

TV RAMACHANDRAN

FIBRE FIRST: RETHINKING INDIA'S BROADBAND BACKBONE

India must treat FWA as a stopgap and prioritise fibre as the core of its digital infrastructure to enable inclusive, high-performance growth.



Fixed Wireless Access (FWA) has emerged as a key instrument in India's efforts to extend last-mile connectivity to hard-to-reach areas. It enables relatively rapid deployment and circumvents right-of-way and trenching barriers that often delay wired infrastructure projects. In recent years, it has allowed operators to plug coverage gaps in semi-rural zones and deliver basic broadband services. However, the global experience is instructive—FWA is a transitional tool, not a long-term solution. For a country with India's digital ambitions, economic scale, and population density, the focus must shift decisively toward fibre.

The real test of digital infrastructure lies not in reach alone, but in capacity, sustainability, and readiness for next-generation applications. Fibre to the Home (FTTH) excels on all these fronts. India must treat FWA

as a tactical measure and embrace fibre as the strategic backbone of its digital economy.

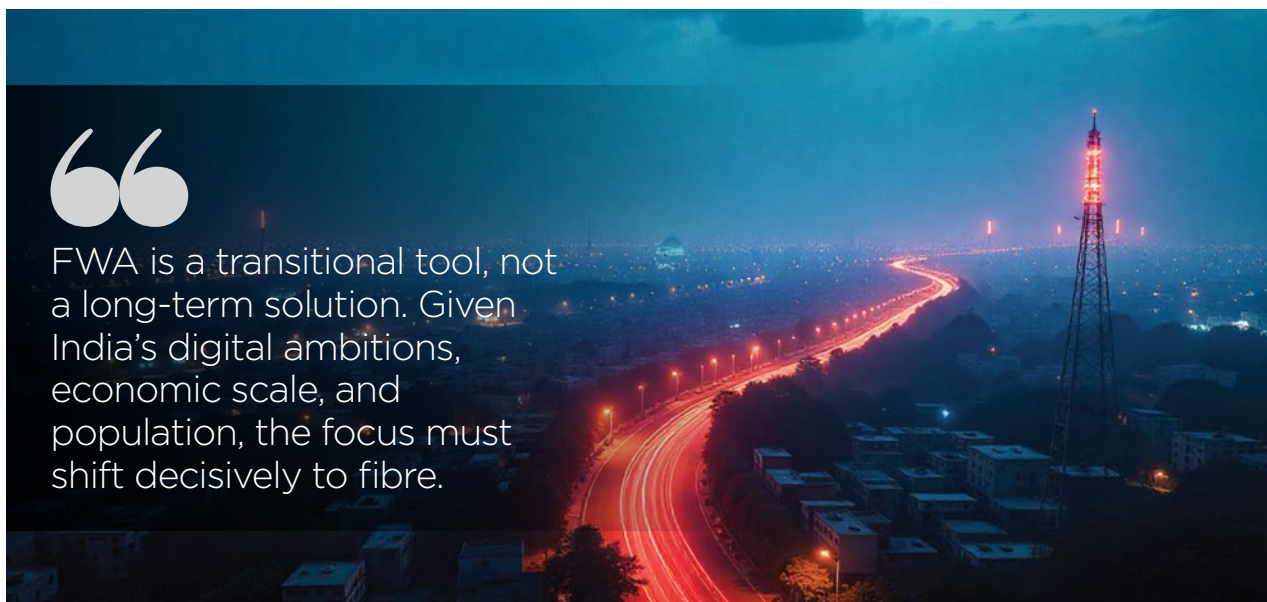
INDIA'S DIGITAL GAP IN A GLOBAL PERSPECTIVE

India's fixed broadband story reveals a paradox: while mobile Internet has proliferated, fixed-line broadband remains underdeveloped. According to international estimates, India has just over three fixed broadband connections per 100 people, far behind global digital leaders. France and Germany have penetration rates above 45%, China and the UK above 40%, and even countries such as Brazil and Russia exceed India's numbers several times over.

This disparity reflects a long-standing mobile-first growth model. While it helped extend basic connectivity,

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it falls short in supporting applications requiring ultra-low latency, high throughput, or symmetrical upload and download speeds.

Moreover, India's infrastructure mix is skewed. Fibre accounts for just 2.6% of fixed broadband connections, compared to 43% in China, 33.5% in Japan, and 31% in the UK. India also lacks the DSL or cable footprint that served as stepping stones in other markets. Without a foundational fixed network, India must leap directly to fibre.

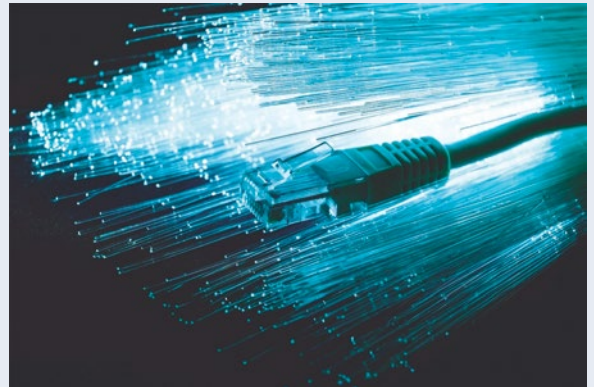
The mismatch between mobile and fixed access is stark. India has approximately 922 million mobile broadband users, but fixed wired broadband reaches only around 46 million subscribers, covering fewer than 10% of households. This digital imbalance undermines the government's vision for inclusive and deep-rooted digital enablement.

FIBRE VS FWA: SPEED, COST, AND RELIABILITY

Fibre-based broadband offers a significant performance edge. FWA, though easier to deploy, faces inherent limitations due to radio signal interference, spectrum congestion, and physical obstructions. Real-world FWA speeds typically range from 50 to 150 Mbps with latency between 30 to 80 milliseconds. FTTH services, in contrast, routinely deliver 300 Mbps to 1 Gbps, with sub-10 millisecond latency.

Energy efficiency is another differentiator. FWA networks consume between 1.5 to 2.5 kilowatt-hours per 100 GB, while fibre networks require only 0.4 to 0.6 kWh for the same volume of data. This makes fibre 3 to 5 times more energy efficient, a crucial factor as India targets Net Zero by 2070.

Fibre is also more affordable in high-usage scenarios. TRAI data suggests that FTTH users typically consume between 200 and 500 GB per month, significantly higher than mobile or FWA users. The effective cost per GB for fibre stands at Rs 1–2, compared to Rs 9 or more for mobile or FWA. In simple terms, fibre provides higher volume, better quality, and far lower unit cost.



IN BRIEF

- India has 922 million mobile users but only 46 million fixed broadband subscribers—less than 10% of households.
- Fibre is 3–5x more energy efficient than FWA, consuming just 0.4–0.6 kWh per 100 GB versus 1.5–2.5 kWh for FWA.
- FWA data costs hover around Rs 9/GB, while FTTH delivers high-volume usage at Rs 1–2/GB with unlimited plans.
- Countries like China, South Korea, and the US use FWA tactically, but rely on fibre to support future technologies.
- Nomadic use of FWA disrupts network planning, reducing quality and stability for latency-sensitive applications.
- Fibre supports SDGs and India's Net Zero goals, and must be central to digital infrastructure and policy investments.

In terms of operational longevity, FWA devices often require a hardware refresh every five to seven years. Fibre networks, however, are future-ready—upgrades can be performed via software and passive optical components, without altering the core infrastructure.

LESSONS FROM GLOBAL FIBRE-FIRST ECONOMIES

Countries that have taken broadband seriously from a

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policy and infrastructure standpoint have made fibre their default. South Korea leads the world with 96–97% household FTTH coverage. China has reached 93.6% fibre penetration, with urban areas exceeding 85%. Even in the United States, which had traditionally leaned on wireless networks, nearly 90% of the population now has access to gigabit fibre speeds.

Importantly, FWA in these markets is limited to rural, disaster-prone, or geographically inaccessible areas. In the US, FWA accounts for just seven per cent of fixed broadband subscriptions. In Brazil, fibre dominates urban connectivity (over 70%), with FWA used selectively in the Amazon basin. Germany has kept FWA below six per cent, prioritising urban densification through fibre, supported by federal and EU co-investment.

These examples underscore a universal trend: nations building for 6G, AI, quantum networking, and digital sovereignty are not relying on temporary wireless patches—they are investing in deep fibre.

CHALLENGES OF FWA IN THE INDIAN CONTEXT

India's FWA push—spearheaded by JioAirFiber and Airtel Xstream AirFiber—has been valuable in bringing basic broadband to underserved areas. However, this approach has clear limitations when it comes to enabling the next wave of digital services.

Latency-sensitive applications such as telemedicine, virtual classrooms, video surveillance, real-time financial services, and AI data centres require consistent bandwidth and network stability. FWA, by design, struggles to meet these demands reliably.

A practical challenge also arises from FWA's nomadic usage. Consumers often relocate devices to different locations, disrupting network planning and causing unanticipated demand spikes. This undermines service consistency and network load optimisation.

From a sustainability lens, the case for fibre becomes even stronger. As mentioned earlier, FWA's energy consumption is 3 to 5 times higher than fibre. This has

significant implications for India's climate goals. Fibre directly aligns with the United Nations Sustainable Development Goals, particularly SDG 7 (Clean Energy), SDG 9 (Industry, Innovation and Infrastructure), and SDG 13 (Climate Action). Countries like Germany and South Korea have explicitly embedded fibre into their national climate and digital transition plans.

A FIBRE SPINE FOR VIKSIT BHARAT 2047

As India marches toward its Viksit Bharat 2047 goal, broadband infrastructure must evolve from stopgap to strategic. FWA may help address access inequalities in the near term, but it cannot serve as the foundation for a digitally empowered economy.

Future applications—smart manufacturing, precision farming, autonomous mobility, immersive education, and quantum communication—demand high throughput, symmetrical bandwidth, and near-zero latency. These cannot be achieved without a deep fibre infrastructure.

India's public digital infrastructure initiatives must reflect this shift. BharatNet should be upgraded to a fibre-grade platform, capable of supporting multi-gigabit last-mile connectivity. To support rapid fibre expansion, the government should introduce 10–15-year bond-backed financing models for last-mile fibre entrepreneurs. A spillover investment approach can encourage ecosystem development beyond the urban core.

Policy support must also streamline right-of-way (RoW) permissions, promote urban micro-trenching, and drive convergence between central and state regulatory frameworks.

Fibre is not just a better network—it is the enabling platform for India's digital aspirations. FWA is a rope bridge. FTTH is the highway. India must walk the rope when needed—but build the road without delay. 🛤️

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Views are personal.

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