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IAFI/2025-26/L-16

To,

**Dr. Abdul Kayum**
Advisor (BB & PA),
Telecom Regulatory Authority of India,
World Trade Centre, Tower-F, (4th to 7th Floors),
Nauroji Nagar, New Delhi- 110029

**Subject: IAFI Comments/Suggestions on TRAI Consultation Paper regarding Proliferation of Public Wi-Fi Networks in India.**

Ref: TRAI Consultation Paper No. 07/2026 dated 27 April 2026

Dear Sir,

The ITU-APT Foundation of India (IAFI) sincerely thanks TRAI for issuing the Consultation Paper regarding the "**Proliferation of Public Wi-Fi Networks in India**" and for inviting comments/suggestions from stakeholders.

IAFI has examined the various issues raised in the Consultation Paper and, after detailed examination and consultation with our industry partners, we forward our detailed comments and suggestions to TRAI for consideration.

IAFI would be happy to participate in any Open House Discussion (OHD) or meeting, should TRAI deem it necessary for further clarification on our submission. We look forward to collaborating with TRAI and remain available for any further discussions that may be required.

**Warm Regards,**

**Bharat B Bhatia,**
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**Vice Chairman, World Wireless Research Forum (WWRF)**
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Copy to: Secretary, TRAI

## Executive Summary

The proliferation of Public Wi-Fi networks is a critical pillar in achieving the vision of a digitally inclusive India, acting as a low-cost alternative to complement cellular mobile broadband coverage. In response to the specific questions raised in Chapter 1 of the Consultation Paper, our submission highlights the following key positions:

**Current Architecture and Structural Bottlenecks:** While the introduction of the Public Data Office (PDO) and Public Data Office Aggregator (PDOA) framework under the PM-WANI scheme has laid a strong foundation, significant commercial and technical bottlenecks remain. The high cost of internet back-haul, stringent regulatory compliance, lack of business case for small entrepreneurs, and lack of seamless interoperability have historically limited the rapid scaling of these access points.

**Enhancing the PM-WANI Ecosystem:** To truly democratize broadband access, we recommend regulatory interventions that lower the cost of backhaul bandwidth specifically for PDOAs, using the concept of Retail-minus pricing for wholesale. Furthermore, simplifying the onboarding process for citizens through unified, secure, and one-time authentication mechanisms (such as e-KYC or federated IDs) is essential to improve user adoption.

**Interoperability and Roaming:** We emphasize the urgent need for a robust, cross-provider roaming standard. Users should be able to transition seamlessly between different cellular networks (LTE/5G) and Public Wi-Fi hotspots (Wi-Fi offloading) without requiring repetitive logins or multiple payment applications, thereby optimizing overall network capacity and improving user experience. Open roaming can be facilitated by use of DLT ( Distributed Ledger Technology) by transforming the Central registry into Decentralised one.

**Sustainability and Monetization Models:** For public Wi-Fi to be sustainable, the regulatory framework must encourage diverse monetization models. This includes facilitating advertising-backed free data tiers, hyper-local content delivery, and structured revenue-sharing models between infrastructure providers, aggregators, and venue owners. Also MDO ( Mobile Data Offload) should be leveraged through PDOs hotspots. Also for Capex funding of PDOAs, the hotspots to be setup under PM-WANI to be made eligible for CSR funding.

IAFI has comprehensively examined the Consultation Paper and presents its considered views and recommendations on the issues raised as enclosed

**Q-1. 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.**

IAFI supports the proliferation of Public Wi-Fi as a critical component of India's digital inclusion strategy and as a complementary broadband platform alongside 4G, 5G, and future IMT systems. Public Wi-Fi can provide affordable connectivity, improve indoor coverage, offload mobile traffic, and extend broadband access to underserved communities. The PM-WANI framework has created an important foundation, but specific supply-side bottlenecks must be addressed to ensure commercial viability and operational scalability.

From a policy perspective, TRAI should adopt a technology-neutral, light-touch regulatory framework that encourages investment, innovation, interoperability and sustainable business models. The PM-WANI framework has created an important foundation, but further measures are required to address commercial viability, backhaul affordability, user experience and operational scalability through Decentralization.

IAFI recommends that Government, regulators, service providers, PDOs, PDOAs, local authorities and infrastructure providers work together to create a seamless national Wi-Fi ecosystem. Particular emphasis should be placed on affordable backhaul, simplified authentication, roaming interoperability, Retail-minus pricing for wholesaler like PDOAS, infrastructure sharing and integration with BharatNet and Digital Public Infrastructure initiatives. Additional detailed measures specific to Question 1 should be considered in line with the Executive Summary, including targeted incentives, streamlined procedures, and sustainable monetisation mechanisms to accelerate nationwide deployment and adoption of Public Wi-Fi services.

**1. Key Supply-Side Constraints Affecting Public Wi-Fi Proliferation:** Prohibitive Cost of Backhaul: For Public Data Offices (PDOs) and small aggregators, the cost of acquiring internet bandwidth is a major barrier. ISPs often classify PDOs as commercial entities and charge premium enterprise/leased-line tariffs rather than standard or wholesale rates, severely degrading the PDO's return on investment (ROI).

- **Right of Way (RoW) and Infrastructure Bottlenecks:** Local deployment is hindered by complex, multi-agency RoW permissions and high levies for installing access points on street furniture (poles, bus stops) and laying last-mile optical fiber. Spectrum Congestion and Capacity Limitations: Existing unlicensed bands (2.4 GHz and 5 GHz) are increasingly congested in high-footfall urban areas, leading to interference and poor Quality of Service (QoS). While the recent delicensing of the lower 6 GHz band is a positive step, the lack of sufficient wideband spectrum restricts the deployment of high-capacity Wi-Fi 6E/7 networks.
- **Complex Authentication and Interoperability Friction:** Repeated OTP/SMS-

based authentication for every session creates user friction, leading to drop-offs. Furthermore, the lack of seamless roaming between dissimilar Wi-Fi networks prevents a unified, cellular-like user experience.

- **Lack of Viable Monetization Models:** Public Wi-Fi is largely perceived as a & service by consumers. PDOs struggle to monetize their capital expenditure (CAPEX) solely through low-yield digital advertising or data analytics, making the business model unsustainable without indirect support.

**2. Targeted Policy and Regulatory Measures Required:** To address these constraints, IAFI recommends a technology-neutral, light-touch regulatory framework supported by the following targeted measures:

- Mandate Affordable Tariffs for Backhaul. TRAI should recommend that government should support TSPs/ISPs, to offer a specialized, low-cost wholesale tariff for PM-WANI PDOs, distinct from expensive enterprise leased lines. Cheaper backhaul is the single biggest factor in making the PDO business model viable for small entrepreneurs.
- Enforce Uniform RoW and Open Up Street Furniture (Justification: CAPEX Reduction): Standardize RoW rules strictly across all municipalities. State and local governments should mandate the sharing of public street furniture (streetlights, utility poles) for Wi-Fi access points at nominal or zero cost to reduce deployment friction.
- Expand Delicensed Spectrum (Justification: Network Capacity): To support high-throughput, low-latency applications, the government should consider delicensing the V-band (57-66 GHz) to support next-generation Wi-Fi technologies and wireless backhaul solutions.
- Transition to Seamless, Identity-Linked Authentication (Justification: User Retention): Move away from mandatory SMS-OTP per session. Regulatory support should be given for seamless, one-time authentication mechanisms (such as EAP-SIM, MAC-binding, or tokenized Aadhaar/DigiLocker integration) to enable frictionless roaming across PM-WANI networks.
- Targeted Financial Subsidies via USOF / Digital Bharat Nidhi (Justification: Rural Inclusion): Provide targeted CAPEX/OPEX grants to PDOs deploying infrastructure in rural or tier-3/tier-4 areas where purely commercial models fail. Integrating PM-WANI hotspots with BharatNet infrastructure at subsidized rates will rapidly scale rural deployments. In conclusion, by addressing backhaul affordability, infrastructure sharing, and spectrum availability, stakeholders can work together to create a seamless, monetizable national Wi-Fi ecosystem.

**Q-2. 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.**

**IAFI Response:**

IAFI supports the proliferation of Public Wi-Fi as a critical component of India's digital inclusion strategy. While the PM-WANI framework has laid a strong foundation, consumer adoption of public Wi-Fi remains lower than anticipated. To scale PM-WANI and public Wi-Fi networks, it is essential to address the primary demand-side barriers that discourage end-users from utilizing these networks.

**1. Major Demand-Side Constraints Limiting Uptake:**

- **Abundance of Affordable Mobile Data:** India has some of the lowest 4G/5G data tariffs in the world. With high daily data limits provided by Telecom Service Providers (TSPs), the average consumer lacks a compelling incentive to seek out public Wi-Fi unless they are in a mobile "dead zone".
- **High User Friction and Authentication Fatigue:** The current process to connect to public Wi-Fi—which often involves downloading a specific captive portal app, entering mobile numbers, and waiting for SMS-OTPs, is cumbersome. Users frequently abandon the process before connecting.
- **Lack of Discoverability and Unified Signage:** Consumers are often unaware that a PM-WANI or public Wi-Fi hotspot is available. There is a lack of standardized physical signage at the street level and no native, built-in device discovery mechanism, forcing users to rely on fragmented, third-party App Provider platforms to find hotspots.
- **Security and Privacy Apprehensions:** Amid rising cases of cyber fraud and "digital arrests," users are increasingly wary of connecting to open, unencrypted public Wi-Fi networks due to fears of data theft, malware, and privacy breaches.

**2. Targeted Policy and Regulatory Measures Required:**

To address these demand-side constraints and drive consumer adoption, IAFI recommends the following targeted measures:

- **Implement Seamless, Zero-Touch Authentication for eliminating User Friction:** TRAI should recommend regulatory changes to allow seamless, automated authentication without requiring a captive portal or OTP for every session. Utilizing latest available technologies, where the SIM card automatically authenticates the user, may achieve a seamless, "cellular-like" Wi-Fi experience.
- **Mandate Standardized Discoverability and App Integration for Increasing Awareness:** TRAI should mandate a unified discovery protocol. Furthermore, integrating PM-WANI hotspot discovery into ubiquitous applications (such as UPI apps, DigiLocker, or popular mapping services) will dramatically increase visibility without requiring users to download niche PM-WANI apps.
- **Enforce Baseline Security Standards for building Consumer Trust:** To alleviate security concerns, TRAI should mandate minimum security protocols, such as WPA2/WPA3 encryption, for all PM-WANI access points. The government should also run digital literacy campaigns assuring users that certified public Wi-Fi networks are safe for transactions.
- **Bundle Wi-Fi with Citizen Services:** State and Central governments should integrate free/freemium public Wi-Fi access at e-governance kiosks, post offices, hospitals, and educational institutions. Providing dedicated, high-speed access specifically for government portals, educational content, and digital payments will create a distinct use-case for public Wi-Fi beyond general browsing.

In conclusion, for Public Wi-Fi to succeed in an era of cheap cellular data, the user experience must be frictionless, secure, and automatically discoverable. Shifting from manual OTP logins to seamless authentication will be the most critical driver of consumer demand.

**Q-3. 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.**

**IAFI Response:**

IAFI recognizes that while urban centers have seen a gradual increase in Wi-Fi hotspots, the geographic spread across tier-3 cities, rural areas, and underserved geographies remains severely uneven. The PM-WANI framework effectively decentralized the administrative process, but it cannot single-handedly overcome the harsh infrastructural and economic realities of rural deployment.

**1. Key Challenges in Expanding Geographic Spread to Remote Regions:**

- **Unviable Economics (High OPEX vs. Low ARPU):** In rural areas, the cost of establishing and running a hotspot (CAPEX for enterprise-grade routers, OPEX for backhaul bandwidth) remains high, while the Average Revenue Per User (ARPU) is exceptionally low. The lack of a clear return on investment (ROI) discourages private aggregators (PDOAs) from expanding into these regions.
- **Absence of Last-Mile Backhaul:** While BharatNet has reached many Gram Panchayats (GPs), the "last-mile" fiber connectivity from the GP to individual villages or public squares is often missing, damaged, or unlit, leaving rural PDOs without reliable internet backhaul to power their Wi-Fi routers.
- **Unreliable Grid Power:** Consistent electricity supply remains a major hurdle in remote geographies. Frequent power cuts disrupt Wi-Fi availability, leading to poor network reliability and consumer dissatisfaction.
- **Operations and Maintenance (O&M) Logistics:** Deploying skilled technicians to repair routers, restore cut fiber, or troubleshoot network issues in remote areas is logistically difficult and highly expensive for centralized ISPs or PDOAs.

**2. Strategies to Accelerate Balanced, Nationwide Coverage:** To overcome the rural-urban divide and scale the density of hotspots nationwide, IAFI recommends the following strategies:

- **Subsidize Rural Backhaul via Digital Bharat Nidhi / USOF (To bridge the Viability Gap):** The government should utilize the Digital Bharat Nidhi (formerly USOF) to subsidize the monthly bandwidth costs for PDOs operating in designated rural and underserved blocks. Reducing the operational cost of backhaul is the single most effective way to make rural Wi-Fi commercially viable for small entrepreneurs.

- **Leverage BharatNet and Common Service Centres (CSCs):** BharatNet infrastructure should be offered at zero or nominal cost to local PM-WANI PDOs. Furthermore, the Village Level Entrepreneur (VLE) model used for CSCs should be integrated with PM-WANI. Empowering local VLEs to act as PDOs solves the O&M challenge, as local entrepreneurs can physically maintain the equipment and market the service to their community.
- **Mandate Infrastructure Sharing on Public Buildings (Rapid, Low-Cost Deployment):** State governments should issue directives allowing free access to public real estate, such as Panchayat Bhavans, rural post offices, primary health centers, and railway stations etc for the installation of PM-WANI access points.
- **Promote Green / Solar-Powered Wi-Fi Solutions (Ensuring Network Uptime):** To counter the challenge of unreliable grid power, the government should offer one-time CAPEX grants or tax incentives for PDOs deploying solar-powered Wi-Fi access points with battery backups in off-grid or power-deficient regions.
- **Anchor Demand via Government E-Services ( For stimulating Rural Usage):** To build a critical mass of users in remote areas, public Wi-Fi access should be bundled with essential digital public infrastructure (DPI). For instance, offering daily free data allowances specifically whitelisted for accessing agricultural portals (e-NAM), telehealth services, educational platforms (DIKSHA), and digital payments (UPI) will drive organic adoption and justify government investment in rural hotspots.

In conclusion, scaling PM-WANI in rural India requires shifting from a purely commercial model to a subsidized, infrastructure-sharing model. Empowering local rural entrepreneurs with affordable BharatNet backhaul is the most sustainable path to nationwide coverage.

**Q-4. 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.**

**IAFI Response:**

IAFI asserts that the long-term success of the PM-WANI framework depends entirely on the financial viability of the Public Data Office (PDO) and the Public Data Office Aggregator (PDOA). Currently, the framework lacks guaranteed revenue streams, making it difficult for small entrepreneurs to recover their initial CAPEX and ongoing backhaul OPEX. To improve revenue certainty and long-term sustainability, structural changes to the commercial ecosystem of PM-WANI are urgently required.

**1. Key Challenges to Revenue Certainty in PM-WANI:**

- **Perception of "Free" Wi-Fi:** Consumers inherently expect public Wi-Fi to be free, making direct "pay-per-use" or voucher-based monetization extremely difficult, especially when 4G/5G mobile data is abundant and cheap.
- **Low Advertising Yields:** While ad-based monetization is often proposed, the scale required to generate meaningful programmatic ad revenue is far beyond the reach of an individual rural or neighbourhood PDO.

- **Absence of B2B Revenue Streams:** The current ecosystem relies too heavily on Business-to-Consumer (B2C) monetization, ignoring the massive potential of Business-to-Business (B2B) models, such as cellular data offloading.

**2. Required Changes in the Framework to Ensure Sustainability:** To create a sustainable economic engine for PDOs and PDOAs, IAFI recommends the following structural and regulatory changes:

- **Introduce "Freemium" Models Linked to Digital Public Infrastructure:** Government agencies should act as "anchor tenants" for PM-WANI networks. The framework should be modified so that access all government e-services, UPI payments, and educational portals are permanently free and subsidized by the government via the Digital Bharat Nidhi. Users requiring high-speed data for entertainment (streaming, gaming) can then be upsold to premium, paid tiers.
- **Enable Micro-Targeted Local Advertising & Data Analytics:** The PM-WANI central registry and App Providers should be permitted to offer aggregated, anonymized, and privacy-compliant hyper-local advertising platforms. This would allow a local shopkeeper (acting as a PDO) to push local offers to connected users, transforming the Wi-Fi hotspot into a localized digital storefront.
- **Integrate UPI Natively into the PM-WANI Architecture (Justification: Frictionless Payments):** To facilitate micro-transactions for premium Wi-Fi tiers, the PM-WANI framework must natively integrate UPI autopay or one-click payments into the captive portal or App Provider interface. Reducing the friction of payment increases the likelihood of users purchasing sachet-sized data packs (e.g., ₹5 or ₹10 for an hour of high-speed gaming).
- **Regulatory Relief on Backhaul Input Costs (Justification: OPEX Reduction):** Revenue certainty is not just about earning more; it is about spending less. As emphasized in Q-1, TRAI must mandate that ISPs offer subsidized wholesale backhaul tariffs to registered PM-WANI PDOs. By artificially lowering the input cost, the break-even point for the PDO is significantly reduced, ensuring long-term sustainability even with lower ARPU.

In conclusion, shifting the PM-WANI revenue model away from purely B2C voucher sales toward B2B carrier offloading and government-subsidized anchor tenancy is the only way to guarantee long-term financial sustainability for PDOs.

**Q-5. 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.**

**IAFI Response:**

IAFI recognizes that while the PM-WANI framework was designed to be "light-touch," grassroots entrepreneurs (such as local shopkeepers, Village Level Entrepreneurs, and small business owners) still face administrative and financial friction that deters them from becoming Public Data Offices (PDOs). Beyond backhaul and revenue concerns, several operational challenges remain.

**1. Additional Challenges Currently Faced by PDOs/PDOAs:**

- **High Cost of Compliant Hardware:** There is a lack of affordable, indigenous, PM-WANI-compliant enterprise routers. PDOs often have to rely on imported, expensive Wi-Fi access points to ensure the Quality of Service (QoS) and concurrent user capacity required for public networks. This heavily inflates the initial capital expenditure (CAPEX).
- **Lack of Access to Micro-Financing:** Small entrepreneurs struggle to secure small-ticket loans from traditional banks to fund the initial setup of a PDO (which includes the router, battery backup, and installation costs).
- **Compliance and Taxation Friction:** Even though PDOs are exempt from telecom licensing, the requirement to navigate GST compliance and complex service agreements with PDOAs can be intimidating for micro-entrepreneurs operating in the informal economy.
- **Technical Knowledge Gap:** Many potential PDOs lack the basic technical literacy required to troubleshoot network outages, understand bandwidth contention, or optimize router placement, leading to poor network performance and frustration.

**2. Proposed Changes to Enhance the Participation of Entrepreneurs:** To lower the barrier to entry and incentivize mass participation of small entrepreneurs under PM-WANI, IAFI recommends the following measures:

- **Integrate PM-WANI with Micro-Credit Schemes (Easing CAPEX Barriers):** The government should officially categorize the setting up of a PDO as an eligible micro-enterprise activity under the PM MUDRA Yojana. Providing standardized, collateral-free micro-loans (e.g., ₹10,000 to ₹50,000) specifically for PM-WANI equipment will instantly unlock participation from thousands of rural and urban entrepreneurs.
- **Incentivize Indigenous Manufacturing of Wi-Fi Equipment (Lowering Hardware Costs):** To reduce CAPEX, the Department of Telecommunications (DoT) and the Ministry of Electronics and IT (MeitY) should extend Production Linked Incentive (PLI) benefits or direct subsidies to domestic manufacturers who build affordable, PM-WANI compliant Wi-Fi 6/6E routers.
- **Simplify Tax and Regulatory Compliance :** TRAI should recommend that the Ministry of Finance clarify and simplify the GST requirements for micro-PDOs whose total turnover falls well below the standard GST threshold. A simplified, one-click registration process integrated with the Udyam portal would encourage informal businesses to participate.
- **Deploy Standardized Capacity Building Programs:** The government, in partnership with PDOAs and bodies like the CSC e-Governance Services India, should launch a certified, vernacular training program for PDOs. Equipping entrepreneurs with basic technical troubleshooting skills and marketing materials will ensure network reliability and boost their confidence in running the service.

In conclusion, scaling PM-WANI requires treating PDOs not just as telecom nodes, but as micro-businesses. By providing access to affordable indigenous hardware, targeted micro-credit, and simplified compliance, the government can transform public Wi-Fi into a powerful engine for grassroots entrepreneurship.

**Q-6. 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.**

**IAFI Response:**

IAFI appreciates the foundational decentralized architecture of the PM-WANI framework (comprising PDOs, PDOAs, App Providers, and the Central Registry). However, to achieve a truly global scale and a "cellular-like" user experience, the current architecture must evolve. The heavy reliance on captive portals, app downloads, and manual micro-transaction flows creates significant friction, leading to high user drop-off rates.

**1. Improvements in Authentication & Authorization:**

- **Current Challenge:** The existing framework largely requires users to download a PM-WANI App, undergo KYC (mobile verification/OTP), and navigate a captive portal. This manual authentication process is cumbersome and deters instantaneous connectivity.
- **Proposed Measure (Passpoint & EAP-SIM):** TRAI should mandate the integration of **Hotspot 2.0 (Passpoint / IEEE 802.11u)** and **EAP-SIM / EAP-AKA** authentication protocols into the PM-WANI architecture.
- **Justification:** Passpoint allows a user's device to automatically discover and securely connect to an authorized PM-WANI hotspot in the background, entirely bypassing captive portals and OTPs. EAP-SIM utilizes the cryptographic credentials already present on the user's mobile SIM card to authenticate them seamlessly. This creates a zero-touch, secure connection experience identical to connecting to a cellular tower.

**2. Improvements in Roaming Architecture:**

- **Current Challenge:** While the Central Registry allows a user to roam across different PDOAs within the PM-WANI ecosystem, it remains somewhat isolated from the broader global and cellular roaming ecosystem.
- **Proposed Measure (WRIX Implementation):** The framework should adopt the **Wireless Roaming Intermediary exchange (WRIX) :** Implementing WRIX facilitates standardized clearing and settlement processes not just between PDOAs, but between PDOAs and Telecom Service Providers (TSPs). This architectural upgrade is critical to enabling cellular data offloading, allowing a TSP subscriber to seamlessly roam onto a PM-WANI hotspot while the TSP settles the data cost with the PDOA in the backend via a standardized clearinghouse.

**3. Improvements in Payment Architecture:**

- **Current Challenge:** Purchasing small sachet data packs (e.g., ₹5 or ₹10) requires the user to be redirected to a payment gateway. Payment gateway timeouts, multiple clicks, and entering UPI PINs for micro-transactions create immense friction.
- **Proposed Measure (Direct Carrier Billing & UPI AutoPay):**
    - **Direct Carrier Billing (DCB):** Enable the PM-WANI payment architecture to interface with TSP billing systems. A user can authorize a data pack purchase, and the amount is simply deducted from their mobile prepaid balance or added to their postpaid bill.

- **UPI AutoPay / e-RUPI:** Integrate UPI AutoPay or purpose-specific e-RUPI vouchers natively into the PM-WANI Central Registry. DCB entirely eliminates the need for credit cards or external payment gateways, utilizing the telecom billing relationship the user already trusts.

In conclusion, to scale effectively, PM-WANI's architecture must transition from an "App and Captive Portal" model to a "Zero-Touch and Carrier-Integrated" model. Embracing Passpoint for authentication, WRIX for roaming, and Carrier Billing/UPI for payments will transform public Wi-Fi into an effortless, invisible utility for the Indian consumer.

**Q-7. 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.**

**IAFI Response:**

IAFI strongly recommends **Model (b)** for the proliferation of Public Wi-Fi in the Indian context.

Under this model, the Government primarily ensures the availability of robust backhaul infrastructure and intervenes in hotspot deployment only in cases of market failure. This approach aligns perfectly with the decentralized, entrepreneurial spirit of the PM-WANI framework and ensures the most efficient use of public funds.

**Justification for Supporting Model (b):**

**1. Government as an Enabler, not a Retail Operator:** Direct government deployment and operation of retail Wi-Fi hotspots (Model A) have historically faced severe Operations and Maintenance (O&M) challenges. Government agencies are not agile enough to manage the daily physical upkeep, customer support, and localized marketing required for retail Wi-Fi hotspots. By acting as an enabler providing robust, affordable backhaul (through initiatives like BharatNet), the government allows nimble, hyper-local entrepreneurs (PDOs) to handle the retail deployment and O&M far more efficiently.

**2. Avoiding the Crowding Out of Private Investment:** If the government actively funds and implements free public hotspots everywhere, it will artificially depress the market and crowd out private PDOAs and ISPs. PM-WANI was designed to create millions of telecom micro-entrepreneurs. Model (b) protects this ecosystem. When the government focuses on wholesale

backhaul—often the single largest OPEX barrier for PDOs—it incentivizes private capital to flow into the retail access layer without competing against a heavily subsidized state entity.

**3. Targeted Interventions for Market Failure (The Rural Divide):** IAFI acknowledges that a purely free-market approach will not organically reach extremely remote, rural, or economically disadvantaged areas due to unviable unit economics (low ARPU). This is the "market failure" where government intervention is strictly necessary. However, even in these cases, the intervention should not be direct government deployment. Instead, the government should utilize the Digital Bharat Nidhi (formerly USOF) to provide targeted CAPEX subsidies or VGF (Viability Gap Funding) to local Village Level Entrepreneurs (VLEs) to set up PM-WANI hotspots, thereby maintaining the private-sector O&M model while solving the financial unviability.

**4. Maximizing the Utility of BharatNet:** The government has already invested massive capital into laying optical fiber across the country via BharatNet. Model (b) directly leverages this sunk cost. If the government allows private PDOs to tap into BharatNet at zero or nominal wholesale rates, the "middle-mile" bottleneck is instantly solved.

In conclusion, **model (b)** represents the ideal public-private partnership. It relies on the government's strength in funding heavy infrastructure (middle-mile backhaul) while relying on the private sector's strength in customer acquisition, innovation, and last-mile operations (hotspot deployment).

**Q-8. 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.**

**IAFI Response:**

IAFI firmly believes that a "one-size-fits-all" approach to Public Wi-Fi will fail. There is an absolute need to adopt separate, targeted strategies for rural and urban areas because the underlying economic, technical, and demographic realities of these two geographies are entirely different.

In urban areas, the challenge is **capacity and spectrum congestion**; in rural areas, the challenge is **coverage and financial viability**.

**1. Strategy for Urban Areas (Focus: Capacity, Offloading, and Monetization)**

Urban areas already have high cellular penetration and robust fiber availability. The goal of public Wi-Fi here is to relieve congested 4G/5G networks and provide high-speed seamless connectivity in dense public spaces.

- **Unlocking Street Furniture:** State and municipal policies must allow frictionless, low-cost Right of Way (RoW) for mounting Wi-Fi access points on urban street furniture (bus stops, streetlights, metro pillars).
- **Spectrum Expansion for High Density:** Urban hotspots in malls, airports, and stadiums face severe interference in the 2.4 GHz and 5 GHz bands. The strategy must

focus on enabling Wi-Fi 6E/7 by opening up the lower 6 GHz band to support gigabit-level throughput for dense crowds.

- **Commercial Monetization:** Urban strategies can rely on free-market dynamics. Premium "freemium" models localized digital advertising, and location-based data analytics are commercially viable in high-footfall urban centers.

**2. Strategy for Rural Areas (Focus: Coverage, Subsidies, and Infrastructure Integration)**

Rural areas suffer from a lack of reliable middle-mile backhaul, frequent power outages, and extremely low Average Revenue Per User (ARPU), making purely commercial models unviable.

- **Subsidized Operations via Digital Bharat Nidhi:** The rural strategy cannot rely on free-market monetization. The government must step in with targeted Viability Gap Funding (VGF) or operational subsidies from the Digital Bharat Nidhi (formerly USOF) to cover the monthly broadband backhaul costs for rural PDOs.
- **Leveraging BharatNet and CSCs:** The strategy must integrate PM-WANI deeply with existing rural infrastructure. BharatNet fiber must be provided to rural PDOs at zero or highly subsidized wholesale rates. Furthermore, the Village Level Entrepreneurs (VLEs) operating Common Service Centres (CSCs) should be empowered and incentivized to become local PDOs.
- **Off-Grid and Solar Capabilities:** Due to erratic grid power in remote villages, the rural strategy must include CAPEX grants for solar-powered Wi-Fi access points with battery backups to ensure network uptime.
- **Demand Anchoring via DPI:** Rural Wi-Fi usage should be stimulated by offering zero-rated (free) access to critical Digital Public Infrastructure (DPI) such as agricultural portals (e-NAM), telemedicine, and educational platforms, effectively turning the hotspot into a digital lifeline rather than just an entertainment portal.

In conclusion, TRAI must formulate a **bifurcated policy framework**: one that facilitates commercial data offloading and spectrum availability to relieve urban congestion, and another that utilizes targeted subsidies and BharatNet integration to bridge the rural digital divide.

**Q-9. 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.**

**IAFI Response:**

IAFI recognizes that high-footfall areas present unique technical and commercial challenges for Public Wi-Fi. In these environments, user density causes severe spectrum congestion, and the physical environment dictates the deployment strategy. To improve deployment and uptake, distinct strategies must be employed for outdoor and indoor scenarios.

**1. Measures for Outdoor Scenarios (Bus stops, parks, transit points, tourist sites):** Outdoor deployments suffer from lack of power, environmental hazards, and complex Right of Way (RoW) rules for mounting equipment.

- **Zero-Cost RoW for Street Furniture (Justification: CAPEX Reduction & Speed):** Municipalities must mandate a uniform, low-cost (or zero-cost) RoW policy allowing Public Data Offices (PDOs) to mount Wi-Fi access points on existing public street furniture, such as streetlights, bus shelters, and traffic poles. This eliminates the need for new civil works.
- **Solar-Powered and Weather-Hardened Infrastructure (Justification: Network Reliability):** In public parks and heritage tourist sites, trenching for continuous grid power is environmentally damaging and expensive. Government guidelines should encourage and subsidize IP67-rated, solar-powered Wi-Fi routers with battery backups to ensure 24/7 uptime.
- **Zero-Touch Authentication for Commuters (Justification: User Retention):** Users at roadside transit points are on the move. Forcing a commuter to stop, open a portal, and wait for an SMS-OTP results in massive drop-offs. Implementing Hotspot 2.0 / Passpoint ensures that a commuter's phone automatically connects and authenticates as they walk past a bus stop.

**2. Measures for Indoor Scenarios (Airports, railway stations, malls, public institutions):** Indoor venues typically lack reliable cellular penetration due to building materials (e.g., low-E glass, concrete), making public Wi-Fi an absolute necessity. However, extreme device density causes severe interference.

- **Opening 6 GHz Spectrum for Wi-Fi 6E/7 (Justification: High-Density Capacity):** In environments like airports and malls, the legacy 2.4 GHz and 5 GHz unlicensed bands are completely saturated. As government gas delicensed the lower 6 GHz band for Wi-Fi, it will allow the deployment of Wi-Fi 6E/7, which offers wider channels and eliminates indoor network congestion.
- **Mandatory Neutral-Host In-Building Solutions (Justification: Avoiding Fragmentation):** Building codes (such as TRAI's Rating of Properties for Digital Connectivity) should mandate shared, neutral-host Wi-Fi infrastructure in large public buildings. Instead of multiple ISPs deploying overlapping, interfering networks in a mall, a single robust network should be deployed that allows all PM-WANI PDOAs to seamlessly roam on it.
- **Location-Based Analytics and Wayfinding (Justification: Commercial Viability):** To sustain indoor networks, PDOs should be permitted to monetize Wi-Fi via B2B avenues. Providing anonymized footfall analytics to mall tenants or integrating indoor digital wayfinding (e.g., flight gate directions) creates alternate revenue streams beyond charging the consumer.

**3. Role of Government – Funding Deployments:** While private enterprise can easily fund Wi-Fi in commercial hubs like malls or private airports, the government must actively fund deployments in non-commercial, high-footfall public zones:

- **Targeted Grants via Digital Bharat Nidhi:** The government should provide Viability Gap Funding (VGF) or direct CAPEX subsidies to PDOAs willing to deploy PM-WANI infrastructure in public railway stations, government hospitals, and state-run educational institutions where commercial monetization is unviable.

- **Smart City Anchoring:** Funds allocated under the Smart Cities Mission should explicitly earmark budgets for public Wi-Fi deployment, treating it as a core citizen utility (like water or electricity) rather than an optional telecom overlay.

## B. Role of Government- Funding deployments

**Q-10. 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.**

**IAFI Response:**

IAFI strongly opposes a uniform, nationwide funding mechanism. A "one-size-fits-all" financial approach would lead to market distortion and a massive misallocation of public resources. Instead, IAFI recommends a **strictly differentiated funding mechanism** tailored to the unique economic realities of rural, urban, and high-footfall areas, primarily leveraging the recently established **Digital Bharat Nidhi (DBN)** under the Telecommunications Act, 2023.

**1. Rural Areas (Mechanism: VGF and Direct Subsidies via Digital Bharat Nidhi)**

- **Context:** Rural areas suffer from high deployment costs and exceptionally low Average Revenue Per User (ARPU). The free market cannot organically sustain PM-WANI PDOs in these geographies.
- **Funding Mechanism:** The government must utilize the Digital Bharat Nidhi to provide **Viability Gap Funding (VGF)**. Rather than just funding CAPEX (equipment), the DBN should provide targeted **OPEX subsidies** to cover the monthly fiber backhaul costs for rural PDOs. Furthermore, under the expanded scope of the DBN, targeted grants should be given to local Village Level Entrepreneurs (VLEs) and women-led Self-Help Groups (SHGs) to act as PDOs, thus subsidizing the grassroots deployment directly.

**2. Urban Areas (Mechanism: Market-Driven with Regulatory Relief)**

- **Context:** Urban areas have high user density, high smartphone penetration, and the potential for strong commercial monetization (B2B offloading, digital advertising, premium tiers).
- **Funding Mechanism:** Direct financial subsidies are **not required** and should be avoided to prevent crowding out private investment. Instead of direct funding, the government's "support" in urban areas should be regulatory in nature. This includes zero-cost Right of Way (RoW) for street furniture and enforcing reduced "PDO wholesale tariffs" from ISPs. Any DBN funds used in urban areas should be strictly limited to R&D, supporting indigenous start-ups manufacturing Wi-Fi 6/7 equipment as permitted under the new DBN rules.

**3. High-Footfall Areas (Mechanism: PPPs, Smart City Funds, and Anchor Tenancy)**

- **Context:** Areas like railway stations, public hospitals, and heritage sites require massive, enterprise-grade neutral-host infrastructure to handle extreme device density, but may not yield direct B2C commercial returns.
- **Funding Mechanism:** The government should adopt a **Public-Private Partnership (PPP)** or **Anchor Tenant** funding model.
    - For civic spaces, funds allocated under the **Smart Cities Mission** should be earmarked for deploying neutral-host Wi-Fi infrastructure.
    - For government institutions (hospitals, universities), the government should act as an "Anchor Tenant," paying a fixed wholesale rate to a PDOA to keep the network free for citizens to access e-governance and essential services. This guarantees baseline revenue for the private operator while ensuring public access.

**Conclusion:**

In summary, India's public Wi-Fi funding strategy must be surgical. The Digital Bharat Nidhi should be deployed heavily in rural areas to bridge the digital divide via OPEX subsidies, while urban and high-footfall areas should rely on Smart City budgets, PPPs, and regulatory enablers to unlock private capital.

**Q-11. 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.**

**IAFI Response:**

IAFI asserts that the allocation and disbursement of public funds (primarily via the Digital Bharat Nidhi / DBN) for Public Wi-Fi must be governed by strict, distinct criteria tailored to the specific geography. A uniform disbursement policy risks subsidizing profitable urban areas while underfunding critical rural infrastructure. The overarching principle should be that the **Government's role is focused on backhaul provisioning and targeted funding**, rather than acting as a direct retail operator.

To maximize the return on public investment, IAFI recommends the following criteria for fund allocation:

**1. Criteria for Rural Areas (Focus: Bridging the Digital Divide)** In rural geographies, the market failure is systemic. Funding should be prioritized based on community impact and operational viability.

- **Demonstrable Viability Gap:** Disbursement should be calculated based on the proven gap between the high OPEX (specifically backhaul bandwidth costs) and the low Average Revenue Per User (ARPU) in a specific Gram Panchayat or block.
- **Proximity to BharatNet Infrastructure:** Priority funding should be given to PM-WANI PDOs that can immediately utilize existing (unlit or underutilized) BharatNet fiber for backhaul. This ensures rapid deployment and maximizes the government's prior infrastructure investments.
- **Community Utility Anchoring:** Funds should be prioritized for hotspots located at critical public institutions, such as Panchayat Bhavans, Primary Health Centres (PHCs), rural schools, and agricultural mandis (e-NAM hubs), ensuring the Wi-Fi serves a civic utility rather than just general entertainment.

**2. Criteria for Urban Areas (Focus: Targeted Interventions & Innovation)** Urban areas are generally commercially viable. Therefore, public funding should be highly restricted and governed by socioeconomic and technological criteria.

- **Socio-Economic Market Failure:** Funds should only be disbursed for deployments in designated Economically Weaker Section (EWS) housing, urban slums, or municipal government schools where private ISPs refuse to deploy due to low purchasing power.
- **Indigenous R&D and Technology Pilots:** Under the expanded scope of the DBN, urban funding should be allocated as grants to indigenous startups and manufacturers conducting pilot deployments of next-generation, locally manufactured Wi-Fi 6E/7 access points.

**3. Criteria for High-Footfall Areas (Focus: Public Utility vs. Commercial Gain)** High-footfall areas require massive, enterprise-grade neutral-host infrastructure, but the funding must strictly differentiate between public and private venues.

- **Public vs. Private Ownership:** This must be the primary filter. Zero government funds should be allocated to commercially viable private spaces (e.g., shopping malls, multiplexes, private airports).
- **Public Transit and Civic Density:** Full or partial funding should be strictly reserved for state-owned, high-density civic areas such as Railway Stations, Interstate Bus Terminals (ISBTs), government hospital waiting areas, and public heritage sites.
- **Neutral-Host Mandate:** To qualify for funding, the deployed infrastructure in high-footfall areas must be technologically capable of acting as a "neutral host," allowing multiple PM-WANI PDOAs and cellular TSPs to seamlessly roam on the same network to prevent redundant infrastructure.

**Conclusion: The Role of the Government** Ultimately, the criteria for disbursement must reflect the government's primary role as an enabler. The government must focus its capital on provisioning robust, subsidized backhaul (middle-mile) and funding the viability gap at the extreme edges of the network, leaving the commercialization and customer acquisition to the private PM-WANI ecosystem.

## C. Role of Government- Backhaul provisioning and funding

**Q-12. 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.**

**IAFI Response:**

IAFI firmly agrees that the lack of adequate, reliable, and affordable last-mile connectivity (often referred to as last-mile backhaul) is a critical constraint paralyzing the proliferation of Public Wi-Fi. While middle-mile infrastructure like BharatNet successfully brings high-capacity bandwidth to Gram Panchayats (GPs) or municipal boundaries, the physical link from the GP to the actual Public Data Office (PDO) hotspot is frequently absent, damaged, or prohibitively expensive to build.

To bridge this last-mile gap, coordinated regulatory and administrative action is required across all three tiers of government:

**1. Specific Measures by the Central Government:**

- **Use of Fixed Wireless Access (FWA) Technology:** Fixed Wireless Access (FWA) has become a highly popular solution for connecting Customer Premises Equipment (CPE) to 5G Base Transceiver Stations (BTS). By utilizing standard IMT and 5G New Radio (NR) spectrum, FWA delivers high capacity backhaul that essentially functions as "fiber in the air." The technology boasts several key advantages: it can be installed rapidly and fault-free within a few hours, and it completely bypasses the need for civil works and Right of Way (RoW) permissions. Consequently, FWA is exceptionally valuable in semi-urban and rural areas, providing ultra-high-speed broadband where laying physical fiber is geographically or economically prohibitive.

  To fully realize this potential and accelerate public Wi-Fi proliferation, it is strongly recommended that the Government provide financial support to Telecom Service Providers (TSPs) through the Digital Bharat Nidhi (DBN). Specifically, the DBN should subsidize 100% of the Capital Expenditure (CAPEX) and a minimum of five years of Operational Expenditure (OPEX) for TSPs providing FWA connections as backhaul to Public Data Offices (PDOs).

- **Open V-Band and E-Band for Wireless Backhaul (Justification: Rapid, Fiber-less Deployment):** Laying last-mile fiber is not always feasible due to terrain, civil costs, or RoW delays. The Department of Telecommunications (DoT) should allow the use of V-Band (57-66 GHz) and E-Band (71-76 / 81-86 GHz) for wireless backhaul on a delicensed or light-licensed basis. This would allow PDOAs to beam gigabit-capacity internet wirelessly over short distances to power Wi-Fi hotspots without digging.
- **Integrate LEO Satellite Backhaul for Ultra-Remote Areas (Justification: Universal Coverage):** For geographically difficult terrains (mountains, islands, dense forests) where both fiber and microwave fail, the Central Government should permit and subsidize the use of Low Earth Orbit (LEO) satellite terminals as the backhaul source for PM-WANI hotspots via the Digital Bharat Nidhi.

- **Subsidize BharatNet Last-Mile Tariffs (Justification: Economic Viability for PDOs):** The Central Government must mandate that BBNL/BSNL provide last-mile BharatNet bandwidth to registered PM-WANI PDOs at heavily subsidized wholesale rates, rather than standard commercial enterprise rates, to make the PDO business model viable.

**2. Specific Measures by State Governments:**

- **Enforce Uniform Right of Way (RoW) Policies (Justification: Eliminating Deployment Bottlenecks):** While the Central Government has issued RoW rules, State-level execution remains highly fragmented. States must adopt a single-window clearance portal and strictly adhere to the RoW rules, capping the charges for laying aerial or underground optical fiber to hotspot locations.
- **Leverage State-Led Fiber Grids (Justification: Maximizing Existing Assets):** States that have built their own fiber networks (e.g., K-FON in Kerala, T-Fiber in Telangana, or AP FiberNet) should actively open their last-mile fiber to local PM-WANI PDOs to set up public hotspots at state-subsidized rates.

**3. Specific Measures by Local Bodies (Municipalities & Gram Panchayats):**

- **Mandate Access to Street Furniture (Justification: Reducing Civil CAPEX):** Municipalities and local electricity boards must allow PDOs to run aerial fiber and mount Wi-Fi access points on existing street furniture (streetlights, utility poles, bus shelters, and traffic lights) at zero or nominal cost.
- **Adopt Micro-Trenching Approvals (Justification: Speed and Cost of Execution):** Local municipal bodies often impose exorbitant restoration charges for digging, effectively killing last-mile fiber business cases. Municipalities should adopt and encourage micro-trenching technologies, charging only the actual, localized cost of restoration to facilitate the fast and cheap laying of last-mile fiber to public squares.

**Conclusion:** Solving the last-mile constraint requires a hybrid approach. The Central Government must unlock wireless backhaul spectrum (E/V band), use of FWA technology and satellite solutions where fiber cannot go, while State and Local bodies must remove the RoW friction and taxation where fiber *can* go.

**Q-13. 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.**

**<u>IAFI Response:</u>**

IAFI asserts that there is an absolute, critical need for the Government to provide funding for the provisioning of last-mile connectivity in uncovered and underserved areas. In these regions, the core telecom problem is an insurmountable Viability Gap: the capital expenditure (CAPEX) to lay the last-mile fiber and the operational expenditure (OPEX) to maintain it far

exceed the revenue potential from the local population. Without government funding, private players simply cannot justify the investment.

**1. Best Suited Funding Option in the Indian Context:** The most appropriate and ready funding mechanism is the **Digital Bharat Nidhi (DBN)**, formerly known as the Universal Service Obligation Fund (USOF). The DBN was specifically structured under the Telecommunications Act, 2023 to bridge the digital divide. Rather than creating a new scheme, the DoT should carve out a dedicated "PM-WANI Last-Mile Infrastructure Fund" under the DBN to offer Viability Gap Funding (VGF) specifically to ISPs and PDOAs expanding into designated unserved blocks.

**2. Criteria for Funding Allocation by Geography:**

- **Rural Areas (High Funding Priority):**
  - Criteria: Gram Panchayats with no existing optical fiber beyond the Panchayat Bhavan, or areas with a teledensity substantially below the national average.
  - Funding Strategy*:* The government should provide up to **100% CAPEX subsidies** for laying the last-mile fiber or deploying wireless backhaul (e.g., microwave/satellite links) to the hotspot location, alongside OPEX subsidies for the first 3 years to ensure the PDO survives the incubation period.
- **Urban Areas (Highly Restricted Funding):**
  - Criteria: Urban areas are largely commercially viable, so blanket funding must be avoided. However, "underserved" micro-geographies exist within cities.
  - Funding Strategy*:* Funding should only be released under strict socio-economic criteria, specifically for deploying Wi-Fi in recognized urban slums, Economically Weaker Section (EWS) housing colonies, and municipal schools.
- **High-Footfall Areas:**
  - Criteria: The venue must be non-commercial and state-owned.
  - Funding Strategy: No funding should go to private malls or commercial transit hubs. Instead, DBN or Smart City funds should be utilized to build shared, neutral-host last-mile infrastructure in civic utility zones like government hospitals, public university campuses, and local courts.

**3. The Facilitative Role of States and Local Bodies:** While the Central Government (via DBN) provides the financial capital, State Governments and Local Bodies must act as the primary facilitators. Throwing money at the last-mile problem will fail if local administrative bottlenecks remain.

- **Zero-Cost Right of Way (RoW):** State governments must waive RoW charges for PDOAs laying last-mile fiber to approved public Wi-Fi hotspots in underserved areas.
- **Access to Street Furniture:** Municipalities and local panchayats must facilitate the deployment by allowing free access to public infrastructure (streetlights, bus stops, community halls) for mounting Wi-Fi equipment and aerial fiber.
- **Single-Window Clearance:** Local bodies must implement a time-bound, single-window digital clearance system for micro-trenching and aerial cabling to ensure that subsidized deployments are not stalled by local bureaucratic delays.

**Conclusion:** In summary, covering the last mile requires a symbiotic partnership: the Central Government must bridge the financial Viability Gap using the Digital Bharat Nidhi, while

States and Local Bodies must completely remove the administrative and civil friction (RoW and street furniture access) that traditionally stalls telecom deployments.

## D. Facilitative role- States and local bodies

**Q-14. 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.**

**IAFI Response:**

IAFI asserts that Right of Way (RoW) bottlenecks remain the single most significant physical hurdle to the proliferation of Public Wi-Fi. While the Central Government has introduced progressive frameworks—most notably the Telecommunications Act, 2023, and the amended RoW Rules, 2024, the actual ground-level execution by state and municipal authorities remains highly fragmented, stalling the rollout of PM-WANI hotspots.

**1. Key RoW Challenges Faced in Accessing Street Furniture:**

- **Fragmented Local Implementation:** Despite the central RoW rules, numerous local bodies and municipalities continue to enforce their own disparate guidelines, ignoring the standardized timelines and fee structures established by the Department of Telecommunications (DoT).
- **Treating RoW as a Revenue Source:** Many local authorities view the leasing of street furniture (utility poles, bus shelters, traffic lights) as a municipal revenue-generation tool rather than a public utility enabler. They impose exorbitant recurring rental charges and high upfront administrative fees for mounting Wi-Fi equipment, destroying the commercial viability for small PM-WANI PDOs.
- **Complex Multi-Agency Approvals:** Service providers and PDOAs frequently have to navigate a bureaucratic maze to obtain No Objection Certificates (NOCs) from multiple disjointed agencies (e.g., municipal corporations, traffic police, electricity boards, and environmental departments) just to install a single access point.
- **Structural and Power Constraints:** Existing Street furniture is often structurally inadequate to bear the weight and wind load of enterprise-grade Wi-Fi routers. Furthermore, electricity on streetlights is typically switched on only at night, meaning there is no 24/7 continuous power supply available to keep the Wi-Fi hotspot active during the day.

**2. Suggestions for Improvements:** To accelerate deployment, IAFI recommends the following targeted policy and regulatory improvements:

- **Mandate Uniform Adoption of RoW Rules 2024 (Justification: Regulatory Certainty):** The Ministry of Communications must ensure that all State Governments and Local Bodies strictly align their local telecom infrastructure policies with the central RoW Rules, 2024. The disbursement of central Smart City funds should be conditionally tied to a municipality's adoption of these uniform rules.

- **Zero or Nominal Fees for Street Furniture Access (Justification: OPEX Reduction):** Given the low Average Revenue Per User (ARPU) of public Wi-Fi, TRAI should recommend a nationwide mandate capping the rental fee for mounting Wi-Fi access points on public street furniture to a nominal, token amount.
- **Full Integration with PM GatiShakti Sanchar Portal (Justification: Streamlined Approvals):** All municipal bodies, regardless of size, must be onboarded onto the central PM GatiShakti Sanchar portal. Approvals for using street furniture should be processed entirely via this single-window digital system, complete with strict "deemed approval" clauses if local bodies fail to respond within a stipulated timeframe (e.g., 15 days).
- **Provide 24/7 Unmetered Power Access (Justification: Network Uptime):** State Electricity Boards (SEBs) should be directed to provide a provision for 24/7 unmetered power tap-offs from streetlights specifically for telecom small cells and Wi-Fi hotspots, billed at a standardized industrial/telecom tariff rather than ad-hoc commercial rates.
- **Mandate "Dig-Once" and Shared Ducts (Justification: Infrastructure Sharing):** Any new road construction, expansion, or municipal digging project must mandatorily include the laying of shared telecom ducts. Public entities must make these conduits available to PM-WANI PDOAs on an open-access, non-discriminatory basis to pull last-mile fiber without requiring new digging permissions.

In conclusion, for Public Wi-Fi to scale rapidly, street furniture must be viewed as essential national infrastructure, not municipal real estate. Eradicating the local RoW friction and providing standardized, low-cost access to street poles is critical for both Wi-Fi proliferation and the denser rollout of complementary 5G networks.

**Q-15. 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.**

**IAFI Response:**

IAFI asserts that State Governments must act primarily as **facilitators and enablers**, rather than direct retail service providers. In response to whether States should consider deploying Public Wi-Fi networks themselves at the municipal and gram panchayat level, **IAFI strongly recommends against direct state-run deployments.**

**1. Justification Against Direct State Deployment:** Historically, when state or municipal bodies attempt to deploy, operate, and maintain retail Wi-Fi networks, the initiatives suffer from sluggish Operations and Maintenance (O&M), lack of technical upgrades, and poor customer support. The PM-WANI framework was specifically designed to decentralize the retail access layer to nimble micro-entrepreneurs (PDOs) and private aggregators (PDOAs). If State Governments deploy their own free, state-funded networks, it will artificially distort the market, crowd out private investment, and destroy the business case for local PM-WANI entrepreneurs.

**2. Facilitative Roles of State Governments by Geography:** Instead of operating networks, State Governments should accelerate deployment by removing friction and offering targeted support:

- **Facilitative Role in Rural Areas (Gram Panchayat Level):**
  - **Unlocking State Fiber Networks:** States operating their own middle-mile fiber grids (e.g., K-FON in Kerala, T-Fiber in Telangana, AP FiberNet) should offer wholesale bandwidth to PM-WANI PDOs at highly concessional, subsidized rates in rural blocks.
  - **Empowering VLEs:** State rural development agencies should actively facilitate the transition of local Common Service Centre (CSC) Village Level Entrepreneurs (VLEs) into PM-WANI PDOs. Providing one-time CAPEX grants or micro-credit specifically for Wi-Fi equipment will stimulate grassroots deployment.
  - **Government-Anchored Demand:** States should anchor rural demand by guaranteeing free daily Wi-Fi access specifically whitelisted for state e-governance portals, land registry services, and digital agriculture platforms, paying the local PDO for the data consumed.
- **Facilitative Role in Urban Areas (Municipal Level):**
  - **Streamlining Right of Way (RoW):** The most critical facilitative role in cities is enforcing the central RoW Rules 2024 uniformly across all municipal corporations. States must eliminate local ad-hoc taxes and create a strict single-window clearance portal for aerial cabling and micro-trenching.
  - **Providing Access to Street Furniture:** States should mandate that all municipal bodies allow private PDOAs to mount Wi-Fi access points on streetlights, bus stops, and utility poles at zero or nominal RoW charges.
  - **Power Provisioning:** State Electricity Boards (SEBs) should be directed to offer unmetered, flat-rate industrial tariffs for telecom equipment mounted on urban street furniture, avoiding commercial billing disputes.
- **Facilitative Role in High-Footfall Areas:**
  - **Anchor Tenancy in Public Buildings:** Instead of building the network, the State should adopt an "Anchor Tenant" model. For state-owned high-footfall areas (e.g., government hospitals, state universities, bus terminals), the State should pay a fixed bulk rate to a private PDOA to keep the network free for citizens. This guarantees the PDOA's revenue while ensuring a high-quality, privately managed service.
  - **Smart City Integration:** State governments should ensure that municipal budgets allocated under the Smart Cities Mission are utilized to fund the deployment of shared, neutral-host Wi-Fi infrastructure by private players in key civic zones.

**Conclusion:** The most effective role for State Governments is to eliminate civil friction (RoW), provide access to public infrastructure, and offer targeted subsidies, leaving the actual deployment and retail operation of the Wi-Fi hotspots to the private PM-WANI ecosystem.

**Q-16. 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 incentivize States /municipalities to undertake city- and town-level fiberisation to ensure Public Wi-Fi network proliferation? Please provide your response in**

**detail with justification.**

**IAFI Response:**

IAFI emphatically agrees that State Governments must take proactive initiatives to improve last-mile connectivity. While telecom licensing is a central subject, the physical deployment of last-mile fiber is fundamentally a local civil engineering challenge. States and municipalities control the roads, ducts, and street furniture. Without their active participation in town-level fiberization, the proliferation of Public Wi-Fi will remain stalled.

**1. The Need for State Initiatives:** The cost of civil works (digging and trenching) constitutes up to 70-80% of the total cost of laying optical fiber. States must intervene to reduce this civil friction. By developing shared, open-access city-level fiber grids, States can drastically lower the capital expenditure (CAPEX) for private ISPs and PM-WANI PDOAs, thereby making public Wi-Fi deployment commercially viable.

**2. Measures to Incentivize States and Municipalities:** To encourage States and local bodies to undertake aggressive fiberization, IAFI recommends the following strategic and financial incentives:

- **Link Central Grants to Telecom Reforms:** The Central Government should conditionally tie the disbursement of funds under major urban development schemes (such as the Smart Cities Mission or AMRUT) to a municipality's compliance with the RoW Rules 2024 and its progress in city-level fiberization. If a municipality refuses to streamline telecom RoW, its central infrastructure grants should be correspondingly restricted.
- **Implement a State "Broadband Readiness Index":** The Department of Telecommunications (DoT) should publish a highly visible, annual "Broadband Readiness Index" (BRI) that ranks States and Municipalities on metrics such as fiber-kilometres laid, RoW approval times, and the density of PM-WANI hotspots. Top-ranking states should be rewarded with bonus allocations from the Digital Bharat Nidhi (DBN).
- **Mandate and Incentivize "Dig-Once" Policies (Justification:** The Central Government should provide matching grants to States that legally mandate a "Dig-Once" policy. Under this policy, any new state-funded infrastructure project (road construction, water pipelines, or gas networks) must mandatorily include the laying of pre-connectorized telecom ducts. These ducts can then be leased to PDOAs to pull last-mile fiber without requiring fresh digging.
- **Subsidize State-Led Open Access Networks:** For states willing to build their own municipal fiber networks (similar to K-FON in Kerala or T-Fiber in Telangana), the Central Government should offer Viability Gap Funding (VGF). The strict condition for this funding must be that the state offers this fiber on an open-access, non-discriminatory, and wholesale basis to all registered PM-WANI PDOs.
- **Allow Municipalities to Retain Fiber Lease Revenues:** Instead of treating telecom deployment as a nuisance, municipalities should be incentivized to view it as an asset. By building shared municipal ducts and leasing them to PDOAs at reasonable, regulated rates, municipalities can generate a steady, legitimate stream of non-tax revenue to fund local civic services.

**Conclusion:** In summary, State Governments are the custodians of the last mile. To incentivize them, the Central Government must use a combination of "carrots and sticks"—rewarding progressive states with Digital Bharat Nidhi grants and competitive rankings, while linking broader urban development funds to strict RoW compliance and Dig-Once execution.

**Q-17. 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.**

**IAFI Response:**

IAFI asserts that local bodies, specifically Municipal Corporations in urban areas and Gram Panchayats in rural areas, are the most critical link in the physical deployment of Public Wi-Fi. While Central and State governments design policy and allocate capital, it is the local body that controls the ground-level infrastructure (roads, poles, civic buildings). The primary facilitative role of local bodies must be to eliminate operational friction and actively incentivize service providers.

**1. Facilitative Roles of Local Bodies in Rural Areas (Gram Panchayats):**

- **Providing Anchor Infrastructure:** Gram Panchayats should allow PM-WANI Public Data Offices (PDOs) and local Village Level Entrepreneurs (VLEs) free access to Panchayat Bhavans, community halls, and rural primary health centers to mount Wi-Fi equipment safely.
- **Acting as an Anchor Tenant:** To ensure sustainable operations in low-ARPU (Average Revenue Per User) rural areas, the Gram Panchayat can act as an "anchor tenant." By allocating a small portion of the Panchayat's administrative budget to purchase bulk data from the local PDO, the Panchayat can offer free, localized Wi-Fi for citizens accessing state e-governance services, thereby guaranteeing baseline revenue for the local operator.

**2. Facilitative Roles of Local Bodies in Urban Areas (Municipalities):**

- **Frictionless Street Furniture Access:** Municipalities must view telecom deployment as a civic utility, not a municipal real-estate revenue stream. They should allow private PM-WANI PDOs to mount Wi-Fi access points on streetlights, bus shelters, and traffic poles at nominal or zero Right of Way (RoW) charges.
- **Expediting Micro-Trenching Approvals:** Urban local bodies must implement a standardized, low-cost restoration fee for micro-trenching. This allows ISPs and PDOAs to lay last-mile fiber quickly to power hotspots without facing exorbitant digging penalties or months of bureaucratic delays.
- **Integrating Wi-Fi into Civic Amenities:** Municipalities should mandate that all new urban infrastructure projects (e.g., smart bus stops, modernized public parks, automated parking lots) include pre-installed telecom ducts and continuous 24/7 power tap-offs specifically designated for public Wi-Fi hotspots.

**3. Incentivizing Service Providers (PDOs, PDOAs, and ISPs):** To accelerate deployment and ensure long-term sustainability, local bodies must actively incentivize service providers to invest in their jurisdictions. IAFI recommends the following localized incentives:

- **Property Tax Rebates for Micro-Entrepreneurs:** Municipalities can offer targeted, partial rebates on commercial property/shop taxes for local shopkeepers and small businesses that register as PM-WANI PDOs and provide high-quality public Wi-Fi access in their vicinity.
- **Waiving Utility Levies:** Local bodies should coordinate with local electricity distribution companies (DISCOMs) to waive commercial electricity tariffs for public Wi-Fi equipment, permitting them to be billed at a subsidized or flat industrial rate to significantly lower the operator's OPEX.
- **Exclusive Digital Advertising Rights:** To incentivize PDOAs to deploy in high footfall but commercially challenging public spaces (such as large public parks or municipal markets), the municipality can grant the PDOA exclusive digital advertising rights on the captive Wi-Fi portal for that specific zone, providing a strong B2B revenue stream in lieu of charging the consumer.

**Conclusion:** Local bodies must shift their regulatory mindset from being "toll collectors" on telecom infrastructure to becoming proactive partners. By reducing civil costs, opening up street furniture, and actively incentivizing service providers through tax rebates and infrastructure sharing, local bodies can rapidly accelerate the sustainable operation of public Wi-Fi.

## E. Incentivizing Service Providers

**Q-18. 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.**

**IAFI Response:**

IAFI asserts that the active participation of Telecom Service Providers (TSPs) and Internet Service Providers (ISPs) is critical to scaling Public Wi-Fi to a national level. Currently, TSPs often view public Wi-Fi as a low-margin alternative to 4G/5G mobile data, while ISPs struggle with the high civil costs of laying last-mile fiber. To promote their active participation, the government must introduce regulatory and financial incentives that align Public Wi-Fi with the core business interests of these larger operators.

**1. License Fee and AGR Exemptions for Wi-Fi Revenues:**

- **The Policy:** The Department of Telecommunications (DoT) should entirely exempt the revenue generated strictly from Public Wi-Fi services from the calculation of Adjusted Gross Revenue (AGR) for TSPs and ISPs.
- **Justification:** TSPs currently pay high license fees based on their AGR. If revenue generated from public Wi-Fi is heavily taxed under the cellular AGR regime, TSPs have no incentive to invest in it. A clear, permanent AGR exemption for Wi-Fi

revenues will dramatically improve the ROI and encourage TSPs to deploy Wi-Fi aggressively in commercial hubs.

**2. Targeted Subsidies via Digital Bharat Nidhi (DBN):**

- **The Policy:** Under the Telecommunications Act, 2023, the Digital Bharat Nidhi should introduce a specific "TSP/ISP Wi-Fi Expansion Scheme." This scheme would offer Viability Gap Funding (VGF) to TSPs/ISPs that deploy public Wi-Fi in designated rural blocks and Tier-3/4 cities.
- **Justification:** TSPs and ISPs possess the technical expertise and scale to deploy nationwide networks, but they avoid rural areas due to low Average Revenue Per User (ARPU). Offering OPEX subsidies (e.g., subsidizing the backhaul costs for the first three years) will de-risk the investment and pull massive TSP infrastructure into the deepest parts of rural India.

**3. Incentivizing "PDO Wholesale Tariffs" through Tax Rebates:**

- **The Policy:** To solve the backhaul affordability issue mentioned in Q-1, TRAI should mandate that ISPs offer subsidized "PDO Tariffs" to PM-WANI entrepreneurs. In return, the ISPs offering these subsidized rates should receive equivalent GST rebates or deductions on their corporate taxes.
- **Justification:** ISPs cannot be forced to sell bandwidth below cost without damaging their business. By offering a tax rebate equal to the subsidy provided to the PDO, the government incentivizes ISPs to become active backend partners in the PM-WANI ecosystem without forcing them to absorb the financial loss.

**4. "Dig-Once" and Zero-Cost RoW Priorities for Wi-Fi Fiber:**

- **The Policy:** State and local governments should offer zero-cost Right of Way (RoW) and expedited single-window clearances specifically for TSPs/ISPs laying last-mile fiber dedicated to powering public Wi-Fi hotspots.
- **Justification:** Civil digging costs deter ISPs from expanding. If an ISP knows they can bypass exorbitant municipal RoW charges by dedicating the endpoint of the fiber to a public Wi-Fi node, it heavily incentivizes the rapid expansion of their fiber footprint.

**Conclusion:** To secure the active participation of TSPs and ISPs, policy must shift from mere compliance to active commercial alignment. Exempting Wi-Fi revenues from AGR, subsidizing rural backhaul via the Digital Bharat Nidhi, and creating a standard framework for cellular offloading will transform Public Wi-Fi from a regulatory obligation into a highly profitable core business vertical for telecom operators.

**Q-19. 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.**

**<u>IAFI Response:</u>**

IAFI firmly believes that the prohibitive cost of bandwidth and backhaul is the primary barrier to the commercial sustainability of Public Wi-Fi networks in India. Without affordable internet backhaul, the unit economics for a PM-WANI Public Data Office (PDO) simply fail. To resolve this, the Government must introduce targeted regulatory and fiscal incentives specifically designed to incentivize private entities (ISPs, TSPs, and Infrastructure Providers) to offer robust, low-cost backhaul to public Wi-Fi operators.

**1. Fiscal Incentives to Private Entities:**

- **Tax Rebates for Subsidized "PDO Tariffs" (Justification: OPEX Reduction for PDOs):** As highlighted in previous responses, ISPs currently charge premium "enterprise" rates for commercial broadband. If an ISP offers a heavily discounted "Wholesale PDO Tariff" to a registered PM-WANI entrepreneur, the Government should provide that ISP with a commensurate GST rebate or corporate tax deduction. This incentivizes the private ISP to support the PM-WANI ecosystem without forcing them to absorb a financial loss.
- **Viability Gap Funding (VGF) via Digital Bharat Nidhi (Justification: Rural Expansion):** For rural and underserved areas where laying backhaul is economically unviable, the Digital Bharat Nidhi (DBN) should provide direct OPEX subsidies or VGF to private ISPs. The funding should specifically cover the cost of backhaul bandwidth for the first 3-5 years, incubating the rural Wi-Fi hotspots until they achieve financial self-sufficiency.
- **Import Duty Waivers on Backhaul Equipment (Justification: CAPEX Relief):** The government should waive or significantly reduce customs duties on high-capacity wireless backhaul equipment (such as V-Band and E-Band microwave radios) imported by private entities, provided the equipment is strictly dedicated to provisioning backhaul for public Wi-Fi networks.

**2. Regulatory Incentives for Private Entities:**

- **Exemption of Wi-Fi Backhaul Revenue from AGR (Justification: Financial Viability for TSPs):** For TSPs offering cellular backhaul or wholesale bandwidth to PDOs, the revenue generated from these specific B2B backhaul transactions should be fully exempt from the calculation of Adjusted Gross Revenue (AGR). This removes the regulatory tax burden and makes Wi-Fi backhaul provisioning a lucrative business segment for larger telecom operators.
- **Delicensing V-Band and E-Band (Justification: Bypassing Civil Constraints):** To instantly incentivize private entities to provision high-speed backhaul without the exorbitant civil costs of trenching fiber, the DoT must immediately delicense or authorize light-touch licensing for the 60 GHz (V-Band) and 70/80 GHz (E-Band) spectrum. This enables private operators to deploy gigabit-speed wireless backhaul to public Wi-Fi access points in a fraction of the time and cost.
- **Priority and Zero-Cost Right of Way (RoW) for Backhaul Fiber (Justification: Accelerating Deployment):** Private ISPs and Infrastructure Providers (IP-1s) laying middle-mile or last-mile fiber specifically to connect PM-WANI hotspots should be granted "priority status." This status should guarantee zero-cost RoW access to state and municipal infrastructure (ducts, poles) and mandate strict, time-bound single-window clearances.

**3. Incentivising Infrastructure Sharing:**

- **Monetization of Unlit "Dark Fiber":** Private entities holding excess, unutilized dark fiber should be incentivized to lease this capacity specifically to PM-WANI PDOAs at wholesale rates. Revenue earned from leasing dark fiber strictly for public Wi-Fi purposes could be given a tax holiday for a specified period, incentivizing infrastructure owners to light up unused assets for the public good.

**Conclusion:** Incentivizing private entities to provision affordable backhaul requires a mix of direct fiscal support (tax rebates and DBN funding) and regulatory easing (AGR exemptions and spectrum delicensing). By lowering the input cost of backhaul, the entire PM-WANI ecosystem becomes commercially viable, ensuring sustainable, long-term proliferation.

## F. Incentivizing Private entities

**Q-20. 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.**

**IAFI Response:**

IAFI asserts that the ultimate success of the PM-WANI framework hinges on the mass participation of private enterprises, local shop owners (kiranas), and community institutions acting as Public Data Offices (PDOs). Currently, these entities are hesitant to adopt the PDO model due to a lack of clear financial returns, technical apprehension, and high initial hardware costs.

To incentivize these grassroots entities to install public Wi-Fi hotspots, the government and regulatory bodies must adopt measures that turn the Wi-Fi router from a "cost center" into a "revenue-generating asset."

**1. Measures to Incentivize Shop Owners and Commercial Establishments:**

- **Enable Hyper-Local Advertising & Footfall Analytics (Justification: Direct Monetization):** PM-WANI App Providers and PDOAs should be permitted to offer hyper-local, privacy-compliant advertising platforms. If a local cafe owner provides free Wi-Fi, the captive portal should allow the owner to push their own digital coupons or localized ads to the connected user. Transforming the Wi-Fi hotspot into a localized digital storefront provides a massive incentive for retail establishments to participate.
- **Property Tax Rebates:** Municipal corporations should offer a defined, tiered rebate on commercial property taxes or trade license fees for shop owners and commercial establishments that maintain a certified PM-WANI hotspot offering a minimum threshold of free daily data to the public.
- **Micro-Credit for Equipment (Justification:** The initial cost of an enterprise-grade router with battery backup is a deterrent for small shopkeepers. The government should officially categorize PM-WANI PDO setups under the PM MUDRA Yojana, providing collateral-free, subsidized micro-loans (e.g., ₹10,000) specifically for purchasing compliant Wi-Fi equipment.

**2. Measures to Incentivise Private Enterprises and Corporate Campuses:**

- **Corporate Social Responsibility (CSR) Eligibility :** The Ministry of Corporate Affairs should explicitly notify the deployment of PM-WANI public Wi-Fi networks in rural areas, slums, and government schools as an eligible activity under Corporate Social Responsibility (CSR) spending. This would instantly incentivize large private enterprises to fund the deployment of hotspots in their surrounding communities.
- **Exemption from ISP/Telecom Levies:** Large private enterprises (like mall operators or multiplexes) often fear that offering large-scale public Wi-Fi might subject them to ISP-like regulatory burdens or Adjusted Gross Revenue (AGR) liabilities. DoT must issue clear, permanent guidelines explicitly exempting non-telecom enterprises from telecom levies when operating PM-WANI hotspots.

**3. Measures to Incentivize Community Institutions (RWAs, Panchayats, Trusts):**

- **Subsidized "Community Backhaul Tariffs" (Justification: Financial Viability):** Resident Welfare Associations (RWAs), religious trusts, and community halls operate on tight civic budgets. ISPs should be mandated to offer a specialized, heavily subsidized "Community Wi-Fi Tariff" for backhaul bandwidth provided to these non-profit institutions, making it affordable for them to offer free Wi-Fi in community centers.
- **"Digital Village" Recognition and Grants (Justification: Civic Pride and Funding):** The government should introduce a certification program for Gram Panchayats and community bodies. Institutions that successfully deploy and maintain public Wi-Fi should receive "Smart Community" certifications, which unlock additional matching grants from state digital inclusion funds.

**Conclusion:** To achieve mass proliferation, public Wi-Fi must make business sense for the local shopkeeper and civic sense for the community institution. By explicitly allowing CSR funding, offering municipal tax rebates, and enabling hyper-local advertising, the government can organically incentivize millions of private and community entities to become the backbone of India's public Wi-Fi network.

**G.**

**Q-21. 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.**

**<u>IAFI Response</u>:**

IAFI strongly agrees that there is an urgent need to strengthen the role of both public and private entities as System Integrators (SIs) for the deployment of Public Wi-Fi networks. The PM-WANI framework, by design, unbundles the Wi-Fi ecosystem into discrete layers (PDO, PDOA, App Provider, Central Registry). While this unbundling lowers the barrier to entry, it creates massive friction in deployment. Small entrepreneurs do not have the technical expertise to stitch these disparate components together.

**1. The Need for System Integrators (Technical Architecture, Authentication, and Interoperability):** The primary bottleneck in PM-WANI today is not a lack of intent, but a lack of seamless integration. A robust System Integrator is required to bridge the following gaps:

- **Technical Architecture & Hardware Sourcing:** PDOs often struggle to procure PM-WANI-compliant hardware. SIs can provide "plug-and-play" Wi-Fi kits (combining the router, battery backup, and pre-configured software) tailored for specific environments (e.g., indoor cafes vs. outdoor solar deployments).
- **Authentication & Interoperability:** As highlighted in earlier responses, moving toward seamless authentication (like Passpoint / Hotspot 2.0) is necessary for PDOA radius servers, and the PM-WANI Central Registry. Only specialized SIs possess the software engineering capabilities to ensure this interoperability functions flawlessly across different networks.

**2. The Role of Public vs. Private Entities:**

- **Private SIs (The Execution Engine):** Private IT firms, telecom startups, and managed service providers (MSPs) should act as the primary commercial SIs, offering "Wi-Fi as a Service" (WaaS) to PDOAs, municipalities, and enterprise campuses.
- **Public SIs (The Standardization Engine):** Public R&D entities like C-DOT (Centre for Development of Telematics) and NIC (National Informatics Centre) should act as master integrators, developing open-source reference architectures, indigenous software stacks, and establishing standard APIs to ensure private SIs do not create closed, proprietary walled gardens.

**3. Required Policy and Institutional Support:** To empower and incentivize System Integrators, IAFI recommends the following institutional support:

- **Formal Recognition in the PM-WANI Framework:** SIs exist in a grey area. TRAI and DoT should officially recognize "Managed Wi-Fi System Integrators" within the PM-WANI framework, clarifying that acting as an SI (providing the hardware/software stack) does not subject the entity to standard ISP licensing or Adjusted Gross Revenue (AGR) liabilities, provided they are not the ones supplying the core internet bandwidth.
- **Establishment of National Interoperability Labs:** The DoT should establish or fund third-party "Wi-Fi Interoperability Testing Labs." These labs would allow SIs to rapidly test and certify that their specific hardware/software configurations are fully compliant with PM-WANI roaming, Passpoint authentication, and government security standards before mass deployment.
- **R&D Grants for Indigenous Integration (Justification: Reducing Import Dependency):** The Digital Bharat Nidhi (DBN) should provide targeted R&D grants to indigenous SIs and startups that successfully develop and integrate low-cost, "Made in India" Wi-Fi 6/7 solutions specifically optimized for the PM-WANI ecosystem.

**Conclusion:** In a highly decentralized ecosystem like PM-WANI, the System Integrator is the glue that holds the architecture together. By providing regulatory clarity and institutional testing support, the government can foster a robust SI ecosystem capable of delivering seamless authentication and true interoperability.

## G. Technical Architecture, Authentication, and Interoperability:

**Q-22. 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.**

**IAFI Response:**

IAFI asserts that the current authorization and authentication procedures are among the biggest demand-side constraints impeding the adoption of Public Wi-Fi, so the users are facing significant challenges. The existing process, which typically involves discovering the network, being redirected to a captive portal, entering a mobile number, waiting for an SMS-OTP, and submitting the OTP, is fraught with friction, timeouts, and privacy concerns.

**1. Challenges Users Face with Current Authentication Procedures:**

- **Captive Portal Fatigue and Timeouts:** Captive portals often fail to load properly on modern smartphone operating systems. When users are on the move, the time it takes to navigate the portal and await an SMS-OTP often exceeds the time they are physically in range of the hotspot, leading to abandoned sessions.
- **Repeated Logins:** Users are frequently forced to re-authenticate via OTP every time their device sleeps or they move to a different access point within the same PM-WANI network. This breaks the seamless "always-on" experience that users expect from modern cellular networks.
- **Privacy and Security Anxieties:** Forcing users to input their mobile numbers into unfamiliar captive portals raises legitimate fears of spam, data harvesting, and cyber fraud. The lack of standard encryption (open Wi-Fi) further deters usage.

**2. How to Simplify Authorization While Ensuring Compliance:** To eliminate user friction while adhering to KYC and security mandates, the PM-WANI framework must transition from manual, OTP-based captive portals to **automated, zero-touch authentication mechanisms**. IAFI recommends the following measures:

- **Mandate Passpoint (Hotspot 2.0) Integration (Justification: Zero-Touch Access):** TRAI should mandate the adoption of the Passpoint standard across the PM-WANI ecosystem. Passpoint allows a user to complete a one-time provisioning step (e.g., downloading a secure profile via the PM-WANI app). Thereafter, whenever the user is in range of a PM-WANI hotspot, their device authenticates in the background securely and connects automatically, completely bypassing the captive portal.
- **Enable EAP-SIM / EAP-AKA Authentication (Justification: Leveraging Cellular KYC):** For users offloading from cellular networks, authentication should be handled via the EAP-SIM protocol. Because the Telecom Service Provider (TSP) has already completed a rigorous Aadhaar-based KYC for the SIM card, EAP-SIM uses the cryptographic credentials on the SIM to instantly authenticate the user on the Wi-Fi network. This satisfies all compliance requirements without requiring the user to do anything.
- **Allow MAC-Binding for Session Persistence (Justification: Eliminating Repeated Logins):** Once a user is authenticated on a PM-WANI network, the Central Registry and PDOAs should be permitted to securely bind the device's MAC address to the

user's verified identity for a stipulated period (e.g., 30 days). This allows returning users to connect instantly without undergoing OTP verification for every session.

- **Integrate Digital Public Infrastructure (DPI) for Trust and Speed:** For users lacking a dedicated PM-WANI app, authentication should be integrated into trusted, ubiquitous DPI platforms like DigiLocker or UPI apps (e.g., BHIM). A one-click consent framework through these apps can authenticate the user instantly and securely, eliminating the need to type out phone numbers on unverified portals.

**3. Ensuring Security and Data Protection:** While simplifying access, security must be upgraded from the baseline.

- **Shift to WPA2/WPA3-Enterprise:** The automated authentication protocols mentioned above (Passpoint, EAP-SIM) inherently utilize WPA2/WPA3-Enterprise, ensuring that the over-the-air connection is encrypted. This protects users from "evil twin" attacks and packet sniffing—vulnerabilities common in current open captive portal systems.
- **Data Minimization:** Regulatory guidelines must strictly enforce data minimization. PDOAs and App Providers must be prohibited from collecting or retaining user data beyond what is legally mandated for telecom security compliance, addressing the privacy concerns that deter usage.

**Conclusion:** Public Wi-Fi will only scale when the login experience matches the effortlessness of cellular networks. By adopting global standards like Passpoint and EAP-SIM, the PM-WANI framework can eliminate the friction of SMS-OTPs while simultaneously elevating the security and compliance standards of the entire ecosystem.

**Q-23. 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.**

**IAFI Response:**

IAFI asserts that while the physical deployment of Wi-Fi hotspots should remain highly decentralized, the underlying architecture for authentication, roaming, and payment settlement **must be centralized via a national platform**.

Without a centralized clearinghouse, every Public Data Office Aggregator (PDOA) would be forced to sign complex, bilateral roaming agreements and payment settlements with every other PDOA and Telecom Service Provider (TSP) in the country, an administrative and technical impossibility. A centralized platform is the only way to achieve a seamless, "cellular-like" roaming experience for the end-user.

**1. The Need for a Centralized Platform:**

- **Seamless Roaming and Interoperability:** To allow a user who registers in Mumbai to automatically connect to a different PDOA's hotspot in Delhi, a central registry must

instantly verify the user's credentials and authorize the session across disparate networks.

- **Frictionless Micro-Payments and Settlement:** Public Wi-Fi relies on sachet-sized data packs (e.g., ₹5 or ₹10). Standard commercial payment gateways charge fixed per-transaction fees that instantly destroy the profit margin on a micro-transaction. A centralized payment platform is required to execute zero-fee micro-transactions and instantly route the split revenue to the PDO, PDOA, and App Provider.

**2. Which Entities are Best Suited for Implementation and Management?** IAFI strongly recommends against creating a new bureaucratic entity. Instead, the government should leverage India's existing, world-class Digital Public Infrastructure (DPI) through a dual-entity approach:

- **For Authentication and Roaming: C-DOT (Centre for Development of Telematics)**
  - **Justification:** C-DOT currently manages the foundational PM-WANI Central Registry. As a trusted, neutral government R&D organization, C-DOT is universally accepted by the telecom industry. Its mandate should be formally expanded and funded to upgrade the Central Registry into a fully-fledged **National Wi-Fi Roaming Hub**. C-DOT is best suited to manage the centralized database of Passpoint profiles, EAP-SIM authentication requests, and cross-network session data without any commercial bias.
- **For the Payment System: NPCI (National Payments Corporation of India)**
  - **Justification:** NPCI is the architect of the UPI ecosystem. It is the only entity in the country capable of processing billions of micro-transactions securely and at zero Merchant Discount Rate (MDR). NPCI should be tasked with integrating UPI AutoPay, one-click biometric payments, and purpose-specific e-RUPI vouchers natively into the PM-WANI Central Registry APIs. This allows users to pay for Wi-Fi frictionlessly from their existing banking apps, bypassing clunky third-party payment gateways entirely.

**Conclusion:** In conclusion, a centralized backend platform is an absolute necessity, but it must act as an invisible utility. Entrusting the authentication architecture to C-DOT and the payment architecture to NPCI leverages India's proven digital public infrastructure, enabling thousands of decentralized PDOs to operate efficiently on a unified national backbone.

## H. Monetization and Sustainability

**Q-24. 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.**

**IAFI Response:**

IAFI asserts that without interoperability and seamless roaming, PM-WANI will remain a fragmented collection of isolated hotspots rather than a unified national broadband grid.

Achieving seamless inter-hotspot roaming is the most critical technical milestone required to replicate the frictionless user experience of cellular networks.

**1. Steps Required to Achieve Interoperability and Seamless Roaming:**

- **Adoption of Passpoint (Hotspot 2.0):** At the device and access-point level, TRAI must mandate the integration of IEEE 802.11u / Passpoint standards. This allows a user's device to automatically discover and securely authenticate onto a roaming partner's network in the background, without requiring a captive portal.
- **Implementation of WRIX Standards:** At the backend, the ecosystem must adopt the **Wireless Roaming Intermediary exchange (WRIX)** framework. WRIX standardizes the financial clearing, settlement, and data exchange processes between different network operators, ensuring that if User A (registered to PDOA 1) uses data on PDOA 2's hotspot, PDOA 2 is compensated accurately.

**2. Should Inter-Hotspot Roaming be Made Mandatory?**

**Yes.** IAFI strongly recommends that inter-hotspot roaming within the PM-WANI ecosystem be made mandatory in a phased manner. Permitting "walled gardens"—where a PDOA locks its users only to its own hotspots—defeats the entire purpose of a national registry. If an entity wishes to enjoy the regulatory exemptions of being a PM-WANI PDOA, they must legally commit to an open-roaming architecture.

**3. The Need for a "Super-Aggregator" (National Roaming Hub):**

**Yes, a "super-aggregator" is structurally essential.**

If there are 500 PDOAs in the country, forcing them to sign individual, bilateral roaming and payment agreements with the other 499 PDOAs is commercially and administratively impossible.

- **The Solution:** A "super-aggregator" (acting as a central WRIX Clearinghouse) must be introduced. A PDOA only needs to connect and sign one agreement with the super-aggregator. The super-aggregator then authenticates the roaming users and handles the backend financial settlements between all connected PDOAs.
- **The Entity:** As highlighted in Q-23, a neutral government entity like **C-DOT** is best positioned to act as this super-aggregator, upgrading the current PM-WANI Central Registry into a fully functional National Wi-Fi Roaming Hub.

**4. Link to Monetization and Sustainability:**

Mandatory roaming via a super-aggregator is not just a technical feature; it is the ultimate driver of **monetization and sustainability** for the entire ecosystem.

**Conclusion:**

To achieve scale, TRAI must mandate inter-hotspot roaming powered by a C-DOT-managed super-aggregator. This architectural shift solves the user-experience problem through Passpoint, while simultaneously solving the profitability problem by unlocking B2B data-offloading revenues.

**Q-25. What monetization models are most appropriate for rural, urban, and high-footfall locations, respectively? Please also suggest any additional monetization models that may be suitable in the Indian context. Please provide your response in detail with justification.**

**IAFI Response:**

IAFI asserts that the lack of sustainable monetization models is the primary reason past public Wi-Fi initiatives have stalled. Because cellular data in India is highly affordable, forcing consumers to pay premium rates for Wi-Fi (a purely B2C model) is no longer viable. Monetization must be diversified across B2C, B2B, and Government-to-Business (G2B) avenues, strictly tailored to the socioeconomic realities of the location.

**1. Most Appropriate Monetization Models by Geography:**

- **Rural Areas (Focus: Anchor Tenancy and Government Subsidies)**
  - Constraint: Extremely low Average Revenue Per User (ARPU) and low digital literacy.
  - Model - Government Anchor Tenancy (G2B): The Gram Panchayat or local state body acts as the "Anchor Tenant." The government pays the local PDO a fixed monthly rate to keep the Wi-Fi free for villagers accessing agricultural portals (e-NAM), telemedicine, and educational content.
  - Model - Freemium / CSC Integration: Basic low-speed access is provided for free (subsidized by the Digital Bharat Nidhi), while the local Village Level Entrepreneur (VLE) running the Common Service Centre (CSC) charges a minimal fee for high-speed usage (e.g., downloading study materials or movies).
- **Urban Areas (Focus: Sachet Pricing and Hyper-Local Advertising)**
  - Constraint: High competition from 4G/5G networks; users only use Wi-Fi when cellular is congested or exhausted.
  - Model - Hyper-Local Advertising (B2B): Urban PDOs (like cafes and neighbourhood shops) provide free Wi-Fi but monetize the captive portal. Before connecting, the user must view a digital coupon or advertisement specific to that local shop or neighbourhood.
  - Model - UPI-Driven Sachet Pricing (B2C): For users who have exhausted their daily cellular limit, urban PDOAs can offer highly affordable "sachet" data packs (e.g., ₹5 for 5 GB for 2 hours) integrated natively with UPI AutoPay for frictionless, impulse purchases.

**2. Additional Monetization Models Suitable in the Indian Context:**

- **Brand Sponsorship (Zero-Rating):** Large FMCG brands or streaming platforms can "sponsor" public Wi-Fi in specific zones (e.g., "Free Wi-Fi at New Delhi Railway Station, brought to you by Brand X"). The brand pays the PDOA for the bandwidth in exchange for exclusive video ad placements on the splash page or zero-rated access to their specific app.

- **e-RUPI Subsidies for Targeted Demographics:** The government can utilize NPCI's e-RUPI framework to issue purpose-specific Wi-Fi vouchers to students or BPL (Below Poverty Line) citizens. The citizen scans the e-RUPI voucher at a PM-WANI hotspot, and the government instantly settles the payment with the PDOA. This ensures subsidies go directly to Wi-Fi consumption without leakage.
- **Neutral-Host Infrastructure Leasing:** Instead of selling data directly to consumers, an Infrastructure Provider (IP-1) builds a massive Wi-Fi grid in a high-footfall area and leases "Virtual SSIDs" to multiple ISPs and PM-WANI PDOAs. The IP-1 monetizes the physical infrastructure by collecting rent from the service providers.

**Conclusion:** In the Indian context, the era of relying solely on selling Wi-Fi vouchers to consumers is over. Profitability lies in B2B data offloading, localized digital advertising, and leveraging digital public infrastructure (UPI/e-RUPI) for frictionless micro-transactions.

**Q-26. 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.**

**IAFI Response:**

IAFI appreciates the opportunity to provide inputs on this critical consultation. While the preceding questions have addressed the commercial, architectural, and geographic challenges of deploying Public Wi-Fi, IAFI wishes to highlight several forward-looking strategic, spectrum, and standardization issues that must be integrated into the overarching policy framework to ensure long-term success.

**1. Strategic Spectrum Allocation and the 6 GHz Band:**

- **Observation:** The proliferation of Public Wi-Fi cannot be sustained solely on the legacy 2.4 GHz and 5 GHz bands, which are already highly congested. The introduction of Wi-Fi 6E and Wi-Fi 7 requires wider contiguous spectrum channels (e.g., 160 MHz and 320 MHz) to deliver gigabit speeds.
- **Suggestion:** DoT must implement a balanced, forward-looking approach to the 6 GHz band, the lower 6 GHz band (5925-6425 MHz) is well-suited for delicensing for Wi-Fi indoor use and the upper 6 GHz band (6425-7125 MHz) for IMT (International Mobile Telecommunications). This ensures a harmonious balance between cellular 5G/6G expansion and Wi-Fi proliferation, aligning with the international harmonization outcomes established at recent ITU-R World Radiocommunication Conferences.

**2. Convergence and Harmonization with 5G-Advanced and 6G:**

- **Observation:** Public Wi-Fi should not be viewed in isolation as a competing technology to cellular networks. As the industry prepares for the 6G era, the rigid boundaries between unlicensed Wi-Fi and licensed cellular access will dissolve.
- **Suggestion:** The regulatory framework must actively encourage **Fixed Mobile Convergence (FMC)**. Policy should incentivize the deployment of technologies like

Access Traffic Steering, Switching, and Splitting (ATSSS), which allows a user's device to simultaneously aggregate bandwidth from both 5G and Wi-Fi. The PM-WANI architecture must be fundamentally aligned with 3GPP and ITU-T standards, ensuring that Wi-Fi acts as a seamless, native extension of the cellular core.

**3. Promoting Indigenous R&D and Manufacturing (Atmanirbhar Bharat):**

- **Observation:** Currently, a significant portion of enterprise-grade Wi-Fi routers and access points deployed in public networks are imported. This not only inflates capital expenditure (CAPEX) but also presents potential supply-chain security vulnerabilities in critical public infrastructure.
- **Suggestion:** The mass rollout of Public Wi-Fi must be strategically tied to domestic manufacturing initiatives. The government should extend Production Linked Incentive (PLI) benefits specifically to domestic manufacturers designing indigenous Wi-Fi 6/7 equipment. Furthermore, deployments seeking subsidies from the Digital Bharat Nidhi (DBN) should be mandated to prioritize "Made in India" telecom gear.

**4. Baseline Quality of Service (QoS) and Cybersecurity Standards:**

- **Observation:** The intentional "light-touch" regulation of PM-WANI is highly beneficial for rapid grassroots rollout. However, without baseline standards, it has led to inconsistent Quality of Experience (QoE) and varying security protocols, which causes consumer mistrust and deters mass adoption.
- **Suggestion:** Without imposing burdensome telecom licensing, TRAI should mandate a minimum baseline QoS index (e.g., minimum guaranteed throughput per user) that PDOAs must maintain to retain their PM-WANI certification. Furthermore, cybersecurity must be standardized; utilizing WPA2/WPA3-Enterprise encryption must be made mandatory to protect citizens from data harvesting and rogue access point (Evil Twin) vulnerabilities.

**5. Sustainable and "Green" Wi-Fi Deployments:**

- **Observation:** As lakhs of active Wi-Fi access points are deployed nationwide across street furniture and rural squares, the aggregate energy consumption and carbon footprint of this infrastructure will become substantial.
- **Suggestion:** Policy should actively incentivize "Green Wi-Fi." The government should provide targeted CAPEX bonuses or tax rebates for PDOs that deploy energy-efficient access points powered by renewable energy (such as hybrid solar/battery setups). This is particularly critical in rural off-grid locations, ensuring that India's digital proliferation aligns with its national climate and sustainability commitments.

**Conclusion:** In conclusion, the successful proliferation of Public Wi-Fi in India requires a holistic approach that goes far beyond laying fiber and reducing RoW costs. By carefully managing spectrum allocation, driving cellular-Wi-Fi convergence, securing the networks, and incentivizing indigenous manufacturing, TRAI and DoT can build a world-class, future-ready public broadband ecosystem.

## Concluding Remarks

The ITU-APT Foundation of India (IAFI) reiterates that the proliferation of Public Wi-Fi is not merely a matter of telecom expansion, but a foundational driver of India's socio-economic growth and digital inclusion. While the PM-WANI framework has laid a commendable groundwork, realizing its true potential requires a paradigm shift from a purely retail focus to solving structural backend bottlenecks. By addressing backhaul economics, particularly through subsidizing FWA technology via the Digital Bharat Nidhi, eliminating Right of Way (RoW) friction, unlocking the lower 6 GHz spectrum, and transitioning to zero-touch authentication like Passpoint, the Government can transform public Wi-Fi into a seamless, nationwide utility. We urge TRAI to adopt a differentiated, geography-specific approach that leverages free-market dynamics in urban centers while bridging the viability gap in rural India through targeted government support. IAFI remains fully committed to assisting TRAI and the Department of Telecommunications in building a robust, secure, and world-class public broadband ecosystem, and we look forward to further collaborative deliberations on this vital subject.

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