AIR Spotlight: Bharat 6G Vision - Telecom Technology to Empower People

AIR Spotlight is an insightful program featured daily on the All India Radio News on air. In this program, many eminent panellists discuss issues of importance which can be quite helpful in IAS exam preparation.

This article is about the discussion on: **'Bharat 6G Vision -Telecom Technology to Empower People'.**

Participants:

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Context: Prime Minister Narendra Modi unveiled the Bharat 6G vision document in March 2023.

Introduction:

- Preparing the ground for the launch of 6G services in the country, Prime Minister Narendra Modi on March 22, 2023, unveiled the Bharat 6G vision document and launched the 6G research and development testbed.
- According to the Prime Minister, India is planning to set up 100 new 5G labs to develop 5G applications as per the unique needs of India.
- India is one of the countries to have rolled out 5G mobile technology at the fastest pace. 5G services have been expanded to 125 cities within 120 days of its launch.
- Stressing that India's telecom and digital model is smooth, secure, transparent and trusted, the Prime Minister said this decade is 'tech-ade'.

Bharat 6G vision document:

- The vision document released by the Department of Telecom states that while 5G technology promises a speed of 40-1,100 Mbps with the potential to hit a maximum speed of 10,000 Mbps, whereas 6G will offer ultra-low latency with speeds up to 1 terabit per second — which is 1,000 times more than the top speed of 5G.
- 6G will build upon 5G technology and provide more reliable, ultra-low latency and affordable solutions.
- Vision document emphasises that India must focus on aligning its research on technologies in the coming decade that would bolster and propel the implementation of 6G in India in a highly customised manner.

- It also speaks about India's telecom revolution and provides a detailed roadmap to 6G implementation in India.
- The vision document also provides summaries of task forces on various aspects of emerging telecom technologies such as multi-platform next-generation networks and spectrum policy.

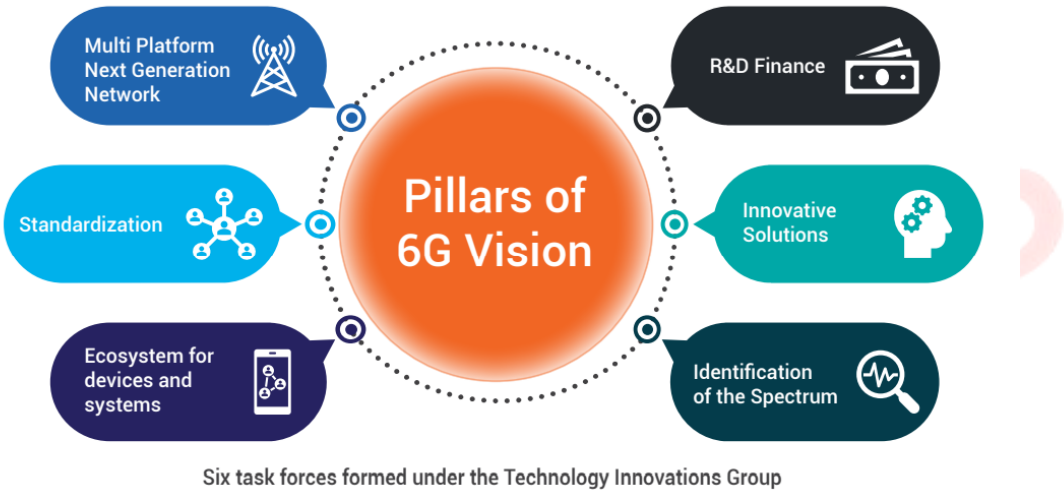

Image Source: DoT

What is 6G?

- 6G is built upon the infrastructure of 5G and it is hoped that it will accomplish more than 5G in terms of adoption, reduction of cost, and better service. While 5G provides less than 1 ms latency, 6G provides less than 0.1 ms latency.
- The important areas that will benefit from this technology are the likes of smart devices and self-driving cars.
- 6G will also be beneficial to the advancement of Artificial Intelligence and Machine Learning.
- Several companies such as Xiaomi, Samsung, Nokia, LG, Huawei, and Apple have taken several steps to make 6G a reality.
- According to Nokia Labs, 6G will operate on the mid bands (7 – 20 GHz) for places that are crowded, low bands (460 – 694 MHz) for long-distance coverage, and use sub-THz for peak data rates in the short range of up to 100 Gbps.
- 6G will also use significantly advanced network devices, including MIMO (multiple input, multiple output) antennas. While 4G uses 2x2 MIMO and 4x4 MIMO, and 5G uses around 200 antenna elements, 6G may support upto 1024 antenna elements.

	2G	3G	4G	5G	5G Advanced	6G
Introduction Year	1992	2000	2010	2020	2025	2030
Key Features	Voice, SMS	Broadband Data	MTC, Video	Industrial IOT Interactive Video	mMTC+ URLLC+ eMBB+	Connecting Worlds Massive Scale AI & Sensing Holographic Video
Broadband Data Rate Device MIMO		1-10Mbps 1Tx/1Rx	10Mbps-1Gbps 1Tx/2+Rx	100Mbps-20Gbps 2Tx / 4+Rx		1GBps -1Tbps+ 4Tx/8+Rx
Spectrum		FDD+ 2.3Ghz TDD ~100MHz+	+2.5GHz TDD+ Unlicensed 5GHz ~600MHz+	+3.5 – 7 GHz +mmW ~3+GHz		+7 – 24GHz +Sub THz ~50 GHz+
Network Densification		Nominal	+	+device		++device
User Plane Latency			50ms	4 ms (eMBB) 1ms (uRLLC)		25 us – 1ms
Mobility			350 KMPH	500 KMPH		1000 KMPH (Multiple moving platforms)
Killer Use cases	Voice, SMS, VAS	Mobile Web	Mobile Video/TV Social Media Video Call	V2X Smart City/Factory/Home Cloud Gaming, XR UHD Video	Telemedicine Wearables	N-D Holographic Comm AI efficient System NTN Systems Tactile/Haptic/Digital Sensing Automated Driving Internet of bio-nano things

Image Source: DoT

Advantages of 6G:

- Hyperconnectivity and advanced user experience delivered by 6G will improve and enable access to required information, resources (both virtual and physical), and social services without constraints of time and physical location.
- 6G wireless communication network is also expected to integrate the terrestrial, aerial, and maritime communications into a robust network which would be more reliable, faster, and can support a massive number of devices with ultra-low latency requirements.
- The advent of 6G will significantly reduce differences in regional and social infrastructure and availability of economic opportunities and will thereby provide alternatives to rural exodus, mass urbanisation, and its related problems.
- 6G technology will have significant advancements in communication, sensing, imaging, presence technologies and location awareness.
- The computational infrastructure of 6G will automatically select the ideal place for computing, including artificial intelligence (AI) driven decisions regarding data storage, processing, and sharing.
- New industry verticals will emerge driven by 6G technologies, these may include Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) Communication across road transport, trains, airlines, in personal, community and public transport sectors, holographic communications, tactile and haptic internet applications, telehealth including diagnosis, surgery and rehabilitation activities.

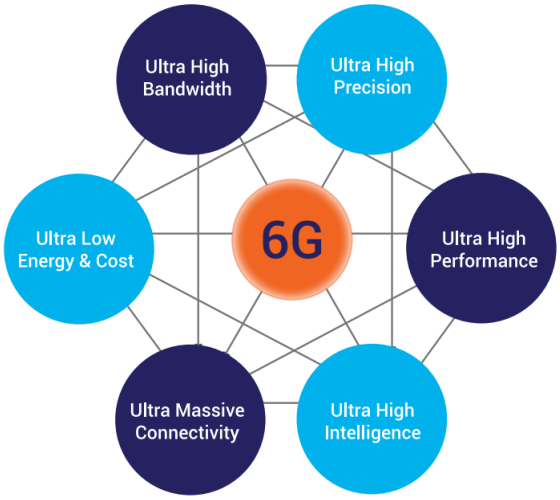

Image Source: DoT

India and 6G:

- India is expected to launch a 6G Mission to identify priority areas for research by involving all stakeholders including industry, academia, and service providers, spanning theoretical and simulation studies, proof-of-concept prototypes and demonstrations, and early market interventions through start-ups, to take the lead.
- 6G connectivity can help India to leapfrog to become a highly industrialised society. While technology adoption improves productivity, and quality of life for rural and urban citizens, achieving leadership in the development of technology will create immense job opportunities in the country.
- 6G connectivity can help India address many social issues like law and order, healthcare, knowledge-led job creation, improvements in government and citizen interaction through smart cities, the internet of things, digitalization and G2C services, cyber and physical integration among many others.
- These technologies will also provide immense opportunities for India's entrepreneurs to innovate and develop new products based on their Intellectual Property (IP) for the Indian and global market, transforming India into a global leader providing life and livelihood-transforming solutions.