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## **From 5G to 6G: India's Push for Next-Generation Networks**

*By Manoj Harjani*

### **SYNOPSIS**

*India's vision statement for 6G lays out an advanced plan for the country to implement the next generation of communications networks by 2030. However, having experienced a delayed 5G rollout and needing more domestic capabilities to facilitate indigenous technology development, India's 6G ambitions require further evaluation. To ensure an optimal 6G rollout, India should aim to balance technical, commercial and national security concerns through a risk-based approach.*

### **COMMENTARY**

Earlier this year, India's Department of Telecommunications (DOT) published a [vision statement](#) for 6G which outlined its desire to implement the next generation of communications networks by 2030. This document, which draws on the recommendations of six [taskforces](#) formed by the DOT in late 2021, lays out an advanced plan for India to make its mark by contributing to global 6G technology research and standards, as well as to equipment manufacturing domestically.

But the reality is that India's rollout of 5G has been [slower than expected](#), and the country would be venturing into indigenously developing a technology that it has relatively limited experience and capabilities in. Are India's 6G ambitions realistic? It will be a tremendous challenge for a country to develop 6G technology on its own, notwithstanding India's technological potential.

To ensure an optimal 6G rollout in the future that avoids the delays seen with the implementation of 5G, the government will have to balance technical, commercial and national security concerns through a risk-based approach.

## Obstacles to India's 6G Vision

India's journey towards 6G has nevertheless gotten off to a good start. The DOT's six multi-stakeholder taskforces have covered a wide range of factors related to nurturing the overall 6G ecosystem, including the technologies necessary to realise next-generation networks, spectrum policy, use cases, devices, standardisation, and R&D finance.

This is a significant step since India had paid little attention to indigenous technology development and to international standardisation prior to 4G and 5G. Having developed a vision statement, India is now situated within a small club of countries involved in finalising technology standards for 6G, although this does not guarantee influence over the final outcome.

However, there will be a significant obstacle to navigate when it comes to R&D. India's overall R&D expenditure as a proportion of GDP stands at only 0.7 per cent – far below the global average of 1.8 per cent – but such indicators are subject to a time lag and inaccuracies in measurement, particularly for [private sector contributions](#).

While the DOT's taskforce on R&D finance has [recommended](#) creating a funding pool of ₹10,000 crore (~S\$1.6 billion) over ten years, it is unclear how this will be realised, and what the extent of the government's contributions will be relative to that of the private sector.

This taskforce's recommendation is within range of the funding commitments made by other major players involved in 6G development. For example, the European Union's budget is approximately [€1.8 billion](#) (~S\$2.7 billion) from 2021 to 2027, while Japan and the United States jointly committed to spending [US\\$4.5 billion](#) (~S\$6 billion) in 2021.

Beyond R&D, another key obstacle will be faced when manufacturing the full suite of 6G equipment domestically. The government took a first step towards encouraging indigenisation when it [banned](#) the use of “non-trusted” equipment for India's communications networks in July 2022. This has effectively ruled out participation by key Chinese equipment producers Huawei and ZTE in India's 5G network and future 6G rollout as they have [yet to receive](#) “trusted” status.

Furthermore, it will take some time before supply chains and manufacturing capabilities adjust, and even then, it will be unlikely that India can completely indigenise the supply chain for 6G. For example, there are no major local players in the design and production of 5G chips, and it is very unlikely that India can develop this capability for 6G by 2030 given the complexities of breaking into the chip industry.

In light of these circumstances, the Indian government's [claim](#) of having a fully indigenised technology stack needs to be unpacked further. The “[India Telecom Stack](#)” that was developed by a consortium of local companies will primarily serve state-owned telco BSNL in its rollout of 4G services, and eventually for non-standalone 5G services.

But the core equipment of the India Telecom Stack – which is based on the Open

Radio Access Network (O-RAN) architecture developed by a global alliance of major telcos – actually relies on foreign intellectual property. This underscores the fact that no single country or company will independently develop every aspect of 6G technology. Complete indigenisation is therefore a myth.

Telcos clearly recognise this reality, which is why those that have already rolled out 5G services in India have done so with a mix of local and foreign equipment. For example, Reliance Jio [partnered](#) with European equipment manufacturers Ericsson and Nokia, even though it initially promised to deliver a fully indigenised 5G network.

### **Cautious Optimism?**

Despite these obstacles, the Indian government's launch of a 6G "[mission](#)" to realise its vision statement is a step in the right direction. Creating a multi-stakeholder institutional setup can serve India well if it is mobilised towards minimising bureaucracy and creating a conducive regulatory environment for R&D.

The primary stumbling block is likely to be ideological in nature. Anchoring the 6G mission to "Atmanirbhar Bharat" – which refers to a government campaign to encourage a "self-reliant India" – may bolster India's techno-nationalist credentials but could result in a sub-optimal and delayed 6G rollout if domestic R&D and manufacturing capabilities are not able to ramp up and deliver within the 2030 timeframe.

Advocates of developing 6G technology in India on the basis that it is essential to safeguard national security also need to consider another factor – not only does India have the option to procure from trusted foreign suppliers, there is no guarantee that domestically manufactured equipment is free from security risks.

In any case, given the limitations that exist for developing truly indigenised 6G technology, a more pragmatic option for the government could be a risk-based approach. Where there are genuine national security risks – for example through software or hardware backdoors – the case for greater oversight of the technology supply chain is clearer.

In areas where risks are minimal, the government should avoid the temptation to produce everything in India and to consider trusted foreign suppliers. It is unnecessary to precondition 6G realisation on a "Made in India" appellation. Ultimately, the most important capability that will be needed to ensure a timely and effective 6G rollout is sensitivity in balancing technical, commercial and national security concerns.

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