Examining Wi-Fi 6E for India

An International Perspective

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1. Introduction

The 21st century has witnessed several revolutionary advances in digital technology.[1] This has led to the global need for universal and meaningful connectivity,[2] as a new standard for internet access.[3] Access to high-speed internet has been found to be crucial for services such as Work from Home (WfH), e-learning,[4] healthcare services,[5] and Ultra High Definition (UHD) video consumption, among others. High-speed connectivity required for these services can be accessed through Wi-Fi.

1 Artificial Intelligence (AI), Internet of Things (IoT), Augmented Reality, Virtual Reality, cloud computing, among others and also include technological fusions like AI and IoT, which are increasingly becoming mainstream. Available at: https://www.weforum.org/agenda/2021/03/ai-is-fusing-with-the-internet-of-things-to-create-new-technology-innovations/

2 Universal and meaningful connectivity: The new imperative. Available at: https://www.itu.int/itu-d/reports/statistics/2022/05/29/gcr-chapter-1/

3 Meaningful Connectivity: A New Standard for Internet Access. Available at: https://www.ictworks Meaningful Connectivity.org/meaningful-connectivity-a-new-standard-for-internet-access/#.Y3vfPnZBzIU

4 COVID-19 A wake-up call for Indian Internet Service Providers. Available at: https://www.igauge.in/admin/uploaded/report/files/QSIGAUGECOVIDISPReportApril2020_1606732097.pdf

5 High-speed internet offers key connection to health, but millions lack it. Available at: https://www.heart.org/en/news/2020/08/05/high-speed-internet-offers-key-connection-to-health-but-millions-lack-it

Why Wi-Fi

Studies on Wi-Fi indicate its inherent strengths, such as its unlicensed spectrum operation, affordable performance, ease of use, self-deployment, etc. and ability to support advanced use cases. The role of Wi-Fi became crucial in mitigating the socio-economic disruption caused due to the Covid-19 pandemic.[6] Accordingly, globally, the policy landscape is recognising the value and benefits that Wi-Fi brings to the table on different parameters such as speed, quality of service, and access, among others.

Recent studies have also highlighted the economic value of Wi-Fi and its role in improving economic resiliency as a key driver of digital resilience and innovation.[7] While Wi-Fi is helping in connecting the unconnected and bridging the digital divide; however, the goal of universal and meaningful connectivity for all is yet to be achieved. Despite all efforts, 2.9 billion people remain unconnected.[8]

To accelerate progress towards universal and meaningful connectivity, expanding Wi-Fi is necessary to eliminate the remaining connectivity gaps and improve the quality of digital connectivity.[9]

Many countries have adopted one solution in this regard: to make the 6 GHz spectrum band available for Wi-Fi 6E[10].[11] Recognising the multiple benefits of Wi-Fi 6E, several countries have made Wi-Fi 6E available (details tabulated in annexure 1).[12] Additionally, certain countries have partially made the 6 GHz band available for Wi-Fi 6E (details tabulated in annexure 2).[13] Many are deliberating on the subject (details tabulated in annexure 3).[14] These have been given in the Figure 1.

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6 COVID-19 AND THE ECONOMIC VALUE OF Wi-Fi. Available at: https://www.wi-fi.org/download.php?file=/sites/default/files/private/COVID-19_Economic_Value_Wi-Fi_202012.pdf

7 *Ibid*

8 CC White Paper on Delivering Universal Meaningful Connectivity. Available at: https://iccwbo.org/publication/icc-white-paper-on-delivering-universal-meaningful-connectivity/

9 Accelerating progress towards universal and meaningful connectivity. Available at: https://www.itu.int/itu-d/reports/statistics/2022/05/30/gcr-chapter-3/

10 Wi-Fi 6E is the name of the standard in which connected devices shall operate in the 6 GHz band. The 'E' in Wi-Fi 6E stands for the term 'extended', since an extended pristine 1200 MHz bandwidth is available in the 6 GHz band.

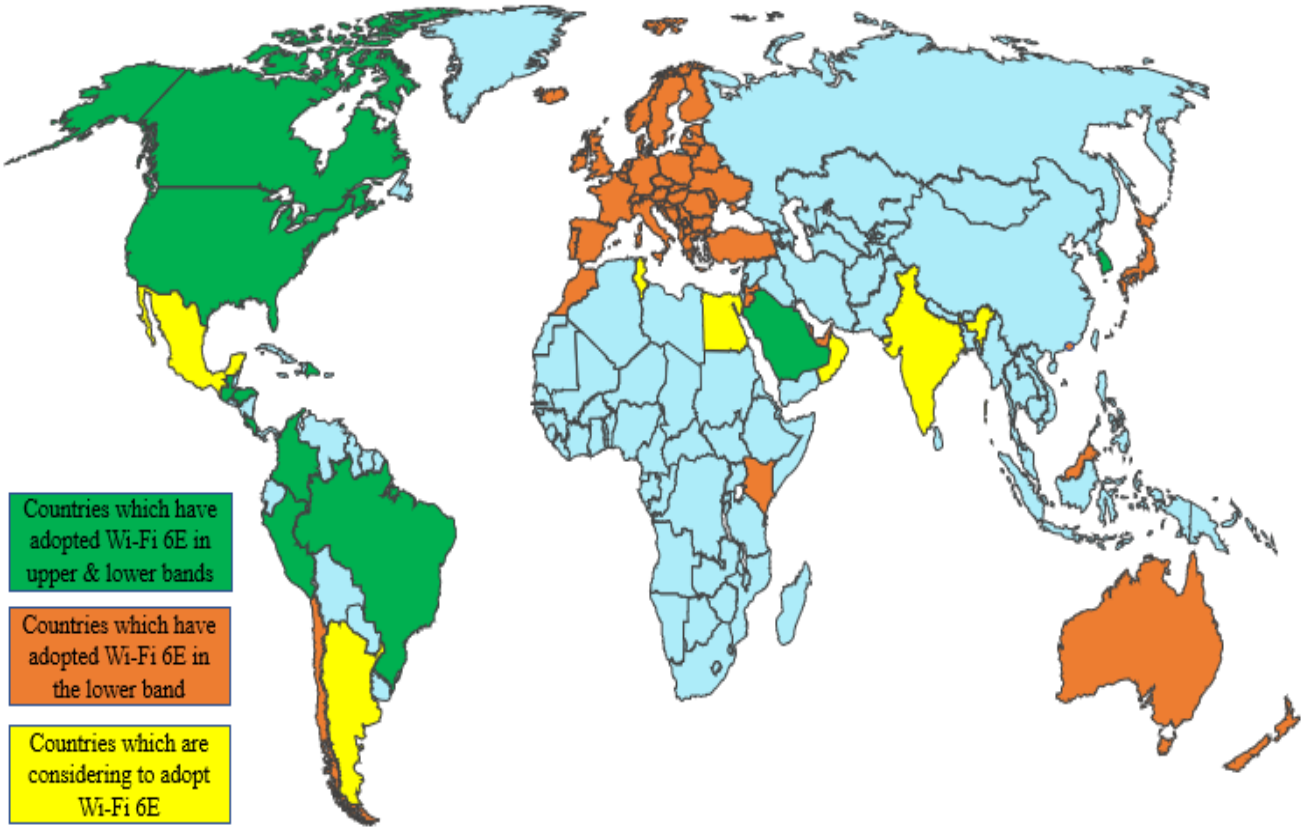
11 Policy and regulatory strategies that drive digital transformation. Available at: https://www.itu.int/itu-d/reports/statistics/2022/05/30/gcr-chapter-7/

12 Apart from the countries mentioned in the annexure, countries like Dominican Republic, Guatemala, Honduras, and Costa Rica have fully made available the Wi-Fi 6E. Available at https://www.wi-fi.org/countries-enabling-wi-fi-in-6-ghz-wi-fi-6e Last accessed on 27.12.2022.

13 Apart from the countries mentioned in the annexure, other countries like Turkey, Switzerland, Norway, Malaysia, Liechtenstein, Kenya, Jordan, Iceland and Chile have also partially made available the 6 GHz band for unlicensed use. Available at https://www.wi-fi.org/countries-enabling-wi-fi-in-6-ghz-wi-fi-6e Last accessed on 27.12.2022.

14 *Ibid.*

Figure 1: Global Developments around Wi-Fi 6E



The Evolution of Wi-Fi to Reach 6E

The original Wi-Fi standard was called the IEEE 802.11 standard. After being first released for consumers in 1997, the standards continually evolved with new technological capabilities and upgrades to the technology.[15] The Wi-Fi 4 standard operated on both the 2.4 GHz and 5 GHz spectrum bands, and Wi-Fi 5 only uses bands in the 5 GHz spectrum band. The currently used Wi-Fi 6, optimised the transmission frequencies of both 2.4 GHz and 5 GHz bands.[16] Wi-Fi 6E is the name of the standard in which connected devices shall operate in the 6 GHz band. The key differences between Wi-Fi 6 and 6E have been tabulated below.

[15] The evolution of Wi-Fi standards: a look at 802.11a/b/g/n/ac/ax. Available at: https://www.actiontec.com/evolution-wi-fi-standards-look-802-11abgnac/

[16] Wi-Fi 6 offers better 2.4 GHz and 5 GHz bands spectrum support. Wi-Fi 6 makes the edges of the network more navigable and the range feels larger as a consequence of the stability.

Figure 2: Difference between Wi-Fi 6 and Wi-Fi 6E

Parameters	Wi-Fi 6	Wi-Fi 6E
Band	2.4 GHz and 5 GHz bands.	6 GHz band.
Backward compatible	Yes, but the experience might not be optimal if working with incompatible devices.	Not backward compatible and has expensive hardware.
Availability	Already featured prominently in most of the latest smartphones, laptops, and routers.	There are very few devices[17] currently equipped with the Wi-Fi 6E standard.
Benefits & Challenges	It enables more devices to operate simultaneously on the same Wi-Fi channel, improving the wireless network's efficiency, latency, and data throughput.[18] While Wi-Fi 6 is designed to improve the overall performance and reliability of Wi-Fi networks, individual consumer devices will also see wireless speed gains. A lot of the new computational intelligence behind Wi-Fi 6 is devoted to handling streaming to multiple gadgets at once. It is a Wi-Fi for a world crowded with mobile gadgets, Internet of Things (IoT) devices, and connected equipment. It will also support WPA3, a new security standard that offers more individualised encryption options.[19]	The 'E' in Wi-Fi 6E refers to the extended spectrum band offered by the 6 GHz band. With the density of Wi-Fi devices and neighbouring networks increasing dramatically, Wi-Fi 6E provides pristine spectrum to maintain a great user experience. Unlike existing Wi-Fi channels, Wi-Fi 6E channels do not overlap or cause interference. It also reduces battery drain, courtesy of TWT (Target Wake Time). It brings Wi-Fi improvements to the 6 GHz band, though the top speed of Wi-Fi at 5 GHz and 6 GHz is the same – 9.6 Gbps. However, there will be four times more bandwidth, ultimately helping devices get higher-speed internet. However, higher frequencies have more difficulty penetrating solid walls and floors. Also, Wi-Fi 6E has a shorter range than Wi-Fi 6.[20]

[17] However, it is noted that the number of Wi-Fi 6E capable devices and routers are steadily increasing. 'Number of Wi-Fi 6E-capable devices and routers closing in on 200 types and models'. Available at: https://wifinowglobal.com/news-and-blog/number-of-wi-fi-6e-capable-devices-and-routers-closing-in-on-200-types-and-models/

[18] Network throughput refers to how much data can be transferred from source to destination within a given timeframe. Throughput measures how many packets arrive at their destinations successfully. For the most part, throughput capacity is measured in bits per second, but it can also be measured in data per second. Available at: https://www.dnsstuff.com/network-throughput-bandwidth#what-is-throughput-in-networking (last accessed on 28 December 2022)

[19] Wi-Fi 6 Will Be Here Soon. What Is It? Available at: https://www.wired.com/story/what-is-wi-fi-6/

[20] *Ibid*

With these benefits and international trends, India must analyse such issues and make appropriate policy decisions (s) on the 6 GHz band.

2. Analysis

In light of the above, analysed below is the contextual background on the current scenario prevailing in India, regarding the consideration of Wi-Fi 6E, along with common trends and factors considered by different countries while making Wi-Fi 6E available.

The Indian Context

India has the second highest internet users in the world, after China. As of January 2020, India has over 687.6 million users.[21] Also, in the last decade itself, India's mobile traffic share increased from 2 to 21 percent,[22] with estimates suggesting that total mobile subscriptions would increase to 9.2 billion by 2028.[23] Further, this number is likely to increase even further, with the Government of India's (GoI's) commitment to bolster the connectivity potential in India and bridge the digital divide.

Recognising the potential of Wi-Fi, GoI came up with the Prime Minister Wi-Fi Access Network Interface (PM-WANI) scheme to elevate wireless internet connectivity in India.[24] It was observed that exploring the opening up of additional bands for Wi-Fi use would be necessary, Considering the evolving use cases and data demand.[25] In this regard, the 6 GHz band is gradually being identified as the appropriate band for licence-exempt or unlicensed use.

GoI has also made targeted efforts to learn about the 6 GHz band, by setting up a Research and Development (R&D) institution, the Society for Applied Microwave Electronics Engineering and Research (SAMEER), that *has been instrumental in developing the critical deployable hardware for both sub 6 GHz and mmWave 5G solutions.*[26]

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21 India Is Predicted To See 1.5 Billion Internet Users By 2040: What Impact Will It Have On Our Economy? Available at: https://news.abplive.com/india-at-2047/india-internet-1-5-billion-users-2040-impact-economy-sectors-agriculture-digitisation-world-bank-mackinsey-1554493

22 India, China corner nearly 50% of global traffic. Available at: https://www.communicationstoday.co.in/india-china-corner-nearly-50-of-global-mobile-traffic/

23 *Ibid*

24 PM- WANI Wifi Scheme | PM Wifi Access Network Interface. Available at: https://waniwifi.in/

25 Role & Importance of Next Generation Wi-Fi Technologies in Acceleration of Digital Transformation. Available at: 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

26 Society for Applied Microwave Electronics Engineering and Research (SAMEER). Available at: https://www.meity.gov.in/content/sameer

Experts have opined that the current unlicensed spectrum bands primarily being operated in India, i.e., 2.4 GHz and 5 GHz are congested and overcrowded.[27] Though, the Telecom Regulatory Authority of India (TRAI) in its Recommendations on 'Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed', stated that the existing spectrum bands for Wi-Fi, i.e., 2.4 GHz and 5 GHz have still not been fully utilised.[28]

The National Digital Communications Policy, 2018 envisages a 'Connect India' mission, the goals for which were meant to be met by 2022. The policy specified '*recognising spectrum as a key resource for the public benefit to achieve India's socio-economic goals, ensure transparency and optimise availability'* as a strategy. To meet the same, it mentioned making adequate spectrum available for the new broadband era through light-touch licensing/ de-licensing of spectrum for broadband proliferation.[29]

An increase in internet consumption was also observed in India when a lockdown was announced in the country due to the COVID-19 pandemic. Post-pandemic, a 30 percent increase in data consumption was witnessed. An example of the unpreparedness of Indian internet infrastructure can be observed when an industry body wrote to Over-The-Top (OTT) service providers to downsize their content so that data consumption increases at a lower rate.

Furthermore, with the new sub-variant BF.7 of Omicron already in India, an increase in internet consumption is anticipated, which further strengthens the case for Wi-Fi 6E.

Merits identified by different countries

As different countries are moving towards adopting Wi-Fi 6E, they have relied on different rationales for their own countries. These have been discussed below.

- Increased reliance during COVID-19

  The COVID-19 pandemic increased people's reliance on the digital world. Due to the pandemic, an unprecedented number of people were forced to adapt to digital technologies, further increasing internet consumption, connected devices, and, thus, congestion in existing bands. As discussed above, even in India there was an increase in internet consumption due to the COVID-19 pandemic. With this background, several countries emphasised that the onset of the pandemic was one of the reason for making the 6 GHz band available for unlicensed use. Accordingly, countries like Canada, the United Kingdom (UK), European Union (EU), Japan, New Zealand and United Arab Emirates (UAE)

[27] Consultation Paper on Proliferation of Broadband Through Public Wi-Fi Networks, Consultation Paper No. 14/2016. Available at: https://www.trai.gov.in/sites/default/files/201608260616254662529Wi-Fi_Alliance.pdf

[28] ISPAI response to TRAI Consultation Paper on "Auction of Spectrum in frequency bands identified for IMT/5G". Available at: https://trai.gov.in/sites/default/files/ISPAI_11012022.pdf

[29] National Digital Communications Policy 2018. Available at: https://dot.gov.in/sites/default/files/EnglishPolicy-NDCP.pdf

explicitly stated the COVID-19 pandemic was a reason for enabling Wi-Fi 6E in their respective countries.

- Growth in demand for wireless broadband and Increase in internet consumption

  The increase in data consumption has led to a rise in demand for wireless broadband. In India, between February and April 2021, there was an estimated 50 to 60 percent increase in broadband data consumption due to the rise in dependency on internet connectivity at home.[30] The Federal Communications Commissions' Report and Order[31] mentioned an increase in demand for wireless broadband in the United States of America (USA) as one of the reasons behind making the 1200 MHz of the spectrum of the 6 GHz band available for unlicensed use. The report emphasised the projection of an increase in mobile internet consumption by two folds. Another report further suggested that 59 percent of mobile data traffic will be offloaded to Wi-Fi by 2022. Countries like Japan, UAE, Europe, Colombia, etc. mentioned increase in mobile internet consumption as a reason while considering Wi-Fi 6E.

- Quality of Service

  Increase in reliance on internet has simultaneously led to high congestion in the existing 2.4 GHz and 5GHz band, that further causes high latency, lower internet speed, high power consumption by devices and disrupts multiple access experience. Thus leading to overall deterioration in quality of service. As Wi-Fi 6E is not backwards compatible, it will create low congestion and reduce the load on existing bands. The Wi-Fi 6E addresses the issue of congestion caused by multiple devices thus leading to better multiple access experience and better quality of service. Many countries like the USA, Canada, Peru, the UK, Australia, the UAE, Hong Kong, New Zealand, Qatar and others have explicitly mentioned existing congestion in the 2.4 GHz and 5 GHz band as a factor making the spectrum in the 6 GHz band available for Wi-Fi. While Oman is still considering enabling Wi-Fi 6E, its "Consultation Paper on the Use of the 6 GHz Frequency Band for Wi-Fi Technology" discusses the issues of latency and speed, and further highlights the merit of Wi-Fi 6E in providing high-speed internet in congested areas. Brazil has stated that Wi-Fi 6E leads to better multiple access experience. The Annexures reveal that "high speed" or "low latency" is considered by almost all jurisdictions as a reason to move towards Wi-Fi 6E. This builds a case for exploring the possibility of enabling Wi-Fi 6E in India.

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30 Covid restrictions push up demand for mobile data, home WiFi. Available at: https://economictimes.indiatimes.com/tech/technology/covid-restrictions-push-up-demand-for-mobile-data-home-wifi/articleshow/82268616.cms

31 FCC- Unlicensed Use of the 6 GHz Band Report and Order and Further Notice of Proposed Rulemaking ET Docket No. 18-295; GN Docket No. 17-183. Available at: https://docs.fcc.gov/public/attachments/DOC-363490A1.pdf

- Digital divide and bolstering rural connectivity

  Increasing reliance on technology fuels risks for people to miss out on its opportunities due to the existing digital divide.[32] Similarly, due to COVID-19, the world has also increased reliance on being digitally connected and people who are away from digital technologies have been victims of this new inequality. The case in India can be understood from the National Family Health Survey 2019–21 (NFHS) report,[33] which indicates that only 51.8 percent of women in urban areas have ever used the internet compared to 72.5 percent of men. Only 24.6 percent of women in rural areas have used the internet compared to 48.7 percent of men. This highlights the digital divide in India based on geographic area and gender. Countries like USA and Canada have stated that the introduction of Wi-Fi 6E will promote connectivity among people, focusing on rural and underserved areas, thereby increasing rural connectivity. This shows the existence of a digital divide even in one of the most developed nations and the possible role of Wi-Fi 6E in overcoming the same. Accordingly, India may have merit in exploring Wi-Fi 6E to bridge such digital divides. Notably, reports by industry bodies[34] have highlighted the issue of last-mile connectivity, especially in the case of high-speed data, and further considered unlicensed spectrum as a cost-effective mechanism to resolve this issue.

- In line with new emerging technologies/advanced use cases/ remote working, telemedicine, online learning, gaming, and virtual reality

  Post the pandemic, there has been an increase in remote working, gaming, video streaming, telemedicine, e-learning, etc. Furthermore, advanced and evolving uses like Augmented Reality (AR) and Virtual Reality (VR) have also been bolstered recently. These developments have led to the creation of business models around them, thus increasing the need for quality internet connection. Countries like Europe, Saudi Arabia, United Arab Emirates, Canada, Qatar, Europe and others have stated the above factors to be drivers in the adopting 6E.

- Economic Development

[32] Gap between individuals, households, businesses, and geographic areas at different socio-economic levels about both their opportunities to access information and communication technologies (ICTs) and to their use of the Internet for a wide variety of activities. Available at https://stats.oecd.org/glossary/detail.asp?ID=4719

[33] Ministry of Health and Family Welfare- National Family Health Survey – 5 2019-21. Available at: http://rchiips.org/nfhs/NFHS-5_FCTS/India.pdf

[34] "The Economic Value of Wi-Fi Spectrum for India". Available at: https://broadbandindiaforum.com/wp-content/uploads/2021/06/The-Economic-Value-of-Wi-Fi-Spectrum-for-India-online-19-MAY-2021-accessible.pdf

Reports indicate that the internet accounted for over 21 percent of the GDP growth in mature economies over the past five years.[35] The global economic value of Wi-Fi is estimated at more than US$3.3 trillion; by 2025, this value is expected to grow to nearly $5 trillion.[36] Recent studies have also highlighted the role of Wi-Fi in improving economic resiliency and as a key driver of digital resilience and innovation.[37] Further, in India, Wi-Fi in these unlicensed bands can generate up to INR 12.7 lakh crore economic value.[38]

A recent report states that the economic value of Wi-Fi in India's considered unlicensed spectrum bands for 2025 is INR12,69,998 crore (for GDP at current prices), which accounts for nearly 6 percent of the projected GDP in 2025.[39] Further, it is projected that Wi-Fi 6E will contribute 9.5 percent of the Total Economic Value in 2025.[40]

- Wi-Fi 6E complements 5G network

  As per the Communications Regulatory Authority of Qatar, the introduction of Wi-Fi 6E will support the mobile telecom market as a complementary technology to the (5G) Networks.[41] In an interview conducted by Wi-Fi Alliance[42], Mohammad Al Janoobi, General Manager of Radio Spectrum Planning at CITC (Saudi Arabia) stated that Wi-Fi is a key facilitator for 5G networks as users depend on Wi-Fi to offload and explore the full capabilities of 5G. In a similar fashion, the recent launch of 5G in India can further be complemented by the introduction of Wi-Fi 6E in India as well.

3. Conclusion

India's internet-connected population is bound to increase in line with year-on-year growth. This is especially true in a post-COVID world, wherein reliance on high-speed internet enabled through Wi-Fi has become the new normal for various existing and evolving use cases.

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35 McKinsey Global Institute The great transformer: The impact of the Internet on economic growth and prosperity. Available at: https://www.mckinsey.com/~/media/mckinsey/industries/technology%20media%20and%20telecommunications/high%20tech/our%20insights/the%20great%20transformer/mgi_impact_of_internet_on_economic_growth.pdf

36 Discover Wi-Fi - Value of Wi-Fi. Available at: https://www.wi-fi.org/discover-wi-fi/value-of-wi-fi

37 Supra Note 6

38 WiFi in unlicensed frequency bands can generate Rs 12.7 lah crore economic value. Available at: https://telecom.economictimes.indiatimes.com/news/wifi-in-unlicensed-frequency-bands-can-generate-rs-12-7-lah-crore-economic-value-bif/82728076

39 Supra Note 35

40 *Ibid*

41 CRA Issues a Class License related to Wi-Fi 6E. Available at: https://www.cra.gov.qa/en/press-releases/cra-issues-a-class-license-related-to-wi-fi-6e

42 Wi-Fi 6E Insights Issue 5- April 2022. Available at: https://www.wi-fi.org/download.php?file=/sites/default/files/private/Wi-Fi_Alliance_Wi-Fi_6E_Insights_Newsletter_202204_0.pdf

As has been discussed above, a peak into the future reveals risks faced by Indian consumers concerning Wi-Fi network congestion and Wi-Fi channel overlaps, leading to insufficient quality of internet services on parameters of speed, reliability, power consumption, number of connected devices etc. These are not exclusive concerns or risks for Indian consumers but are faced by countries worldwide.

Accordingly, the world is moving towards making more spectrum available for Wi-Fi use, by opening up the 6 GHz band, i.e., enabling Wi-Fi 6E (either fully or partly). While its many merits and few demerits have been discussed above, the same need to be assessed deeply concerning the Indian context. This warrants an in-depth study examining the costs and benefits of enabling Wi-Fi 6E in India.

As has been highlighted above, many perspectives of many stakeholders (subject experts, telecom and internet service providers, industry associations, academicians etc.) have already been voiced in the public domain. However, a consumer perspective remains missing, despite them being the ultimate beneficiaries of Wi-Fi services. Therefore, Consumer Unity & Trust Society (CUTS) is presently conducting a consumer-facing, evidence-based study on the subject and will have in-depth interactions with consumers across the country. It would be imperative for the DoT, and the TRAI, to consider the study's findings while deliberating on whether or not to partly or fully open the 6 GHz band for Wi-Fi use.

Annexure 1

Countries made the Entire 1200 MHz Available for Wi-Fi 6E

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
United States of America (USA) The Foreign Communications Commission (FCC)	Through its Report and Order dated April 02, 2020,[43] the FCC made the entire 1200 MHz of spectrum in the 6 GHz band available for unlicensed use. **Device classification** Standard-Power (SP) and Low-Power Indoor (LPI).	While adopting the 6 GHz band, the FCC focused on the growth in demand for wireless broadband in USA. It is believed that the additional spectrum will complement the existing spectrum by easing any existing and anticipated congestion. In doing so, it is likely to help increase internet speed and bolster IoT. Additionally, this step is expected to advance the FCC's efforts to make broadband connectivity available to all Americans, especially those in rural and underserved areas.[44]
Canada Innovation, Science and Economic Development Canada (ISED)	ISED allowed unlicensed Wi-Fi use in the 5925-7125 MHz band on May 19, 2021. **Device classification** SP (Both indoor and outdoor), LPI (for both indoor and outdoor), and Very Low Power (VLP) in both indoor and outdoor	The ISED in its study "Spectrum Outlook 2018 to 2022"[45], predicted growth in demand for spectrum for unlicensed use majorly due to growth in the number of Wi-Fi and IoT devices. Further, it highlighted that unlicensed 1200 MHz spectrum would improve the Wi-Fi experience for homes and businesses and reduce congestion between nearby neighbours. It will also assist the ability of small wireless Internet service providers to offer cost-effective and enhanced broadband connectivity in rural and remote areas. This was considered useful in a post-Covid world. Furthermore, over 60 percent of mobile cellular data traffic is offloaded on Wi-Fi technology in Canada, which is further expected to increase in the coming years. The availability of the 6 GHz band helps existing commercial mobile operators to offload data traffic from exclusively licensed bands to this newly released unlicensed band. Additionally, it will foster innovation, make wireless

[43] FCC- Unlicensed Use of the 6 GHz Band Report and Order and Further Notice of Proposed Rulemaking ET Docket No. 18-295; GN Docket No. 17-183. Available at: https://docs.fcc.gov/public/attachments/DOC-363490A1.pdf

[44] *Ibid*

[45] ISED- Spectrum Outlook 2018 to 2022. Available at: https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/learn-more/key-documents/consultations/spectrum-outlook-2018-2022

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
		services affordable, and availability of wireless broadband Internet across the country.[46]
Brazil The National Telecommunication Agency (ANATEL)	On May 06, 2020, the ANATEL approved changes to its Restricted Radiation Radio Communications (RRRC) Equipment regulation to allow unlicensed use of 5925-7125 GHz frequency band.[47] **Device classification[48]:** LPI, and VLP devices across all 1200 MHz.	The ANATEL highlighted that Wi-Fi 6E would be beneficial as it will lead to higher transmission rates, better multiple access experience,[49] and lower energy consumption.[50] This is in line with new emerging technologies, which promise users better quality and diversity of services enjoyed through wireless devices. ANATEL believes that unlocking the full potential of Wi-Fi 6E will give consumers the best connectivity experience and alignment with international practices. This will lead to minimisation of costs of entry of products into the domestic market by avoiding specific customisation for the country (technical compliance assessment). As per a study cited by ANATEL in its press release, the availability of Wi-Fi 6E will unlock $ 163.35 billion for the Brazilian economy from 2020-30. Additionally, it is believed that it will position the Brazilian economy as a hub for developing new technologies and use cases, which will immensely benefit the local economy.[51]
South Korea Ministry of Science and Information Communication	The MSIT, on October 15, 2020, approved the use of the entire 1200 MHz	When MSIT performed Wi-Fi 6E testing, it found that wireless speeds could reach 2.1 Gbps, five times faster than the currently available Wi-Fi speeds.

46 ISED- Decision on the Technical and Policy Framework for Licence-Exempt Use in the 6 GHz Band. Available at: https://ised-isde.canada.ca/site/spectrum-management-telecommunications/en/spectrum-allocation/radio-local-area-network-rlan-6-ghz-band/decision-technical-and-policy-framework-licence-exempt-use-6-ghz-band

47 Anatel approves technical requirements for Wi-Fi 6E. Available at: https://www.gov.br/anatel/pt-br/assuntos/noticias/anatel-aprova-requisitos-tecnicos-para-wi-fi-6e

48 Massive win for Wi-Fi as Brazil releases full 6 GHz band to unlicensed use. Available at: https://wifinowglobal.com/news-and-blog/massive-win-for-wi-fi-as-brazil-releases-full-6-ghz-band-to-unlicensed-use/

49 OFDMA (orthogonal frequency-division multiple access) is a technology in Wi-Fi 6, which improves wireless network performance by establishing independently modulating sub-carriers within frequencies. This approach allows simultaneous transmissions to and from multiple clients. Available at: https://www.cisco.com/c/en/us/products/wireless/what-is-ofdma.html.

50 Supra Note 48

51 Supra Note 48

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
Technologies (MSIT)	spectrum in the 6GHz band for unlicensed use.[52] **Device classification** VLP and LPI	
Peru The Ministry of Transport and Communications (Ministerio de Transportes y Comunicaciones or MTC)	Peru's National Frequency Attribution Plan was modified to enable unlicensed access to the 1,200 MHz spectrum in the country's 6 GHz band (5925-7125 MHz). **Device classification** The device classifications of the 6 GHz band are still to be announced. However, it is confirmed that the band will be designated for indoor use only.	The MTC, in its working paper dated October 20, 2020,[53] mentioned that the state of the network, its ability to scale, and its connectivity in the country are fundamental to the well-being of citizens. Also, the pandemic made the MTC realise the need for significant capacity upgrades. It further stated that Wi-Fi carries higher internet traffic than any other wireless technology. The MTC believed that making the 6 GHz frequency band available for Wi-Fi would unleash the performance needed for future applications. It also emphasised that Wi-Fi 6E will significantly reduce congestion and allocate channels that do not overlap. Unlicensed access to the 6 GHz band is likely to add an economic value of US$15.83bn in GDP contribution, US$3.6bn in producer surplus to Peruvian enterprises, and US$3.40bn in consumer surplus to the Peruvian population over the next 10 years.[54]
Saudi Arabia The Communications and Information	The CITC, on April 01, 2021[55] announced the allocation of 1,200 MHz of	The CITC stated that the decision *"set the stage for the next decade of Wi-Fi advancements, with many applications for users in Saudi Arabia with many use cases*

[52] The Economic Value of Wi-Fi®: a global view (2021-2025). Available at: https://www.wi-fi.org/download.php?file=/sites/default/files/private/The_Economic_Value_of_Wi-Fi-A_Global_View_2021-2025_202109.pdf

[53] Working Paper- Proposed allocation of 3.5 GHz and 26 GHz frequency bands and identification of 6 GHz frequency band for the development of 5G and beyond digital services and technologies- Ministry of Transport and Communications. Available at: https://cdn.www.gob.pe/uploads/document/file/1722059/Documento%20de%20trabajo%20%28versi%C3%B3n%20Ingl%C3%A9s%29.pdf?v=1615343288

[54] DSA celebrates MTC's decision to enable unlicensed access to the 6 GHz band, bringing benefits for Peruvians and the economy. Available at: https://www.bnamericas.com/en/news/dsa-celebrates-mtcs-decision-to-enable-unlicensed-access-to-the-6-ghz-band-bringing-benefits-for-peruvians-and-the-economy

[55] Saudi Arabia launches first WiFi 6e network in Europe, Africa and Middle East region. Available at: https://www.cst.gov.sa/en/mediacenter/pressreleases/Pages/2021040101.aspx

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
Technology Commission (CITC)	the radio spectrum for Wi-Fi 6E.[56] **Device classification** SP and LPI	*such as telemedicine, schooling, and remote working."* Furthermore, it is believed that the decision will increase internet speed by five times for Wi-Fi users at home and in public areas such as airports and shopping malls.[57]
Colombia Ministry for the Information and Communications Technologies (MinTic) and Agencia Nacional del Espectro (ANE)[58]	Through its press release dated November 18, 2022, the MinTic announced the allocation of the entire 6 GHz band for unlicensed use.[59] **Device classification** Low Power Indoor (LPI)	The MinTic and ANE took this decision to promote the implementation of wireless access systems in indoor spaces and with low power. As per the DSA,[60] this decision of the MinTic and ANE will contribute to the Colombian economy with an amount up to US$58.93bn over the next 10 years. Furthermore, it will address the growing demand for high-speed internet due to e-learning, WfH, and other innovations such as AR and VR that require high-quality and real-time connectivity.

56 Saudi Arabia's plans for licence exempt 6 GHz access and spectrum sharing to foster innovation and digital empowerment, praises Dynamic Spectrum Alliance. Available at: https://www.realwire.com/releases/Saudi-Arabias-plans-for-licence-exempt-6-GHz-access-and-spectrum

57 Supra Note 56

58 The National Spectrum Agency is the entity of the Colombian State that is in charge of the functions of planning, attribution, surveillance and control of the radioelectric spectrum as an inalienable and imprescriptible public good subject to the management and control of the State (according to article 75 of the Political Constitution of Colombia), as well as providing specialized technical support for its proper administration to the Ministry of Information Technology and Communications - MinTiC.

59 The 6 GHz band will be fully used for unlicensed use. Available at: https://www.ane.gov.co/SitePages/det-noticias.aspx?p=414

60 6 GHz unlicensed access and Wi-Fi 6E to add billions to Colombia and Mexico economies, reveals Dynamic Spectrum Alliance. Available at: https://dynamicspectrumalliance.org/wp-content/uploads/2021/02/2021-02-Colombia-and-Mexico-6-GHz-PR-FINAL.pdf

Annexure 2

Countries Partially Opened the 6 GHz Band for Wi-Fi 6E

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
United Kingdom (UK) The Office of Communications (Ofcom)	The Ofcom, through its statement dated July 24, 2020,[61] released 500 MHz spectrum in the 6 GHz band with a frequency range of 5925-6425 MHz. The Ofcom is not considering opening the upper band as per its statement on December 06, 2022.[62] **Device classification** LPI VLP (outdoor)	Making the lower band of 6 GHz available may assist in solving the existing problems of slow speeds and congestion, especially in a post-Covid world.[63] Furthermore, releasing the lower 6 GHz band will meet the demand emanating from increasing reliance on Wi-Fi in the everyday life of UK's populace and the introduction of new applications demanding higher speed and better Wi-Fi.[64] Lastly, the 6 GHz band will make more channels available, increase capacity, and reduce latency and congestion in existing bands caused by large numbers of devices.[65]
Australia Australia Communications and Media Authority (ACMA)	ACMA has opened the lower band of 6 GHz band (5925-6425 MHz) for unlicensed use.[66] It was considering opening the upper 700Mhz of the 6 GHz band as well. However, it has been dropped for the time being.[67]	The ACMA believes that the availability of the 6 GHz band will solve the issues of congestion and lead to access to the latest technology for their citizens.[68]

61 Statement: Improving spectrum access for wifi – spectrum use in the 5 and 6 GHz bands. Available at: https://www.ofcom.org.uk/consultations-and-statements/category-2/improving-spectrum-access-for-wi-fi

62 Update on the 6 GHz band. Available at: https://www.ofcom.org.uk/spectrum/spectrum-management/6-ghz

63 https://www.ofcom.org.uk/__data/assets/pdf_file/0036/198927/6ghz-statement.pdf

64 Statement: Improving spectrum access for wifi – spectrum use in the 5 and 6 GHz bands. Available at: https://www.ofcom.org.uk/consultations-and-statements/category-2/improving-spectrum-access-for-wi-fi

65 Ofcom- Improving spectrum access for Wi-Fi Spectrum use in the 5 GHz and 6 GHz bands. Available at: https://www.ofcom.org.uk/__data/assets/pdf_file/0036/198927/6ghz-statement.pdf

66 Radiocommunications (Low Interference Potential Devices) Class Licence Variation 2022 (No. 1)- ACMA. Available at: https://www.legislation.gov.au/Details/F2022L00249/Explanatory%20Statement/Text

67 Proposed updates to the LIPD Class Licence for 6 GHz RLANs Outcomes paper- ACMA. Available at: https://www.acma.gov.au/sites/default/files/2022-03/Outcomes%20Paper_Proposed%20updates%20to%20the%20LIPD%20Class%20Licence%20for%206%20GHz%20RLANs.pdf

68 Proposed changes to LIPD class licence for 6GHz RLAN_consultation paper- ACMA. Available at: https://www.acma.gov.au/sites/default/files/2021-10/Proposed%20changes%20to%20LIPD%20class%20licence%20for%206GHz%20RLAN_consultation%20paper.docx

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
	Device classification: LPI and VLP	
Europe European Commission (EC)	480 MHz (5945-6425) spectrum in the 6 GHz band is available.[69] **Device classification:** LPI and VLP[70].	The EC's "Commission Implementing Decision - C (2021)4240" made available Wi-Fi 6E with the intent to tackle the increase in number and diversity of devices requiring Wi-Fi, connection speeds, and data traffic volumes.[71] The additional spectrum will cater to the need to achieve gigabit speeds, which is required to support many applications, including video-conferencing, downloading media, telemedicine, e-learning and gaming, AR and VR, which have gained further importance post the Covid-19 pandemic.[72] Furthermore, the EC believes that the lower 6 GHz frequency band will enhance wireless connectivity in the European Union, which would further benefit the internal market by generating large economies of scale for equipment manufacturers.
United Arab Emirates Telecommunications Regulatory Authority (TRA)	The TRA has made available 500 MHz of the 6 GHz (specifically 5925-6425 MHz) band for unlicensed use.[73] **Device classification:** LPI	The TRA realised the importance of a reliable Wi-Fi system due to the Covid-19 pandemic. Further, the increased demand for quality internet used in remote working, e-learning, and other data-intensive activities also raised the need for a reliable Wi-Fi system. Further, as mentioned in the press release, the adoption of Wi-Fi 6E is expected to resolve congestion issues in the 2.4 GHz and 5 GHz bands. The TRA also relied on the International Telecommunication Union (ITU) database, which states that 99 percent of homes in the

69 6GHz harmonisation decision: more spectrum available for better and faster Wi-Fi- EC. https://digital-strategy.ec.europa.eu/en/library/6ghz-harmonisation-decision-more-spectrum-available-better-and-faster-wi-fi

70 VLP provides mobile indoor or outdoor usage from mobile clients for use cases like small cell coverage, hotspots, etc. The maximum density it can operate in is 8 dBm/MHz PSD.

71 Supra Note 70

72 *Ibid*

73 The Telecommunications Regulatory Authority (TRA) adds additional 500 MHz of 6 GHz band for the Wi-Fi radio frequency spectrum- TRA. Available at: https://tdra.gov.ae/en/media/press-release/2020/the-telecommunications-regulatory-authority-tra-adds-additional-500-mhz-of-6-ghz

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
		UAE have internet access. Wi-Fi is essential in providing connectivity between users' routers and the increasing number of wireless consumer devices in their homes, and this further strengthened the need for Wi-Fi 6E.
Hong Kong Communications Authority (CA)	Through its report dated April 29, 2022, the CA enabled the 5925 – 6425 MHz band of the 6 GHz band for unlicensed use.[74] **Device classification** NA	The decision will provide consumers with a wider selection of high-end Wi-Fi products, which will support faster data rates, lower latency and higher performance. The CA also acknowledged the existing congestion in the 2.4 GHz and 5 GHz band in its report.[75]
Japan Ministry of Internal Affairs and Communications (MIAC)	The MIAC has allowed the use of 5925-6425 MHz of the 6 GHz band for unlicensed use. **Device classification:** LPI and VLP.[76]	The recent increase in WfH, and e-learning lead to a rise in demand for higher-speed and more stable communication services. This prompted the MIAC to take this decision.[77]
Morocco National Telecommunications Regulatory Agency (ANRT)	The ANRT, through its decision of May 2021, had adopted 5925-6425 MHz of the 6 GHz band for unlicensed use. **Device classification** Low-power and short-range radios	The ANRT believes that its decision will make it possible for consumers in Morocco to use the latest evolution of Wi-Fi standards, which will provide 40 percent higher speed than its predecessor. There is also an expectation of a reduction in latency for activities such as telecommuting, video conferencing, e-learning and AR and VR applications.[78]
New Zealand	The RSM has made the 5925 –	The RSM recognised the increased reliance on

74 Statement of the Communications Authority Creation of a Class Licence for Regulating the Use of and Trade in 6 GHz Devices for Wireless Local Area Network and Variation to the Class Licence for Provision of Public Wireless Local Area Network Services. Available at: https://www.coms-auth.hk/filemanager/statement/en/upload/591/ca_statement_6GHzDevices.pdf

75 Statement of the Communications Authority Creation of a Class Licence for Regulating the Use of and Trade in 6 GHz Devices for Wireless Local Area Network and Variation to the Class Licence for Provision of Public Wireless Local Area Network Services. Available at: https://www.coms-auth.hk/filemanager/statement/en/upload/591/ca_statement_6GHzDevices.pdf

76 Wi-Fi 6E (6GHz Band) Regulation is released by Japan Mic. Available at: https://www.sporton.com.tw/innerVisitContent.aspx?id=533&uid=219

77 Technical Requirements Relating to the Introduction of 6 GHz Band Wireless LAN. Available at: https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/pressrelease/2022/4/19_01.html

78 WiFi 6E is now authorized in Morocco- ANRT. Available at: https://www.anrt.ma/en/lagence/actualites/wifi-6e-now-authorized-morocco

Jurisdiction and Authority	Regulatory Policy surrounding 6 GHz band	Rationale
Radio Spectrum Management (RSM)	6425 MHz frequency band available for unlicensed use. **Device classification** LPI and VLP (Indoor and Outdoor)	Wi-Fi due to the COVID-19 pandemic, the need to address congestion in the 2.4 GHz and the 5 GHz, bands.[79] It also stated that Wi-Fi networks are important for IoT and Machine-to-Machine (M2M) connectivity,[80] which prompted their decision to unlicensed the lower 6 GHz band.
Qatar Communications Regulatory Authority (CRA)	The CRA had made available the 5925 - 6425 MHz of the 6 GHz band for unlicensed use.[81] **Device classification** LPI and Very Low Power (Indoor and Outdoor).[82]	The CRA believes that Wi-Fi 6E will address the congestion caused by multiple devices' connectivity to the same Wi-Fi hub. Furthermore, it assumes that consumers in Qatar will get high-speed and high-quality internet connectivity. Additionally, Wi-Fi 6E is set to enable different IoT applications and support innovative applications such as AR, VR, UHD video streaming etc. Furthermore, the introduction of Wi-Fi 6E is expected to support the mobile telecom market as a complementary technology to 5G Networks.[83]

79 WLAN use in the 6 GHz band Discussion document- RSM. Available at: https://www.rsm.govt.nz/assets/Uploads/documents/consultations/2021-wlan/wlan-use-in-the-6-ghz-band-discussion-document.pdf

80 WLAN use in the 6 GHz Band: Outcomes and Other Updates – RSM. Available at: https://www.rsm.govt.nz/projects-and-auctions/completed-projects/wlan-use-in-the-6-ghz-band/

81 Supra Note 42

82 Class License for the use of RLAN devices over 5925-6425 MHz Band. Available at: https://www.cra.gov.qa/en/document/class-license-for-the-use-of-rlan-devices-over-5925-6425-mhz-band

83 Supra Note 42

Annexure 3

Countries considering Wi-Fi 6E

Jurisdiction and Authority	Debate surrounding Wi-Fi 6E	Points of View
Oman The Telecommunications Regulatory Authority of Oman (TRA)	The TRA launched public consultations on releasing the lower part of the 6 GHz band for licence-exempt use.[84] **Device classification** Preferring to enable indoor use only.	The TRA, in its "Consultation Paper on the Use of the 6 GHz Frequency Band for Wi-Fi Technology" highlights several benefits of Wi-Fi 6E, such as supporting more Wi-Fi users simultaneously, even in very dense and congested environments, high speed and extremely low latency.[85]
Mexico Mexico Federal Telecommunications Institute (IFT)	The IFT, on November 05, 2020, started a public consultation on releasing 5925-7125 MHz band.[86] **Device classification** NA	The delay in action from the IFT is said to be depriving the Mexicans from a "historic" increase in internet speeds.[87]
Tunisia National Frequency Agency (ANF)	The ANF conducted a public consultation between September 15-October 30, 2021, to collect opinions of various interested parties on the future use of 6 GHz Wi-Fi in Tunisia.[88] The ANF is seeking opinions on whether to fully or partially make the 6GHz band available for unlicensed use.	The DSA submitted its comments to ANF by October 30, 2021,[89] under which it had outlined the benefits Wi-Fi 6E will bring to Tunisian citizens. The DSA has submitted that the introduction of Wi-Fi 6E will offload traffic from cellular 5G networks. Furthermore, the introduction of Wi-Fi 6E will lead achieve low latency and high throughput.

84 Consultation Paper on the Use of the 6 GHz Frequency Band for Wi-Fi Technology- TRA. Available at: https://www.tra.gov.om/En/DownloadFile.jsp?type=DocumentList&code=236

85 *Ibid*

86 Public Consultation for the Integration of the "Questionnaire on the frequency band 5925-7125 MHz". Available at: https://www.ift.org.mx/industria/consultas-publicas/consulta-publica-de-integracion-del-cuestionario-sobre-la-banda-de-frecuencias-5925-7125-mhz

87 Telecoms industry eager for Mexican regulator to adopt speedy Wi-Fi 6. Available at: https://www.reuters.com/technology/telecoms-industry-eager-mexican-regulator-adopt-speedy-wi-fi-6-2022-09-30/

88 Public Consultation Summary Notice on "The future use of 6 GHz Wi-Fi in Tunisia". Available at: http://www.anf.tn/index.php/fr/actualites/avis-de-synthese-de-consultation-publique-sur-lutilisation-future-de-wi-fi-6-ghz-en

89 DSA Comments to the ANF on the Public Consultation on the future utilization of Wi-Fi in the 6 GHz band in Tunisia. Available at: https://dynamicspectrumalliance.org/wp-content/uploads/2021/12/DSA-Comments-to-ANF-Tunisie-on-6-GHz-Band.pdf