

Consumer Explainer on Unlicensed Spectrum and WiFi 6E Use Cases

Executive Summary

This consumer explainer notes the pervasive impact internet has on human life and the revolutionary technological advances bolstering a 'connected living' future. The critical need for high speed internet connection has also been further underlined due to the multiple integral use cases identified during the COVID-19 pandemic.

However, the paper highlights that the present internet landscape may not be adequately supporting and contributing to the potential of this spiralling digital growth story. With the telcos and mobile broadband plagued with their own set of concerns, it becomes all the more necessary to have a complementary WiFi ecosystem which is easily accessible. And, experts opine that the limited spectrum available for WiFi is overcrowded and getting choked.

In this light, the additional bandwidth available in the 6 Ghz and 60 Ghz spectrum bands, can potentially bolster access, speed, quality and security of internet services, as detailed in the paper. From a macro economic perspective as well there are several benefits that may be derived. Additionally, the potential of WiFi 6E is such that it can unlock many additional devices, use cases and opportunities for innovation.

With this background, the paper recommends evidence based research on consumer utility of 6 Ghz and 60 Ghz, assessment of latest spectrum capacity, support for bolstering PM-WANI scheme for WiFi proliferation, regular periodic ecosystem stakeholders' consultations, updation of policies and opportunities for adoption of emerging technologies to prevent India from being a technology laggard.

Background and Context

The advent of technology has drastically impacted all spheres of human life. Revolutionary advances in technologies have managed to pierce through and become a part of the social fabric. The automated systems introduced by Industry 3.0 considerably improved efficiency in manufacturing processes, increased productivity, contributed to economies, and led to a better standard of living.

The digital transformation witnessed during Industrial Revolution 3.0 paved the way for a more connected Industry 4.0 and beyond. This has been spearheaded by increased digitalisation of services and network integration. With a focus on smart machines requiring minimal human intervention, technology trends point towards a more intelligent and '**connected living**', subsequently leading to Industry 5.0. The past decade has witnessed a thawing of the physical and virtual world barriers and is envisaged to continue to do so.



Source: Scoop.com

Figure: Industry 4.0 Technologies

The future of connected living envisages growth in trends for wearables¹, smart homes, smart cities and smart industries,² which shall make use of cyber-enabled critical technologies, (CTs) such as Artificial Intelligence (AI), Internet of Things (IoT), Augmented Reality (AR), Virtual Reality (VR), cloud computing, among others and also include technological fusions like AIoT (AI and IoT) which are increasingly becoming mainstream.³

¹ The worldwide end-user spending on wearable devices is estimated to total USD81.5bn in 2021, seeing an 18.1% increase from USD69bn in 2020. Gartner predicts that by 2024, miniaturising capabilities will advance to the point that 10% of all wearable technologies will become unobtrusive to the user. Available at:

<https://www.gartner.com/en/newsroom/press-releases/2021-01-11-gartner-forecasts-global-spending-on-wearable-devices-to-total-81-5-billion-in-2021>

² <https://www.weforum.org/agenda/2021/03/ai-is-fusing-with-the-internet-of-things-to-create-new-technology-innovations/>

³ [Ibid](#)

The onset of the COVID-19 pandemic has further spurred the pace of digitalisation for the long haul⁴ and bolstered technological innovations⁵ in businesses, living and gadgets, noting the growing demand and need for hyperconnectivity. With home spaces doubling up as workstations, the most routine human interactions happen online. Similarly, consumer preferences have shifted to online shopping, entertainment, telehealth, digital payments, etc.

With swift acceleration and adoption of digitalisation, the hyper-connected world may become a reality much earlier than anticipated. This shall make integration of Industry 5.0 features⁶ possible, optimise performance and ensure delivery of maximum efficiency throughout the product life cycle.⁷

Estimates suggest that smart cities' spending on new technologies such as AI, big data, 5G, autonomous and robotic technologies is expected to grow at a compound annual growth rate (CAGR) of 22.7 percent for the next six years and reach US\$327bn by 2025.⁸

The findings of the recent Frost and Sullivan study, which estimates that there could be more than 20 connected devices per human by 2030 globally,⁹ suggests the pressing consumer demands for a connected living; however, the necessary infrastructure for the same seems to be falling back.

Data traffic is a key determinant of the shift towards a more connected living in India. India's data traffic has grown by approximately 60 times over the last five years, the highest globally¹⁰ and in 2020, the data traffic grew by 36 percent.¹¹ Consumers can choose between cellular data options and WiFi networks to access the Internet. Since WiFi networks are usually found in offices or in public places like railway stations and the fact that. **India poses significant growth opportunities¹² for internet connectivity.**

Most importantly, the cruciality of high internet speed was recognised, especially for critical services such as online education,¹³ healthcare services¹⁴ (including registering for Covid-19 vaccination¹⁵), news and other important information,¹⁶ financial services, including digital payments, online e-commerce, etc. Gradually, with the further advancement and development of technology and boost to innovation,¹⁷ the internet and associated technologies would soon become foundational in

⁴ <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever>

⁵ <https://www.weforum.org/agenda/2020/04/coronavirus-covid19-pandemic-gadgets-innovation-technology/> ; <https://www.who.int/news/item/31-08-2021-who-releases-new-compendium-of-innovative-health-technologies-for-covid-19-and-other-priority-diseases>

⁶ This includes digitally engineered products such as AR, VR, and automation.

⁷ <https://www.frost.com/frost-perspectives/industry-5-0-bringing-empowered-humans-back-to-the-shop-floor/>

⁸ <https://store.frost.com/future-of-connected-living.html>

⁹ <https://store.frost.com/future-of-connected-living.html> and <https://www.itnonline.com/content/frost-sullivan-analyzes-future-privacy-and-cybersecurity>

¹⁰ <https://www.nokia.com/sites/default/files/2021-02/Nokia-MBiT-2021.pdf>

¹¹ <https://www.nokia.com/sites/default/files/2021-02/Nokia-MBiT-2021.pdf>

¹² <https://www.nokia.com/sites/default/files/2021-02/Nokia-MBiT-2021.pdf>

¹³ https://www.igauge.in/admin/uploaded/report/files/QSIGAUGECOVIDISPReportApril2020_1606732097.pdf

¹⁴ <https://www.heart.org/en/news/2020/08/05/high-speed-internet-offers-key-connection-to-health-but-millions-lack-it>

¹⁵ <https://blogs.lse.ac.uk/southasia/2021/06/28/india-digital-divide-and-the-promise-of-vaccination-for-all/>

¹⁶ <https://www.apc.org/en/node/37367>

¹⁷ From furniture makers to AI software developers, companies worldwide are adapting existing products or inventing new gadgets to help fight the pandemic COVID 19. Coronavirus impact: Tech gadgets to fight Covid-19,

agriculture¹⁸ (including the emergence of agri-tech companies during the pandemic¹⁹), transportation, logistics, heavy industries, among other sectors.

With these insights, it is not surprising that the Supreme Court of India has recognised the Right to Access Internet as an integral part of the Right to Privacy and Right to Education under Article 21 and Article 21A of the Constitution of India.²⁰ **It is imperative that the state guarantees these rights and focuses on bridging the digital divide for an inclusive digital economy.**²¹

Unfortunately, the COVID pandemic, while concretising online consumer preferences and accelerating digital growth,²² exposed and exacerbated India's digital divide.²³ **The risk of creating a new class of digitally poor citizens,** if the benefits of digitalisation do not reach all Indians is substantive.²⁴ This could hamper the potential of connected living and pose a double setback for developing nations such as India, as access to Industry 5.0 products would necessarily require citizens' access to and working knowledge of the digital world.

In the light of this, an enabling ecosystem that supports the demand and supply for real-time connectivity and avenues for increased internet penetration in an easily accessible and affordable manner is necessary.²⁵ Towards this, CTs and other dependent essentials would primarily operate on emerging wireless connectivity technologies such as 5G, 6G, WiFi 6E (6 GHz band) and WiGig (60 GHz band) as the demand and efficient spectrum allocation would increase along with anticipated exponential growth in device density.

This paper seeks to highlight the current internet landscape while making a case for assessing spectrum needs in India. Also, it would highlight the lacunae in India's potential of enhancing fast speed connectivity to the last mile in the future while emphasising consumer use cases of WiFi 6 and the need for innovative devices supported by WiFi 6.

¹⁸ <https://timesofindia.indiatimes.com/most-searched-products/electronics/miscellaneous/impact-of-coronavirus-tech-gadgets-to-fight-covid-19/articleshow/75758338.cms>

¹⁹ <https://www.govtech.com/network/the-farms-of-the-future-hinge-on-high-speed-internet.html>

²⁰ <https://economictimes.indiatimes.com/small-biz/sme-sector/how-agri-tech-companies-evolved-during-the-pandemic-their-impact-on-indias-agriculture/articleshow/86473601.cms?from=mdr>

²¹ Faheema Shirin v. State of Kerala, 2019 SCC OnLine Ker 2976 : (2019) 4 KLJ 634 : AIR 2020 Ker 35 : (2019) 4 KLT 30 ; See also Anuradha Bhasin v. Union of India, (2020) 3 SCC 637

²² <https://www.ericsson.com/en/blog/6/2021/bridging-the-digital-divide-for-an-inclusive-digital-economy>

²³ <https://www.jpmmorgan.com/solutions/cib/research/covid-spending-habits>

²⁴ <https://theprint.in/india/eduhttps://www.govtech.com/network/the-farms-of-the-future-hinge-on-high-speed-internet.html>

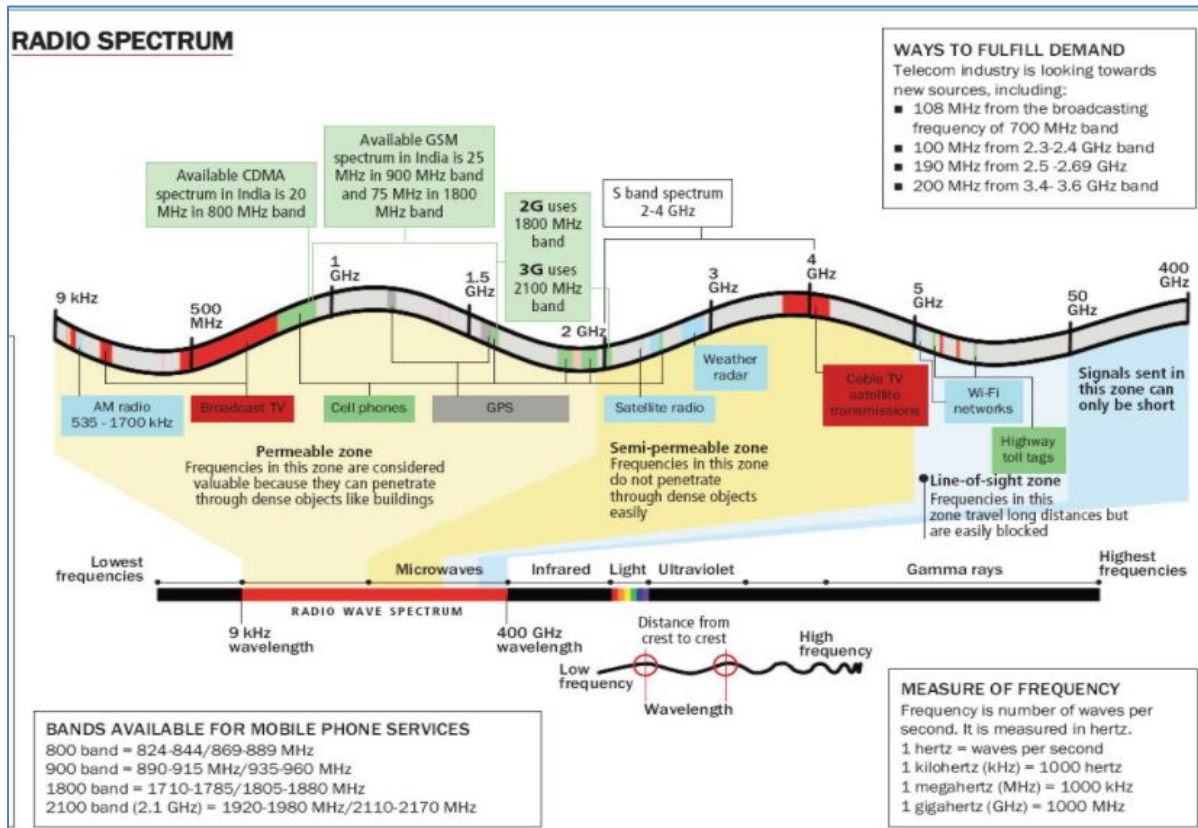
²⁵ <https://www.dvara.com/research/blog/2010/05/25/net-working-on-the-hills/ ation/as-digital-divide-widens-India-risks-losing-a-generation-to-pandemic-disruption/568394/>

²⁶ <https://theprint.in/india/education/as-digital-divide-widens-india-risks-losing-a-generation-to-pandemic-disruption/568394/>

²⁷ <https://tra.gov.in/sites/default/files/Broadband%3D17.04.2015.pdf>

The Internet Landscape

In India, the Internet can be accessed by both WiFi and cellular/mobile data. WiFi uses base stations to transfer signals, whereas mobile broadband delivers Internet over mobile phone radio spectrum such as CDMA,²⁶ GSM,²⁷ 3G, 4G LTE, 5G, etc.²⁸



Source: Down to Earth

Figure: A Glimpse into the Electromagnetic Spectrum

Even as India has a relatively lower mobile data cost, compared to other countries, the average download speed in India of 11.58 Mbps for a 4G connection is regarded as extremely low, against the average global benchmark of 30-40 Mbps of speed.²⁹ To add to the woes, the systemic flaws³⁰ that

²⁶ Code-division multiple access (CDMA) is a digital cellular technology that uses the spectrum to transmit information from several transmitters over a single communication channel. It is an example of multiple access, which is locked to a carrier.

²⁷ Global System for Mobile Communication (GSM) is a second-generation digital cellular network used by mobile devices and tablets to digitise and compress data for sending down to a channel.

²⁸ <https://testmyspeed.onl/difference-between-mobile-broadband-and-fixed-wireless/>

²⁹ Ankit Tuteja, Explained: Why 4G network is slow in India, 13 March 2020, <https://www.wionews.com/opinions-blogs/explained-why-4g-network-is-slow-in-india-286106> and ET Online, India continues to have cheapest mobile data, 14 July 2020, <https://economictimes.indiatimes.com/tech/internet/india-continues-to-have-cheapest-mobile-data/the-methodology/slideshow/76957963.cms>

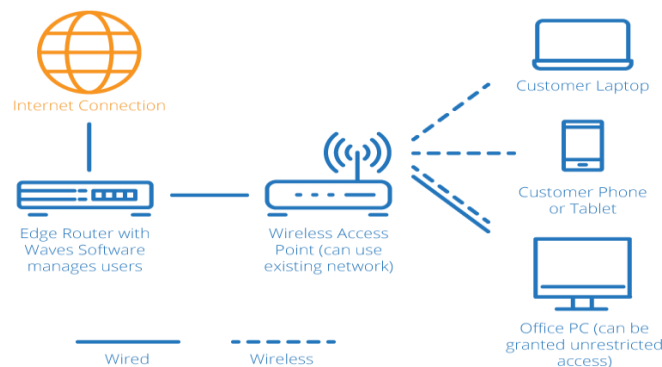
³⁰ <https://www.wionews.com/opinions-blogs/explained-why-4g-network-is-slow-in-india-286106>

have contributed to poor mobile internet speed seem unlikely to disappear even after the introduction and adoption of 5G,³¹ the trials for which are already delayed.³²

Further, stakeholders opine that as compared to WiFi or fixed broadband services, mobile broadband-based service depends on multiple aspects such as backhaul spectrum, technology in use, clutters of buildings, environment, etc.³³ and the operators' coverage area to determine the distance from the base station. Therefore, WiFi technology offers a stable, secure internet connection, which mobile data coverage cannot always guarantee.

As regards data transfer technology, in fixed WiFi networks, fibre-optic and cable networks enable high-speed connections, whereas the traditional xDSL connections of a telephone network have limited maximum transfer speeds,³⁴ which leads to WiFi networks having marginally better speed indices than mobile.³⁵

Not only does WiFi have the advantage of high speed, high reliability, high bandwidth and low latency,³⁶ It is also the most suitable technology to take last-mile broadband connectivity to rural and uncovered areas.³⁷



Source: STL Blog

Figure. How do we access the Internet?

Significance of WiFi

WiFi relates to connecting to the Internet through wireless routers or wireless access points in public places. Considering the prominence being given to the potential of connected living and increased integration of Industry 4.0 and 5.0 technologies in consumer products, WiFi holds great value. It is

³¹ Amrit Burman, Broadband or 4G Mobile Data, Which is better for professional use, 16 February 2021, <https://www.dnaindia.com/technology/report-broadband-or-4g-mobile-data-which-is-a-better-option-for-professional-use-2875626>

³² <https://the-ken.com/story/as-5g-spectrum-auctions-loom-jio-airtel-get-cold-feet/>

³³ https://www.trai.gov.in/sites/default/files/Recommendations_31082021_0.pdf

³⁴

³⁵ India Today Tech, India records its highest average broadband speed of 62.45 Mbps in August, as per Ookla, 17 September 2021, <https://www.indiatoday.in/technology/news/story/india-records-its-highest-average-broadband-speed-of-62-45mbps-in-august-as-per-ookla-1853849-2021-09-17> ; See also <https://www.orfonline.org/expert-speak/quantity-over-quality-towards-universal-broadband-in-india/>

³⁶ Latency is typically a measure of network delay, and it measures the time taken for data to reach its destination across the network.

³⁷ 3.27 https://www.trai.gov.in/sites/default/files/Recommendations_31082021_0.pdf

predicted that the significance of WiFi will only increase in the future since WiFi technology will be an essential complement to 5G networks and beyond.³⁸

TRAI recommendations on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed (TRAI Recommendations) further throw light on the importance of WiFi for supporting the digitalisation trend and ensuring last-mile connectivity by highlighting that, *"Using WiFi hotspots to fill the gap in cellular coverage is a widely adopted trend globally. In fact, as per industry reports, mobile users use WiFi technology to communicate in most of the major economies for 50 to 70 percent of their total usage time."*³⁹ Regrettably, this figure stands at a mere 10 percent in India, largely due to the inadequate proliferation of public WiFi hotspots.⁴⁰

Therefore, there is an urgent need for the government to work on the two-fold objective of **the aggressive proliferation of fixed-line broadband** (the same offers 'always-on'⁴¹ high-speed connection within individual consumer premises⁴² as well as industrial premises) and simultaneously **ensure the establishment of public WiFi networks across the country** through schemes such as Prime Minister WiFi Access Network Interface (PM-WANI) scheme.⁴³

The early budding examples of PM-WANI are already bearing fruit and are huge success stories. India's first Public Data Office (PDO) under the scheme, i2e1, established in Delhi's Kusumpur Pahadi area, is converting kirana stores to WiFi hotspots⁴⁴ and allows area residents to access 50Mbps high-speed unlimited internet at merely INR5 per day even with no registration.⁴⁵

In villages like Baslambi and Baidebettu, where there was hardly any reliable connectivity, the PM-WANI-powered initiative shall offer stable WiFi solutions to over 9000 citizens, up to a radius of six kilometres.⁴⁶ There are endless such possibilities for the Indian PDO model⁴⁷ which can completely revolutionise and cater to current consumer demands, especially with statistics showing that more than 50,000 access points were already deployed in 2021.⁴⁸

To achieve the same, **there must be the availability of spectrum.**

³⁸ Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017-2022

³⁹ https://www.trai.gov.in/sites/default/files/Recommendations_31082021_0.pdf

⁴⁰ https://www.trai.gov.in/sites/default/files/Recommendations_31082021_0.pdf

⁴¹ Always-on data connection is used to define the terms Fast broadband and Ultra-Fast broadband related to a continuously accessible internet connection.

⁴² https://www.trai.gov.in/sites/default/files/Recommendations_31082021_0.pdf

⁴³ 3.21 https://www.trai.gov.in/sites/default/files/Recommendations_31082021_0.pdf

⁴⁴ <https://inc42.com/startups/i2e1-turns-kiranas-into-wi-fi-hotspots-can-it-take-on-cheap-4g-plans/>

⁴⁵ <https://telecom.economictimes.indiatimes.com/news/delhi-based-startup-i2e1-launches-first-pdo-under-pm-wani-initiative/80450032> <https://telecom.economictimes.indiatimes.com/news/delhi-based-startup-i2e1-launches-first-pdo-under-pm-wani-initiative/80450032>

⁴⁶ <https://timesofindia.indiatimes.com/business/india-business/hfcl-to-set-up-pm-wani-in-baidebettu-village/articleshow/83847882.cms>

⁴⁷ Details available here: <https://inc42.com/startups/i2e1-turns-kiranas-into-wi-fi-hotspots-can-it-take-on-cheap-4g-plans/>

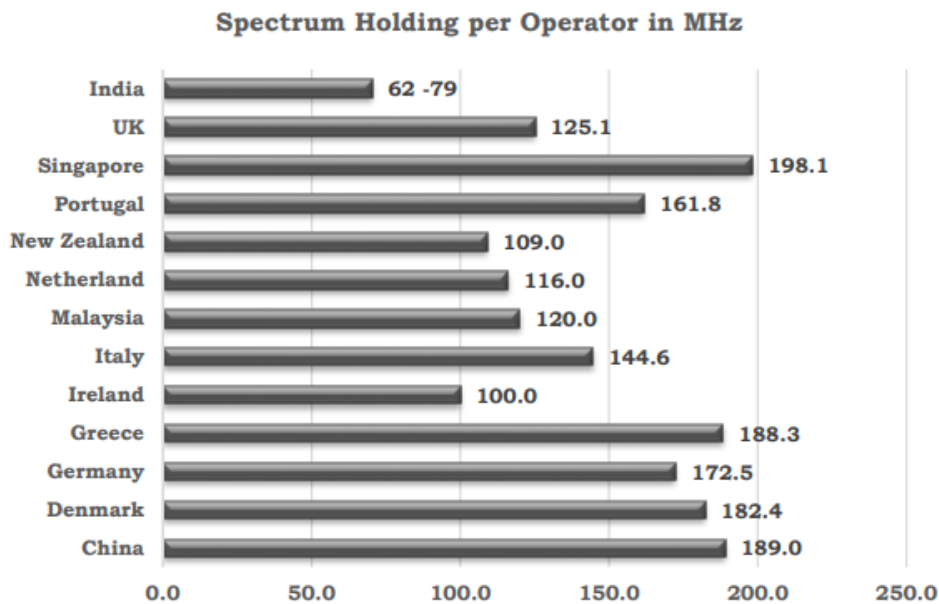
⁴⁸ <https://www.livemint.com/industry/telecom/dot-says-50-000-plus-access-points-deployed-under-pm-wani-in-2021-11640595175854.html>

India’s Spectrum Story

India’s WiFi broadband internet primarily uses 2.4 GHz and 5 GHz bands. Reportedly, even though TRAI opines that these existing spectrum bands are not fully utilized,⁴⁹ there is no comprehensive data analysis or reports available on this claim. Further, numerous stakeholder concerns have highlighted that WiFi has played a crucial role in offloading and easing connectivity issues and that the **limited spectrum is, in fact, getting choked**.

Stakeholders such as the Internet Service Providers’ Association of India have submitted to the TRAI that the 2.4GHz band was **overcrowded** with unavailability of more unlicensed spectrum and the existing 50Mhz of license-exempt spectrum in the 5.7GHz spectrum choked up since many Internet Service Providers (ISPs) switched to providing services using the unlicensed frequencies.⁵⁰

Towards this, multiple stakeholders have opined that in line with the demands of community groups, industry bodies, telecom experts and international best practices, it may be in the best interest of the country to **open up frequencies,⁵¹ as freeing up the spectrum would lead to better connectivity and less cluttering of devices on the same spectrum**. Further, with the emergence of the new WiFi standard, WiFi 6E, the WiFi space has more to offer in terms of faster Gigabit speeds⁵² and additional consumer use cases.



Source: TRAI Recommendations

Figure. Spectrum Holding: Countries’ Comparative

India, with the seventh-largest population in the world has only 700 MHz spectrum available for unlicensed use, whereas countries such as USA, UK, China, Japan and Brazil have over 15,000 Mhz

⁴⁹ 3.27 https://www.trai.gov.in/sites/default/files/Recommendations_31082021_0.pdf

⁵⁰ <https://traigov.in/sites/default/files/201609011026048541407ISPAI.pdf>

⁵¹ <https://traigov.in/sites/default/files/201609011026048541407ISPAI.pdf>

⁵² <https://www.thenewsminute.com/article/opinion-delicensing-6-ghz-60-ghz-bands-crucial-improve-wi-fi-scenario-india-158974>

unlicensed spectrum.⁵³ Further, with estimates expecting the number of internet users in India to reach 900mn by 2025⁵⁴ and connected consumers progressively on the rise since COVID-19, it is imperative to check whether spectrum needs are being fulfilled adequately.

Specifically, since the quality of service in terms of throughput and latency generally degrades as the number of users sharing the spectrum increases,⁵⁵ in order to access high speed internet with lower latency, a higher bandwidth of spectrum is necessary. Therefore, it is necessary to consider unlicensing the spectrum in India expediently.

Drawing reference from policies in place, it seems that this may be a possibility since the Indian regulatory landscape has been supportive of unlicensing the spectrum. The Telecom Policy (NTP-2012) lists de-licensing additional frequency bands for public use as an objective.⁵⁶ And, the National Digital Communications Policy, 2018 enables light-touch licensing and mentions that the key natural resource may be de-licensed for broadband proliferation.⁵⁷

Challenges to the Potential of Hyperconnectivity for India

Access to Internet Services

Even as internet users have grown rapidly over the past few years, a sizable population still has no access to the Internet, especially in rural areas, states with limited resources and insufficient access to the Internet and digital infrastructure and economically disadvantaged society.⁵⁸

The rural broadband penetration is a meagre 29 percent as against the national average of 51 percent.⁵⁹ Reportedly, within Asia-Pacific, India has the widest gender gap of 40.4 percent, with only 15 percent of the women accessing the Internet as against 25 percent of the men.⁶⁰

Most importantly, as a consequence of the Covid-19 pandemic, this digital divide adversely impacted the ability of people to access essential services. Over 60 percent of the school students could not access school learning. In the Kamsanpalle village of the Ranga Reddy district in Telangana, villagers had to travel over 23 kilometres merely to get access to an internet kiosk towards registering themselves on the CoWIN portal, showcasing a sharp digital divide hindering access to essential services.

The bridging of this harsh digital divide may be possible through WiFi technology, which, as emphasised in Telecom Regulatory Authority of India (TRAI) recommendations, could facilitate last-mile broadband connectivity and complement 5G, towards the benefit of consumers.⁶¹

⁵³ https://broadbandindiaforum.com/wp-content/uploads/2021/06/BIF-WP_Role-Importance-of-Next-Generation-Wi-Fi-Technologies-in-Acceleration-of-Digital-Transformation_June-2021.pdf

⁵⁴ Kantar ICUBE 2020, Report on Internet Adoption in India, https://images.assettype.com/afaqs/2021-06/b9a3220f-ae2f-43db-a0b4-36a372b243c4/KANTAR_ICUBE_2020_Report_C1.pdf

⁵⁵ Thanh Nguyen, Hang Zhou, Randall A. Berry, Michael L. Honig, Rakesh Vohra, The Cost of Spectrum.

⁵⁶ <https://dot.gov.in/sites/default/files/NTP-06.06.2012-final.pdf>

⁵⁷ <https://dot.gov.in/sites/default/files/EnglishPolicy-NDCP.pdf>

⁵⁸ <https://www.hindustantimes.com/india-news/connectivity-gets-better-but-parts-of-india-still-logged-out/story-VSgXriMdGUudWb7eBcWzjN.html>

⁵⁹ <https://www.orfonline.org/expert-speak/indias-gendered-digital-divide/>

⁶⁰ <https://www.orfonline.org/expert-speak/indias-gendered-digital-divide/>

Speed & Quality of Internet Services

India ranked 127 out of 138 countries on Ookla's Speedtest Global Index for mobile broadband speeds and 71 out of 181 nations for fixed broadband speed.⁶² Recently, TRAI also recommended revising the threshold for internet download speed from 512 Kbps to 2 Mbps, recognising the necessity of better internet speed to access basic internet applications.⁶³ However, even this revised speed threshold is abysmally low as compared to global standards.

The internet speed and quality in India witnessed increased demand during COVID-19 pandemic. The internet usage shot up amidst lockdown and buckled under the high population demands and increased device density.

A survey conducted by IIT Kanpur reported that only 34.1 percent of its students had an internet connection that supported the streaming of real-time lectures.⁶⁴ Similarly, telemedicine applications such as Practo witnessed a jump in seven times its users, the platform recognised the compelling need to strengthen connectivity with free transponder space.^{65,66}

No. of devices	Light Use cases (Web surfing, email, social networking, audio Music 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

Source: TRAI Recommendations

Figure. Use Cases and Corresponding Bandwidth Requirement

With this and the concretisation of consumer preferences to online, especially after the pandemic, the potential connectivity demand will only rise. The number of networked devices per capita in India is estimated to increase from 2.4 in 2018 to 3.6 by 2023.⁶⁷

⁶¹ Telecom Regulatory Authority of India, Recommendations on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed, 31 August 2021, https://traigov.in/sites/default/files/Recommendations_31082021.pdf

⁶² Speedtest Global Index, September 2021, <https://www.speedtest.net/global-index#mobile>

⁶³ https://traigov.in/sites/default/files/Recommendations_31082021.pdf

⁶⁴ https://www.business-standard.com/article/education/education-in-the-time-of-covid-19-how-institutions-and-students-are-coping-120043001575_1.html

⁶⁵ Transponder space or capacity is used to

⁶⁶ https://www.practo.com/company/insights/practo_tsi_telemedicine_report.pdf

⁶⁷ <https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.html>

According to TRAI, an Indian household may have about two to ten devices connected to broadband Internet, which may further increase with the advent of 5G and technologies and services requiring real-time connectivity.⁶⁸

The potential connectivity demand and increasing user and device density could further impact internet speed and quality in India as the broadband networks could get congested and saturated, and thus may further impact consumers' ability to benefit from the emerging technologies and essential critical services.

To do justice to the potential of connected living, the Internet must be made available to support high-use cases. Particularly with the significant improvements in WiFi 6 standard as compared to the previous generations of WiFi technology, WiFi 6 borrows several multi-user technologies from the cellular industry, including MU-MIMO and OFDMA, which significantly improve the speed and quality of WiFi as it uses the spectrum more efficiently and thereby enables more simultaneous connections⁶⁹ with low latency.

Affordability of Internet Services

The average cost of broadband in India is on the higher side compared to mobile Internet, which may have contributed to its lesser adoption.⁷⁰ According to the Economic Survey 2020-21, reduced cost of data could enable affordable internet access at a rapid pace.⁷¹

The 6 GHz and 60 GHz bandwidth could potentially decongest the existing spectrum bands and provide higher speed over multiple devices at affordable cost,⁷² given such spectrum are unlicensed. A licensed spectrum could increase services costs, which may dis-incentivise consumers in availing faster speed internet.

Additionally, the PM-WANI initiative intends to proliferate and democratise internet access, if facilitated by unlicensed 6 GHz and 60 GHz bands, it could support the higher speed at affordable rates across regions with high population density and remove right-of-way hurdles.⁷³ This would strengthen opportunities for last-mile connectivity.

⁶⁸ https://tra.gov.in/sites/default/files/Recommendations_31082021.pdf

⁶⁹ <https://www.techspot.com/article/1769-wi-fi-6-explained/>

⁷⁰ <https://indianexpress.com/article/technology/tech-news-technology/survey-cheapest-mobile-broadband-globally-top-countries-7493915/>

⁷¹ https://www.indiabudget.gov.in/economicsurvey/doc/vol2chapter/echap08_vol2.pdf

⁷² Present examples show that unlimited high-speed internet can be available for as low as INR5 per day. More details are available at:

⁷³ <https://telecom.economicstimes.indiatimes.com/news/delicense-v-band-to-promote-pm-wani-itu-apt/86477226>

Security of Internet Services

In the education sector, WiFi 6E is expected to facilitate new learning materials built over AR and access and download study materials while providing enhanced internet safety, privacy, and security through the WPA3 standard.⁷⁴

The high speed and security of WiFi 6E would play a pivotal role in various sectors since technology has long been considered a catalyst of social change.⁷⁵ For example, Novant Health is already leveraging WiFi 6E solutions for mission-critical applications and medical devices during the Covid-19 pandemic in the healthcare sector.⁷⁶

Moreover, the 6 GHz and 60 GHz bands are expected to complement 5G and 6G technology across different use cases⁷⁷, verticals, and IoT require low latency and near-real-time communications, in addition to offering greater privacy, confidentiality, and security to users.

Macro-Economic Considerations

It is estimated that a 10 percent increase in broadband penetration increases a country's Gross Domestic Product (GDP) by 1 percent.⁷⁸ Similarly, WiFi penetration directly correlates with consumer surplus leading to economic growth⁷⁹ and even creates employment opportunities and income opportunities for micro-entrepreneurs.⁸⁰

Furthermore, broadband Internet has empowered people and communities. For example, a railway porter in Kerala cleared the State Public Service Commission exam with help from free public WiFi available at railway stations.⁸¹ Although this success was facilitated by free Internet, the potential for opportunities and economic opportunities seems untapped in areas where internet connectivity and speed is poor and unaffordable.

Unlocking the Potential of WiFi 6E

With the increasing internet adoption and penetration and India's population density, the unlicensed 6 GHz and 60 GHz can further appreciate the economic value with associated economies of scale,

⁷⁴ WPA3 (WiFi Protected Access 3) represents the latest generation in mainstream security for wireless networks. It improves security compared to the widely popular WPA2 standard (released in 2004), yet maintains backward compatibility. <https://www.mist.com/wpa3-just-the-essentials-on-the-latest-in-wi-fi-security/>

⁷⁵ <https://www.livemint.com/Industry/HeayecHJaniyHTnKGEJVVM/Using-technology-to-speed-up-community-development.html>

⁷⁶ <https://hitconsultant.net/2021/10/27/novant-health-wi-fi-6e-deployment/#.YY4ppNJBzIV>

⁷⁷ This includes multi-gigabit wireless network, 4k/8k video to multi-screens, IoT, AR/VR and gaming, 5G backhaul. Details available at <https://www.celeno.com/blog/wi-fi-6/6e-use-cases-and-derived-wi-fi-ap-architectures>

⁷⁸ <https://documents1.worldbank.org/curated/en/178701467988875888/pdf/102955-WP-Box394845B-PUBLIC-WDR16-BP-Exploring-the-Relationship-between-Broadband-and-Economic-Growth-Minges.pdf>

⁷⁹ <https://broadbandindiaforum.com/wp-content/uploads/2021/06/The-Economic-Value-of-Wi-Fi-Spectrum-for-India-online-19-MAY-2021-accessible.pdf>

⁸⁰ https://traigov.in/sites/default/files/Recommendations_31082021.pdf

⁸¹ <https://indianexpress.com/article/trending/trending-in-india/kerala-luggage-porter-who-cracked-kpsc-exam-using-free-wifi-at-railway-station-to-study-is-an-inspiration-5173257/>

increased productivity and efficiency.⁸² The economic value of WiFi in the unlicensed bands in India stands at USD 164.97bn (GDP at current prices)⁸³ and is estimated to reach US\$240bn by 2025.⁸⁴

However, the telecom companies in India have expressed concerns that unlicensed 6 GHz and 60 GHz spectrum could impact the adoption of 5G⁸⁵ and business profitability of operators.⁸⁶ On this, TRAI reported that opening more unlicensed frequencies would facilitate the development of the 5G ecosystem.⁸⁷

Moreover, doing away with the need for licence to leverage spectrum bands eases entry and reduces operational costs (since no license fee is paid), thus potentially allowing smaller service providers to offer consumers cheaper and more innovative products⁸⁸ and services⁸⁹ towards higher speed internet.

It has also been argued that unlicensing new spectrum bands may adversely affect its revenue. Even with such concerns, India unlicensed the 2.4 GHz and 5 GHz band channels⁹⁰ as part of the National Telecom Policy in favour of open spectrum.⁹¹

Similarly, **suppose 6 GHz and 60 GHz bands are unlicensed. In that case, the associated benefits may outweigh the government's revenue shortfall, enabling a connected ecosystem, increasing internet penetration, and facilitating economic growth, efficiency, and reinvestment in the industry.**⁹² Importantly, unlicensed spectrum also promotes creativity,⁹³ open innovation,⁹⁴ and has

⁸² National Digital Communications Policy, 2018, <https://dot.gov.in/sites/default/files/EnglishPolicy-NDCP.pdf>

⁸³ Broadband India Forum, The Economic Value of WiFi Spectrum for India, <https://broadbandindiaforum.com/wp-content/uploads/2021/06/The-Economic-Value-of-Wi-Fi-Spectrum-for-India-online-19-MAY-2021-accessible.pdf>

⁸⁴ WiFi Alliance, WiFi global economic value to reach \$5 trillion in 2025, 3 February 2021, <https://www.wi-fi.org/news-events/newsroom/wi-fi-global-economic-value-to-reach-5-trillion-in-2025>

⁸⁵ <https://economictimes.indiatimes.com/industry/telecom/telecom-news/its-tech-majors-vs-telcos-for-rich-6-ghz-pickings/articleshow/79895062.cms?from=mdr>

⁸⁶ <https://cis-india.org/telecom/cis-tra-consultation-response-broadband> and

<https://economictimes.indiatimes.com/industry/telecom/telecom-news/its-tech-majors-vs-telcos-for-rich-6-ghz-pickings/articleshow/79895062.cms?from=mdr>

⁸⁷ https://tra-ai.gov.in/sites/default/files/White_Paper_22022019.pdf

⁸⁸ The innovative products include access points such as routers that supports WiFi 6E, boasting of speeds up to 11000 Mbps and reducing congestion in WiFi networks while delivering stable connections for clearer, faster home networks, NETGEAR Nighthawk for lower latency, 4K/8K streaming, AR/VR gaming and video conferencing, smartphones, laptops, TVs and accessories including Samsung Galaxy S21 Ultra, Intel 10th & 11th Gen Core platforms, Samsung Neo QLED 8K TV, wireless adapters such as ASUS ROG Strix for high-performance networking and chipsets and modules; For more details, read: <https://www.wi-fi.org/beamcon/the-beacon/quarterly-update-wi-fi-6e-devices-driving-technology-innovation>

⁸⁹ <https://www.itic.org/news-events/news-releases/iti-cautions-fees-on-unlicensed-spectrum-would-harm-innovation-economic-growth>

⁹⁰ Federal Communications Commission, Types of Broadband Connections, 23 June 2014, <https://www.fcc.gov/general/types-broadband-connections>

⁹¹ <https://cis-india.org/telecom/unlicensed-spectrum-brief.pdf> and

<https://economictimes.indiatimes.com/industry/telecom/telecom-news/government-frees-spectrum-for-wifi-5g-services-in-5-ghz-band-from-licence/articleshow/66322128.cms?from=mdr>

⁹² <https://tra-ai.gov.in/sites/default/files/Broadband%3D17.04.2015.pdf>

⁹³ <https://www.brookings.edu/wp-content/uploads/2017/05/spectrum-policy-in-india8515.pdf>

⁹⁴ <https://www.rstreet.org/2021/11/04/r-street-comments-against-fees-on-the-unlicensed-spectrum/>

immense economic potential. As WiFi is expected to carry most IP global traffic by 2022, the need to focus on its proliferation is also critical.⁹⁵

Recommendations and the Way Forward

- It is necessary to undertake **evidence-based research** that addresses consumer use cases and the utility of unlicensed 6 GHz and 60 GHz spectrum bands from a consumer perspective.
- It may be a suitable time for TRAI to collaborate and conduct data analysis and evidence-based studies to assess the latest figures on the utilisation of the spectrum, especially against the backdrop of the pandemic. Not doing so may lead to unintended adverse consequences on consumer demands and the entire digital economy. There is a need to continuously **assess the spectrum capacity, utilisation status, and requirements as per current and predicted consumer needs**.
- Availability of spectrum may significantly contribute to bolstering the PM-WANI scheme.
- International collaboration with countries and multilateral organisations in R&D and spectrum management is essential.
- There is a need for **periodic interactions, consultation, and engagement** with key stakeholders of the ecosystem such as civil society, innovators, consumer organisations, consumer groups, academia, industry associations, etc. by the government to analyse the current demands of the society.
- An updated version of the Telecom Policy and National Digital Communications Policy may be necessary to consider the **emergence of different new technologies** and increased need since the onset of the pandemic.

This Briefing Paper is authored by Vidushi Sinha, Senior Research Associate, CUTS International. The author would like to thank Kapil Gupta, Assistant Policy Analyst, CUTS International for his constant encouragement, review and inputs on this paper.

© CUTS International 2021. This Briefing Paper is published by CUTS Centre for Competition, Investment & Economic Regulation (CUTS CCIER), D-217, Bhaskar Marg, Bani Park, Jaipur 302 016, India. Ph: +91.141.228 2821, Fx: +91.141.228 2485, E-mail: c-cier@cuts.org, Web: www.cuts-ccier.org.
Also at Delhi, Calcutta and Chittorgarh (India); Lusaka (Zambia); Nairobi (Kenya); Accra (Ghana); Hanoi (Vietnam); Geneva (Switzerland); and Washington DC (USA).

February, 2022

⁹⁵ Kaveh Pahlavan, Prashant Krishnamurthy, Evolution and Impact of WiFi Technology and Applications: A Historical Perspective, International Journal of Wireless Information Networks, 28, 3-19, 19 November 2020, <https://link.springer.com/article/10.1007/s10776-020-00501-8>