# 5G and Optical Fibre

This editorial is based on **"Preparing for 5G"** which was published in The Indian Express on 29/06/2022. It talks about the significance of 5G Technology and how optimum use of optical fibre can help in achieving digital inclusiveness.

**For Prelims:** Spectrum, Bandwidth, Internet of Things, Regulatory Bodies, TRAI

**For Mains**: Evolution of Internet, Science of 5G, Challenges, Impacts, Related Government Initiatives

**5G technology** is going to make inroads into the country very soon. Top smartphone manufacturers in India have already released phones with 5G capability. With over 117 crore telecom users and more than 82 crore internet subscribers, India is one of the fastest-growing markets for digital consumers.

**Digital infrastructure,** which seamlessly integrates with physical and traditional infrastructure, is critical to India's growth story and the country's thrust towards self-reliance.

**Internet connectivity** is critical for making the **Digital India project** inclusive, and widespread use of optical fibre in the remotest corners of the country is vital to ensure that no one is left behind in this endeavour.

In this context, let's understand the fundamentals of 5G and Optical Fibre.

## What do we mean by 5G Technology?

- **Basics:**
  - 5G is the 5th generation mobile network. It is a new global wireless standard after 1G, 2G, 3G, and 4G networks.
  - 5G works in **3 bands (Low, Mid and High frequency spectrum)** - all of which have their own uses as well as limitations.
  - It enables a new kind of network that is designed to connect virtually everyone and everything together including machines, objects, and devices.
  - In India, Satcom Industry Association-India (SIA) has voiced concerns over the Government's plan to include the **Millimetre Wave (mm Wave) bands** in the 5G **spectrum auction.**

## What Benefits Does 5G Provide?

- **Enhanced Mobile Broadband:**
  - In addition to making our smartphones better, 5G mobile technology can usher in new immersive experiences such as **Virtual reality (VR)** and **Augmented Reality (AR)** with

faster, more uniform data rates, lower latency, and lower cost-per-bit.

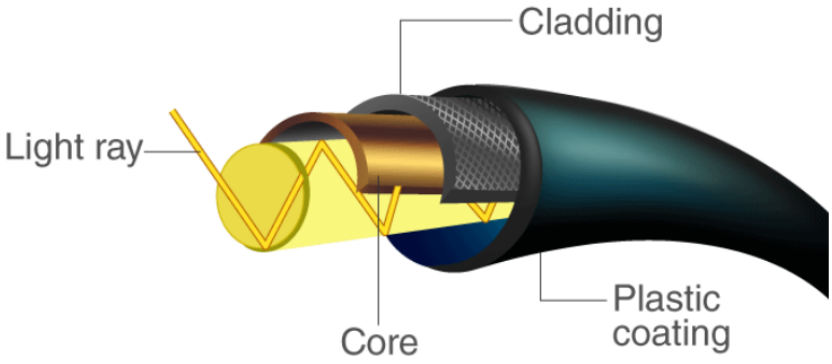
- **High Speed Technology:**
  - 5G will increase the downloading and uploading speeds over the mobile network.
  - Internet speeds in the high-band spectrum of 5G have been tested to be as high as 20 Gbps (gigabits per second).
    - The maximum internet data speed in 4G has been recorded at 1 Gbps.
  - 5G will also reduce the latency i.e. the time taken by a network to respond.
- **Machine-to-Machine Interaction:**
  - 5G will be the first technology to facilitate machine-to-machine communication, the foundation of **Internet of Things (IoT).**
    - Combined with IoT, **cloud**, **big data**, AI, and **edge computing**, 5G could be a critical enabler of the **fourth industrial revolution.**
- **Boost to the Economy:**
  - 5G is expected to create a cumulative economic impact of USD1 trillion in India by 2035, according to a report by a government-appointed panel (2018).
    - It will give a huge amount of economic boost to India by increased connectivity between machines and various sectors which will in turn increase efficiency.
    - Production will also increase which would lead to huge revenue collections.
- **Collaborative Network Deployment:**
  - 5G will lead to, for the first time, the business verticals and technical verticals come together for network deployment.
    - Earlier, the **telecommunications** used to discuss internally and deploy networks but now, the businesses, technology companies and cyber experts will be coming together for deploying networks.

## How Optical Fibre Can Quantify Benefits?

- **High Speed:**
  - Fiber provides more bandwidth and has standardized performance up to 10 Gbps and beyond, something that it is impossible to achieve when using copper.
    - More bandwidth means that fiber can carry more information with far greater efficiency than copper wire.
- **Range of Transmission:**
  - Since data travels in the form of light in fiber-optic cables, very little signal loss occurs during transmission and data can move at higher speeds and greater distances.
- **Not susceptible to interference:**
  - Fiber-optic cable is also much less susceptible to noise and electromagnetic interference than copper wire.
    - It is so efficient, in fact, that roughly 99.7% of the signal reaches the router in most cases.
- **Durability:**
  - Fiber-optic cable is completely immune to many environmental factors that affect copper cable.
  - The core is made of glass, which is an insulator, so no electric current can flow through.

## What Do We Mean by Optical Fibre?

- Optical fibre is the backbone of the digital infrastructure — the data is transmitted by light pulses travelling through long strands of thin fibre.
- Metal wires are preferred for transmission in optical fibre communication as signals travel with fewer damages.
  - The optical fibre works on the principle of **total internal reflection (TIR).**
- Light rays can be used to transmit a huge amount of data (In case of long straight wire without any bend).
  - In case of a bend, the optical cables are designed such that they bend all the light rays inwards (using TIR). //




## What are the Challenges for 5G Rollout in India?

- **Low Fiberization Footprint:**
  - There is a need to upgrade fibre connectivity across India, which at present connects only 30% of India's telecom towers.
    - India exported optical fibre worth $138 million to over 132 countries between April 2020 and November 2021.
    - Indian optical fibre cable consumption is predicted to increase to 33 million fibre km by 2026 from 17 million fibre km in 2021.
      - A little more than 30% of mobile towers have fibre connectivity; this needs to be scaled up to at least 80%.
- **Dumping by other countries:**
  - Countries like China, Indonesia and South Korea have been **dumping** their fibre products in India at rates lower than the market price.
    - **The World Trade Organisation** defines dumping as "an international price discrimination situation in which the price of a product offered in the importing country is less than the price of that product in the exporting country's market".
- **Choosing the Optimal 5G Technology Standard:**
  - The tussle between the homegrown 5Gi standard and the global 3GPP standard needs to be concluded in order to hasten 5G technology implementation.
    - While 5Gi brings obvious benefits, it also increases 5G India launch costs and interoperability issues for telcos.
    - 3GPP is a collaborative Project Agreement between telecommunications industry partners (Organizational Partners) for formalizing global mobile 3G wireless systems based on radio access technologies and Global System for Mobile Communications (GSM) specifications.
- **'Make in India' Hardware Challenge:**
  - The ban on certain foreign telecom OEMs (original equipment manufacturer) upon which most of the 5G technology development depends, presents a hurdle in itself.
- **Lesser Government Subsidies:**
  - A low likelihood of government subsidies is expected, given the history of high reserve prices set by the governments for spectrum auctions amid ongoing fiscal deficits.
- **Health and Environmental Setbacks:**
  - Concerns regarding impact of 5G and low intensity radiofrequency (RF) electronic magnetic field (EMF) radiation on human health, and its environmental impact have been raised by various scientists.
  - 5G technology and associated RF radiation from wirefree gadgets and network cell towers will be "extremely harmful and injurious to the health and safety of the people and also of animals and birds.
  - Radiation at very high levels, also referred to as ionizing radiation, heats up our tissue and can eventually lead to cancer.

## What Initiatives have India Regarding Digital Inclusiveness?

- **BharatNet:**
  - **BharatNet** is the world's largest rural broadband connectivity programme using Optical fibre. And also a flagship mission implemented by **Bharat Broadband Network Ltd. (BBNL).**
  - It is a highly scalable network infrastructure to provide on demand, affordable broadband connectivity of 2 Mbps to 20 Mbps for all households and on demand capacity to all institutions, to realize the vision of Digital India, in partnership with States and the private sector.
  - It is being implemented by the Department of Telecommunication under the Ministry of Communications.
- **National Broadband Mission:**
  - **NMB** will facilitate universal and equitable access to broadband services across the country, especially in rural and remote areas.
  - The vision of the Mission is to fast-track growth of digital communications infrastructure, bridge the **digital divide**, facilitate digital empowerment and inclusion, and provide affordable and universal access to broadband for all.
- **Ghar Tak Fibre Scheme:**
  - **GTFS** aims to connect all 45,945 villages of Bihar with high-speed optical fibre.
  - Under the scheme, Bihar has to provide at least five fibre-to-the-home (FTTH) connections per village and at least one WiFi hotspot per village.
  - The Scheme will lead digital services including **e-Education**, **e-Agriculture**, **Tele-Medicine**, **Tele-law** and other social security schemes in Bihar ensuring easy access to all state natives.
  - It is also likely to boost the local employment generation with the implementation of Bharat Net initiative which will be done by recruiting local workers.
- **Other Initiatives:**
  - **GramNet**
  - **JanWiFi**
  - **Fibre First Initiative**

## What Should Be Our Approach Going Forward?

- **Anti-Dumping Duties:**
  - India should impose **anti-dumping duties** on the imports of cheap fibre products from countries like China, Indonesia etc.
- **Production-Linked Incentive:**
  - In order to boost domestic manufacturing of optical fibre, the government should consider introducing a **PLI** scheme that aims to give companies incentives on incremental sales from optical fibre manufactured in domestic units.
- **Bridging the Rural-Urban Gap:**
  - 5G can be deployed at different band spectrums and at the low band spectrum, the range is much longer which is helpful for the rural areas.
- **Government's Assistance:**
  - The government has complete control over the inputs. One of the key inputs of 5G is the band spectrum.
    - By managing the design of the spectrums, the government can control the price to be paid by the people.
    - The government shall support the telecom companies to roll out networks which are sustainable and affordable for the public.
- **Viable Technology from Consumers' Perspective:**
  - For widespread 5G deployment, it needs to become financially viable otherwise rural integration will remain a pipe dream.
  - Also, the 5G technology has to be viable to the telecom operators too.

***Drishti Mains Question***

Internet Connectivity in the remotest corner of the country is critical for making the Digital India Project

inclusive. Discuss the utility of Optical fibres in the light of the present statement.