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INDIA'S 2030 SPECTRUM PLAN BACKS 6G, STUMBLES ON WI-FI

NFAP 2025 charts spectrum priorities till 2030 for IMT, satcom, and HAPS, but the missing lower 6 GHz band risks slowing next-gen Wi-Fi.

As India progresses towards its vision of becoming a Viksit Bharat by 2047, the telecommunications sector is a foundational enabler of this transformation. With over 96% of broadband connections dependent on mobile or wireless networks, the country remains largely mobile-first. In such a context, radio-frequency spectrum—a finite and valuable natural resource—becomes critical to realising the goals of digital connectivity and deep tech integration.

The spectrum, which enables mobile and wireless communication, is globally regulated under the International Telecommunication Union's Radio Regulations (ITU-RR). In India, its allocation and management fall under the jurisdiction of the Wireless Planning and Coordination (WPC) Wing, functioning within the Ministry of Communications. The guiding document for spectrum planning is the National Frequency Allocation Plan (NFAP), published every four years. This plan is not merely a technical manual; it is a policy instrument reflecting India's technology

> India has secured spectrum for 6G-era networks and satcom scale; now the lower 6 GHz decision must match the ambition of digital inclusion.

> NFAP 2025 sharpens India's spectrum architecture for IMT, satcom, IFMC, and HAPS—setting the operating map for telecom growth through 2030.

ambitions, regulatory vision, and alignment with global standards.

The latest version, NFAP 2025, serves as a roadmap for managing India's spectrum resources in accordance with international norms while addressing domestic digital priorities. It lays down allocations across the frequency range from 8.3 kHz to 3000 GHz and outlines specific provisions for mobile broadband, satellite communications, and emerging technologies such as Vehicle-to-Everything (V2X) communication, High Altitude Platform Stations (HAPS), and In-Flight and Maritime Connectivity (IFMC).

FOCUS: IMT, SATELLITES, AND EMERGING TECHNOLOGIES

NFAP 2025 introduces several key changes designed to support India's digital transformation and to prepare the spectrum ecosystem for upcoming technologies, including 5G Advanced and 6G. A critical change in the plan is the identification of the 6425–7125 MHz frequency band, commonly known as the Upper 6 GHz band, for International Mobile Telecommunications (IMT). This allocation meets the growing demand for mid-band spectrum, which is crucial to supporting high-capacity, low-latency mobile broadband services.

The plan also strengthens satellite communications, an increasingly vital component of India's digital infrastructure, especially in remote and underserved regions. It has reserved the Ka (27.5–31 GHz), Q (33–50 GHz), and V (40–75 GHz) bands for satellite services. These bands are essential for supporting both Geostationary Orbit (GSO) satellites and large constellations of Low and Medium Earth Orbit (LEO/MEO) satellites, enabling high-throughput and low-latency connectivity.

In addition, NFAP 2025 has allocated spectrum for In-Flight and Maritime Connectivity (IFMC), ensuring broadband access is available not only on land but also in the air and at sea. This is seen as a significant step in creating uninterrupted, ubiquitous access to digital services.

The plan also accounts for future use cases by earmarking spectrum for emerging technologies. This includes allocations for V2X communications, High Altitude Platform Stations (HAPS), and other innovative applications that demand high reliability and broad coverage.

HAPS AND V2X GET BOOST WITH GLOBAL HARMONISATION

Among the notable allocations is the 5.9 GHz band for V2X communication, which supports technologies such as Cellular Vehicle-to-Everything (C-V2X). Based on 3GPP global standards, C-V2X enables real-time communication between vehicles, infrastructure, pedestrians, and networks. This can play a pivotal role in reducing road accidents, improving traffic management, and developing Intelligent Transport Systems (ITS). With India experiencing a high number of traffic-related fatalities each year, the deployment of V2X systems aligns well with the national goal of 'Vision Zero'—a future with zero road fatalities.

In addition to ground-based innovations, NFAP 2025 introduces significant changes in spectrum allocation for High Altitude Platform Stations (HAPS). These platforms operate in the stratosphere and can deliver broadband over vast areas. In India, HAPS are being considered for various applications, including rural broadband coverage, disaster recovery, broadcasting, temporary event connectivity, and as redundancy networks for terrestrial backhaul.

However, earlier efforts to commercialise HAPS were impeded by technical and regulatory challenges. Many previously identified bands, such as the 28/31 GHz band, were region-specific and lacked harmonisation. This made it difficult to achieve cost-efficient global deployment, and operators often faced complex interference mitigation requirements between fixed-satellite services and terrestrial systems. Additionally, higher mmWave bands like 38 GHz and 47/48 GHz—though identified for HAPS—are vulnerable to rain attenuation, especially in tropical regions like India, thereby limiting coverage and service reliability.

Recent global regulatory developments have sought to address these issues. At WRC-19, the 31–31.3 GHz and

> The roadmap strengthens mid-band IMT and satellite spectrum, signalling a deliberate pivot to hybrid connectivity for coverage, resilience, and capacity expansion.

38–39.5 GHz bands were globally identified for HAPS, adding to the previously harmonised 47.2–47.5 GHz and 47.9–48.2 GHz bands. Even more significantly, WRC-23 allowed the use of lower IMT bands (700–900 MHz, 1.7 GHz, and 2.6 GHz) for HAPS operations.

These lower frequencies are far less susceptible to weather disruptions and can connect directly to standard mobile devices, eliminating the need for customised user equipment and thereby lowering capital and operating costs. This development marks a turning point in making HAPS a commercially viable and scalable connectivity solution for India.

ENABLING BACKHAUL AND WI-FI WITH E AND V BANDS

The introduction and growth of 5G—and eventually 6G—have led to significant increases in data consumption per site. The co-location of multiple generations of mobile technologies (2G to 5G) on a single physical tower has intensified the demand for high-capacity backhaul solutions. Traditional microwave systems are unable to keep pace with this exponential capacity growth. In response, NFAP 2025 supports the use of E-band (71–76 GHz and 81–86 GHz) for high-capacity point-to-point terrestrial backhaul links. These bands are well-suited for urban environments where quick deployment is essential.

Further, the lower V band (57–66 GHz) has been identified as a potential candidate for delicensing. This move could support the deployment of millions of public Wi-Fi hotspots across India, in alignment with various government programmes promoting digital inclusion. Globally harmonised for Wi-Fi applications, this band provides up to 9 GHz of spectrum, nearly 70 times more than the currently available delicensed Wi-Fi bands. TRAI has supported this move in its recent recommendations on backhaul spectrum.

These spectrum provisions could transform India's last-mile connectivity and support the growth of data-intensive applications such as video streaming, online education, and remote work, especially in Tier II and Tier III towns.

OMISSION OF THE LOWER 6 GHZ BAND RAISES CONCERNS

Despite several forward-looking provisions, NFAP 2025 has drawn criticism for excluding the lower 6 GHz band (5925–6425 MHz), which had been earmarked for Wi-Fi in India's 6G Vision document released in March 2023. A draft gazette notification issued on 16 May 2025 also proposed delicensing this band. However, the final plan makes no reference to it, raising policy concerns.

This absence undermines India's efforts to ensure sustainable and inclusive digital connectivity. Wi-Fi remains the most widely used and cost-effective broadband access method in the country, particularly for indoor and public network usage. Advanced Wi-Fi technologies like Wi-Fi 6E and Wi-Fi 7 rely on wide, contiguous spectrum blocks, which only the lower 6 GHz band can provide.

Without access to this band, India risks falling behind in key areas such as digital education, telemedicine, immersive technologies (AR/VR/XR), cloud gaming, digital twins, and metaverse services—all of which require high-throughput, low-latency connections.

The lower 6 GHz band also holds the key to overcoming the indoor coverage limitations of high-frequency 5G and future 6G networks. With 70–80% of data consumed indoors, relying solely on dense small cell deployments for indoor coverage may prove cost-intensive. Instead, wide deployment of next-generation Wi-Fi technologies, supported by the lower 6 GHz band and a robust fibre backbone, can deliver seamless connectivity across homes, enterprises, campuses, and public venues.

NFAP 2025's silence on this issue not only contradicts earlier policy directions but also casts uncertainty on India's long-term innovation and broadband strategy. The lack of clarity may delay the rollout of next-gen Wi-Fi, curtailing digital inclusion and hindering socio-economic progress.

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(Views are personal.)

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