



## Telecom Sector: Inclusion, Innovation, Regulation

*This editorial is based on "[Indian telecom: A global leader in the making](#)" which was published in The Financial Express on 03/03/2025. The article brings into picture the rapid growth of India's telecom sector with 1.18 billion subscribers, highlighting the urban-rural teledensity gap.*

**For Prelims:** [India's telecom industry](#), [OTT services](#), [Right of Way \(RoW\) policy](#), [6G](#), [FDI liberalization](#), [Ayushman Bharat Digital Mission](#), [Teledensity](#), [Digital Personal Data Protection Act \(DPDPA\) 2023](#), [Production Linked Incentive \(PLI\) schemes](#), [BharatNet](#).

**For Mains:** Key Factors Driving the Development of the Telecom Sector in India, Key Issues Related to the Telecom Sector in India.

[India's telecom industry](#) is experiencing remarkable growth with **1.18 billion subscribers**, though a significant **urban-rural divide persists in teledensity**. The rapid **5G rollout**, supported by AI and localized data centers, promises further expansion. With leading global data consumption rates despite competitive pricing, the sector faces important challenges in **balancing OTT services, data security, and infrastructure costs**. Beyond technology, the industry's success depends on **skilled manpower development and strategic global partnerships** to sustain its growth trajectory.

### What Key Factors Driving the Development of the Telecom Sector in India?

- **Rapid 5G Rollout and Infrastructure Expansion:** India is witnessing one of the fastest **5G deployments globally**, enhancing connectivity and enabling new-age applications like AI-driven automation and IoT.
  - As of June, 2024, out of the **4.48 lakh 5G base stations** deployed in India, approximately **3.03 lakh have been fiberized**.
    - Telecom companies are **aggressively expanding fiber networks** and base stations to ensure seamless high-speed internet.
  - The government's [Right of Way \(RoW\) policy reforms](#) have streamlined network expansion, reducing bureaucratic delays.
- **Increasing Smartphone and Internet Penetration:** Rising **affordability of smartphones and data plans** has led to a surge in internet adoption, even in rural areas.
  - The increasing **digital literacy and government-backed initiatives** are promoting deeper smartphone usage across sectors like **e-commerce, fintech, and education**.
  - India will have **1 billion smartphone users by 2026** with rural areas driving the sale of internet-enabled phones
- **Government Policy Support and Telecom Reforms:** The Indian government has

implemented **progressive telecom policies**, including **spectrum pricing rationalization**, **FDI liberalization**, and **financial relief packages**.

- The government's decision to **waive bank guarantees needed for past spectrum auctions** supports the telecom industry, enabling better utilization of banking resources for expanding **4G and 5G networks**.
- Within **3 years of the Telecom PLI scheme**, the scheme has attracted an investment of **Rs 3,400 crore**, the telecom equipment production has exceeded the milestone of Rs 50,000 crore.
- **Surge in Data Consumption and Digital Services:** India has emerged as the **world's largest consumer of mobile data**, driven by **video streaming, gaming, and social media**.
  - The rise of **Over-the-Top (OTT) platforms** and e-commerce has significantly increased internet demand.
    - The **work-from-home (WFH) and hybrid work models** post-pandemic have further fueled data consumption.
  - The **OTT video users** in India is expected to increase by 28.89% between 2024 and 2029, reaching **634.31 million users**.
- **Growth of Indigenous Telecom Manufacturing and R&D:** The push for **Atmanirbhar Bharat (Self-Reliant India)** has strengthened domestic telecom equipment manufacturing, reducing import dependency.
  - The government is encouraging **local production of semiconductors, 5G infrastructure, and network gear**.
  - India is also investing in **research and development (R&D)** for future telecom technologies, including **6G and AI-driven networks**.
  - In **FY 2023-24**, exports of telecom equipment and mobiles combined totaled over **Rs 1.49 lakh crore**, marking a significant growth.
- **Expansion of Satellite-Based Internet Services:** Satellite communication is revolutionizing rural and remote area connectivity, where terrestrial networks are impractical.
  - Companies like **OneWeb, Starlink, and JioSpaceFiber** are working on providing high-speed internet via **Low Earth Orbit (LEO) satellites**.
  - The government is supporting satellite-based internet to bridge the **digital divide** and improve broadband access in difficult terrains. This will play a crucial role in **last-mile connectivity**.
- **Increasing Role of Telecom in Governance and Public Services:** The government is leveraging telecom infrastructure for **e-governance, telemedicine, digital banking, and smart cities**.
  - Initiatives like **Aadhaar-based mobile authentication** and **UPI transactions** rely heavily on strong telecom networks.
  - The success of such programs demonstrates how telecom is now a **critical enabler of public service delivery**.
  - UPI transactions hit record high in January 2025, with over 16.99 billion transactions and ₹23.48 lakh crore value.
    - The **Ayushman Bharat Digital Mission** expanded **telemedicine services** using mobile-based platforms.

## What are the Key Issues Related to the Telecom Sector in India?

- **Rural-Urban Digital Divide:** India's urban **teledensity** stands at **131.01%**, whereas rural teledensity lags at **58.31%**, highlighting severe disparity.
  - Poor infrastructure, low digital literacy, and affordability constraints hinder telecom penetration in rural areas.
    - The slow rollout of fiber networks and limited adoption of **5G-enabled handsets** exacerbate the issue.
  - As of January 2025, through the government's BharatNet programme, **only 1.99 lakh villages out of 6.5 lakh villages**, or 30.4%, had broadband.
- **High Spectrum Costs and Debt Burden:** Indian telecom operators face **one of the highest spectrum costs globally**, leading to massive debt accumulation.

- The **Adjusted Gross Revenue (AGR)** dues imposed by the government have further strained telecom finances, with companies struggling to stay competitive.
  - The need for **continuous infrastructure upgrades** for **5G and AI-driven networks** adds to the financial stress.
  - India's major telecom operators held a **combined debt of Rs 4.09 lakh crore in FY24**.
- Price wars between telecom players have reduced tariffs, lowering **Average Revenue Per User (ARPU)**.
- **Affordability and 5G Accessibility:** While 5G roll-out is progressing, affordability remains a barrier, particularly in rural areas.
  - **5G-enabled smartphones are still expensive**, limiting adoption among lower-income users.
    - Telecom operators have not significantly reduced **5G data prices**, further discouraging mass adoption.
  - **Network congestion and lack of indigenous 5G infrastructure** add to cost inefficiencies.
  - GSMA Intelligence reports over 40% 5G penetration in China, the US, Japan, and parts of Europe, **while India remains below 20%**.
    - Despite affordable data, limited sub-Rs 10,000 devices hinder 2G and 4G users from **upgrading to 5G**.
- **Cybersecurity and Data Privacy Risks:** With growing telecom penetration, **cyber threats, hacking, and data breaches** are rising, posing risks to national security.
  - The presence of **untrusted foreign telecom equipment**, especially from China, increases vulnerabilities.
    - **OTT services remain largely unregulated**, raising concerns about data misuse.
  - The **Digital Personal Data Protection Act (DPDPA) 2023** was introduced to address privacy concerns but lacks strict enforcement.
  - The **Telecom Regulatory Authority of India (TRAI)** has been alerted to fraudulent WhatsApp messages, SMS, and calls impersonating TRAI officials, with perpetrators using forged notices resembling official communications.
    - In 2024, the Telecom Ministry plans to disconnect **21.7 million fraudulently obtained mobile connections** and block 2.26 lakh handsets linked to cybercrime.
- **Regulatory Uncertainty and OTT-ISP Conflict: OTT platforms (like WhatsApp, Zoom, and Netflix)** use telecom networks but do not contribute to network infrastructure costs.
  - Telecom companies argue this creates an **unfair playing field**, affecting revenue models.
  - The government is considering **OTT regulation**, but balancing industry interests remains a challenge.
  - Global comparisons suggest that unregulated OTT services impact telecom sustainability.
  - Telecom operators demand a **"fair share" mechanism**, similar to **EU's digital tax proposals** on OTTs.
- **Import Dependence and Lack of Indigenous Manufacturing:** Despite **Make in India** efforts, India remains **heavily reliant on telecom equipment imports**, mainly from China.
  - Lack of **domestic semiconductor manufacturing** and reliance on **foreign telecom software** limit self-reliance.
  - **Production Linked Incentive (PLI) schemes** have attracted investment, but challenges remain in building a robust supply chain.
  - India's telecom equipment imports stood at **₹1.53 lakh crore in FY 2023-24**, with a significant share from China.
- **Foreign Investment Challenges and Geopolitical Risks:** The Indian telecom sector requires **large-scale foreign investments** for 5G, AI, and satellite connectivity.
  - However, **policy unpredictability, bureaucratic delays, and geopolitical concerns** discourage potential investors.
  - The government's **security concerns regarding Chinese telecom firms (Huawei, ZTE)** have also led to restrictions, impacting supply chains.
    - Indian telecom companies depend on foreign satellites, which could become a point of contention, as seen recently when **Starlink blocked Russia's use of Starlink**.

## satellites in the Ukrainian War.

- **Sustainability and E-Waste Management Issues:** The rapid expansion of telecom infrastructure has **increased energy consumption and e-waste generation**.
  - **5G networks consume 2-3 times more energy** than 4G, raising sustainability concerns.
  - Lack of robust **e-waste recycling mechanisms** exacerbates environmental degradation.
  - India's e-waste generation surged by **73% in 5 years**, reaching 1.751 million MT in 2023-24, with telecom equipment being a major contributor.

## What Measures can India Adopt to Reform and Revamp India's Telecom Sector?

- **Enhancing Rural Connectivity and Digital Inclusion:** Expanding **fiber-optic networks, satellite-based internet, and mobile tower infrastructure** in underserved areas is crucial to bridge the rural-urban digital divide.
  - The government should incentivize **private telecom players** to invest in remote regions through **subsidies and viability gap funding**.
  - Strengthening **public-private partnerships (PPPs)** can accelerate last-mile connectivity.
  - Initiatives like **BharatNet and universal service obligations (Digital Bharat Nidhi)** must be fast-tracked with a clear implementation roadmap.
  - Ensuring **affordable 5G smartphones and low-cost data plans** will further drive digital inclusion.
- **Rationalizing Spectrum Pricing and Licensing Norms:** India's **high spectrum costs and complex licensing framework** burden telecom operators, affecting financial sustainability.
  - The government should adopt a **graded pricing mechanism** and introduce **long-term payment flexibility** to ease financial pressure.
  - Spectrum allocation should prioritize **usage efficiency** over revenue maximization.
  - Simplifying regulatory approvals and ensuring **uniform right-of-way (RoW) policies** across states can accelerate infrastructure rollout.
    - Moving towards a **light-touch regulatory framework** will encourage investments and innovation.
- **Strengthening Cybersecurity and Data Protection:** As telecom networks handle sensitive personal and national security data, a **robust cybersecurity framework** is essential.
  - The government should mandate **end-to-end encryption, AI-driven fraud detection, and regular cybersecurity audits** for telecom operators.
  - Implementing a **zero-trust security model** will mitigate risks from foreign telecom vendors and cyber threats.
  - The **Digital Personal Data Protection Act (DPDPA)** must be effectively enforced with clear **data localization and privacy safeguards**.
    - Collaboration between **government, telecom firms, and cybersecurity experts** is necessary to build resilient telecom networks.
- **Regulating OTT Services and Ensuring Fair Revenue Sharing:** OTT platforms like **WhatsApp, Zoom, and Netflix** use telecom networks but do not contribute to infrastructure costs, creating an **imbalance in the digital ecosystem**.
  - India should introduce a **fair revenue-sharing mechanism** where OTTs contribute to telecom infrastructure development.
  - Ensuring **regulatory parity between OTTs and telecom service providers** can create a level playing field.
  - A **transparent policy framework** should govern net neutrality while allowing reasonable network usage fees.
    - Encouraging **telecom-OTT collaborations** can drive innovation while ensuring sustainable revenues for both sectors.
- **Boosting Indigenous Telecom Manufacturing and R&D:** Reducing dependence on foreign telecom equipment requires a strong **domestic manufacturing ecosystem** for **5G gear**,

## semiconductors, and network infrastructure.

- The government should **expand Production-Linked Incentive (PLI) schemes**, offer tax benefits, and provide **low-interest credit for telecom startups**.
- Strengthening **indigenous 5G and 6G research** through collaborations with **IITs, NITs, and private research labs** can drive innovation.
  - Encouraging **Open RAN (O-RAN) deployment** will foster a **self-reliant telecom ecosystem** and enhance global competitiveness.
- **Addressing Financial Distress and Telecom Sector Viability:** The government should create a **long-term financial restructuring plan**, including relief on **adjusted gross revenue (AGR) dues**.
  - Encouraging **consolidation and strategic mergers** can improve financial stability while ensuring competition.
  - Introducing **floor pricing for telecom tariffs** will help sustain revenues without hurting consumers.
    - Facilitating **long-term foreign direct investment (FDI) inflows** through transparent policies will strengthen capital infusion.
- **Accelerating Fiberization and 5G Infrastructure Expansion:** The government must incentivize **fiber deployment across rural and urban areas** by reducing **RoW charges and bureaucratic hurdles**.
  - Encouraging **municipal-level infrastructure sharing** can optimize resources and reduce costs.
  - Telecom operators should integrate **energy-efficient and AI-driven network management systems** for smart infrastructure growth.
    - Strengthening **public-sector and private-sector collaboration** can fast-track India's digital transformation.
- **Promoting Satellite-Based Internet and Last-Mile Connectivity:** Satellite broadband can revolutionize **telecom access in remote areas, disaster-prone regions, and high-altitude terrains**.
  - The government should create a **dedicated policy framework for satellite-based communication**, ensuring smooth spectrum allocation and regulatory approvals.
  - Integrating **satellite and fiber-optic networks** can create a **hybrid telecom model for nationwide digital inclusion**.
    - Partnerships between **ISRO, private firms, and global satellite operators** will ensure seamless deployment.
- **Leveraging AI, Blockchain, and Emerging Technologies:** AI-driven solutions can enhance **network efficiency, predictive maintenance, and fraud detection** in telecom.
  - Implementing **blockchain-based subscriber verification systems** can curb SIM-related fraud and identity theft.
  - Encouraging telecom firms to deploy **AI-powered chatbots and automated customer service** will improve user experience.
  - AI-enabled network optimization can **reduce downtime and enhance bandwidth allocation**.
    - Creating a **regulatory sandbox** for testing new telecom innovations can accelerate **5G and 6G deployment**.

## Conclusion:

India's telecom sector stands at a critical juncture, balancing **rapid expansion with regulatory, financial, and technological challenges**. Strengthening **indigenous telecom manufacturing and ensuring fair revenue sharing between OTT platforms** and telecom operators will be key. With strategic reforms and investments, India can solidify its position as a **global telecom powerhouse** while ensuring **digital inclusion for all**.

**Drishti Mains Question:**

The rise of OTT platforms has sparked debates over fair revenue-sharing with telecom service providers. Discuss the challenges and suggest a balanced regulatory framework.

### UPSC Civil Services Examination, Previous Year Question (PYQ)

**Q. Which of the following is/are the aims/aims of the “Digital India” Plan of the Government of India? (2018)**

1. Formation of India’s own Internet companies like China did.
2. Establish a policy framework to encourage overseas multinational corporations that collect Big Data to build their large data centers within our national geographical boundaries.
3. Connect many of our villages to the Internet and bring Wi-Fi to many of our schools, public places and major tourist centers.

**Select the correct answer using the code given below:**

- (a) 1 and 2 only
- (b) 3 only
- (c) 2 and 3 only
- (d) 1, 2 and 3

**Ans: (b)**

PDF Reference URL: <https://www.drishtiias.com/printpdf/telecom-sector-inclusion-innovation-regulation>