed as **Annexure**.
7. This letter is being issued with the approval of the Hon'ble Minister of Communications, Government of India.



12/3/2021

(S.B. Singh)

Deputy Director General (AS)

Tel: 011-23036918

**Brief Description of
the Licensing Regime for Internet Service Providers (ISPs) in India**

A. Licensing regime for ISPs prior to UL regime

1. In the year 1998, Internet service sector was opened for private participation with a view to encourage growth of Internet and increase its penetration. Initially, there was no License Fee for the ISP licenses issued under 1998 guidelines.
2. In the year 2002, ISPs were allowed to offer Internet Telephony (IT) service after signing amended ISP license (referred to as 'ISP-IT license') issued under 2002 guidelines.
3. Till 31.10.2003, there was no License Fee for the ISP licensees (with or without Internet Telephony). A token License Fee of Re. 1 per annum was imposed on all ISP licensees (with or without Internet Telephony) with effect from 01.11.2003.
4. Through an amendment dated 03.03.2006, License Fee as 6% of Adjusted Gross Revenue (AGR) was imposed on ISP-IT licensees with effect from 01.01.2006; revenue from pure Internet service (i.e. charges from Internet access, Internet content and Internet access related installation charges) was excluded from the Gross Revenue to arrive at the AGR.
5. In the year 2007, DoT issued revised guidelines for grant of license for operating Internet services. In the ISP licenses issued under 2007 guidelines, License Fee of 6% of AGR was imposed; revenue from pure Internet service (i.e. charges from pure Internet service and activation charges from pure internet subscribers) was excluded from the Gross Revenue to arrive at the AGR.

6. In the year 2012, DoT revised the License Fee for all ISP and ISP-IT licenses. In this regard, the DoT's letter dated 29.06.2012 provided as below:

"In pursuance of the right of Licensor to modify at any time the terms and conditions of the License Agreement for provision of Internet Services, in public interest or for the proper conduct of the services, the Licensor hereby intimates that :

A uniform license fee rate of 8% of "Adjusted Gross Revenue (AGR)" shall be adopted for all ISP and ISP-IT licenses, in two steps starting from 01.07.2012 as follows:

Category of License	Details	Annual License Fee Rate as % of AGR	
		For the period from 01.07.2012 to 31.03.2013	For year 2013-14 and onwards
ISP	License for provisioning of Internet Services issued under 1998 guidelines (without Internet Telephony)	4%	8%
ISP-IT	License for provisioning of Internet Services (including Internet Telephony) issued under 2002 guidelines, License for provisioning of Internet Services issued under 24.08.2007 guidelines	7%	8%

2. Revenue for the purpose of license fee for ISP category shall provisionally include all types of revenue from Internet Services, allowing only those deductions available for pass through charges and taxes/ levies as in the case of access services, without any set-off for expenses; revenue from Internet Services will also be included in the definition of applicable AGR

provisionally for ISP-IT category till government takes a final decision after obtaining TRAI recommendations in this regard.

3. Necessary amendment(s) to the License Agreement(s) to above effect will be issued in due course of time. ..."

7. Through a judgment dated 12.10.2012 passed in the Petition No. 429 of 2012 (Internet Service providers Association of India & Ors. Vs. Union of India), the Hon'ble TDSAT set aside the para-2 of the afore-mentioned order dated 29.06.2012.

8. Later, through an order dated 30.05.2018 passed in the Telecom Petition No. 418 of 2014 (M/s World Phone Internet Service Pvt. Ltd. Vs. Union of India), the Hon'ble TDSAT ordered as below:

"7. ... we note that para 3 of the order dated 29-6-2012 which states that "Necessary amendment(s) to the License Agreement(s) to above effect will be issued in due course of time." No amendment to this effect has been shown to have been issued to the petitioner. Hence, the rate of 7/8% is not applicable in respect of the license fee payable by the petitioner in absence of any amendment in relevant terms and condition of the license. We however, hasten to add that the petitioner is liable to continue to pay license fee at 6% in accordance with terms and condition of the license and the amendment dated 3-3-2006 to the license. ..."

9. At present, the Department is considering a proposal to amend the ISP licenses issued under all the regimes prior to UL to incorporate the definition of Gross Revenue, Adjusted Gross Revenue and rate of License Fee as provided in the UL (ISP authorisation).

B. Licensing regime for ISPs under UL regime

10. In the year 2013, Unified License (UL) regime was instituted in the country. Internet service authorization is one of the authorizations under the UL. License Fee at the rate of 8% of AGR is to be paid by a licensee under the UL

regime; AGR for UL (Internet service authorization) does not exclude revenue from pure Internet services.

11. Internet Service Providers Association of India and a few licensees having UL (Internet Service authorization) filed several petitions before the Hon'ble TDSAT on the plea of non-level playing field between the licensees in UL regime and pre-UL regime in respect of levy of License Fee; they prayed to exclude the revenue earned from pure Internet service for arriving at AGR for ISPs under UL regime. The Hon'ble TDSAT passed its judgment in the Telecom Petition No. 169 of 2014 on 18.10.2019 and ordered, *inter-alia*, as below:

"... 42. As a result, the decision to include revenue from pure Internet services in the AGR for levy of license fee on the ISPs under Unified License regime is set aside on the grounds already considered and decided in favour of the petitioners. Accordingly, the impugned demands of license fee are set aside with a direction to raise revised demands for license fee on the basis of same concept of AGR as is being done in respect of ISPs holding licenses under the old regime. ..."

12. DoT filed a Civil Appeal Diary No. 14382/2020 (Union of India vs. Internet Service Providers Association of India & Ors.) before the Hon'ble Supreme Court of India against the judgment dated 18.10.2019 passed by the Hon'ble TDSAT in Telecom Petition No. 169 of 2014. The Hon'ble Supreme Court heard the matter on 05.01.2021 and, *inter-alia*, directed that the appellant (i.e. DoT) shall not be required to refund any amounts in pursuance of the impugned order of the Hon'ble TDSAT dated 18.10.2019.

Annexure E (Chapter 6/Para no. 6.75)

Format of Statement of Fixed-line Broadband Subscribers to claim License

Fee exemption as per DoT OM dated

_____ (Name and address of the licensee) _____

(Name of the License/ Authorisation) in _____ (Service Area)

for the Quarter of the financial year

Sr. No.	Particular	At the end of the quarter of the previous financial year	At the end of the quarter of the current financial year	Net increase	Targeted increase in percentage to become eligible for the incentive	Actual achieved net increase in percentage	Target Achieved (Yes/ No)	Remarks
(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)
1	Total number of fixed-line broadband working subscribers in the service area	1C	1D	[1E = 1D - 1C]	1F = Minimum 15% of 1C	[1G= (1E/1C) *100]		It is applicable for all types of licensees including Category A Internet service licensees. For Category A Internet Service licensees, the target for rural
2	Total number of rural fixed-line broadband working subscribers in the service area	2C	2D	[2E = 2D - 2C]	Minimum 20% of 1F	[2G= (2E/1E) *100]		

									fixed-line broadband working subscribers should be calculated after excluding the number of fixed-line broadband subscribers working in Delhi, Mumbai, and Kolkata Metro Areas from the total number of fixed-line broadband subscribers working at all India level.
3(i)	Total number of fixed-line broadband working subscribers	Name of Telecom Circle – Andhra Pradesh	3C	3D	[3E = 3D - 3C]	3F = Minimum 10% of 3C	[3G= (3E/3C) *100]		It is applicable for Category A Internet Service licensees only in addition to the targets mentioned at SL.Nos 1 &2 of Column A above i.e overall All India target of 15% is
4(i)(A)	Total number of rural fixed-line broadband working subscribers in the service area	Name of Telecom Circle – Andhra Pradesh	4C	4D	[4E = 4D - 4C]	Minimum 20% of 3F	[4G= (4E/3E) *100]		

3(ii)	Total number of fixed-line broadband working subscribers	Name of Telecom Circle – Assam	3C	3D	[3E = 3D - 3C]	3F = Minimum 10% of 3C	[3G= (3E/3C) *100]		applicable for CAT A ISPs also.
4(ii)(A)	Total number of rural fixed-line broadband working subscribers in the service area	Name of Telecom Circle – Assam	4C	4D	[4E = 4D - 4C]	Minimum 20% of 3F	[4G= (4E/3E) *100]		
-----	-----	-----	---	----	----	----	----	---	
3(xix)	Total number of fixed-line broadband working subscribers	Name of Telecom Circle – West Bengal	3C	3D	[3E = 3D - 3C]	3F = Minimum 10% of 3C	[3G= (3E/3C) *100]		
4(xix)(A)	Total number of rural fixed-line broadband working subscribers in the service area	Name of Telecom Circle – West Bengal	4C	4D	[4E = 4D - 4C]	Minimum 20% of 3F	[4G= (4E/3E) *100]		

List of Acronyms

No.	Acronym	Description
1.	3GPP	3rd Generation Partnership Project
2.	4G	4th generation cellular network
3.	5G	5th generation cellular network
4.	ADSL	Asymmetric digital subscriber line
5.	ADSS	All-Dielectric-Self-Support cables
6.	AGR	Adjusted Gross Revenue
7.	AMRUT	Atal Mission for Rejuvenation and Urban Transformation
8.	BB	Broadband
9.	BBNL	Bharat Broadband Network Limited
10.	BSNL	Bharat Sanchar Nigam Limited
11.	BTS	Base Transceiver Station
12.	CAG	Comptroller and Auditor General
13.	CAGR	Compound Annual Growth Rate
14.	CapEx	Capital Expenditure
15.	CATV	Cable Television
16.	CD	Common Ducts
17.	CDA	Common Ducts Agency
18.	CDMA	Code Division Multiple Access
19.	CDMA	Code Division Multiple Access)
20.	CDN	Content Delivery Networks
21.	CERC	Central Electricity Regulatory Commission
22.	CN	Core Network
23.	COAI	Cellular Operators Association
24.	COVID-19	Coronavirus Disease of 2019
25.	CP	Consultation Paper
26.	CPE	Customer Premises Equipment
27.	CPU	Central Processing Unit
28.	CTI	Common Telecom Infrastructure

No.	Acronym	Description
29.	DBT	Direct Benefit Transfer
30.	DDG	Deputy Director General
31.	DISCOM	Electricity Distribution Company (in India)
32.	DL	Download speed
33.	DOCSIS	Data Over Cable Service Interface Specification
34.	DoT	Department of Telecommunications
35.	DPIIT	Department for Promotion of Industry and Internal Trade
36.	DSL	Digital subscriber line
37.	DTC	District Level Telecom Committees
38.	DTH	Direct to Home
39.	EMF	Electric and Magnetic Fields
40.	ER	Essential Requirement
41.	EU	European Union
42.	FCC	Federal Communications Commission
43.	FDD	Frequency Division Duplex
44.	FTTH	Fiber to the Home
45.	FWA	Fixed Wireless Access
46.	GDP	Gross Domestic Product
47.	GDP	Gross Domestic Products
48.	GIS	Geographic Information Systems
49.	GP	Gram Panchayat
50.	GPON	Gigabit Passive Optical Networks
51.	GPU	Graphics Processing Unit
52.	GSR	General Statutory Rules
53.	GST	Goods and Services Tax
54.	HD	High definition
55.	HDD	Horizontal Directional Drilling
56.	HFC	Hybrid fibre-coaxial network
57.	HSPA	High Speed Packet Access
58.	IBS	In-Building Solution
59.	ICT	Information and Communication Technology
60.	IDI	ICT Development Index

No.	Acronym	Description
61.	IMDA	Infocomm Media Development Authority
62.	IoT	Internet of Things
63.	IP-I	Infrastructure Providers Category-I
64.	IPTV	Internet Protocol Television
65.	ISP	Internet Service Provider
66.	IT	Information Technology
67.	ITU	International Telecommunication Union
68.	IXP	Internet Exchange Point
69.	LCO	Local Cable Operator
70.	LED	Light-Emitting Diode
71.	LEO	Low Earth Orbit
72.	LF	License Fee
73.	LOA	Land Owning Agencies
74.	LPG	Liquefied Petroleum Gas
75.	LSA	Licensed Service Area
76.	LTE	Long-Term Evolution standard
77.	M2M	Machine-to-Machine
78.	MEO	Medium Earth Orbit
79.	MIMO	Multiple-In Multiple-Out
80.	MoRTH	Ministry of Road Transport and Highways
81.	MSME	Micro, Small and Medium Enterprise
82.	MSO	Multi System Operator
83.	MWA	Microwave Access
84.	MWB	Microwave Backbone
85.	NBM	National Broadband Mission
86.	NDCP	National Digital Communication Policy
87.	NHAI	National Highways Authority of India
88.	NIC	National Informatics Centre
89.	NIXI	National Internet Exchange of India
90.	NOC	No Objection Certificate
91.	NOFN	National Optical Fibre Network
92.	OECD	Organisation for Economic Co-operation and Development

No.	Acronym	Description
93.	OFC	Optical Fibre Cable
94.	OG	Overground
95.	OpEx	Operational Expenditure
96.	OPGW	Optical Ground Wires
97.	OTT	Over-the-top media service
98.	PDO	Public Data Offices
99.	PDOA	PDO Aggregators
100.	PM-WANI	PM Wi-Fi Access Network Interface
101.	POP	Point of Presence
102.	PPP	Public-private partnership
103.	PWD	Public Works Department
104.	QoS	Quality of service
105.	RAN	Radio Access Network
106.	ROI	Return on investment
107.	RoW	Right of Way
108.	RWA	Resident Welfare Association
109.	SAARC	South Asian Association of Regional Cooperation
110.	SAR	Specific Absorption Rate
111.	SEB	State Electricity Board
112.	SH	State Highways
113.	SME	Small and Medium Size Enterprises
114.	SPV	Special Purpose Vehicle
115.	SSA	Secondary Switching Area
116.	STC	State Level Telecom Committees
117.	SUC	Spectrum Usage Charge
118.	TAIPA	Towers and Infrastructure Providers Association
119.	TDSAT	Telecom Disputes Settlement and Appellate Tribunal
120.	TEC	Telecom Engineering Centre
121.	TERM	Telecom Enforcement and Resource Monitoring Cell
122.	TRAI	Telecom Regulatory Authority of India
123.	TSP	Telecom Service Provider

No.	Acronym	Description
124.	UASL	Unified Access Service Licence
125.	UDD	Urban Development Department
126.	UE	User Equipment
127.	UG	Underground
128.	UK	United Kingdom
129.	UL	Upload speed
130.	UL (VNO)	Unified License (Virtual Network Operator)
131.	USOF	Universal Service Obligation Fund
132.	UT	Union Territory
133.	UTP	Unshielded Twisted Pair
134.	VDSL	Very high-speed digital subscriber line
135.	WANI	Wi-Fi Access Network Interface
136.	Wi-Fi	Wireless Fidelity
137.	WLAN	Wireless Local Area Network