Fifth Generation (5G) Cellular Technology

Why in News?

- **Worldwide, chipmakers and smartphone companies are conducting trials of 5G technology based services that are going to hit the globe in 2019.**
- India has also set up a high-level forum to develop a roadmap for adopting 5G in the country and the spectrum auction for 5G is expected during the latter half of 2019.

About

- 5G is the fifth generation cellular technology that apart from increasing the downloading and uploading speeds over the mobile network, also reduces the latency i.e. the time taken by a network to respond.
- 5G will provide download speed of 1 Gbps, which is at least 100 times the existing data speeds.
- It also increases energy efficiency and offers more stable network connections.
- 5G will have a wider area in the frequency spectrum (range of frequencies) that will ensure no network congestion.
- In addition, it will also ensure connectivity to a full circle i.e. everything is connected to every other thing.
- The standards for the usage of 5G are defined and driven by 3rd Generation Partnership Project.

Evolution from First Generation to Fifth Generation

- 1G was launched in the 1980s and worked on analog radio signals and supported only voice calls.
- 2G was Launched in the 1990s which uses digital radio signals and supported both voice and data transmission with a Bandwidth of 64 Kbps.
- 3G was launched in the 2000s with a speed of 1 Mbps to 2 Mbps and it has the ability to transmit telephone signal including digitised voice, video calls and conferencing.

- 4G was launched in 2009 with a peak speed of 100 Mbps to 1 Gbps and it also enables 3D virtual reality.

Deployment of 5G

- Its deployment will happen with the auction of the millimetre-wave spectrum i.e. the frequency range of 28 - 100 GHz. In this area India is not fully prepared and that's why 5G implementation will take more time.
- Three mobile carriers of U.S. - Sprint, T-Mobile and Verizon have taken the task to upgrade the existing 4G infrastructure to 5G. Verizon has already launched its 5G home service in Houston, Indianapolis, Los Angeles and Sacramento.
- The switch from 4G to 5G will be infrastructure intensive i.e. mobile service providers will have to upgrade their underlying hardware countrywide in order to provide 5G speeds.
- Overnight upgradation of hardware is not possible so telecom companies would use the 4G LTE infrastructure to eventually migrate to 5G.
- It means that even when 5G is deployed, it will take the telecom giants, a couple of years to achieve the speed of 5G.
- The customers will have to upgrade their SIM cards and buy new 5G enabled phones to access better speeds.
- India being a traditional late adopter of advanced technologies, still struggling to achieve the speed which 4G network offers.
- In that scenario any major developments in coming year is doubtful. Though the Telecom Regulatory Authority of India (TRAI) has started the process of auctioning the 5G spectrum, analysts have predicted that India will only fully adopt 5G by 2022.

Steering Committee on 5G

- The committee was set up in September 2017 and submitted its report on August 24, 2018, under the chairmanship of **AJ Paulraj** to suggest road map for 5G adoption.
- It gave wide-ranging recommendations to Department of Telecommunication for areas like spectrum policy, regulatory policy, standards and education.
- It has asked for setting up a Standing Committee with five-year term to advice on building Spectrum Technology Infrastructure.
- It has proposed promulgation of key norms on regulatory matters by March 2019 in order to facilitate early deployment of 5G technology and noted that 5G technologies will start entering service globally beginning 2019 and advance to full range of services by 2024.
- It recommended deployment classification of 5G into three phases based on technologies and expects that economic impact of 5G to be over $1 trillion by 2035.
- It said that the early adoption of 5G will make equipments needed for 5G roll out more expensive but early adoption will fast track India's embrace of 5G's benefits.

- The committee pointed out that even after entry of 5G, the earlier generation mobile technologies will continue to remain in use for almost 10 more years.

Applications

- High-Speed mobile network
- Entertainment and multimedia
- Internet of Things
- Smart cities
- Smart farming
- Telemedicine services
- Controlling of critical infrastructure and vehicles.
- Industrial applications

Advantages

- 5G is expected to offer enhanced mobile broadband that can meet high coverage requirements.
- It will offer very high upload and download speed.
- 5G can diversify services and has potential to demonstrate spectral efficiency.
- High data speed of 5G Network might help cloud systems to stream software updates, music, and navigation data.
- 5G will help to incorporate Artificial Intelligence (AI) in our daily lives.
- It will also facilitate the ecosystem for the Internet of Things (IoT).
- It will help in digital growth of country that will result in rise of GDP and employment generation in the country.

Government Steps in this Direction

- Recently approved, **National Electronics Policy 2019** aims to position India as a global hub for **Electronics System Design and Manufacturing** and promotes early stage Start-ups in emerging technology areas such as 5G, loT, Artificial Intelligence etc.
- **Bharat Net** project aims to provide digital infrastructure on a non-discriminatory basis by an affordable broadband connectivity of 2 Mbps to 20 Mbps for all households.
- Indian government also initiated measures to introduce 5G technology via the **National Telecom Policy (NTP)**, which aims to reach 100% teledensity, high-speed internet highways and delivery of citizen-centric services electronically.
- The Department of Telecommunications set up a high-level forum to develop the roadmap for 5G services in India by 2020.
- The government is also working on creating a corpus of Rs 500 crore for research and development for 5G technology in India.

- The government has invited leading telecom companies to undertake pilot projects on spectrum allocated free of charge for a year.
- India is making efforts to have its own Intellectual Property Rights (IPR) as a part of 5G global standards.
- The auction for a broad range of spectrum bands for 5G, later this year, will set the stage for India to power the next generation mobile networks.

Challenges

- The promised speed of 5G is difficult to achieve considering the incompetent technological support in most parts of the world.
- Many of the old devices will need to be replaced as they are not supporting 5G.
- In India average download speed is 9.12 Mbps which is very less in comparison to the global average speed of 23.54 Mbps.
- Number of users in India also poses huge challenge in terms of swift upsurge in mobile broadband consumption and the subsequent network congestion.
- The switch from 4G to 5G will be infrastructure intensive and development of infrastructure for 5G is very expensive.
- 5G cannot take off without basic infrastructure foundation, such as standard servers, open application programming interface (APIs) etc.
- The transition experience from one technology generation to another is not very good as one has to buy a whole another phone to start using latest cellular technology, thereby creating financial liability.
- There are expected to be 20 billion connected devices in the world by 2020 and as a result data will become highly distributed. It will be a new challenge to manage, analyze, store and protect data, irrespective of where it exists**.**

Way Ahead

- The arrival of 5G-enabling smart devices will change the way we live & think and can be a game changer for better service delivery, faster access to services and deeper penetration of digital services.
- It is high time that India should strengthen the domestic telecommunication manufacturing market to enable local industries to capture both domestic as well as global market.
- An "intelligence-first" approach will need to be adopted by Telecom providers for managing core networks as an important business investment.
- For widespread 5G deployment, it needs to become financially viable otherwise rural integration will remain a pipe dream.
- The roadmap for digital futures of masses is being chalked out this year so 2019 will be the defining year.

- Given that 4G networks are still nascent in India, for developing a robust telecom infrastructure and backhaul spectrum to associated bandwidth and a well-defined data protection law, we have a long way to go.