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## BACKGROUND

In the financial year 2023-24, the Indian telecommunications industry witnessed growth and development. This was attributed to strategic tariff changes, greater infrastructure spending, and consumption growth. The sector's expansion is also driven by the rapid adoption of budget smartphones and data packages, as well as ongoing infrastructure investment in 4G and 5G networks.

India's telecom industry underwent significant improvement in 2023-24, enhancing major areas. Teledensity rose, reflecting wider availability of phone services. Internet adoption picked up, with a significant rise in users throughout the nation, improving digital inclusion. The growth was succeeded by a robust increase in broadband subscriptions, with more Indians having access to high-speed internet. Wireless data usage trends showed two prominent trends: a steep rise in the number of users along with data usage. The increase indicates a shift in Indians' consumption of digital services, most likely due to higher consumption of video streaming, online education, work from home, and digital entertainment. These trends demonstrate the ongoing digitalization of India, with more people getting online and consuming digital services in ways greater than ever.

Market Leadership and Key Players:

**Reliance Jio** leads the market with over 450 million subscribers and around 40% market share. **Bharti Airtel** is the second-largest operator with around 380 million subscribers and around 32% of the market. **Vodafone Idea** (Vi) is the third-largest carrier with around 230 million subscribers and around 21% market share. The government-owned **BSNL** has around 90 million subscribers, which is around 7% of the market.

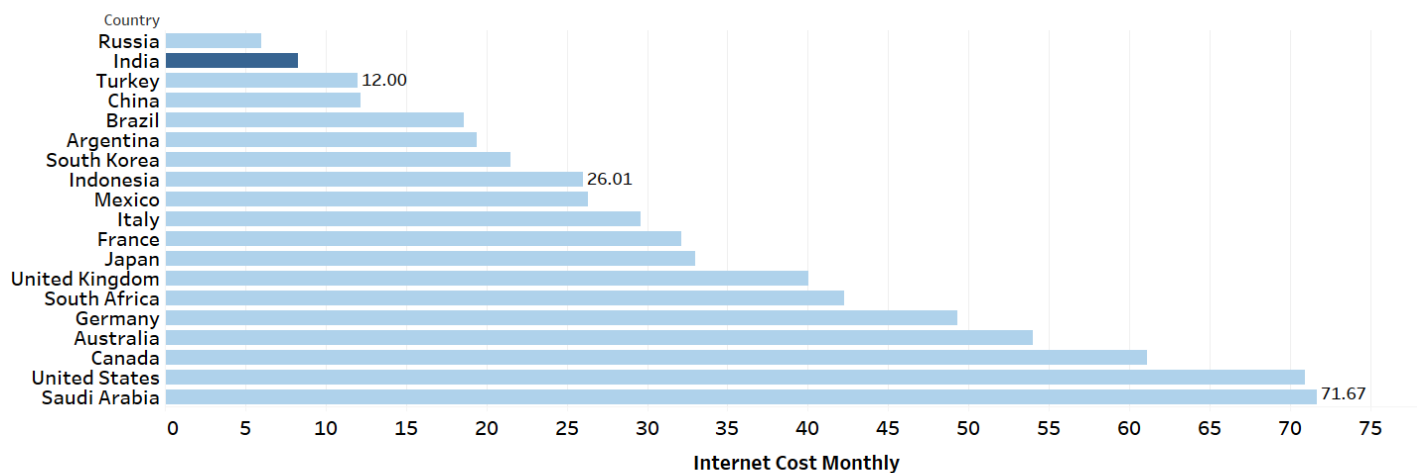
India's telecommunication industry is at a turning point, and there is a necessity for a holistic analysis across various parameters. India's digital ecosystem is examined here in this report through a number of important prisms: its place among the G20 nations in terms of digital connectivity, the intensity and extent of internet penetration in the country, and the differences in service quality being experienced by different user segments. The document mentions the lively competition among service providers driving the marketplace, along with geography differences from comparing states. Areas of focus also involve speed anomalies in data affecting the customer experience. These convergent themes collectively present an entire landscape of India's telecommunication world with areas of development and enhancement as the nation goes to become progressively more digitally enhanced.

## FOCUS 1 : INDIA v/s G20 NATIONS

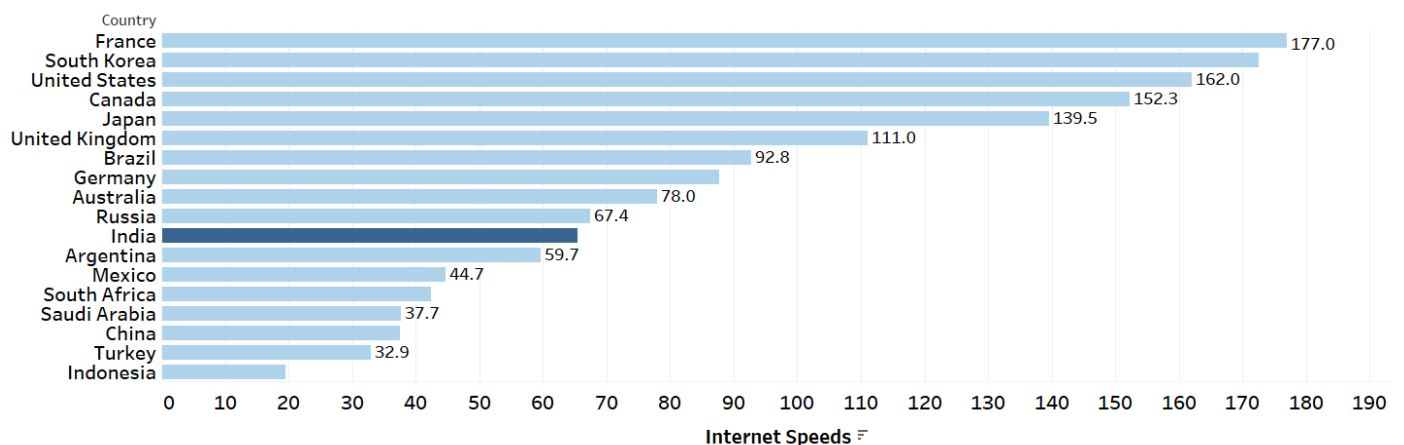
The **G20 (Group of Twenty)** is an intergovernmental forum comprising **19 countries and the European Union (EU)**, representing the world's largest economies which was established in **1999** to address global economic issues, financial stability, and sustainable development. They collectively account for **over 80% of global GDP, 75% of international trade, and two-thirds of the world's population**. India is a key member of the **G20** and has played an active role in shaping global economic and policy discussions, also holding the G20 Presidency in the year 2023.

With the Internet being the driver of the Digital Age and all the countries of the world striving to lead this digital revolution, we felt it was imperative for us to analyse where India stands in terms of Internet accessibility vis a vis G20 nations.

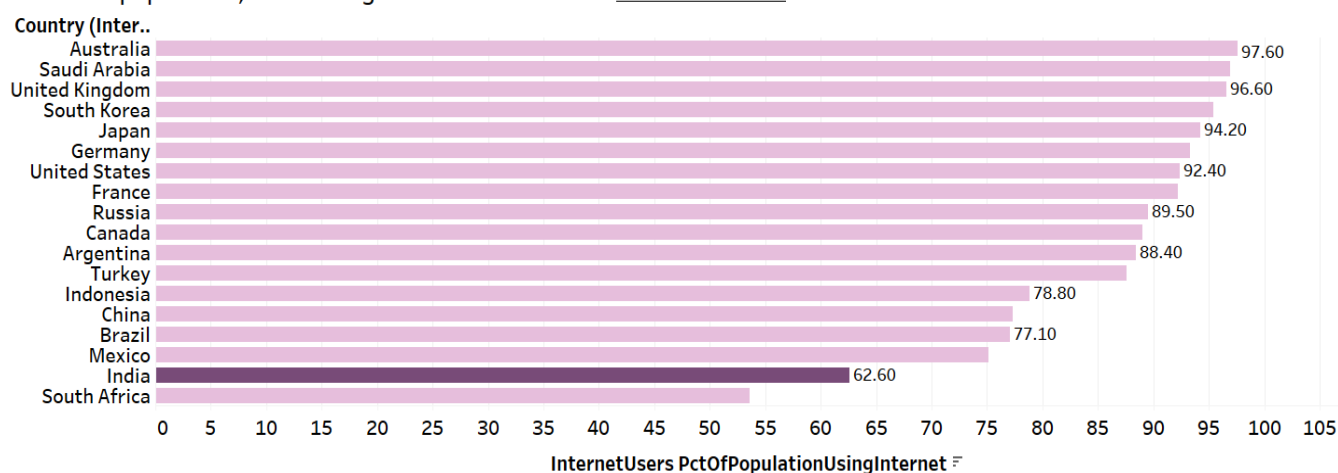
India has one of the lowest internet cost among the G20 countries



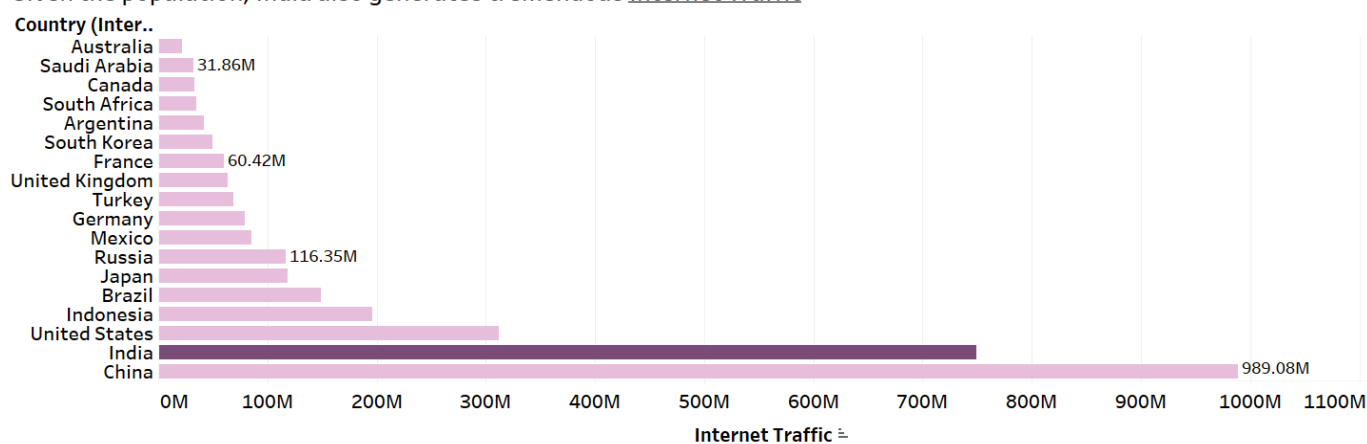
But India is also on the lower end of the spectrum in terms of internet speeds among the G20 countries



Given the population, India also generates tremendous [Internet Traffic](#)



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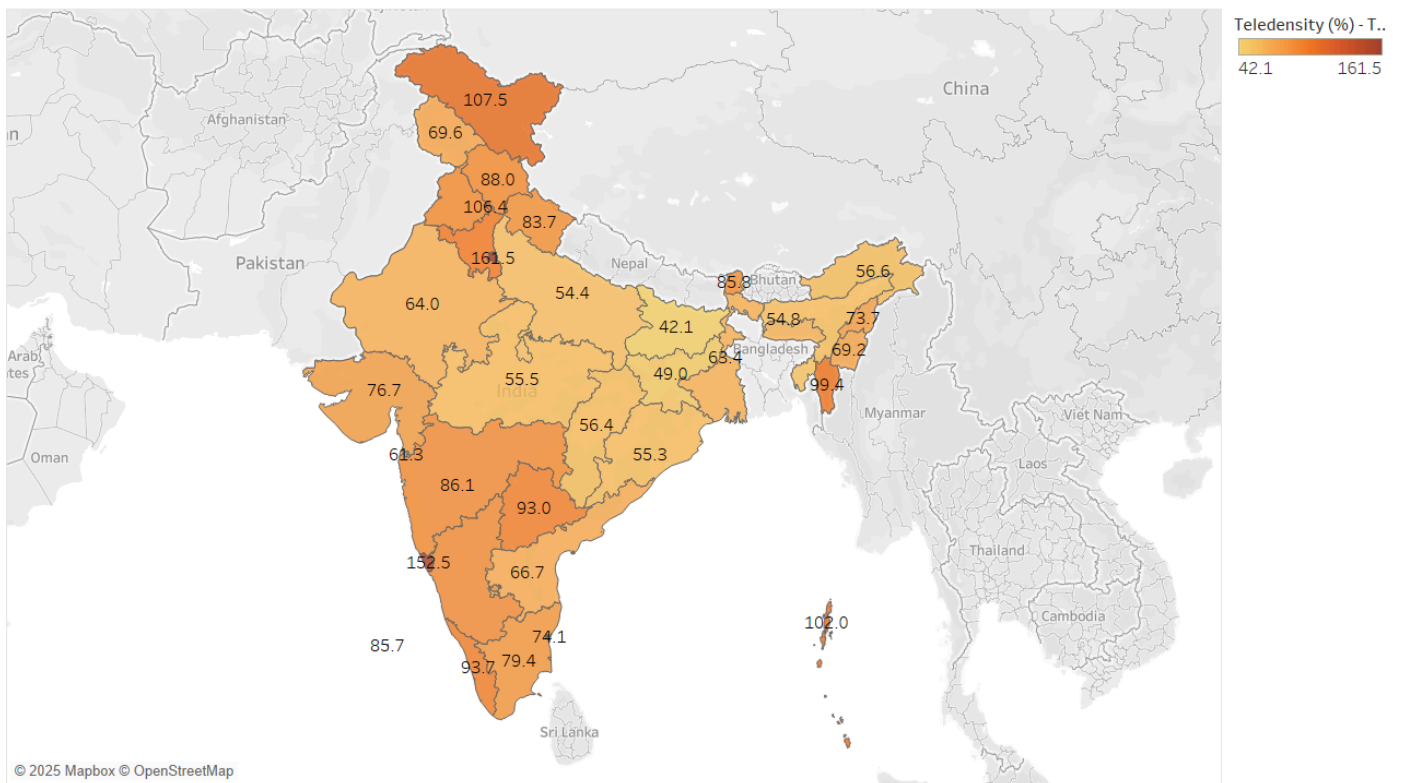


India has one of the lowest internet costs among G20 countries, making internet access more affordable and inclusive compared to developed nations like the U.S., Canada, and Germany. Despite this affordability, the percentage of the population using the internet in India remains lower than in many developed nations, where countries like the UK, South Korea, and Japan have over 90% internet penetration. This indicates significant potential for further digital expansion, especially with India's growing mobile and broadband infrastructure. However, one major challenge is India's relatively low internet speed, which lags behind other G20 nations such as the U.S., UK, and South Korea. Slower internet speeds could hinder productivity, digital innovation, and the efficiency of tech-driven businesses unless improvements are made. On the other hand, India generates massive internet traffic, second only to China, which aligns with its large population and affordable internet access. This high traffic presents a significant opportunity for digital businesses, content consumption, and the rapid growth of e-commerce. While India's digital landscape is expanding, enhancing internet speeds and further increasing penetration will be crucial for unlocking its full digital potential.

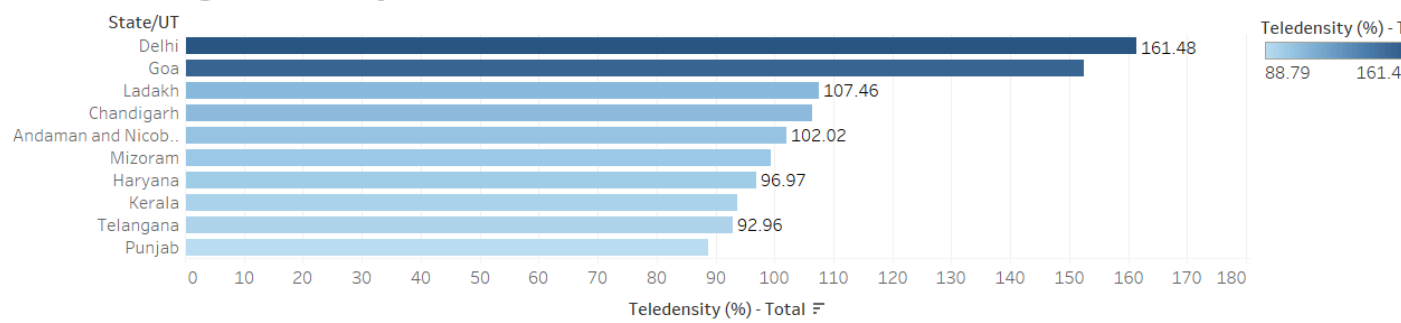
## FOCUS 2 : INDIA’S INTERNET PENETRATION STATS

Further on we analysed the teledensity data for India which involved studying the data of Internet penetration (internet users per 100 population) across the various states. This factor serves as a key indicator of internet accessibility. Our analysis revealed some significant disparities in teledensity across Indian states and union territories.

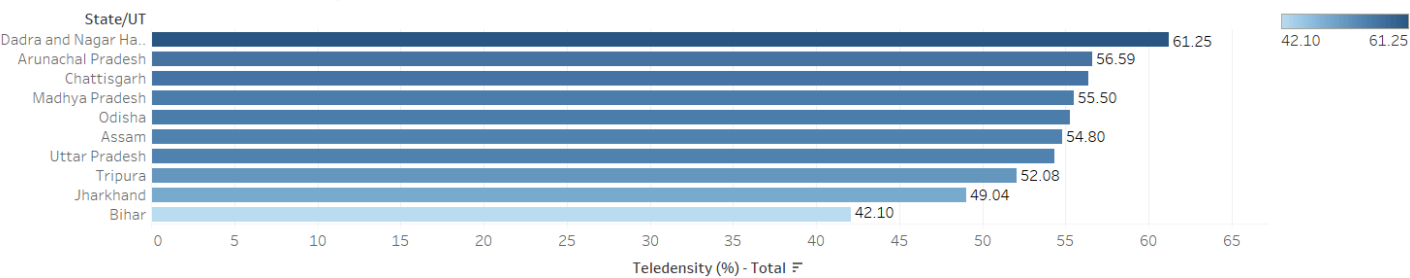
State Teledensity Variations across the Country



States with High Teledensity



States with Lower Teledensity



The data reveals significant disparities across regions, with states like Bihar, Jharkhand, and Uttar Pradesh showing teledensity below 55%, indicating limited telecommunication infrastructure and access, likely due to economic and developmental challenges. In contrast, regions such as Delhi, Goa, and Ladakh exhibit teledensity exceeding 100%, reflecting advanced telecommunication networks and higher digital adoption. Geographically, southern states generally demonstrate higher teledensity compared to northern regions, highlighting a clear divide in telecommunication development. These insights underscore the need for targeted investments in underperforming areas to bridge the digital divide and ensure equitable access to telecommunication services.

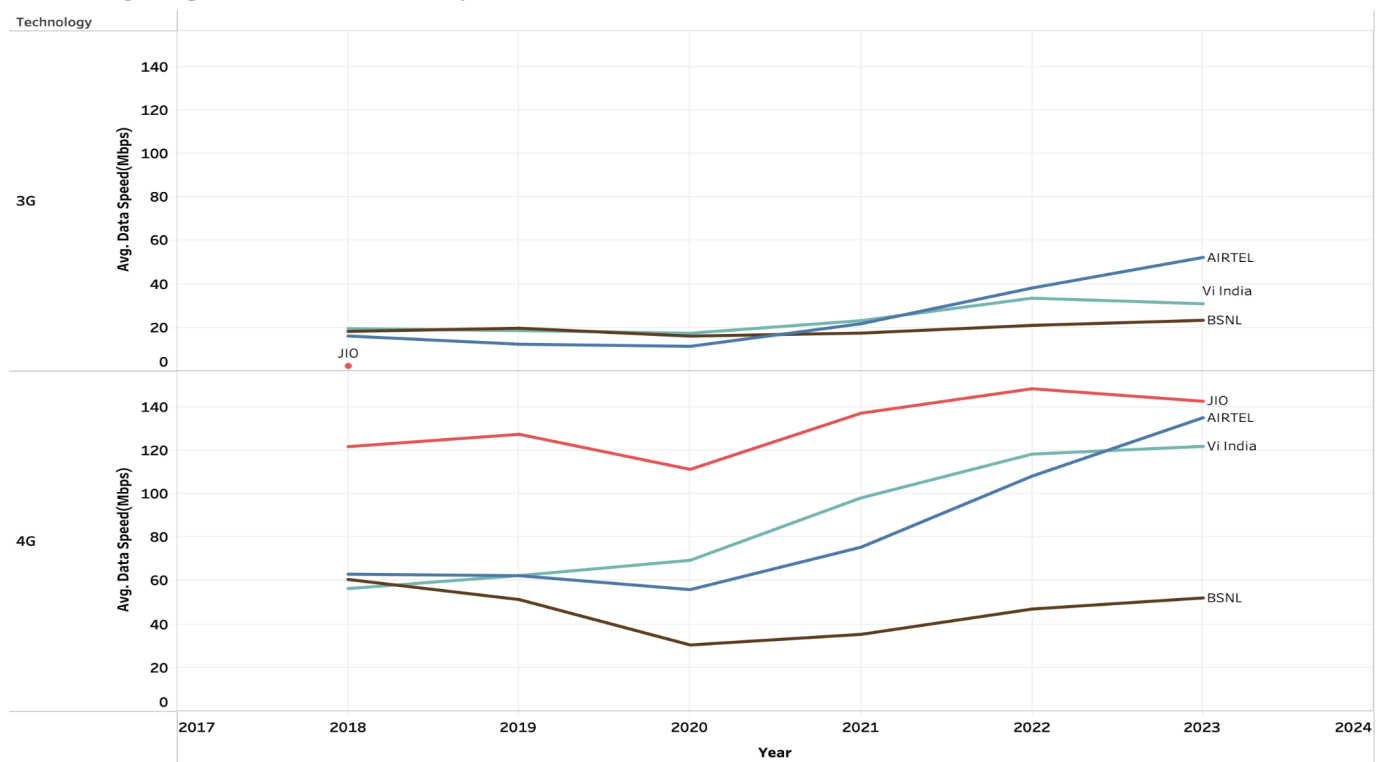
### FOCUS 3: DOES EVERYONE GET THE SAME INTERNET EXPERIENCE?

The evolution of internet services in India has been marked by rapid advancements in technology, shifting consumer demands, and increasing competition among service providers. Over the years, the industry has transitioned from 2G and 3G networks to the widespread adoption of 4G, with ongoing developments toward 5G connectivity. The demand for faster and more reliable internet has grown exponentially, fueled by the increasing penetration of smartphones, digital services, and remote work requirements.

Service providers have continually invested in infrastructure enhancements, including the expansion of fiber-optic networks, the rollout of new spectrum bands, and the adoption of advanced signal transmission technologies. However, despite these advancements, disparities in network performance remain, with factors such as geographic coverage, spectrum allocation, and network congestion impacting internet speed and reliability.

With over a billion mobile users in India, mobile internet plays a crucial role in digital inclusion. But does everyone get the same internet experience?

Does everyone get the same internet experience?



Internet speed has shown an overall improvement over the years, especially in the 4G segment. Jio has consistently maintained its lead in speed, while Airtel and Vi India have seen gradual growth. BSNL has consistently lagged behind, showing slow progress in speed improvement. The gap between different service providers has widened, indicating varying levels of service quality. 3G speeds remain relatively stagnant, suggesting that providers are focusing more on 4G improvements.

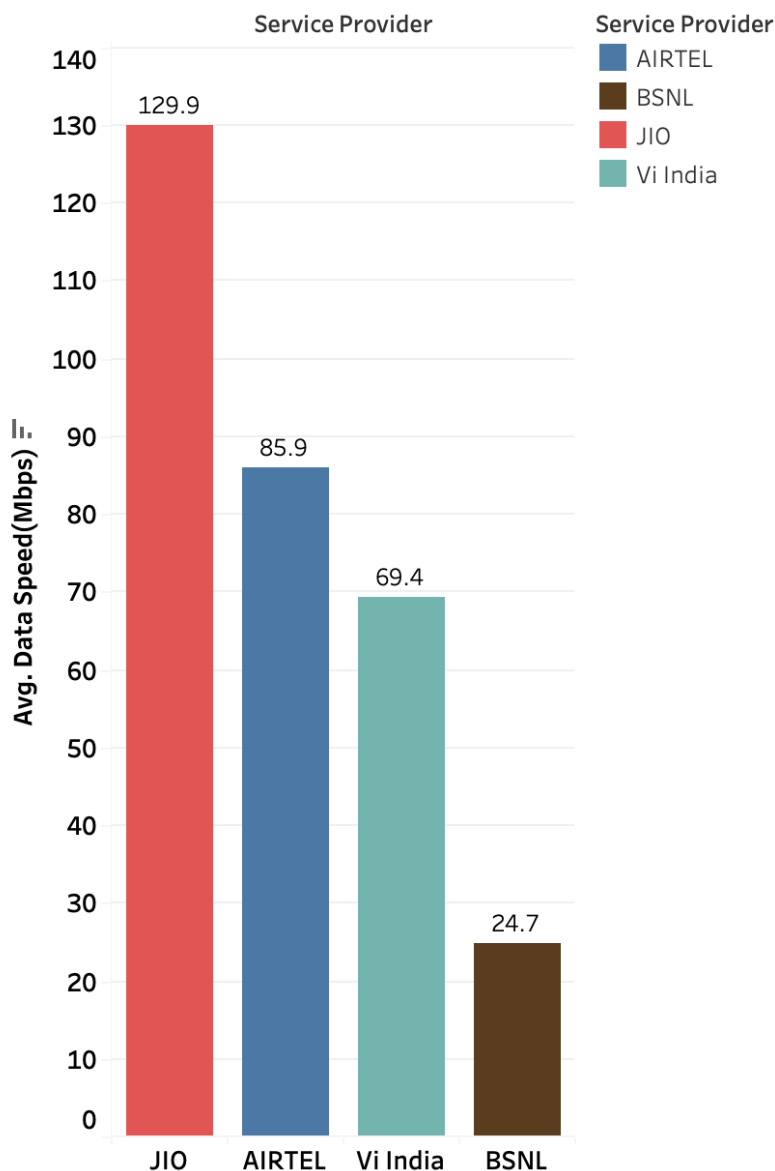
The overall trend suggests that 4G speeds are improving, while 3G usage is stagnating or declining. Airtel and Vi India have made progress but remain behind Jio in performance. BSNL requires significant upgrades to compete with private providers.

## FOCUS 4: SERVICE PROVIDER WARS : WHO'S WINNING?

One of the most common concerns among internet users is determining which provider offers the fastest and most reliable connection. Graph 2 provides a comparative analysis of average data speeds and signal strengths across different service providers in India. This visualization is essential for understanding which telecom companies are leading in terms of internet speed and network consistency.

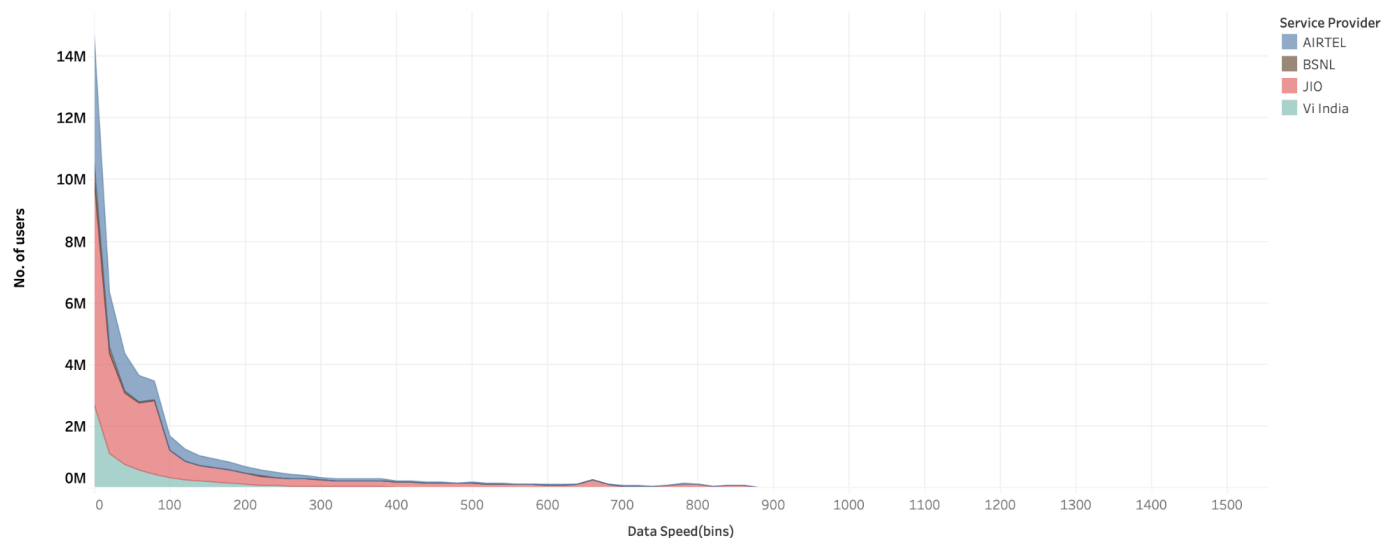
The graph compares service providers based on their recorded internet speeds, allowing consumers to evaluate performance variations. While Jio consistently ranks as the fastest provider, Airtel and Vi India demonstrate competitive performance, while BSNL lags behind. Signal strength, a key factor affecting real-world data speeds, is also an important metric in assessing user experience. Stronger signals generally lead to better internet performance, especially in congested areas or rural locations where infrastructure may be less developed.

### Service Providers performance





Signal Strength vs Data Speed  
Theme 4.2



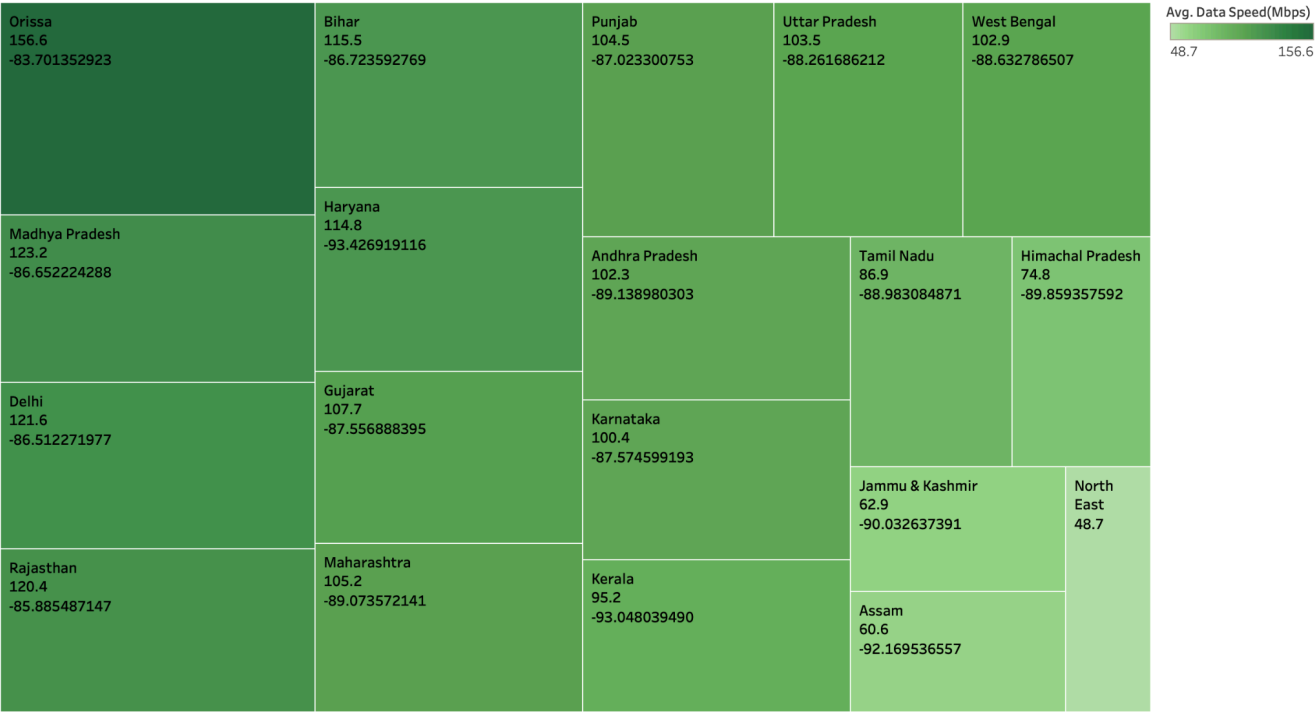
The highest density of users is concentrated in the lower speed bins (0-50 Mbps), suggesting that most users experience lower speeds. Jio (Red) and Airtel (Blue) dominate the user base, contributing the most to the overall distribution of data speeds. BSNL (Brown) and Vi India (Teal) have a relatively smaller presence, indicating fewer users or lower adoption rates. There are occasional spikes in higher speed bins (100-125 Mbps), which could indicate specific regions, technologies, or network conditions favoring higher speeds. Some users experience very high speeds (200+ Mbps), but these cases are rare, leading to a long-tail distribution. The consistency of speed distribution can be evaluated by examining the spread of data—if a provider has a wider, flatter distribution, it may indicate inconsistent network performance.

Jio and Airtel dominate the speed distribution, with Jio leading in both speed and consistency. BSNL and Vi India have a smaller user base and lag behind in overall performance. The concentration of users in lower speed bins suggests possible network congestion or infrastructure limitations. Occasional high-speed spikes indicate isolated instances where optimal network conditions allow for better performance. Analyzing the consistency of speed distribution across providers can help determine which provider delivers the most reliable experience.

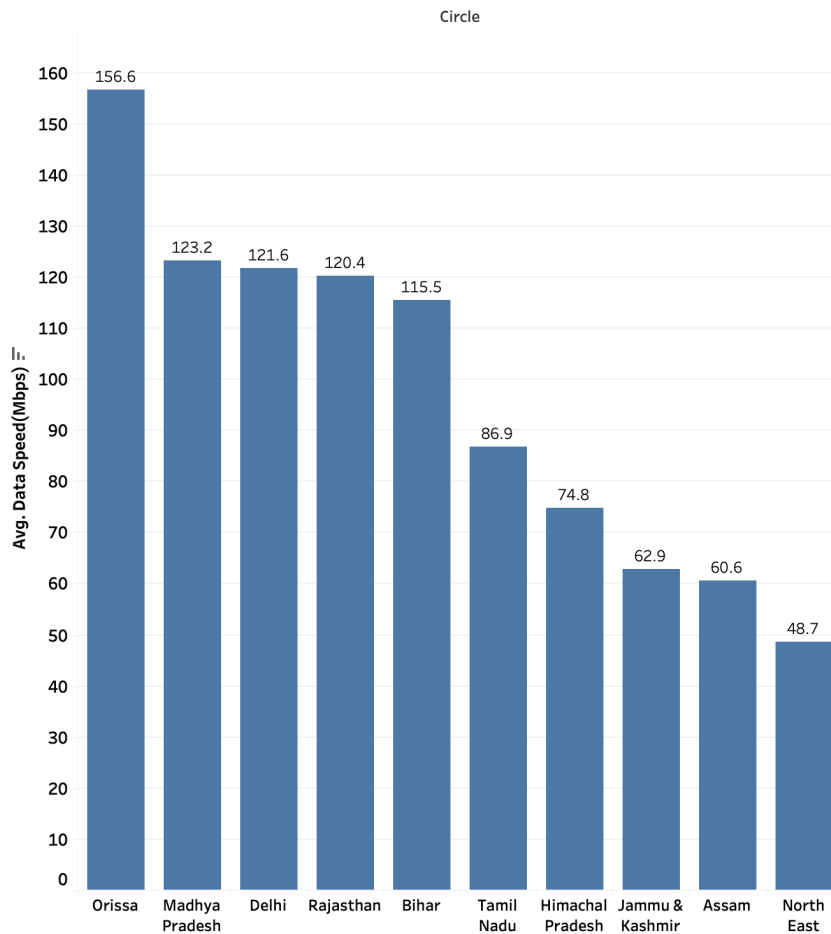
## FOCUS 5: STATE-WISE COMPARISON

In the digital age, internet connectivity plays a crucial role in economic development, education, and social inclusion. However, internet access and quality vary significantly across different states in India. While metropolitan cities enjoy high-speed internet and strong network infrastructure, rural and remote regions often suffer from low speeds and inconsistent connectivity. This digital divide creates inequalities in access to online services, remote work opportunities, and e-learning platforms. The Indian government and telecom providers have made efforts to expand internet coverage, yet regional disparities persist. Understanding these disparities through data-driven analysis helps identify gaps and recommend strategies to bridge the connectivity divide. This report aims to highlight which states receive better internet services and identify those in need of infrastructure improvements.

State-wise Speed & Signal Strength



### States with highest and lowest average data speeds



The *color intensity* indicates the average speed, with darker shades representing higher speeds. The *size* of each section correlates with the *signal strength* in the respective state. This map highlights disparities in internet speed distribution across India, helping identify which states experience poor connectivity.

The next bar chart ranks states based on their *average data speed*. It distinctly showcases the *top 5 states* with the highest data speeds and the *bottom 5 states* with the lowest speeds. The objective is to highlight regional differences and observe whether certain states consistently achieve better network performance.

- The states with the highest *average data speeds* include:
  - **Odisha (156.6 Mbps)**
  - **Madhya Pradesh (123.2 Mbps)**
  - **Delhi (121.6 Mbps)**
  - **Rajasthan (120.4 Mbps)**
  - **Bihar (115.5 Mbps)**
- The states with the lowest *average data speeds* include:
  - **Tamil Nadu (86.9 Mbps)**

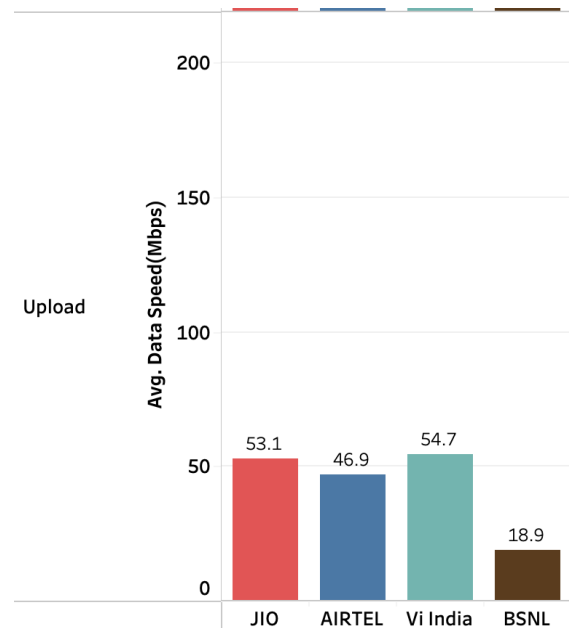
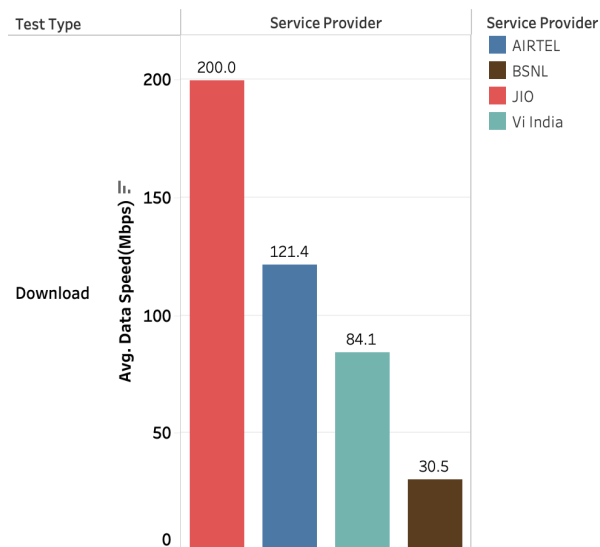
- **Himachal Pradesh (74.8 Mbps)**
- **Jammu & Kashmir (62.9 Mbps)**
- **Assam (60.6 Mbps)**
- **North East (48.7 Mbps)**

States with major metropolitan regions, such as *Delhi and Rajasthan*, report higher data speeds, suggesting that urban areas generally receive better connectivity. *Northeastern states and some rural regions* (e.g., Assam, Himachal Pradesh) exhibit significantly lower speeds, indicating a disparity in network infrastructure development. While some states (e.g., Odisha and Madhya Pradesh) outperform others, the performance of service providers varies by region. The disparity suggests potential challenges related to *network congestion, terrain, infrastructure investments, and provider-specific strategies*.

## FOCUS 6: ANOMALIES IN DATA SPEEDS

In today's digital landscape, both upload and download speeds are essential for a seamless online experience. While download speeds are prioritized for streaming and browsing, upload speeds are critical for video calls, content creation, and cloud-based applications. Disparities between these speeds can negatively impact productivity and user experience.

Compare upload and download speeds for each provider.



### Download Speeds:

**JIO** leads with the highest average download speed at **200.0 Mbps**. **Airtel** follows with **121.4 Mbps**, showing significant performance but still far behind JIO. **Vi India** delivers an average of **84.1 Mbps**, indicating moderate performance. **BSNL** lags far behind with just **30.5 Mbps**, reflecting outdated infrastructure and weaker service quality.

### Upload Speeds:

**Vi India** surprisingly leads in upload speeds with **54.7 Mbps**. **JIO** follows closely at **53.1 Mbps**, showing a strong balance in its network. **Airtel** performs slightly lower at **46.9 Mbps**. **BSNL** has the weakest upload speed at **18.9 Mbps**, reinforcing its poor network capabilities.

### Download vs Upload Speed Disparity:

Most providers show a stark contrast between upload and download speeds. **JIO's network is heavily optimized for downloads**, with upload speeds significantly lower. **Vi India maintains the most balanced network**, with a relatively small gap between upload and download speeds. **BSNL struggles in both areas**, providing the lowest speeds for both uploads and downloads.

**Impact on User Experience:**

Heavy download users (streaming, gaming, browsing) benefit most from JIO and Airtel. Users reliant on uploads (remote workers, cloud storage users, content creators) may find Vi India's balanced speeds more favorable. BSNL's poor performance in both categories suggests it is not a viable option for high-speed internet needs.

## CONCLUSION

India's mobile network has seen significant improvements in recent years, driven by increasing infrastructure investments, growing broadband subscriptions, and the rapid adoption of 4G and 5G technologies. However, this progress has not been uniform across all users, leading to a growing digital divide in network experience.

Service providers play a crucial role in shaping this disparity. While Jio consistently leads in speed and coverage, Airtel and Vi India show competitive but varied performance. In contrast, BSNL continues to lag behind, struggling with outdated infrastructure and lower service quality. The gap between service providers has widened, with some users enjoying high-speed connectivity while others face persistent limitations.

Network performance also differs state-wise, with regions like Odisha, Madhya Pradesh, and Delhi experiencing significantly higher data speeds compared to states such as Himachal Pradesh, Assam, and the North East. This variation suggests differences in network investments, infrastructure capabilities, and provider strategies across different regions.

Additionally, anomalies in data speeds—such as download and upload speed disparities—affect user experience differently based on their needs. While some networks prioritize downloads for streaming and browsing, others provide more balanced performance, benefiting content creators and remote workers.

In conclusion, while India's mobile network is evolving rapidly, the digital divide in network experience persists due to differences in service provider capabilities, state-wise infrastructure development, and speed distribution. Addressing these disparities through targeted infrastructure expansion and policy interventions will be critical in ensuring equitable digital access for all users.

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