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Telecom Regulatory Authority of India

Consultation Paper

On the

"Proliferation of Public Wi-Fi Networks in India"

New Delhi, India

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Tower F, NBCC World Trade Centre, Nauroji Nagar

New Delhi - 110029

"प्रभावी विनियम – सुगम संचार"

"Effective Regulation - Ease of Communication"

Written comments on the Consultation Paper are invited from the stakeholders by 25th May 2026, and counter-comments by 8th June 2026. The comments and counter-comments may be sent, preferably in electronic form, to Dr. Abdul Kayum, Advisor (BB&PA), TRAI at the email ID advbbpa@trai.gov.in with a copy to jtadvbbpa-1@trai.gov.in. Comments and counter-comments received from stakeholders will be posted on the TRAI's website (www.trai.gov.in).

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CONTENTS

LIST OF FIGURES

LIST OF TABLES

Chapter 1 – Introduction

A. Background

1.1 Broadband refers to high-speed internet access delivered through technologies such as fibre, Digital Subscriber Line (DSL), cable, 4G/5G, Wi-Fi and satellite. As per the notification by the Government of India, *Broadband is a data connection that is able to support interactive services including Internet access and has the capability of minimum 2 Mbps download speed to an individual subscriber from the point of presence of the service provider.*[1]. The availability, quality, and expansion of broadband infrastructure are foundational for achieving deeper, more meaningful internet penetration across the country.

1.2 Broadband has become a core component of digital infrastructure, comparable to electricity or transport networks in its enabling role. It supports digital transformation across sectors, including education, health, financial services, commerce, and governance. High-speed connectivity has expanded access to online learning, telemedicine, digital financial services, remote work, and a range of digital platforms, including e-commerce, digital media, and content distribution. By facilitating greater social and economic inclusion, broadband directly contributes to progress on the Sustainable Development Goals (SDGs), especially SDG 3 (health), SDG 4 (education), SDG 8 (decent work and growth), and SDG 9 (industry, innovation, and infrastructure).

1.3 Broadband has reshaped enterprise operations through digitisation of processes, e-commerce integration, online payments, digital compliance systems, and remote service delivery. These efficiencies reduce operating costs, expand market access—especially for Micro, Small and Medium Enterprises (MSMEs)—and facilitate the emergence of new digital-first business models. With rising smartphone penetration, 4G/5G adoption, and affordable

[1] https://egazette.gov.in/WriteReadData/2023/243333.pdf

data services, India's digital consumer base continues to expand, strengthening the demand side for online businesses.

1.4 India's e-commerce market is projected to reach USD 163 billion by 2026, supported by widespread Unified Payments Interface (UPI) usage, increasing online shoppers, and strong adoption in tier-2 and tier-3 cities[2]. However, only 20–25% of India's internet users currently shop online, compared to over 85% in mature digital markets, reflecting significant untapped potential[3]. Broader internet penetration, low-cost internet services and improved broadband access, particularly in rural and semi-urban areas, will be essential to unlock this demand[4].

1.5 The services sector contributes more than half of India's Gross Value Added (GVA) and drives significant export earnings[5], with the Information Technology and Business Process Management (IT-BPM) industry alone contributing nearly 10% of Gross Domestic Product (GDP) and maintaining double-digit growth[6]. India's global competitiveness in Information technology (IT), Information Technology enabled services (ITeS), and emerging digital services depends on reliable, high-speed broadband infrastructure. As digital trade, Artificial Intelligence (AI) enabled services, cloud operations, and remote delivery models expand, sustained broadband penetration will be essential to retain India's leadership in global digital value chains.

1.6 Apart from enabling digital inclusion for individuals and driving efficiency and growth across enterprises and the services sector, broadband connectivity is equally fundamental to effective governance and public service delivery. It

[2] https://www.ibef.org/industry/ecommerce

[3] https://m.economictimes.com/industry/services/retail/only-20-25-of-indias-850-mn-internet-users-shop-online-shows-untapped-potential-mckinsey-report/amp_articleshow/122944287.cms

[4] https://www.business-standard.com/industry/news/e-commerce-market-to-hit-325-billion-by-2030-rural-india-to-lead-growth-124042900284_1.html

[5] https://www.civilsdaily.com/news/invisible-exports-of-india

[6] https://www.ibef.org/industry/information-technology-india

underpins flagship national programmes such as Digital India, the Smart Cities Mission, Atmanirbhar Bharat, and large-scale digital skilling initiatives, and forms the backbone of India's Digital Public Infrastructure (DPI) ecosystem—including Aadhaar, UPI, DigiLocker, e-KYC, FASTag, the Account Aggregator framework, and Open Network for Digital Commerce (ONDC). High-quality broadband enables secure, interoperable, and real-time digital interactions between the Government, citizens, and businesses, supporting efficient delivery of public services such as Direct Benefit Transfers (DBT), digital land records, online grievance redressal, and welfare scheme monitoring. It also enhances transparency, accountability, and administrative efficiency, while enabling data-driven decision-making, cloud-based governance platforms, and integrated service delivery models. As public administration increasingly shifts towards digital-first approaches, sustained expansion of reliable broadband across urban, rural, and remote areas remains essential for inclusive governance, fiscal efficiency, and responsive public service delivery.

1.7 Broadband connectivity is critical for the effective adoption of AI and other emerging technologies. AI depends on fast, reliable, and low-latency networks to process large volumes of data and enable real-time decision-making. As AI-driven applications become more widespread—from automation and healthcare to smart cities and personalised services—the demand for high-capacity, resilient broadband infrastructure continues to grow. Strong connectivity is therefore essential to unlock the full potential of AI and ensure its widespread, inclusive use.

1.8 The discussions above highlight the significant socio-economic value of broadband expansion. However, realizing of these benefits depends critically on ensuring *inclusive* digital access. India's broadband strategy must simultaneously focus on widening coverage through infrastructure expansion and deepening usage by promoting meaningful adoption and advanced use cases. Urban areas, which already perform relatively well in terms of connectivity, require enhanced network capacity, improved quality of

experience, and encouragement of high-end applications such as Augmented Reality/Virtual Reality (AR/VR) and eXtended Reality (XR) platforms, high-definition video streaming, Internet of Things (IoT) systems, smart mobility solutions, AI and cloud- and edge-enabled services. Rural areas, on the other hand, require reliable connectivity, affordable services, and targeted measures to stimulate sustained adoption of broadband. In both contexts, a foundational requirement is the availability of adequate access technologies supported by robust backhaul infrastructure. Ensuring this technological readiness is essential for achieving the desired proliferation of broadband services across the country.

1.9 Broadband services in India are delivered through multiple technologies, including Fibre to the Home (FTTH), DSL, cable broadband, 4G/5G mobile networks and satellite. While each has distinct strengths, they differ in their performance, scalability, and cost structures. FTTH, as a fixed broadband technology, provides high reliability, assured bandwidth, and consistently superior speeds, along with very high network capacity and low latency, making it well-suited for data-intensive and real-time applications. It also supports multiple devices simultaneously and offers virtually unlimited data, making it ideal for homes, enterprises, and high-demand environments. In contrast, mobile broadband, while essential for wide-area mobility and personal connectivity, operates under capacity, speed and latency constraints, and typically exhibits high variability. It also faces challenges such as higher per-GB delivery costs, variable speeds, and congestion-sensitive performance, particularly in dense urban areas.

1.10 In this context, there is a need for an access layer that can efficiently bridge the performance advantages of fixed broadband with the flexibility of wireless connectivity, especially in high-density and multi-device environments. Within this ecosystem, Wi-Fi serves as a fixed wireless access layer, extending the benefits of fixed broadband without requiring individual wired connections to every device. Operating in unlicensed spectrum and backed by fixed broadband, Wi-Fi enables high-speed, low-cost, and scalable connectivity

suitable for dense urban areas, public spaces, educational institutions, enterprises, and underserved clusters. Public Wi-Fi (including Prime Minister's Wi-Fi Access Network Interface (PM-WANI)) and private Wi-Fi deployments together therefore represent a critical component of India's broadband architecture.

1.11 Private and Public Wi-Fi networks differ in their access models, ownership, authentication mechanisms, and typical use cases. A private Wi-Fi network is usually owned by an individual, household, or enterprise and is accessible only to authorised users with passwords, making it suitable for controlled environments such as homes, offices, and small businesses. In contrast, Public Wi-Fi is deployed by Government bodies, public institutions, or neutral host providers to offer open or semi-open internet access to the public in shared spaces. These networks rely on mechanisms such as captive portals, One-Time Password (OTP) -based login, or federated authentication and are designed to handle high user churn in locations such as railway stations, airports, markets, educational campuses, cafes, libraries, malls, and community hotspots. These hotspots provide broad coverage, enabling travellers, students, remote workers etc. to check their emails, browse the internet, avail digital services or stay connected without needing personal setups. In contrast to restricted private networks, it operates under open-access or shared-access models.

1.12 With evolving work patterns and lifestyles, Public Wi-Fi has become an essential infrastructure, providing a low-cost, reliable, high-capacity, and high-speed alternative, as well as acting as a redundancy layer for mobile broadband, thereby supporting ubiquitous, on-the-go connectivity for professional requirements (remote work, co-working spaces) and personal needs (streaming, gaming, communication). Public Wi-Fi also plays a critical role in delivering Government services, especially in underserved areas, thereby enabling broader digital inclusion. The rising demand for seamless connectivity across private and public environments has amplified the need for large-scale deployment of Public Wi-Fi networks.

1.13 Recognizing the critical importance of broadband proliferation, TRAI has, over the years, conducted several consultations and issued comprehensive recommendations. Notably, in 2017, TRAI recommended measures to accelerate broadband availability through Public Wi-Fi, which contributed to the development and eventual launch of the PM-WANI framework in 2020. PM-WANI introduced an unbundled architecture that enabled small entrepreneurs to operate as Public Data Offices (PDOs) without licensing barriers, thus encouraging participation by local entities. However, despite its potential, Public Wi-Fi proliferation has not achieved national targets. Some bottlenecks reported include low commercial viability for PDOs, under-utilization of hotspots, privacy and security concerns, and limited State-level /local body participation[7]. Meanwhile, in the global landscape, many viable models have been successfully deployed that have helped in the proliferation of Wi-Fi significantly, such as South Korea, European Union (EU), United Kingdom (UK), Singapore etc. Therefore, the current Public Wi-Fi ecosystem in India and its proliferation challenges underline the need for measures to expand India's Public Wi-Fi ecosystem and explore ways that can gain on experience from global trends for realising national connectivity goals.

B. Wi-Fi Technology: Overview and Evolution

1.14 Wi-Fi (Wireless Fidelity) is a wireless networking technology that allows devices such as smartphones, laptops, and IoT equipment to connect to the internet or local area networks using radio waves instead of wired connections. It is primarily governed by the IEEE 802.11 family of standards and coordinated globally by the Wi-Fi Alliance and ITU-R. Wi-Fi works on unlicensed spectrum bands (mainly 2.4 GHz, 5 GHz, and 6 GHz, with newer extensions to 7 GHz). The 2.4 GHz band provides wider coverage due to its longer propagation range but has bandwidth limitations. The 5 GHz band supports higher throughput and experiences comparatively lower congestion, making it suitable for dense

[7] https://internetfreedom.in/pm-wani-explainer/ , https://broadbandindiaforum.in/wp-content/uploads/2025/05/Indias-WiFi-gap-The-missing-link-to-digital-India_Article-by-TVR-in-VD_May25.pdf

environments. The 6 GHz band (Wi-Fi 6E) offers substantial additional spectrum for Wi-Fi, enabling multi-gigabit speeds and lower latency for advanced high-capacity applications.

1.15 Wi-Fi modulation has also progressed from Orthogonal Frequency Division Multiplexing (OFDM) in earlier standards such as 802.11a/g to more advanced techniques like Orthogonal Frequency Division Multiple Access (OFDMA) and Multi-User Multiple Input Multiple Output (MU-MIMO) in Wi-Fi 6 and Wi-Fi 7, enabling simultaneous multi-user communication and significantly improving overall network efficiency and speeds.[8] Wi-Fi security, encryption, and authentication have also evolved from Wired Equivalent Privacy (WEP- 1997) to Wi-Fi Protected Access (WPA-2018), with WPA3 compliance mandatory for all newly certified devices since July 2020. It provides stronger security through 192-bit encryption, protection against brute-force attacks, and individualized encryption for each user, even on open networks. A brief overview of Wi-Fi security protocol evolution is presented in the following table[9].

Table A: Overview of Wi-Fi security protocol evolution

Standard	WEP	WPA	WPA 2	WPA 3
Release year	1997	2003	2004	2018
Encryption	RC4	TKIP / RC4	AES-CCMP	AES-CCMP /AES-GCMP
Session Key	64 /128 bit	128 bit	128 bit	128/256 bit
Authentication	Open system, shared key	Pre-shared key	Pre-shared key	AES-CCMP /AES-GCMP

[8] **OFDM (Orthogonal Frequency Division Multiplexing)** is a modulation technique that divides a channel into multiple closely spaced subcarriers, improving robustness against interference and enabling efficient data transmission. **OFDMA (Orthogonal Frequency Division Multiple Access)** extends OFDM by allowing different subcarriers to be allocated to multiple users at the same time, thereby increasing spectral efficiency and reducing latency. **MU-MIMO (Multi-User Multiple Input Multiple Output)** further enhances multi-user performance by enabling an access point to transmit and receive data streams to and from multiple devices simultaneously, significantly improving throughput and overall network capacity compared to traditional OFDM-based systems.

[9] https://www.esecurityplanet.com/trends/the-best-security-for-wireless-networks/

Security Level	Very low	Low	Moderate	High
Weakness	Insecure encryption easily exploited by hackers	Weak encryption, compatibility issues	Vulnerable to key reinstallation attack (KRACK)	Complex deployment

1.16 The Wi-Fi technology operates on the IEEE 802.11 family of standards, which has progressively evolved from the original 802.11 released in 1997 to the more recent amendments such as 802.11ax (Wi-Fi 6/6E), extended to the 6 GHz band in 2021, and the latest 802.11be (Wi-Fi 7), adopted in 2024. The table below provides a summary of the major Wi-Fi standards and their evolution, highlighting their key technical features.

Table B: Wi-Fi standards and their evolution[10]

IEEE Standard	Year	Frequency Band	Max Speed	Channel Bandwidth	Key Features
802.11 (Wi-Fi 0)	1997	2.4 GHz	2 Mbps	20 MHz	Legacy Wi-Fi Standard
802.11b (Wi-Fi 1)	1999	2.4 GHz	11 Mbps	20 MHz	First mass-market adoption
802.11a (Wi-Fi 2)	1999	5 GHz	54 Mbps	20 MHz	Higher frequency, less interference
802.11g (Wi-Fi 3)	2003	2.4 GHz	54 Mbps	20 MHz	Compatible with 11b
802.11n (Wi-Fi 4)	2009	2.4 & 5 GHz	600 Mbps	20 / 40 MHz	MIMO introduced

[10] https://www.dell.com/support/contents/en-in/article/product-support/self-support-knowledgebase/networking-wifi-and-bluetooth/wi-fi-network-standards-overview#:~:text=Frequency%20Bands:%205%20GHz%20%7C%20Channel%20Width:,5%20(802.11ac)%20%7C%20Frequency%20Bands:%205%20GHz , https://standards.ieee.org/beyond-standards/the-evolution-of-wi-fi-technology-and-standards/ , https://www.researchgate.net/publication/384564672_The_Evolution_of_Wi-Fi_Standards_From_Wi-Fi_6_to_Wi-_Fi_7

802.11ac (Wi-Fi 5)	2013	5 GHz	3.5 Gbps	20 / 40 / 80 / 160 MHz	Multi-user (downlink MU-MIMO), beamforming
802.11ax (Wi-Fi 6)	2019	2.4 & 5 GHz	9.6 Gbps	20 / 40 / 80 / 160 MHz	Multi-user (uplink & downlink via OFDMA)
802.11ax 6E (Wi-Fi 6E)	2021	2.4 / 5 / 6 GHz	9.6 Gbps	20 / 40 / 80 / 160 MHz	Multi-user (more users due to wider spectrum)
802.11be (Wi-Fi 7)	2024	2.4 / 5 / 6 GHz	~46 Gbps	20 / 40 / 80 / 160 / 320 MHz	Wider channels, very high user density + multi-link operation

1.17 The introduction of 802.11ax 6E (Wi-Fi 6E) significantly enhanced Wi-Fi performance by extending Wi-Fi 6 into the 6 GHz band, providing 500-1,200 MHz of additional spectrum (varying across countries), wider 160 MHz channels, lower latency, and reduced interference from legacy devices. These improvements enable multi-gigabit speeds, better performance in dense environments, and stronger security through WPA3. Building on this, 802.11be (Wi-Fi 7) further advances throughput, capacity, and reliability with 320 MHz channels, 4096-QAM (Quadrature Amplitude Modulation), and Multi-Link Operation (MLO), allowing simultaneous use of multiple bands, enhanced MU-MIMO, and more deterministic low-latency communication, supporting emerging applications like AR/VR, cloud gaming, and industrial automation. Together, these standards are expected to improve user experience in high-density public environments, enhance quality of service for next-generation applications, and strengthen the resilience of digital infrastructure and smart city deployments. Looking ahead, Wi-Fi 8 and beyond are likely to integrate with 6G architectures, leveraging AI-driven optimisation, spectrum-sharing, and

energy-efficient designs to deliver more intelligent, adaptive, and sustainable wireless networks[11].

1.18 A Wi-Fi network operates through the coordinated functioning of key components that collectively enable seamless wireless connectivity. A simplified representation of how a Wi-Fi ecosystem functions is depicted in the figure below.

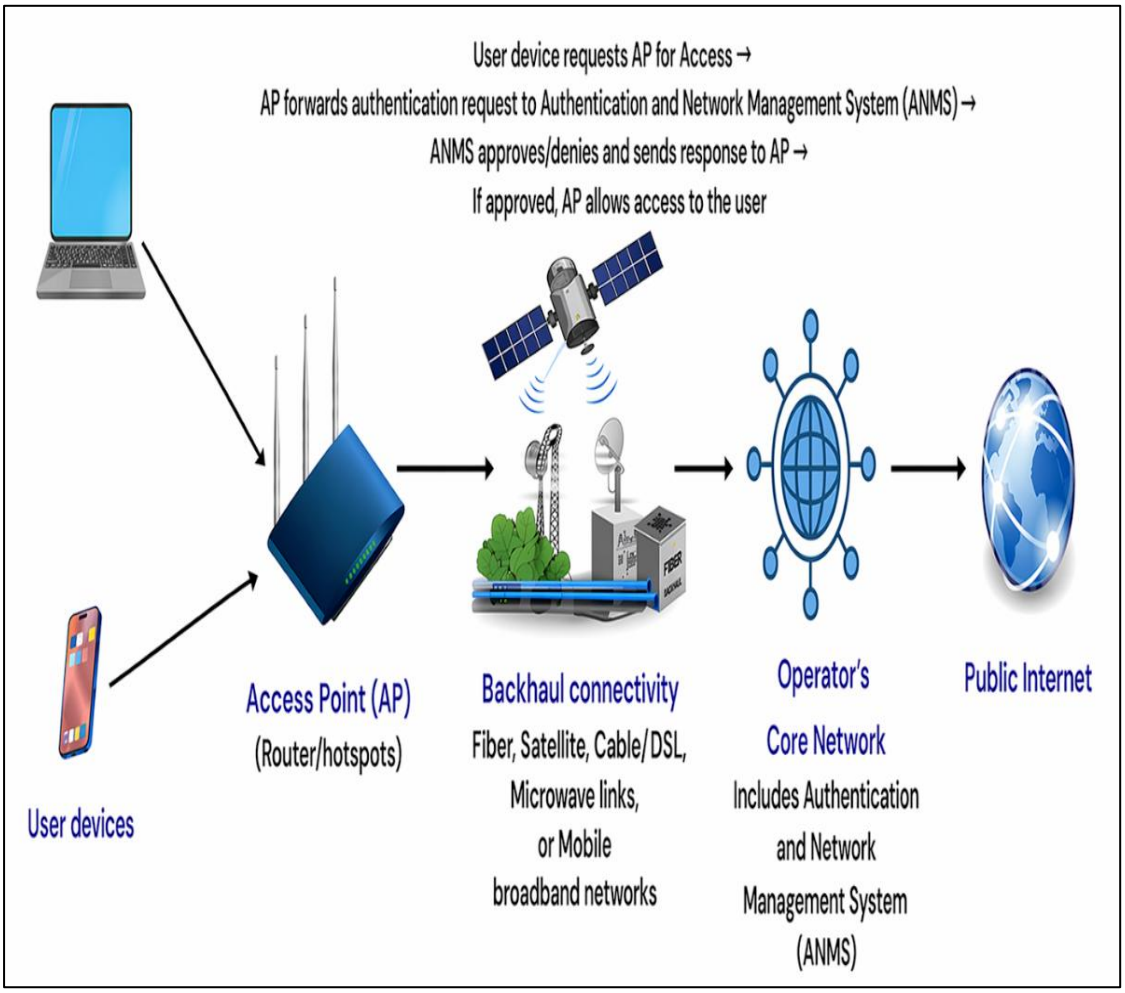


Figure 1.1: Wi-Fi ecosystem

User devices such as smartphones, laptops, and tablets act as clients that initiate requests for internet access and connect to Access Points (APs), which generate wireless coverage and serve as the immediate interface between

[11] https://www.itu.int/dms_pubrec/itu-r/rec/m/R-REC-M.2160-0-202311-I!!PDF-E.pdf , https://www.nevsemi.com/blog/what-is-wi-fi-8-and-why-it-matters-the-future-of-wireless-connectivity

users and the network. Each AP then forwards user traffic through a backhaul link—commonly provided via fibre, cable/DSL, microwave links, mobile broadband networks or satellite—which transports data to the telecom operator's core network. Within the core network, essential functions such as routing, authentication, billing, and quality-of-service management are carried out before the traffic is routed to the public internet. Throughout this process, Authentication and Network Management Systems (ANMS) ensure secure access, device authorisation, and efficient service provisioning. Together, these components deliver reliable, secure, and high-quality Wi-Fi connectivity across both public and private deployments. The following sections explore the technical concepts and policy aspects of Public Wi-Fi.

C. Public Wi-Fi: Concepts and Ecosystem

1.19 The principle behind the working of a Public Wi-Fi system is broadly similar to that of a private Wi-Fi setup, but differs significantly in mode of deployment. Public Wi-Fi systems are engineered to support a much larger, more dynamic user base and therefore rely on higher-capacity backhaul links to accommodate heavy traffic across multiple access points. In a typical Public Wi-Fi setup, a user device first connects to a nearby Wi-Fi Access Point (AP), which serves as the immediate access point for users within its coverage area. These access points are linked to a central Public Wi-Fi hotspot router that aggregates traffic from several such access points. The hotspot router is connected to the operator's core network through a backhaul link. When a user attempts to log in, the authentication request flows from the user device, through the access point and the Public Wi-Fi hotspot router, across the backhaul link, and finally to the operator's core network, where the authentication and network management system verifies the credentials. Once approved, the user is granted network access, and subsequent data travels along the same path toward the public internet. This layered structure with open or authenticated access mechanisms supported through suitable backhaul networks, along with inherent authentication frameworks and the network management system,

enables Public Wi-Fi systems to deliver secure, scalable, and reliable connectivity to large numbers of users across diverse public locations.

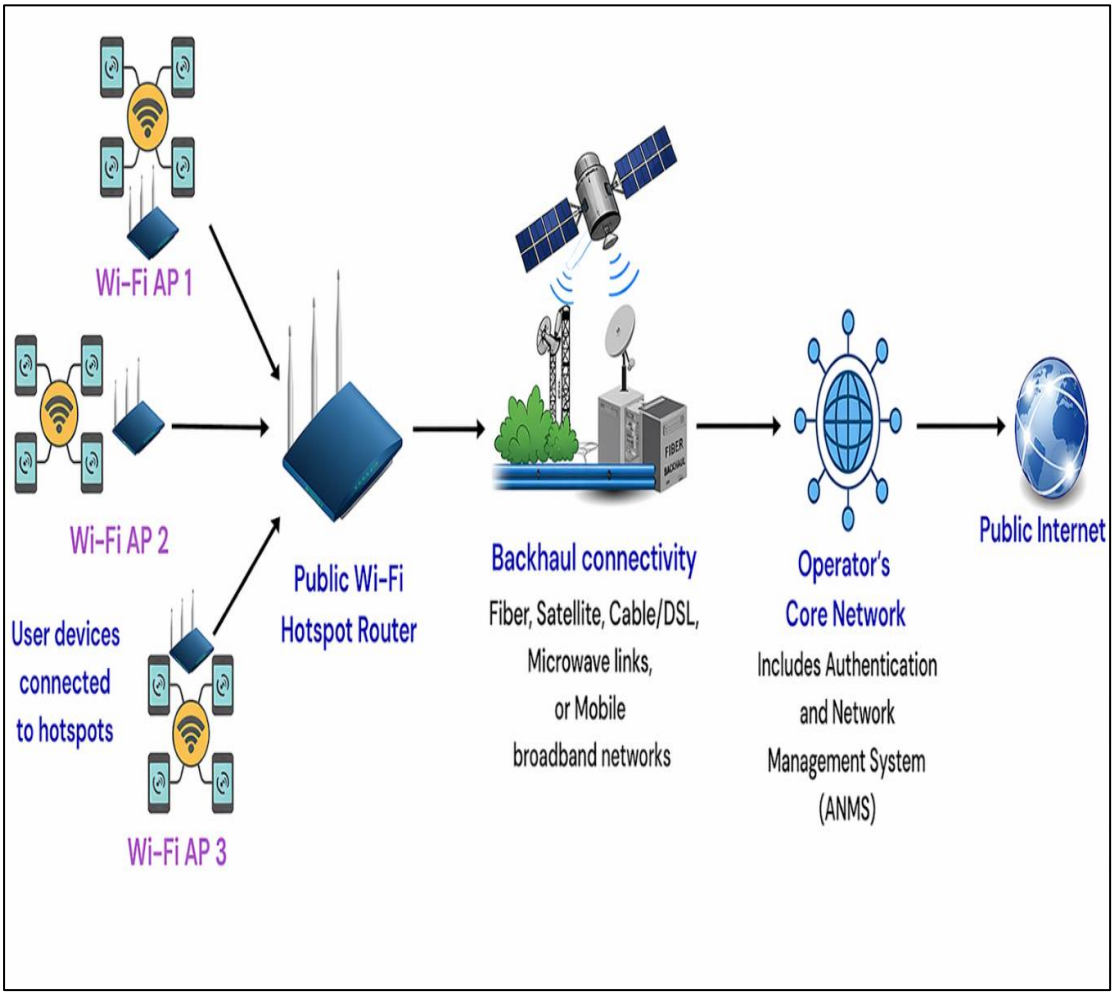


Figure 1.2: Public Wi-Fi ecosystem

1.20 A mature Public Wi-Fi ecosystem typically comprises multiple access points and associated hotspots that collectively enable seamless connectivity for users, whether stationary, mobile, or in transit. Depending on the scale, location, user density, and design requirements, different network topologies may be adopted for Public Wi-Fi deployment. In many indoor environments such as malls, railway stations, and airports, a star topology—where a central access point connects to multiple hotspots—is commonly used due to its simplicity and ease of management. The following image illustrates a star topology model in an airport.

Figure 1.3: Star-based Public Wi-Fi Deployment

For larger or more distributed environments such as university campuses, technology parks, or municipal city blocks, a tree topology may be preferred, with a hierarchical arrangement of access points linking users to the core network. The following figure illustrates a tree topology model within a university.

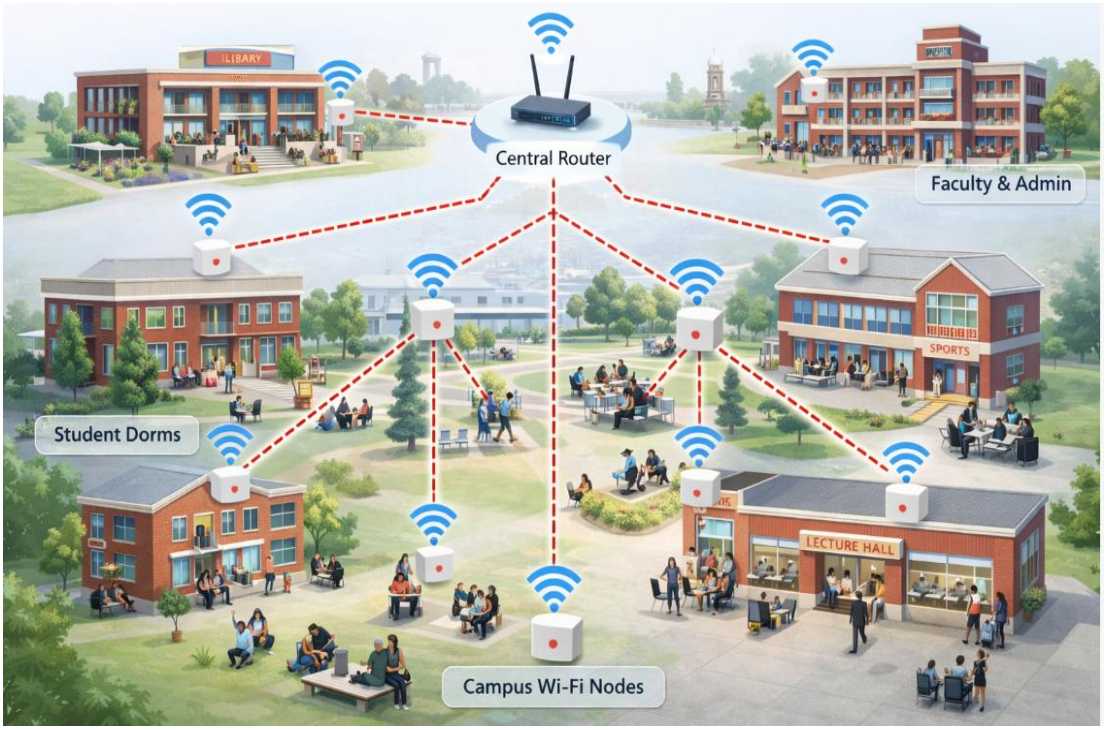


Figure 1.4: Tree-based Public Wi-Fi Deployment

Increasingly, however, Public Wi-Fi deployments—especially in outdoor and high-density urban settings—are shifting towards mesh topologies, where multiple access points interconnect to form a resilient and self-configuring network. Mesh architectures enhance coverage, reliability, and redundancy, making them well-suited for smart-city zones, large campuses, tourist areas, and dense public spaces. A typical illustration of a mesh-based Public Wi-Fi deployment in a smart-city framework is provided below.

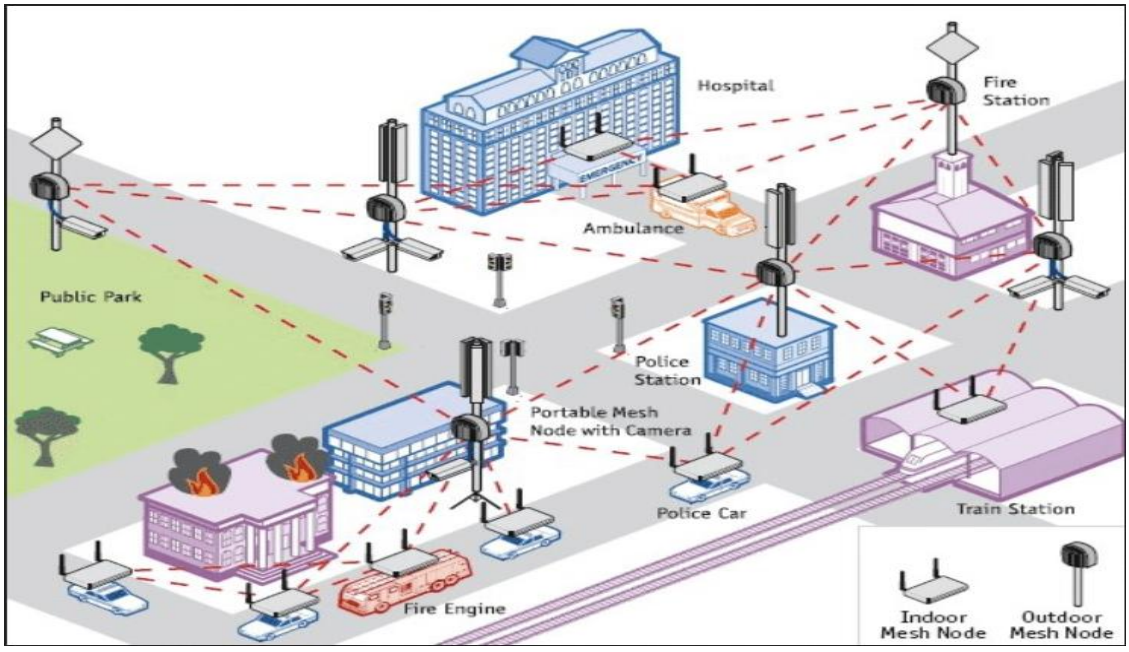


Figure 1.5: Mesh-based Public Wi-Fi deployment

1.21 Owing to their open and shared nature, Public Wi-Fi systems require stronger safeguards to ensure user security, session isolation, and consistent quality of service. Public Wi-Fi networks are typically governed by security protocols such as WPA3, 802.1x-based authentication, Extensible Authentication Protocol (EAP) methods, and secure onboarding mechanisms that protect users from interception, spoofing, and unauthorised access. Roaming and interoperability across hotspots are enabled through standards such as Passpoint/Hotspot 2.0 (IEEE 802.11u), which allow uninterrupted movement between networks without repeated logins, thereby enabling seamless authentication across multiple Wi-Fi networks and to cellular networks. Ensuring consistent

performance further requires adherence to Quality of Service (QoS) frameworks—such as those defined in IEEE 802.11e (WMM) and operator-level traffic management practices—which help prioritise latency-sensitive services, maintain throughput, and reduce congestion in high-density public environments. Alongside these technical standards, Public Wi-Fi deployments are subject to national laws and regulatory guidelines, including spectrum use rules, lawful interception requirements, user data protection norms, and mandated authentication frameworks. When these standards are rigorously complied with by network operators, service providers, or authorised Wi-Fi aggregators, and effectively enforced by regulatory authorities, Public Wi-Fi systems can offer secure, reliable, and interoperable broadband access, enabling them to function at a truly carrier-grade level suitable for widespread public use.

1.22 Despite the presence of well-defined security and interoperability standards, Public Wi-Fi networks are still widely perceived as insecure, creating a persistent trust deficit that discourages users from fully adopting these services. This is because Public Wi-Fi operates in open, shared environments where inadequate configuration, outdated equipment, and irresponsible user practices can expose users to risks such as data interception, man-in-the-middle attacks, rogue hotspots, session hijacking, malware distribution, and financial fraud, creating mistrust in its adoption. However, the Wi-Fi technology in itself is not inherently insecure. When Wi-Fi systems are properly designed, standards-compliant, securely configured, integrated with strong authentication, encryption, and backend management, they can offer safe and reliable connectivity. Ensuring this requires robust enforcement of security standards by regulators, strict compliance by service providers and manufacturers, and sustained user awareness, so that with the right product design, technical integration, and responsible usage, Public Wi-Fi can provide a secure, high-quality, and trusted connectivity option.

1.23 The broader discussion of this consultation paper underscores the substantial role that Public Wi-Fi can play in advancing broadband proliferation. In this context, the next section examines the socio-economic significance of Public Wi-Fi in India, reviews deployment trends at domestic and global levels, and the need for a comprehensive stakeholder consultation to address the gaps.

D. Socio-Economic Importance of Public Wi-Fi and Need for Consultation

1.24 In a mobile-first country like India—characterised by the world's largest population and among the highest per-capita mobile data consumption—Public Wi-Fi assumes considerable socio-economic significance. A large share of internet access in India is delivered through mobile networks, and as data consumption continues to grow, heavy usage in crowded public spaces such as markets, transport hubs, and commercial centres can lead to network congestion and reduced service quality. Public Wi-Fi can serve as an important complementary connectivity layer in such high-footfall environments by enabling users to access data-intensive applications through high-capacity shared networks. By offloading a portion of traffic from mobile networks to Wi-Fi hotspots, overall congestion can be managed, thereby improving the quality of service for mobile users. In addition, relying exclusively on mobile data for high-bandwidth activities may increase costs for consumers due to daily data caps and additional usage charges. Public Wi-Fi, owing to its shared-access nature and relatively lower cost structure, provides a cost-effective alternative for meeting rising data needs. In this context, the expansion of Public Wi-Fi can help improve network efficiency while supporting affordable and reliable digital connectivity for a large and growing user base.

1.25 The increasing deployment of Public Wi-Fi networks across the world reflects their growing socio-economic importance as a critical enabler of broadband proliferation. With rapid digitisation and the emergence of new digital services, the demand for reliable and affordable broadband has surged, particularly after the COVID-19 pandemic, which transformed learning, work, healthcare, commerce, and entertainment into predominantly online activities. This shift

underscored the need for resilient, high-capacity connectivity solutions and drove the widespread adoption of Wi-Fi as an accessible, interoperable, and cost-effective means of supporting intensive data use within homes, institutions, and public spaces. Wi-Fi has since become a key driver of digital resilience—facilitating telecommuting, remote education, and community service delivery, and its global economic value has grown faster than anticipated. Importantly, the pandemic also highlighted the role of Public Wi-Fi in inclusive governance, prompting many countries to establish community access centres and rural broadband initiatives to ensure meaningful digital participation for all.

1.26 The rising digital needs, lack of ubiquitous coverage from mobile networks, and costs of mobile broadband make the internet inaccessible, especially for low-income households. It is here that Wi-Fi, be it public or private, offers an affordable option that complements mobile broadband. An analysis of the affordability advantage that Wi-Fi offers its users compared to mobile broadband can be understood by comparing the per-GB cost of Wi-Fi to that of mobile broadband. A preliminary cost analysis indicates that the average price of 1 GB of mobile broadband data is approximately ₹8, whereas the effective per-GB cost on fixed Wi-Fi networks is as low as ₹0.27. In the case of PM-WANI, retail user coupons show a maximum per-GB price of about ₹6 for small-denomination plans and a minimum of around ₹0.99 for larger monthly packages. Details of cost calculations are given in Annexure I. This is because Wi-Fi, operating on unlicensed spectrum and benefitting from significantly lower deployment and operational costs, offers a much cheaper per-GB alternative. This cost differential becomes even more pronounced in Public Wi-Fi systems, where shared usage further reduces the average cost per user.

1.27 Although the per-GB cost of Wi-Fi is generally lower than that of mobile data, the monthly cost of a Home Wi-Fi connection is typically higher in absolute

terms[12]. However, in a country such as India, Wi-Fi is primarily used as a shared resource within households or premises, significantly lowering the per-capita cost. In contrast, mobile data plans are personal and subject to daily usage caps, beyond which users must either incur additional charges or migrate to higher-priced plans to access more data. Wi-Fi connections, by comparison, usually offer unlimited data with more consistent bandwidth and a better quality of experience, making them more suitable for sustained, data-intensive use. Further, while mobile networks may face indoor coverage issues due to signal attenuation and building penetration losses, Wi-Fi, anchored to fixed broadband, offers a cost-effective and reliable means to enhance indoor connectivity across homes, workplaces, and public venues. While mobile data tariffs in India have been the lowest globally and are widely apprehended to rise, Wi-Fi costs may decline further as deployments scale[13]. The Public Wi-Fi thus offers an economically efficient and flexible way to shift a larger share of high-volume data consumption to Wi-Fi, while using mobile broadband primarily for mobility. Therefore, Public Wi-Fi networks can emerge as a sustainable, high-value option for expanding broadband access, supporting enterprise digitisation, and delivering community-level e-services at minimal cost.

1.28 Public Wi-Fi deployments also offer cost, management, and efficiency advantages to Telecom Service Providers (TSPs) and Internet service providers (ISPs). By offloading substantial volumes of mobile data traffic from licensed cellular networks (3G/4G/5G) to Wi-Fi operating on unlicensed spectrum, operators can ease congestion in high-density areas (such as urban areas, transport hubs, university campuses, stadiums, airports, or busy urban centres) and prevent network congestion. Data offloading improves overall network performance by reducing latency, increasing throughput, and enhancing the

[12] The entry level plans for mobile is Rs.299 and for fixed broadband is Rs. 399 for a month.

[13] https://telecomtalk.info/jio-airtel-vi-to-raise-prepaid-tariffs/1002675/#:~:text=Indian%20private%20telecom%20operators%20including,year%20period%20for%20raising%20tariffs. , https://economictimes.indiatimes.com/industry/telecom/telecom-news/morgan-stanley-predicts-16-20-telecom-tariff-jump-in-q1-fy27/articleshow/126003825.cms?from=mdr

user experience. Better connectivity in congested zones enhances customer satisfaction, reduces concerns about mobile data consumption, deepens loyalty, and reduces churn, while simultaneously strengthening the operator's digital ecosystem across apps, payments, and content. Further, the visible presence of operator-branded hotspots in public spaces reinforces brand value, attracts new customers, and supports a more sustainable and diversified revenue base.

1.29 Wi-Fi technology in general enables telecom and internet service providers to expand network capacity in a highly cost-effective manner. By intelligently distributing data traffic between cellular networks and Wi-Fi, operators can avoid the heavy capital expenditure associated with continuous cellular infrastructure augmentation, such as adding new towers, base stations, or small cells. High-capacity Wi-Fi hotspots operating in unlicensed bands can significantly reduce both Capex and Opex by lowering dependence on costly spectrum acquisition and minimising the need for extensive radio access deployments. Moreover, Public Wi-Fi rollouts can leverage existing assets—such as BharatNet backhaul, municipal and enterprise fibre, and street infrastructure including poles, bus stops, and stations—thereby maximising utilisation of deployed resources and accelerating coverage expansion at lower cost. In addition to infrastructure savings, Wi-Fi deployments generate valuable data on user movement, device characteristics, peak demand patterns, and quality-of-experience indicators. These insights can help operators improve network planning, refine service offerings, design targeted marketing strategies, and develop new business models. Together, these advantages enable TSPs/ISPs to enhance operational efficiency, optimise investment decisions, and strengthen their overall long-term business strategy.

1.30 Public Wi-Fi deployments also enable TSPs/ISPs to diversify and expand their revenue streams by actively participating in the broader Wi-Fi ecosystem through multiple service models. Operators can generate revenues from paid Wi-Fi plans, top-ups, vouchers, and session-based billing, while also offering

enterprise-grade Wi-Fi solutions for malls, airports, hotels, and large campuses. They can further monetise services through backhaul bandwidth sales to Public Data Offices (PDOs), provision of "Public Wi-Fi as a Service" (PWaaS) with integrated management, analytics, and security for Business to Business (B2B) clients, and targeted advertising or location-based marketing via captive portals. Participation in neutral-host networks, Wi-Fi roaming arrangements, and Hotspot 2.0–enabled services provides additional commercial opportunities. These models create a sustainable supplementary revenue base for TSPs/ISPs alongside traditional mobile broadband services, strengthening their role in the Public Wi-Fi ecosystem.

1.31 Public Wi-Fi deployments also support the Government in advancing multiple policy objectives, including digital inclusion, enhanced service delivery, revenue generation, and more efficient governance. Public Wi-Fi serves as an affordable broadband option for low-income households and underserved rural and urban areas, thereby accelerating digital inclusion and providing an economical alternative to mobile data. Wider availability of low-cost Wi-Fi enables citizens to access Government schemes, digital public infrastructure, and essential services such as digital banking, education, and healthcare without data constraints, thereby improving the uptake and effectiveness of public programmes.

1.32 Public Wi-Fi strengthens citizen–Government engagement by enabling wider participation in grievance redressal systems, public consultations, and feedback platforms, while also improving the dissemination of local and community-level information. It provides a critical connectivity backbone for smart mobility solutions, digital governance dashboards, public safety systems, IoT-enabled city management, emergency alerting, disaster response communications, and community information services. Together, these applications enhance data-driven decision-making, improve the speed and responsiveness of public service delivery, and support more resilient governance systems—contributing to

efficient, streamlined urban management and inclusive, sustainable rural development.

1.33 The proliferation of Public Wi-Fi also helps the Government harness its revenue potential through broadband expansion and its spill-over benefits across increased economic activity and innovation. Increased data consumption, higher broadband subscriptions, growth in the device ecosystem, and rising digital transactions indirectly contribute to Government revenues through Goods and Services Tax (GST), licence fees, and other levies linked to the digital economy. Public Wi-Fi also acts as a digital catalyst by enabling start-ups, small businesses, freelance professionals, and students to operate online, promoting local entrepreneurship and innovation clusters in Public Wi-Fi zones, and expanding market access for micro-enterprises. The resulting economic growth also enhances tax revenues.

1.34 The wide socio-economic benefits of Wi-Fi for individuals, enterprises, service providers, and Governments have significantly increased global demand for Wi-Fi networks, particularly Public Wi-Fi. International experience clearly demonstrates that countries worldwide have recognised Wi-Fi's inherent strengths and are actively promoting its proliferation as a critical component of digital infrastructure. Reflecting this momentum, the global number of Public Wi-Fi hotspots grew from 362 million in 2019 to 549 million in 2022 and is expected to reach 3.15 billion by 2030[14]. Correspondingly, the global Public Wi-Fi market was valued at USD 8.2 billion in 2024 and is projected to expand rapidly to USD 25.1 billion by 2033, at a strong CAGR of 13.2% between 2025 and 2033. This sustained growth underscores the increasing global reliance on Wi-Fi as an affordable, scalable, and high-impact connectivity solution[15].

1.35 The global and regional distribution of Public Wi-Fi hotspots reflects clear differences in digital maturity, infrastructure investment, and policy support,

[14] https://www.broadbandsearch.net/blog/public-wifi-statistics

[15] https://growthmarketreports.com/report/public-wi-fi-hotspot-market

yet collectively underscores Wi-Fi's emergence as a critical pillar of global connectivity. North America holds the largest market share—with a valuation of USD 2.9 billion in 2024—driven by early adoption of advanced wireless technologies, strong municipal and provider-led deployments, and sustained Government-backed digital inclusion efforts. Europe, valued at USD 2.3 billion, continues to expand through robust regulatory protections, extensive national broadband initiatives, and EU programmes such as WiFi4EU, and is projected to grow at a Compound Annual Growth Rate (CAGR) of 12.8% through 2033. Asia-Pacific stands out as the world's fastest-growing and most dynamic Public Wi-Fi market, with a USD 1.8 billion value in 2024, the world's largest mobile subscriber base, rapid urbanisation, and ambitious digital programmes in India, China, Japan, and South Korea. The region is expected to record the highest global CAGR of 15.5% and already accounts for over 40% of global hotspot device deployments[16], and continues to accelerate through massive smart-city investments and competitive data markets. Meanwhile, Latin America and the Middle East & Africa, with a combined USD 1.2 billion market in 2024, are steadily expanding due to rising mobile penetration and Government-led digital inclusion initiatives, despite infrastructural constraints. Taken together, these patterns highlight strong global momentum toward Public Wi-Fi as an increasingly indispensable component of broadband ecosystems worldwide, with Asia-Pacific emerging as the key driver of future growth[17].

1.36 The rapid evolution of next-generation Wi-Fi—beginning with Wi-Fi 6 (IEEE 802.11ax) in 2019 and Wi-Fi 6E in 2020—has significantly enhanced the capacity, efficiency, and performance of unlicensed wireless networks. Supported by recent ITU-aligned standards, these developments have prompted a global shift toward delicensing mid-band spectrum, particularly the 6 GHz band, to enable wider channels, reduced congestion, and high-throughput Wi-Fi. In India, the Government has issued a Notification on the de-licensing of the lower 6 GHz band (5925-6425 MHz) for low-power

[16] https://www.industryresearch.biz/market-reports/wi-fi-hotspot-devices-market-104809

[17] https://growthmarketreports.com/report/public-wi-fi-hotspot-market

applications[18]. This expansion of unlicensed spectrum will be instrumental in accelerating Wi-Fi proliferation by lowering entry barriers, supporting cost-effective capacity augmentation, and strengthening high-performance Public Wi-Fi ecosystems. Further, TRAI, vide its recommendations dated 10th December 2025, has recommended to the Government that the V-Band (57-66 GHz) be delicensed for low-power indoor and very low-power outdoor use.

1.37 The emerging digital landscape—characterised by the rise of data-intensive applications such as large-scale IoT deployments, high-resolution video streaming, AR/VR services, Wi-Fi 7, Open Roaming, seamless 5G–Wi-Fi integration, AI-enabled network optimisation, and advanced Wi-Fi sensing—signals a future where user experience depends on continuous, high-capacity connectivity. These technologies significantly increase data requirements and will progressively shift usage patterns toward high-bandwidth, low-latency networks. In this context, Wi-Fi complements mobile broadband by enabling affordable access to data-intensive applications, particularly for low-income and underserved households, for whom sustained high-volume mobile data usage may otherwise be difficult to afford. Public Wi-Fi, operating on shared, high-capacity unlicensed spectrum, offers a cost-effective, accessible alternative that can meet these rising data demands. By providing affordable, high-throughput connectivity, it ensures that digitally marginalised populations do not lag behind in accessing next-generation digital services and evolving technologies, thereby supporting inclusive and equitable participation in the future digital ecosystem.

1.38 The discussions above underline the growing socio-economic importance of Public Wi-Fi and the increasing efforts undertaken by Governments worldwide to expand broadband access through this technology. The widespread delicensing of the 6 GHz band has opened substantial opportunities to scale high-capacity Wi-Fi networks, while PPP-based deployment models—supported

[18] https://www.dot.gov.in/static/uploads/2026/02/88f0ac8c74eb6f6907934d17d0015ab5.pdf

by municipal bodies, local administrations, and private-sector participation—are enabling faster, more sustainable rollouts. With the evolution of global standards and the transition from free, best-effort hotspots to secure, managed, and carrier-grade Public Wi-Fi, policymakers have proactively introduced measures such as certification frameworks, security standards, and digital literacy programmes to build user trust and encourage adoption. Given Wi-Fi's inherent advantages—lower access costs compared to cellular data, its ability to complement mobile broadband through traffic offload and improved indoor coverage, ease of deployment in dense urban areas, support for high-bandwidth applications such as video streaming, IoT and AI-based services, and its role as an enabler of smart cities, tourism, education, retail digitization, and overall spectrum efficiency—countries across the world are accelerating Public Wi-Fi proliferation as a central component of their digital transformation strategies.

1.39 India presents one of the most promising markets for large-scale expansion of Public Wi-Fi, backed by its vast population, rapidly growing digital literacy, expanding device penetration, and an unparalleled demographic dividend that can accelerate the country's digital transformation. Given that India has also decided on delicensing its lower 6 GHz spectrum, there is immense potential to make investments in Public Wi-Fi and reap its benefits across entities and sectors. National initiatives such as Digital India, National Digital Communications Policy (NDCP) 2018, BharatNet, PM-WANI, and the Smart Cities Mission have laid a strong foundation for universal and meaningful connectivity. However, for these schemes to fully deliver their intended outcomes, citizens must be able to participate as applicants, beneficiaries, and productive users, which in turn requires strong last-mile connectivity, adequate digital skills, and affordable access points. Public Wi-Fi, with its ability to bridge the affordability gap, offload congested mobile networks, support public service delivery, and nurture community-level entrepreneurship, holds strategic value for India's national priorities as a fast-growing economy.

1.40 India's current Public Wi-Fi footprint remains inadequate when viewed against its vast geography, diverse terrain, and the scale of demand from the world's most populous country, having one of the largest youth populations. To keep pace with global developments and to fully harness its domestic digital potential, it is imperative to revisit operational strategies for Public Wi-Fi proliferation in the country. This necessitates a comprehensive stakeholder consultation to gather informed views and diverse perspectives on overcoming persistent challenges to design sustainable, scalable, and context-appropriate Public Wi-Fi models, and to devise an effective pathway for accelerated Wi-Fi proliferation across the country.

1.41 This introductory chapter sets the overall context of the consultation paper by outlining the fundamentals of Wi-Fi technology in general and Public Wi-Fi in particular, and examines the need for reassessment in the light of the socio-economic importance of Public Wi-Fi and recent global developments. The subsequent chapter undertakes a detailed examination of the subject by analysing global deployment and business models, and assesses India's current Public Wi-Fi landscape, identifying the key challenges impeding proliferation. Drawing from international best practices and considering India's domestic experiences, evolving digital needs, and policy landscape, it discusses deployment and business models for rural clusters, urban centres, and high-density public spaces, with particular emphasis on the role of State Governments, local bodies, public–private partnerships, and the scope for viability-gap funding in shaping sustainable Public Wi-Fi ecosystems. The final chapter consolidates the insights from this analysis and presents specific issues for consultation, outlining the questions on which stakeholder comments are sought.

Chapter 2 - Examination of the Issues

A. International scenario

A.1 South Korea

2.1 The Public Wi-Fi ecosystem in South Korea reflects a focused national approach to universal connectivity, where state, municipal, and private actors jointly enable affordable, high-quality broadband access in public spaces. The country is home to a staggering 94,547 Public Wi-Fi locations (as shown in the figure below) across its 1,00,000 sq km area, ensuring connectivity to its citizens as well as tourists[19].

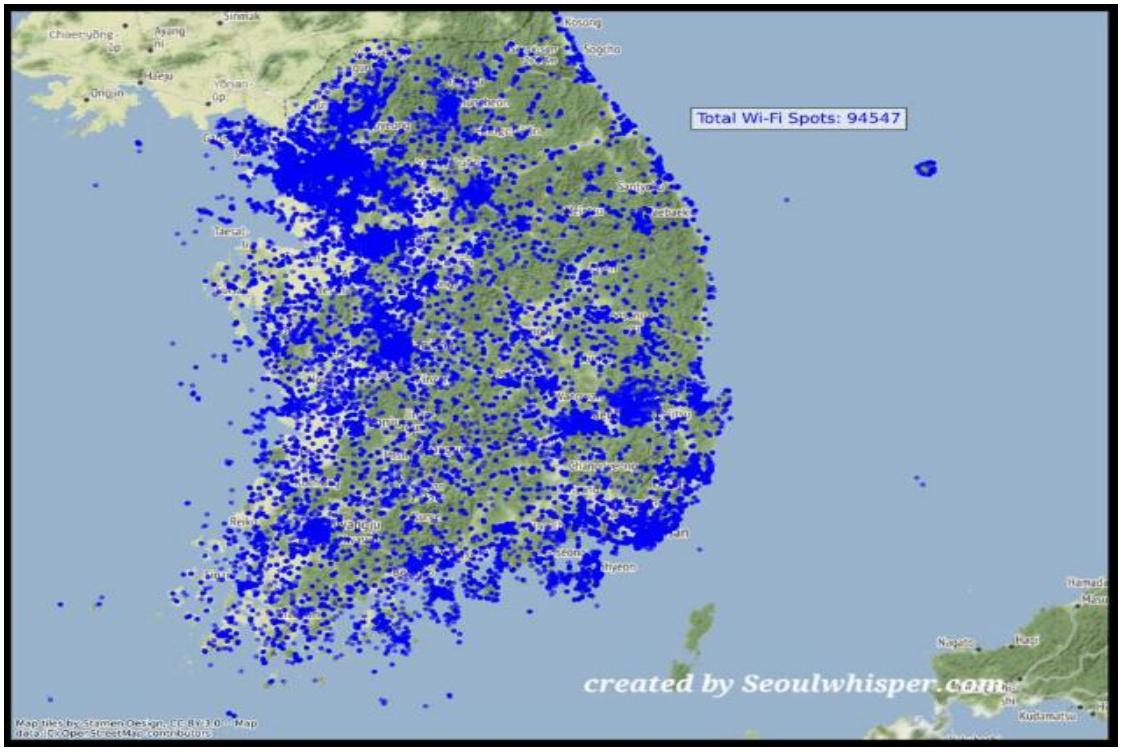


Figure 2.1 Public Wi-Fi locations in South Korea

Public Wi-Fi is installed in high-traffic, accessible areas such as parks (e.g., Hangang Park, Seoul Grand Park), cultural sites, community centres, health centres, welfare institutes, and public transportation (e.g., city buses and subway stations). Initially, the Government had launched Public Wi-Fi 1.0 to

[19] https://www.seoulwhisper.com/blog/free-wifi

provide free Wi-Fi at public facilities (markets, health centres, welfare centres). By 2017, they aimed to reach 12,000 sites (6,000 by telcos)[20]. Usage grew massively from 160,000 users in Jan 2013 to 5.63 million in Sep 2016. Later, the Government developed a Public Wi-Fi 2.0 strategy with a self-supporting profit-based model. The Ministry of Science and ICT (MSIT), along with the respective metropolitan Governments, plans and implements Public Wi-Fi initiatives, often partnering with major internet service providers, such as LG Uplus, KT Corporation, and SK Broadband. Metropolitan Governments facilitate Public Wi-Fi deployment by easing Right of Way (RoW) and related procedural clearances, while private enterprises expand coverage by offering Wi-Fi within their establishments, complemented by Government support through the provision of public spaces for hotspot installation. South Korea also ensures continuous technological upgradation, with Governments actively pursuing systematic transitions to advanced standards such as Wi-Fi 6 and, increasingly, Wi-Fi 7.

2.2 The cost of expanding Public Wi-Fi networks is shared between the Government and network operators, who contribute to the cost of establishing and maintaining these networks. Public Wi-Fi hotspots are free to use. The revenue streams for providers of hotspots come from advertisement-supported access, and bundled services. The operators benefit from savings by mobile data offloading and analytics-based revenue from analysis of footfall and movement insights.

2.3 The Public Wi-Fi ecosystem in South Korea becomes easily accessible to its population through a simple login and authentication process. This ease of access and login makes Wi-Fi services among the most in demand in South Korea. A dedicated application is available to help users identify nearby free Wi-Fi hotspots and assess internet speeds, which is particularly useful for data-intensive activities such as video streaming and large file downloads. Strong

[20] https://www.telecomtv.com/content/news/south-korea-adopts-sharing-approach-to-public-wifi-10523/

consumer uptake is driven by South Korea's deeply digital lifestyle, where mobile streaming, online gaming, IoT services, and smart-city applications continually reinforce demand for robust, upgraded Public Wi-Fi infrastructure.

2.4 Seamless roaming across public and carrier Wi-Fi hotspots is enabled through the widespread use of standards, which allow devices to pre-authenticate and hand over instantly between access points in dense urban and transit environments. The country also hosts an AI security control system that leverages artificial intelligence to quickly and accurately respond to the growing number of intelligent cyber threats. This system also includes threat prediction and response for the Public Wi-Fi network.

2.5 The role of metropolitan Governments at the local level is one of the major reasons for the proliferation of Public Wi-Fi in South Korea. The entire city of Seoul is connected via an integrated network of advanced fiber-optic cables (approx. 4,237 km), which is an integral part of the backhaul for Public Wi-Fi. The Seoul Metropolitan Government established 'e-Seoul Net', a first-generation self-owned network connecting the city hall and 25 autonomous districts in 2003. Since 2013, the second-generation network 'u-Seoul Net' has been extended to community service centres providing administrative services, Public Wi-Fi, CCTV, and other citizen services. The network has expanded to about 34,000 Public Wi-Fi hotspots. The city continues upgrading older hotspots to Wi-Fi 6 and adds new ones in high-footfall and digitally vulnerable areas each year[21]. Public Wi-Fi installation areas are selected through big-data analysis of Seoul's population and regional demand surveys[22]. Seoul also has an AI-based security control system that uses accumulated cybersecurity data to predict and respond to threats across multiple digital platforms, including public Wi-Fi networks. By analysing patterns of cyber threats, vulnerabilities, and infringement attempts, the system can identify potential risks in public Wi-Fi environments and trigger appropriate response measures in real time. This

[21] https://english.seoul.go.kr/seoul-to-expand-intelligent-cctvs-and-public-wi-fi-for-a-digitally-safe-city/

[22] https://www.scribd.com/document/832152476/Seoul-Smart-City-Booklet-as-of-Dec-2020-1

capability is integrated within the broader smart city security framework, which applies AI-driven monitoring and automated countermeasures across key digital infrastructure platforms.

2.6 While the Central Ministry and Metropolitan Governments play an active role in the proliferation of Public Wi-Fi, they also play an integral role in the creation of necessary backhaul for sustaining the Wi-Fi and mobile ecosystems in the country. Efforts to increase broadband penetration in South Korea date back to the early 1990s. In 2004, a consortium, including the then Ministry of Information and Communication and private sector telecommunication and cable firms such as KT, Hanaro, and others, launched the Broadband Convergence Network (BcN) project. This was a three-phase project completed successfully by 2010 and enabled practically all cities, towns, and rural communities to use 50-100 Mbps FTTH and Hybrid Fiber-Coaxial (HFC) based broadband Internet services. The Rural BcN project aimed at providing universal broadband access to villages with fewer than 50 households. It had a cost-sharing model among the Central Government, Local Governments, and private operators in the ratio 25:25:50. Alongside network rollout, a range of digital services, including video-based information delivery, greenhouse control, CCTV surveillance, weather monitoring, agricultural training, and remote healthcare, were introduced to drive usage and inclusion[23]. Building on the progress achieved under the BcN programmes, South Korea launched the Giga Internet project in 2009, offering speeds of 100 Mbps to 1 Gbps—nearly ten times faster than the earlier BcN network. By December 2012, FTTH-based broadband had expanded to around 38% of all villages (5,002 out of 13,217), marking a significant deepening of rural digital infrastructure. Korea is now advancing next-generation subscriber network technologies, including Giga Wi-Fi, 10-Gigabit Ethernet Passive Optical Network (10GE-PON), and RF-overlay–based Giga Internet, to further enhance network performance and service delivery.

[23] https://www.icact.org/upload/2013/0139/20130139_finalpaper.pdf

2.7 Further, in 2020, the Government launched an initiative that designated broadband speeds of at least 100 Mbps as a universal service. This means that, by law, every household in the country should have access to broadband internet at this minimum speed. Alongside this, the Government also introduced a Public-Private Partnership (PPP) initiative, targeting around 1,300 rural and remote villages. Running from August 2020 to 2022, this program brought together Central and Local Governments with major ISPs in a PPP mode to share the cost of building new broadband networks in underserved areas. These initiatives were built on the earlier successes of BcN project with improved technology and more targeted cost-sharing strategies[24]. Thus, by combining universal service funding with well-structured Public–Private Partnerships, South Korea has extended reliable connectivity to virtually every region and citizen. More recently, South Korea's Digital New Deal (2020)[25] and Digital New Deal 2.0 (2022)[26] reaffirmed connectivity as core national infrastructure. These programmes emphasise nationwide 5G rollout, AI-based security frameworks, expanded Public Wi-Fi, advanced fiber backhaul, and digital inclusion for vulnerable populations. Public connectivity is positioned not merely as a welfare measure but as the foundation of future economic competitiveness, smart cities, cloud adoption, and high-value digital industries.

2.8 South Korea demonstrates how the integration of extensive Public Wi-Fi with long-term broadband expansion can create a highly inclusive and resilient digital ecosystem. Nationwide free hotspots, unified SSIDs (Service Set Identifier), and Wi-Fi 6 upgrades are effectively supported by strong fiber backhaul, cost-sharing strategies, and universal service funding. The model

[24] https://www.telecomreviewasia.com/news/featured-articles/13330-south-koreas-binary-broadband-push-bridging-the-digital-divide-one-village-at-a-time/

[25] https://www.msit.go.kr/eng/bbs/view.do?sCode=eng&mId=4&mPid=2&pageIndex=&bbsSeqNo=42&nttSeqNo=443&searchOpt=&searchTxt

[26] https://www.msit.go.kr/eng/bbs/view.do?sCode=eng&mId=4&mPid=2&pageIndex=&bbsSeqNo=42&nttSeqNo=626&searchOpt=ALL&searchTxt#:~:text=Under%20the%20Action%20Plan%202022,trillion%20won%20into%20the%20initiative.&text=To%20be%20specific%2C%205.9%20trillion,%2C%20and%20Artificial%20Intelligence (D.N.A.)

underscores the value of combining Public–Private Partnerships with proactive Government action—both at the central and municipal levels—to ease procedural bottlenecks, extend last-mile fiber, and sustain high-capacity networks. It also highlights how keeping Public Wi-Fi free is driving demand through targeted digital services, while ensuring continuous technological upgrades. Overall, South Korea's experience shows that treating Public Wi-Fi as essential infrastructure, adopting shared funding models, and linking connectivity to real public-service applications can enable universal, high-speed broadband through sustained policy commitment and coordinated governance.

A.2 European Union (EU)

2.9 The European Union has a dedicated initiative to ensure the proliferation of Public Wi-Fi among EU countries, known as the Wi-Fi4EU. It is spearheaded by three major EU institutions- the European Council, the European Commission, and the European Parliament[27]. "WiFi4EU" aimed to set up a multilingual portal that would provide users with an affordable, secure, high-speed Internet connection and easy access to the digital services of the public body that provides the connection. It is a unique supranational program designed to ensure digital inclusion across all member states by directly funding local public spaces. The WiFi4EU initiative promotes free access to Wi-Fi connectivity for citizens and visitors in public spaces, including parks, squares, public buildings, libraries, health centres, and museums in municipalities throughout Europe[28].

2.10 The initiative allocates funds on a first-come, first-served basis through a voucher-based system while ensuring a fair geographical balance between participating countries[29]. Municipalities wishing to apply for a voucher first register at the WiFi4EU portal. Once registered, municipalities apply when the call opens by revisiting the portal and submitting their application. The voucher

[27] https://www.privateinternetaccess.com/blog/eu-agrees-deploy-6000-8000-free-public-wifi-hotspots-local-communities/

[28] https://www.business-standard.com/article/news-ians/eu-nations-to-offer-free-wifi-hotspots-in-public-places-117053001566_1.html

[29] https://digital-strategy.ec.europa.eu/en/library/wifi4eu-free-public-wi-fi-all-europeans-brochure

winners are selected on a first-come, first-served basis. The municipality uses the voucher to select a registered Wi-Fi installation company (installer). The EU Commission pays the €15,000 directly to the installer upon verification that the network is operational. The municipality must then fund the backhaul connectivity subscription (the internet service provider cost) and maintenance for a minimum of three years. The backhaul connection can be established using various technologies, depending on what is available and most cost-effective in the specific public space, even though fiber is often preferred as it offers high speed and reliable connectivity.

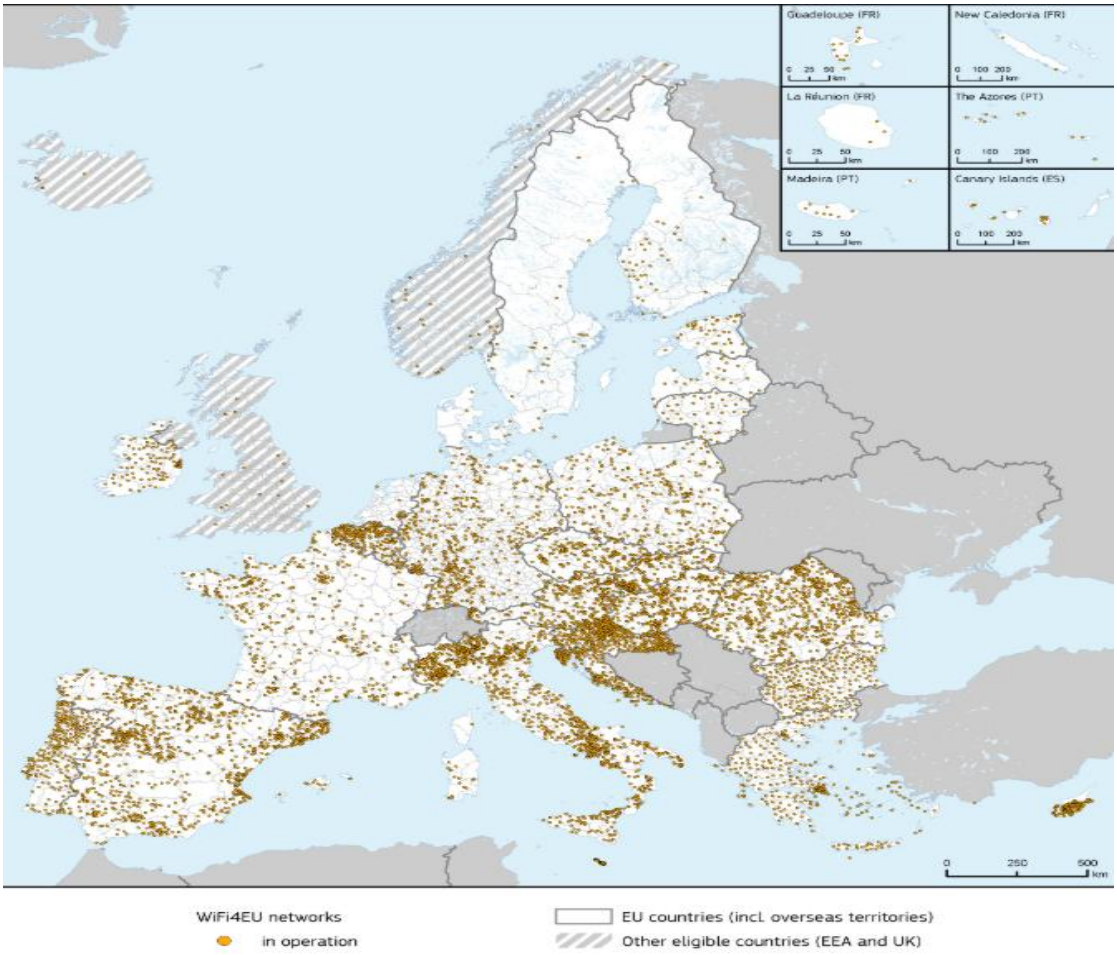
2.11 As per the available information, the European Commission has opened up four calls for applying for the vouchers. The last call of the WiFi4EU initiative was opened for applications in June 2020[30]. The WiFi4EU initiative's calls for funding proposals are currently closed, as the program allocated its whole budget between 2018 and 2020[31]. The initiative successfully distributed 8,802 vouchers worth €15,000 each to eligible EU municipalities to cover Wi-Fi equipment and installation costs. There are a total of 87,904 eligible municipalities, of which 28,880 are registered on the portal[32]. The initiative has resulted in the successful deployment of over 93,000 hotspots across Europe[33]. The following figure shows the WiFi4EU networks in operation.

[30] https://digital-strategy.ec.europa.eu/cs/node/935

[31] https://digital-strategy.ec.europa.eu/en/library/wifi4eu-free-public-wi-fi-all-europeans-brochure

[32] https://digital-strategy.ec.europa.eu/en/library/factsheet-wifi4eu

[33] https://hadea.ec.europa.eu/programmes/connecting-europe-facility/wifi4eu/download-wifi4eu-app_en#:~:text=The%20WiFi4EU%20initiative%20provides%20free,the%20burden%20of%20data%20charges.



Source: https://digital-strategy.ec.europa.eu/en/library/wifi4eu-networks-maps

Figure 2.2 WiFi4EU Public Wi-Fi network in Europe

2.12 Upon installation of the Public Wi-Fi, municipalities must display the WiFi4EU visual identity in the designated public spaces[34]. All WiFi4EU hotspots must use a single, common network identifier (SSID: WiFi4EU) across Europe, ensuring a seamless, recognizable service for citizens travelling between member states. A simplified login portal streamlines user access while providing secure session management[35]. Upon first connecting to a WiFi4EU hotspot, users are directed to a secure captive portal on an HTTPS (Hypertext Transfer Protocol Secure) server that offers a simple click-to-connect login. Subsequent reconnections within a 12-hour window do not require re-authentication, enabling

[34] https://digital-strategy.ec.europa.eu/en/library/wifi4eu-free-public-wi-fi-all-europeans-brochure

[35] https://www.ipeos.com/expertises-1/success-stories/article/public-wifi-deployment-a-model-project-under-the-wifi4eu-program

uninterrupted access to the free Public Wi-Fi service. Open Roaming enables citizens and visitors across the EU to connect securely and automatically to Public Wi-Fi hotspots using a single trusted identity. A robust legal and encryption framework protects user privacy, while allowing seamless roaming between locations and countries without repeated logins[36]. Public Wi-Fi networks in the European Union are expected to comply with the General Data Protection Regulation (GDPR), which requires organisations providing internet access to ensure lawful processing and protection of users' personal data through appropriate technical and organisational safeguards. In addition, EU cybersecurity guidance encourages network operators and public authorities to adopt security practices such as monitoring, risk management, and incident response to protect digital services, including public connectivity networks. WiFi4EU is free to the user. The rules laid out by the European Commission ensure that neither monetary remuneration nor other indirect forms of payment, such as advertising or data farming, are permitted on the WiFi4EU network for the three-year engagement period. These hotspots comply with the latest industry standards and use Wi-Fi Alliance-certified devices. There is also Real-time tracking to ensure a minimum data speed of 30 Mbps[37].

2.13 The European Union plays a proactive role in strengthening backhaul infrastructure that supports Wi-Fi and broader digital connectivity. At the financial level, multiple EU-wide instruments support digital connectivity, including the European Structural and Investment Funds (ESI), under which the European Regional Development Fund (ERDF) provides non-refundable grants for broadband deployment, while the European Agricultural Fund for Rural Development (EAFRD) supports rural broadband roll-out[38]. The Connecting Europe Facility (CEF) includes a dedicated telecom component, under which the WiFi4EU initiative operates as a voucher-based mechanism for

[36] https://digital-strategy.ec.europa.eu/en/policies/wifi4eu-citizens#:~:text=WiFi4EU%20%E2%80%93%20Connecting%20You,required%20to%20log%20in%20again

[37] https://www.ipeos.com/expertises-1/success-stories/article/public-wifi-deployment-a-model-project-under-the-wifi4eu-program

[38] https://digital-strategy.ec.europa.eu/en/library/eu-funding-broadband-2021-2027

Public Wi-Fi deployment[39]. The European Fund for Strategic Investments (EFSI), now continued under InvestEU, further supports high-speed broadband and Information and Communication Technology (ICT) infrastructure primarily through loans and equity financing. Collectively, these instruments form the financial backbone of Member States' nationally determined broadband strategies. In addition, several EU countries operate targeted subsidy programmes to connect the uncovered and underserved rural regions, where fiber infrastructure deployed under these schemes often functions as backhaul for local Public Wi-Fi networks[40]. These financial efforts are reinforced by EU-level regulatory frameworks—such as the Broadband Cost Reduction Directive, the Gigabit Infrastructure Act, and the European Electronic Communications Code—which lower deployment costs, enable infrastructure sharing, streamline approvals, and promote co-investment[41,42]. Together, these measures have strengthened backhaul availability, accelerated the roll-out of gigabit-capable networks, and created a robust foundation for scalable Public Wi-Fi deployment and sustained digital inclusion across the EU.

2.14 The EU's voucher-based model for Public Wi-Fi deployment has demonstrated strong effectiveness by combining central funding with local implementation. Under WiFi4EU, municipalities act as the primary project owners, selecting installation contractors, ensuring site readiness, and facilitating right-of-way and backhaul access—often leveraging existing municipal or state-supported fiber networks to ensure robust connectivity. The European Commission's harmonised technical standards, security requirements, and interoperability frameworks ensure that all funded hotspots deliver consistent performance across Member States. Service agreements tied to each voucher promote

[39] https://www.eib.org/en/products/equity/funds/connecting-europe-broadband-fund
[40] https://digital.gob.es/en/comunicacion/notas-prensa/secretaria-estado-telecomunicaciones-e-infraestructuras-digitales/2024/12/2024-12-03.html
[41] https://www.europarl.europa.eu/RegData/etudes/BRIE/2024/762298/EPRS_BRI(2024)762298_EN.pdf
[42] https://www.thefastmode.com/expert-opinion/45868-europe-s-fibre-future-from-rollout-to-real-value#:~:text=Since%202012%2C%20fibre%20coverage%20has%20grown%20fivefold,high%2Dcapacity%20networks%20(VHCNs)%20for%20Europe's%20digital%20decade.

sustainability beyond initial deployment, integrating Wi-Fi networks with broader national broadband strategies and complementing fiber and mobile coverage. This model has enabled thousands of "community-life centres"—parks, squares, libraries, municipal buildings—to offer free, reliable, high-quality Wi-Fi, enhancing the attractiveness of local areas, supporting tourism, and meaningfully reducing digital access gaps across the Union.

A.3 United Kingdom (UK)

2.15 In the United Kingdom (UK), Public Wi-Fi is installed through ISP-managed fiber backhaul, enterprise-grade access points, and municipal partnerships, rather than a national Government-funded programme like WiFi4EU. In UK, the Councils install Public Wi-Fi in town centres, transport hubs, libraries, and public buildings, usually by contracting ISPs such as BT, Virgin Media O2, or local fiber providers. The ISP lays the required fiber or uses existing council-leased lines, installs access points on street furniture, and manages the network. Airports, cafés, universities, rail stations, and retail chains install enterprise Wi-Fi systems using fiber or high-capacity leased lines as backhaul.

2.16 The UK offers several well-established examples of Public Wi-Fi deployment across transport, civic, health, education, and Government facilities, reflecting a mix of Government-led (in public places and Government offices), operator-led, and Public–Private Partnership models. Key initiatives include the following:

i. **Transport for London (TfL) Wi-Fi on the Tube**: Wi-Fi services in the London Underground are delivered through a shared network operated by major mobile operators—EE, O2 (Virgin Media-O2), and Three. Customers of these networks receive free access, while other users can

purchase passes, enabling broad coverage in high-footfall transit environments[43,44].

ii. **City of London Wi-Fi**: This network is delivered through O2 hotspots in partnership with the Corporation of London. Branded as "O2 Wi-Fi," it provides free access to all users after a one-time login, with no data caps and speeds of up to 200 Mbps across the Square Mile[45].

iii. **NHS Wi-Fi**: The National Health Service (NHS) provides a secure and uniform Wi-Fi service across healthcare facilities in England. More than 8,000 NHS sites have been enabled, offering free Wi-Fi access to over 63 million patients and visitors annually[46].

iv. **Connect the Classroom Scheme (Department for Education)**: This Government-funded programme aims to upgrade and future-proof digital connectivity in schools by improving Wi-Fi access points and network infrastructure. £25 million has been allocated for 2025–26, following £215 million invested between 2021 and 2025. Schools meeting prescribed infrastructure standards are eligible for funding[47,48].

v. **GovWifi**: GovWifi is a secure, single sign-on Wi-Fi service for staff and visitors across Government offices and public sector buildings, allowing users to register once and automatically connect in any participating location using a single username and password, offering a consistent and secure guest network experience[49,50].

2.17 User authentication in UK Public Wi-Fi networks is primarily via captive portals requiring email or mobile number sign-in[51] or through one's social media

[43] https://tfl.gov.uk/info-for/media/press-releases/2022/july/customers-of-all-major-networks-set-to-have-access-to-high-speed-mobile-coverage-across-london-tube-network

[44] https://tfl.gov.uk/travel-information/improvements-and-projects/improving-digital-connectivity-on-our-network#:~:text=Our%20Connected%20London%20programme%20sees,mobile%20connectivity%20across%20the%20Tube.

[45] https://www.cityoflondon.gov.uk/supporting-businesses/commercial-property-support-and-advice/telecommunications-and-utilities-infrastructure-in-the-city-of-london/wifi

[46] https://digital.nhs.uk/services/nhs-wifi

[47] https://www.gov.uk/guidance/connect-the-classroom

[48] https://www.streamnetworks.co.uk/dfe-connect-the-classroom-programme

[49] https://www.gov.uk/service-standard-reports/govwifi

[50] https://www.wifi.service.gov.uk/

[51] https://digital.nhs.uk/services/nhs-wifi/how-to-set-up-nhs-wifi

accounts[52] or automatic authentication for ISP/TSP subscribers when they connect to the Wi-Fi offered by the respective ISP/TSP[53]. The providers are required to comply with UK GDPR and security standards and must collect minimal user information, retain logs temporarily, and provide clear consent options on the login portal[54]. Security of public Wi-Fi networks in the United Kingdom is supported through the use of secure wireless encryption standards such as WPA2/WPA3 and authenticated access mechanisms, as implemented in Government initiatives like GovWifi[55]. In addition, cybersecurity guidance issued by the National Cyber Security Centre recommends the use of encrypted web connections (HTTPS), Virtual Private Networks (VPNs), and verification of legitimate networks to mitigate risks such as data interception and rogue hotspot attacks[56]. In the UK, Public Wi-Fi monetisation relies primarily on free-to-user access supported by advertising, venue sponsorship, and commercial analytics, with some freemium (free for limited time/data, paid for extended use) and operator-bundled models still in use[57,58]. Telecom operators and venue owners generate revenue through sponsored access, data insights, and value-added commercial services.

2.18 While the UK Government does not directly deploy Public Wi-Fi hotspots, it plays a critical enabling role by funding and expanding the backhaul and fiber infrastructure that underpins local Wi-Fi deployments. One of the early major schemes was the Super-connected Cities Programme (2012), which drew funds from the Urban Broadband Fund (UBF) to deliver faster and better broadband to businesses and residents in major cities. The scheme comprised 12 capital projects and the Connection Voucher Scheme (CVS), which enabled SMEs to apply for a £3,000 voucher towards the costs of upgrading to a superfast or

[52] https://information-services.ed.ac.uk/computing/desktop-personal/wifi-networking/visit-ed
[53] https://info.btwifi.com/help/
[54] https://www.gov.uk/data-protection
[55] https://docs.wifi.service.gov.uk/requirements.html
[56] https://www.ncsc.gov.uk/guidance/krack
[57] https://www.o2wifi.co.uk/
[58] https://info.btwifi.com/help/

ultrafast connection[59]. In addition to broadband grants, free Public Wi-Fi was installed in more than 1,000 buildings across the UK and was also made available on buses, trams, and trains in many of the country's major towns and cities[60].

2.19 The Local Full Fiber Networks (LFFN) programme, through models like Public Sector Anchor Tenancy, Public Sector Buildings Upgrade, and Public Sector Asset Reuse, the Government funded fiber deployment to public buildings and leveraged public-sector demand and assets to expand backhaul infrastructure, reduce investment risk, and stimulate wider commercial rollout of gigabit-capable networks[61]. Project Gigabit, launched by the UK Government in 2021, is designed to extend gigabit-capable broadband to hard-to-reach and commercially unviable areas[62]. Under this programme, the Gigabit Broadband Voucher Scheme (GBVS) offers vouchers of up to £4,500 to eligible homes and businesses outside planned commercial or publicly funded rollouts, with support delivered through registered suppliers and funds released only after network deployment and service activation, ensuring delivery-focused and accountable implementation[63]. Alongside direct funding, complementary regulatory and fiscal measures such as business rates relief for new fibre, reforms to the Electronic Communications Code, planning relaxations, infrastructure sharing, and the use of public street furniture and buildings have reduced deployment costs and accelerated fibre and advanced wireless roll-outs, thereby strengthening the backhaul foundation necessary for scalable and sustainable Public Wi-Fi networks[64].

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[59] https://assets.publishing.service.gov.uk/media/5f8709d9e90e07415db00345/18-02311-01_SCCP_-_Synthesis_Report_v5_March_2020__1_.pdf

[60] https://www.taxassist.co.uk/resources/news/superconnected-cities-scheme-provides-grants-to-14000-smes#:~:text=The%20UK%20Government's%20Superconnected%20Cities%20Programme%20has,leading%20cities%20develop%20their%20digital%20infrastructure%20to

[61] https://www.gov.uk/Government/publications/local-full-fibre-network-evaluation-plan/local-full-fibre-network-programme-evaluation-plan

[62] https://www.gov.uk/guidance/project-gigabit-uk-gigabit-programme

[63] https://www.gov.uk/Government/publications/gigabit-broadband-voucher-scheme-information/gigabit-broadband-voucher-scheme-information

[64] https://assets.publishing.service.gov.uk/media/5a817a3c40f0b62302697851/Extending_Local_Full_Fibre_Networks__Call_for_Evidence__For_Publication_.docx

2.20 The UK's approach is highly focused on commercial viability. It uses public funds only to stimulate investment where the market fails, primarily for fixed broadband (which provides the backhaul for Public Wi-Fi). The UK model shows that extensive Public Wi-Fi coverage can also be achieved, with a strong underlying backhaul infrastructure created through Government support. While local authorities and transport operators typically deploy and operate Wi-Fi networks, the central Government focuses on expanding fiber and 4G/5G backhaul—particularly in underserved areas—through various programmes and schemes. Complementary regulatory measures, including streamlined planning rules, access to public assets, and cost-reduction reforms, further ease network rollout. Therefore, strengthening backhaul infrastructure, easing regulatory barriers, and enabling municipalities and private providers to expand access can lead to widespread, organically driven Public Wi-Fi deployment without requiring direct hotspot subsidies. This is evident from the fact that BT—one of the UK's major telecom service providers and a private commercial operator—today operates more than five million Public Wi-Fi hotspots across the country, underscoring how extensive hotspot availability can emerge organically when the underlying broadband and mobile infrastructure is strong[65].

A.4 United States of America (USA)

2.21 In the United States, Public Wi-Fi deployment typically occurs through public–private partnerships, where the Federal Government funds backhaul expansion and, in some cases, directly supports hotspot deployment through programmes such as Broadband Equity Access and Deployment (BEAD); State and Local Governments facilitate rollout by streamlining right-of-way processes and simplifying approval procedures, while also integrating hotspot installation and backhaul development into their broader regional development agendas; and private service providers play a central role in building, operating, and maintaining the networks.

[65] https://business.bt.com/help/article/broadband-and-internet/bt-wi-fi-and-guest-wi-fi/using-bt-ee-wi-fi/

2.22 In many U.S. States, Public Wi-Fi initiatives initially began with school-focused connectivity projects. They later expanded as cities entered the ecosystem—often providing free access to municipal assets such as light poles and existing fiber backhaul, in return for opening the resulting networks to all city residents. New York City has over 10,000 active LinkNYC smart kiosks, which offer free Wi-Fi, local directions, emergency alerts, and even phone charging, along with 30,000 public hotspots. Companies were allowed to install kiosks and recoup investment through advertising. Los Angeles has over 5,000 Public Wi-Fi hotspots citywide. Chicago has deployed more than 400 smart kiosks across business districts. San Francisco has invested in making outdoor spaces more digitally connected by providing Public Wi-Fi facilities in more than 30 major parks and plazas. Washington, D.C., offers over 3,000 public Wi-Fi access points across its libraries, parks, recreation centres, and public transportation. Philadelphia's Public Wi-Fi covers 95% of the downtown core[66]. Philadelphia's PHLConnectED program, launched in 2020, extended free broadband and Public Wi-Fi hotspots to over 35,000 students and families[67].

2.23 Private operators also play a significant role—Charter Communications, the largest private broadband and cable provider in the country, manages nearly 530,000 operator-managed Public Wi-Fi access points across 41 States, typically located in parks, marinas, city streets, and other high-footfall public areas[68]. As of 2023, the United States hosted over 450 million Public Wi-Fi access points, a significant rise from just over 250 million in 2018. Urban centres such as New York City, Los Angeles, and Chicago contribute a substantial share, where dense populations and high mobile traffic demand robust connectivity options[69]. Overall, over 50% of Public Wi-Fi hotspots in U.S.

[66] https://patentpc.com/blog/public-wifi-smart-kiosks-usage-deployment-stats-across-cities
[67] https://www.rsinc.com/wifi-statistics-data-on-usa-adoption-security-and-performance-trends.php#:~:text=As%20of%202023%2C%20the%20United,hotspots%20through%20initiatives%20like%20LinkNYC.
[68] https://corporate.charter.com/newsroom/all-spectrum-wifi-hotspots-free-for-public-use-through-may-15
[69] https://www.rsinc.com/wifi-statistics-data-on-usa-adoption-security-and-performance-trends.php#:~:text=As%20of%202023%2C%20the%20United,hotspots%20through%20initiatives%20like%20LinkNYC.

cities are operated by telecom providers. Transit stations, now key digital hubs with high dwell times, account for approximately 35% of all Public Wi-Fi access points. Together, these figures demonstrate the rapid growth and extensive, city-wide scale of Public Wi-Fi deployment across the United States[70].

2.24 The United States also has a strong and emerging consumer base and demand side adoption. A survey of US residents found that over 70% have used Public Wi-Fi in the past year, and 60% of these users access it primarily on smartphones. Statista reports for 2023 reveal that 97% of smartphone users and more than 85% of tablet users routinely rely on Wi-Fi as their primary access channel. This trend is reinforced by OpenSignal's findings that U.S. mobile users spent 70.6% of their device time connected to Wi-Fi rather than cellular networks[71]. 52% of Public Wi-Fi users use the network for data-intensive applications like video streaming, and 48% of city-deployed Wi-Fi is used during commuting hours, which generates much of the internet traffic during the morning and evening rush hours. It also implies that network capacity in these zones is subjected to intense peak-period congestion twice daily. 76% of Public Wi-Fi usage in urban areas occurs indoors (cafes, libraries, terminals) 43% of the people surveyed considered Public Wi-Fi as an essential infrastructure for daily connectivity. The survey also identified that 39% of surveyed users are concerned about privacy on Public Wi-Fi[72].

2.25 While this represents the demand side from the perspective of the individuals, increasing digitization of services and digital services raised the demand for Public Wi-Fi from enterprises in the United States. Public Wi-Fi demand of US enterprises is soaring, driven by remote work, smart city initiatives, IoT growth, and the need for seamless, high-speed connectivity, pushing significant market

[70] https://patentpc.com/blog/public-wifi-smart-kiosks-usage-deployment-stats-across-cities

[71] https://www.rsinc.com/wifi-statistics-data-on-usa-adoption-security-and-performance-trends.php#:~:text=As%20of%202023%2C%20the%20United,hotspots%20through%20initiatives%20like%20LinkNYC

[72] https://patentpc.com/blog/public-wifi-smart-kiosks-usage-deployment-stats-across-cities

growth, new tech adoption (Wi-Fi 6E/ Wi-Fi 7), and the shift to Wi-Fi as a Service (WaaS) models for both customer engagement and internal operations, despite security and complexity challenges[73]. Demand also comes from Governments that are increasingly integrating Wi-Fi into broader smart city plans, using technologies like Wi-Fi 6E to improve performance and achieve operational savings. In parallel, to meet this rising demand and to enhance user experience, ISPs are upgrading customer equipment to Wi-Fi 6/6E, deploying mesh systems, and using AI-based diagnostics. A survey conducted revealed that 58% of city officials rank Public Wi-Fi as a "high-priority" infrastructure investment. This recognition has led to dedicated budget allocations, active issuance of Request for Proposals (RFPs), and long-term planning, while simultaneously creating greater openness among cities to partnerships, innovation, and public participation[74].

2.26 The majority of Public Wi-Fi hotspots deployed by municipalities or States have been available for free since their inception. Retail chains such as Starbucks, McDonald's, and Target, which initially charged for Wi-Fi, transitioned to offering free Wi-Fi access during the 2010s. Likewise, hotels and airlines that once charged for Wi-Fi services now include it in their loyalty programs, providing free data either entirely or through freemium models. Surveys conducted by Statista in 2022 indicated that over 72% of U.S. users prefer free Wi-Fi access over mobile data when available. Cisco's Annual Internet Report shows a clear shift towards open-access models: between 2018 and 2023, free Public Wi-Fi hotspots in the U.S. grew at an average of 19.6% per year, compared to just 3.4% annual growth for paid hotspots—indicating strong user preference for free connectivity[75]. Security on public Wi-Fi in the USA is primarily ensured through user-side measures, including using a VPN for

[73] https://www.mordorintelligence.com/industry-reports/public-wi-fi-market#:~:text=Public%20Wi%2DFi%20Market%20Analysis,a%2027%25%20CAGR%20through%202030.

[74] https://patentpc.com/blog/public-wifi-smart-kiosks-usage-deployment-stats-across-cities

[75] https://www.rsinc.com/wifi-statistics-data-on-usa-adoption-security-and-performance-trends.php#:~:text=As%20of%202023%2C%20the%20United,hotspots%20through%20initiatives%20like%20LinkNYC.

encryption, accessing only HTTPS-secured websites, and enabling firewalls. While venues may provide password-protected WPA2/WPA3 networks, users are responsible for protecting data by avoiding sensitive transactions, disabling automatic connectivity, and using multi-factor authentication (MFA)[76].

2.27 In the United States, the expansion of backbone and backhaul infrastructure is enabled through a layered, multi-level governance model in which Federal, State, and municipal actors each play a distinct role. At the Federal level, grant-based programmes provide capital support for fiber and fixed-wireless build-outs in underserved and rural regions, forming the foundation for subsequent access networks. State Governments and municipal bodies then complement this by partnering with private ISPs through co-funding arrangements, streamlined rights-of-way approvals, and targeted subsidy schemes that address uncovered zones where commercial deployment is otherwise unviable. In many rural areas, fiber rollouts are executed through Public–Private Partnerships or by smaller regional providers leveraging these grants. At the same time, some local Governments invest directly in municipal fiber to support public services, digital inclusion, and future Public Wi-Fi initiatives. Once high-capacity backhaul is established, it becomes the critical enabler for municipalities, ISPs, and private operators to deploy robust Public Wi-Fi networks across community and civic locations.[77]

2.28 Federal support for broadband deployment in the United States is delivered through a multi-agency framework led primarily by the Federal Communications Commission (FCC), National Telecommunications and Information Administration (NTIA), and United States Department of Agriculture (USDA), together committing nearly USD 97 billion to extend connectivity to unserved and underserved areas, with strict non-duplication rules to prevent

[76] https://media.defense.gov/2021/Jul/29/2002815141/-1/-1/0/CSI_SECURING_WIRELESS_DEVICES_IN_PUBLIC.PDF , https://watech.wa.gov/tips-safely-using-public-wi-fi , https://consumer.ftc.gov/articles/are-public-wi-fi-networks-safe-what-you-need-know

[77] https://lynxplanning.com/us/municipal-telecom-planning-inited-states/#:~:text=As%20society%20increasingly%20relies%20on,speeds%20as%20future%20needs%20grow.

overbuilding[78,79]. The FCC drives universal broadband access through the Universal Service Fund (USF), deploying support via reverse auctions, mapping initiatives, and targeted programmes such as the Rural Digital Opportunity Fund (RDOF), the 5G Fund for Rural America, and the National Broadband Map[80]. The USDA focuses on rural connectivity through a suite of broadband programmes implemented via grants, loans, and loan–grant combinations to extend networks to small and commercially unviable rural areas, including the Community Connect Program, ReConnect Program, Rural Broadband Access Program, and Telecommunications Infrastructure Program[81]. The NTIA administers major federal broadband grant programmes under the Infrastructure Investment and Jobs Act (IIJA) in coordination with state, local, and Tribal entities. These include the Middle Mile Program (MMP), the Tribal Broadband Connectivity Program (TBCP), and the Broadband Equity, Access and Deployment (BEAD) Program—the largest broadband investment in U.S. history, with USD 42.45 billion allocated to states based on unserved locations identified through the FCC's National Broadband Map[82]. BEAD follows a structured, state-led implementation framework comprising a Five-Year Action Plan, an Initial Proposal (subject to public review and NTIA approval, triggering partial fund release), and a Final Proposal for full disbursement, after which states award funds through competitive sub-grants. While prioritising fibre-based last-mile connectivity, BEAD also supports Wi-Fi deployment within multi-dwelling units, subsidised access points in public and community facilities, and Wi-Fi–based access solutions that improve affordability and expand meaningful

[78] https://www.congress.gov/crs-product/R47883

[79] https://www.nokia.com/broadband-access/rural-broadband/us-Government-funding-opportunities/bead-applicant-resource-center/infrastructure-funding-explained/

[80] https://www.nokia.com/broadband-access/rural-broadband/us-Government-funding-opportunities/bead-applicant-resource-center/infrastructure-funding-explained/ , https://www.congress.gov/crs-product/R47883

[81] https://www.nokia.com/broadband-access/rural-broadband/us-Government-funding-opportunities/bead-applicant-resource-center/infrastructure-funding-explained/ , https://www.congress.gov/crs-product/R47883

[82] https://www.nokia.com/broadband-access/rural-broadband/us-Government-funding-opportunities/bead-applicant-resource-center/infrastructure-funding-explained/ , https://www.congress.gov/crs-product/R47883

internet use[83]. The above-mentioned funding initiatives are complemented by Treasury-led instruments[84] such as the American Rescue Plan Act (ARPA)[85] and the Capital Projects Fund (CPF)[86]. This layered funding and governance architecture has positioned broadband backhaul expansion as a foundational public investment to enable last-mile connectivity and Public Wi-Fi deployment nationwide.

2.29 Public Wi-Fi deployment in the United States has grown through a coordinated Public–Private model, with the Federal Government funding major broadband and backhaul infrastructure and States and municipalities complementing this through co-financing, streamlined approvals, and integration with local development plans. Over time, initiatives that began with school connectivity expanded into wider city networks, supported by municipal asset-sharing and collaboration with private operators. Major cities now leverage smart kiosks, hotspot zones, and public-space connectivity as part of their digital inclusion and smart-city programmes. At the same time, private ISPs operate extensive hotspot footprints in high-traffic areas. Public Wi-Fi is widely used across residents, enterprises, and agencies, driven by the rise of digital services, remote work, IoT, and mobility needs. Overall, the ecosystem reflects a mature, expanding model supported by strong federal investment, state and local facilitation, and active private-sector participation.

A.5 Hong Kong

2.30 Hong Kong, a densely populated city-state, ensures extensive and easily recognisable Public Wi-Fi coverage by leveraging Public–Private Partnerships and a unified branding system that offers a consistent Wi-Fi experience across

[83] https://www.ookla.com/articles/ongoing-network-performance-monitoring-us-states#:~:text=In%202026%2C%20we%20will%20finally,for%20monitoring%20performance%20over%20time.
[84] https://www.nokia.com/broadband-access/rural-broadband/us-Government-funding-opportunities/bead-applicant-resource-center/infrastructure-funding-explained/
[85] https://www.ncsl.org/fiscal/arpa-state-fiscal-recovery-fund-allocations , https://www.gfoa.org/american-rescue-plan-spending-guiding-principles
[86] https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-Governments/capital-projects-fund

Government, commercial, and community locations. The city's efforts to expand Public Wi-Fi can be traced back to the launch of the Government Wi-Fi ("GovWiFi") initiative in 2008, which aimed to strengthen digital connectivity as part of Hong Kong's broader ICT development agenda. Over time, Government entities, public bodies, and private organisations progressively expanded free Wi-Fi availability across their respective venues, laying the foundation for the city-wide ecosystem visible today[87].

2.31 To further enhance accessibility, the Government introduced the "Wi-Fi.HK" common brand in August 2014, creating a unified identity for Public Wi-Fi hotspots and ensuring users could easily identify points offering at least 30 minutes of free access per day. The initiative received strong support, with over 120 public and private organisations—including telecom operators, tourism bodies and universities—joining the programme by 2019. Wi-Fi.HK hotspots are widely available across Hong Kong, including telephone booths, cafés, restaurants, convenience stores, shopping centres, tourist sites, banks, hotels, themed buses, and designated Government venues. Users can locate these hotspots through Wi-Fi.HK mobile app or online hotspot map: mobile hotspots on themed buses appear only in list view, while fixed-location hotspots, such as those in shops or restaurants, are mapped geographically[88]. As of March 2026, Hong Kong has 12,586 registered Wi-Fi zones supported by 80,971 hotspots under the "Wi-Fi.HK" brand.[89]

2.32 Building on this momentum, the Government launched the Wi-Fi Connected City Programme in 2016, integrating the Government-funded coverage, the "Wi-Fi.HK" brand, and a new Public–Private Collaboration (PPC) mechanism aimed at further expanding free Wi-Fi availability. Under the PPC initiative,

[87] https://wballiance.com/wp-content/uploads/2022/04/Case-Study-Wi-Fi-Connected-City-Programme-Hong-Kong_20190617.pdf

[88] https://wi-fi.hk/en/FAQ

[89] https://www.ofca.gov.hk/en/news_info/data_statistics/internet/wifi/index.html#:~:text=Class%20licensees%20for%20the%20provision%20of%20public,network%20services%20(public%20Wi%2DFi%20services)%2C%20238%20;

Government venues are made available to private service providers without financial subsidies, enabling them to install and operate Public Wi-Fi while offering value-added services such as small-cell mobile stations and potentially future 5G-based offerings[90]. While all participating organisations must provide at least 30 minutes of free access daily per SSID, many choose to extend or fully waive usage limits, depending on their business model[91].

2.33 To safeguard users and maintain service quality, Hong Kong has established clear technical and security requirements under the "Wi-Fi.HK" framework. Participating organisations are mandated to use digital server certificates to help users verify authentic connections, with more than 80 per cent of providers having adopted them by 2019. Quality assurance measures have also been institutionalised, technical standards and service benchmarks are developed with industry input, third-party organisations conduct regular checks, and extensive user-experience surveys have been carried out since 2018 to ensure that Public Wi-Fi performance meets service requirements and public expectations[92].

2.34 While building on its Public Wi-Fi initiatives, Hong Kong has also undertaken sustained and complementary efforts to strengthen fiberisation and mobile backhaul as the structural backbone of its digital ecosystem. These efforts have been guided by the Digital 21 Strategy, which for nearly two decades provided a coherent policy framework emphasising robust, future-proof ICT infrastructure, open competition, and continuous investment in high-capacity fiber networks and backhaul systems to support advanced broadband and successive generations of mobile services[93,94]. Within this largely market-driven

[90] https://wballiance.com/wp-content/uploads/2022/04/Case-Study-Wi-Fi-Connected-City-Programme-Hong-Kong_20190617.pdf
[91] https://wi-fi.hk/en/FAQ
[92] https://wballiance.com/wp-content/uploads/2022/04/Case-Study-Wi-Fi-Connected-City-Programme-Hong-Kong_20190617.pdf
[93] https://www.sheto.gov.hk/filemanager/content/press/en/2007/2008%20Digital%2021%20Strategy%20Leaflet.pdf , https://www.legco.gov.hk/yr06-07/english/panels/itb/papers/itbcb1-105-1e.pdf , https://www.unapcict.org/sites/default/files/2019-01/2008%20Digital%2021%20Strategy.pdf
[94] https://www.legco.gov.hk/yr13-14/english/panels/itb/papers/itb1209cb4-196-7-e.pdf

model, the Government has intervened in a targeted manner through a dedicated Subsidy Scheme, administered by Office of the Communications Authority (OFCA), to extend fiber connectivity to remote and underserved villages where commercial incentives were inadequate. Beneficiaries will gain access to high-speed, stable broadband services, while participating Fixed Network Operators (FNOs) are required to meet the specified technical, rollout, and service standards, including commitments to offer gigabit-level broadband or install free Public Wi-Fi hotspots in common village areas. To promote competition, operators receiving subsidies must also make at least half of the capacity of the subsidised network facilities available to other FNOs at no cost, ensuring that the improved infrastructure serves as an open-access platform for the wider market[95]. Collectively, these measures have reinforced network resilience and backhaul capacity, improved service quality in hard-to-serve areas, and enhanced readiness for 5G, Public Wi-Fi expansion, and long-term digital inclusion objectives.

2.35 In summary, Hong Kong has achieved widespread Public Wi-Fi proliferation through a carefully sequenced strategy that combines Government leadership, strong Public–Private Partnerships, and a unified national branding framework that ensures visibility, trust, and ease of use across diverse public and commercial locations. This front-end expansion of Wi-Fi access has been consistently supported by back-end investments in fiberisation and mobile backhaul, guided by the long-standing Digital 21 Strategy and complemented by targeted subsidies to extend high-capacity networks into commercially unviable and remote areas. By aligning Public Wi-Fi deployment with robust core and backhaul infrastructure, clear technical standards, and open-access principles, Hong Kong has created a resilient and scalable connectivity ecosystem that is future-ready for advanced digital services. The experience underscores that sustainable Public Wi-Fi outcomes are best achieved when

[95] https://www.ofca.gov.hk/en/industry_focus/infrastructures/subsidy_scheme_to_extend_fibre_based_networks/index.html#:~:text=To%20meet%20the%20demand%20for,covered%20under%20the%20Subsidy%20Scheme;

hotspot expansion is embedded within a broader, coordinated infrastructure and policy framework.

A.6 Key Takeaways from International experiences

2.36 Globally, Public Wi-Fi has emerged as an important complementary access layer to mobile and fixed broadband networks. International experience shows that Public Wi-Fi is increasingly relied upon as a cost-effective means of internet access, particularly for data-intensive applications and for users accessing services outside their homes or workplaces. Across countries, Public Wi-Fi is deployed in a wide range of locations to support access, inclusion, and convenience. Major areas of deployment include Government offices and public service institutions such as schools, universities, libraries, hospitals, and training centres. High-footfall public spaces—such as city centres, markets, parks, tourist attractions, stadiums, and cultural venues—also account for a large share of deployments. In addition, Public Wi-Fi is widely available in transport and mobility environments, including airports, railway stations, metro systems, bus terminals, and onboard public transport. Commercial establishments such as cafés, hotels, malls, coworking spaces, and entertainment venues also deploy Wi-Fi as a value-added service.

2.37 Global experience indicates that Public Wi-Fi networks are deployed by a mix of public authority initiatives and private entity investments. National, state, and municipal Governments deploy Wi-Fi as part of smart city programmes, local area development initiatives, and rural connectivity schemes. At the same time, telecom service providers, broadband operators, and venue owners deploy large numbers of hotspots as part of commercial strategies, often outsourcing network design, deployment, and operations to specialised service providers.

2.38 The proliferation and sustained success of Public Wi-Fi globally is driven by a combination of supply-side and demand-side factors. On the supply side, supportive Government policies, public funding, and facilitative regulatory

frameworks lower deployment barriers. On the demand side, rising data consumption and the expanding range of digital services reinforce the need for ubiquitous and affordable connectivity, creating a reinforcing cycle of investment and adoption.

2.39 On the demand side, global internet usage has grown sharply due to widespread adoption of high-definition video streaming, AI, cloud services, online gaming, remote work, IoT applications, and digital public services. Individuals increasingly depend on connectivity while on the move, enterprises require reliable access beyond office premises, and Governments integrate connectivity into service delivery, urban management, and mobility systems. As a result, Public Wi-Fi has become a critical access layer supporting connectivity needs outside home and office networks.

2.40 International experience also shows that the demand for Public Wi-Fi is strengthened by user-centric and user-friendly service design. Affordable access models, simple and quick login processes, unified network identities, and seamless connectivity across locations significantly reduce access barriers. Visible signage, common branding, hotspot discovery tools, and clear security standards further enhance user confidence and sustained usage. Monetisation is achieved through a mix of direct and indirect revenue streams, with direct models such as paid or freemium access typically priced at affordable levels. Indirect revenue streams include advertising on captive portals, bundling Wi-Fi access with broadband or mobile subscriptions, mobile data offloading benefits, anonymised usage and footfall analytics, Government grants or subsidies, and, in some jurisdictions on cost-sharing basis.

2.41 On the supply side, the international experience highlights the central role of Governments in enabling Public Wi-Fi proliferation. Governments deploy Wi-Fi directly in public buildings and facilities, fund hotspot deployment through direct funding and vouchers, and support large-scale roll-outs through Public–Private Partnerships. A particularly important Government function is ensuring

the availability of adequate backhaul infrastructure to support scalable, and reliable Wi-Fi networks. Globally, Governments play a major role in funding and enabling backhaul infrastructure through universal service funds, dedicated broadband programmes, grants, loans, voucher schemes, and cost-sharing arrangements. Multiple funding programmes often operate across different agencies, with a strong focus on rural, unserved, and underserved areas. These sustained public investments have contributed to the relatively strong and widespread backhaul infrastructure observed in countries with mature Public Wi-Fi ecosystems. In addition to funding and direct deployment, Governments assume important facilitative roles. These include simplifying permissions, easing access to rights of way, standardising technical and security frameworks, enabling infrastructure sharing, and coordinating deployment with other public works. Such facilitation reduces deployment costs, shortens timelines, and improves the overall viability of Public Wi-Fi networks.

2.42 At the regional level, international practice shows that State Governments and local bodies play a coordinating and enabling role by aligning municipal deployments with broader digital strategies, setting common guidelines, and providing targeted funding support. Local Governments and municipal bodies play a particularly critical role at the ground level by enabling access to public assets, streamlining approvals, coordinating local implementation, and supporting demand creation through local services and community engagement. In several countries, local or municipal Governments also create telecom infrastructure, especially fibre and duct networks and lease or provide access to service providers for deploying public Wi-Fi and other broadband services.

2.43 Service providers and private sector entities play a central operational role in the global Public Wi-Fi ecosystem. Telecom service providers and broadband operators deploy and operate hotspots, provide backhaul connectivity, and integrate Wi-Fi into broader network strategies. Private enterprises and venue owners host Wi-Fi infrastructure within their premises and often partner with

professional service providers under managed-service or revenue-sharing arrangements. Together, these actors ensure efficient deployment, operation, and long-term sustainability of Public Wi-Fi networks.

2.44 The overall, global experience shows that the proliferation of Public Wi-Fi requires a coordinated combination of enabling factors, including the active involvement of Governments and municipal or State bodies as owners, facilitators, and funders[96]; the availability of robust and scalable backhaul infrastructure; sustained private sector participation; and demands for these services. Together, these elements contribute to improved digital access, enhanced service delivery, and ultimately to higher standards of living.

B. Public Wi-Fi: The Indian Experience

B.1 Current scenario of Public Wi-Fi deployments

2.45 India's experience with Public Wi-Fi has evolved alongside the country's broader digital transformation, supported by rising internet adoption, affordable data, and the expansion of digital public infrastructure. Public Wi-Fi is now recognised as a complementary access layer to mobile and fixed broadband, particularly in high-footfall public spaces and shared connectivity environments. While national policy frameworks such as the National Digital Communications Policy (NDCP) 2018 had envisaged the creation of around 10 million public Wi-Fi hotspots by 2022, actual deployments have fallen short of these targets[97]. Notwithstanding this gap, Public Wi-Fi in India has progressed through a mix of market-led initiatives and targeted Government interventions. The following paragraphs outline the major sources of Public Wi-Fi deployment in India and present an overview of the current status of such networks.

2.46 Public Wi-Fi hotspots in India are provided through a mix of private enterprise deployments, telecom and internet service providers, and select State or

[96] This is also highlighted by the UN Habitat report 'Addressing the digital divide'- https://unhabitat.org/sites/default/files/2021/11/addressing_the_digital_divide.pdf
[97] https://www.telecomepc.in/assets/tepc/pdf/policies/National_Digital_Communication_Policy_2018.pdf

municipally led initiatives. A significant share of Public Wi-Fi is hosted by private venue owners in high-footfall locations, such as airports, shopping malls, convention centres, educational institutions, and transport hubs and corporate and Government offices, where connectivity is offered to enhance user experience and support commercial activity. Retail establishments, including cafés, restaurants, hotels and small shops, also increasingly provide Wi-Fi as a complementary service to attract and retain customers. Telecom and internet service providers contribute to Public Wi-Fi availability by deploying hotspots across multiple locations, often leveraging their existing broadband and mobile networks. As per the Performance Indicator Report of TRAI, as of December 2025, TSPs/ISPs offered a total of 55,483 Wi-Fi hotspots, accounting for approximately 1,59,600 access points nationwide[98].

2.47 Alongside these private deployments, public-led initiatives have also played a role in expanding Public Wi-Fi access, most notably through RailTel. With the objective of transforming railway stations into platforms for digital inclusion, RailTel has deployed Public Wi-Fi services under the brand "RailWire." At present, over 6,115 railway stations are live with RailTel's RailWire Wi-Fi, enabling passengers to access online services, stream content, download media, and undertake work-related activities within station premises[99]. RailWire is a community-based broadband service provided by RailTel in partnership with more than 11,000 local service partners across India[100]. Launched in 2008, the service is supported by an extensive optical fiber network running along railway tracks, covering over 63,000 route kilometres and connecting more than 7,000 railway stations through exclusive right-of-way[101]. RailTel currently follows a freemium access model, under which users are provided limited free usage at

[98] https://www.trai.gov.in/sites/default/files/2026-03/QPIR_03032026_0.pdf
[99] https://www.railtel.in/key-projects/station-wi-fi-project.html
[100] https://railwire.co.in/
[101] https://www.railtel.in/network-operating-center.html

basic speeds, with higher speeds and extended access available through paid plans at nominal rates[102].

2.48 Another significant source of Public Wi-Fi deployment in India is the PM-WANI, which represents the Government's flagship initiative for Wi-Fi proliferation. Launched by the Department of Telecommunications (DoT) in 2020, PM-WANI was operationalised following TRAI's 2017 Recommendations on Proliferation of Broadband through Public Wi-Fi Networks, which articulated the need for a new delivery architecture for Public Wi-Fi. As of April 2026, approximately 4,10,131 Public Wi-Fi hotspots have been deployed under the PM-WANI framework[103]. The scheme marked a clear shift away from traditional, licence-heavy models towards a light-touch regulatory approach, based on an unbundled and distributed architecture. By separating the service delivery value chain and adopting an app-based hub framework, PM-WANI seeks to reduce entry barriers, encourage participation by small entrepreneurs, and promote competition. Public Wi-Fi under PM-WANI is delivered through a decentralised and interoperable model in which four distinct entities perform clearly defined and complementary roles as mentioned below[104]:

- Public Data Offices (PDOs): These are the last-mile service providers in the PM-WANI ecosystem. Typically operated by local entrepreneurs or small establishments such as shops, cafés, kiosks, or Common Service Centres, PDOs set up, own, and operate WANI-compliant Wi-Fi access points at the ground level. They procure internet bandwidth from licensed telecom or internet service providers and offer Wi-Fi connectivity directly to end users by selling data packs. Importantly, PDOs are not required to obtain a telecom licence, which significantly lowers compliance burdens and enables widespread participation by small and local businesses.

[102] https://sr.indianrailways.gov.in/view_detail.jsp?lang=0&id=0,4,268&dcd=11342&did=163997849939490F84152513C6EC2A89E257630C2440B

[103] https://pmwani.gov.in/wani

[104] https://pmwani.gov.in/wani

- Public Data Office Aggregators (PDOAs): PDOAs function as intermediaries between PDOs and upstream telecom networks. They aggregate multiple PDOs and provide essential backend services, such as authorization, accounting, security, network management, and settlement. By handling technical and operational complexities on behalf of PDOs, PDOAs allow small providers to focus on service delivery while ensuring standardisation and regulatory compliance across the network.
- App Providers: They develop and operate mobile or web-based applications through which users can discover PM-WANI hotspots, register, get authenticated, and purchase data packs. These applications offer a common and user-friendly interface, enabling seamless access to Wi-Fi services across different PDOs and PDOAs. App Providers do not offer connectivity directly; their role is limited to user onboarding, discovery, and facilitation of access.
- The Central Registry: The Central Registry serves as the core discovery and interoperability layer of the PM-WANI ecosystem. Operated by the Centre for Development of Telematics (C-DOT), it maintains a real-time database of all registered PDOs, PDOAs, and App Providers. The Central Registry ensures that users can connect to any PM-WANI hotspot irrespective of the service provider, thereby supporting a unified and open Wi-Fi network.

2.49 In practice, the PM-WANI ecosystem operates through a coordinated interaction among its four entities. A Public Data Office installs and operates a Wi-Fi hotspot and connects it to a Public Data Office Aggregator, which manages backend functions such as authorization, accounting, security, and network management. End users discover nearby hotspots through an App, complete authentication and purchase data packs through the application, and access the internet via the PDO's Wi-Fi access point, while the Central Registry ensures that all participating entities are registered, discoverable, authenticated, and interoperable across the network. This functional separation of roles reflects a deliberately unbundled and distributed architecture, in which

infrastructure ownership, service aggregation, user interface, and registry functions are handled by different entities. By decentralising infrastructure and adopting light touch regulatory measures, the framework significantly lowers entry barriers, enables participation by small and local entrepreneurs, and supports competition and scalability, thereby advancing the objective of affordable and widespread Public Wi-Fi access in India.

2.50 In addition to deployments by private enterprises, telecom service providers, and the PM-WANI framework, several State Governments and urban local bodies have undertaken independent Public Wi-Fi initiatives within their jurisdictions to support digital inclusion and improve access in public spaces. In Kerala, the State has implemented the Kerala Free Internet (KFi) initiative to provide free Public Wi-Fi (2000+)[105] at selected locations, complemented by the Kerala Fibre Optic Network (KFON) project aimed at extending affordable high-speed connectivity, particularly to below-poverty-line households and Government institutions[106]. Telangana has rolled out the "Hy-Fi" project with over 3000 hotspots[107] in Hyderabad under the Digital Telangana programme, covering thousands of public locations, including metro stations, schools, hospitals, and Government offices[108]. Delhi had a city-wide plan to establish a large number of free Public Wi-Fi hotspots across public areas[109]. Maharashtra has implemented municipal Wi-Fi initiatives in cities such as Mumbai and Pune, including the "Aaple Sarkar Mumbai Wi-Fi" programme and smart city–led deployments[110]. The Aaple Sarkar Wi-Fi project, offered close to 1,200 hotspots. While the project was launched with high targets, subsequent reports

[105] https://itmission.kerala.gov.in/projects/kfi-kerala-wifi-service
[106] https://www.kfi.kerala.gov.in/
[107] https://pioneeronline.com/blog-single/Ultimate-Broadband-Guide-Best-Internet-Plans-for-Hyderabads-Tech-Professionals-and-Remote-Workers-in-2025/
[108] https://it.telangana.gov.in/initiatives/hy-fi/
[109] https://timesofindia.indiatimes.com/city/delhi/11000-hotspots-to-provide-free-wi-fi-across-city-soon/articleshow/70527170.cms
[110] https://indianexpress.com/article/cities/mumbai/maharashtra-Government-launches-wifi-services-connecting-500-hotspots/

highlighted challenges with connectivity and functionality.[111] Tamil Nadu has introduced Public Wi-Fi through initiatives such as "Amma Wi-Fi" and has deployed hotspots in Chennai in partnership with private service providers[112]. As of July 2024, 958 Free Wi-Fi access points have been installed in Chennai[113]. Bihar has created a free Wi-Fi corridor, a 20 km stretch between National Institute of Technology (NIT) Patna and Danapur[114]. Karnataka, particularly Bengaluru, was among the early Indian cities to introduce free Public Wi-Fi, launching the "Namma Wi-Fi" initiative in 2014 at prominent locations such as MG Road and Brigade Road, marking an early step towards citizen-facing public connectivity[115]. Uttar Pradesh has announced plans to provide free Wi-Fi in major public locations in 217 cities across municipal corporations and district headquarters[116]. Goa has also rolled out 75 free Wi-Fi hotspots across both North and South Goa[117]. Among these, Gujarat represents a more structured State-led model, where Public Wi-Fi is supported through Urban Wi-Fi Project and BharatNet-linked initiatives, implemented by Gujarat ISP Services Ltd (GISL) using the Gujarat Fiber Grid Network to provide affordable access in public spaces. Notably, the Gujarat approach aligns closely with the PM-WANI framework and is often cited as a relatively successful example of a State-driven, scalable Public Wi-Fi deployment[118]. As of April, 2026, Gujarat alone hosts a total of 11,857 PM-WANI hotspots[119]. Collectively, these initiatives demonstrate the growing role of the State Governments /local bodies in

[111] https://mumbaimirror.indiatimes.com/mumbai/other/still-connecting-/articleshow/62245651.html , https://www.hindustantimes.com/cities/mumbai-news/citys-free-public-wi-fi-project-lying-defunct-since-2020-101705864455403.html

[112] https://it.tn.gov.in/sites/default/files/2018-10/it_e_pn_2017_18_0_0.pdf , https://w.media/tamil-nadu-Government-launches-224-public-wi-fi-hotspots-in-chennai/

[113] https://elcot.tn.gov.in/public-free-wi-fi#:~:text=Hon'ble%20Chief%20Minister%20inaugurated,have%20been%20installed%20in%20Chennai.

[114] https://timesofindia.indiatimes.com/tech-news/worlds-longest-free-wi-fi-zone-in-patna/articleshow/30691352.cms

[115] https://apacnewsnetwork.com/2023/03/Government-of-karnataka-launches-100-free-wi-fi-hotspots-powered-by-act-fibernet/ , https://wballiance.com/first-few-free-wifi-spots-rolled-out-in-bangalore/

[116] https://invest.up.gov.in/wp-content/uploads/2021/07/press-release-26july21-1.pdf

[117] https://timesofindia.indiatimes.com/city/goa/state-launches-75-free-public-wi-fi-hotspots/articleshow/116448826.cms

[118] https://www.tcil.net.in/tender/pdf/25f2514_1.pdf

[119] https://pmwani.gov.in/wani

complementing national programmes and market-led efforts to expand Public Wi-Fi access across India.

2.51 Beyond State-level programmes, a number of Public Wi-Fi initiatives have also been undertaken directly at the municipal and local body level, reflecting the growing role of urban local bodies and grassroots institutions in enabling last-mile digital access in public spaces. In Kerala, the Eraviperoor Gram Panchayat was the first to provide free Public Wi-Fi within a defined radius around key Panchayat institutions[120], while Malappuram Municipality implemented town-wide Wi-Fi coverage through 20 hotspots in collaboration with the State IT Department and RailTel[121]. In Gujarat, Surat Municipal Corporation, in partnership with TSP, launched the Surat Wi-Fi Service, offering citizens limited free daily internet access (30 minutes) at prominent public locations[122]. In Delhi, the South Delhi Municipal Corporation approved plans to establish Wi-Fi hotspots across its wards to expand neighbourhood-level connectivity with plans of integration with PM WANI framework[123]. The Greater Visakhapatnam Municipal Corporation (GVMC) has provided free Public Wi-Fi through facilities such as the Visakhapatnam Public Library and other public locations, with hotspot discovery supported through the Smart Vizag application[124]. Vijayawada Municipal Corporation has integrated free Wi-Fi into urban design initiatives, including smart streets and vending zones, as part of broader city development efforts[125]. In Bengaluru, the Bruhat Bengaluru Mahanagara Palike has planned and funded Public Wi-Fi deployments at transport hubs and public facilities, including pilot hotspot projects implemented in collaboration with

[120] https://forms.iimk.ac.in/websiteadmin/FacultyPublications/Cases/41abs.pdf

[121] https://www.thehindu.com/news/national/kerala/malappuram-rides-on-free-wifi-wave/article7571208.ece

[122] https://timesofindia.indiatimes.com/city/surat/surat-to-get-14-more-wi-fi-zones/articleshow/50633235.cms

[123] https://www.business-standard.com/article/current-affairs/south-delhi-civic-body-to-set-up-20-wi-fi-hotspots-in-each-ward-panel-head-121022301552_1.html

[124] https://en.wikipedia.org/wiki/Visakhapatnam_Public_Library , https://smart-vizag-by-gvmc.en.softonic.com/android

[125] http://www.ourvmc.org/engg/RfP_CCP_DDN.pdf , https://timesofindia.indiatimes.com/city/vijayawada/vijayawada-municipal-corporation-identifies-land-for-innovative-street-vendor-zones/articleshow/122371042.cms

private internet service providers[126]. In West Bengal, the New Town Kolkata Development Authority enabled a Public Wi-Fi corridor along a major arterial road, creating an early example of area-wide municipal Wi-Fi coverage[127]. In Hyderabad, Public Wi-Fi deployment has been driven through close coordination between the State Government and urban local bodies under the Hy-Fi initiative, resulting in around 3000 Public Wi-Fi hotspots across the city[128]. Taken together, these municipal-level initiatives highlight the important role of local bodies in complementing national and State programmes by tailoring Public Wi-Fi solutions to local contexts and public service needs.

2.52 While these initiatives reflect the growing role of State Governments and local bodies in expanding Public Wi-Fi access, the overall ecosystem in India remains fragmented and limited in scale, and cannot yet be regarded as a mature or ubiquitous public connectivity framework. In many cases, deployments are concentrated in selected urban areas, transport hubs, or public institutions within specific municipal jurisdictions, resulting in uneven coverage and limited service continuity. The absence of seamless interoperability across different cities or State networks may also pose challenges for users in terms of consistent access and roaming when moving across locations. In addition, some initiatives have faced operational challenges related to maintenance, service quality, and long-term sustainability after the initial rollout phase. In some cases, continuity of such initiatives has been affected over time due to changing administrative priorities and evolving user preferences, including increased reliance on affordable mobile data for connectivity. These factors suggest that, despite encouraging steps at the State and municipal levels, targeted policy support and coordinated implementation strategies may be required to scale Public Wi-Fi deployments across rural areas, urban centres, and high-footfall

[126] https://www.business-standard.com/article/news-ians/bengaluru-civic-body-offers-free-wireless-in-tech-city-118022801384_1.html

[127] https://en.wikipedia.org/wiki/New_Town%2C_Kolkata

[128] https://telecom.economictimes.indiatimes.com/news/telangana-Government-launches-3000-public-wi-fi-hotspots-in-collaboration-with-act-fibernet/85037692

public spaces, while also ensuring interoperability, reliability, and long-term viability of the ecosystem.

2.53 The Wi-Fi Choupal scheme, which was implemented through Common Service Centres (CSC) e-Governance Services under MeitY, also aimed to extend affordable Public Wi-Fi in rural India by leveraging BharatNet fiber connectivity and engaging Village Level Entrepreneurs (VLEs) for last-mile delivery[129]. By 2018, over 43,000 Wi-Fi hotspots were deployed across multiple states[130]. The scheme covered nearly 1.10 lakh GPs, with CSC-SPV also providing about one lakh FTTH connections to Government institutions, mainly on a free-trial basis. However, the overall impact of Wi-Fi Choupal has been limited by gaps in implementation, lower-than-targeted coverage, infrastructure issues, and sustainability concerns.

2.54 The Smart Cities Mission is one of the key national initiatives that recognises the importance of Public Wi-Fi in urban areas, positioning it as a critical component of smart urban infrastructure to support digital services, connectivity, and improved quality of life in cities. The Smart Cities Mission, launched in 2015 by the Ministry of Housing and Urban Affairs, represents India's comprehensive initiative to develop 100 cities across the country with digital-first infrastructure. Integration of free Wi-Fi services within Smart Cities Mission cities remains uneven. As of November 2024, only 39 of 100 Smart Cities Mission cities have launched public Wi-Fi services. This indicates that while the Smart Cities Mission has created robust digital infrastructure foundations, Wi-Fi service deployment represents an ongoing implementation phase requiring acceleration[131]. Wi-Fi services deployed within smart cities demonstrate varying maturity levels. Services range from free open Wi-Fi in municipal centres and public spaces, to premium business-grade connectivity

[129] https://usof.gov.in/upload/all_projects_documents/wifi_schemes/CSC_Wifi_choupal/Amendment/CSC_WiFi_Choupal_Agreement.pdf

[130] https://indianexpress.com/article/what-is/what-is-wi-fi-choupal-hotspots-in-gram-panchayats-5221050/

[131] https://www.hindustantimes.com/india-news/39-smart-cities-offer-free-wifi-service-minister-in-lok-sabha-101732787745080.html

in commercial districts, to data-intensive IoT applications supporting city management systems[132].

2.55 Beyond State, local, and private-led initiatives, national-level policies have consistently recognised Public Wi-Fi as an important instrument for expanding digital access in India. Frameworks such as the NDCP 2018 and the Digital India Programme articulated ambitious visions for large-scale Public Wi-Fi proliferation—particularly in urban centres, rural areas, and key public and educational institutions—positioning Wi-Fi as a complementary access layer to mobile and fixed broadband networks. However, despite this clear policy intent and multiple forms of deployment, actual rollout has remained below envisaged targets, largely due to challenges related to last-mile connectivity, availability of backhaul, coordination across implementing agencies, commercial sustainability, and uneven demand-side readiness. Notwithstanding these constraints, Public Wi-Fi continues to hold significant potential in the Indian context. With targeted interventions to strengthen backhaul, streamline implementation, and support local adoption, Public Wi-Fi can serve as a scalable and affordable access layer for advancing digital inclusion, service delivery, and broader digital transformation objectives.

B.2 Proliferation of Public Wi-Fi – TRAI's Recommendations

2.56 TRAI has consistently recognised the importance of Wi-Fi, including Public Wi-Fi, as a critical component for broadband expansion and digital inclusion in India. Since the early 2000s, the Authority has undertaken a series of regulatory and policy initiatives to facilitate Wi-Fi proliferation by promoting unlicensed spectrum usage, easing regulatory barriers, and encouraging innovative service delivery models. These efforts reflect TRAI's evolving understanding of Public Wi-Fi as a complementary access layer to mobile and fixed broadband networks.

[132] https://www.hindustantimes.com/india-news/39-smart-cities-offer-free-wifi-service-minister-in-lok-sabha-101732787745080.html

2.57 The regulatory foundation for Wi-Fi deployment was established through TRAI's Recommendations on accelerating growth of internet and broadband penetration dated 29 April 2004, which recommended de-licensing of certain frequency bands[133]. The 2.4-2.48 GHz band was recommended for low-power outdoor usage on non-interference, non-protection and non-exclusive basis, technology-neutral in approach. Similarly, de-licensing of the 5.725-5.85 GHz band was recommended to facilitate Wireless Access technologies for Broadband deployment. Additionally, the 5.15 – 5.35 GHz band was also recommended to be vacated expeditiously and delicensed to further facilitate the objectives. The Government issued instructions on 23 February 2009 to all Internet Service Providers regarding Wi-Fi Internet service provision under de-licensed frequency bands. These instructions mandated secured Internet services through Login ID and password with central authentication mechanisms, with restrictions on simultaneous logins and requirements for retention of subscriber identification for one year[134].

2.58 The Consultation Paper on Proliferation of Broadband through Public Wi-Fi Networks, released by TRAI on 13 July 2016, identified three critical success factors for large-scale deployment: (1) technical interoperability and seamless connectivity to Wi-Fi networks, (2) innovative payment, commercialization, and monetization models, and (3) collaborative partnerships between various ecosystem entities[135]. Building on stakeholder comments received in response, the Authority subsequently issued recommendations that emphasized a light-touch, facilitative regulatory framework aimed at enabling rapid proliferation of public Wi-Fi through minimal entry barriers[136]. To speed up deployment, TRAI recommended allowing the sharing of Wi-Fi active equipment (routers, APs)[137]. This recommendation led to design of the PM-WANI framework, which adopts

[133] https://trai.gov.in/sites/default/files/2024-09/reco29april04.pdf

[134] https://www.trai.gov.in/sites/default/files/2024-09/Wi-Fi_consultation%20Paper_13_july_2016.pdf , https://www.airwaybroadband.com/pdf/Wi-%20fi%20Direction%20to%20UASL-CMTS-BASIC%2023%20Feb%2009.pdf

[135] https://www.trai.gov.in/sites/default/files/2024-09/Wi-Fi_consultation%20Paper_13_july_2016.pdf

[136] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2115285&reg=3&lang=2

[137] https://www.trai.gov.in/sites/default/files/2024-09/WiFi_Recommendation_09032017_0.pdf

a licence-exempt, registration-based structure for PDOAs and App Providers, with no entry fee, application processing fee, or bank guarantee requirements, and no prescribed minimum equity or net worth, thereby enabling wider participation, including by small and marginal players.

2.59 Subsequently, in the consultation and recommendation process undertaken by the Authority on the framework for service authorisations under the Telecommunications Act, 2023, PM-WANI was considered under auxiliary services, inter alia, for assessing the need for any modification to the existing framework. Based on the stakeholder feedback, the Authority recommended continuation of the prevailing light-touch approach without substantive changes. This position was reflected in the draft Notification issued by the Department of Telecommunications on "Authorisation for Provision of Miscellaneous Telecommunication Services" (September 2025), wherein PM-WANI has been included, and the existing framework was proposed to be retained, with continued exemption from entry fee, application processing fee, and bank guarantee requirements, subject to compliance with the defined scope of services.

2.60 The more recent interventions by TRAI have focused on economic viability for small providers, specifically targeting backhaul costs and spectrum availability. To facilitate further uptake of PM WANI, TRAI released the Telecommunication Tariff (71st Amendment) Order, 2025, aimed at reducing operational costs and technical bottlenecks for PDOs. As per the Order, tariff charged by Service Providers to PDOs for retail broadband (FTTH) connectivity must not exceed twice the tariff applicable to regular retail consumer subscribers for the same capacity[138].

2.61 The Government implemented several technical reforms in September 2024, such as PDOs are now allowed to aggregate multiple Wi-Fi Access Points onto

[138] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2136639&reg=3&lang=2

a single broadband connection (previously, 1 AP often required 1 connection). Further, the existing private home or business Wi-Fi routers can now broadcast a second, public "PM-WANI" SSID[139]. This allows millions of existing routers to essentially "turn on" Public Wi-Fi without new hardware.

2.62 The Government has issued a Notification on the de-licensing of the lower 6 GHz band (5925-6425 MHz) for low-power applications. TRAI Recommendations dated 10th December 2025 on Assignment of the Microwave Spectrum in the 6 GHz (lower), 7 GHz, 13 GHz, 15 GHz, 18 GHz, and 21 GHz Bands, E-Band, and V-Band have recommended delicensing the V-Band (57-66 GHz) for low-power indoor and very low-power outdoor use. This band supports short-range, multi-gigabit connectivity, ideal for Wi-Fi Mesh networks.

2.63 Overall, at the regulatory level, TRAI's interventions—from early spectrum de-licensing to recent reforms on tariffs, backhaul aggregation, and unlicensed spectrum expansion—have sought to lower costs, reduce entry barriers, and improve technical viability.

B.3 Backhaul Infrastructure for Public Wi-Fi

2.64 One of the critical factors underpinning the proliferation and effective functioning of Public Wi-Fi networks is the availability of robust and scalable backhaul infrastructure. The international experiences show that adequate backhaul is essential to ensure reliable connectivity, consistent quality of service, and the ability to scale Wi-Fi deployments across diverse geographies. The following section examines the backhaul landscape in India, outlining the key technologies, programmes, and institutional efforts supporting Public Wi-Fi deployment.

2.65 In a Public Wi-Fi network, backhaul refers to the transport connectivity that links Wi-Fi access points to the wider service infrastructure, and it can be viewed from two distinct perspectives: the access network side and the core

[139] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2198211&reg=3&lang=2

network side. On the access network side, backhaul connects distributed Wi-Fi access points or controllers to an aggregation node, often using Fiber (such as FTTH) or wireless links (such as Fixed Wireless Access (FWA)); this segment focuses on last-mile reach, cost efficiency, ease of deployment, and sufficient capacity to handle localized user traffic bursts. On the core network side, backhaul provides high-capacity, resilient connectivity from the aggregation layer into the operator's core network and onward to the internet, authentication platforms, and service gateways; focusing on scalability, redundancy, low latency, and traffic engineering to support large user populations and service-level guarantees. Together, these two backhaul domains ensure that Public Wi-Fi delivers reliable local access while maintaining robust, high-performance integration with the broader network core.

2.66 Recognising backhaul as a critical enabler for scalable and reliable Wi-Fi deployment, the Government of India has consistently emphasised its expansion through successive policy and mission frameworks. The National Broadband Mission (NBM) 1.0 (2019–2024) and NBM 2.0 (2024–2030) explicitly identify backhaul—primarily in the form of optical fiber and high-capacity transport networks—as a key bottleneck for broadband expansion, and prioritise fiberisation of towers, middle-mile network expansion, and shared backhaul infrastructure, especially in underserved areas. NBM 2.0 further strengthens this approach by linking backhaul development to 5G/6G readiness, wireless broadband proliferation, and digital public infrastructure[140]. Complementing this, the NDCP, 2018 articulates long-term objectives for fiber-rich networks and robust backhaul, positioning optical fiber as the preferred backbone while recognising wireless and satellite backhaul as necessary complementary solutions for remote and challenging geographies[141].

[140] https://dipa.co.in/national-broadband-mission.pdf , https://eservices.dot.gov.in/sites/default/files/user-mannual/NBM%202-0%20Vision%20Document_Final_RoW-compressed.pdf

[141] https://www.telecomepc.in/assets/tepc/pdf/policies/National_Digital_Communication_Policy_2018.pdf

2.67 Backhaul for last-mile connectivity for Public Wi-Fi in India is provisioned through a mix of technologies, including optical fiber, mobile broadband, microwave and radio links, and satellite connectivity. Optical fibre is the primary and preferred last-mile backhaul for Public Wi-Fi globally, and India is no exception. Its high capacity, low latency, and reliability make it well-suited for high-density Wi-Fi deployments in urban areas, transport hubs, and public institutions, while alternative backhaul options may be used depending on the local conditions and cost considerations. India's optical fiber network has expanded rapidly in recent years through coordinated public and private sector efforts. As of the end of 2025, approximately 42.36 lakh route kilometres of Optical Fibre Cable (OFC) had been laid across India[142]. Fibre Connectivity is primarily provided through a combination of BharatNet, state fiber networks, and TSPs/ISPs' infrastructure. These fibre rollouts have significantly strengthened middle-mile connectivity across the country by extending high-capacity networks closer to population centres. However, limited last-mile fibre extension to neighbourhoods, public locations, and community spaces continues to constrain the effective proliferation of Public Wi-Fi hotspots, as Wi-Fi deployments depend on reliable fibre availability at the point of access. Targeted investments to bridge these last-mile gaps can therefore substantially accelerate hotspot deployment and improve utilisation of existing fibre assets. The following section provides an overview of the major fibre rollouts that comprise the backhaul in the Indian context, particularly at the middle-mile level.

2.68 A major public infrastructure backbone is the Government's BharatNet programme, which aims to connect rural India. Under BharatNet, as of March 2026, approximately 7.22 lakh km of fiber has been laid, and over 2,18,462 Gram Panchayats have been connected, with more than 9.56 million FTTH active connections. The BharatNet project is funded through the Digital Bharat Nidhi (DBN). In addition to Government-led fiber initiatives, the State-run

[142] https://www.pib.gov.in/PressReleasePage.aspx?PRID=2206477&reg=3&lang=1

telecom operator has significantly expanded FTTH connectivity across both urban and rural areas. TSPs have also scaled up fiber deployment to meet growing commercial and backhaul requirements. TSPs continue to expand FTTH networks and fiber connectivity to mobile cell sites to support high-speed broadband services and 5G fixed wireless access[143]. Together, the convergence of public fiber infrastructure under BharatNet and extensive private-sector rollouts has created a complementary backhaul ecosystem that underpins broadband connectivity, mobile networks, and the expanding deployment of Public Wi-Fi across the country.

2.69 States also play a significant role in fiber deployment, particularly under BharatNet, where around eight states—Chhattisgarh, Gujarat, Jharkhand, Andhra Pradesh, Maharashtra, Odisha, Tamil Nadu, and Telangana—have adopted a state-led model of implementation. Under the BharatNet State-led model, as of March 2026, about 283,958 km of optical fiber has been laid, connecting more than 65,000 Gram Panchayats. A case in point is Gujarat, where the Government has established a special purpose vehicle, Gujarat Fiber Grid Network Limited (GFGNL) to implement BharatNet, with a focus on creating a state-to-village fiber grid and Government-owned infrastructure available on a shared basis. In Gujarat, about 40,853 km of optical fiber had been laid, connecting more than 8,000 Gram Panchayats, and this backbone is being used for delivering Public Wi-Fi services under the PM-WANI framework[144]. Punjab became the first state to fully implement the amended BharatNet scheme statewide in November 2025, with over 1,000 kilometres of fiber laid and all 43 administrative blocks connected[145]. In addition to BharatNet, several States have also undertaken independent fiber deployment initiatives to strengthen last-mile and middle-mile connectivity, such as Kerala

[143] https://timesofindia.indiatimes.com/city/lucknow/jio-airfiber-leads-in-5g-fwa-segment-in-up-east/articleshow/121041350.cms

[144] https://dst.gujarat.gov.in/Home/GujaratFibreGridNetworkLimited

[145] https://www.newsonair.gov.in/punjab-becomes-first-state-to-implement-amended-bharat-net-scheme-statewide/ , https://www.dnpindia.in/states/punjab/bharatnet-scheme-in-punjab-punjab-becomes-the-first-state-in-india-to-bring-fast-internet-to-every-village/573697/

Fiber Optic Network (K-FON), Andhra Pradesh State FiberNet Limited (APSFL), T-Fiber project of Telangana Fiber Grid Corporation Limited etc.

2.70 States and urban local bodies also deploy fiber infrastructure as part of Smart City projects. Under the Smart Cities Mission, fiber infrastructure is an eligible and widely supported component, funded through area-based development and pan-city solutions implemented via city-level Special Purpose Vehicles. Each selected city receives ₹500 Crore over five years from the Central Government, matched by an equal contribution from the State or urban local body, and these funds may be utilised for digital infrastructure as part of approved projects. As of May 9, 2025, a total of 7,555 projects—94% of the total 8,067 projects—have been completed, amounting to ₹1,51,361 crore[146]. One example of a city undertaking significant fibreisation under its Smart City programme is Gurugram. The Gurugram Metropolitan Development Authority (GMDA), through a Public–Private Partnership, has implemented a common underground duct-based fibre network in Gurugram Sub City-2 with a concession period of 21 years. The project involves a four-duct network connecting key public and private locations such as bus stops, schools, police stations, Government offices, and commercial buildings, with two ducts reserved for Smart City operations and two made available for commercial use by service providers. The fibre network is GIS (Geographic Information System)-mapped, centrally monitored, and supports GMDA's Integrated Command and Control Centre, with operations and maintenance handled by the private partner and no right-of-way charges levied[147].

2.71 While most Smart Cities have undertaken significant fibreisation initiatives, Public Wi-Fi deployments have not scaled to the levels originally envisaged

[146] https://www.pib.gov.in/PressNoteDetails.aspx?NoteId=154736&ModuleId=3&reg=3&lang=2#:~:text=The%20total%20allocated%20union%20budget,total%20investment%201.64%20lakh%20crores.&text=The%20implementation%20of%20the%20Smart,congestion%20and%20promoting%20public%20health.

[147] https://www.gmda.gov.in/download.html?fid=681e06c5-ced5-422a-a572-33a79e259218&code=tenderResource&key=tenderAttachment&identifier=1568187202739 , https://www.constructionweekonline.in/projects-tenders/14314-sterlite-power-executes-gurugram-smart-city-optical-fibre-intracity-project

under these projects. In contrast, Smart City programmes have seen widespread and rapid deployment of CCTV cameras, traffic management systems, and command-and-control infrastructure, all of which already leverage extensive fibre and power networks created under these initiatives. Given that Public Wi-Fi deployments require the same core infrastructure—reliable fibre backhaul and assured power supply—these Smart City assets offer substantial untapped potential to expand Public Wi-Fi at a marginal additional cost. Accordingly, States and urban local bodies may consider closer coordination between Smart City projects and Public Wi-Fi initiatives, with explicit provisioning for Wi-Fi deployment in Smart City planning and implementation frameworks, to improve infrastructure utilisation and accelerate affordable public connectivity in urban areas.

2.72 Where fiber connectivity is unavailable or for rapid deployments, the last-mile connectivity for Public Wi-Fi hotspots is also being provided using 4G LTE and, increasingly, 5G networks, especially in rural areas, temporary locations, and small-scale deployments. Since the launch of 5G services in October 2022, rollout has been exceptionally rapid, with coverage extended to all States and Union Territories and 99.6 per cent of Districts nationwide. As of March 2026, telecom service providers have installed approximately 5.30 lakh 5G Base Transceiver Stations, making India one of the fastest 5G rollouts globally[148].

2.73 The bulk of mobile towers in India are financed directly by the Infrastructure Providers (IPs). These investments are commercially driven and therefore focus on commercially viable areas. Apart from these private investments, DBN funds are also used to create mobile infrastructure. These investments in mobile towers also strengthen the underlying mobile backhaul infrastructure, which can be leveraged to support Public Wi-Fi deployments, particularly in areas where fixed fibre backhaul is limited or not immediately available.

[148] https://www.dot.gov.in/static/uploads/2026/04/404239be29de5002288b2401e6e03345.pdf

2.74 In the context of mobile backhaul, the role of State Governments and local bodies is primarily that of facilitators rather than direct funders. By streamlining RoW approvals, rationalising fees, and granting access to State and municipal assets—such as buildings, street furniture, light poles, and public land, which can also support backhaul expansion for public Wi-Fi—states can substantially lower deployment costs and accelerate timelines for mobile infrastructure, including towers and small cells.

2.75 Overall, the backhaul landscape in India has evolved into a multi-technology ecosystem, with optical fiber as the primary backbone, complemented by mobile, microwave, and satellite solutions to address diverse geographic and economic conditions. The international experiences show that the proliferation of Public Wi-Fi, as well as broader telecom and broadband expansion, requires active participation by the Central Government as a funder and policy anchor, and by State Governments and local bodies primarily as facilitators. Thus, the discussions above underscore that a coordinated Centre–State-Local Body action is central to strengthening India's backhaul foundation and enabling affordable, scalable digital connectivity.

2.76 India's Public Wi-Fi ecosystem is still evolving and has substantial scope for expansion, particularly in the light of the country's vast geography, large and diverse population, and rapidly growing digital economy. The density and operationalisation of Public Wi-Fi hotspots are lower than those of global peers amid rising domestic digital demand. While fibre connectivity has improved significantly at higher levels of network aggregation, substantial gaps persist at lower levels, particularly at the last mile, where the actual Public Wi-Fi deployments take place—underscoring the need for targeted interventions, especially in uncovered and underserved areas. Despite the notification of the RoW Rules in 2024, challenges such as non-uniform adoption across States and municipalities, high and variable charges, multiple and overlapping clearances (including from utility agencies), and adherence to approval timelines continue to reflect an implementation gap at the ground level, acting as a significant

impediment to fibre-based backhaul expansion and the timely deployment of Wi-Fi hotspots. These supply-side constraints adversely affect cost-effective broadband and Wi-Fi expansion, constrain private investment, and risk slowing digital inclusion outcomes, thereby underscoring the need for a holistic regulatory and institutional reassessment to enable faster, more affordable, and scalable Wi-Fi proliferation across the country.

B.4 Public Wi-Fi – Demand scenario in India

2.77 India's digital economy has expanded rapidly over the last decade and has emerged as a central pillar of national economic growth. According to the State of India's Digital Economy Report 2024, India is the third-largest digitalised economy globally. The digital economy accounted for about 11.7% of GDP (₹31.64 lakh crore / USD 402 billion) in 2022–23 and is projected to contribute nearly 20% of GVA by 2029–30, growing almost twice as fast as the overall economy. At this pace, the digital economy is expected to surpass agriculture and manufacturing in relative economic share within the next few years. Key drivers include the rapid diffusion of digital technologies across sectors, the growth of digital platforms and intermediaries, the adoption of AI and cloud services, and the expansion of Global Capability Centres (GCCs), with India hosting more than half of the world's GCCs[149].

2.78 This digital expansion has been accompanied by a sharp rise in internet usage and data demand across all segments of the economy. Among individuals, internet usage has grown rapidly due to e-learning, e-commerce, digital Government and financial services, entertainment, social media, OTT platforms, gaming, information search, and everyday digital interactions, leading to routine, heavy data consumption across mobile and Wi-Fi networks. Enterprises increasingly depend on high-speed, reliable internet for digital business operations, cloud-based services, e-commerce, digital payments, marketing analytics, remote work tools, and AI-driven workloads, all of which require

[149] https://www.pib.gov.in/PressReleaseIframePage.aspx?PRID=2097125&reg=3&lang=2

robust bandwidth and connectivity. The Government has also emerged as a major driver of digital demand through large-scale digitisation of public services. Platforms such as DigiLocker, Unified Mobile Application for New-age Governance (UMANG), online tax filing systems, land records digitisation, and UPI-based digital payments have shifted routine citizen–state and financial interactions to online channels, structurally embedding internet usage into daily life. Reflecting this trend, average wireless data usage per subscriber increased from just 0.27 GB per month in 2014–15 to 25.70 GB per month by December 2025, representing a CAGR of over 57%, while total internet subscribers have crossed one billion[150].

2.79 A critical factor underpinning India's internet uptake is the affordability of data services combined with widespread smartphone adoption. India remains among the most affordable data markets globally, with average revenue realisation per GB of wireless data at around ₹7.87 as of December 2025[151]. The availability of multiple service providers, affordable data plans, and declining device costs have made internet access more affordable for a broad segment of the population. Smartphones have become the primary gateway to the digital ecosystem, with approximately 750 million devices, making India the second-largest smartphone market, and enabling access to a wide range of digital services, including social media, e-commerce, digital payments, and public services.[152] This shift has also transformed the telecom revenue model, with data now accounting for nearly 85% of average revenue per user, reinforcing the economy's transition towards data-centric digital consumption[153].

[150] https://www.trai.gov.in/sites/default/files/2026-03/QPIR_03032026_0.pdf
[151] https://www.trai.gov.in/sites/default/files/2026-03/QPIR_03032026_0.pdf
[152] https://www.reuters.com/business/media-telecom/indias-vast-internet-social-media-apps-market-2026-01-29/
[153] https://www.investindia.gov.in/blogs/indias-internet-surge-catalyzing-change-telecom-landscape#:~:text=Telecom-,India's%20internet%20surge:%20Catalyzing%20change%20in%20the%20telecom%20landscape,job%20creation%20and%20social%20progress.

2.80 Alongside these developments, the Government has undertaken multiple initiatives to widen the scope of India's digital landscape and to promote awareness, digital literacy, and effective usage among citizens and enterprises. Programmes such as Digital India have focused on building basic digital skills and encouraging adoption, particularly among rural households and economically weaker sections. Parallel efforts under the Jan Dhan-Aadhaar-Mobile (JAM) trinity, UPI, DBT, and other digital public platforms have embedded digital interfaces into routine economic and service delivery processes. On the enterprise side, initiatives supporting MSME digitisation, startups, and the increasing use of mandatory online systems for taxation, procurement, and compliance have further expanded the role of digital connectivity in business operations. However, notwithstanding these sustained efforts, a significant segment of the population continues to face risks of digital exclusion across income levels, geographies, capabilities, and enterprise sizes. As public services, markets, and governance become progressively more digitised, the risk of exclusion is likely to intensify in the absence of adequate digital empowerment, affordable access, and sustained capacity-building. This underscores the continued importance of targeted demand-side interventions to ensure that expanding digital infrastructure translates into inclusive, meaningful, and sustained participation in the digital economy.

2.81 Looking ahead, emerging use cases such as AI, cloud computing, connected devices, IoT, augmented and virtual reality (AR/VR), immersive media, digital health, smart mobility, and data-intensive enterprise applications will substantially increase both the volume and intensity of data consumption. In this context, the wider adoption of Wi-Fi, as a more affordable, high-capacity, and reliable access technology, therefore, becomes critical to sustaining inclusive digital growth.

2.82 In India, internet usage is largely shaped by the wide availability and affordable mobile data, resulting in a predominantly mobile-first pattern of access. Most users rely on mobile networks for connectivity in public and on-the-move

situations, while shifting to fixed or home Wi-Fi for indoor and high-data usage. This indicates that users choose their mode of access based on convenience and the type of use. In many developed countries, mobile data is relatively more expensive and Public Wi-Fi networks are widely available, with easy access, seamless service, and integrated payment options, resulting in higher uptake of Public Wi-Fi. In comparison, the demand for Public Wi-Fi in India appears relatively lower, as mobile data continues to meet a large share of user needs. At the same time, limited availability of Public Wi-Fi services, along with concerns related to security, privacy, and trust influence user demand.

2.83 These demand-side realities point to the need for focused interventions to popularise Public Wi-Fi as a trusted, affordable, and user-friendly connectivity option. This includes deploying easily discoverable, well-located hotspots, enabling simple, secure login processes, supporting seamless roaming across networks, and ensuring consistent service quality. Equally important are awareness and confidence-building measures to communicate the cost advantages, safety, and convenience of Public Wi-Fi. Strengthening user trust and visibility of Public Wi-Fi services will be essential for positioning Wi-Fi as a meaningful complement to mobile data and for advancing digital inclusion in an increasingly data-intensive digital economy.

2.84 The foregoing analysis of the demand-side dynamics, together with the supply-side issues highlighted in paragraph 2.76, underscores the need for a comprehensive regulatory and policy reassessment, undertaken through a consultative process, to enable wider and more effective proliferation of Wi-Fi networks across the country.

C. Need for Regulatory Reassessment

2.85 Over the past decade, regulatory reforms have significantly strengthened the digital connectivity ecosystem in the country. While the expansion of Public Wi-Fi has yet to fully match the global benchmarks, proactive Government initiatives—such as simplified licensing and the promotion of decentralised,

entrepreneurial participation—have laid a strong foundation for growth. However, certain economic and operational challenges continue to affect the large-scale viability of Public Wi-Fi networks. The following paragraphs highlights key issues that need to be addressed to accelerate the proliferation of Public Wi-Fi in India.

2.86 **Municipal/local body involvement**: The expansion of Public Wi-Fi needs a deeper collaboration with municipal and local bodies, particularly in strengthening last-mile connectivity. While national-level policies clearly encourage wider participation and decentralised delivery of Public Wi-Fi services, collaborative implementation at the local level can further unlock this potential. Municipal authorities can play a pivotal role, as they manage key public infrastructure—such as electric poles, bus stops, traffic signals, and public buildings—that are essential for deploying Wi-Fi access points. A more facilitative approach that recognises digital connectivity as a public utility can enhance economic sustainability by rationalising Right-of-Way charges, rentals, and electricity tariffs. Additionally, introducing unified and streamlined approval processes would accelerate fiber backhaul deployment and reinforce the ease-of-doing-business objectives envisioned by central policies. Achieving this will require close coordination between the Central and State Governments, as well as the active engagement of local bodies.

2.87 **Expectation of Free Wi-Fi**: The widespread expectation of "free Wi-Fi" acts as a significant psychological and economic barrier to the expansion of Public Wi-Fi, as it directly weakens the commercial viability of hotspot providers that operate on paid or freemium business models. Indian consumers have been conditioned by the aggressive pricing of 4G/5G mobile data to view internet connectivity as a near-zero-cost commodity. Consequently, when a Public Wi-Fi Hotspot provider/PDO attempts to sell Wi-Fi vouchers even at nominal rates (e.g., ₹5 or ₹10), they encounter user's reluctance who either rely on their own mobile data or expect Wi-Fi to be a complimentary amenity similar to what is

offered at transports hubs, hotels or restaurants. This narrative creates an unviable business case for Public Wi-Fi.

2.88 **Competition from mobile service**: The competitive data tariffs, and convenience of mobile usage in India have unintentionally created a major structural challenge for the adoption and commercial sustainability of Public Wi-Fi networks. From a user behaviour standpoint, mobile data provides a seamless, always-on experience: there is no need to scan for networks, manually authenticate, purchase vouchers, or deal with login portals. In contrast, Public Wi-Fi, especially under decentralized models like PM-WANI, often requires several extra steps: discovering the hotspot, connecting, authenticating via an app or OTP, and purchasing a small voucher. Most users perceive these steps as unnecessary hassles when their mobile data already works fast enough. As a result, even in areas where Public Wi-Fi is deployed, actual usage remains low because the "switching cost" in terms of time and effort outweighs the marginal financial savings. This impacts the Public Wi-Fi provider/PDO who operate the hotspots. Their business model relies heavily on frequent micro-transactions, small payments for limited data sessions. But if users are unwilling to leave their mobile data connection, each hotspot attracts only a small number of paying customers per day. This leads to low average revenue per hotspot, often insufficient to cover the Public Wi-Fi Hotspot provider's/PDO's recurring expenses, such as backhaul bandwidth charges, electricity costs, equipment maintenance, and revenue-sharing obligations with higher entities.

2.89 **Last-Mile connectivity**: The success of Public Wi-Fi deployment depends on the availability of reliable last-mile connectivity. In the Indian context, despite initiatives such as BharatNet and fibre deployments by State and private entities, overall fibre penetration at the last mile remains limited, particularly outside major urban centres. Dedicated or semi-dedicated backhaul connections are often expensive due to high last-mile provisioning charges and limited competition in wholesale bandwidth markets, making them unviable for

Public Wi-Fi hotspot providers operating on thin margins. India lacks a uniform, open-access backhaul layer comparable to municipal fiber networks available in other countries. Strengthening last-mile connectivity through expanded fiber deployment, more competitive wholesale bandwidth markets, and accessible shared infrastructure is not just a technical necessity but a strategic imperative and prerequisite for achieving scalable, high-quality, and inclusive Public Wi-Fi access.

2.90 **Security, privacy, and trust deficits**: Security, privacy, and trust deficits pose a significant barrier to the widespread adoption of Public Wi-Fi networks, undermining the broader objectives of initiatives like PM-WANI. Despite the robust technical architecture of schemes like PM-WANI, users remain skeptical about connecting to "open" networks managed by small entities such as local shopkeepers (PDOs). Further, public concerns about cyber threats have grown alongside high-profile incidents of data breaches and financial fraud, making users increasingly cautious about connecting to unfamiliar hotspots, especially for sensitive transactions. As a result, even when Public Wi-Fi is available and affordable, users often prefer the perceived safety of their mobile data networks. Addressing these trust deficits requires stronger security standards, mandatory encryption practices, user education campaigns, and transparent data-handling norms to make Public Wi-Fi a reliable and trusted alternative for digital connectivity.

2.91 **Authentication Process**: Although PM-WANI was designed to simplify onboarding through app-based discovery and OTP-based authentication, in practice, users frequently encounter multiple steps—downloading a Wi-Fi access app, registering with a provider, navigating login portals, generating OTP, and purchasing small data vouchers—which collectively introduce friction and deter casual usage. For many users, especially those with low digital literacy or limited patience for repeated authentication, these steps feel complex compared to the instant connectivity offered by mobile data. Additionally, inconsistent implementation across different PDOs results in a

wide range of user experiences, with some hotspots requiring repeated logins even over short periods. Simplifying authentication, single-click onboarding, persistent logins, or device-based authentication can improve usability and drive higher adoption.

2.92 **Seamless roaming concerns**: The lack of seamless roaming may further undermine the user experience and attractiveness of Public Wi-Fi. In contrast to mobile networks that enable uninterrupted connectivity across cell sites, PM-WANI hotspots largely lack standardised solutions for session continuity between PDOs. As a result, users may experience interrupted connections, repeated logins, and the need to re-authenticate when moving between hotspots—even within the same city. Addressing these challenges through unified authentication, standardized roaming protocols, and backend integration is essential for a user-friendly Public Wi-Fi network.

2.93 **Low Public Awareness**: Limited public awareness continues to affect the uptake of Public Wi-Fi services. Many potential users are not adequately informed about the availability of Wi-Fi hotspots, the access method, or the cost and reliability of such services. This information gap, along with concerns about security and the relative convenience of mobile data, limits user adoption and regular use. Bridging this awareness deficit through targeted campaigns, in-app guidance, and community engagement is essential to drive adoption, increase usage, and make Public Wi-Fi a viable complement to mobile broadband. Similarly, a perceptible lack of awareness persists among potential and existing PDOs. Many are not adequately informed that becoming a PDO involves minimal entry barriers, with no licensing requirement and only a simple registration process. Further, there is limited awareness among local entrepreneurs, small businesses, and community institutions that operating as a PDO can offer a viable primary or supplementary source of income. The potential for generating revenue through user access charges, partnerships, or bundled services is often poorly understood, which reduces incentives to participate. Addressing this awareness gap could help position Public Wi-Fi not

only as a connectivity solution but also as a local entrepreneurship and livelihood opportunity.

2.94 The discussion above provides an overview of the current Public Wi-Fi landscape in India, covering Wi-Fi deployments by various entities, the prevailing backhaul and last-mile connectivity infrastructure, and the demand-side characteristics of Public Wi-Fi usage. In this context, the stakeholder views are solicited on the following questions:

Q1. What are the key supply-side constraints affecting Public Wi-Fi proliferation in India? What targeted policy or regulatory measures may be required to address these supply-side constraints? Please provide your response in detail with justification.

Q2. What are the major demand-side constraints limiting the uptake of Public Wi-Fi services in the country? What targeted policy or regulatory measures may be required to address these demand-side constraints? Please provide your response in detail with justification.

Q3. Despite the PM WANI initiative, scaling the number of public hotspots across diverse geographies, especially in remote and underserved regions, remains uneven. What are the key challenges in expanding both the density and geographic spread of hotspots, and what strategies could help accelerate more balanced, nationwide coverage? Please provide your response in detail with justification.

Q4. What changes, if any, are required in the existing PM-WANI framework to improve revenue certainty and long-term sustainability for PDOs/PDOAs? Please provide your response in detail with justification.

Q5 **Are there any other challenges currently faced by PDOAs/PDOs? If yes, what changes can enhance the participation of entrepreneurs under the PM-WANI framework? Please provide your response in detail with justification.**

Q6 **Are there improvements needed in the Authentication, Authorization, Roaming, and Payment architecture of the PM-WANI Framework? Please share suggestions, if any. Please provide your response in detail with justification.**

D. Policy Pathways for the proliferation of Public Wi-Fi

2.95 International experience, when viewed alongside India's domestic context, indicates that the country has substantial untapped potential to scale up its Public Wi-Fi ecosystem. However, given India's vast geography and heterogeneity in digital needs, levels of digital literacy, skills, awareness, and existing infrastructure, a differentiated, targeted approach is required for varying user segments and usage contexts. Therefore, the primary objective of this consultation paper is to identify and propose viable and effective models for the proliferation of Public Wi-Fi in India across three distinct contexts: (i) rural areas, (ii) urban areas, and (iii) high-footfall areas.

2.96 Rural areas here refer to villages and sparsely populated regions characterised by lower population density, dispersed settlements, and relatively limited digital infrastructure. In the context of digital connectivity, such areas often face constraints in terms of reliable broadband backhaul, availability of telecom infrastructure, and access to public internet facilities. Consequently, the deployment of Public Wi-Fi networks in rural areas remains limited and typically depends on Government-supported initiatives or community-based connectivity programmes. Urban areas refer to cities and towns characterised by higher population density, greater economic activity, and relatively well-developed telecommunications infrastructure. In the context of digital connectivity, these

areas generally benefit from wider availability of broadband networks and a greater presence of digital service infrastructure. Consequently, most Public Wi-Fi deployments in India are concentrated in urban locations such as Government offices, public institutions, commercial districts, transport facilities, and educational campuses.

2.97 High-footfall areas refer to locations where people assemble in large numbers, move through, or spend time on a regular or periodic basis, resulting in consistently high demand for data connectivity. In such locations, users may be stationary or mobile, but typically require reliable, high-capacity internet access for communication, information, and digital services. High-footfall areas include places of public and social importance such as schools, colleges, hospitals, public libraries, Government offices, and community facilities. They also encompass critical transit and interchange points, such as bus terminals, railway stations, metro stations, and airports, along with their associated waiting and circulation areas. In addition, mobile or semi-mobile environments, such as buses, trains, and other mass transit systems, generate sustained connectivity demand during transit. Commercial and recreational spaces, including shopping malls, theatres, auditoriums, markets, plazas, tourist centres, and entertainment hubs, also constitute high-footfall areas due to prolonged user presence and intensive data usage. Further, certain locations may become high-footfall areas on a temporary or event-based basis, such as stadiums, exhibition grounds, convention centres, fairs, melas, and large public gatherings, where data demand peaks sharply during specific periods.

2.98 The models envisaged under this consultation encompass both outdoor and indoor Public Wi-Fi deployment scenarios, recognising the distinct technical and operational requirements associated with each. Outdoor deployments typically include locations such as bus stops, roadside transit points, open public parks, markets, tourist sites, and other open-access community spaces, where coverage needs to be extended across wider geographic areas. However, such deployments face challenges related to the availability of a reliable power

supply, extension of high-capacity backhaul to dispersed locations, and RoW permissions. Further, the equipment in open areas is more susceptible to physical damage or vandalism. Collectively, these factors contribute to increased deployment costs and operational complexities. Addressing these challenges requires a combination of policy support and infrastructure facilitation. Streamlining RoW processes and enabling access to existing infrastructure such as street furniture, utility poles, utility ducts, CCTV infrastructure and buildings can significantly ease deployment and reduce costs. Ensuring a reliable power supply and a common or bulk billing mechanism, where power consumption of multiple installations can be aggregated and billed together through a single application or connection, can simplify processes, reduce administrative burden, and enable faster and more cost-effective network rollout. Further, standardised deployment frameworks, along with measures to enhance physical security and durability of equipment, can support more efficient and resilient outdoor Public Wi-Fi networks.

2.99 In contrast, a significant proportion of Public Wi-Fi usage—particularly in high-footfall environments—occurs within indoor settings such as railway stations, metro stations, airports, shopping malls, hospitals, educational institutions, convention centres, libraries, museums, and large commercial or public buildings. These indoor environments often present specific challenges and therefore require focused planning and targeted interventions to ensure reliable, high-quality connectivity. Signal propagation is constrained by walls, floors, and building materials, while high user density places significant pressure on network capacity. This necessitates a denser deployment of access points, careful network design to manage interference, and robust internal cabling and power arrangements. Further, effective indoor deployment often requires integration with building design at the planning stage, along with coordination with building owners or facility managers, which can add to deployment complexity. Collectively, these factors lead to higher costs and greater complexity in infrastructure deployment within indoor environments. Addressing these challenges requires targeted policy and planning measures,

including policies that promote infrastructure sharing, streamlined approvals, and incentives for neutral host network models, which enable multiple service providers to utilise a shared in-building Wi-Fi infrastructure. Incorporating digital connectivity provisions within building codes—such as in-building solutions (IBS) and dedicated spaces for telecom equipment—can significantly ease deployment barriers. Leveraging indoor assets for access point deployment and data-driven network planning can enable more optimal placement of access points and improved capacity management, thereby ensuring that indoor Public Wi-Fi networks remain reliable, scalable, and responsive to rising user demand.

2.100 In this context, recognising the importance of integrating digital connectivity into building design and infrastructure planning, TRAI, in its Recommendations on 'Rating of Buildings or Areas for Digital Connectivity' (February 2023), recommended that the Model Building Bye-Laws (MBBL) and National Building Code of India (NBC) should be amended to incorporate necessary provisions on Digital Connectivity Infrastructure (DCI). It was also recommended that DCI should be made an essential component of building development plans, on the lines of water supply, electrical services, gas supply, fire protection, and fire safety requirements. Further, TRAI recommended that in all existing buildings owned by the Government, Public Sector Units (PSUs) or autonomous bodies, as well as in commercial buildings and public places such as airports, ports, railway stations, bus stations, metro stations, and other notified buildings, DCI should be upgraded or provisioned to meet the requirements of state-of-the-art digital connectivity. DCI refers to both passive and active elements that are used, or are capable of being used, to enable seamless digital connectivity, including Wi-Fi.

2.101 Global experience demonstrates that successful Public Wi-Fi deployment is typically underpinned by coordinated action across multiple stakeholders. In particular, the effectiveness and sustainability of Public Wi-Fi networks depend on the complementary roles played by:

(i) The Government- Centre and States,

(ii) Local bodies

(iii) Service Providers (TSPs and ISPs)

(iv) Private sector entities.

In this context, the following section outlines the prospective roles that each of these stakeholders can play in the Indian ecosystem, drawing upon international best practices and adapting them to domestic conditions.

D.1 Role of the Government- Centre and States

2.102 Global experience demonstrates that Public Wi-Fi proliferation follows multiple models, which can be broadly grouped into three approaches.

a. A Government-led and coordinated model, in which the Government plays a proactive role in setting policy direction, undertaking and financing deployments, and ensuring the availability of high-quality backhaul, while private operators, local authorities, and venue owners actively undertake hotspot deployment and operations by co-operating with the state to achieve its broad goals and targets. This approach is evident in countries such as South Korea and several EU Member States, where Public Wi-Fi is treated as a core digital public service.

b. A market-driven model, in which the Government focuses on creating an enabling environment by ensuring robust backhaul infrastructure, facilitating deployments in public institutions and Government premises, and intervening selectively only to address market failures or underserved areas. This model characterises countries such as the United States and the United Kingdom.

c. A Public–Private Partnership (PPP) model, where public authorities and private entities jointly undertake Wi-Fi deployments, often combining Government-supported backhaul networks with commercially driven installations by service providers and venue owners. Under this approach, public authorities play a key role in facilitating the availability of backhaul infrastructure, while service providers and venue owners

deploy access networks and deliver services based on commercial considerations. Hong Kong illustrates this hybrid approach, leveraging both public initiatives and private investment.

Together, these models highlight that successful Public Wi-Fi ecosystems rely on an appropriate balance among public intervention, private participation, and strong underlying backhaul infrastructure.

2.103 Irrespective of the Public Wi-Fi deployment model adopted, certain common features emerge across international experience. Governments play an active role in facilitating Wi-Fi deployment in public institutions and Government offices, and in extending connectivity to rural and remote areas where private investment may be limited due to weak commercial viability. In such contexts, the State often undertakes direct deployment or finances Wi-Fi infrastructure as part of broader digital inclusion and public service delivery objectives. In urban areas, Government-led deployments are typically aligned with smart city programmes, digital governance initiatives, and the provision of public digital services. In high-footfall public locations such as community halls, parks, airports, railway stations, transit hubs, and public transport systems, including metros and trains, local authorities frequently take the lead in enabling or deploying Public Wi-Fi. In contrast, in commercially viable high-footfall locations such as shopping malls, theatres, auditoriums, tourist centres, markets, and entertainment venues, Wi-Fi deployment is generally overseen by venue owners or private operators. Across all models, the most critical and consistent role of the Government is to ensure the availability of robust backhaul infrastructure, either through direct rollout of fibre and core networks or through financial support and policy facilitation, recognising that reliable backhaul is a prerequisite for sustainable and scalable Public Wi-Fi deployment.

2.104 In the Indian context, the current status of Public Wi-Fi deployment has been discussed in detail in Section B.1. In rural areas, Public Wi-Fi deployment remains limited, primarily due to weak commercial viability, limited last-mile infrastructure, and low levels of user awareness. In urban areas, several State

and municipal initiatives, often implemented under programmes such as the Smart Cities Mission, have facilitated the deployment of Public Wi-Fi across selected locations. However, there remains scope to further expand coverage, enhance service quality consistency, and improve user uptake. High-footfall areas present a mixed picture. Public Wi-Fi is available at most major airports and railway stations; however, usage can be increased by addressing security concerns and by increasing public awareness. Public Wi-Fi deployment within Government institutions and public offices has also not been widely mainstreamed. Public Wi-Fi hotspots are also available in a range of public spaces, including parks, metro stations, and transit corridors; however, patterns of sustained and regular usage continue to vary across locations. In educational institutions, universities, and hospitals, Wi-Fi networks are largely restricted to students, staff, or registered users and are not generally accessible to the wider public. Taken together, these observations indicate that while the policy intent and initial deployment efforts are in place, outcomes on the ground remain uneven across geographies and use cases.

2.105 India's large and digitally active population, rising data consumption, and growing dependence on continuous connectivity—particularly in high-footfall environments—highlight the importance of Public Wi-Fi as a complementary access layer within the broader broadband ecosystem. Connectivity is increasingly critical for enabling smart city services in urban areas and for advancing digital inclusion in rural and underserved regions. There is a need for distinct and targeted Public Wi-Fi proliferation strategies for rural areas, urban spaces, and high-footfall locations, taking into account differences in digital maturity, user segments, usage patterns, institutional capacity, and local implementation constraints. In this background, stakeholder's comments are solicited on the following questions:

Q7. In the Indian context, which of the following models would be more appropriate for the proliferation of Public Wi-Fi?

a. A model where the Government actively ensures hotspot deployment through direct funding and implementation support, including backhaul provision; or

b. A model where the Government primarily ensures availability of robust backhaul infrastructure and intervenes in hotspot deployment only in cases of market failure.

Please provide your response in detail with justification.

Q8. Is there a need to adopt separate strategies for Public Wi-Fi proliferation in rural and urban areas? If yes, suggestions may be provided. Please provide your response in detail with justification.

Q9. What measures can be taken to improve the deployment and uptake of Public Wi-Fi networks in high-footfall areas for both outdoor (such as bus stops, roadside transit points, open public parks, markets, tourist sites), and indoor (such as airports, railway stations, malls, public institutions)? Please provide your response in detail with justification, separately for outdoor and indoor scenarios.

2.106 The paragraphs above reflect upon the role played by the Government in the direct deployment of Public Wi-Fi hotspots. Beyond direct deployment, Governments across jurisdictions also assume funding and facilitative roles in enabling Public Wi-Fi expansion. International experience indicates two broad funding approaches. The first involves direct public funding for Wi-Fi hotspot deployment, in which Governments finance deployments based on identified needs, policy priorities, and coverage objectives, as seen in countries such as South Korea. The second approach is voucher-based funding, exemplified by the European Union's WiFi4EU programme, under which eligible municipalities apply for standardised vouchers, typically disbursed on a first-come, first-served basis. In several other countries, Governments do not routinely fund

hotspot deployment directly but engage in self-deployment in public institutions and make targeted interventions in areas where market-led deployment is unlikely due to limited commercial viability.

2.107 In the Indian context, should the Government consider assuming a more explicit funding role, it would be important to recognise that digital access requirements, institutional capacity, and deployment economics vary widely across geographies. Rural areas, urban locations, and high-footfall environments differ significantly in terms of commercial viability, user density, operational complexity, and long-term maintenance requirements, and consequently, the appropriateness of funding instruments and disbursement criteria may vary across deployment models. This underscores the need for context-sensitive funding frameworks for different deployment environments, supported by clear eligibility conditions, transparent disbursement criteria, and appropriate accountability mechanisms to ensure effective utilisation of public funds. The choice of funding mechanism may also influence the nature and extent of participation by local bodies, service providers, venue owners, and other private entities. In this background, stakeholder's comments are solicited on the following questions:

Q10. If the Government decides to provide financial support for the proliferation of Public Wi-Fi, which funding mechanisms would be most suitable for India? Should a uniform funding mechanism be adopted nationwide, or should differentiated funding mechanisms be used for rural, urban, and high-footfall areas? Please provide your response in detail with justification.

Q11. What criteria should govern the allocation and disbursement of funds across rural, urban, and high-footfall areas, respectively? Please provide your response in detail with justification.

2.108 International experience demonstrates that the proliferation and long-term success of a mature Public Wi-Fi ecosystem is fundamentally dependent on the availability of strong and robust backhaul infrastructure. In most countries with well-established Public Wi-Fi networks, Governments play a prominent role in ensuring backhaul availability, often extending fibre connectivity to street level. Governments typically support backhaul expansion through a combination of direct network roll-outs and financial intervention. International practice shows that multiple public agencies administer broadband and digital infrastructure programmes with a strong focus on backhaul deployment. Funding is commonly provided through a mix of grants, loans, grant–loan combinations, cost-sharing arrangements, voucher schemes, and, in many cases, targeted subsidies from national Universal Service Funds. Disbursement is generally guided by need- and policy-based criteria, with priority accorded to unserved and underserved areas to address market gaps and advance digital inclusion objectives.

2.109 The Indian backhaul scenario is discussed in detail in Section B.3 of this consultation paper. Fibre presence in rural India has expanded primarily through Government-led initiatives, most notably BharatNet, which has extended optical fibre to a large number of Gram Panchayats. This has improved middle-mile availability; however, the last-mile fibre connectivity from Gram Panchayats to households, institutions, and Wi-Fi access points remains limited and uneven. In many locations, fibre is underutilised due to gaps in local distribution networks, power availability, and operational readiness. Private TSP/ISP-led fibre deployment in rural areas remains selective, largely confined to commercially viable pockets.

2.110 Urban centres exhibit relatively higher levels of fiberisation, driven mainly by private ISPs and TSPs deploying FTTH/FTTB (Fibre to the Building) networks for residential, enterprise, and mobile backhaul requirements. Municipal and State-led fibre deployments, often under Smart City and e-governance programmes, have supplemented this base in selected cities. While core and aggregation fibre networks are generally adequate in urban areas, last-mile

fibre access is still constrained in many localities due to right-of-way challenges, fragmented duct infrastructure, and coordination issues with local bodies. High-footfall locations such as airports, major railway stations, metro networks, and select commercial hubs typically have access to robust fibre backhaul, sourced from a mix of central agencies, State entities, and private operators. However, fibre availability across other public spaces such as bus terminals, markets, public institutions, and transit corridors remains inconsistent. In many cases, while fibre passes nearby, structured last-mile connectivity for Public Wi-Fi deployment is either absent or not readily accessible on reasonable terms.

2.111 In this context, targeted public funding could be considered to address persistent last-mile connectivity gaps that constrain Public Wi-Fi deployment. Where adequate infrastructure is not available, suitable technologies—including fibre, wireless, or hybrid solutions—may be deployed using resources from the Digital Bharat Nidhi (DBN), in accordance with applicable guidelines, to bridge connectivity gaps. In this background, stakeholder's comments are solicited on the following questions:

Q12. Is the lack of adequate and reliable last-mile connectivity a critical constraint for the proliferation of Public Wi-Fi in the country? If yes, what specific measures may be considered by the Central Government, State Governments, and local bodies to address the last-mile constraints? Please provide your response in detail with justification.

Q13. Is there a need for the Government to provide funding for provisioning of last-mile connectivity in the uncovered or underserved areas for Public Wi-Fi networks? If yes, which funding option is best suited in the Indian context, and what should be the criteria for rural, urban, and high footfall areas, respectively? Please provide your response in detail with justification.

2.112 Beyond their roles as deployers and funders of Wi-Fi networks and backhaul infrastructure, Governments internationally play a critical facilitative role in enabling the proliferation of Public Wi-Fi. This includes setting unified technical and security standards, establishing clear regulatory frameworks to streamline right-of-way permissions and the integration of street furniture, and supporting demand-side measures such as digital literacy campaigns, skilling initiatives, and awareness programmes to encourage adoption. These facilitative measures are essential for accelerating the rollout of fibre and other backhaul infrastructure, as well as for enabling faster, more predictable deployment of Public Wi-Fi hotspots at the local level. By reducing procedural complexity and regulatory uncertainty, Governments create an enabling environment for participation by service providers, local bodies, and private entities.

2.113 In the Indian context, elements of this facilitative role are already visible. Technical and security requirements have been prescribed for Public Wi-Fi deployments, including for PM-WANI–based hotspots. Further, the Telecommunications Right of Way Rules, 2024, notified under the Telecommunications Act, 2023, provide a uniform national framework to streamline permissions for network deployment. The facilitative role of the Central Government now lies in ensuring effective coordination with States and local bodies so that these Rules are formally adopted, aligned, and operationalised through State notifications, municipal by-laws, and simplified administrative processes. To further incentivise States, the recent Special Assistance to States for Capital Investment (SASCI) guidelines dated 27th March, 2026 have linked the disbursal of 50-year interest-free loans to the implementation of the Right of Way (RoW) Rules, 2024, with a dedicated outlay of ₹4,000 crore earmarked for this purpose. Under this framework, Part VI operationalises a reform-linked, milestone-based incentive structure, wherein States must undertake measures such as enabling notifications, integrated RoW portals, and streamlined approvals a precondition for accessing the funds. This approach effectively aligns telecom infrastructure expansion with broader fiscal support, encouraging States to undertake time-bound regulatory reforms.

Consistent and predictable implementation across jurisdictions is essential to reduce delays, uncertainty, and costs, and to support scalable, sustainable Public Wi-Fi deployment nationwide.

2.114 While the deployment of Public Wi-Fi hotspots, fibre networks, and other backhaul infrastructure, as well as the funding of such initiatives, may be undertaken by both the Central and State Governments, certain functions are more effectively discharged at the State level. Against this backdrop, the discussion now turns to the specific role of State Governments in the Public Wi-Fi ecosystem. As key stakeholders in planning, infrastructure provision, and last-mile implementation, and by virtue of their closer proximity to ground-level connectivity needs, availability of public assets, and local institutional capacity, State Governments are better positioned to shape deployment strategies, facilitate coordination with local bodies, and influence on-ground outcomes in a timely and context-sensitive manner- be it rural, urban or high footfall locations.

2.115 State Governments can play a decisive role in strengthening backhaul availability through structured, State-led approaches. The fibre created under BharatNet can be effectively leveraged in rural areas as a common backhaul layer for extending connectivity for Public Wi-Fi and other digital services. Gujarat provides an illustrative example, where the Gujarat Fiber Grid Network has been used to support Public Wi-Fi deployments in urban and public spaces. In urban areas, State and city-level agencies can further facilitate Public Wi-Fi by promoting street-level fiberisation through planned shared infrastructure. The Gurugram Smart City initiative exemplifies this approach, where a common underground duct-based fibre network has been deployed through a public–private partnership, with dedicated ducts for public use and additional capacity made available to service providers. Such models reduce right-of-way constraints, lower deployment costs, and ensure long-term fibre availability at the street level. Collectively, these experiences highlight the ability of State Governments to accelerate fibre roll-out, enable shared infrastructure, and

ensure the availability of robust last-mile backhaul—an essential prerequisite for the sustainable proliferation of Public Wi-Fi networks.

2.116 Yet another effective intervention available to State Governments is to act directly as a PDOA under the PM-WANI framework. A State Government institution can efficiently discharge the PDOA function by leveraging its scale, administrative reach, and ability to coordinate across departments and local bodies. As a PDOA, the State can aggregate a large and diverse base of PDOs across rural and urban areas, including Panchayats, municipalities, Common Service Centres (CSCs), schools, health facilities, and local entrepreneurs, by offering a common onboarding interface, standardised technical support, and assistance with regulatory and operational compliance. This significantly lowers entry barriers for PDOs, promotes uniform service quality, and accelerates the rollout of Public Wi-Fi hotspots. A practical illustration of this model is the Gujarat State-supported ISP functioning as a PDOA, which has demonstrated the viability of a State-anchored aggregation approach through wide PDO onboarding and streamlined operations.

2.117 This role of State Governments as key enablers in widespread broadband and Wi-Fi proliferation has been consistently emphasised by TRAI across multiple earlier Recommendations. In its Recommendations on National Broadband Plan (December 2010), TRAI proposed the creation of a National (NOFA) and State Optical Fiber Agencies (SOFA), wherein the SOFAs under the overall guidance of NOFA have to carry out the works related to creation of shared infrastructure for access aggregation and backhaul in the rural areas and shared fiber infrastructure in the urban areas where necessary[154]. Similarly, TRAI Recommendations on Implementation Strategy for BharatNet (February 2016) clearly identified that State Government involvement is essential for the success of the BharatNet project. It also recommended that the States/UTs be made an integral part of the project implementation and suggested the constitution

[154] https://www.trai.gov.in/sites/default/files/2024-09/Rcommendation81210.pdf

of an institutional mechanism, both at the State and District levels, to effectively coordinate and resolve implementation issues[155].

2.118 TRAI has also given specific Recommendations with respect to easing of RoW procedures and for street furniture integration. The Recommendations on Roadmap to Promote Broadband Connectivity and Enhanced Broadband Speed (August 2021) recommended the formulation of a Centrally Sponsored Scheme by the Central Government to incentivise States/ UTs for RoW reforms wherein the quantum of incentive for a State/ Union territory (UT) can be linked to the net improvement in the Broadband Readiness Index score of that State/ UT. It also recommends for creation of District-level committees with District Magistrate as Chairman, a representative from Licensed Service Area (LSA) unit of DoT, and Superintendent Engineer / Executive Engineer of Public Works Department to streamline RoW permissions framework at district level. The District level committees could necessarily include representatives from the Irrigation Department, Forest Department, Rural Development Department, Local Bodies like Municipal corporation, Municipality etc. and Utility Service Providers like telegraph, electricity, water, gas etc. The recommendation also identifies the role of reduction in RoW charges in the proliferation of broadband and suggests that respective State Government/UT Administration should direct Local Bodies to not to charge any other fee or charge for RoW permission other than what fees or charges are prescribed in the Indian Telegraph Right of Way Rules, 2016[156] (subsequently superseded by Telecommunications Right of Way Rules, 2024). Similarly, the Recommendations on use of street furniture for small cell and aerial fiber deployment (Nov 2022) suggested the issuing of advisory guidelines by DoT to States for mandating Controlling Administrative Authorities that own/control traffic lights to share these assets with TSPs/IP-Is for deployment of small cells. It also suggests earmarking dedicated spaces in existing and planned buildings/structures of all Central Government entities for

[155] https://www.trai.gov.in/sites/default/files/2024-09/Recommendations%20on%20BharatNet%2001.02.2016%20FINAL.pdf
[156] https://www.trai.gov.in/sites/default/files/2024-09/Recommendations_31082021.pdf

installing DCI, followed by advisory guidelines to the states for similar action by their entities and local bodies[157]. The above-mentioned TRAI recommendations underscore the need for the Central and State Governments, along with municipal bodies, to collaborate as facilitators to expedite the deployment of a robust national telecom infrastructure.

In the above context, stakeholders' comments are solicited on the following questions:

Q14. Are there any RoW challenges faced by service providers in accessing public places or street furniture to install Public Wi-Fi hotspots? If yes, details may be provided along with suggestions for improvements. Please provide your response in detail with justification.

Q15. What facilitative roles can State Governments play in accelerating Public Wi-Fi deployment across rural, urban, and high-footfall areas, respectively? Should States consider deploying Public Wi-Fi networks at the municipal and gram panchayat level? Please provide your response in detail with justification.

Q16. Should the State Government need to take initiatives to improve the availability of last-mile connectivity for Public Wi-Fi networks? If yes, what measures can incentivise States /municipalities to undertake city- and town-level fiberisation to ensure Public Wi-Fi network proliferation? Please provide your response in detail with justification.

D.2 Role of Local Bodies

2.119 The role of local bodies is central to the effective deployment and uptake of Public Wi-Fi as such networks are implemented and experienced primarily at

[157] https://www.trai.gov.in/sites/default/files/2024-09/Recommendations_29112022_0.pdf

the ground level. International experience indicates that local bodies generally play a predominantly facilitative role, reflecting their close engagement with communities, local institutions, and service delivery mechanisms. Municipal and local bodies are well positioned to translate national and State-level policies into on-ground outcomes by enabling timely, coordinated, and context-specific implementation within their jurisdictions. In some cases, they may also directly own, manage, or operate Public Wi-Fi infrastructure, particularly under digital inclusion or Smart City initiatives.

2.120 On the supply side, local bodies facilitate Public Wi-Fi deployment by easing right-of-way (RoW) permissions, streamlining local approvals, coordinating implementation at the ward or neighbourhood level, and providing access to municipal infrastructure such as streetlights, bus shelters, public buildings, parks, and other street furniture. Their involvement is particularly important for supporting fibre and other last-mile backhaul infrastructure through faster approvals, coordinated planning alongside other civic works, and reduction in deployment delays and costs. Such facilitation enables faster roll-out of Wi-Fi hotspots and improves the availability of last-mile connectivity required for sustainable operations.

2.121 Local bodies can play an important role in enabling Public Wi-Fi deployment in high-footfall locations such as transport hubs, theatres, auditoriums, markets, tourist areas, educational institutions, hospitals, and public plazas. Owing to their proximity to local demand patterns, municipal authorities are best placed to identify priority locations based on footfall, congestion, and service needs, and to coordinate with venue owners, TSPs/ISPs, and PDOs for timely deployment. Facilitation at this level includes access to public spaces and assets, expediting RoW and local clearances, and ensuring availability of basic infrastructure such as power and security. Through local monitoring of service quality and uptime, municipal bodies can also help ensure that deployments in such locations remain reliable and responsive to peak demand.

2.122 Ensuring the availability of adequate last-mile backhaul is another important facilitative function of local bodies. Local bodies can begin by assessing existing backhaul infrastructure within their jurisdictions in relation to Public Wi-Fi requirements. Where backhaul is found to be inadequate or absent, they can leverage the Digital Bharat Nidhi (DBN) infrastructure for creation or augmentation of last-mile connectivity. In rural areas, where BharatNet provides fibre connectivity up to the Gram Panchayat level, local bodies can facilitate last-mile extension by identifying, encouraging, and supporting private entities to operate as BharatNet Udyamis (BNUs). This includes raising awareness of the BNU model and its associated incentives for extending connectivity from Gram Panchayats to villages, habitations, and households. In urban areas, while most locations are served by TSP/ISP or State-led networks, local bodies can still assess the adequacy for Public Wi-Fi use cases and explore alternative funding mechanisms to address gaps.

2.123 Local bodies can also play a catalytic role in expanding the PDO ecosystem. By undertaking targeted awareness and outreach, local bodies can encourage local shops, small enterprises, residential associations, and community institutions to participate as PDOs, highlighting the low entry barriers, simplified registration, and potential for supplementary income under the PM-WANI framework. Viability can be further enhanced through simplified local permissions, limited financial or in-kind support such as access to municipal assets, concessional power supply, or space for equipment, and by anchoring initial demand through integration of Wi-Fi usage with municipal and community services.

2.124 On the demand side, the role of local bodies is particularly important in rural and semi-urban areas, where limited digital awareness, literacy, and skills often constrain effective internet use and reduce incentives for deployment. Local bodies can address these constraints through community-level awareness and capacity-building activities conducted via Panchayats, schools, anganwadis, self-help groups, and local institutions. By demonstrating practical, locally

relevant applications of Public Wi-Fi, such as access to Government services, education, health, and digital payments, local bodies can support sustained use and strengthen the overall viability of Public Wi-Fi networks. Together, these facilitative functions position local bodies as key enablers of both the supply-side and demand-side conditions necessary for scalable, inclusive, and sustainable Public Wi-Fi deployment.

In the above context, stakeholders' comments are solicited on the following question:

Q17. What facilitative roles can local bodies play in accelerating the deployment and sustainable operation of Public Wi-Fi networks in rural and urban areas? Please provide your response in detail with justification.

D.3 Role of Service Providers

2.125 The Telecom Service Providers (TSPs) play a significant role in the proliferation of Public Wi-Fi in India by virtue of their extensive access network infrastructure, spectrum holdings, and nationwide reach. By providing backhaul connectivity, last-mile access, and integration with mobile networks, TSPs can support the large-scale deployment of Public Wi-Fi hotspots, particularly in high-traffic urban areas. Public Wi-Fi offloading can also complement mobile broadband networks by easing network congestion and improving overall quality of service for consumers. Further, TSPs are well-positioned to ensure compliance with lawful interception, security, and quality-of-service requirements, given their established operational capabilities and regulatory experience. A regulatory framework that enables commercial viability, encourages infrastructure sharing, and provides clarity on licensing and revenue models can enhance TSP participation in Public Wi-Fi deployment, thereby contributing to digital inclusion and efficient utilization of telecom networks.

2.126 The Internet Service Providers (ISPs) play a pivotal role in the proliferation of Public Wi-Fi infrastructure in India, as they constitute the primary backbone for connectivity, bandwidth provisioning, and network management. By enabling last-mile connectivity and offering scalable broadband services, ISPs serve as essential enablers for Public Wi-Fi hotspots deployed across commercial, institutional, and community spaces. Their participation is critical in ensuring quality of service, network reliability, and cybersecurity compliance, particularly in high-density public environments. Furthermore, ISPs can facilitate wider adoption of Public Wi-Fi through flexible wholesale bandwidth pricing, infrastructure sharing, and partnerships with Public Data Offices (PDOs), local bodies, and private enterprises. A conducive regulatory framework that incentivizes ISP participation—while reducing operational and right-of-way constraints—can significantly accelerate the expansion of Public Wi-Fi networks, thereby supporting the objectives of digital inclusion, affordable internet access, and the National Digital Communications Policy.

In the above context, stakeholders' comments are solicited on the following questions:

Q18. What regulatory or policy incentives, schemes or programs are required to promote active participation of TSPs and ISPs in Public Wi-Fi deployment? Please provide your response in detail with justification.

Q19. What regulatory or fiscal incentives, schemes or programs may be required in the provisioning of bandwidth and backhaul for Public Wi-Fi networks? Please provide your response in detail with justification.

D.4 Role of Private entities

2.127 The private sector plays a critical and complementary role in the deployment and expansion of Public Wi-Fi by translating policy frameworks and public infrastructure into on-ground connectivity outcomes. Private entities primarily

participate in the Public Wi-Fi ecosystem as venue owners and system integrators, leveraging their proximity to users and control over commercial and community spaces. In the Indian context, private sector participation as venue owners is particularly significant, as businesses and institutions can host Wi-Fi infrastructure by providing physical space, power supply, and basic site security at minimal incremental cost. In rural areas, local enterprises such as kirana stores, Common Service Centre (CSC) operators, cooperatives, and village-level entrepreneurs can function as Wi-Fi venues by extending connectivity from Gram Panchayat or BharatNet nodes to habitations and community locations. In urban settings, shops, cafés, offices, residential welfare associations, and small businesses can support neighbourhood-level Wi-Fi availability, while in high-footfall locations, larger private establishments such as malls, theatres, auditoriums, hospitals, educational institutions, hotels, and tourist sites can enable Wi-Fi access at scale. In event-based high-footfall environments such as stadiums, convention centres, exhibition grounds, concert venues, and festival sites, private venue owners can further support the deployment of high-capacity, temporary or scalable Public Wi-Fi networks to cater to concentrated and time-bound connectivity demand. Under the PM-WANI framework, such private venue owners can directly operate as Public Data Offices (PDOs) by registering with authorised PDO Aggregators and offering Wi-Fi services at their premises with limited regulatory and technical overhead.

2.128 In addition to access provision, private entities can also contribute meaningfully to last-mile backhaul extension, particularly in rural areas. Through the BharatNet Udyami model, private entrepreneurs extend fibre connectivity from BharatNet Gram Panchayat points to households, institutions, and commercial premises within villages, thereby addressing last-mile gaps. These entities receive financial incentives for deploying and maintaining Fibre-to-the-Home connections, strengthening local connectivity while creating sustainable livelihood opportunities. Together, these roles enable the private sector to act as a key delivery arm for Public Wi-Fi and broadband initiatives.

2.129 Private sector entities can also play a pivotal role in the proliferation of Public Wi-Fi by efficiently performing the function of system integrators within the ecosystem. System integrators serve as technical coordinators for Public Wi-Fi projects, responsible for designing, integrating, deploying, and managing end-to-end Wi-Fi solutions across diverse geographies and use cases. They bring together multiple components—such as Wi-Fi access points, routers and switches, last-mile backhaul connectivity (including fiber, wireless, or satellite), authentication platforms (including captive portals and identity verification mechanisms), network management systems, cybersecurity controls, and analytics tools—into a single, functional, secure, and scalable network. Rather than owning spectrum or directly providing retail internet services, system integrators focus on ensuring that all components supplied by different vendors operate seamlessly and meet defined performance, security, and service-level requirements. The presence of system integrators in the Public Wi-Fi ecosystem offers multiple advantages: it reduces technical and coordination complexity for venue owners and small enterprises seeking to host Public Wi-Fi in shops, markets, transport hubs, or other premises; enables faster and more cost-effective deployments through standardized and interoperable solutions; and provides a single point of technical accountability. At the same time, system integrators can significantly assist central, state, and municipal bodies by translating policy objectives and coverage goals into implementable network architectures, managing multi-vendor deployments, and supporting sustainable operations, thereby strengthening the overall effectiveness and scalability of Public Wi-Fi initiatives.

In the above context, stakeholders' comments are solicited on the following questions:

Q20. What measures can be adopted to incentivise private enterprises, commercial establishments, shop owners, community institutions, etc., to install Public Wi-Fi hotspots? Please provide your response in detail with justification.

Q21. Is there a need to strengthen the role of public or private entities as system integrators for the deployment of Public Wi-Fi networks? If yes, what policy or institutional support may be required? Please provide your response in detail with justification.

D.5 Authentication, Payment, Roaming, and Revenue streams options

2.130 This section examines the Public Wi-Fi ecosystem with other globally available methodologies for authentication, payment, roaming, and probable revenue streams that together determine user experience, scalability, security, and commercial sustainability.

2.131 India's Public Wi-Fi authentication system has been governed by DoT instructions issued in 2009 that mandated verification through SMS-based OTPs or physical/photo identity documents retained for audit purposes[158]. This methodology prioritizes security and traceability but relies on manual, per-session authentication and prohibits simultaneous logins with the same credentials.

2.132 The introduction of the PM-WANI framework in December 2020 marked a methodological shift toward light-touch regulation by enabling registration-based deployment of Public Wi-Fi access points[159]. However, PM-WANI did not fundamentally change the authentication mechanism. The dependence on SMS OTP for first-time authentication introduces operational friction, more so in high-density environments where cellular congestion may even delay OTP delivery.

[158] https://www.airwaybroadband.com/pdf/Wi-%20fi%20Direction%20to%20UASL-CMTS-BASIC%2023%20Feb%2009.pdf

[159] https://www.pib.gov.in/PressReleseDetail.aspx?PRID=2198211

2.133 In contrast, globally available contemporary authentication methodologies such as Passpoint (Hotspot 2.0) eliminate manual login through 802.1X/EAP-based automatic provisioning, enabling seamless and secure connectivity without user intervention[160]. The persistence of a legacy model therefore represents a structural constraint on scalability, interoperability, and user experience.

2.134 The PM-WANI initiative seeks to expand affordable public internet access through a decentralized ecosystem of Public Data Offices, aggregators, and application providers; however, existing authentication often introduces user friction and operational inefficiencies. Integrating the Unified Payments Interface (UPI) into Public Wi-Fi Networks, such as PM-WANI, can provide a unified solution for user authentication and payments by leveraging UPI's widely adopted, secure, and consent-driven digital payment infrastructure. A centralized authorization, authentication, and payment gateway can interface with Public Wi-Fi systems and UPI systems to authenticate users and obtain explicit consent. By minimizing reliance on OTP-based captive portals and reducing the need to store sensitive user data, the approach can enhance security, privacy, and user experience, while improving the economic sustainability and scalability of Public Wi-Fi Networks.

2.135 Public Wi-Fi roaming in India is currently ISP-specific, with minimal inter-provider interoperability. Most deployments operate as isolated networks without technical mechanisms for seamless roaming. While PM-WANI enables registration-based hotspot deployment, it does not mandate alignment with roaming standards. In contrast, globally available seamless roaming standards, such as 'OpenRoaming', launched in May 2020 by the WBA, are increasingly being adopted for interoperable roaming standards[161].

[160] https://www.wwt.com/blog/demystifying-hotspot-20-passpoint-and-openroaming-the-pros-and-cons, https://wayfiwireless.com/hotspot-2-0-passpoint-vs-captive-portal

[161] https://wballiance.com/wba-annual-industry-report-2025-shows-steep-growth-in-confidence-for-wi-fi-and-openroaming/

2.136 TRAI's 2016 Consultation Note proposed a forward-looking "1-Click" authentication and payment architecture, leveraging Aadhaar/eKYC, national registries, and UPI integration. The methodology envisioned a layered ecosystem comprising central registries, hotspot providers, registration app providers, software enablers, and payment APIs (Application Programming Interface). The proposed flow enabled one-time user registration, token-based authentication, seamless device authorization, and integrated digital payments[162]. From a design perspective, the framework anticipated many elements now standardized globally, including federated identity, centralized discovery, and unified payments. However, subsequent developments, such as PM-WANI, implemented the proposed registration mechanisms but with a limited architectural design.

2.137 From the available International best practices and comparative methodologies, Passpoint (Hotspot 2.0) represents a mature global standard for Public Wi-Fi authentication, enabling automatic, secure, and seamless connectivity through enterprise-grade encryption. While captive portals have served their purpose for years, they are rapidly becoming outdated in a world that demands seamless, secure, and scalable connectivity. Passpoint (Hotspot 2.0) is a fast-emerging choice for Public Wi-Fi providers to enhance user experiences, strengthen security, and future-proof the networks[163]. 'OpenRoaming' represents an advanced framework that enables dynamic peer discovery, seamless roaming, and tiered quality-of-service models. Its rapid global adoption reflects industry consensus around the need for interoperable Wi-Fi that integrates seamlessly with cellular networks[164].

[162] https://www.trai.gov.in/sites/default/files/2024-09/Consultation_Note_15_November_2016_1.pdf

[163] https://wayfiwireless.com/hotspot-2-0-passpoint-vs-captive-portal , https://www.wwt.com/blog/demystifying-hotspot-20-passpoint-and-openroaming-the-pros-and-cons

[164] https://wballiance.com/wba-annual-industry-report-2025-shows-steep-growth-in-confidence-for-wi-fi-and-openroaming/
https://www.econstor.eu/bitstream/10419/205200/1/Navio-Marco-et-al.pdf

2.138 Comparative analysis reveals that India's Public Wi-Fi ecosystem is constrained by legacy authentication practices, fragmented payments, and a lack of roaming federation. India possesses a unique strategic advantage through UPI's mature, high-volume payment infrastructure, which can directly address monetization and sustainability challenges. Aligning PM-WANI with internationally available comparative methodologies and mandatory UPI integration may modernize India's Public Wi-Fi architecture while remaining consistent with TRAI's original 2016 vision.

2.139 Therefore, the next phase of evolution of India's Public Wi-Fi policy may require modernization and upgradation of authentication, payments, and roaming to contemporary global standards. Such alignment would significantly enhance user experience, support sustainable business models, and enable Public Wi-Fi to function as a true complement to cellular broadband in achieving universal digital access.

In the above context, stakeholders' comments are solicited on the following questions:

Q22. Are users experiencing challenges with the authentication and authorization procedures for accessing Public Wi-Fi Networks? If yes, how can authorization and authentication processes be simplified while ensuring security and compliance? Please provide your response in detail with justification.

Q23. Is there a need for a centralized platform for authentication and payment systems in the Public Wi-Fi ecosystem? If yes, which entity is best suited for its implementation and management? Please provide your response in detail with justification.

Q24. What steps are required to achieve interoperability and seamless roaming among Public Wi-Fi networks? Should

inter-hotspot roaming be made mandatory, and if so, should a "super-aggregator" be introduced to facilitate it? Please provide your response in detail with justification.

Revenue stream options

2.140 In many countries, Public Wi-Fi is predominantly offered at low or no cost to users. Indian consumers, particularly in urban and semi-urban areas, are accustomed to relying on mobile data for outdoor connectivity due to affordable data tariffs. A significant percentage of the urban population carries dual SIMs, as different operators may perform better in different areas, helping reduce call drops and improve connectivity while on the move. To meaningfully shift a portion of this mobile data consumption to Public Wi-Fi—especially in high-footfall public spaces—it is important that Public Wi-Fi services are offered at affordable and competitive price points that incentivise adoption and regular usage. Such pricing improves user uptake, familiarity, and habitual reliance on Public Wi-Fi networks. However, this also implies that hotspot operators—whether TSPs, ISPs, local bodies, or neutral host providers—must rely on alternative, diversified revenue streams rather than direct user charges alone. The following paragraphs examine the key direct and indirect revenue models that are considered viable in the Indian context, based on insights from existing domestic and international implementations.

2.141 International experience shows that Public Wi-Fi networks can generate direct revenues through a mix of user payments and commercial partnerships, depending on location and user behaviour. The key direct monetisation models are:

- **Paid access model:** Users pay for Wi-Fi based on time or data usage; suitable mainly for captive or premium locations (airports, hotels, lounges) where willingness to pay is higher.

- **Freemium model:** Limited free access is provided initially, with charges applied for extended or higher usage; balances inclusion and revenue generation and works well in transport hubs, campuses, and public institutions.

- **Advertisement-based model:** Users receive free access in exchange for viewing advertisements on login portals or banners. This is particularly effective in high-footfall public spaces and can also support the dissemination of Government information.

- **Bundled Wi-Fi by TSPs:** Public Wi-Fi access is bundled with mobile subscription plans, and operators monetise indirectly through higher-value plans and mobile traffic offload.

- **Community-led Model:** Initial funding to the community comes through Corporate Social Responsibility (CSR) funds of corporations or Government or NGOs. Subsequently, the cost of operation is shared by the community.

- **Revenue-sharing arrangements:** Revenues from ads, services, or bundles are shared among hotspot providers, venue owners, backhaul providers, and platform operators based on agreed terms.

2.142 Beyond direct user-facing revenues, Public Wi-Fi networks derive significant indirect economic value, which strengthens long-term viability and justifies public support. Key indirect models include:

- **Mobile data offload benefits:** Shifting traffic from mobile networks to Wi-Fi reduces congestion, defers spectrum investment, improves quality of service, and supports subscriber retention.

- **Data analytics and insights:** Aggregated and anonymised usage and footfall data can be monetised by venue owners, urban authorities, and planners for better operational and service decisions.

- **Cross-subsidisation through public funding:** Grants, viability gap funding, and performance-linked subsidies help offset costs in low-revenue or high-cost areas, enabling inclusive and scalable Wi-Fi deployment.

- **Support for Smart City and IoT services:** Wi-Fi infrastructure is leveraged for surveillance, sensors, traffic management, and utilities, with costs met through municipal or urban development budgets.

- **Enablement of digital public services:** Wi-Fi supports e-governance, tele-education, telemedicine, and digital payments, delivering efficiency gains that justify public funding even without direct revenues.

In the above context, stakeholders' comments are solicited on the following question:

Q25. What monetisation models are most appropriate for rural, urban, and high-footfall locations, respectively? Please also suggest any additional monetisation models that may be suitable in the Indian context. Please provide your response in detail with justification.

Q26. Please provide any additional comments, observations, or suggestions related to the proliferation of Public Wi-Fi in the country, including any potential issues or considerations that may not have been covered in the sections above. Please provide your response in detail with justification.

Chapter 3 - Issues for Consultation

A. Status Assessment and specific strategies for the proliferation of Public Wi-Fi

Q1. What are the key supply-side constraints affecting Public Wi-Fi proliferation in India? What targeted policy or regulatory measures may be required to address these supply-side constraints? Please provide your response in detail with justification.

Q2. What are the major demand-side constraints limiting the uptake of Public Wi-Fi services in the country? What targeted policy or regulatory measures may be required to address these demand-side constraints? Please provide your response in detail with justification.

Q3. Despite the PM WANI initiative, scaling the number of public hotspots across diverse geographies, especially in remote and underserved regions, remains uneven. What are the key challenges in expanding both the density and geographic spread of hotspots, and what strategies could help accelerate more balanced, nationwide coverage? Please provide your response in detail with justification.

Q4. What changes, if any, are required in the existing PM-WANI framework to improve revenue certainty and long-term sustainability for PDOs/PDOAs? Please provide your response in detail with justification.

Q5. Are there any other challenges currently faced by PDOAs/PDOs? If yes, what changes can enhance the participation of entrepreneurs under the PM-WANI framework? Please provide your response in detail with justification.

Q6. Are there improvements needed in the Authentication, Authorization, Roaming, and Payment architecture of the PM-WANI Framework? Please

share suggestions, if any. Please provide your response in detail with justification.

Q7. In the Indian context, which of the following models would be more appropriate for the proliferation of Public Wi-Fi?

a. A model where the Government actively ensures hotspot deployment through direct funding and implementation support, including backhaul provision; or

b. A model where the Government primarily ensures availability of robust backhaul infrastructure and intervenes in hotspot deployment only in cases of market failure.

Please provide your response in detail with justification.

Q8. Is there a need to adopt separate strategies for Public Wi-Fi proliferation in rural and urban areas? If yes, suggestions may be provided. Please provide your response in detail with justification.

Q9. What measures can be taken to improve the deployment and uptake of Public Wi-Fi networks in high-footfall areas for both outdoor (such as bus stops, roadside transit points, open public parks, markets, tourist sites), and indoor (such as airports, railway stations, malls, public institutions)? Please provide your response in detail with justification, separately for outdoor and indoor scenarios.

B. Role of Government- Funding deployments

Q10. If the Government decides to provide financial support for the proliferation of Public Wi-Fi, which funding mechanisms would be most suitable for India? Should a uniform funding mechanism be adopted nationwide, or should differentiated funding mechanisms be used for rural, urban, and high-footfall areas? Please provide your response in detail with justification.

Q11. What criteria should govern the allocation and disbursement of funds across rural, urban, and high-footfall areas, respectively? Please provide your response in detail with justification.

C. Role of Government- Backhaul provisioning and funding

Q12. Is the lack of adequate and reliable last-mile connectivity a critical constraint for the proliferation of Public Wi-Fi in the country? If yes, what specific measures may be considered by the Central Government, State Governments, and local bodies to address the last-mile constraints? Please provide your response in detail with justification.

Q13. Is there a need for the Government to provide funding for provisioning of last-mile connectivity in the uncovered or underserved areas for Public Wi-Fi networks? If yes, which funding option is best suited in the Indian context, and what should be the criteria for rural, urban, and high footfall areas, respectively? Please provide your response in detail with justification.

D. Facilitative role- States and local bodies

Q14. Are there any RoW challenges faced by service providers in accessing public places or street furniture to install Public Wi-Fi hotspots? If yes, details may be provided along with suggestions for improvements. Please provide your response in detail with justification.

Q15. What facilitative roles can State Governments play in accelerating Public Wi-Fi deployment across rural, urban, and high-footfall areas, respectively? Should States consider deploying Public Wi-Fi networks at the municipal and gram panchayat level? Please provide your response in detail with justification.

Q16. Should the State Government need to take initiatives to improve the availability of last-mile connectivity for Public Wi-Fi networks? If yes, what

measures can incentivise States /municipalities to undertake city- and town-level fiberisation to ensure Public Wi-Fi network proliferation? Please provide your response in detail with justification.

Q17. What facilitative roles can local bodies play in accelerating the deployment and sustainable operation of Public Wi-Fi networks in rural and urban areas? Please provide your response in detail with justification.

E. Incentivising Service Providers

Q18. What regulatory or policy incentives, schemes or programs are required to promote active participation of TSPs and ISPs in Public Wi-Fi deployment? Please provide your response in detail with justification.

Q19. What regulatory or fiscal incentives, schemes or programs may be required in the provisioning of bandwidth and backhaul for Public Wi-Fi networks? Please provide your response in detail with justification.

F. Incentivising Private entities

Q20. What measures can be adopted to incentivise private enterprises, commercial establishments, shop owners, community institutions etc. to install public Wi-Fi hotspots? Please provide your response in detail with justification.

Q21. Is there a need to strengthen the role of public or private entities as system integrators for the deployment of Public Wi-Fi networks? If yes, what policy or institutional support may be required? Please provide your response in detail with justification.

G. Technical Architecture, Authentication, and Interoperability

Q22. Are users facing challenges in the authorization and authentication procedures for accessing Public Wi-Fi Networks? If yes, how can authorization and authentication processes be simplified while ensuring security and compliance? Please provide your response in detail with justification.

Q23. Is there a need for a centralized platform for authentication and payment systems in the Public Wi-Fi ecosystem? If yes, which entity is best suited for its implementation and management? Please provide your response in detail with justification.

Q24. What steps are required to achieve interoperability and seamless roaming among Public Wi-Fi networks? Should inter-hotspot roaming be made mandatory, and if yes, should a "super-aggregator" need to be introduced to facilitate it? Please provide your response in detail with justification.

H. Monetisation and Sustainability

Q25. What monetisation models are most appropriate for rural, urban, and high-footfall locations, respectively? Please also suggest any additional monetisation models that may be suitable in the Indian context. Please provide your response in detail with justification.

Q26. Please provide any additional comments, observations, or suggestions related to the proliferation of Public Wi-Fi in the country, including any potential issues or considerations that may not have been covered in the sections above. Please provide your response in detail with justification.

Annexure-I

Cost Comparison: Per-GB Mobile Data vs. Wi-Fi Data (Fixed Broadband in India)

Mobile Data – Per GB Cost (based on Operator Tariffs)

Jio ₹239 plan[165] (1.5 BG, 28 days)

- 1.5 GB/day × 28 days = 42 GB
- Per GB = 239 ÷ 42 = **₹5.69**

Airtel ₹299 plan[166] (1GB, 28 days)

- 1 GB/day × 28 days = 28 GB
- Per GB = 299 ÷ 28 = **₹10.67**

Average price: ₹8.18/GB

Wi-Fi / Fixed Broadband – Per GB Cost (Using ISP Plans)

Fixed broadband is *not billed per GB*, so we calculate per-GB from fair-use limits or typical monthly usage.

JioFiber ₹899 plan[167]

- Speed: 100 Mbps
- Typical monthly usage assumption as per fair use limit: ~3300 GB/month
- Per GB cost = 899 ÷ 3300 = **₹0.27 per GB** ≈ 27 paisa per GB

Airtel Xstream ₹999 plan[168]

- Speed: 100 Mbps
- Assuming same monthly usage: ~3300 GB/month
- Per GB = 999 ÷ 3300 = **₹0.30 per GB**

Average price: ₹0.285/GB

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[165] https://www.jio.com/selfcare/plans/mobility/prepaid-plans-list/?category=Popular%20Plans&categoryId=UG9wdWxhciBQbGFucw==&subcategory=MS41IEdCL2RheSBQbGFucw==

[166] https://www.airtel.in/recharge-online

[167] https://www.jio.com/selfcare/plans/fiber/fiber-postpaid-plans-home/

[168] https://www.airtel.in/plans/broadband/999-fiber

As per figures reported by TSPs, FTTH services have a monthly consumption per subscriber ranging from **250 to 300 GB**[169]

Extending the above calculations to the same, the Per GB cost of Wi-Fi based on usage is as follows:

JioFiber ₹899 plan

- Per GB cost = 899 ÷ 250 = **₹3.56 per GB**
- Per GB cost = 899 ÷ 300 = **₹2.99 per GB**

Airtel Xstream ₹999 plan

- Per GB cost = 999 ÷ 250 = **₹3.99 per GB**
- Per GB cost = 999 ÷ 300 = **₹3.33 per GB**

Average per GB cost in terms of usage = **₹3.4 per GB**

PM WANI cost calculations[170]

Low-end coupon (1 GB / 1 day)

- Plan: ₹6 for 1 GB (1-day coupon).
- Calculation: ₹6 ÷ 1 GB = **₹6.00 per GB.**
- Note: This is a small, convenience coupon — high per-GB but short validity.

Mid pack (20 GB / 7 days)

- Plan: ₹25 for 20 GB (7-day coupon)
- Calculation: ₹25 ÷ 20 GB = **₹1.25 per GB.**

Monthly pack (100 GB / 30 days)

- Plan: ₹99 for 100 GB (30-day coupon).
- Calculation: ₹99 ÷ 100 GB = **₹0.99 per GB** (≈ 99 paise/GB).

[169] https://www.business-standard.com/industry/news/fixed-wireless-access-users-go-past-ftth-consume-600-gb-data-a-month-124102301203_1.html
[170] https://waniwifi.in/internetplans/Index

LIST OF ACRONYMS

AI	Artificial Intelligence
ANMS	Authentication and Network Management Systems
AP	Access Point
API	Application Programming Interface
APSFL	Andhra Pradesh State FiberNet Limited
ARPA	American Rescue Plan Act, USA
AR/VR	Augmented Reality / Virtual Reality
B2B	Business to Business
BEAD	Broadband Equity Access and Deployment, USA
BcN	Broadband Convergence Network, South Korea
BNU	BharatNet Udyami
CAGR	Compound Annual Growth Rate
CEF	Connecting Europe Facility
C-DOT	Centre for Development of Telematics
CPF	Capital Projects Fund, USA
CSC	Common Service Centres
CSR	Corporate Social Responsibility
CVS	Connection Voucher Scheme, UK
DBN	Digital Bharat Nidhi
DBT	Direct Benefit Transfer
DCI	Digital Connectivity Infrastructure
DoT	Department of Telecommunications
DfE	Department for Education, UK
DPI	Digital Public Infrastructure
DSL	Digital Subscriber Line
EAFRD	European Agricultural Fund for Rural Development
EAP	Extensible Authentication Protocol
EIB	European Investment Bank
EFSI	The European Fund for Strategic Investments
e-KYC	Electronic Know Your Customer

ERDF	European Regional Development Fund
ESI	European Structural and Investment Fund
EU	European Union
FCC	Federal Communications Commission, USA
FNO	Fixed Network Operators
FTTB	Fiber to the Building
FTTH	Fiber to the Home
FWA	Fixed Wireless Access
GB	Giga Bytes
GBVS	Gigabit Broadband Voucher Scheme, UK
GCC	Global Capability Centre
GDP	Gross Domestic Product
GDPR	General Data Protection Regulation, EU
GFGNL	Gujarat Fiber Grid Network Limited
GIS	Geographic Information System
GISL	Gujarat ISP Services Ltd
GMDA	Gurugram Metropolitan Development Authority
GST	Goods and Services Tax
GVA	Gross Value Added
GVMC	Greater Visakhapatnam Municipal Corporation
HFC	Hybrid Fiber-Coaxial
HTTPS	Hypertext Transfer Protocol Secure
IBS	In-Building Solutions
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
IIJA	Infrastructure Investment and Jobs Act, USA
IoT	Internet Of Things
IP	Infrastructure Provider
ISP	Internet Service Provider
IT	Information Technology
IT-BPM	Information Technology and Business Process Management

ITeS	Information Technology Enabled Services
ITU-R	International Telecommunication Union - Radiocommunication Sector
JAM	Jan Dhan-Aadhaar-Mobile
KFi	Kerala Free Internet
KFON	Kerala Fibre Optic Network
LFFN	Local Full Fiber Networks, UK
LSA	Licensed Service Area
MBBL	Model Building Bye-Laws
MFA	Multi-Factor Authentication
MLO	Multi-Link Operation
MMP	Middle Mile Program, USA
MSIT	Ministry of Science and ICT - South Korea
MSME	Micro, Small, and Medium Enterprises
MU-MIMO	Multi-User Multiple Input Multiple Output
NBC	National Building Code
NBM	National Broadband Mission
NHS	National Health Service, UK
NIT	National Institute of Technology
NOFA	National Optical fibre Agency
NDCP	National Digital Communications Policy
NTIA	National Telecommunications & Information Administration, USA
OFC	Optical Fibre Cable
OFCA	Office of the Communications Authority, Hong Kong
OFDM	Orthogonal Frequency Division Multiple
OFDMA	Orthogonal Frequency Division Multiple Access
ONDC	Open Network for Digital Commerce
OTP	One-Time Password
PDO	Public Data Office
PDOA	Public Data Office Aggregators
PM-WANI	Prime Minister’s Wi-Fi Access Network Interface
PON	Passive Optical Network

PPC	Public–Private Collaboration
PPP	Public-Private Partnership
PSU	Public Sector Unit
PWaaS	Public Wi-Fi as a Service
QAM	Quadrature Amplitude Modulation
QoS	Quality of Service
RDOF	Rural Digital Opportunity Fund, USA
RF	Radio Frequency
RFP	Request for proposal
RoW	Right of Way
SASCI	Special Assistance to States for Capital Investment
SDG	Sustainable Development Goals
SOFA	State Optical Fiber Agency
SSID	Service Set Identifier
TBCP	Tribal Broadband Connectivity Program, USA
TfL	Transport for London
TRAI	Telecom Regulatory Authority of India
TSP	Telcom Service Provider
UBF	Urban Broadband Fund, UK
UK	United Kingdom
UPI	Unified Payments Interface
USD	United States Dollar
USDA	United States Department of Agriculture
UT	Union Territory
VHCN	very high-capacity network
VLE	Village Level Entrepreneur
WEP	Wired Equivalent Privacy
Wi-Fi	Wireless Fidelity
WaaS	Wi-Fi as a Service
WLAN	Wireless Local Area Network
WMM	Wi-Fi Multimedia

WPA-3	Wi-Fi Protected Access
XR	eXtended Reality