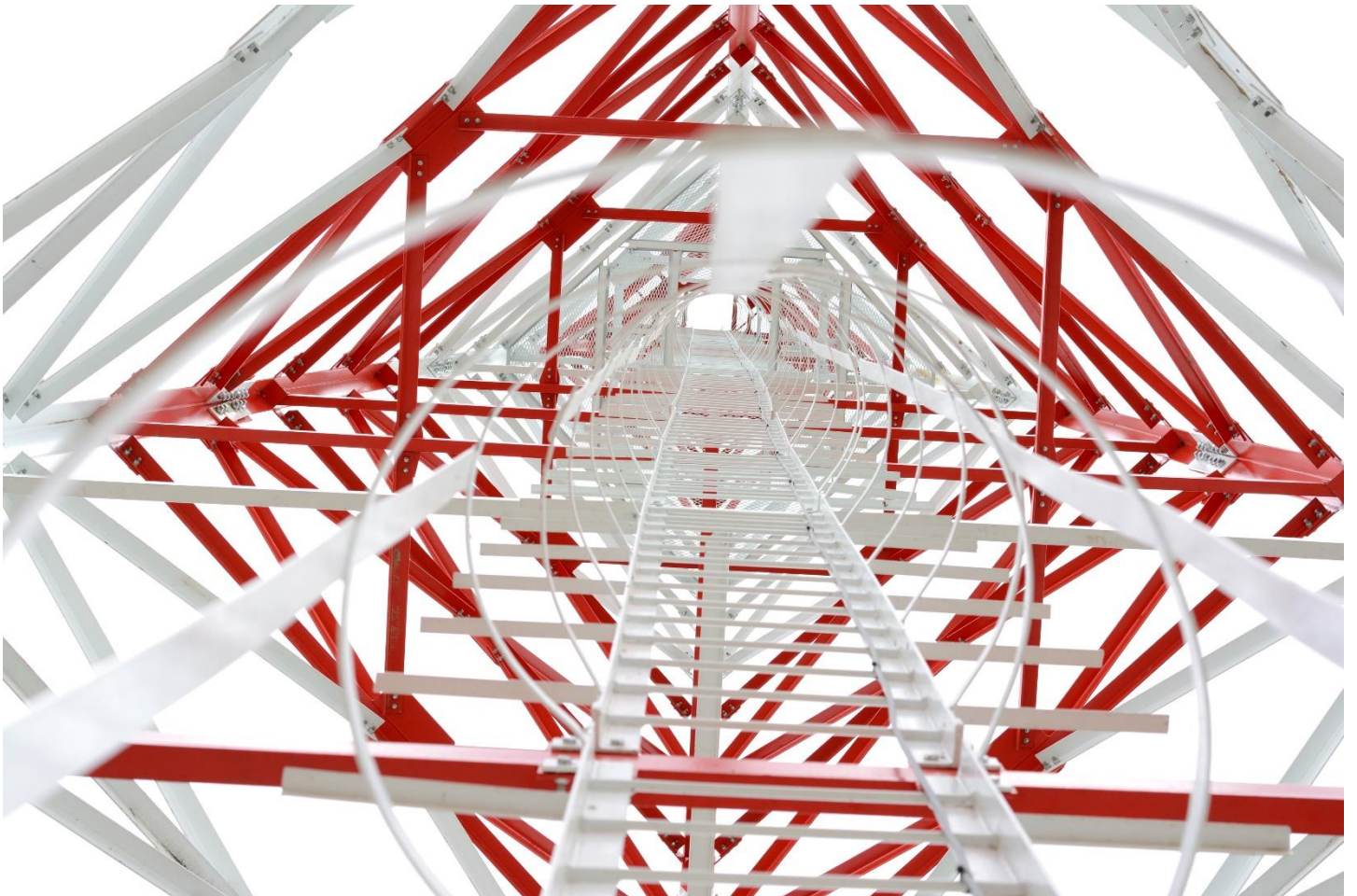


Assessment of telecom industry in India

January 2024



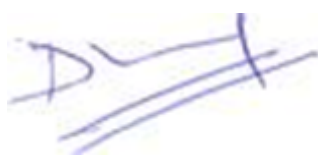
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Contents

- 1 Global macroeconomic overview.....3
- 2 India macroeconomic overview.....7
- 3 Overview of the global telecom industry.....16
- 4 Assessment of the Indian telecom industry21
- 5 Rajasthan and Northeast macroeconomic overview48
- 6 An overview of the telecom market in the Rajasthan and Northeast circles.....53
- 7 Competitive landscape assessment77
- 8 Annexures.....99



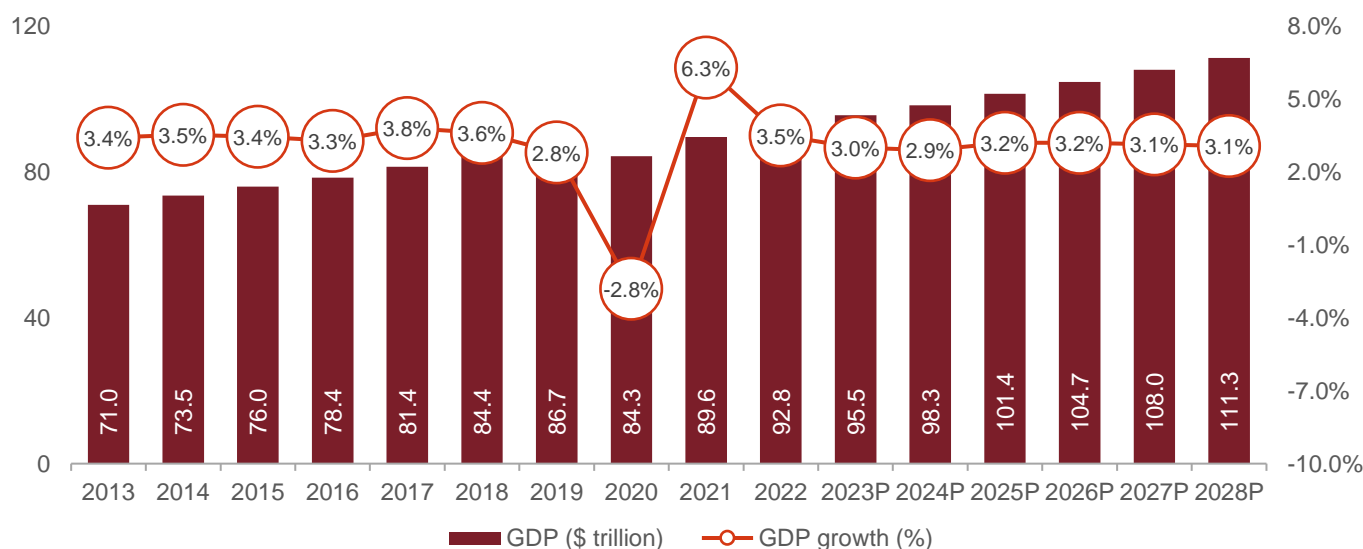
1 Global macroeconomic overview

Global GDP to grow 3.0% in 2023, 2.9% in 2024 amid tighter monetary policy

The International Monetary Fund (IMF) estimates global gross domestic product (GDP) growth to have moderated to 3.0% in 2023 from 3.5% in 2022. It expects a further deceleration to 2.9% in 2024¹. The moderation is because of sluggish and uneven economic recovery owing to the long-term fallout of the Covid-19 pandemic, geopolitical tensions (ongoing Russia-Ukraine conflict and tensions in the Middle East starting with Israel-Hamas conflict to the US and UK attacking the Houthis in Yemen), increasing geoeconomic fragmentation and cyclical factors, such as effects of monetary policy tightening to curtail inflation, withdrawal of fiscal support across countries amid high debt levels, and increasing number of extreme-weather events.

Regions are seeing wide divergence in growth trends with economic activity falling short of the pre-pandemic trajectory in advanced economies and in some emerging and developing economies. But countries such as India, Indonesia and Vietnam have high growth potential.

Global GDP trend and outlook (2013-2028P, \$ trillion)



P: Projected

Source: IMF economic database, World Bank national accounts data, Organisation for Economic Co-operation and Development (OECD) national accounts data, CRISIL MI&A

India among the world's fastest-growing large economies

India was the fastest-growing major economy in 2021, with a growth rate of 9.1%, followed by China at 8.5%. In 2022, India had logged healthy growth, with GDP expanding 7.2% and overtaking the UK as the fifth-largest economy. In 2023, too, India's GDP is projected to have grown 7.3%², faster than that of China.

In 2024 and 2025, India's GDP is forecasted to grow 6.4% and 6.3%, respectively.

Emerging markets and developing economies are projected to post a stable growth of 4.0% in 2024, with a slight pick-up to 4.1% in 2025. Many emerging economies will continue to show resilience, led by domestic factors-driven

¹ As per 2023 World Economic Outlook of the IMF

² First Advanced Estimate for fiscal 2024 (calendar 2023) from the Ministry of Statistics and Programme Implementation (MoSPI)

economies such as India and Indonesia. China is a notable exception as it is facing growing headwinds from a real estate crisis and weakening household confidence.

In contrast, GDP growth of the advanced economies is expected to moderate to 1.5% in 2023 and 1.4% in 2024 from 2.6% in 2022 before recovering to 1.8% in 2025 amid stronger US momentum.

Real GDP growth by geography

Region	GDP, current prices (\$ bn)	GDP growth rate											
		2022	2017	2018	2019	2020	2021	2022	2023P	2024P	2025P	2026P	2027P
US	25,462.7	2.2	2.9	2.3	-2.8	5.9	2.1	2.1	1.5	1.8	2.1	2.1	2.1
China	17,886.3	6.9	6.8	6.0	2.2	8.5	3.0	5.0	4.2	4.1	4.1	3.7	3.4
Euro area	14,150.7	2.6	1.8	1.6	-6.1	5.6	3.3	0.7	1.2	1.8	1.7	1.5	1.3
Japan	4,237.5	1.7	0.6	-0.4	-4.2	2.2	1.0	2.0	1.0	0.7	0.5	0.4	0.4
India*	3,389.7	6.8	6.5	3.9	-5.8	9.1	7.2	7.3[^]	6.4	6.3	6.3	6.3	6.3
UK	3,081.9	2.4	1.7	1.6	-11.0	7.6	4.1	0.5	0.6	2.0	2.1	1.8	1.5
Indonesia	1,318.8	5.1	5.2	5.0	-2.1	3.7	5.3	5.0	5.0	5.0	5.0	5.0	5.0
Thailand	495.4	4.2	4.2	2.1	-6.1	1.5	2.6	2.7	3.2	3.1	3.0	3.0	3.0
Vietnam	406.5	6.9	7.5	7.4	2.9	2.6	8.0	4.7	5.8	6.9	6.8	6.8	6.8
World	-	3.8	3.6	2.8	-2.8	6.3	3.5	3.0	3.0	3.2	3.2	3.1	3.1

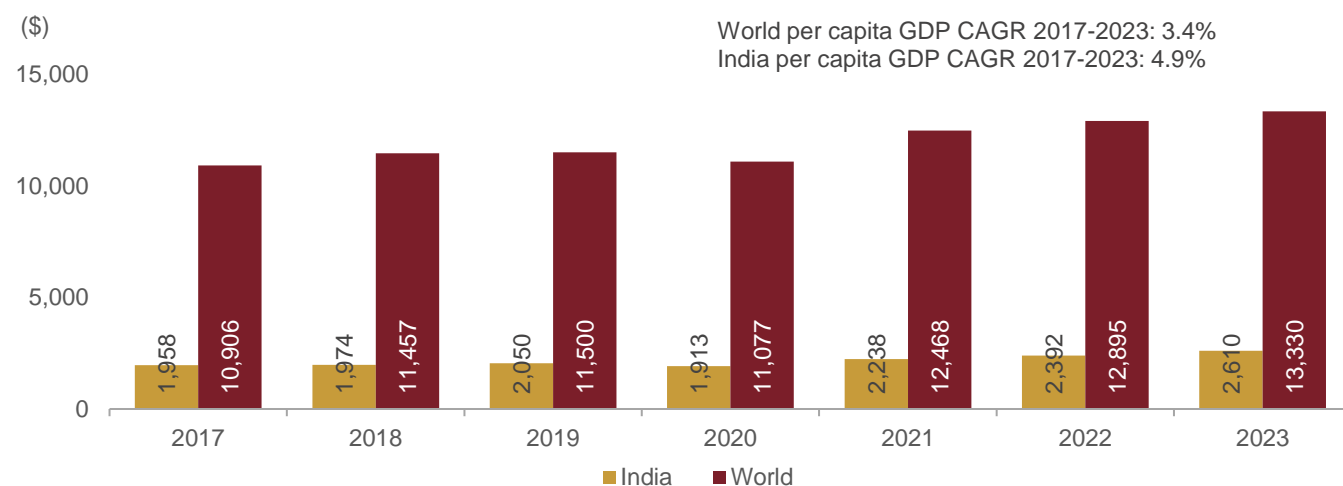
P: Projected. * Numbers for India are for financial year (2020 is fiscal 2021 and so on) and as per the IMF's forecast. India GDP estimate for the current fiscal is 7.3% according to advanced estimate from the Ministry of Statistics and Programme Implementation (MoSPI).

Note: Projection as per IMF update

Source: IMF economic database, World Bank national accounts data, OECD national accounts data, CRISIL MI&A

India's per capita GDP has been growing faster than the global average. Between 2017 and 2023, while the global GDP per capita logged a compound annual growth rate (CAGR) of 3.4%, India's was higher at 4.9%, supported by investments in utilities, infrastructure and public administration and corporate revenue growth.

Per capita GDP at current prices



Source: IMF, CRISIL MI&A

³ As per the IMF data

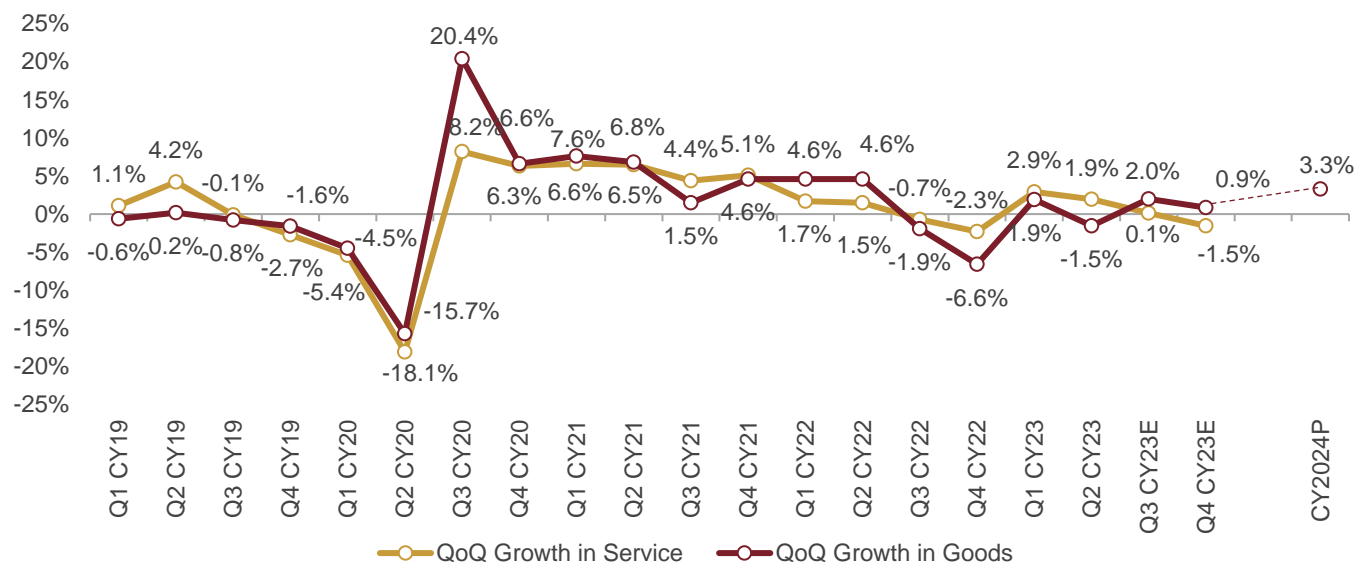
Global trade was relatively flat in 2023, likely to log moderate growth in 2024

Weak demand in developed countries, fall in commodity prices and slow GDP growth in some developing nations, especially in East Asian economies, affected global trade in 2023. However, the services sector trade grew in the first half of the year as recovery from the pandemic took effect with a lag. Tensions between the US and China have led to modest realignment of trade and financial flows, keeping trade growth largely rangebound.

Outlook for global trade in the current calendar is marked by uncertainty, though support is expected from demand for services, especially in the information and communication technology and travel and tourism sectors. Recovery in consumer demand and increased trade of green goods on account of transition towards a greener global economy⁴ would also boost overall global trade in 2024. On the flip side, continuing geopolitical tensions; high interest rates, corporate and government debt and commodity prices; inflationary pressures; and widespread economic fragility would potentially affect trade patterns.

The World Trade Organization expects goods trade to grow in 2024, with Asia being the fastest-growing region and world merchandise (goods) volume growing 3.3% (vs 0.8% in 2023).

Global quarterly trade of goods and services



E: estimated; P: projected

Source: World Trade Organization, UNCTAD Global Trade Update, CRISIL MI&A

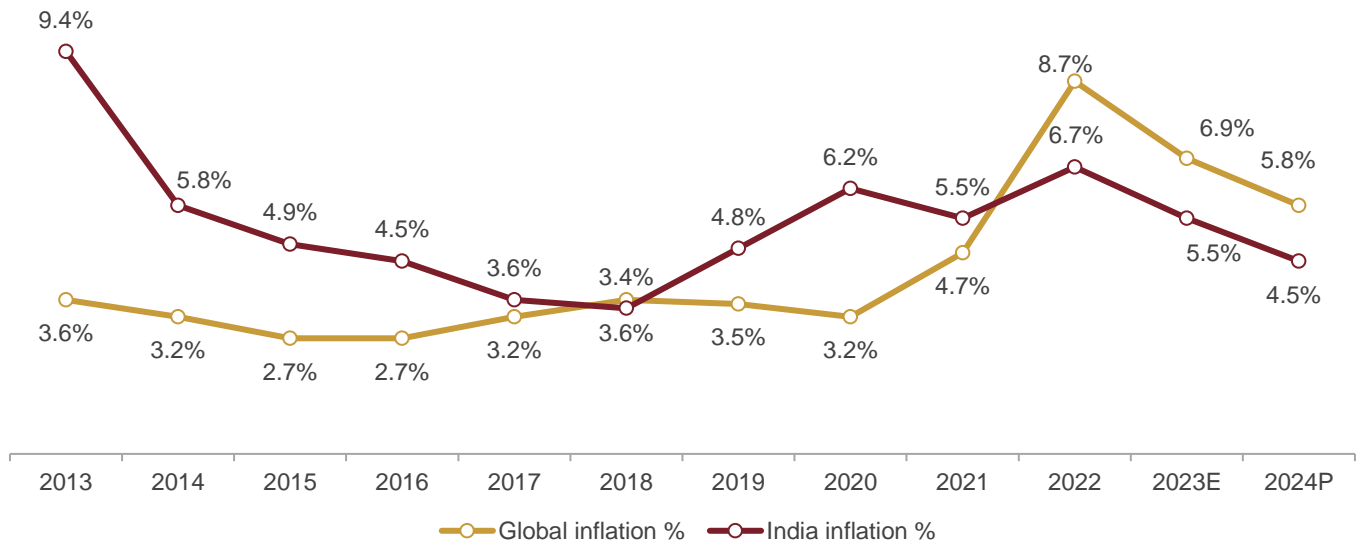
Inflation expected to ease slightly in 2024

In 2022, global inflation hit a high of 8.7%, with advanced economies fanning the rise. Factors such as the Russia-Ukraine conflict (which impacted global supply chains), long-term impact of the pandemic, shrinking of the workforce and high energy prices sharply drove up the prices of goods and services. Demand-related factors, including extensive government stimulus expenditure in the US, pent-up consumer demand and accumulated savings from the pandemic period, also boosted inflation.

That said, going forward, easing of supply-chain disruptions and softening of commodity prices are expected to cool inflation globally. But while global inflation is expected to ease slightly to 5.8% in 2024 from 6.9% in 2023, it will still be higher vis-à-vis the last decade.

⁴ Market capitalisation of green economy as defined by Financial Times Stock Exchange (FTSE) Russell has increased from ~7% in 2019 to 9.2% in 2023

Global inflation trend



E: Estimated; P: Projected

Source: IMF World Economic Outlook, CRISIL MI&A

2 India macroeconomic overview

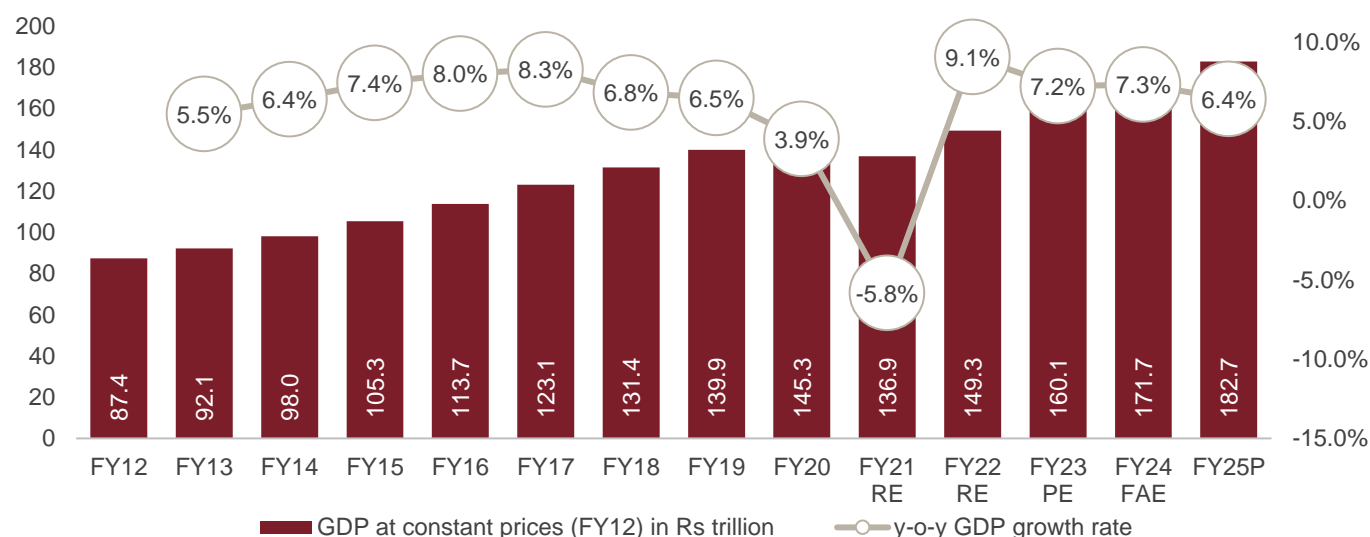
India GDP to grow 7.3% this fiscal, 6.4% in the next

India's GDP logged a 5.7% CAGR between fiscals 2012 and 2023 from Rs 87 trillion to Rs 160 trillion. In fiscal 2021, the GDP had contracted 5.8% because of the pandemic impact. In fiscal 2022, the economy recovered from pandemic-related shocks, though the last quarter saw inflation spiralling up because of the ongoing Russia-Ukraine conflict. GDP grew a robust 9.1% with economic activity resuming and healthy trade flows. In fiscal 2023, growth printed at 7.2%, propelled by domestic demand, increased investment outlay by the government and private consumption.

In the current fiscal, growth is expected to be 7.3%, as per the MoSPI's First Advance Estimates (FAE).

In fiscal 2025, CRISIL expects the country's GDP to expand 6.4%, driven by the manufacturing sector, strong growth in investments and resilient domestic demand.

India real GDP growth at constant prices (new series)



RE: revised estimates, PE: provisional estimates, FAE: First Advance Estimates; P: projected

Source: Central Statistics Office (CSO), MoSPI, CRISIL MI&A

Consumption expenditure largest contributor to GDP

Private final consumption expenditure (PFCE) has been the largest component of India's GDP historically. In the current fiscal, it is estimated to contribute 56.9% to the GDP. Between fiscals 2012 and 2024, PFCE is expected to log a CAGR of 5.9%. The increasing share of discretionary spending from fiscal 2012 suggests rise in disposable income and spending capacity of households.

In the medium-to-long term, positive economic outlook and growth across key employment-generating sectors (such as real estate, infrastructure and automobiles) are expected to have a cascading effect on overall per capita income. This, in turn, is expected to drive discretionary spending.

Broad split of PFCE into basic and discretionary spending

	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21 RE	FY22 RE	FY23 PE	FY24 FAE	CAGR FY12- FY24
PFCE (Rs trillion)	49.1	51.8	55.6	59.1	63.8	69.0	73.3	78.5	82.6	78.2	87.0	93.6	97.7	5.9%
Share of PFCE in GDP	56.2%	56.2%	56.7%	56.2%	56.1%	56.1%	55.8%	56.1%	56.8%	57.2%	58.3%	58.5%	56.9%	-
Share of discretionary spending in PFCE	53.4%	53.2%	52.7%	54.8%	57.1%	57.0%	58.3%	59.3%	59.6%	56.6%	57.9%	N.A		-

RE: Revised estimates, PE: Provisional estimates, FAE: First Advance Estimates

N.A – not available; PFCE data is from the latest available National Account Statistics 2023; discretionary items include education, healthcare, electricity, water supply, footwear, personal care products, processed foods, alcoholic and non-alcoholic beverages, tobacco, narcotics, fuel and gas, furnishing and household equipment, vehicle and personal transportation, spending on recreation and culture, communication, restaurants and hotels, financial insurance and other financial services, and other items not elsewhere classified. The remainder is contributed by basic items, which include food, clothing and housing.

Source: MoSPI, CRISIL MI&A

India’s per capita net national income (NNI) is on an upward trajectory

India’s per capita NNI, a broad indicator of living standards, is estimated to increase to Rs 104,550 in fiscal 2024 from Rs 63,462 in fiscal 2012, logging 4.2% CAGR at constant price, led by better job opportunities, overall GDP expansion and a stable CAGR of ~1% in population.

Per capita NNI at constant prices

	FY12	FY13	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21 RE	FY22 RE	FY23 PE	FY24 FAE	CAGR FY12- 23
Per capita NNI (Rs)	63,462	65,538	68,572	72,805	77,659	83,003	87,586	92,133	94,270	86,054	92,583	98,374	104,550	4.2%
y-o-y growth %		3.3	4.6	6.2	6.7	6.9	5.5	5.2	2.3	-8.7	7.6	6.3	6.3	-

RE: Revised estimates, PE: Provisional estimates, FAE: First advance estimates

Definition: Gross national income (GNI) = GDP + taxes less subsidies on production and imports at market prices (net receivable from abroad) + compensation of employees (net receivable from abroad) + property income (net receivable from abroad); NNI = GNI at market prices – consumption of fixed capital

Source: Provisional Estimates of Annual National Income, 2022-23, CSO, MoSPI, CRISIL MI&A

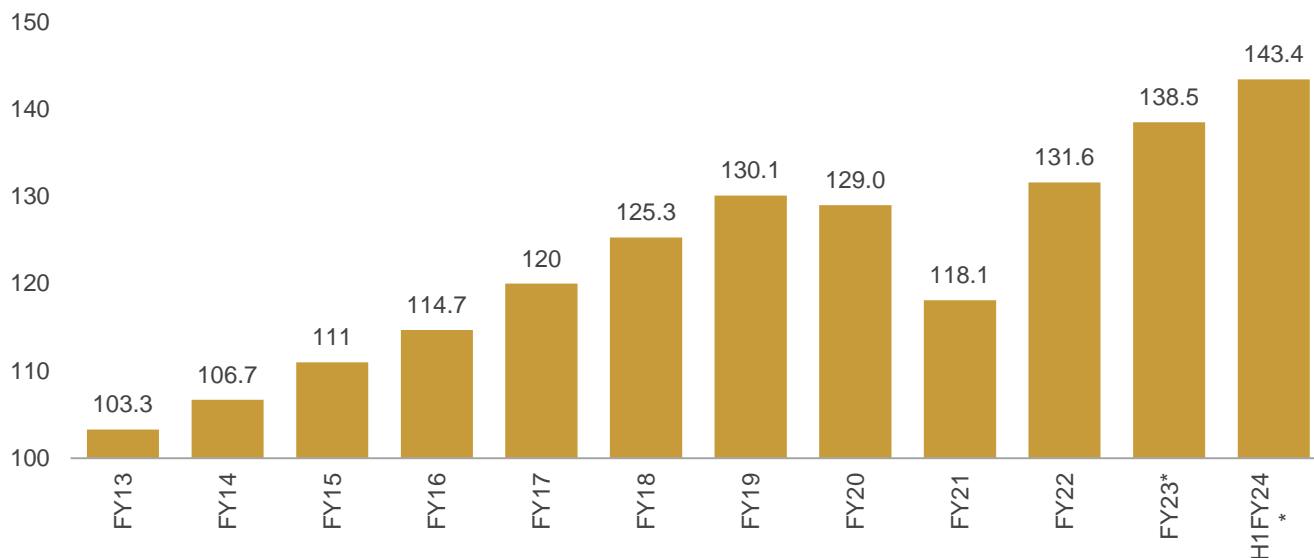
IIP rebounded strongly last fiscal and in the first half of this fiscal

India’s Index of Industrial Production (IIP) posted a steady increase to 143.4 in the first half of fiscal 2024 and 138.5 in fiscal 2023 compared with 103.3 in fiscal 2013, indicating rising economic activity in the country. In fact, the fiscal 2022 print of 131.6 was also an improvement from 129.0 in fiscal 2020 and 118.1 in fiscal 2021 as pandemic-related challenges were tackled with government stimulus, leading to an increase in consumer demand, reflected by growth in private consumption expenditure, and a strong recovery in industrial activity.

Within the IIP basket, the manufacturing sector, which is a significant contributor to the country's overall industrial growth, had 78% weightage as of fiscal 2023, while mining and electricity accounted for 14% and 8%, respectively.

IIP for the manufacturing sector increased to 141.7 in the first half of this fiscal and 137.1 in fiscal 2023, from 131.0 in fiscal 2022, indicating industrial activity was holding up with resilient domestic demand.

All-India IIP with base year fiscal 2012



* Figures for FY23 and H1FY24 are provisional as provided by MoSPI
Source: MoSPI, CRISIL MI&A

India's trade deficit to moderate in fiscal 2024

In fiscal 2023, India's merchandise exports increased 17% year-on-year to Rs 36.8 trillion and services exports, increased 40% to Rs 26.6 trillion. Overall exports rose 26% to Rs 63.4 trillion from Rs 50.4 trillion in fiscal 2022.

Imports rose a sharper 30% year-on-year to Rs 73.4 trillion from Rs 56.6 trillion as merchandise imports increased 29% to Rs 58.8 trillion and services imports rose 34% to Rs 14.6 trillion. The rise in imports was led by crude oil products, coal, coke, briquettes, and transport equipment. This led India's overall trade deficit to widen to Rs 10.0 trillion from Rs 6.2 trillion.

Services trade surplus remains robust in fiscal 2024 and remittances are expected to stay healthy. Hence, CRISIL expects India's current account deficit, which was 2.0% of GDP in fiscal 2023, to soften to 1.8% in fiscal 2024.

Merchandise and service trade in India

Rs trillion		FY18	FY19	FY20	FY21	FY22	FY23	CAGR FY18- FY23
Merchandise	Exports	19.5	23.1	22.2	21.7	31.4	36.8	13.5%
	Imports	29.6	35.5	33.7	29.3	45.7	58.8	14.7%
Services	Exports	11.3	14.3	15.1	15.3	19	26.6	18.7%
	Imports	6.8	8.7	9.1	8.7	11	14.6	16.5%
Overall trade	Exports	30.8	37.4	37.3	37	50.4	63.4	15.5%
	Imports	36.4	44.1	42.8	38	56.6	73.4	15.0%
	Trade balance	-5.6	-6.7	-5.4	-1.0	-6.2	-10.0	12.2%
Current account deficit (CAD) as % of GDP	-1.8	-2.1	-0.9	0.9	-1.2	-2.0	Not applicable	

Note: CAD / GDP if positive figure, indicates surplus, and if negative figure, indicates deficit

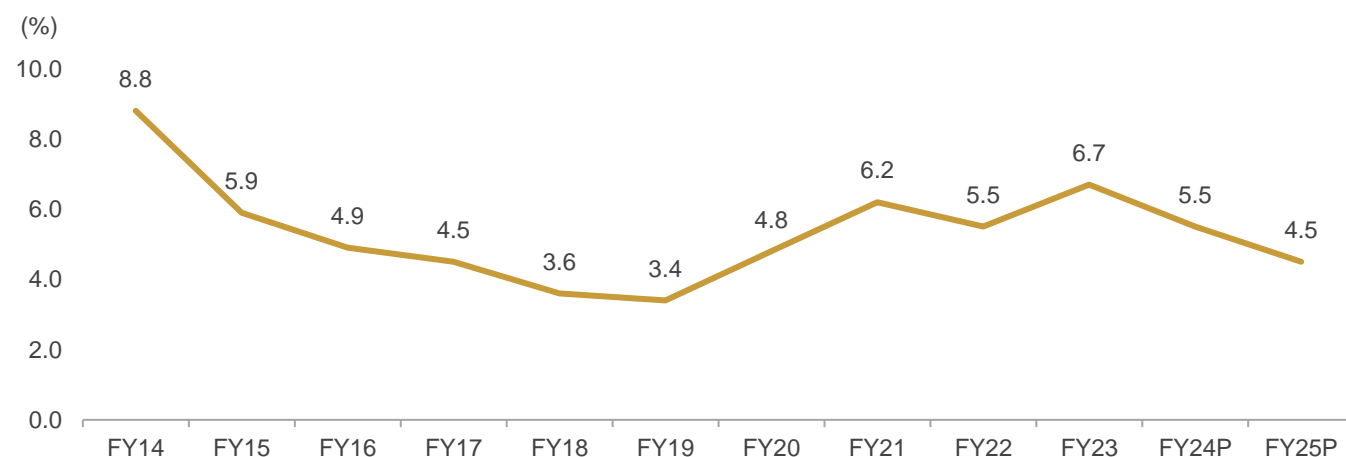
Source: Ministry of Commerce and Industry, RBI, CRISIL MI&A

CPI inflation to soften to 5.5% in fiscal 2024 and 4.5% in fiscal 2025

In May 2016, the Reserve Bank of India (RBI) adopted flexible inflation targeting (FIT), setting the numerical target for Consumer Price Index (CPI)-based inflation at 4% with a tolerance band of +/- 2%. Broadly speaking, CPI has eased from a high of 8.8% last decade. Between fiscals 2017 and 2023, inflation was within the tolerance band, except in fiscal 2021 (CPI of 6.2%), owing to pandemic-led supply-side disruptions, and in fiscal 2023 (6.7%), because of rise in food inflation, supply disruptions on account of Russia-Ukraine conflict and capital outflows impacting India's exchange rate and import bill.

CRISIL expects CPI to ease to 5.5% this fiscal, driven by normal monsoon and reducing food prices. In fiscal 2025, CPI inflation is forecastforecasted to be at 4.5%. A combination of factors — impact of rising interest rates on domestic demand, a global demand slowdown leading to falling international commodity prices, and the base effect — should lower inflation.

CPI inflation trend



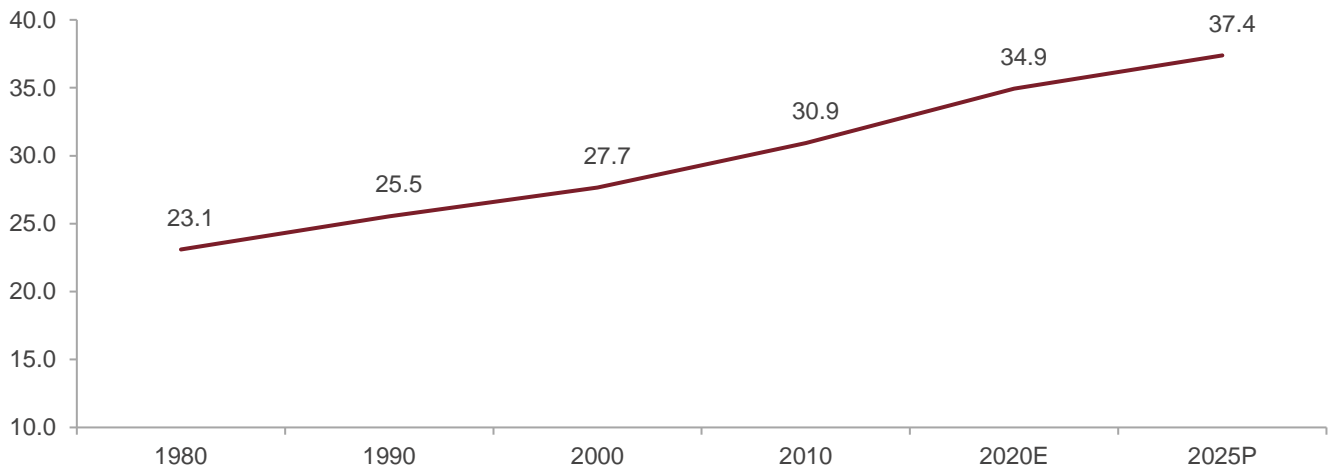
P: Projected

Source: CRISIL MI&A Consulting

Urbanisation and rise in income will drive long-term growth

Urbanisation has been one of the crucial growth drivers for the Indian economy. Going forward, rise in urbanisation is projected to drive substantial investments in infrastructure development, which, in turn, is expected to create jobs, develop modern consumer services, and increase ability for consumption expenditure and saving investments. In calendar year 1980, 23.1% of the country’s total population was urban. The share of urban population rose to 34.9% in 2020 and is estimated to reach 37.4% in 2025⁵.

Urban population as a percentage of total population



E: Estimated; P: Projected

Source: Census 2011, World Urbanization Prospects: The 2018 Revision (UN)

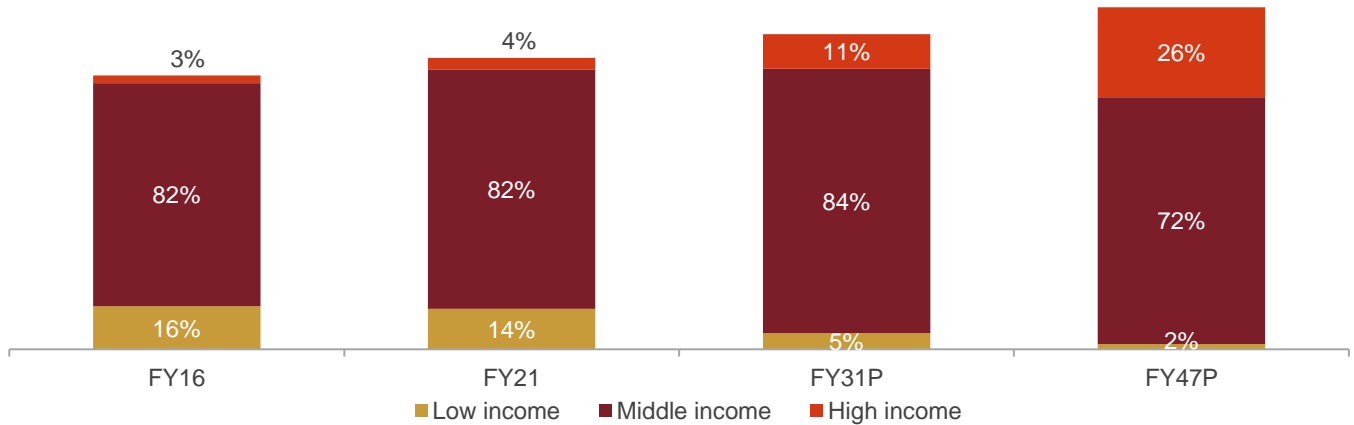
Decline in poverty indicates rise of middle-income population

The proportion of poor in India (defined as those living on Rs 125,000 per annum or less) declined from ~16% in fiscal 2016 to ~14% in fiscal 2021. Conversely, the proportion of those in the middle- and high-income groups increased from 85% to ~86%. By fiscal 2031, this share is expected to reach ~95%, supported by growth in per capita income.

⁵ World Urbanization Prospects: The 2018 Revision (UN)

Income-based split of the population

% share



P: Projected

Note: Low-income group comprises those earning less than Rs 125,000 per annum; middle-income group comprises those earning between Rs 125,000 and Rs 3 million per annum, and high-income group comprises those earning more than Rs 3 million per annum; percent figures are rounded off

Source: People Research on India's Consumer Economy (ICE) 360° survey, CRISIL MI&A

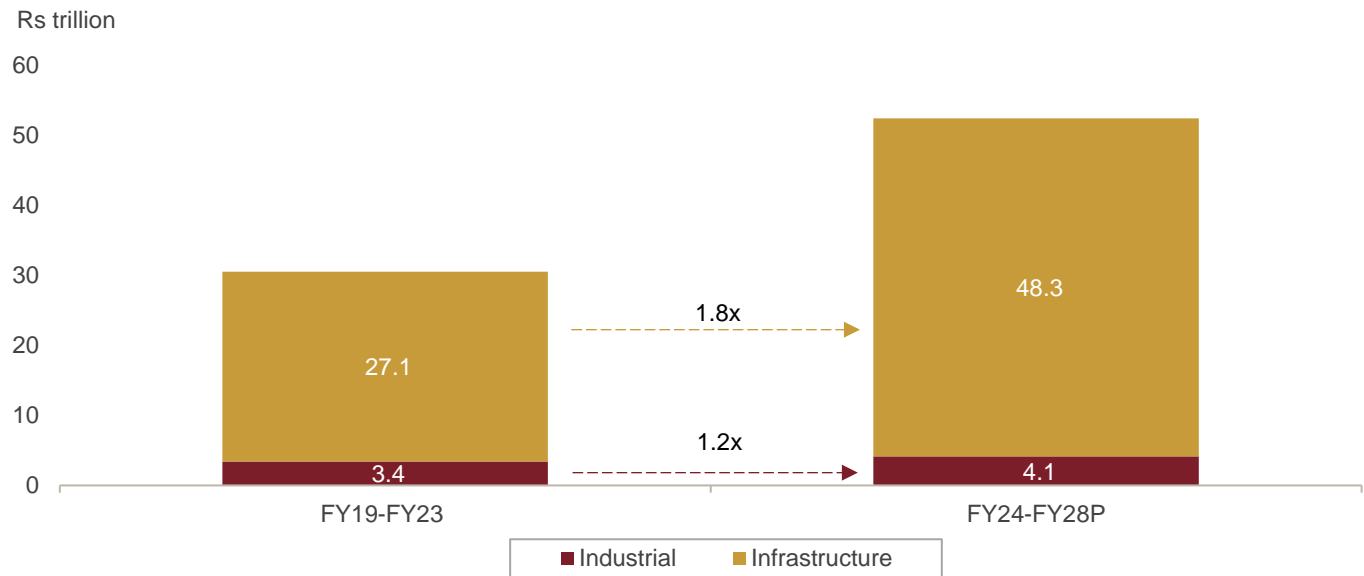
Sustained infrastructure and government spending to support domestic demand

To boost the economy, the government has placed great emphasis on capital and infrastructure investments. Between fiscals 2019 and 2023, infrastructure investment logged 13% CAGR, rising to Rs ~7.0 trillion. It is estimated to grow further at 12-16% in fiscal 2024 and 8-10% in fiscal 2025. CRISIL expects infrastructure investment in fiscals 2024-2028 to be 1.8x that in fiscals 2019-2023. This infrastructure push would lead to improved physical connectivity and lower logistics cost for industries.

Starting fiscal 2021, the government also introduced Production-Linked Incentive (PLI) schemes for various sectors. These schemes are aimed at integrating the existing manufacturing value chain to reduce import dependence and improve competitiveness of domestic products, which, in turn, would boost exports. PLI schemes in 14 sectors, including mobiles, telecom and information technology (IT) hardware, have been announced. As per government estimates, a total incentive of Rs 1.8 trillion would be provided, spurring a capital spend of Rs 2.5-3.0 trillion and generating a revenue of ~Rs 30 trillion. Of the total estimated PLI capex, the mobile sector accounts for 11.6%, telecom 5.0% and IT hardware 2.5%.

Industrial capex has also received a leg-up from government policies and new-age opportunities. CRISIL expects industrial capex in fiscals 2024-2028 to be 1.2x that in fiscals 2019-2023.

Construction investments across infrastructure and industrial segments in India



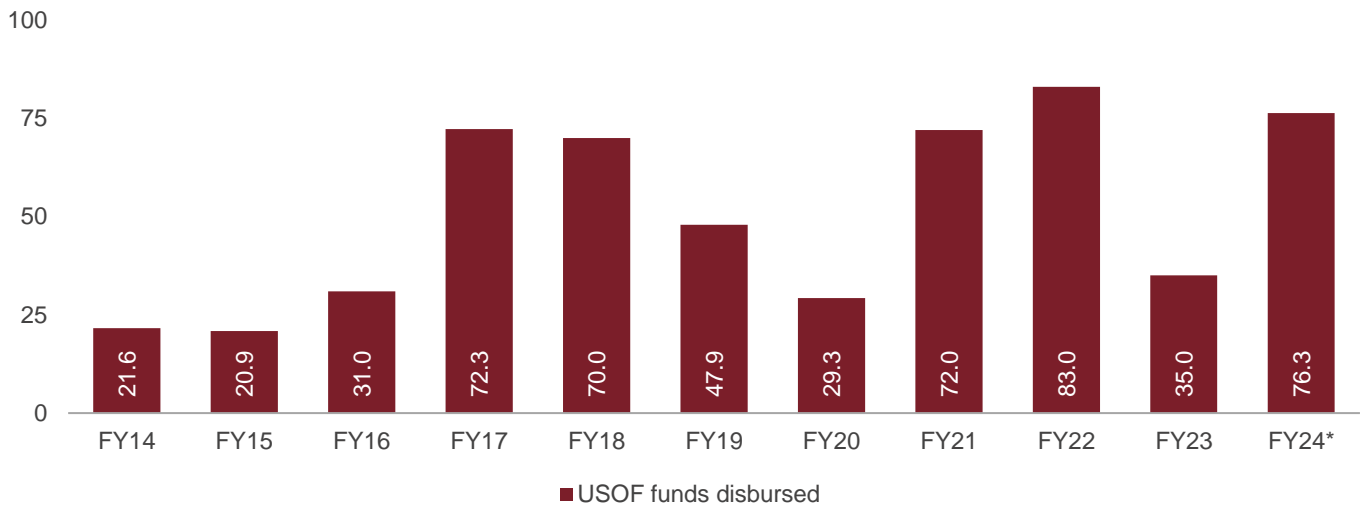
Source: CRISIL MI&A

India's economic growth is also being supported by investments in the telecommunications sector. Between fiscals 2017 and 2024, the government's budget allocation towards the Department of Telecommunications (DoT) logged a CAGR of 22.3%, led by higher allocation towards the Universal Service Obligation Fund (USOF) and DoT projects, which include allocation towards domestic industry incentivisation schemes (such as PLI) and wireless planning and coordination. For fiscal 2024, Rs 975.8 billion was allocated to the telecommunication ministry, which is ~2% of the overall budget and up 19% year-on-year. Of this, Rs. 530.0 billion was capital infusion in BSNL.

USOF fund was started by the Government of India in 2003 to provide telecom services (including mobile services, broadband connectivity, and ICT infrastructure creation - added in 2006) for rural and remote areas in India. Under USOF, some projects are allotted to various mobile service providers for providing mobile network in the country especially in rural and remote areas. Under USOF, about Rs ~559 billion has been cumulatively disbursed from fiscal 2014 till December 2023 under various projects.

USOF funds disbursed

(Rs billion)



Note: * as on December 31, 2023

Source: Universal Service Obligation Fund, Department of Telecommunications, Ministry Of Communications, Government Of India, CRISIL MI&A

Additionally, the budget allocation towards the Digital India programme, which includes electronic governance, capacity building and skill development, manpower development, promotion of electronics and IT hardware manufacturing, and promotion of digital payments, among others, has also seen a cumulative investment of Rs. ~290 billion since fiscal 2017 with Rs ~48 billion budgeted for fiscal 2024. This underscores the government's commitment towards building the country's digital infrastructure.

Digital payments growing at rapid pace

Rapid digital transformation has been fundamentally reshaping the Indian economy. At the crux of this advancement is the Digital India initiative launched by the government in July 2015 to transform the country into a knowledge-based economy and a digitally-empowered society. Encapsulating the vision of digital infrastructure as a core utility for citizens, governance and services on demand, and digital empowerment of citizens, the initiative has deepened digitalisation in rural areas, fuelling the digital economy. Fast and dependable mobile communication networks are helping the government achieve Digital India's targets.

Technological upgrades have facilitated essential digital services such as the Unified Payment Interface (UPI)/digital payments and incorporated several e-governance services in government-to-business (G2B) and government-to-citizen (G2C) applications, leading to citizen empowerment.

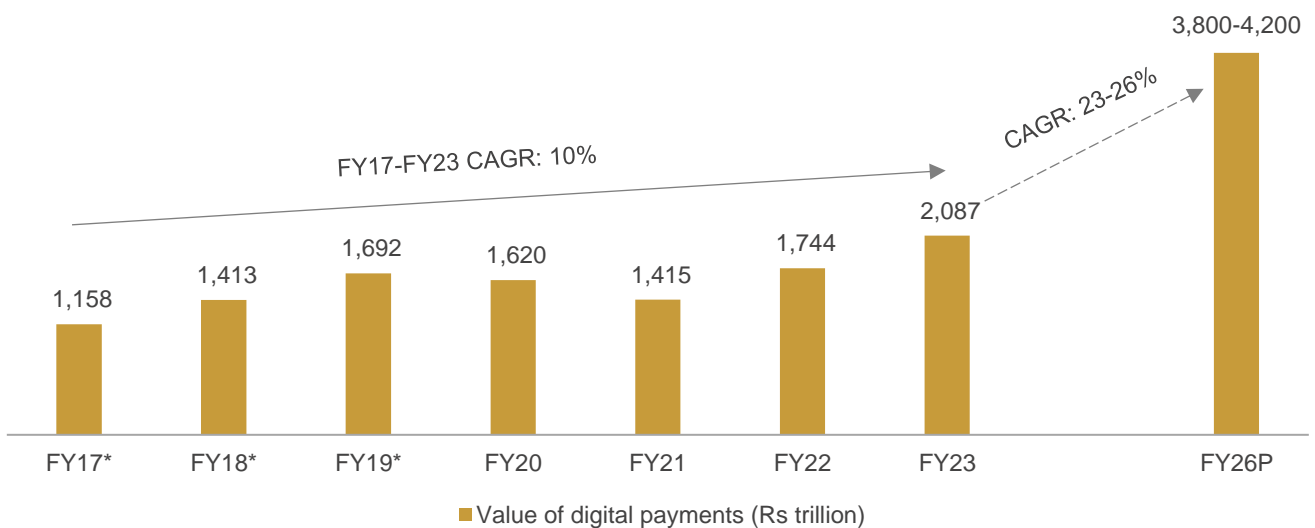
In fact, digital payments in the country have vaulted over the past few years. The value of digital payment transactions increased from Rs 1,158 trillion in fiscal 2017 to Rs 2,087 trillion in fiscal 2023, at a CAGR of 10%. Their share in overall payment transactions increased from 62% in fiscal 2017 to 97% in fiscal 2023. The volume of digital transactions increased from 19.3 billion in fiscal 2017 to 114.0 billion in fiscal 2023, at a CAGR of 34%. Digital transactions are expected to clock a robust CAGR of 23-26% between fiscals 2023 and 2026 to reach Rs 3,800-4,200 trillion in value.

The share of UPI transactions in total digital payments, in value terms, increased from 4.8% in fiscal 2022 to 6.7% in fiscal 2023, as the value of UPI transactions increased from Rs 84.2 trillion to Rs 139.2 trillion. The rise in UPI transactions can be attributed to the platform's seamless integration with diverse banking systems and compatibility with numerous third-party apps. Its open architecture empowers developers to craft innovative solutions, fostering a

robust ecosystem of UPI-enabled apps providing diverse services. Sustained investments and continued strong growth in use of financial services over the digital mode augur well for proliferation of data.

The RBI is the primary enabler of digital transactions in the country. Over the years, it has laid emphasis on the development of a digital payment ecosystem, right from conceptualisation to execution and propelling investments in technology to enable seamless customer transactions. Simultaneously, it has been making efforts to address security concerns. This, along with rising internet penetration, increasing usage of cards and e-commerce, acceptance and adoption of various payments infrastructure with merchants and customers, launch of the digital rupee and changing consumer behaviour, is expected to drive the growth of digital transactions in the country.

Value of digital payments



P: Projected

*Note: Digital payments from fiscal 2020 onwards (as reported by the RBI) include RTGS payments, credit transfers (AePS, APBS, ECS Cr, IMPS, NACH, NEFT), debit transfers (BHIM, ECS Dr, NACH Dr, NETC), card payments (debit and credit cards), and prepaid payment instruments (PPIs). *The RBI changed its reporting format in fiscal 2020, hence, for fiscals 2017-19, the number is calculated based on segregated RBI payments data. It includes RTGS (customer and interbank transactions), retail electronic clearing (ECS Dr, ECS Cr including NECS, EFT/NEFT, IMPS, NACH), cards (credit and debit cards), PPIs (m-Wallet, PPI cards) and mobile banking.*

3 Overview of the global telecom industry

A consolidated industry, driven by economies of scale

The telecom industry is capital intensive and highly competitive. Players undertake mergers and acquisitions (M&As) to not only survive but also upgrade technologically, expand the customer base and widen product diversification. Acquisitions in the sector primarily involve horizontal integration as the companies aim to gain competitive advantage by acquiring competitors. Fewer market players lead to economies of scale and reduction in the overlapping infrastructure. This lowers operational expenses and allows more efficient use of capital investments. In most key countries, 2-5 telecom companies dominate the sector. A few examples are tabled below.

Countries	Top telecom companies
Australia	Telstra, Optus, TPG Telecom, Superloop, Macquarie Telecom Group
Brazil	Claro, Telefônica, TIM
China	China Mobile, China Telecom, China Unicom
France	Orange, SFR, Bouygues Telecom, Free Mobile
Germany	Deutsche Telekom, Vodafone, O2 Telefónica
Japan	NTT DOCOMO, KDDI Corp, Softbank Corp, Rakuten Inc
Hong Kong	China Mobile Hong Kong, Hong Kong Telecommunications, SmarTone Mobile, Hutchison Telephone, 21 ViaNet
India	Bharti Airtel, Reliance Jio, Vodafone Idea, BSNL, MTNL
Spain	Vodafone Spain, Orange Spain, Movistar Telefónica, Yoiga
United States	Verizon, AT&T, T-Mobile
Middle East	Emirates Telecommunications Corporation, Emirates Integrated Telecommunications Company PJSC, Saudi Telecommunication Company (STC), Etihad Etisalat (Mobily), Zain

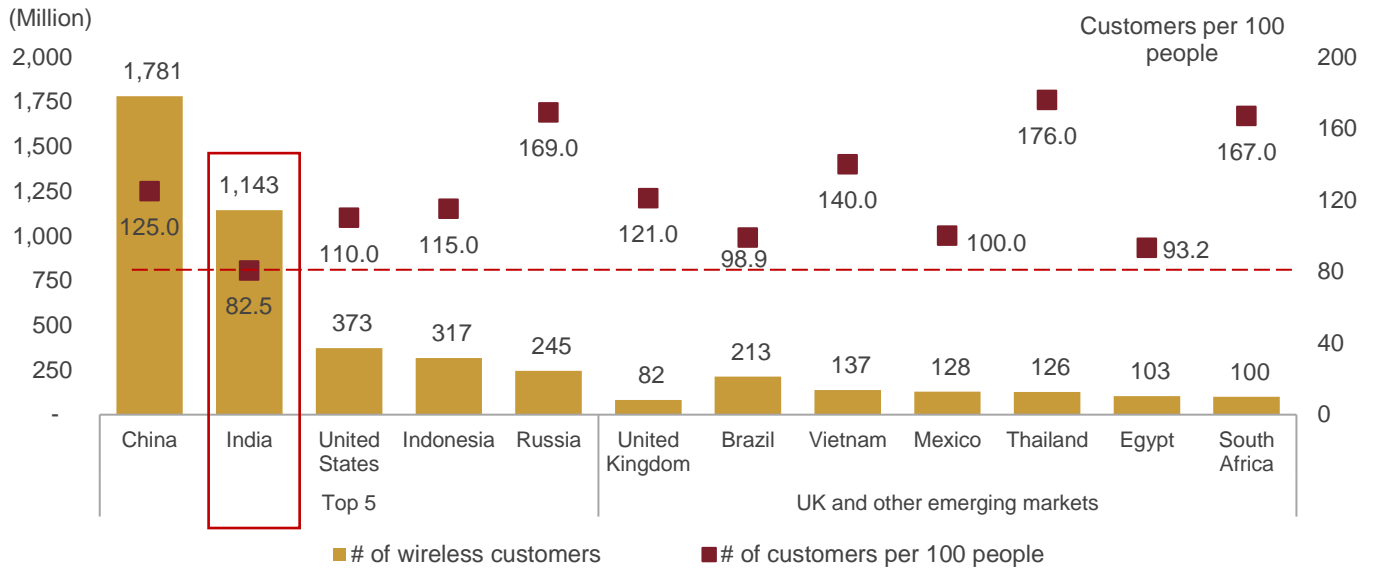
Source: Secondary research, CRISIL MI&A

China and India are the top two telecom markets by customer base

China is the largest telecom market, with 1,781 million wireless customers as of 2022. India follows with 1,143 million wireless customers as of 2022.

India has emerged as one of the five fastest-growing wireless telecom markets, with its customer base clocking 2.9% CAGR between calendar years 2013 and 2022. However, at 82.6 as of 2022, India's wireless customers per 100 people is the lowest among the top five wireless markets as well as among emerging markets, indicating potential for further growth.

Mobile telecom customers – India is among the largest telecom markets



Source: International Telecommunication Union (ITU), CRISIL MI&A

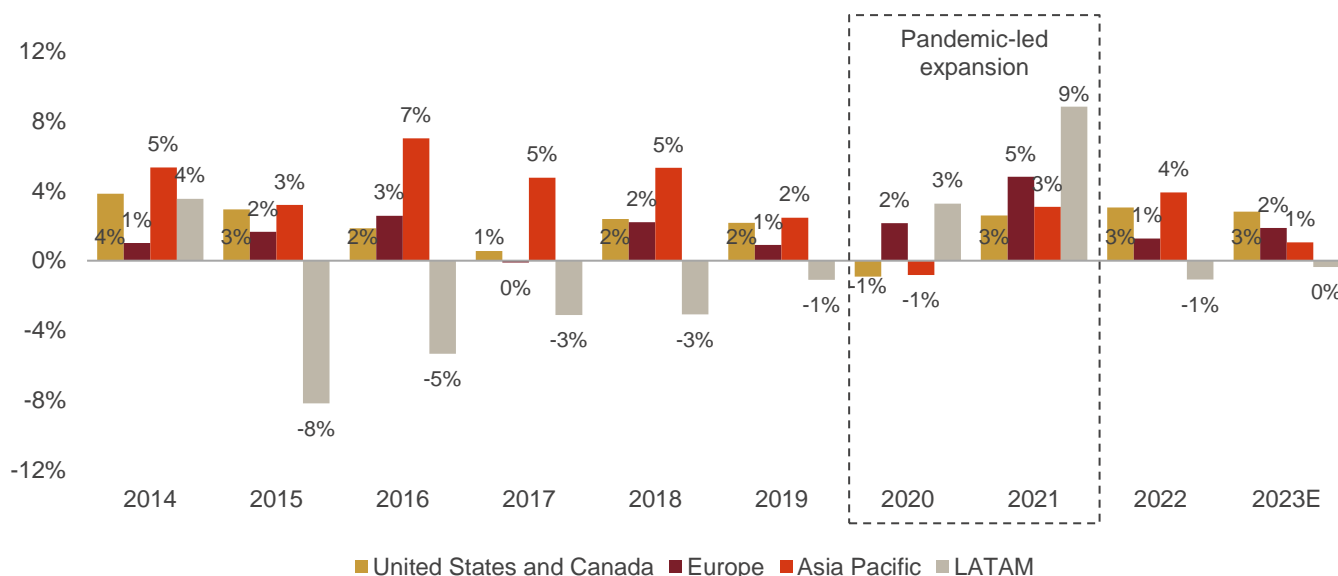
Mobile telecom customers – India registered healthy growth among global peers

Countries	Penetration (per 100 people)				Wireless customers (million)		
	Fixed telephone customer	Fixed broadband customer	Individuals using Internet	Mobile wireless customer	Telecom customers in 2013	Telecom customers in 2022	2013-2022 CAGR (%)
China	12.6	41.4	75.6	124.9	1,229.1	1,780.6	4.2%
Thailand	6.1	18.5	88.0	176.3	93.8	126.4	3.4%
South Africa	2.2	3.3	72.3*	167.4	76.9	100.3	3.0%
India	1.9	2.4	46.3*	82.5	886.3	1,142.9	2.9%
United States	27.1	37.6	91.8*	110.2	310.7	372.7	2.0%
Mexico	21.3	19.5	75.6*	100.3	106.7	127.9	2.0%
Russia*	16.4	23.7	90.4	169.0	218.3	245.3	1.3%
Vietnam	2.4	21.7	78.6	139.9	123.7	137.4	1.2%
Egypt	10.5	9.8	72.2	93.2	99.7	103.5	0.4%
Indonesia	3.1	4.9	66.5	114.9	313.2	316.6	0.1%
Brazil	12.7	21.0	80.5	98.9	271.1	212.9	-2.6%
UK	44.1	41.5	96.7*	120.8	78.7	81.6	0.4%

Note: * Data on individuals using the internet in the US, UK, South Africa, India and Mexico is for 2021. Data for Russia is for 2021. ITU calculates individuals using internet taking into account the teledensity to avoid double counting of multiple mobile SIM users.

Source: ITU, World Bank, CRISIL MI&A

Global mobile customers' year-on-year growth



E: Estimated
Source: CRISIL MI&A

Mobile data traffic has increased exponentially in the last 10 years

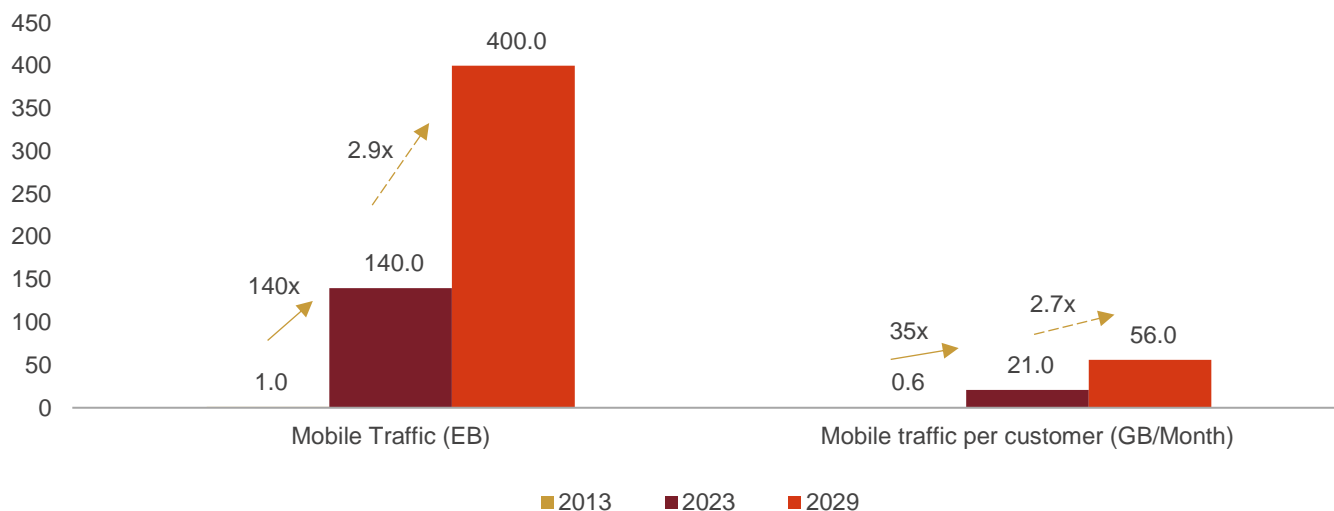
Growth in the digital economy has encouraged people to rely more on digital applications for commonplace activities, leading to rise in mobile users and data consumption. Overall mobile customers' growth has been in the range of 2-4% CAGR across regions during the last 10 years. However, growth was higher during the pandemic.

Global mobile traffic per customer increased from 0.6 GB/customer/month in 2013 to 21.0 GB/customer/month in 2023, logging 35x growth in data consumption. The Ericsson Mobility Report estimates an increase of 140x in mobile traffic over the past decade as global mobile data traffic increased from 1 exabyte (EB)/month in 2013 to 140+ EB/month in 2023. Factors driving data traffic growth in mobile networks include ever-increasing demand for online digital services, 4G/5G deployment across telecom markets, increased network capacity with new generation of mobile technology, improved quality of experience and affordable plans. In 2023, ~73% of the downlink data was consumed for digital video content across platforms.

Global mobile data traffic is expected to cross 400 EB/month by 2029⁶. Long-term data traffic growth is driven by rise in smartphone customers and increasing average data consumption per customer, which are fuelled by increased viewing of video and over-the-top (OTT) content, video-calling, usage of cloud storage, e-commerce shopping, social media and app consumption, digital financial transactions and e-learning.

⁶ Ericsson Mobility Report 2023

Global mobile data consumption growth



Source: Ericsson Mobility Report 2023, CRISIL MI&A

Heading towards 5G

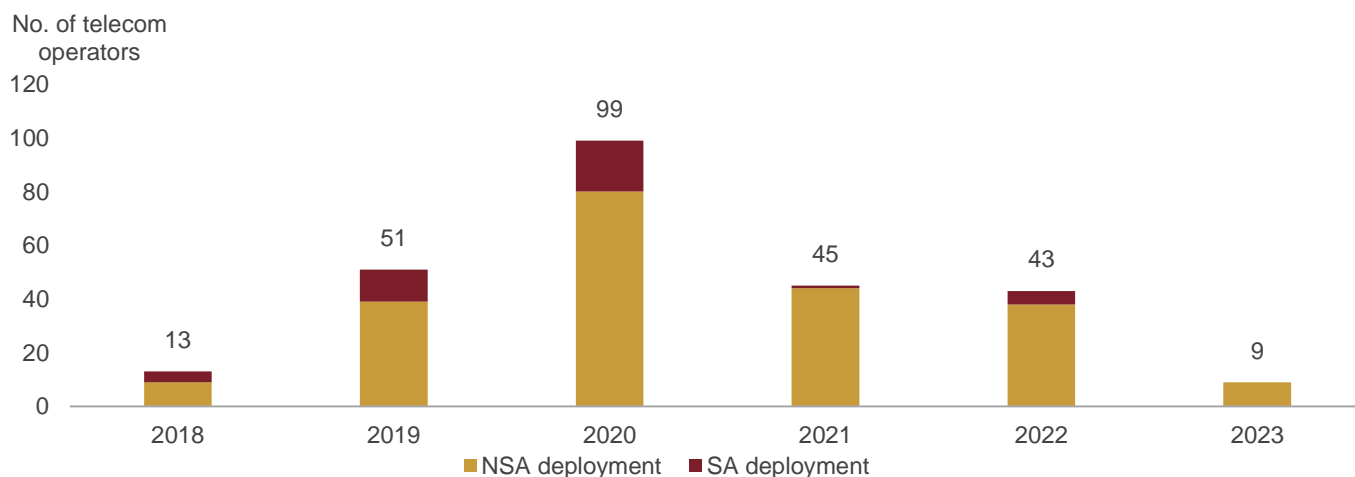
The digital world is moving towards 5G data. After the rollout of 4G services in 2010, many global markets have transitioned to 5G services starting 2019, with the total number of operators with active commercial 5G services at 249 across 97 markets as of August 2023.

For 5G services, telecom companies have two deployment options — non-standalone (NSA) and standalone (SA). NSA has been the widely chosen network architecture, as ~85% of telecom operators worldwide initiated 5G deployment based on the NSA architecture.

However, in select markets, such as the US and China, operators are exploring and transitioning to SA. As of June 2023, at least 57 operators in 33 markets worldwide have activated 5G SA networks according to S&P Global Market Intelligence 5G tracker. Other markets, though, are yet to follow, as 5G adoption is limited to few applications.

Nevertheless, 5G is still in an infancy stage in terms of monetisation and maturity of use cases.

5G deployment – NSA and SA



Source: News articles, company filings, CRISIL MI&A

Global telecom industry leveraging on 5G to carve out new revenue streams

The mobile telecom industry is now a key cog of businesses following the proliferation of internet of things (IoT) and smart devices. In fact, advances in mobile technologies such as 5G and edge computing will only deepen this link, driving new applications in automotive connectivity and solutions by enterprises, as well as in the consumer retail and financial sectors.

Higher bandwidth and gigabit-speed networks have prompted significant changes and introduced opportunities for operators to effectively position their mobile business, even though demand for 5G remains nascent. Operators are, in fact, leveraging 5G to carve out new revenue streams. Private 5G networks, network slicing and edge computing are some of the new technologies enabling this transition.

On the demand front, realisation of 5G use cases is expected over time. Voice over long-term evolution, for instance, took almost five years after the commercialisation of 4G — even 10 years in some international markets. A similar trend is expected in 5G. Ultra-high definition streaming, 3D video, augmented reality/virtual reality, autonomous driving, connected ambulance and remote surgery are representative use cases of 5G that were stated in ITU-R's 5G Vision Recommendation, but have not yet become mainstream. Demand for 5G will pick up with development and mainstreaming of the 5G ecosystem.

Some of the 5G use cases being tested globally include:

Connected ambulance: Technological innovations like the 5G-connected ambulance are letting medical staff help patients before they reach the hospital. 5G connectivity and the latest medical technologies allow medical staff to share patient's vitals and symptoms in real-time with the hospital. High-resolution video calling between the ambulance and hospital gives doctors a better understanding of the kind of emergency involved, aiding timely patient care.

Connected traffic system: Ecosystem of connected cars with traffic system can provide information that can be used to warn the users of congested traffic, incidents, and other hazards that they might be heading towards. This can be enabled through dynamic data exchange between vehicles and traffic systems using 5G connectivity. This can help to improve safety and drive energy efficiency.

4 Assessment of the Indian telecom industry

Telecommunication has been playing a pivotal role in country's economic growth. It is the backbone of many industries, including e-commerce, media and entertainment, finance, information and technology (IT), healthcare, transportation, and logistics. The sector facilitates seamless movement of data worldwide through wired or wireless channels and significantly influences economic progress. The telecom market is constantly evolving with integration of cutting-edge technologies over the years. This has widened the coverage of telecom services globally and made them an indispensable part of the daily lives of consumers. Telecom proved to be an essential service, especially during the Covid-19 pandemic, by enabling people to remain connected amid worldwide lockdowns.

The telecom industry mainly comprises wireless services, or mobile services, and wireline services, or fixed-line services. In India, wireless services accounted for 97.4% of total telecom customers and wireline services for the remaining 2.6% as of the first half of fiscal 2024.

Telecom sector is characterised by high entry barriers

A regulated environment, high capital requirements and dominance of existing players in a consolidated market deter new players from entering the telecom industry.

Spectrum is regulated and available through DoT auction

In India, spectrum auctions are held for 22 telecom circles and a telecom company needs to acquire spectrum in each circle to provide comprehensive coverage to its consumers. Operators also need to acquire a unified license with authorisations for access services in each circle before they participate in auctions. So, if a new telecom company plans to launch services in a particular region, it will have to buy both spectrum and a licence for the entire circle. Further, it would have to either wait for spectrum auction or acquire a telecom company with a spectrum portfolio. Currently, acquisition costs are prohibitive given significant consolidation in the domestic industry.

High capital investments vital for sustaining telecom services

Telecom players require substantial capital to purchase spectrum through government auctions and establish and maintain their network infrastructure. Further, the telecom industry remains susceptible to rapid technological changes, necessitating fresh investments or significant overhaul of existing networks.

The industry spent Rs 1,500 billion during the 5G auction in 2022, with Reliance Jio, Bharti Airtel and Vodafone Idea accounting for Rs 800.8 billion, Rs 430.4 billion and Rs 188.0 billion, respectively. Further, Indian telecom operators have spent nearly Rs 3,000 billion since 2014 to acquire spectrum across various bands.

The telecom sector has low average asset turnover ratio of 0.3 times (fiscals 2020-23), indicating high capex requirements on a sustained basis. Capex intensity is high and estimated at ~30% of total revenue in fiscal 2023 and ~25% in fiscals 2024 and 2025.

Even network opex was 25-30% of revenue based on data collated for industry players over fiscals 2021-23. Thus, the telecom industry's high capital intensity acts as a strong entry barrier for new entrants.

Hurdles in establishing network coverage across India and competing with established players

India's vast landscape and rugged terrain make the process of setting up infrastructure extremely complex and expensive. Hence, new players will face several challenges in matching the coverage of established companies. A new

telecom player would face many roadblocks while establishing network coverage across India. The cost per customer is higher in rural areas than urban areas due to low population density.

Economies of scale important for survival and profitability of players

Given low average revenue per user (ARPU) compared with other similar markets, achieving economies of scale becomes essential for survival in the Indian telecom sector. The capital-intensive nature of the industry, high network deployment costs and significant investments on infrastructure development would deter a new telecom company unless it has a large customer base to justify the returns.

Consolidated market creates significant entry barriers for new entrants

The top three players, viz. Reliance Jio, Airtel and Vodafone Idea, accounted for ~92% of total wireless customers and ~95% of the industry’s wireless revenue as of the first half of fiscal 2024. While Bharti Airtel and Vodafone Idea have been longstanding players in the Indian market, Reliance Jio disrupted the telecom landscape after its entry in 2016. These telecom giants, with nationwide coverage, are aggressively competing to increase their customer base and expand their network. They are strategically targeting the vast non-4G customer base in rural areas using legacy feature phones which is estimated at ~250 million. Thus, competition extends beyond customer acquisition, and includes content bundling, collaboration with smartphone manufacturers for budget-friendly devices, and intensified sales efforts through distribution channels. For a new entrant, competing against these established players is exceedingly challenging, given their extensive coverage, robust infrastructure, comprehensive spectrum portfolios, and understanding of the Indian telecom customer landscape.

Indian wireless telecom market is consolidated in line with global peers

In fiscal 2014, 14 players — Bharti Airtel, Idea Cellular, Vodafone India, BSNL, MTNL, Reliance Communications, Reliance Telecom, Tata Teleservices, Telewings Communications Services, Aircel Cellular, Sistema Shyam (MTS), Videocon Telecommunications, Loop Mobile and Quadrant (HFCL) — had cellular mobile service licence from the Department of Telecommunications (DoT). The price war in the telecom industry, which started in late-2016, led to a sharp reduction in data tariffs along with voice calls being nearly free. Small players were the worst hit, given their limited financial strength, forcing them to either exit or merge with large players.

As of the first half of fiscal 2024, there were five service providers in the Indian telecom market, of which two were public sector units (PSUs) — Bharat Sanchar Nigam Ltd (BSNL) and Mahanagar Telephone Nigam Ltd (MTNL). The top three players — Bharti Airtel, Reliance Jio and Vodafone Idea — held ~92% customer share in the Indian wireless telecom market, leading to an oligopolistic industry (the share of the two PSUs is meagre), in line with the global trend. China, Germany and the UK have just three telecom players each.

Wireless access service providers in India

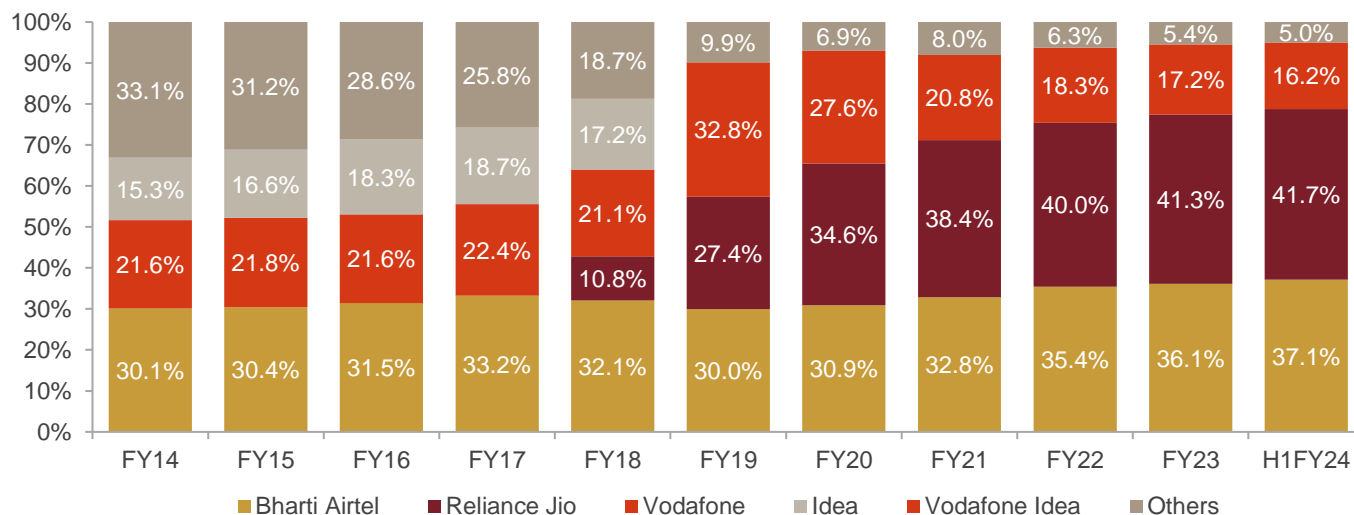
S. no.	Service provider	Licensed service areas	Wireless customers (1H FY24) (million)
1	Reliance Jio Infocom Ltd	All India	449.2
2	Bharti Airtel Ltd	All India	377.8
3	Vodafone Idea Ltd	All India	227.5
4	BSNL (PSU)	All India (except Delhi and Mumbai)	93.7
5	MTNL (PSU)	Delhi and Mumbai	2.0
6	Reliance Communications Ltd	All India (except Assam and Northeastern states)	0.0 ¹

Note: ¹As of September 2023, Reliance Communications had 2,384 wireless customers. On account of a negligible number of customers of Reliance Communications, the Indian telecom market is considered to be a five-player market

Source: DoT website, CRISIL MI&A

Since fiscal 2018, post the entry of Reliance Jio, revenue market share (RMS) of the top two players at a pan-India level has been improving and by the first half of fiscal 2024, it has reached 78.8% from 42.9% in fiscal 2018. This indicates greater consolidation of market share with the top two players. Reliance Jio held RMS of 41.7% and Bharti Airtel 37.1% as of the first half of fiscal 2024 among the mobile telecom operators in India.

Telecom RMS: (wireless + wireline)

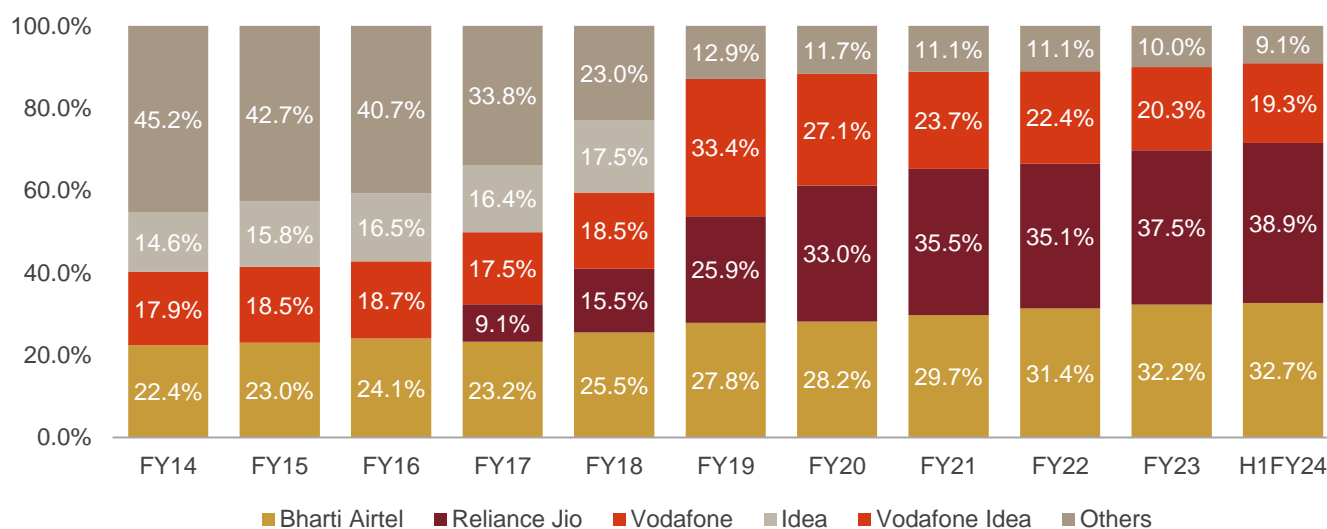


Note: RMS calculated on adjusted gross revenue of telecom operators offering mobile telecom services. Adjusted gross revenue reported by player with TRAI may include revenue from wireline, broadband, FTTH and other telecom services. Vodafone and Idea merged in FY19.

Source: CRISIL MI&A

At the all-India level, Reliance Jio held a total customer market share (CMS) of 38.9% and Bharti Airtel had 32.7% as of the first half of fiscal 2024. Both have gained CMS at the expense of PSUs and Vodafone Idea. CRISIL MI&A expects the trend to continue in the near future. With consolidation, telcos will be inclined to increase tariffs.

Telecom CMS: (wireless + wireline)



Note: Reliance Jio took over wireless assets and customers of Reliance Communications (Reliance Infratel Ltd) in FY18. Due to Reliance Communications' low CMS (0.01% of total customers in FY23), it has been considered in others. Vodafone and Idea merged in FY19. Others include Reliance Communications, BSNL and MTNL as wireless operators, and Tata Tele. Quadrant, V-CON Mobile & Infra Pvt. Ltd., APSFL as wireline operators for FY23. In FY14, others include Reliance, Aircel, Tata, BSNL, MTNL, Telego Communications Services, Sistema Shyam (MTS), Videocon Telecommunications, Loop Mobile, Quadrant (HFCL) as wireless operators and BSNL, MTNL, Reliance, Tata, Quadrant and Sistema as wireline operators.

Source: TRAI, CRISIL MI&A

Reliance Jio has the highest wireless market share across 15 of the 22 circles, followed by Bharti Airtel, which has the highest wireless market share in 6 of the 22 circles, including the Northeast circle as of the first half of fiscal 2024, in terms of RMS.

Reliance Jio has the highest wireless market share across 12 of the 22 circles, followed by Bharti Airtel, which has the highest wireless market share in 9 of the 22 circles, including the Northeast circle as of the first half of fiscal 2024, in terms of CMS.

India has potential to further deepen telecom penetration

India is the second largest telecom market globally, with 1,143.9 million wireless customers in fiscal 2023, behind China with 1,781 million wireless customers in 2022. India has emerged as one of the fastest growing wireless telecom markets among the top five and other emerging global markets. The number of wireless telecom customers in the country increased at a CAGR of ~2.6% between fiscals 2014 and 2023 to 1,143.9 million (2.9% CAGR between calendar years 2013 and 2022).

In fiscal 2023, at 82.5 customers per 100 people, India's wireless teledensity is the lowest among the top five wireless markets in the world as well as among emerging markets. Even India's telephone and fixed broadband customers at 1.9 and 2.4 per 100 people, respectively, are much lower than those in other large economies. The under-penetration of telecom services implies potential for growth, especially in rural areas, supported by projected growth of the Indian economy and per capita income. In urban areas, data consumption beyond mobility is driven by an increase in connected home devices, connected automobiles and other Internet of things (IoT) applications, further supporting both wireless and wireline broadband customers.

Potential for price increases given under-indexation of Indian players versus global peers

India and China have the lowest tariffs in absolute dollar terms compared with other comparable economies. China has the lowest fixed broadband basket price (at least 5 GB) at \$4.5 per month, while India at \$5.0 per month, offers unlimited data. India has the lowest price for mobile telecom, at \$2.0, among peers such as China (\$6.2), Thailand (\$10.7) and Vietnam (\$2.3), indicating headroom for improvement in ARPU in India in line with growth in per capita income. In terms of percentage of gross national income (GNI) per capita (PPP), the telecom tariff is around 0.05% for China compared with 0.09% for India. Hong Kong has the lowest telecom price tariffs for mobile data as a percentage of GNI per capita (PPP), at 0.01%.

Price baskets/tariffs of various telecom services across countries

Countries	Fixed broadband basket (5 GB) (\$)	Data-only mobile broadband basket (2GB) (\$)	Mobile data and voice		For mobile data and voice low-consumption basket (PPP % per capita)
			High consumption basket (140 min + 70 SMS + 2 GB) (\$)	Low-consumption basket (70 min +20 SMS + 500 MB) (\$)	
China	4.5	4.5	10.0	6.2	0.05%
Thailand	18.6	7.4	15.8	10.7	0.15%
South Africa	21.2	9.6	19.0	8.6	0.12%
India	5.0	2.0	2.0	2.0	0.09%
The US	54.4	43.5	43.6	43.6	0.06%
Mexico	17.4	10.0	10.0	10.0	0.08%
Russia	7.5	7.4	7.4	7.4	0.05%
Vietnam	7.8	1.1	2.8	2.3	0.05%
Egypt	7.4	2.7	4.3	2.3	0.07%
Indonesia	21.0	3.8	5.8	4.4	0.09%
Brazil	20.3	3.7	6.1	6.1	0.07%
The UK	41.4	12.6	12.6	12.6	0.02%
Hong Kong	21.4	5.4	9.5	6.9	0.01%

Source: ITU, CRISIL MI&A

Indian telecom industry growth is led by wireless services

At 1,150.2 million as of the first half of fiscal 2024, wireless telecom customers accounted for 97.4% of the total telecom customers of 1,181.1 million.

The number of wireless telecom customers rose from 904.5 million in fiscal 2014 to a high of 1,183.4 million in fiscal 2018 before falling to 1,157.7 by fiscal 2020 due to closure of inactive SIMs and deactivation of SIMs that were not linked with Aadhaar. Additionally, an increase in base (entry-level plans) tariff rates by telcos made owning multiple SIMs an expensive proposition for customers, leading to SIM consolidation. Also the number of customers temporarily declined during the first pandemic wave as urban areas lost 18 million customers, while rural areas gained 3 million. As lockdowns eased, the customer base recovered and exceeded pre-pandemic levels, reaching 1,181.0 million by the end of fiscal 2021. Urban areas contributed significantly to this growth as remote work, e-learning and other online services became widely prevalent.

Wireless customers fell to 1,142.1 million in fiscal 2022, led by SIM consolidation, followed by a modest increase of 0.17% to 1,143.9 million in fiscal 2023 and 1,150.2 in the first half of fiscal 2024. The impact of SIM consolidation diminished by the end of fiscal 2023, resulting in a positive upswing in wireless numbers. However, the overall increase was constrained by inflationary pressures.

Telecom customers in India

Customers (million)	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	H1 FY24	CAGR FY14-FY23	
Total customers	933.0	996.5	1058.9	1194.6	1206.2	1183.5	1178.0	1201.2	1166.9	1172.3	1181.1	2.6%	
Wireless	Customers	904.5	969.9	1033.6	1170.2	1183.4	1161.8	1157.7	1181.0	1142.1	1143.9	1150.2	2.6%
	% of total customers	96.9%	97.3%	97.6%	98.0%	98.1%	98.2%	98.3%	98.3%	97.9%	97.6%	97.4%	-
Wireline	Customers	28.5	26.6	25.2	24.4	22.8	21.7	20.2	20.2	24.8	28.4	31.0	0.0%
	% of total customers	3.1%	2.7%	2.4%	2.0%	1.9%	1.8%	1.7%	1.7%	2.1%	2.4%	2.6%	-
Rural	Customers	377.7	419.3	449.2	501.6	524.6	514.4	521.5	537.4	519.8	518.6	522.7	3.6%
	Share	40.5%	42.1%	42.4%	42.0%	43.5%	43.5%	44.3%	44.7%	44.5%	44.2%	44.3%	-
Urban	Customers	555.3	577.2	609.7	693.2	681.6	669.2	656.5	663.8	647.1	653.7	658.5	1.8%
	Share	59.5%	57.9%	57.6%	58.0%	56.5%	56.5%	55.7%	55.3%	55.5%	55.8%	55.7%	-

Source: TRAI, CRISIL MI&A

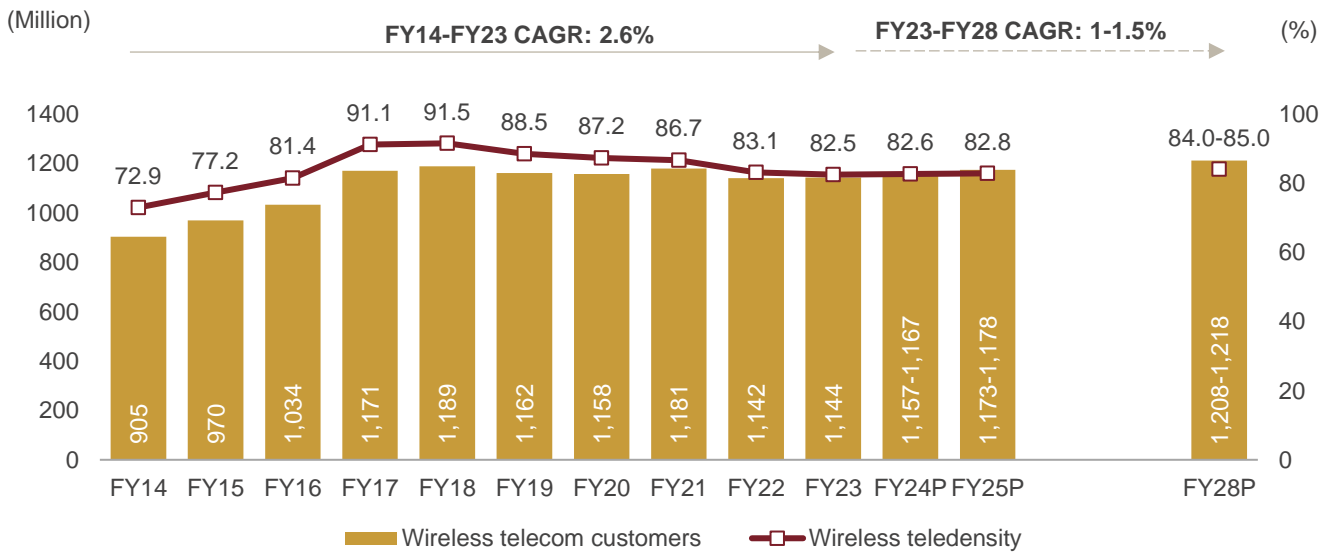
Wireless services have become the preferred choice because of their convenience and lower cost, resulting in a stagnation in the wireline customer base. Notably, wireline services are more popular among the urban milieu. The number of wireline customers declined year-on-year from fiscal 2014 to fiscal 2019. Thereafter, the trend reversed due to an increase in wired broadband penetration amid the pandemic. This was fuelled by the bundling of wired broadband, digital TV content/digital cable and wireline telephone services. As a result, the number of wireline customers reached 28.4 million in fiscal 2023 and 31.0 million in the first half of fiscal 2024.

Urban telecom customers have maintained their dominance, capturing a 55.7% share in the first half of fiscal 2024 compared with 59.5% in fiscal 2014.

Expansive coverage and smartphone penetration to support growth in wireless services

CRISIL MI&A projects the number of wireless customers to clock a CAGR of 1-1.5% between fiscals 2023 and 2028, driven by higher smartphone penetration, increased affordability of mobile phones, and continued demand for data and telecom services. Wireless teledensity, defined as the number of mobile/ wireless connections for every hundred individuals living within an area, stood at 82.5% as of fiscal 2023 and as of first half of fiscal 2024. Wireless teledensity is expected at 84.0-85.0% as of fiscal 2028, driven by telcos' investments in expanding coverage and the increase in smartphone penetration, particularly in rural areas.

Wireless telecom customer base



P: Projected

Source: TRAI, CRISIL MI&A

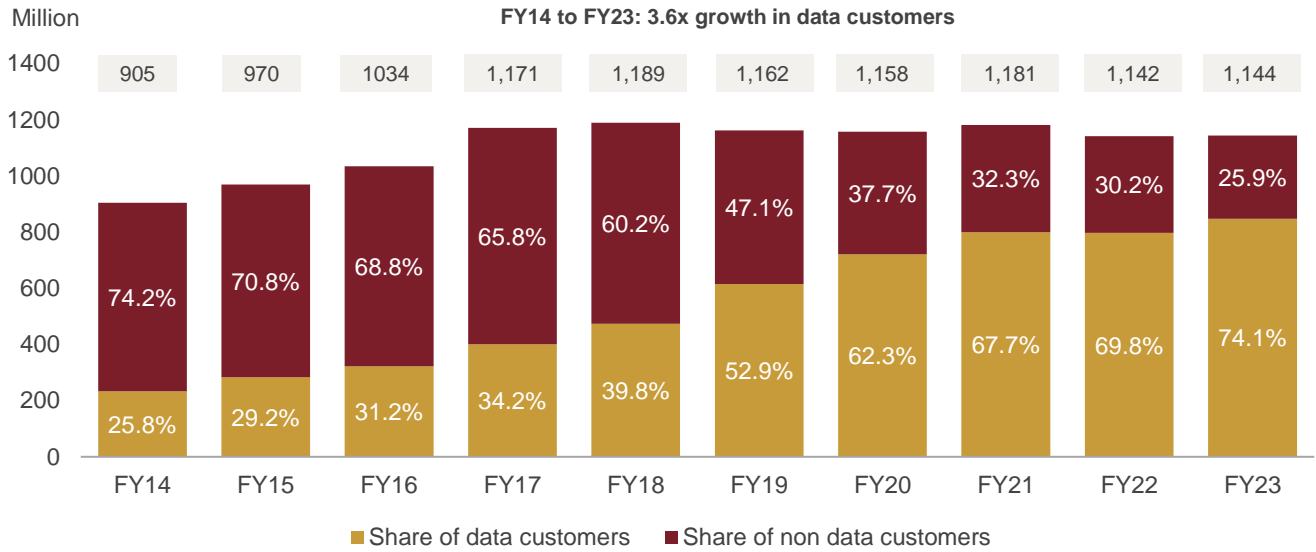
Data users and consumption grew multifold over the past decade

The number of internet or data customers surged 3.6x to 847 million in fiscal 2023 from 233 million in fiscal 2014, registering a CAGR of 15.4%, propelled by a sharp decline in tariffs. Subsequently, the share of data customers soared to 74.1% from 25.8%. Data cost per customer declined from ~Rs 270 per GB in fiscal 2014 to Rs 9.9 per GB in fiscal 2023, driven by a drastic reduction in data tariffs. The increasing affordability of smartphones, coupled with a subsequent increase in smartphone adoption, also supported the rise in data consumption. Smartphone penetration increased from less than 10% in fiscal 2014 to 64% in fiscal 2023. Smartphone sales are estimated to have increased from ~80 million units in fiscal 2013 to peak in the range of 150-160 million units in fiscal 2021, clocking a CAGR of 9.0-10.0%. In fiscal 2023, sales are estimated to have moderated to 130-140 million units on account of a longer replacement cycle among existing smartphone users.

The growth in data customers also increased internet penetration as a percentage of the total population, from 20.3% as of fiscal 2014 to 63.5% as of fiscal 2023.

In fiscals 2024 and 2025, CRISIL MI&A expects consistent growth in data customers due to ongoing technological upgrades, proliferation of smart devices (such as smartphones), increased internet usage, and gradual transition of non-data users towards data-based services. Furthermore, the affordability of data packages will expand the accessibility of data services to a wider demographic.

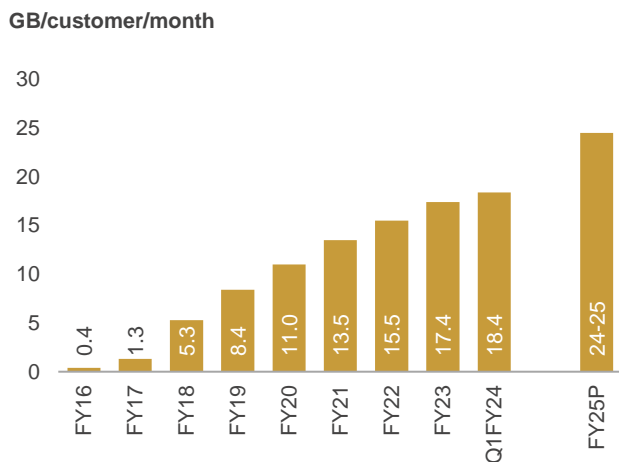
Share of data and non-data customers in the wireless telecom customer base



Source: TRAI, CRISIL MI&A

Average data usage increased from ~0.4 GB/customer/month in fiscal 2016 to 17.4 GB/customer/month in fiscal 2023 and 18.4 GB/customer/month in the first quarter of fiscal 2024, driven by higher demand for data for video and music content, social media engagements, video calling, and sustained adoption of hybrid work-from-home and study-at-home practices. The expansion of 4G networks in rural areas and a steep decline in data tariffs also contributed to the increase in data usage.

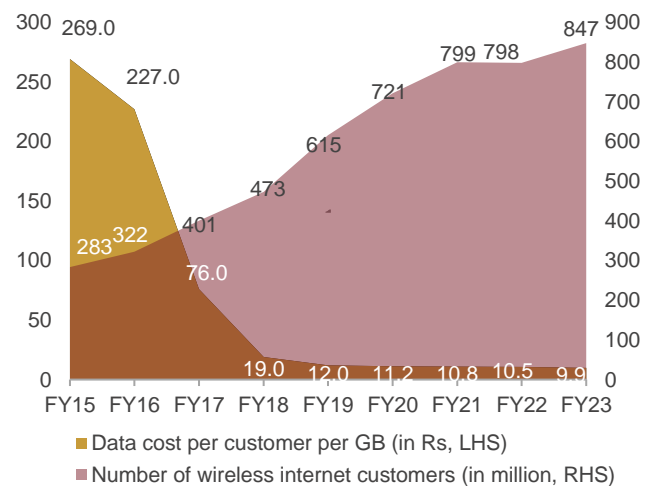
Blended average data usage per customer



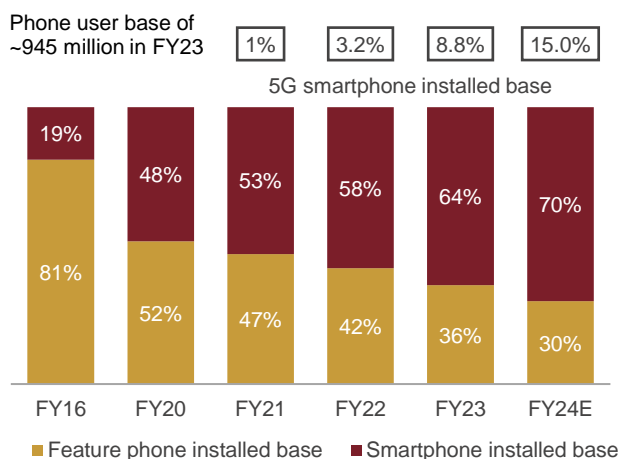
P: Projected

Source: TRAI, company reports, CRISIL MI&A

Jump in internet penetration driven by price drop



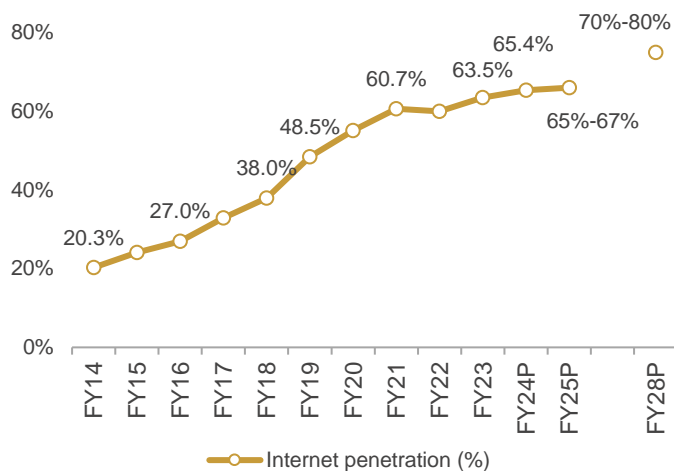
Smartphone share in the Indian mobile market



E: Estimated

Source: Publicly available data on smartphone and mobile shipments through various research agencies, CRISIL MI&A

Wireless internet penetration in India



P: Projected

Source: TRAI, CRISIL MI&A

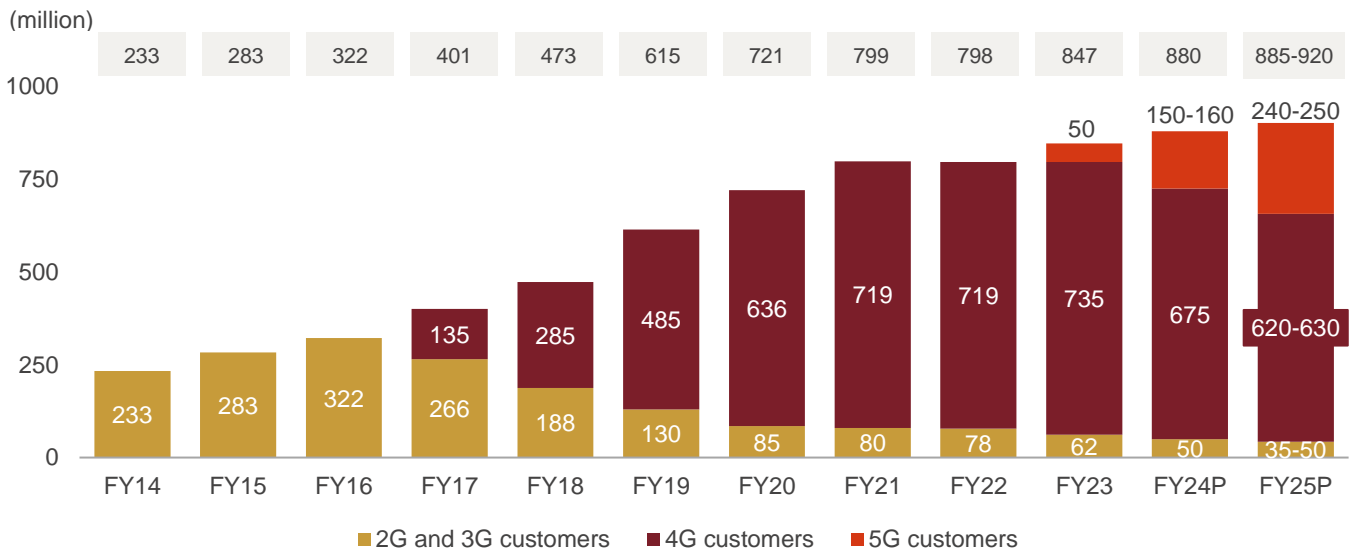
India is among the largest wireless data consumers in the world with highest average data traffic per smartphone. CRISIL MI&A expects average data usage to grow to 24-25 GB/customer/month by fiscal 2025, driven by an increase in social media content consumption, video calling, gaming, and extensive mobile content consumption. Availability of high-speed internet in rural areas with the expansion of network coverage by telcos and a rise in smartphone penetration and usage will further support growth in data traffic. This growth in data will be accompanied by increased usage across various sectors, including entertainment, education, banking, healthcare, education and retail.

5G adoption to rise, fuelled by affordable 5G device options

CRISIL MI&A forecasts the number of 4G customers to reach ~675 million this fiscal, constituting ~77% of the internet customer base. The 5G customer base is expected to grow, with the pace of conversion largely influenced by affordable pricing of 5G devices and continued handset replacement cycle. Offering 5G introductory services for free allows customers to experience high-speed data. This encourages upgrades and plays a vital role in shaping the future trajectory of customers and data usage. Jio offers 5G free for active prepaid or postpaid plans of Rs 239 or above. Airtel offers 5G free to all postpaid customers and to prepaid customers with unlimited packs starting from Rs 239.

In fiscal 2025, CRISIL MI&A projects 65-70% of total users to be on 4G and ~27% to be 5G-enabled, primarily in urban markets, surpassing 240-250 million users. Only a small fraction of data users will continue to rely on legacy 2G and 3G networks.

Number of customers across 2G/3G/4G/5G data



Note: Operators launched 5G services in Oct 2022. Number of 5G customers are catching-up as users adopt 5G-enabled smartphones and 5G coverage becomes more ubiquitous. The number of 5G customers could differ as 5G coverage may be intermittent.
P: Projected

Source: TRAI, CRISIL MI&A

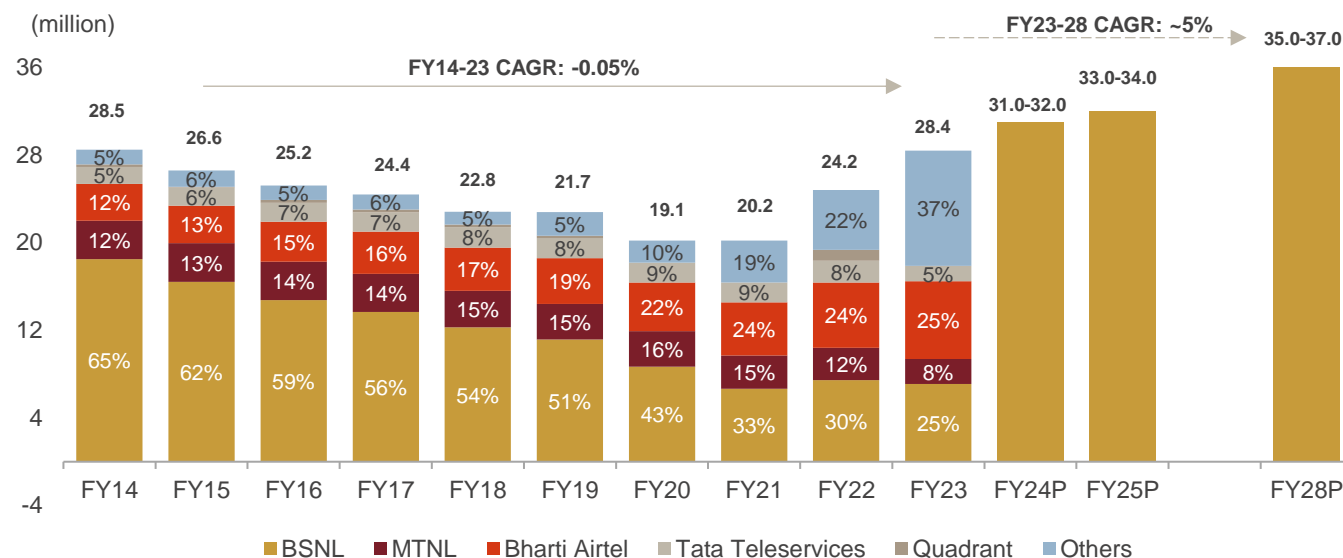
Wireline trajectory changing — telcos converge services with wireline connection

Mobile phones have gradually marginalised traditional landline phones in India. The number of wireline customers declined consistently from 28.5 million in fiscal 2014 to 19.1 million in fiscal 2020. Unlike mobile services that target mass markets, wireline companies have focused primarily on urban areas, with limited growth in small and medium enterprise clients.

Initially BSNL and MTNL and later Airtel and JioFiber offered bundled landline connections with fixed broadband. Thereafter, private players gained market share from the PSUs, especially during pandemic-induced lockdowns as customers favoured reliable wired internet connections and bundled services for work-from-home, online education and addressing content needs. Consequently, the wireline customer base remained stable at 20.2 million in fiscal 2021. From fiscal 2022, the wireline customer base expanded, to ~31.0 million by the first half of fiscal 2024, driven by the growing broadband customer base on account of the converged offering of broadband, mobile, OTT content, DTH service and wireline telephone connection. The converged solutions, including voice, video and data offerings, encourage users to opt for wireline telephone services with no additional charges.

In fiscals 2024 and 2025, the wireline segment will experience moderate demand following the strong growth run-rate seen in the last two years and increased usage of wireless communication alternatives. The number of wireline customers is expected to clock a CAGR of ~5% between fiscals 2023 and 2028, supported by converged offerings and broadband services. CRISIL expects broadband customers to log a CAGR of 5.2% between fiscals 2023 and 2026.

Wireline telecom customers in India



P: Projected

Note: For fiscal 2014, the others category includes Reliance Communications, Vodafone and Sistema. For fiscal 2023, the others category includes Reliance Communications, Vodafone Idea, and Reliance Jio

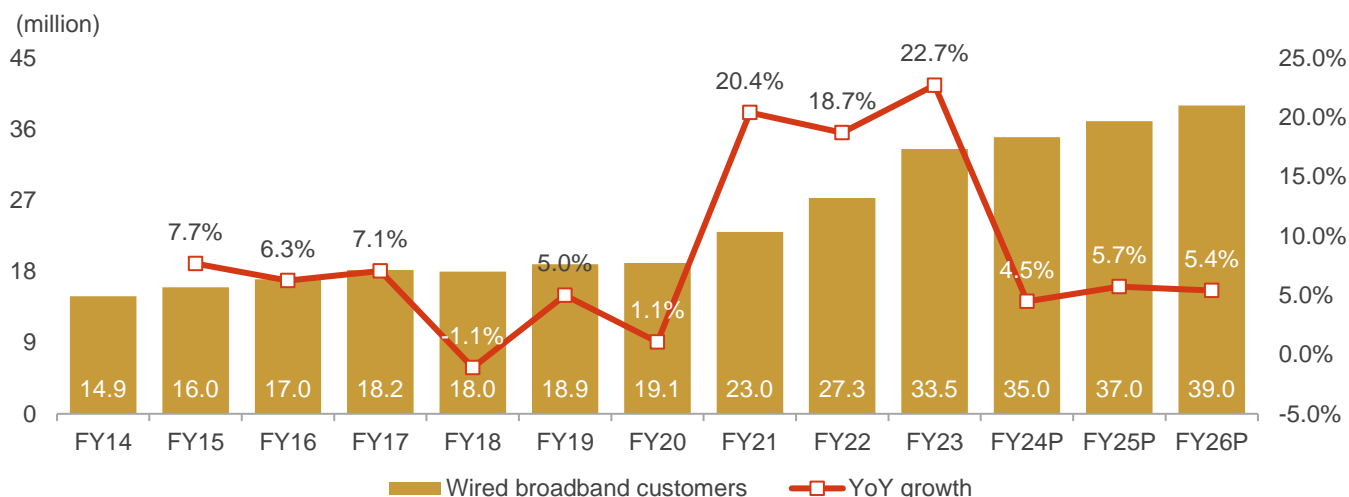
Source: TRAI, CRISIL MI&A

Wired broadband offers reliable internet

A wired network is a carrier of different forms of digital signals from one end to the other via a physical medium of cables (copper wire, twisted pair, or fibre optic). Wired broadband has high reliability, as the signal is conveyed directly through fibre cables or copper cables. However, wired network infrastructure installation is cumbersome, as it requires more time because of multiple compliances needed to secure Right of Way (RoW) permission. That said, wired broadband offers a consistent and reliable broadband experience to the users.

Wired-broadband customer penetration in India in fiscal 2023 was 8.9% of households, which is low compared with developed countries' average of 30-40%. It is significantly lower even when compared to some emerging countries, such as Brazil, China, Indonesia, and Russia. In terms of connections per population, wired broadband has a penetration of 2.4% in India. The low penetration can be attributed to the affordable wireless data tariffs in India, at \$2 for mobile data and low-to-high data consumption, compared with other global economies. In India, mobile broadband prices have been lower than those of wired broadband, so most of the internet consumption has been taking place via mobile phone. As highlighted in the tariffs table earlier in the report for telecom sector trends across countries, fixed-broadband package prices are higher than that of wireless mobile data. To attract wired broadband customers, players such as Reliance Jio and Bharti Airtel have kept entry-level broadband plans at Rs 399 and Rs 499, respectively.

Wired broadband customers



P: Projected

Source: TRAI, CRISIL MI&A

After the surge in demand during the pandemic, CRISIL MI&A expects the pace of wired-broadband customer base addition to moderate after fiscal 2023. Internet service providers and telcos have been acquiring new bandwidth and improving last-mile infrastructure to cater to various internet connectivity requirements.

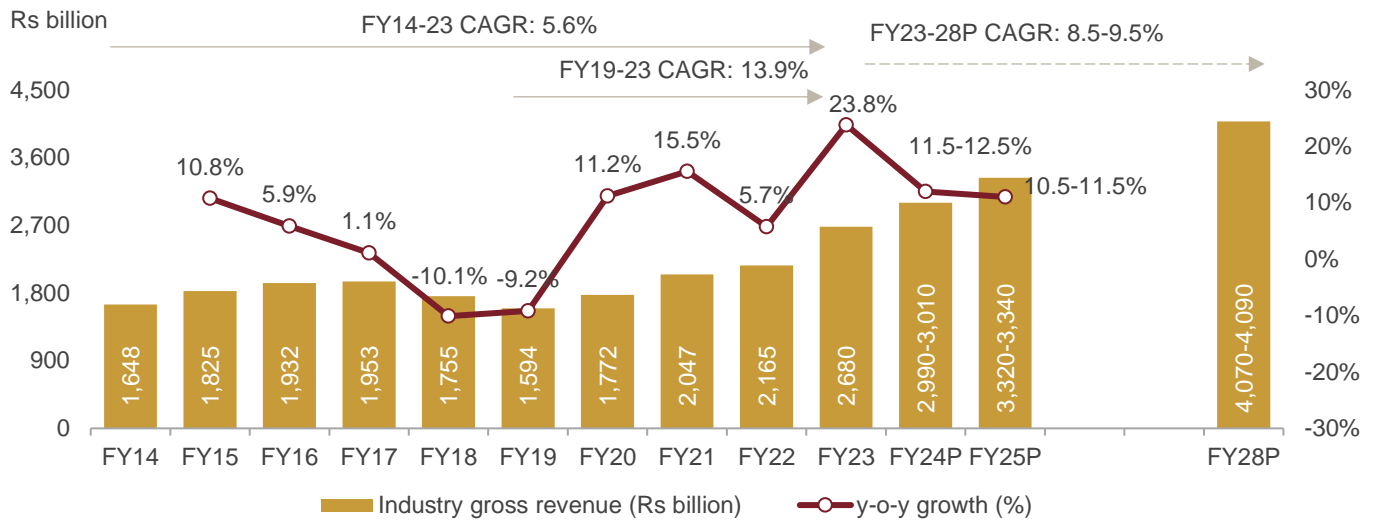
With concurrent connected devices at home, such as multiple smartphones, smart TVs, gaming devices, customer IoT, a reliable and seamless internet connection is needed to provide a high-speed data experience on all the devices. Driven by this consumption trend, CRISIL MI&A expects wired-broadband customers to grow from 33.5 million in fiscal 2023 to ~39 million in fiscal 2026, implying a CAGR of 5.2%. Despite its growing popularity, wired broadband remains largely an urban phenomenon, as ~95% of overall customers belong to the urban areas. Setting up last-mile infrastructure in rural areas is tedious and uneconomical for players because of low adoption rates.

Industry revenue CAGR of 8.5-9.5% likely over the next five years, driven by growth in data users and consumption

In fiscal 2023, the industry’s revenue grew 23.8% year-on-year, attributable to the full impact of the tariff increase that was put into effect in fiscal 2022. Revenue logged a 5.6% CAGR between fiscals 2014 and 2023 (compared with 13.9% between fiscals 2019 and 2023). During this time, the industry saw price wars as Reliance Jio entered the fray. That said, industry growth was supported by various structural and procedural reforms implemented by the government to promote healthy competition, encourage investment, reduce regulatory burden on telecom service providers (TSPs), and protect the interests of consumers.

Between fiscals 2023 and 2028, the telecom industry is expected to clock a CAGR of 8.5-9.5%. This growth will be driven by a 7.0-7.5% boost in ARPU, driven by higher data usage and tariff increase. Additionally, the higher penetration of 4G and 5G services than in fiscal 2023 will contribute to this growth. Furthermore, there will be a 1-1.5% expansion in the wireless customer base, because of the rise in penetration and demand from smartphones and home IoT demand..

Total gross revenue of the telecom industry in India, FY14 to FY28P



P: Projected

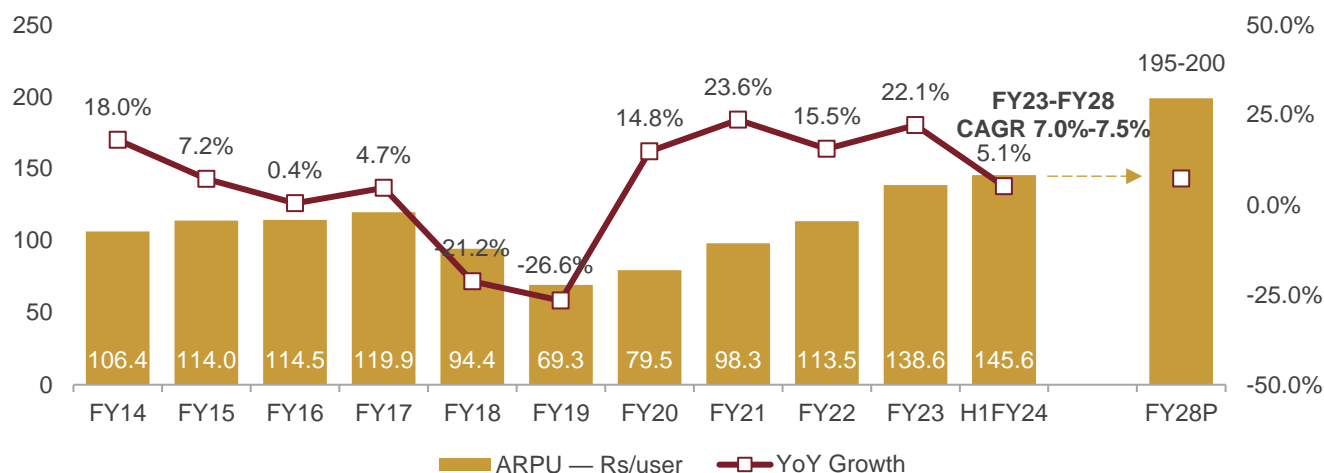
Source: TRAI, CRISIL MI&A

Wireless ARPU has seen strong growth since fiscal 2020 and is expected to witness continued moderate growth, driven by tariff increase and premiumisation

The telecom industry faced a severe price war after Reliance Jio's entry in late-2016, which led to a sharp decline in ARPU and data prices between fiscals 2017 and 2019. By fiscal 2019, the market had consolidated to five players, as weaker players exited. Thereafter, ARPU improved in fiscal 2020 to Rs 79.5, due to tariff hikes in November 2019 and the introduction of minimum recharge plans. Tariff hikes in December 2019 and later in December 2021 provided a major boost. Consequently, fiscal 2021 saw a 23.6% year-on-year rise in ARPU to ~Rs 98.3, driven by higher realisations owing to tariff hikes, continued upgrades of non-data to data customers. However, in fiscal 2022, the increase in ARPU slowed to 15.5% to ~Rs 113.5, influenced by the partial impact of tariff hikes implemented in November 2021. The industry's ARPU surged 22.1% to Rs 138.6 in fiscal 2023, driven by tariff increase and greater uptake of premium plans.

CRISIL MI&A expects higher data consumption, higher tariffs and premiumisation of existing data users to high-value packs to continue, thereby fuelling stronger ARPU CAGR of 7.0-7.5% between fiscals 2023 and 2028. Indian telecom tariffs are low in absolute terms as compared with other global comparable markets, which will support potential tariff hikes going forward. However, ascertaining the timing of tariff hikes is difficult. In the 4G/5G-driven market, focus is expected to be on market share rather than price wars..

Wireless telecom ARPU in India (Rs)



P: Projected

Note: TRAI reports net ARPU arrived at after adjusting interconnect usage charges and roaming settlement charges divided by average customers during the quarter. There is a difference in ARPU calculated by TRAI and the figures published by operators in their financial statements.

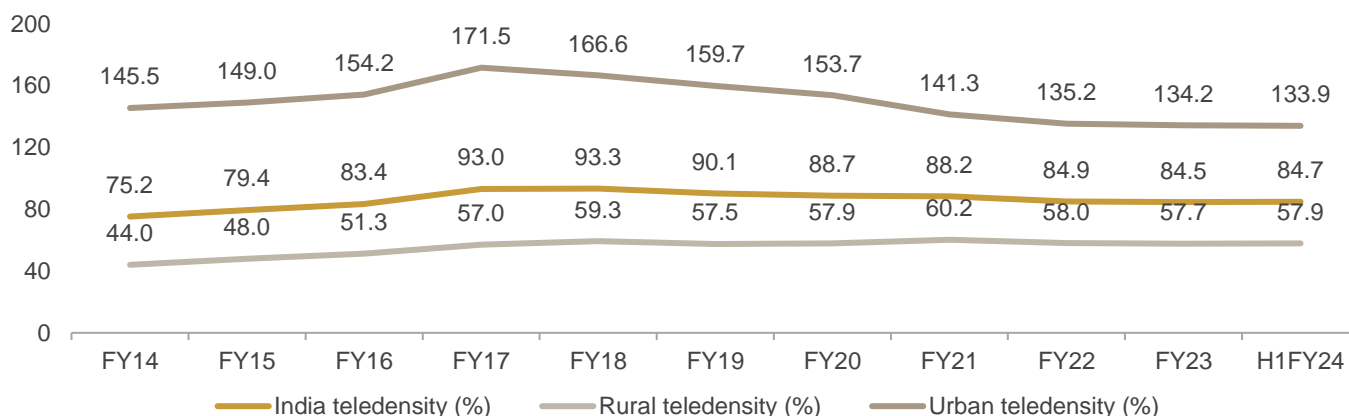
Source: Company reports, TRAI, CRISIL MI&A

Rise in telecom penetration will drive telecom revenue

Growing need for telecom services, network expansion by telecom operators, and availability of services at affordable prices have been driving customer addition and, in turn, contributing to an improvement in teledensity to 84.5% as of fiscal 2023 from 75.2% as of fiscal 2014. Rural teledensity improved to 57.7% as of fiscal 2023 from 44.0% as of fiscal 2014, which was led by higher penetration of wireless services, whereas urban teledensity declined to 134.2% from 145.5%, during the same period led by SIM consolidation.

Rural customers grew faster than urban counterparts, due to low teledensity. Notably, rural customers logged a CAGR of ~3.6% between fiscals 2014 and 2023. In contrast, urban customers exhibited a lower CAGR of ~1.8%. The difference in growth rates can be attributed to affordability of smartphones and telecom services and continued network expansion by telecom operators. Telcos' concentrated and aggressive expansion strategies in rural areas supported rapid customer-base augmentation in these regions. Telecom revenue growth will be supported by a rise in the customer base, supported by an increase in rural teledensity.

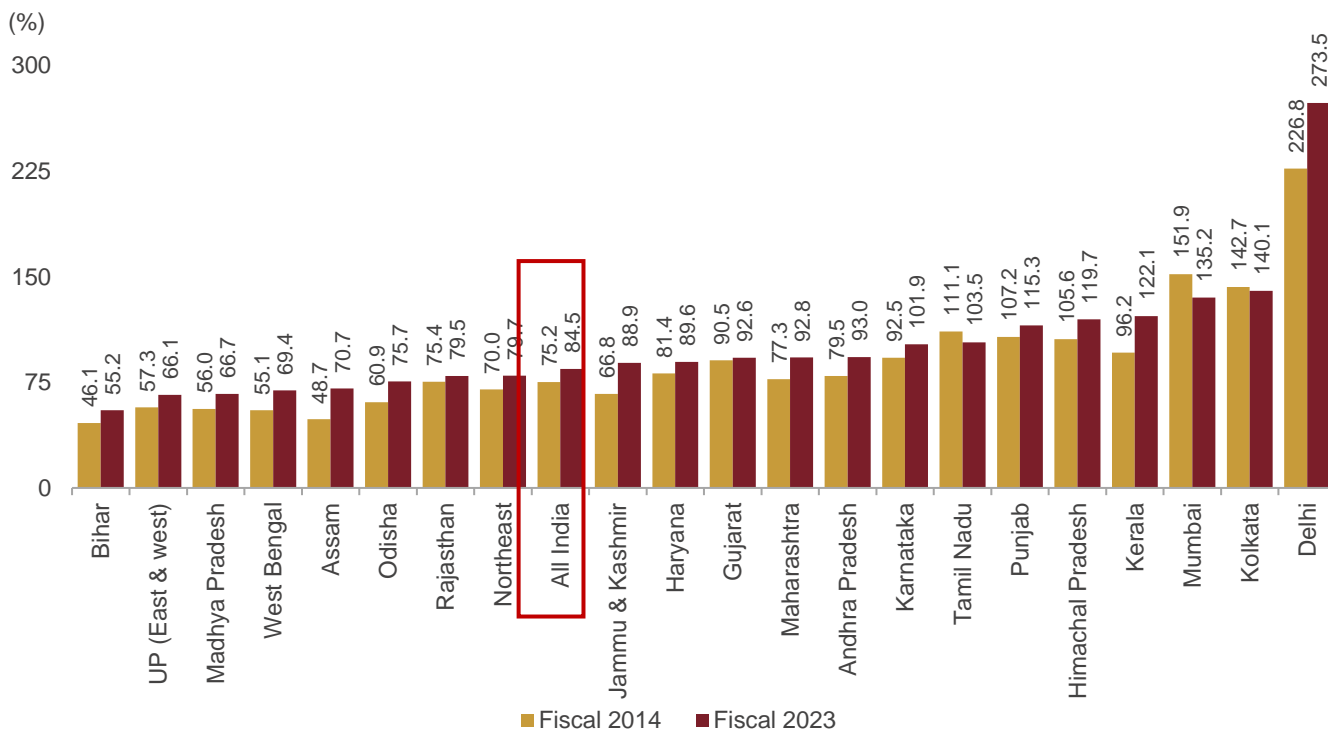
Teledensity



Source: DoT, TRAI, CRISIL MI&A

Under-penetrated telecom circles, such as Rajasthan, the Northeast region, Assam, Odisha, West Bengal, Madhya Pradesh, Uttar Pradesh and Bihar, will be key areas of growth for telcos.

Circle-wise teledensity



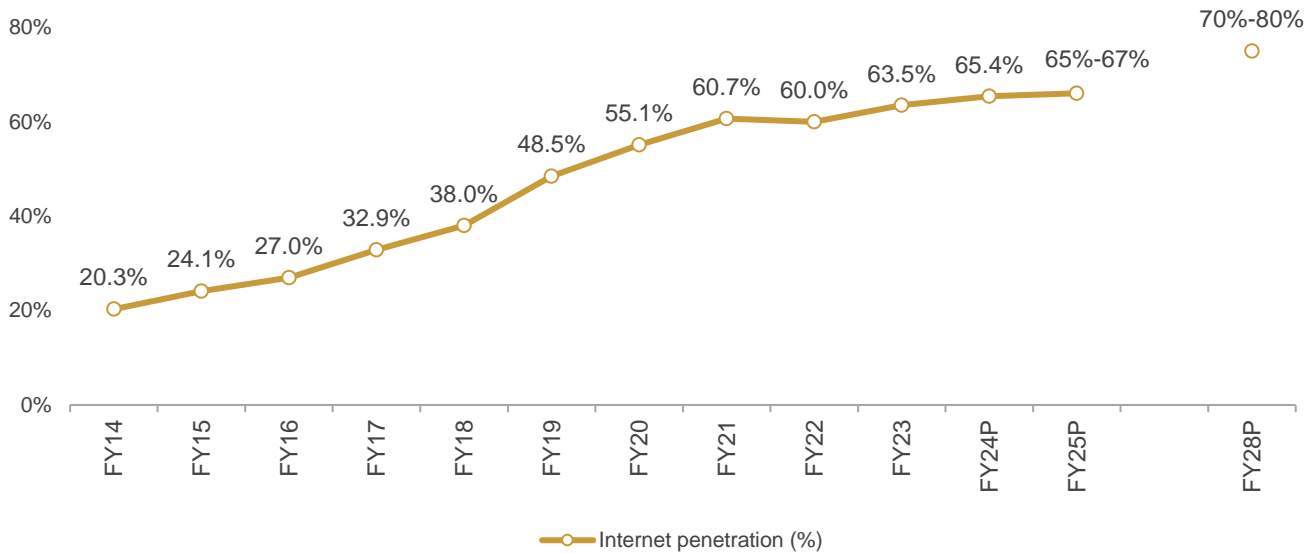
Circles/regions mentioned above are defined as per TRAI definition mentioned in Annexure
Source: DoT, TRAI, CRISIL MI&A

Revenue will be further supported by a rise in wireless internet penetration of 70-80% by fiscal 2028

Internet users in India surged over the past few years — internet penetration as a percentage of the total population was 63.5% as of fiscal 2023 (vs 20.3% as of fiscal 2014). CRISIL MI&A expects the number of internet customers (wireless) to be 925-935 million by fiscal 2025, translating into 65-67% internet penetration. In fact, by fiscal 2025, we expect the majority of customers to transition from 2G and 3G data services to 4G and 5G services. This can be attributed to increased demand for data, affordable pricing of 4G services, early conversion to 5G, and availability of affordable smartphones.

By fiscal 2028, wireless internet penetration is projected to reach 70-80%. The growth, though, is subject to the evolution in the data consumption landscape and increase in the average telecom service tariff.

Internet penetration in India (%)



P: Projected

Internet penetration is per 100 population

Source: TRAI, CRISIL MI&A

Rising 5G smartphone penetration will help telcos to monetise data

The Indian market has evolved from a feature-phone user base to a smartphone user base, with smartphones constituting 64% share of overall phone customers as of fiscal 2023, estimated at ~945 million. This is expected to rise to 70% in fiscal 2024. Also, industry sources estimate the market to comprise more than 120 million 5G-enabled smartphone units as of the third quarter of fiscal 2024, which is estimated to account for 10-15% of the mobile phone base in India. CRISIL MI&A expects rapid 5G smartphone growth to continue due to improving affordability and attractive pricing.

The growing mix of 5G smartphones in overall shipments and emergence of 5G-specific use cases will augur well for the telecom industry players and drive demand for 5G data services.

Smart TV penetration to aid demand of high-speed internet

In India, colour TV sales increased 6% year-on-year in fiscal 2023 to 14.4 million units, with smart TVs contributing to sales of more than 80% of colour TV units. CRISIL MI&A expects colour TV sales in India to grow at a 5-6% CAGR and reach 17.4 million units in fiscal 2027, supported by a shorter replacement cycle, ownership of multiple TV units, and a rise in the penetration of TV in the rural areas. A rise in smart-TV penetration, changing content consumption habits and the continued proliferation of OTT apps would lead to demand for reliable and high-speed internet, which can be supported by wired broadband connection, 5G wireless or fixed wireless access (FWA). Also, the OTT market in India is expected to grow at an 11-14% CAGR between fiscals 2023 and 2025 to Rs 240-250 billion in fiscal 2025, which will promote demand for broadband services, rise in data consumption and higher ARPU.

Converged offerings will enable rise in data monetisation and better realisation for telecom players

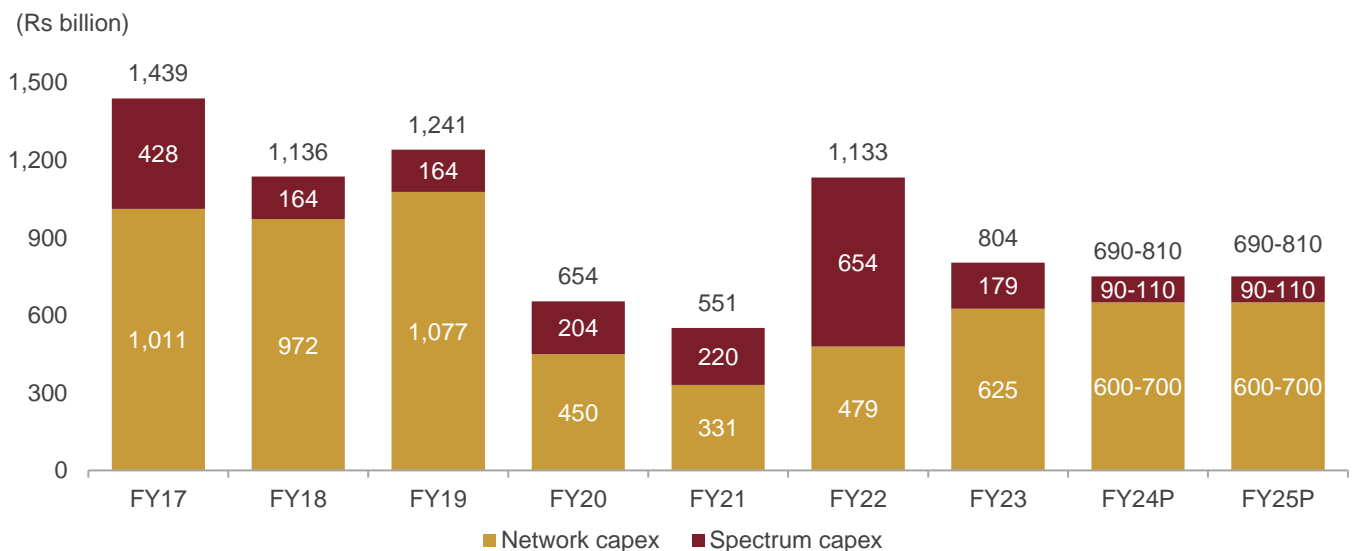
Telcos are providing converged or comprehensive offerings of direct-to-home (DTH), broadband and mobile services. TV penetration in the country stands at ~65%. About 190 million households own cable or DTH connections. Of this, ~167 million are without wired broadband connections (assuming a household with wired

broadband also owns a TV), but 60-70 million of these might not upgrade to broadband owing to poor propensity to pay. Thus, the target households are ~100 million. These households are the target market for the converged offering of broadband services with TV/ content subscription at competitive rates along with mobile service package. This presents an opportunity for telcos to monetise data and increase revenue earning potential from existing mobile customers.

Network capex to stay elevated at Rs 600-700 billion in fiscals 2024 and 2025

The telecom industry is highly capital-intensive as players commit large investments to acquire spectrum and deploy networks. Capex is more susceptible to technological changes than to business plan. Leading telcos typically start new investments before realising returns from earlier ones. For instance, Indian telcos were expanding their 3G network in 2016 when Reliance Jio launched pan-India 4G services, compelling other players to follow, showcasing the industry's adaptability to evolving technology.

Capital investment expected to remain in same range till fiscal 2025



P: Projected

Source: Company reports, CRISIL MI&A

Between fiscals 2017 and 2019, the industry's cumulative capex totalled ~Rs 4 trillion, including spectrum and network investments. Massive capex and ultra-low tariffs forced smaller players to exit, resulting in a three-private-player-market structure in fiscal 2019. After 4G investments of major players peaked, investments started to moderate with capex of Rs 654 billion and Rs 551 billion in fiscals 2020 and 2021, respectively.

However, in fiscal 2022, the industry capex was significantly higher than the previous fiscal as two private players prepaid their spectrum dues. Reliance Jio prepaid all its dues for the spectrum acquired prior to 2021 in two tranches. Bharti Airtel also partly prepaid its dues in three tranches during fiscals 2022 and 2023. The industry paid Rs 179 billion towards spectrum purchased for the July 2023 auction. The balance amount is spread over 19 years, requiring annual outflows of Rs 90-110 billion to maintain the net present value of the winning bid prices.

The network capex was elevated at Rs 625 billion in fiscal 2023, owing to fast-paced 5G rollouts initiated by telcos. The investment in mobile technology such as 4G and 5G has boosted the median speed for mobile to 75.8 Mbps in October from 1.3 Mbps in March 2014.

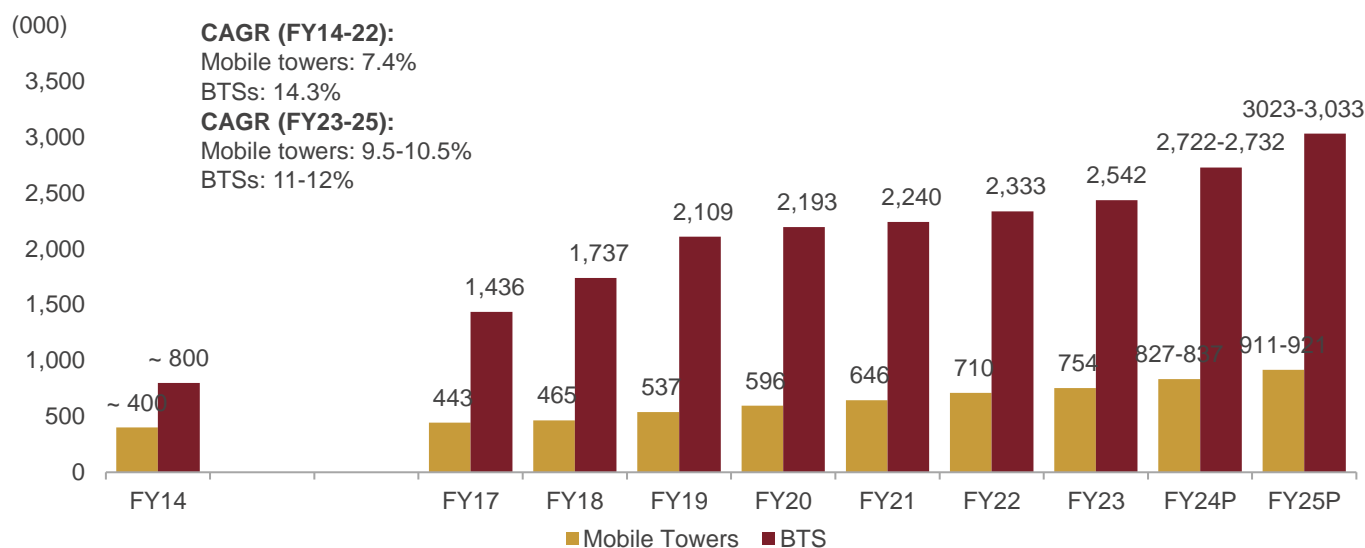
CRISIL MI&A expects telcos' capex to remain in a range of Rs 690-810 billion per year in fiscals 2024 and 2025, largely driven by network capex for deployment of 5G technology — base transceiver stations (BTSs),

strengthening fibre backhaul for towers, enhancement of service quality and routine maintenance capex. The growth in mobile towers and BTSs is expected to be 9.5-10.5% and 11-12%, respectively, between fiscals 2023 and 2025. The emphasis will be on enhancing 5G site coverage and improving service quality. The fiscals also see payment to the tune of Rs 90-100 billion towards spectrum payouts in fiscal 2024 and fiscal 2025.

Telcos have added 0.4 million BTSs for 5G coverage during fiscal 2024

In fiscal 2022, the country had 2.3 million BTSs (0.48 million 2G BTSs, 0.2 million 3G BTSs and 1.7 million 4G BTSs). Based on the latest estimated numbers, 4G BTSs form 65% of the total pie, compared with 45% in fiscal 2018. As of November 2023, 5G BTSs accounted for 15% of total BTSs. The number of total BTSs increased to 2.9 million in November 2023 from 0.7 million in March 2014. The considerable growth in 4G infrastructure aligns with the rising usage of 4G data consumption and expanding connectivity.

Number of BTSs and mobile towers in India



P: Projected
Source: DoT, CRISIL MI&A

Licensed service area-wise and technology-wise BTSs

	FY22				FY23	As of Nov 2023
	2G BTSs	3G BTSs	4G BTSs	Total BTSs	Total BTSs	5G BTSs
Andhra Pradesh	36,293	7,669	123,586	167,548	174,590	32,551
Assam	11,384	3,086	38,622	53,092	57,711	7,274
Bihar	30,709	6,598	115,287	153	168,065	28,142
Delhi	18,837	11,956	79,408	110,201	128,118	10,869
Gujarat	27,389	9,769	105,428	142,586	159,191	27,953
Himachal Pradesh	5,053	1,331	17,902	24,286	26,463	3,392
Haryana	12,022	6,153	38,285	56,460	62,446	14,319
Jammu and Kashmir	6,711	1,738	25,845	34,294	38,458	6,343
Karnataka	32,948	5,059	109,796	147,803	161,635	25,506
Kolkata	8,568	1,588	36,462	46,618	-	Refer to WB
Kerala	21,859	10,804	61,015	93,678	101,861	18,380
Mumbai	11,389	604	44,383	56,376	-	Refer to MH
Maharashtra	40,625	14,708	138,181	193,514	226,827	42,908
Madhya Pradesh	31,922	11,996	119,444	163,362	174,789	17,762
Northeast	8,185	2,353	24,327	34,865	37,014	3,628
Odisha	15,190	3,718	52,082	70,990	77,553	10,953
Punjab	18,822	6,830	58,735	84,387	88,430	14,617
Rajasthan	26,688	9,315	91,620	127,623	136,188	22,875
Tamil Nadu	36,767	12,241	113,356	162,364	169,783	31,260
Uttar Pradesh East	35,204	12,766	125,923	173,893	200,159	48,264
Uttar Pradesh West	25,424	9,296	94,397	129,117	139,642	
West Bengal	21,147	8,532	77,220	106,899	106,899	25,788
Total	483,136	158,110	1,691,304	2,332,550	2,542,213	397,923

Source: DoT, TRAI, CRISIL MI&A

The DoT has taken several policy initiatives to facilitate the growth of telecom infrastructure in the country. They include:

- Ensuring adequate availability of spectrum through open and transparent auction
- Permitting sharing and trading of spectrum
- Permitting passive and active infrastructure sharing
- Formulating procedure for Standing Advisory Committee on Radio Frequency Allocation (SACFA) siting clearance for low power BTSs/ small cells, i.e., micro, pico and femto cells, on existing street furniture/ infrastructure has been simplified

- Amended the Indian Telegraph Right of Way (RoW) Rules, 2016, to facilitate faster and easier deployment of telecom infrastructure
- Launched the GatiShakti Sanchar portal to facilitate and expedite RoW permissions, by providing a single interface between all stakeholders, including central and state/ union territories government(s), local bodies, and service providers
- Making available government land/ buildings for installation of towers
- Saturation of 4G mobile services in 24,680 uncovered villages and 6,279 villages that had only 2G or 3G connectivity
- Rolled out various USOF schemes for providing mobile network in the country in backward and scheduled caste-dominated areas
- Set up 100 5G labs in engineering institutions to develop the application of 5G services across various industries, such as smart classrooms, precision farming, intelligent transport systems and healthcare applications

5G services deployment through NSA network provides cost-efficient 5G infrastructure

For deploying 5G services, telcos have two types of deployment options — non-standalone (NSA) and standalone (SA). Both SA and NSA methods are viable for constructing and expanding a 5G network. The choice depends on the operator's approach and market scenario. The key factors driving preference for NSA 5G over SA are cost and ease of deployment. Globally, majority of telecom operators, approximately 85%, started with the NSA technology approach for deploying 5G services.

NSA is comparatively economical and easier to deploy as it can use an existing 4G core network to connect to the 5G RAN as opposed to SA 5G, which uses a dedicated 5G core network that requires substantially higher infrastructure and equipment investments.

In NSA, 5G services are provided through 4G core infrastructure, utilising existing 4G LTE core, which is called the evolved packet core (EPC). NSA utilises dual connectivity of 5G and 4G spectrum to extend the 5G coverage for a given service level without the need of dedicating sub-GHz spectrum in 5G, thereby providing higher coverage at lower cost. In SA, 5G services are provided with end-to-end 5G infrastructure with a dedicated cellular infrastructure tailored for 5G services.

Both these options are viable for the telecom companies and consumers, but also come with their own challenges. NSA offers faster rollout of 5G services to consumers as they are deployed using existing 4G network infrastructure and 5G radio on mobile towers. NSA is also cost efficient for telecom companies as it not only avoids investment in 5G core, but also saves cost of using sub-GHz spectrum band and deploys fewer radios.

Thus, NSA deployment has lower capex requirement, low cost of ownership and reduced environmental impact (owing to lower overall power consumption on account of fewer 5G radios).

These benefits notwithstanding, an NSA network poses some challenges. It has limits on providing multiple levels of network slicing capabilities and supporting ultra-low latency 5G offerings, such as industrial Internet of Things (IIoT), autonomous vehicle, remote surgery, and real-time financial trading.

On the other hand, the SA network can provide ultra-low latency 5G services to consumers. It supports high density deployment of IIoT and autonomous devices. But the SA network, too, comes with its own challenges. Since this network is based on end-to-end 5G network infrastructure, setting it up is costly and time consuming.

The SA network system, with a spectrum layer of 3.5 GHz for 5G services, requires a sub-GHz spectrum layer working on the SA network. The role of this sub-GHz layer is to increase the coverage of the 5G services in areas where 3.5 GHz spectrum does not reach.

Key differences between NSA and SA networks

Parameters	SA deployment	NSA deployment
Core network	5G core	Existing 4G EPC infrastructure with minimum configuration changes
Primary base station	5G base station used for signalling and traffic	5G base station is used for traffic and 4G base station for both signaling and traffic
Latency	Can provide ultra-low latency	Can provide low latency
Deployment	Challenging with new 5G core, VoNR not matured	Ease of deployment
Time consumption for deployment	High, as new network architecture has to be built	Low, as existing 4G core infrastructure is used

Note: Latency is the time between sending and receiving information, which is critical for use cases such as telesurgery, connected cars, financial markets transactions, etc.

Source: Secondary research, CRISIL MI&A

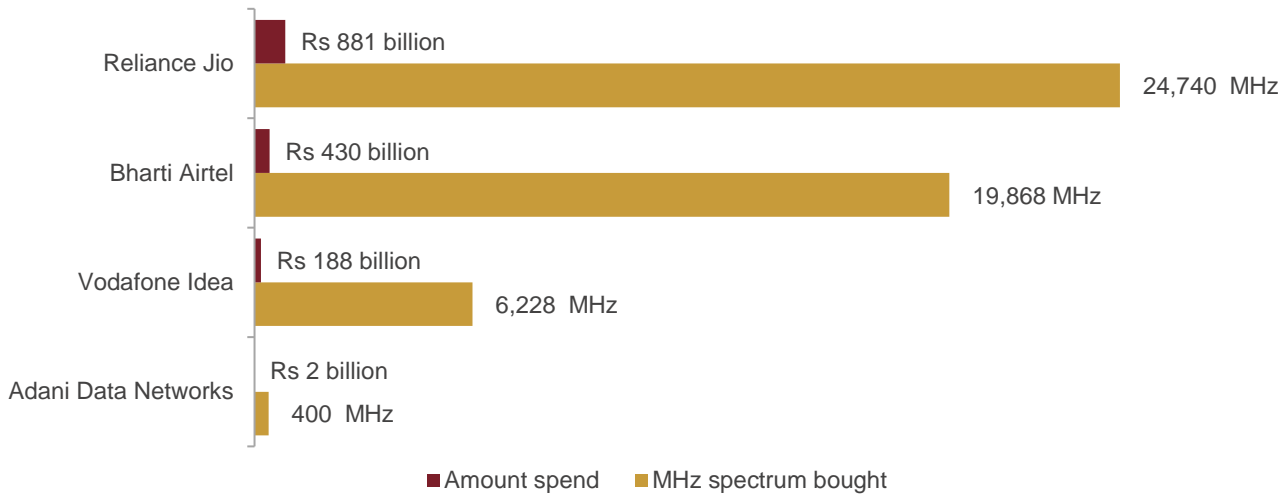
Thus, some operators are deploying NSA 5G strategically to gauge initial demand for 5G, before spending money on building an SA network. Also, currently there are no matured use cases in which advanced 5G services with ultra-low latency are needed. Going forward, emerging new use cases such as broadband IoT (RedCap) and network APIs or multiple number of slicing or ultra-low latency may need SA.

Largely mid- and high-band spectrum from telecom auction of 2022 utilised for 5G rollout

With the 5G telecom auction in 2022, India has joined a select list of 70 countries with 5G technology offerings. The government had put 72,098 MHz spectrum on auction, of which 51,236 MHz (71% of the total) was sold. In the auction, Reliance Jio, Bharti Airtel, Vodafone Idea and Adani Data Networks spent Rs 1.5 trillion on 5G.

A recent entrant, Adani Data Networks entered the 5G market after it won 400 MHz in millimetre wave 26 GHz spectrum in the spectrum auction of 2022. However, Adani bought the spectrum for captive consumption and its share is minuscule compared with that of Bharti Airtel (19,868 MHz) and Reliance Jio (24,740 MHz), which purchased spectrum on pan-India basis across various bands in the auction (Bharti Airtel in the 900 MHz, 1800 MHz, 2100 MHz, 3300 MHz and 26 GHz bands; Reliance Jio in the 700 MHz, 800 MHz, 1800 MHz, 3300 MHz and 26 GHz bands; and Vodafone Idea obtained 6,228 MHz spectrum in the 1800 MHz, 2100 MHz, 2500 MHz, 3300 MHz and 26 GHz bands). The spectrum payments will be made over 20 years/20 instalments at an interest of 7.2%. Spectrum is allocated in various ranges of frequencies within a particular band. For instance, DoT offered 3300 MHz band with frequency range of 3300 MHz to 3600 MHz.

2022 spectrum auction results



Source: Company filings, DoT

The 600 MHz band was put on auction for the first time. However, no bids were received for this band, as the device ecosystem for it is still developing for mobile telephony. However, this band may become relevant in the future. In the 700 MHz band, the 5G ecosystem is better developed than 600 MHz, but still not mature. The 700 MHz band provides a large range and good coverage. Reliance Jio has obtained 10 MHz spectrum in this band across India. For bands between 800 and 2,500 MHz, participants have primarily placed bids for spectrum for augmenting capacity and improving 4G coverage. The mid-band, i.e., 3.5 GHz band, is crucial in providing high 5G throughput. All three existing operators have obtained spectrum in this band. Operators are likely to augment existing 4G capacity and provide 5G services in the 3.5 GHz band. In the mm wave band, 26 GHz has high throughput, but very short range. FWA is becoming popular in this band across the world. FWA can be used as an alternative to fibre in high-density/congested urban areas. All four participants have obtained spectrum in this band.

Telecom companies with strong mid-band spectrum portfolio did not have to buy 700 MHz spectrum band

5G services broadly come in three types of spectrum bands — low, mid and high. Each band provides different sets of benefits.

The low band transmits in less than 1 GHz of spectrum. It has robust propagation qualities, making it useful for extending coverage in sparsely populated regions and ensuring indoor coverage in densely built-up areas. Utilising a low-band spectrum enables telecom companies to offer extensive coverage of 5G services. However, the speed and latency improvements in the 5G network are only marginal compared with 4G networks, due to the constraints posed by smaller bandwidths. The 700 MHz band sells at a higher price and is considered a premium band, as it helps in building deep network coverage.

The mid-band spectrum functions within the 1-6 GHz range, bridging the gap between the low- and high-frequency bands. It provides a balance of coverage, speed and capacity. Offering greater reach than high-band 5G and superior speed and capacity vis-à-vis low-band 5G, the mid-band proves ideal for serving cities, towns and suburban areas, and meeting the diverse needs of both consumers and businesses. This makes it a versatile and well-suited option for achieving an effective and widespread 5G deployment, as it possesses the capability to transmit substantial data over considerable distances.

The high-band spectrum operates at 24 GHz and beyond. High-band 5G (mm wave) delivers high speeds over short distances. It is employed in densely populated urban areas and business districts to optimise 5G performance

in specific locations. However, the overall ecosystem including smartphones in the high-band spectrum is still evolving.

5G spectrum was auctioned in 2022 and only one telco bought the 700 MHz spectrum band. Telcos opting for NSA and having strong mid-band spectrum holdings did not have to acquire spectrum in this band. These telcos choose to deploy NSA network which can combine new 3.5 GHz with other mid-band 4G spectrum. This supports 5G networks at a lower cost than other telecom players, who choose to deploy SA and do not have enough mid-band spectrum. The telcos without strong mid-band spectrum and opting for SA deployment had to buy the 700 MHz band to increase coverage. Overall, it results into higher investments in both spectrum acquisition of 700 MHz band as well as network deployment.

Globally 3.5 GHz remains the standard 5G band

Globally, the spectrum choice for commercial 5G networks has been the mid-band spectrum between 3.0 GHz and 3.7 GHz, with at least 192 operators globally using the mid-band frequencies. At least, 35 operators worldwide are using millimetre wave (mmW) spectrum for their commercial 5G networks, most of which are in North America. Some European operators are slowly adopting the 26 GHz and 28 GHz bands, but 3.5 GHz remains the standard 5G band for many. Millimetre-wave spectrum, useful for high-speed 5G data services over short distance, is not a priority for many operators as the current demand for 5G does not justify further investments in high-frequency spectrum.

Asia-Pacific operators are pushing back on the use of mmW spectrum. South Korea cancelled its 28 GHz licences in November 2022 and May 2023, due to the inability of local operators to meet the requirements for network deployment and lack of demand from consumers. India's auction of 26 GHz in August 2022 was met with less intense bidding from operators compared with low- and mid-frequency bands. Mainland China has not yet released mmW frequencies to local operators.

Robust spectrum holdings based on latest technology to contribute to enhanced customer experience

Cellular technology has evolved significantly over the decades. It has evolved from 1G to 4G and now, 5G. Each technology has been differentiated by the enhanced capacity and usage of different frequency bands. This has compelled telecom companies to buy spectrum in these new bands to stay relevant and provide the latest technology-based services to their customers.

The latest 5G services are a major technological advancement in the telecom sector, better on several aspects compared with 4G. Unlike 4G, 5G uses a broader frequency spectrum, ensuring faster data speeds and more capacity, but with a shorter range. 5G use-cases include IoT applications, connectivity in smart cities, gaming, autonomous vehicles, and AR/VR-based services. These use cases are expected to expand in the future, which will require larger connectivity, lower latency and higher speed. Thus, spectrum holdings in the correct frequency band will become crucial for telcos for providing services against the growing demand for 5G use-cases by customers.

Key reforms and regulatory actions in the Indian telecom industry

Regulations	Development
Spectrum liberalisation	In 2015, operators were given the option to liberalise their entire administratively allotted spectrum holding in the 800 MHz and 1,800 MHz bands in a circle for the remaining validity period of the right to use spectrum
Discriminatory tariff	In 2016, TRAI ruled out discriminatory tariff of data services. As per discriminatory tariff, an operator cannot charge different tariffs for data services based on the content accessed, transmitted or received by the consumer.
Retailing of spectrum, infrastructure	In May 2016, virtual network operators (VNOs) were given permission to obtain licences and offer services of a telecom operator, without owning the spectrum and related infrastructure
Telecom panel announces a 3% minimum SUC	In August 2016, the government approved a minimum spectrum usage charge (SUC) of 3% on adjusted gross revenue (AGR) proposed by the Telecom Commission
Extension of the spectrum payment period	In September 2017, the Telecom Commission extended spectrum payment duration from 10 to 16 years based on an inter-ministerial group (IMG) recommendation. It also lowered interest rates on unpaid dues by at least two percentage points, replacing prime lending rate (PLR) with marginal cost of fund-based lending rate (MCLR) (w.e.f. April 1, 2016) for calculating telecom operators' interest on delayed payment of licence fee and spectrum usage charges. This aimed to alleviate the debt-laden telecom industry
Interconnect usage charge (IUC)	TRAI reduced the termination charges for local and national long-distance calls from 14 paise/minute to 6 paise/minute with effect from October 1, 2017
Relaxation of spectrum cap	In 2018, the spectrum holding cap was increased from 25% to 35% in a circle. The intra-band cap of 50% holding in a circle was removed but 50% cap was also imposed on combined spectrum holdings in sub-1 MHz band per circle
The Telecommunication Tariff (Sixty Third Amendment) Order, 2018	Under this order, if tariff is found to be predatory, the service provider will be charged an amount not exceeding Rs 5 million for each service area, provided it holds a significant market power in the service area, i.e., at least 30% share in the service area
National Digital Communication Policy, 2018	This policy facilitated the development of communication infrastructure and services to achieve inclusive social-economic growth in the country
International termination charge	In February 2018, TRAI reduced the ITC payable by an international long-distance operator (ILDO) to the access provider on whose network the call terminates, from Rs 0.53 per minute to Rs 0.30 per minute. It was again revised in May 2020 – to a range, i.e., minimum Rs 0.35 and maximum Rs 0.65 per minute
Apex court on AGR definition	In October 2019, the Supreme Court ruled in favour of DoT with regard to definition of AGR revenues, resulting in telecom players being liable to pay dues of past 14 years as per the order, including interest, penalty and interest on penalty
Moratorium on spectrum payments	In 2019, the Indian government announced a moratorium of two years on deferred spectrum payments
Scrapping of IUC	In January 2021, TRAI scrapped termination charges for local and national long-distance calls for all telecom operators
Spectrum auctions	DoT initiated the formal process of auctions, scheduled to be held in March 2021. The auctions included spectrum across all bands, except 5G
Apex court slashes incumbent's plea	The Supreme Court rejected the plea of telecom operators of recalculating the AGR dues to the arithmetic errors in 2021
Cabinet announces AGR relief package and other key reforms	In September 2021, the Union Cabinet approved several structural and process reforms in the telecom sector, including:

Regulations	Development
	<ul style="list-style-type: none"> • Four-year moratorium on payment of statutory dues by telecom companies, both AGR and spectrum charges • Definition of AGR has been rationalised by excluding non-telecom revenue of telecom companies • 100% FDI in telecom via the automatic route has been approved • The regime of heavy interest, penalty and interest on penalty on delayed payments of licence fees and spectrum usage charges has been rationalised • The Centre will compound the interest annually instead of monthly <p>Spectrum auction will be done for 30 years, instead of 20 years. After completing the 10-year lock-in period, the buyer will have the option to surrender by paying surrender charges</p> <ul style="list-style-type: none"> • Removal of additional SUC of 0.5% for spectrum sharing • No SUC on spectrum acquired in future spectrum auction
SUC	<p>In June 2022, DoT removed the 3% floor on SUC, as it announced the weighted average of SUC to be calculated by the sum of the product of spectrum holdings and applicable SUC rate divided by the telecom company's total spectrum holdings. No SUC will be applied on spectrum auctioned in 2022.</p>
Universal Service Obligation Fund (USOF)	<p>USOF was started by the Government of India in 2003 to provide telecom services (including mobile services, broadband connectivity, and ICT infrastructure creation – added in 2006) for rural and remote areas in India. Under USOF, about Rs ~480 billion has been disbursed over fiscals 2014 and 2023 under various projects.</p> <p>Under USOF, some projects are allotted to various mobile service providers for providing mobile network in the country, especially in rural and remote areas.</p> <p>Over 2020 and 2021, projects were assigned for setting up mobile connectivity in over 8000 uncovered villages across Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Himachal Pradesh, Maharashtra, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand, Uttar Pradesh, Jammu and Kashmir and Ladakh</p> <p>Northeast was among the key regions to receive funds for expansion of mobile networks with 26.2% share. This region has seen installation of 2,207 towers until December 2023 under the USOF scheme. In 2017, nearly 2,000 mobile towers were installed in 2,128 uncovered village and national highways in Assam and Northeast states. This has helped the telecom companies to increase their penetration in the area.</p> <p>In July 2022, the project for saturation of 4G mobile services in uncovered villages across the country was approved to provide 4G mobile services in 24,680 uncovered villages in remote and difficult areas. In addition, 6,279 villages having only 2G or 3G connectivity would be upgraded to 4G.</p>
5G auctions	<p>The DoT accepted the price cuts recommended by TRAI for the 2022 5G auctions. Also, the Cabinet permitted enterprises to run 'captive non-public networks'. Enterprises were allowed to take spectrum on lease from service providers to run private network.</p>

Key emerging trends in the Indian telecom industry

- **Satellite communications:** Satellite internet, or broadband, is a wireless internet connection facilitated by communication satellites orbiting the earth. Offering global coverage, it is location-independent, accessible from anywhere within the satellite range, providing a versatile and widespread internet service. Since satellite internet is location-independent and accessible from anywhere, it can address the telecom industry's challenge of installing traditional network infrastructure in rural and remote areas with difficult terrains and other issues.

In 2023, the Government of India approved the Indian Space Policy 2023, which allows non-government entities to use low earth orbit (LEO) and medium earth orbit (MEO) satellites to provide broadband services in the country. Jio Satellite Communications Ltd and OneWeb India Communications Pvt Ltd (Eutelsat OneWeb) have been provided with global mobile personal communication by satellite (GMPCS) licences.

Initially, the primary focus of these companies would be on launching satellite internet services in India for enterprises. Jio presented JioSpaceFiber at the India Mobile Congress (IMC) 2023, while Airtel's exhibit highlighted solutions from OneWeb India Communications Pvt Ltd (Eutelsat OneWeb). Amazon and Starlink have applied for licence for satellite internet. Satellite has the potential to bridge the digital divide by covering hitherto uncovered, remote areas, while serving the country's disaster, maritime and defence requirement.

- **5G fixed wireless access:** The emergence of 5G is facilitating a ground-breaking convergence between mobile technology and the requirements of fixed-line services and pricing. Catering to home and business needs in areas where laying and maintaining fibre is cost-prohibitive, FWA empowers network operators to provide ultra-high-speed broadband to suburban and rural regions, especially those in fibre-dark areas. Based on this technology, Jio and Airtel have launched FWA services JioAirFiber and Xstream AirFiber, respectively. Airtel piloted this service in August 2023 in Delhi and Mumbai, while Jio started offering its service from September 2023 in eight cities. FWA has the potential to overcome challenges related to last-mile connectivity of fibre infrastructure in rural and urban regions of India. Since this technology is based on 5G, it can be used for faster monetisation of 5G services in India as well.
- **5G application development labs:** In Union Budget 2023, the Finance Minister of India announced the government's plan to set up 100 labs in engineering institutions to develop applications using 5G services. These labs will play a crucial role in investigating possibilities across various industries, such as smart classrooms, precision farming, intelligent transport systems and healthcare. The central government has also made a provision of Rs 55.6 million for 5G testbed in fiscal 2024.
- **Investment in domestic telecom equipment manufacturing capabilities:** The research and development arm of DoT — Centre for Development of Telematics — received Rs 5,500 million from the central government for fiscal 2024, compared with Rs 500 million in fiscal 2023. This financial commitment is anticipated to stimulate progress and creativity in the telecommunications industry, fostering advancements in technology and services.

The government's PLI scheme for mobile, telecom and networking products aims to offer financial incentives to boost domestic manufacturing and attract investments in target segments. Such initiatives will boost the availability of equipment and devices in the domestic market, catering to both demand and supply markets. This, in turn, is expected to lower import bill and drive growth in the telecom sector.

- **Green telecom:** To align with sustainability and environmental protection goals, telecom companies are transitioning towards green telecom. To reduce greenhouse gas (GHG) emissions from power consumption related to tower assets, the telecom industry is exploring solutions such as distributed solar plants, lithium-ion storage plants and piped natural gas (PNG) gensets, which will help reduce diesel consumption by towers. According to TRAI, going green has become necessary for telecom operators, given that energy costs account for 25% of their operating expenses. Amid rising environmental concerns related to GHG emissions, the DoT

has set up a green passport lab with a facility to carry out energy-efficiency testing of various telecom equipment.

- **6G vision:** Globally and in India, initial 6G networks are expected to be deployed around 2030.

The Government of India has prepared a Bharat 6G Vision document and constituted Bharat 6G Mission and an Apex Council. The objectives, structure and functions of the Apex Council and Bharat 6G Mission are to be completed in two phases: Phase-1 and Phase-2 over 2023-25 and 2025-2030, respectively. Further, Bharat 6G Alliance (B6GA), an alliance of domestic industry, academia, national research institutions and standards organisations, has also been set up to facilitate the implementation of Bharat 6G Vision. B6GA has signed a memorandum of understanding with the Next G Alliance of the US to explore collaboration opportunities on 6G wireless technologies. Further, the government is funding the 6G THz testbed with orbital angular momentum and multiplexing. The project aims to enhance understanding of higher millimetre wave and sub-terahertz deployment scenarios and facilitate research on optical angular momentum (OAM), a key enabling technology for implementing 6G services. Subsequently, 'ubiquitous connectivity' is a usage scenario proposed by India for inclusion in the 6G framework and now part of the International Telecommunication Union 6G Framework. With all the development, matured 6G deployment is nearly a decade away.

5 Rajasthan and Northeast macroeconomic overview

Rajasthan's GSDP clocked a 5.7% CAGR between fiscals 2014 and 2023

Rajasthan is the largest state in India in terms of geographical area (342,239 sq. km, or 10.4% of India's total area). Rajasthan's gross state domestic product (GSDP) grew at a CAGR of 5.7% between fiscals 2014 and 2023, from Rs 4,862 billion to Rs 7,994 billion. Its GDP growth between fiscals 2014 and 2023 closely mirrors India's overall GDP growth of 5.6%. Per-capita net state domestic product (NSDP) of Rajasthan increased to Rs 86,134 in fiscal 2023 from Rs 61,053 in fiscal 2014, implying a CAGR of 3.9% between fiscals 2014 and 2023. The state's per-capita NSDP was around 12.4% lower than India's per-capita NDP, as of fiscal 2023.

GSDP (constant) and per-capita NSDP of Rajasthan

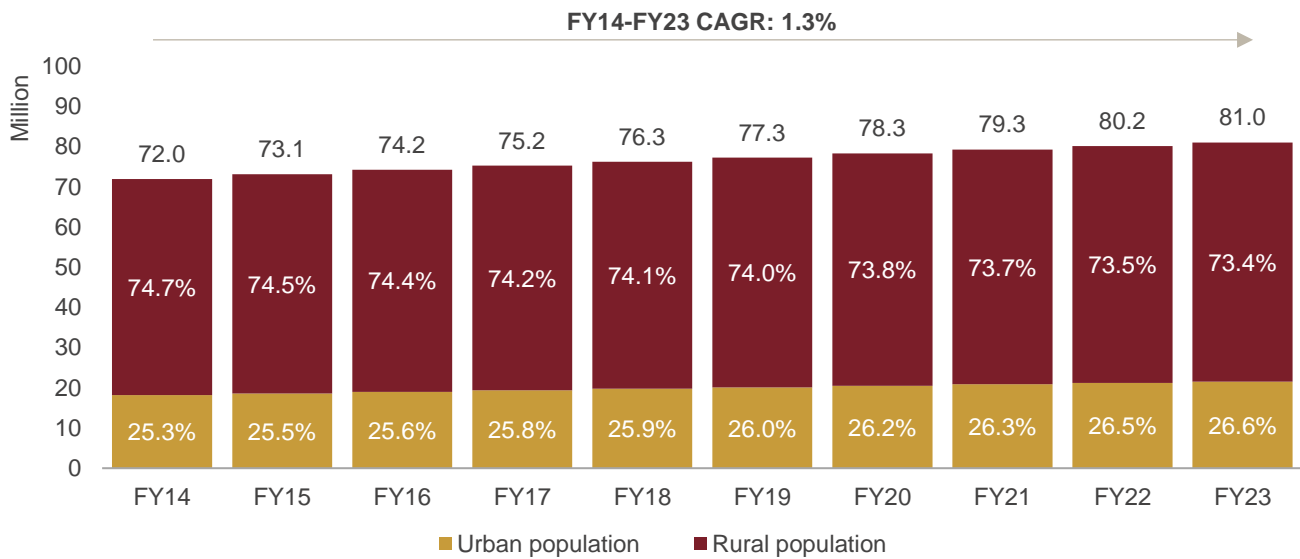
	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	CAGR (FY14-23)	CAGR (FY14-22)
Rajasthan GSDP	4,862.3	5,215.1	5,633.4	5,967.5	6,280.2	6,432.8	6,767.9	6,635.2	7,389.2	7,994.5	5.7%	5.4%
Rajasthan GSDP as % of India GDP	5.0%	5.0%	5.0%	4.8%	4.8%	4.6%	4.7%	4.8%	5.0%	5.0%	-	-
Rajasthan per-capita NSDP	61,053	64,496	68,565	71,324	73,529	73,975	76,643	73,140	80,545	86,134	3.9%	3.5%
India GDP	98,014	105,277	113,695	123,082	131,446	139,929	145,346	136,871	149,258	159,710	5.6%	5.4%
India per-capita NDP	68,572	72,805	77,659	83,003	87,586	92,133	94,270	86,054	92,583	98,374	4.1%	3.8%

Source: MoSPI, CRISIL MI&A

Urban population accounted for 26.6% of Rajasthan's total population in fiscal 2023

As of fiscal 2023, the population of Rajasthan was estimated at 81.0 million, with the rural population accounting for 73.4% and urban population for 26.6%. The share of urban population grew from 25.3% in fiscal 2014 to 26.6% in fiscal 2023. Overall population CAGR was 1.3% between fiscals 2014 and 2023. Rajasthan had a higher share of rural population compared with India (65%) as of fiscal 2023.

Population of Rajasthan with rural-urban split



Source: MoHFW, CRISIL MI&A

GSDP of the Northeast region clocked a 5.6% CAGR between fiscals 2014 and 2022

India's Northeast circle accounts for 1.1% of India's population and nearly 4.7% of geographical area.

The Northeast region considered in this report is as per the DoT's licence for the Northeast circle, which excludes Sikkim and Assam. The Northeast circle includes Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura. The region's GSDP increased to Rs 1,440.4 billion in fiscal 2022 from Rs 928.3 billion in fiscal 2014, marking a CAGR of 5.6%. The region's GSDP grew 20 basis points faster than India's GDP growth rate. The per-capita NSDP of Northeast rose to Rs 84,948 in fiscal 2022 from Rs 59,998 in fiscal 2014, clocking a CAGR of 4.4%. The region's per-capita NSDP was around 8.2% lower than India's overall per-capita NDP as of fiscal 2022, but the NSDP grew 60 basis points faster than India's per-capita GDP growth during the same period.

GSDP (constant) of Northeast region (Rs billion)

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	CAGR (FY14-23)	CAGR (FY14-22)
Arunachal Pradesh	123.4	143.8	142.4	148.9	155.7	166.7	191.4	184.5	198.0	226.0	7.0%	6.1%
Manipur	141.2	152.4	164.2	170.8	187.5	182.6	191.9	180.7	205.1	NA	N. ap.	4.8%
Meghalaya	207.3	201.4	206.4	217.3	225.6	237.2	249.2	229.7	242.7	252.1	2.2%	2.0%
Mizoram	90.4	112.6	123.2	136.0	147.6	161.0	178.8	164.3	184.9	NA	N. ap.	9.4%
Nagaland	137.9	144.0	146.6	156.5	164.4	168.74	184.8	183.6	203.2	221.1	5.4%	5.0%
Tripura	228.2	269.7	267.9	305.4	330.9	367.5	380.6	364.0	394.9	430.0	7.3%	7.1%
Total – Northeast	928.3	1,023.9	1,050.7	1,134.9	1,211.8	1,283.7	1,376.8	1,316.3	1,440.4	NA	N. ap.	5.6%
Northeast GSDP as % of India GDP	0.95%	0.97%	0.92%	0.92%	0.92%	0.92%	0.95%	0.96%	0.97%	N. ap.	-	-

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	CAGR (FY14-23)	CAGR (FY14-22)
Northeast per-capita NSDP	59,998	66,739	67,552	71,570	77,135	79,894	85,365	79,099	84,948	N. ap.	-	4.4%
India GDP	98,014	105,277	113,695	123,082	131,446	139,929	145,346	136,871	149,258	159,710	5.6%	5.4%
India per-capita NDP	68,572	72,805	77,659	83,003	87,586	92,133	94,270	86,054	92,583	98,374	4.1%	3.8%

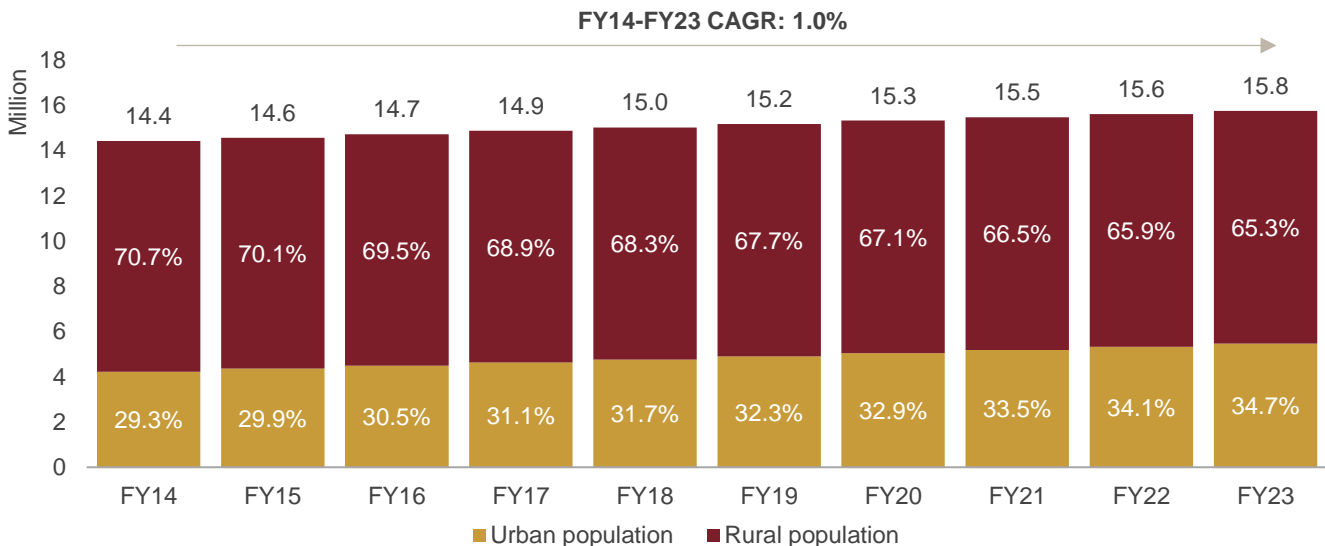
Note: NA – not available; N. ap. – not applicable

Source: MoSPI, CRISIL MI&A

Urban population accounted for 34.7% of Northeast’s total population in fiscal 2023

As of fiscal 2023, the estimated population of the Northeast region was 15.7 million, with the rural population accounting for 65.3% and the urban population for 34.7%. The share of urban population grew from 29.3% in fiscal 2014 to 34.7% in fiscal 2023. The overall population grew at a CAGR of 1.0% between fiscals 2014 and 2023. The Northeast’s share of rural population was comparable with that of India’s (65%) as of fiscal 2023.

Population of the Northeast region



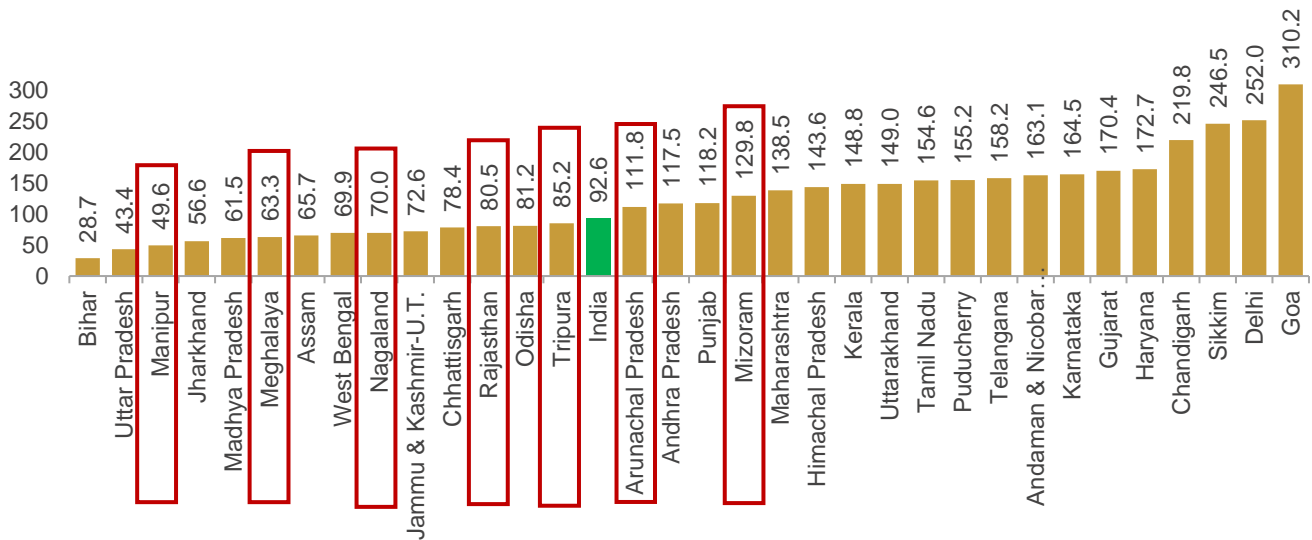
Source: MoHFW, CRISIL MI&A

Economic factors to drive growth for Rajasthan and the Northeast region

Potential for growth in per-capita income with economic expansion

Rajasthan had a per-capita income of Rs 80,545 in fiscal 2022, below India’s average per-capita income of Rs 92,583. Manipur, Meghalaya, Nagaland and Tripura, which are a part of the Northeast circle, reported a lower per-capita income (Rs 49,600, Rs 63,300, Rs 70,000 and Rs 85,200, respectively) than India’s average per-capita income (Rs 92,583) in fiscal 2022. Rajasthan and the Northeast region have potential for growth in per-capita income at par with pan-India growth, as both central and state governments are focusing on improving the infrastructure accessibility in these regions, which is expected to drive economic growth over the medium-to-long term.

Per-capita net income across states at constant prices for FY22 (in Rs '000)



Source: RBI, CRISIL MI&A

Investments to improve infrastructure penetration in Rajasthan and the Northeast states

An established physical infrastructure is needed for the overall development of a state. Growth in the infrastructure sector plays a crucial role in generating employment opportunities, supporting growth in the per-capita income. Also, in the era of digitisation, the IT and communications sector will be among the keys sectors that will play a critical role in boosting the overall economy of the states, creating new milestones for online information flow.

Both central and state governments are implementing various schemes in Rajasthan to develop necessary infrastructure facilities, generate additional employment opportunities, encourage economic development and bring qualitative improvements in the standard of living to reduce the regional imbalance within rural and urban areas.

- For fiscal 2024, under economic services, Rajasthan has earmarked Rs 53.7 billion for the Department of Information Technology & Communication, which includes Rs 35.0 billion for the CM Digital Services Scheme and Rs 4.3 billion for Rajiv Gandhi Fintech Digital Institute, Jodhpur
- Rajasthan has invested more than Rs 500 billion in highway infrastructure over the last five years to improve road density and connectivity in the region. Its road density (916 per 1,000 sq. km) is lower than India's reported average national road density (1,652 per 1,000 sq. km)⁷

The government has been implementing various infrastructure development projects in the Northeast states since fiscal 2017 to improve air, rail, road, waterway, power and telecom connectivity.

- Around 40+ projects were completed over fiscals 2017-2023 to improve air connectivity, with 17 operational airports in the Northeast region as of fiscal 2023
- About 2,011 km of railway projects are in various stages of planning/approval/execution in the Northeast region, including establishing new railway lines, converting gauges and doubling railway lines
- Telecom connectivity: The BharatNet Project has been implemented in a phased manner to provide broadband connectivity to all Gram Panchayats (GPs) in the country, including Northeast region (NER). Funds disbursed for NER under this scheme amounted to Rs 6.4 billion over fiscals 2017 to 2022

⁷ Basic Roads Statistics of India (2018-19)

- The BharatNet Project is implemented in a phased manner to provide broadband connectivity to about 2.6 lakh GPs and all inhabited villages beyond GPs in the country. The government plans to connect all villages through optical fibre by calendar year 2025. As of December 2023, 2.1 lakh GPs were connected through 675,466 km of OFC laid, 7.8 lakh fibre-to-the-home (FTTH) connections were commissioned, and 1.0 lakh wi-fi hotspots were installed to ensure last-mile connectivity through the BharatNet Project
- Power connectivity: Northeastern Region Power System Improvement Project (NERPSIP) aims to strengthen intra-state transmission and distribution system (33kV and above) in six states (Assam, Manipur, Meghalaya, Mizoram, Tripura and Nagaland). Additionally, a comprehensive scheme for strengthening of transmission and distribution systems has been implemented in Arunachal Pradesh and Sikkim. These initiatives are helping improve power connectivity in NER. About 2.6 million households have been electrified since the launch of the Saubhagya scheme in NER, which aims to provide electricity connections to all un-electrified households in rural areas and all poor households in urban areas in the country
- Road connectivity: A total of 4,016 km of roads are under various stages of completion in NER under the Ministry of Road Transport and Highways, and 3,100 km of roads have been constructed since fiscal 2017. Among the Northeast states, Arunachal Pradesh, Mizoram and Manipur have lower road density (660, 771 and 1,451 per 1,000 sq. km, respectively) than the national average (1,652 per 1,000 sq. km)

Focus on digital infrastructure in Rajasthan and the Northeast region

Rajasthan and the Northeast region are focusing on digitisation, since demand for telecommunication services is expected to rise, as the economy expands and penetration of telecommunication services deepens. Rising per-capita income provides a significant opportunity for the telecommunications industry, especially from the under-penetrated rural and semi-urban markets. Governments in these regions have undertaken various steps and schemes to expand digital infrastructure. Some of these are as follows:

- State governments in the Northeast region, along with the central government, are focusing on expanding digital infrastructure in the region to establish it as India's growth engine. Subsequently, investments totalling over Rs 5,000 billion have been made in connectivity and infrastructure development in the region over the past decade since fiscal 2014
- In September 2023, India's first 5G training labs and 5G applications in the healthcare sector were launched in all Northeast states, as a step towards establishing a 5G digital ecosystem in the region
- In 2018, the government launched the 'Digital North East Vision 2022' to transform the lives of the Northeast people by leveraging digital technologies
- To provide network connectivity to government departments, GPs and municipal areas across the state, the Government of Rajasthan implemented the RajNET programme in 2016. The programme uses multiple modes of connectivity, with a 96.8% completion rate for 9,309 total targeted sites as on December 21, 2023
- The government of Rajasthan launched the Raj Wi-Fi project in fiscal 2018, which is aimed at providing a Wi-Fi network to government offices, public places and GPs (access points: 3,811 in urban areas and 9,960 in rural areas) in Rajasthan
- The progress made under the Comprehensive Telecom Development Plan (CTDP) for the Northeast region to provide mobile coverage to 8,621 identified uncovered villages, installation of 321 mobile tower sites along national highways, and strengthening of the transmission network in the region have positively impacted wireless connectivity

As of November 2022, 1,358 mobile towers had been installed in uncovered villages in these states under the CTDP. In addition, 20 Gbps international bandwidth for internet connectivity has been commissioned to Agartala from Bangladesh Submarine Cable Company Ltd via Cox Bazar / Kuakata, Bangladesh.

6 An overview of the telecom market in the Rajasthan and Northeast circles

Telecommunication is the backbone of modern economies and one of the essential services that ensure growth and modernisation of various sectors of the economy. Its importance has multiplied in recent years because of the rapid advancement, and cascading impact, of information technology on the economy, such as through strengthening of communications among various areas, segments and communities.

In Rajasthan, the number of telecom customers in the first half of fiscal 2024 stood at 66.4 million (compared with 64.4 million in fiscal 2023), accounting for 5.6% (5.5%) of the country's telecom customers. In the Northeast region, the number of telecom customers in the first half of fiscal 2024 and in fiscal 2023 stood at 12.6 million, accounting for 1.1% of the country's telecom customers in both periods.

An overview of Rajasthan and Northeast telecom customers

Telecom parameter (million)	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	H1 FY24	CAGR FY14-FY23
Total customers – Rajasthan	53.6	56	60.9	68.1	65.8	64.8	66	66.8	63.9	64.4	66.4	2.1%
Share – Rajasthan circle	5.7%	5.6%	5.7%	5.7%	5.4%	5.5%	5.6%	5.6%	5.5%	5.5%	5.6%	-
Total customers – Northeast	9.6	10.6	11.2	12.7	14	12.1	12.1	12.6	12.1	12.6	12.6	3.1%
Share – Northeast circle	1.0%	1.1%	1.1%	1.1%	1.2%	1.0%	1.0%	1.0%	1.0%	1.1%	1.1%	-
Total customers – overall India	933	996.1	1,059.3	1,194.6	1,211.8	1,183.4	1,176.8	1,200.9	1,166.2	1,172.4	1,181.1	2.6%

Source: DoT, TRAI, CRISIL MI&A

Rajasthan customers grew by ~2.1% CAGR between fiscals 2014 and 2023

The number of customers in Rajasthan grew at a CAGR of ~2.1% between fiscals 2014 and 2023, from 53.6 million to 64.4 million. This growth has significantly contributed to the Rajasthan circle's enhanced teledensity of 79.5% as of fiscal 2023 (81.5% in the first half of fiscal 2024), compared with 75.4% as of fiscal 2014.

Despite this growth, Rajasthan's teledensity was below the national average by ~500 basis points in fiscal 2023 (320 basis points in first half of fiscal 2024); India's teledensity was 84.5% as of fiscal 2023 (84.7% as of first half of fiscal 2024). The lower teledensity in the Rajasthan circle was due to the state's lower rural teledensity of 57.2% as of fiscal 2023, with its rural population accounting for nearly 73.4% as of same fiscal. Similar to pan-India, Rajasthan has seen a trend of declining teledensity from fiscal 2018 due to SIM consolidation.

The Government of India is implementing schemes, such as the 4G saturation project, for the provision of 4G mobile services across all uncovered villages of the country, including Rajasthan, to expand the network coverage, thus supporting a rise in the number of telecom customers.

Like elsewhere in India, telecom customers in Rajasthan mainly used wireless services with 98.7% of the total customers being wireless customers (compared with 97.6% pan-India) in fiscal 2023. This high dependence reflects the limited penetration of wireline services amid the challenges of establishing relevant infrastructure. The state's dry climate and desert terrain pose challenges in laying and maintaining the physical infrastructure required for wireline telecom services.

Wireline-wireless telecom customer split — Rajasthan

Telecom parameter (million)	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	H1 FY24	CAGR FY14-FY23
Total customers	53.6	56.0	60.9	68.1	65.8	64.8	66.0	66.8	63.9	64.4	66.4	2.1%
Wireless customers	52.7	55.2	60.1	67.4	65.2	64.2	65.5	66.3	63.2	63.6	65.5	2.1%
Wireless as % of total	98.3%	98.5%	98.7%	98.9%	99.1%	99.2%	99.3%	99.3%	98.9%	98.7%	98.6%	-
Wireline customers	0.9	0.8	0.8	0.7	0.6	0.5	0.4	0.5	0.7	0.8	0.9	-1.3%
Wireline as % of total	1.7%	1.5%	1.3%	1.1%	0.9%	0.8%	0.7%	0.7%	1.1%	1.3%	1.4%	

Source: DoT, TRAI, CRISIL MI&A

Teledensity

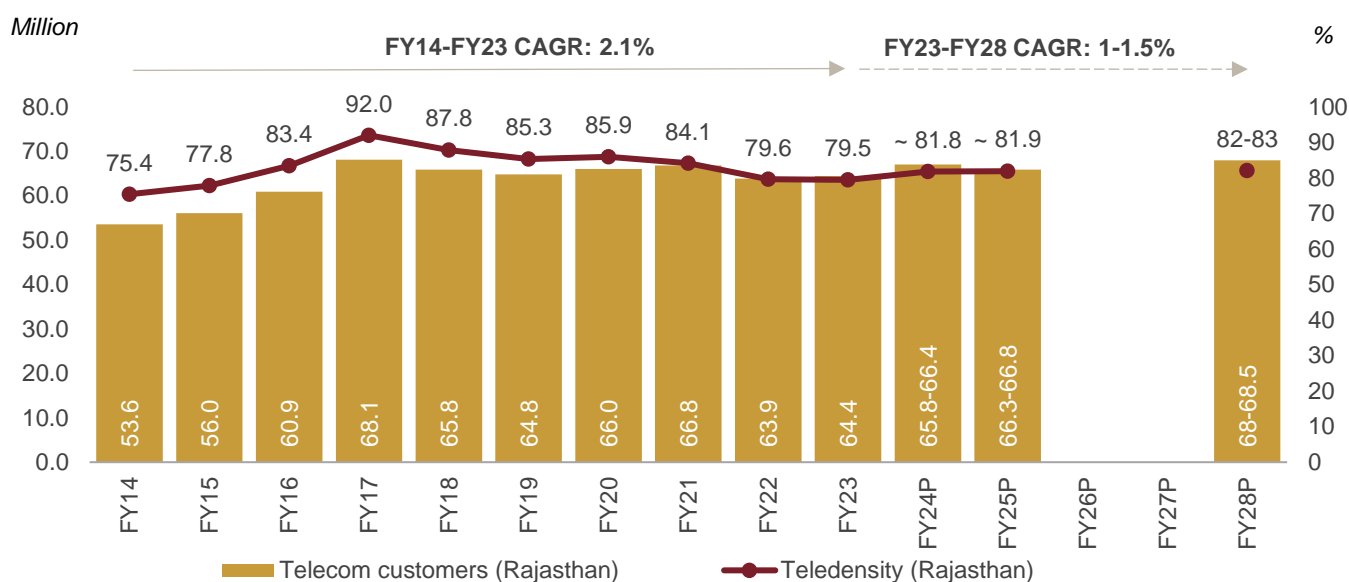
	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	H1FY24
Rajasthan teledensity (%)											
Total	75.4	77.8	83.4	92.0	87.8	85.3	85.9	84.1	79.6	79.5	81.5
Wireline	1.3	1.1	1.1	1.0	0.8	0.7	0.6	0.6	0.9	1.0	-
Wireless	74.1	76.6	82.3	91.0	87.0	84.6	85.3	83.6	78.8	78.4	-
Rural	48.6	53.6	58.3	61.7	60.1	57.6	61.3	62.4	58.3	57.2	-
Urban	160.0	153.9	162.0	186.8	174.4	171.6	162.0	145.1	138.8	140.8	-
India teledensity (%)											
Total	75.2	79.4	83.4	93.0	93.3	90.1	88.7	88.2	84.9	84.5	84.7
Wireline	2.3	2.1	2.0	1.9	1.8	1.7	1.4	1.5	1.8	2.1	2.2
Wireless	72.9	77.2	81.4	91.1	91.5	88.5	87.2	86.7	83.1	82.5	82.5
Rural	44.0	48.0	51.3	57.0	59.3	57.5	57.9	60.2	58.0	57.7	57.9
Urban	145.5	149.0	154.2	171.5	166.6	159.7	153.7	141.3	135.2	134.2	133.9

Source: DoT, TRAI, CRISIL MI&A

Rajasthan customers to grow at CAGR 1.0-1.5% between fiscals 2023 and 2028

The customer base in the Rajasthan circle is expected to log a CAGR of 1.0-1.5% between fiscals 2023 and 2028, to reach 68.0-68.5 million, with a teledensity of 82-83%, in line with the pan-India trend of rising rural teledensity. By fiscal 2028, ~99% of the customers are expected to be on wireless and the balance wireline. Rajasthan's focus on resolving regional imbalances and supporting growth in rural areas will create demand for telecom services in rural areas of the state, driving customer growth.

Customer base — Rajasthan



P: Projected

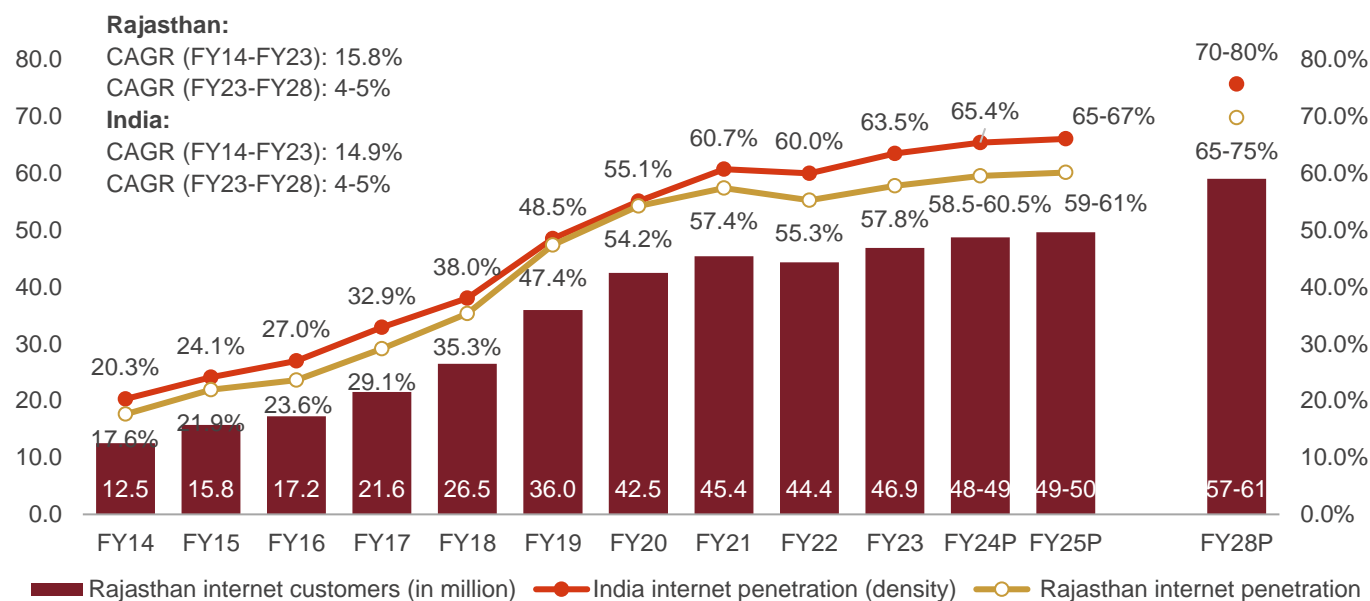
Source: DoT, TRAI, CRISIL MI&A

Low internet penetration in Rajasthan offers strong growth prospects

The internet customer base in Rajasthan has grown significantly from 12.5 million in fiscal 2014 to 46.9 million in fiscal 2023, logging a CAGR of ~15.8%, outperforming the pan-India CAGR of 14.9%. As of fiscal 2023, ~73.7% of all wireless customers of Rajasthan were data customers compared with just 17.6% as of fiscal 2014.

Despite the growth, internet penetration in Rajasthan remains lower at 57.8% as of fiscal 2023 than the national average of 63.5%. The reason for the discrepancy is that at 37.3%, the state's rural internet density lags the national average of 39.8%. Rajasthan's relatively large rural population impacts the overall internet penetration in the region. The total number of internet customers in the circle is projected to reach 49-50 million by fiscal 2025, with penetration at 59-61%. By fiscal 2028, the number is projected to reach 57-61 million from 46.9 million in fiscal 2023, clocking a CAGR of 4.0-5.0%. The growth will be supported by the increase in per capita income, penetration of services in rural areas aided by the Universal Service Obligation Fund (USOF), evolution in the data consumption landscape, average data or service cost changes in the industry and price of various internet consumption devices.

Internet customer, penetration — Rajasthan



P: projected

Internet penetration is per 100 population

Source: DoT, TRAI, CRISIL MI&A

Data and non-data wireless telecom customer split (Rajasthan)

Year	Data customer and non-data customer share	
FY14	23.8%	76.2%
FY23	73.7%	26.3%

Legend: Data customer share — Non-data customer share

Note: Data customers share = Wireless internet customers/total wireless customers

Source: DoT, TRAI, CRISIL MI&A

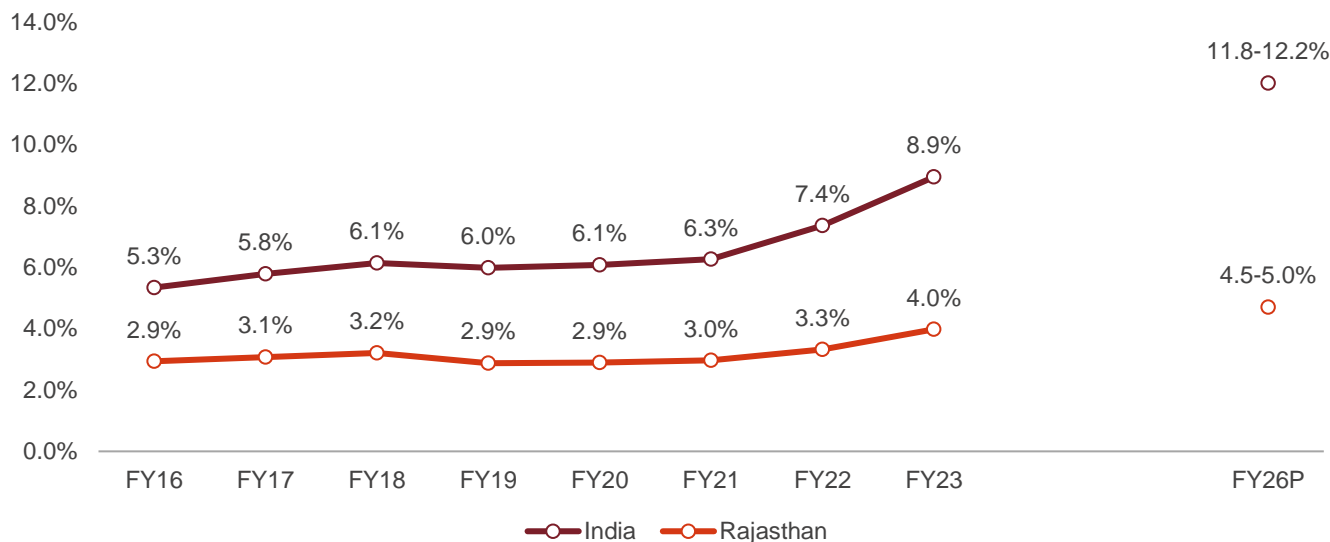
Low wireline penetration bodes well for wireless growth in Rajasthan

Between fiscals 2016 and 2023, wireline internet density in the Rajasthan circle was lower than the national average. Pan-India, wired broadband customers are concentrated in urban areas. Hard terrains in Rajasthan make last-mile connectivity a challenge.

As of fiscal 2023, wired broadband customers in Rajasthan stood at 0.7 million, logging a CAGR of 5.8% from fiscals 2016 levels. Wireline internet density in the circle, meanwhile, stood at 4.0% (percentage of households), up from 2.9% in fiscal 2016. The national average was 8.9% in 2023 and 5.3% in 2016. The low wireline density in Rajasthan can be attributed to shortage of wireline internet infrastructure owing to lower population density, large landmass and higher rural population. Lower demand for reliable internet services at home also makes it less economical for service providers to set up more wireline infrastructure.

The dependence on wireless internet will support growth of wireless mobile services in the state. Low broadband penetration will provide some headroom for an increase in household penetration of broadband connections to 4.5-5.0% by fiscal 2026, registering a CAGR of 5.0-5.5% between fiscals 2023 and 2026 — on a par with pan-India CAGR of 5.2% during the period.

Wired broadband penetration

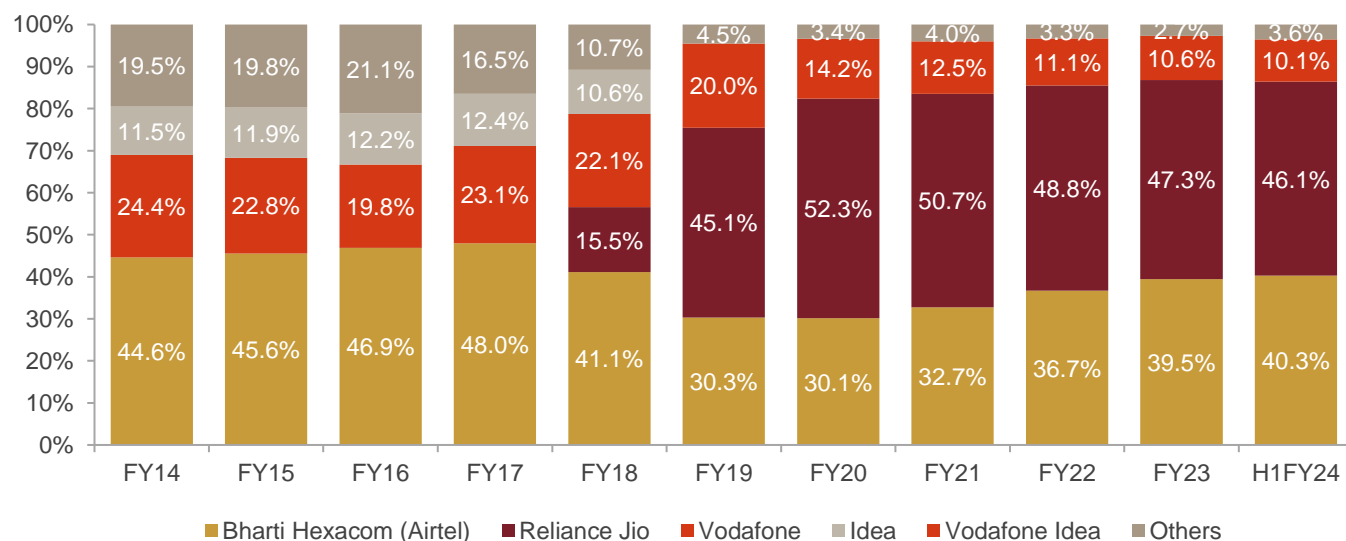


Source: DoT, CRISIL MI&A

Reliance Jio, Bharti Hexacom (Airtel) hold 86.4% revenue market share in Rajasthan

In recent times since fiscal 2019, Rajasthan saw significant shifts (in line with the national market trend), RMS of the top two players in Rajasthan circle has been improving and by the first half of fiscal 2024 it has reached a number of 86.4% from 75.4% in fiscal 2019. This indicates greater consolidation of market share with the top two players. In the first half of fiscal 2024, Reliance Jio enjoyed a revenue market share (RMS) of 46.1%, followed closely by Bharti Hexacom (Airtel) with 40.3%, leaving limited room for other players such as Vodafone Idea and BSNL.

Telecom Rajasthan RMS (AGR) (wireless + wireline)



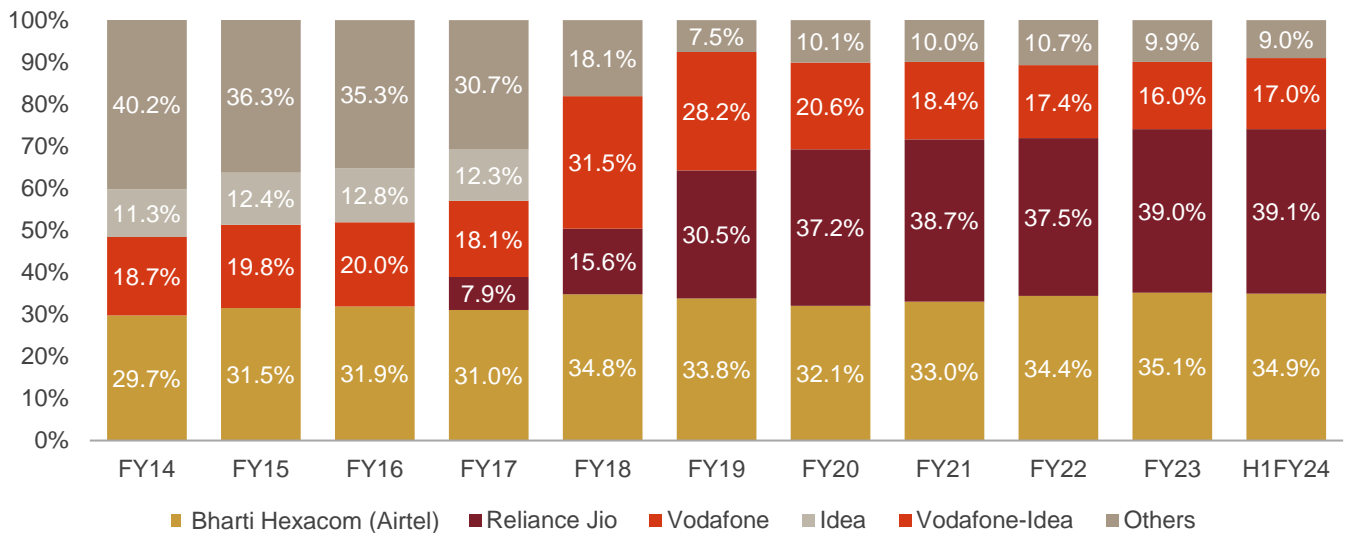
Note: RMS is calculated based on adjusted gross revenue reported by wireless operators to TRAI. Others include BSNL, Airtel, Tata Teleservices and Sistema in FY14 to list a few; others include Reliance Communications, MTNL and BSNL in FY23

Reliance Jio, Bharti Hexacom (Airtel) hold ~74% customer market share in Rajasthan

As of the first half of fiscal 2024, Reliance Jio, Bharti Hexacom (Airtel) and Vodafone Idea were the three major players in the Rajasthan circle, with CMS of 39.1%, 34.9% and 17.0%, respectively.

In the national telecom market, the top two players, Reliance Jio and Bharti Airtel, together enjoy a ~70% CMS. In the Rajasthan market, they have an even higher market share of ~74.0%. The high concentration presents considerable challenges for new entrants attempting to gain a foothold in the region.

Telecom Rajasthan CMS (wireless + wireline)



Note: Others include BSNL, Airtel, Tata Teleservices and Sistema in FY14; others include Reliance Communications, Tata Teleservices and BSNL in FY23

Market share is customer market share

Source: DoT, TRAI, CRISIL MI&A

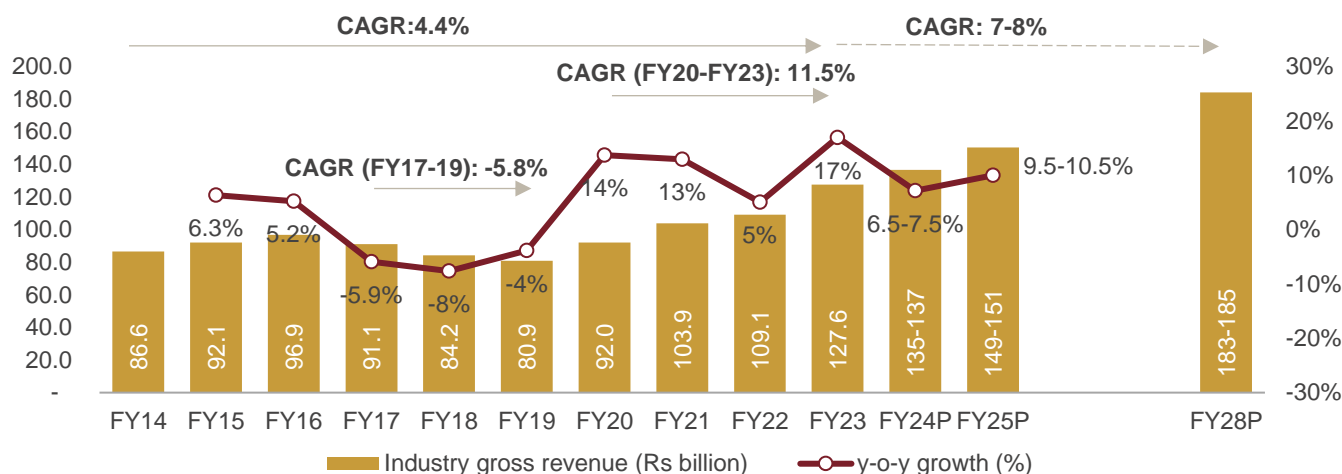
Additionally, Bharti Hexacom (Airtel) enjoys higher ARPU in Rajasthan than its peers, implying superior quality of its customers. This is reflected by Bharti Hexacom (Airtel)'s higher RMS at 40.3% than its customer share of 34.9%. Also, its RMS growth from fiscal 2021 to the first half of fiscal 2024 was higher than that of its customer market share, demonstrating a faster growth of ARPU for the company in the region.

Rajasthan telecom gross revenue to grow at 7-8% CAGR between fiscals 2023 and 2028

Gross revenue of Rajasthan's telecom industry stood at ~Rs 127.6 billion in fiscal 2023 (4.4% CAGR between fiscals 2014 and 2023). In comparison, the national telecom industry clocked a faster ~5.6% CAGR to Rs 2,680 billion in fiscal 2023 from Rs 1,648 billion in fiscal 2014, supported by faster growth in customers and ARPU.

In fiscal 2018, the circle saw a notable decline in revenue, in line with the trend in the national market. Reliance Jio's entry led to a drastic decrease in ARPU, which, in turn, negatively impacted the industry's revenue. However, the revenue started improving from fiscal 2020 with the industry undertaking a calibrated tariff increase and the onset of Covid-19 leading to increased demand for data. The circle revenue grew a robust 17% in fiscal 2023, in line with the national trend.

Total gross telecom revenue in Rajasthan



P: projected

Source: TRAI, CRISIL MI&A

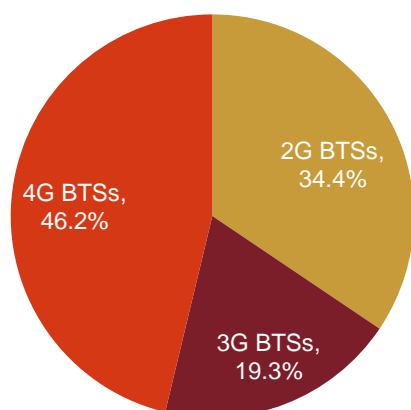
The Rajasthan telecom industry is expected to log a CAGR of 7-8% between fiscals 2023 and 2028 to Rs 183-185 billion, supported by a rise in teledensity in the region, especially in the rural regions, higher tariffs and an increase in internet penetration in the state.

BTS infrastructure expanding rapidly in Rajasthan

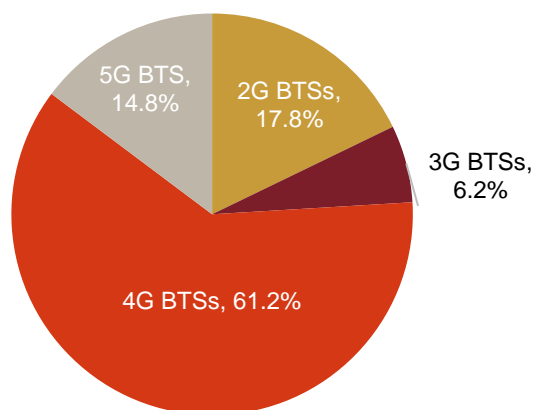
The estimated number of towers and base transceiver stations (BTSs) in Rajasthan stood at ~38,000 and ~136,000, respectively, as of fiscal 2023. The number of BTSs in the circle as a percentage of total BTSs in India grew from 4.8% in fiscal 2014 to 5.5% in fiscal 2023. The share of 4G BTSs as of November 2023 was 61.2%. Notably, 5G BTSs also claimed a substantial share of 14.8% in overall BTSs installed. The share of 5G BTSs is expected to increase further with increase in coverage of 5G technology. With a significant coverage achieved in urban/ large cities, the focus is now shifting towards enhancing connectivity in Tier 2 and 3 cities, leading to a potential increase in 5G and 4G BTSs there. This shift will also help in a notable increase in both 5G and 4G BTS installations, particularly with the advancement of 5G technology in the region.

BTS split technology-wise — Rajasthan

FY18

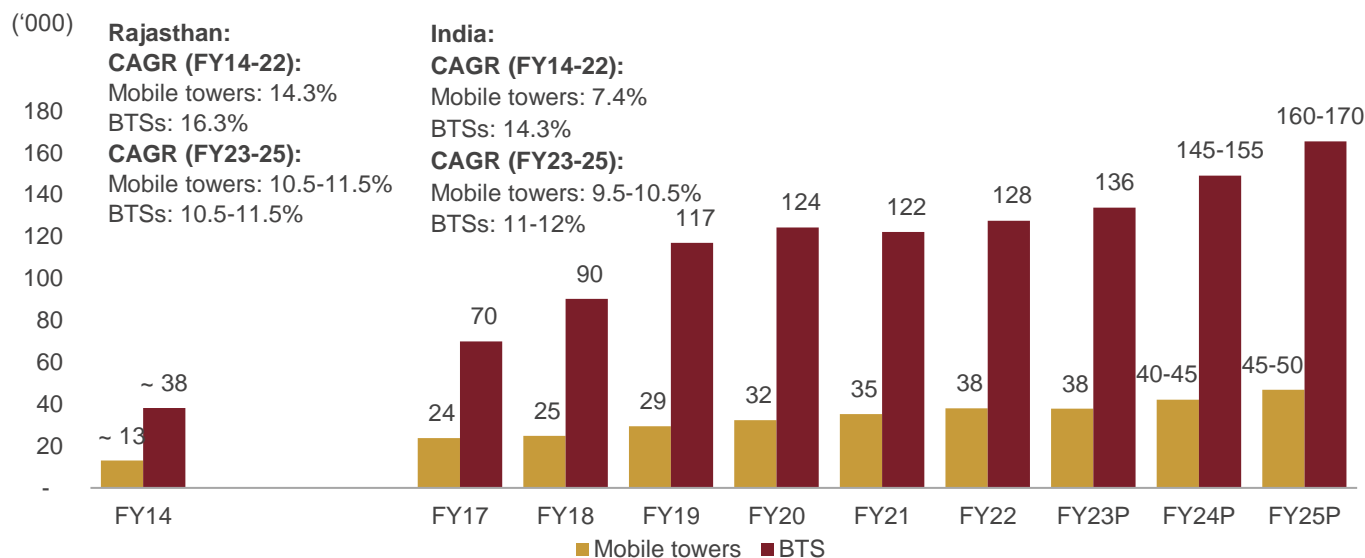


FY22 BTS share + latest 5G installations (Nov 2023)



Source: DoT, TRAI, CRISIL MI&A

Number of BTSs and mobile towers in Rajasthan

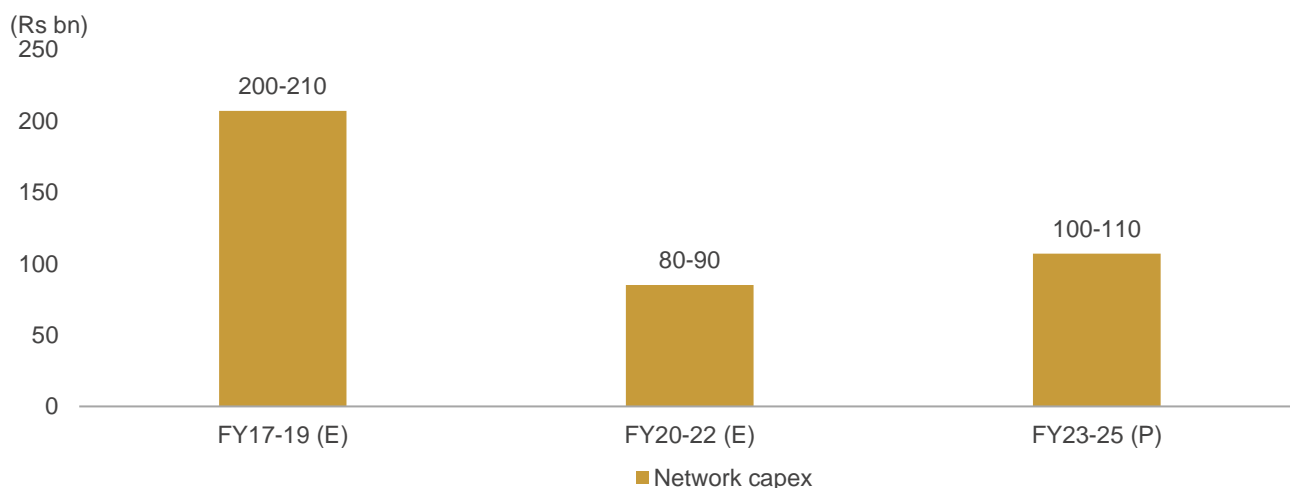


P: Projected
Source: DoT, CRISIL MI&A

The number of both towers and BTSs is projected to clock a CAGR of 10.5-11.5% between fiscals 2023 and 2025 (to 45,000-50,000 and 160,000-170,000, respectively). The increase in infrastructure is likely to result in a network capex of Rs 100-110 billion in Rajasthan over the period.

Over fiscals 2017-2019, network capex in the circle was estimated at Rs 200-210 billion, and over fiscals 2020-2022 at Rs 80-90 billion. It is projected to reach Rs 100-110 billion over fiscals 2023-2025. The capex has moderated in line with the pan-India trend, as competition in the industry has eased. During fiscals 2017-2019, the industry’s cumulative capex peaked, including for 4G spectrum and network investments. The massive capex and ultra-low tariffs forced smaller players to exit, resulting in a three-player market structure in fiscal 2019. Going forward, investment is expected to grow moderately with improvement in technology and better utilisation of existing assets.

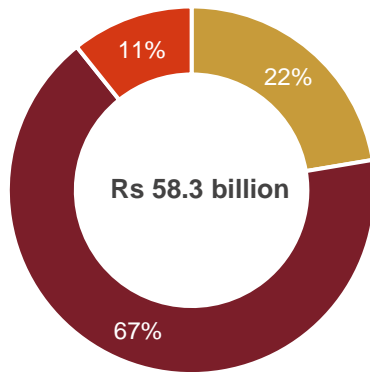
Network capex for Rajasthan



E: Estimated, P: Projected
Source: DoT, CRISIL MI&A

Player-wise bids for Rajasthan circle at 2022 spectrum auction

Rajasthan



- Bid amounts for the Rajasthan circle totalled Rs 58.3 billion in the 2022 spectrum auction
- Reliance Jio accounted for 67% share of the bid amount, followed by Bharti Airtel (Bharti Hexacom), at 22%

■ Jio ■ Bharti Airtel (Bharti Hexacom) ■ Vodafone

Note: Adani Data Networks Ltd has only 0.2% share in Rajasthan spectrum auction bid, and hence is not included in the pie chart

Source: DoT, CRISIL MI&A

Key performance indicators (KPIs) of Rajasthan telecom market

Wireless ARPU logged double-digit CAGR between fiscals 2019 and 2023

ARPU of the wireless segment in Rajasthan increased to Rs 145.0 in fiscal 2023 from Rs 68.0 in fiscal 2019, at a CAGR of 20.8%. The increase outpaced the India average, which rose to Rs 142.3 from Rs 71.0, at 19.0% CAGR. The pace of increase highlights the state’s potential for continued robust growth of the telecom sector and sustained revenue increase for telecom players.

ARPU (wireless services / full mobility services)

Wireless ARPU	FY14*	FY15*	FY16*	FY17*	FY18*	FY19	FY20	FY21	FY22	FY23	CAGR (FY14-FY23)	CAGR (FY19-FY23)
Rajasthan	103	112	110	71	67	68	87	99	126	145	3.9%	20.8%
India	113	120	125	83	76	71	91	104	127	142	2.6%	19.0%

* FY14 to FY18 figures are GSM ARPU

Source: DoT, TRAI, CRISIL MI&A

Rajasthan’s figure notably outperformed the national average, showcasing stronger ARPU growth and higher revenue generated per wireless user.

Prepaid customers have the lion’s share, but postpaid customers increasing

In the Rajasthan circle, prepaid customers accounted for a dominant share of the wireless segment as of fiscal 2023, at 95.1%, which was higher than 91.9% in the case of pan-India. The share of prepaid customers in the Rajasthan circle has been reducing marginally, moving towards postpaid since fiscal 2020, due to better postpaid bundled tariff offerings by the telecom players.

In contrast, in developed markets such as the US and Germany, the share of postpaid customers is higher — 69-70% and 54% as of 2023, respectively. Even in countries such as Thailand and Brazil, the share of postpaid customers (including point of sales and mobile to mobile) is higher than in India – 30% and 57%, respectively, as of 2023. This demonstrates significant potential for postpaid uptake in the country and the circle.

% of prepaid customers in Rajasthan

Prepaid share	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
Rajasthan	98.0%	97.5%	97.0%	97.2%	97.3%	97.8%	97.9%	97.7%	95.8%	95.1%
India	95.9%	95.6%	95.4%	95.4%	95.5%	94.4%	95.4%	95.0%	93.1%	91.9%

Notes:

1. % share is as of the March quarter of the respective fiscal years. Fiscals 2014 to 2018 figures represent GSM prepaid share and fiscal 2019 to 2023 numbers represent wireless prepaid share; remaining % share is of postpaid customers.
2. GSM communication is a technology for providing wireless services.

Source: DoT, TRAI, CRISIL MI&A

Despite a higher share of prepaid customers than the pan-India market, Rajasthan's overall ARPU is on a par with the pan-India average.

Given the potential shifting of customers to postpaid from prepaid, and higher postpaid ARPU, overall ARPU for the Rajasthan market has the potential to outperform the pan-India ARPU growth rate.

MoU for Rajasthan grew faster than pan-India over the last decade

Minutes of usage (MoU) in the wireless segment in Rajasthan clocked a CAGR of 6.5% between fiscals 2019 and 2023, to 926 minutes per customer per month. In comparison, the national average MoU rose at a higher CAGR of 8.1% to 946 minutes. But between fiscals 2014 and 2023, Rajasthan's MoU logged a faster CAGR of 12.0% vs the national average's 10.4% on a smaller base.

MoU

Total MoU	FY14*	FY15*	FY16*	FY17*	FY18*	FY19	FY20	FY21	FY22	FY23	CAGR (FY14-FY23)	CAGR (FY19-FY23)
Rajasthan: Wireless MoU	335	339	332	377	630	719	719	790	943	926	12.0%	6.5%
India: Wireless MoU	389	383	381	405	584	692	750	818	955	946	10.4%	8.1%

* Fiscals 2014 to 2018 figures are GSM MoU

Source: DoT, TRAI, CRISIL MI&A

Data consumption on par with national level

The monthly average wireless data usage per customer for Rajasthan was almost the same as the India average, indicating similar growth in data consumption as well as usage pattern.

Average wireless data usage (GB) per wireless data customer per month

Service area	2017	2018	2023
Rajasthan	4.1	7.4	18.4*
India	4.1	7.4	18.4

* Estimated for Rajasthan based on 2017 and 2018 trends and insights from industry interaction for increased data consumption in the region

Source: DoT, TRAI, CRISIL MI&A

Telecom customers in Northeast circle grew ~3.1% CAGR over fiscals 2014 to 2023

The number of customers in the Northeast circle rose to 12.6 million in fiscal 2023 from 9.6 million in fiscal 2014, at a CAGR of 3.1%. The increase in the customer base was faster than the pan-India CAGR of 2.6%.

Consequently, teledensity in the Northeast circle rose to 79.7% as of fiscal 2023 (79.6% as of the first half of fiscal 2024) from 70.0% as of fiscal 2014. Still, it lagged the national average, which stood at 84.5%.

The lower overall teledensity in the Northeast was because urban teledensity in the circle lagged the all-India average, at 111.0% vs 134.2%. However, in the case of rural teledensity, the Northeast performed better than the India average, at 63.1% vs 57.7%.

The high rural teledensity in the Northeast can be attributed to high dependence on wireless connectivity. Penetration of wired service / infrastructure in the region is low as reported by industry experts. The heavy dependence on wireless services is because of challenges in laying and maintaining wireline infrastructure, given the region's hilly terrain and extreme weather conditions. The region is also receiving special attention from the government towards infrastructure improvement.

Teledensity

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	H1FY24
Northeast teledensity, %											
Total	70.0	77.0	80.2	89.9	98.1	84.2	83.4	81.1	77.4	79.7	79.6
Wireline	1.0	0.9	0.9	0.9	0.8	0.7	0.6	0.7	1.1	1.4	-
Wireless	68.9	76.1	79.3	89.1	97.3	83.4	82.8	80.5	76.3	78.4	-
Rural	42.7	51.1	54.0	60.5	66.8	44.3	53.3	61.6	58.2	63.1	-
Urban	153.0	154.9	158.2	176.4	188.8	198.6	168.5	119.7	114.2	111.0	-
India teledensity, %											
Total	75.2	79.4	83.4	93.0	93.3	90.1	88.7	88.2	84.9	84.5	84.7
Wireline	2.3	2.1	2.0	1.9	1.8	1.7	1.4	1.5	1.8	2.1	2.2
Wireless	72.9	77.2	81.4	91.1	91.5	88.5	87.2	86.7	83.1	82.5	82.5
Rural	44.0	48.0	51.3	57.0	59.3	57.5	57.9	60.2	58.0	57.7	57.9
Urban	145.5	149.0	154.2	171.5	166.6	159.7	153.7	141.3	135.2	134.2	133.9

Source: DoT, TRAI, CRISIL MI&A

Majority of the telecom customers in the Northeast have wireless connections (~98.4% share in fiscal 2023), similar to pan-India (97.6%).

Having said that, the number of wireline customers are increasing in the region, in line with the overall India trend. The wireline customer base in the region reached ~0.2 million in fiscal 2023 vs ~0.1 million in fiscal 2014, at a CAGR of ~4.0% on a low base.

Wireline-wireless telecom customers in the Northeast

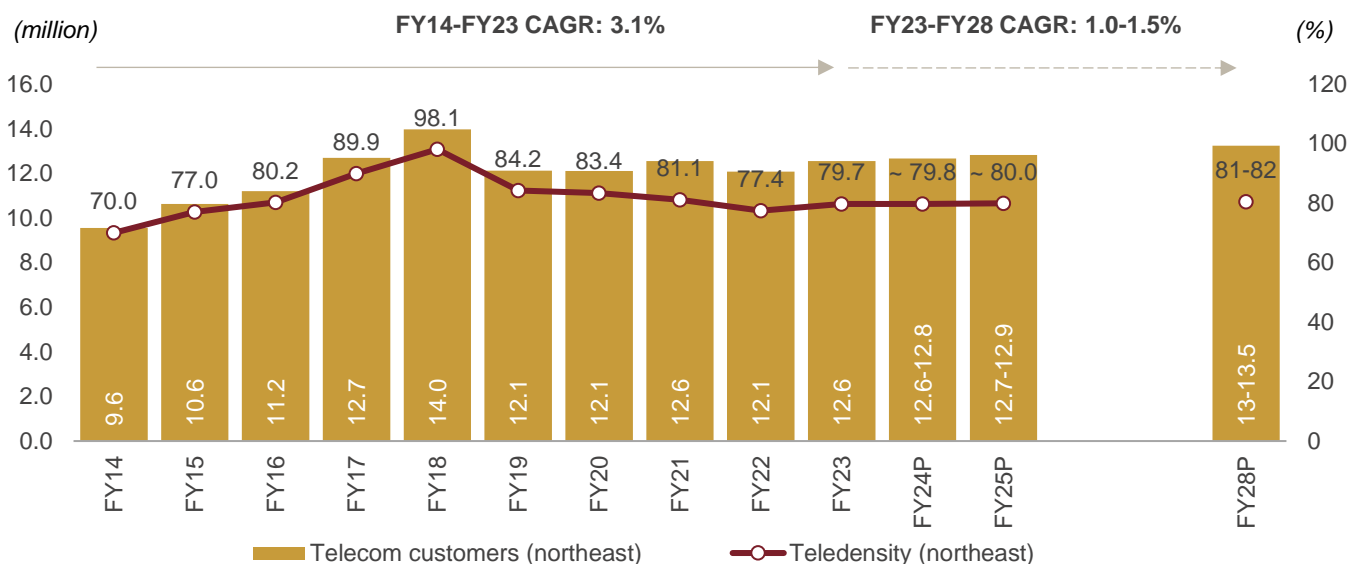
Telecom parameter (million)	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	H1FY 24	CAGR FY14-FY23
Total customers	9.6	10.6	11.2	12.7	14.0	12.1	12.1	12.6	12.1	12.6	12.6	3.1%
Wireless customers	9.4	10.5	11.1	12.6	13.9	12.0	12.0	12.5	11.9	12.4	12.4	3.1%
Wireless as % of total	98.5%	98.8%	98.8%	99.1%	99.2%	99.1%	99.3%	99.2%	98.7%	98.4%	98.1%	
Wireline customers	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	4.0%
Wireline as % of total	1.5%	1.2%	1.2%	0.9%	0.8%	0.9%	0.7%	0.8%	1.3%	1.7%	1.9%	

Source: DoT, TRAI, CRISIL MI&A

Northeast to log 1.0-1.5% CAGR in telecom customers between fiscals 2023 and 2028

The customer base in the Northeast circle is expected to rise at 1.0-1.5% CAGR between fiscals 2023 and 2028, to 13.0-13.5 million, with teledensity at 81-82%. Wireless customers are expected to account for ~98% share in fiscal 2028, with the balance ~2% wireline customers.

Telecom customers in Northeast



P: Projected

Source: DoT, TRAI, CRISIL MI&A

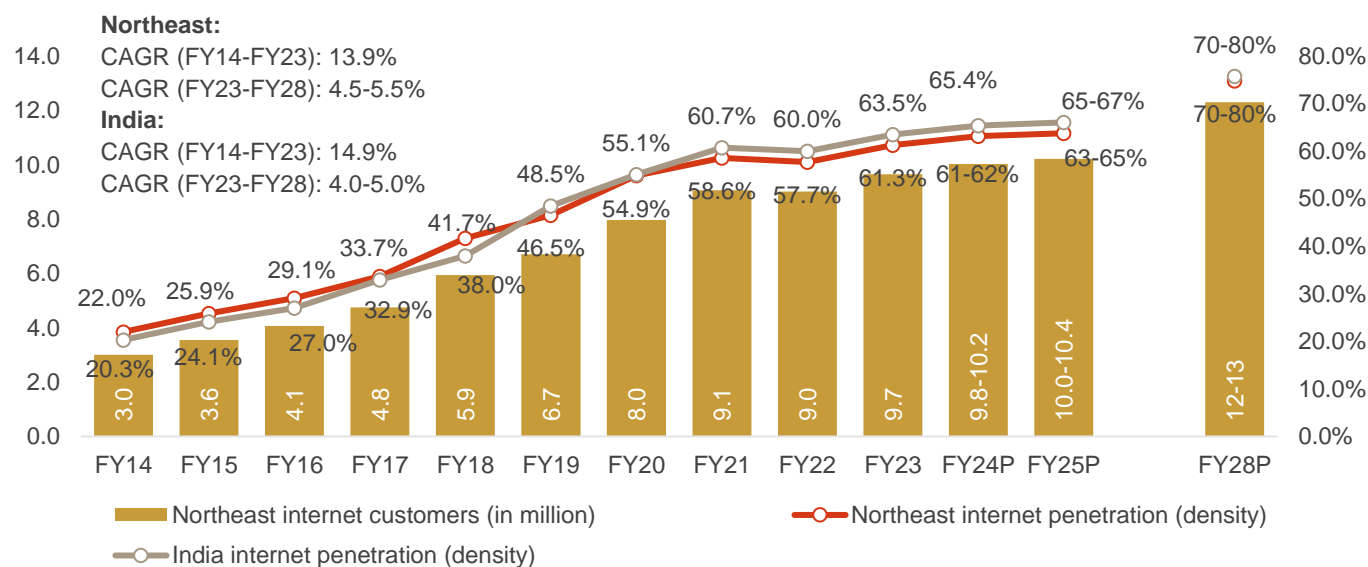
At 61.3%, internet penetration in Northeast slightly below India average of 63.5%

Internet penetration in the Northeast circle largely mirrored the pan-India trend. The number of internet customers in the Northeast circle clocked ~13.9% CAGR between fiscals 2014 and 2023 to reach ~9.7 million, compared with 14.9% CAGR for India overall. Further, internet penetration increased from 22.0% as of fiscal 2014 to 61.3% as of fiscal 2023, only slightly behind India’s internet penetration of 63.5%.

Increase in smartphone penetration to 64% (in fiscal 2023) is driving demand for mobile data consumption. By fiscal 2028, internet customers in the Northeast are projected to reach 12-13 million, at a CAGR of 4.5-5.5% between fiscals 2023 and 2028.

In the Northeast, the increase in internet customers will be supported by growth in per-capita income, increased penetration of services in rural areas, supported by USOF funding, evolution in the data consumption landscape, and average data/ service cost changes in the industry, as well as a decline in the cost of various internet consumption devices.

Internet customers and penetration in Northeast



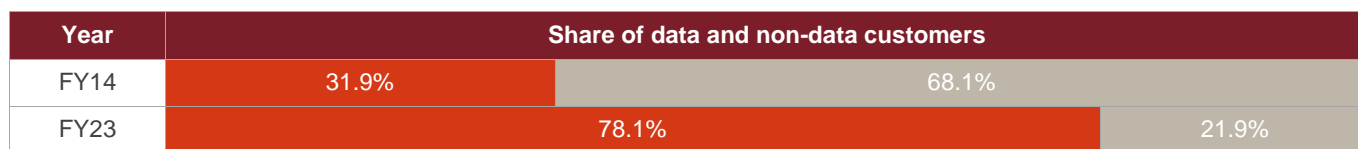
P: Projected

Note: Internet penetration is per 100 population

Source: DoT, TRAI, CRISIL MI&A

In fact, as of fiscal 2023, ~78.1% of the wireless customers in the Northeast accessed data, compared with just 31.9% in fiscal 2014. Going forward, the rise in demand for data is expected to support growth in the ARPU for telecom players in the region.

Data and non-data wireless telecom customer split in Northeast



■ Data customers share ■ Non-data customers share

Note: Data customer share = Wireless internet customers/total wireless customers

Source: DoT, TRAI, CRISIL MI&A

Internet consumption skewed towards wireless in the Northeast; wireline internet penetration lower than national average

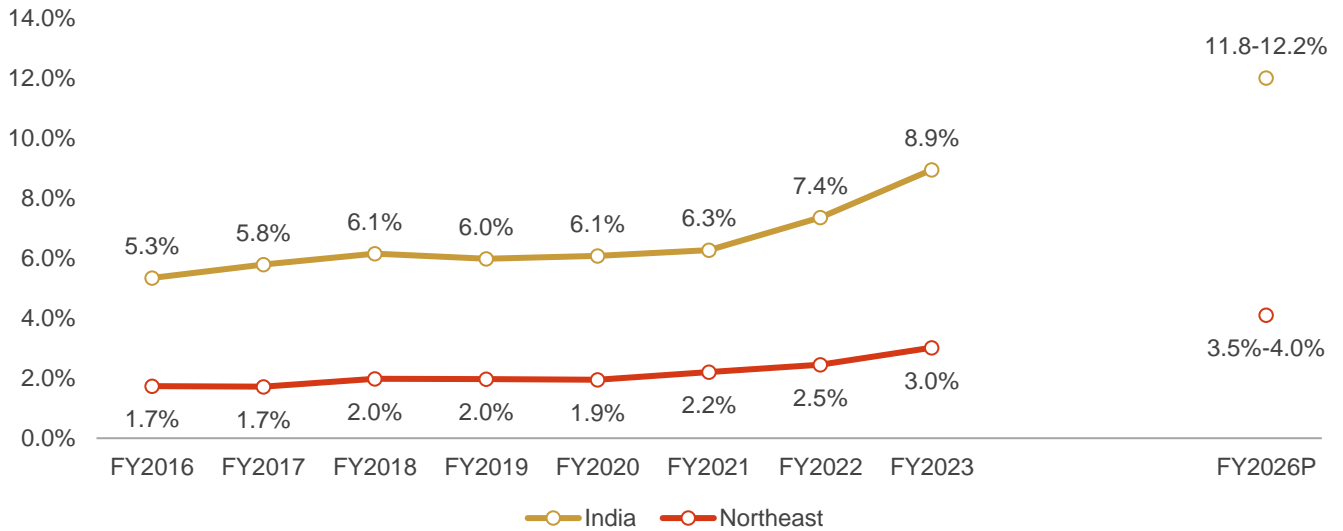
Between fiscals 2016 and 2023, wireline internet density in the Northeast was 3.0%, lower than India’s 8.9%. On a pan-India basis, wired broadband customers are concentrated in urban areas. The discrepancy can be attributed to limited wireline internet infrastructure penetration owing to lower population density and challenging terrain, making it less economical to set up the required wireline infrastructure.

In the Northeast circle, wired broadband customers stood at 0.1 million in fiscal 2023, logging a CAGR of 9.3% from fiscal 2016.

While wired broadband penetration in India increased to 8.9% in fiscal 2023 from 5.3% in fiscal 2016, it rose to 3.0% from 1.7% for the Northeast. This dependence on wireless internet will support continued growth of wireless mobile services in the region, with low broadband penetration also providing some headroom for growth.

Rise in household penetration of broadband connections going forward is estimated to reach 3.5-4.0% by fiscal 2026, growing at ~6.0% CAGR, higher than the expected pan-India growth of ~5.0% CAGR.

Wired broadband penetration



P: Projected
Source: DoT, CRISIL MI&A

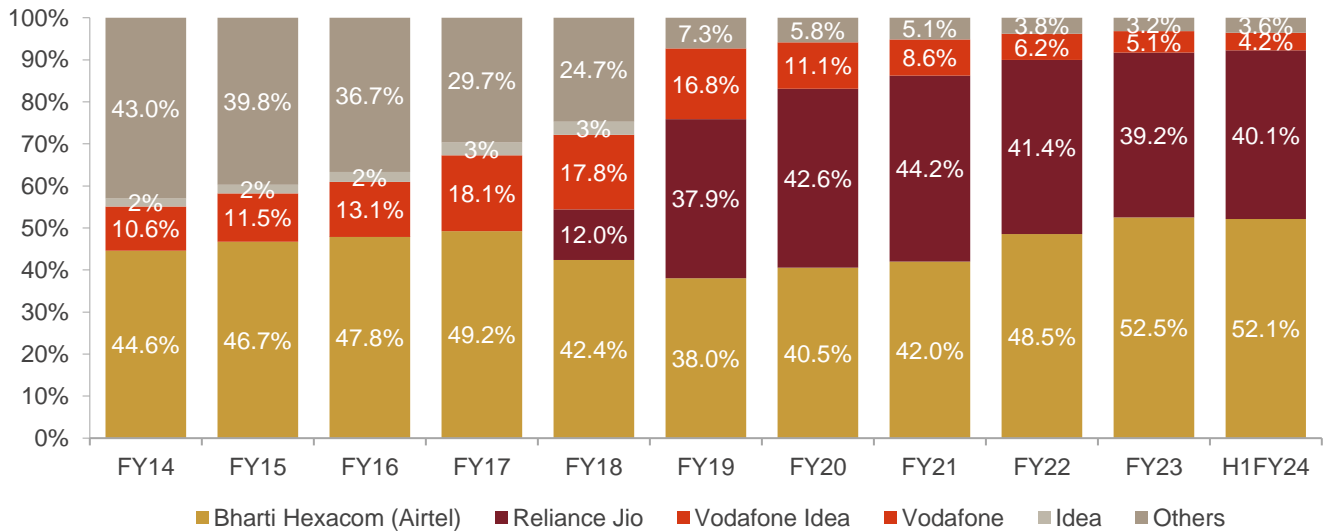
Bharti Hexacom (Airtel) a dominant player in Northeast

In recent times since fiscal 2019, Northeast saw significant shifts (in line with the national market trend), RMS of the top two players in the Northeast circle has been improving and by the first half of fiscal 2024 it has reached a number of 92.2% from 75.9% in fiscal 2019. This indicates greater consolidation of market share with the top two players.

In the first half of fiscal 2024, Bharti Hexacom (Airtel) enjoyed RMS of 52.1%, up from 44.6% in fiscal 2014. It was followed closely by Reliance Jio with RMS of 40.1% in the first half of fiscal 2024, leaving limited room for other players such as Vodafone Idea and BSNL. Bharti Hexacom (Airtel) continued to be a dominant player in the Northeast over fiscals 2014-2023 and maintained a leadership position.

The company enjoys better ARPU in the Northeast compared with its competitors, since its RMS of 52.1% exceeds its CMS of 48.5%.

Telecom Northeast RMS (AGR) (wireless + wireline)

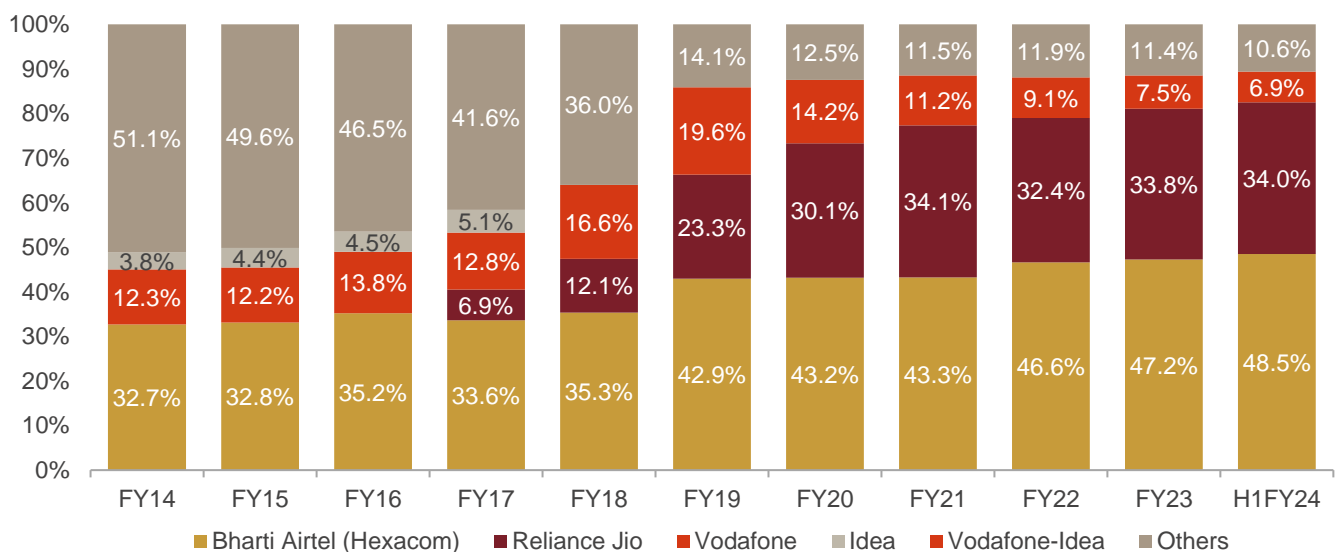


Note: RMS is calculated based on adjusted gross revenue reported by wireless operators to TRAI. Others include BSNL, Airtel, Tata Teleservices and Sistema in FY14 to list a few; others include Reliance Communications, MTNL and BSNL in FY23

Source: DoT, TRAI, CRISIL MI&A

Additionally, compared with their all-India collective CMS of ~70%, Reliance Jio and Bharti Hexacom (Airtel) hold more than 80% CMS in the Northeast, thereby making this circle even more consolidated than the overall Indian telecom industry. As of the first half of fiscal 2024, Bharti Hexacom (Airtel)'s CMS further increased to 48.5%, followed by Reliance Jio (34.0%) and Vodafone Idea (6.9%).

Telecom Northeast CMS (wireless + wireline)



Note: Other players include Reliance Communications, BSNL and Airtel/Dishnet in FY14, and BSNL in FY23

Source: DoT, TRAI, CRISIL MI&A

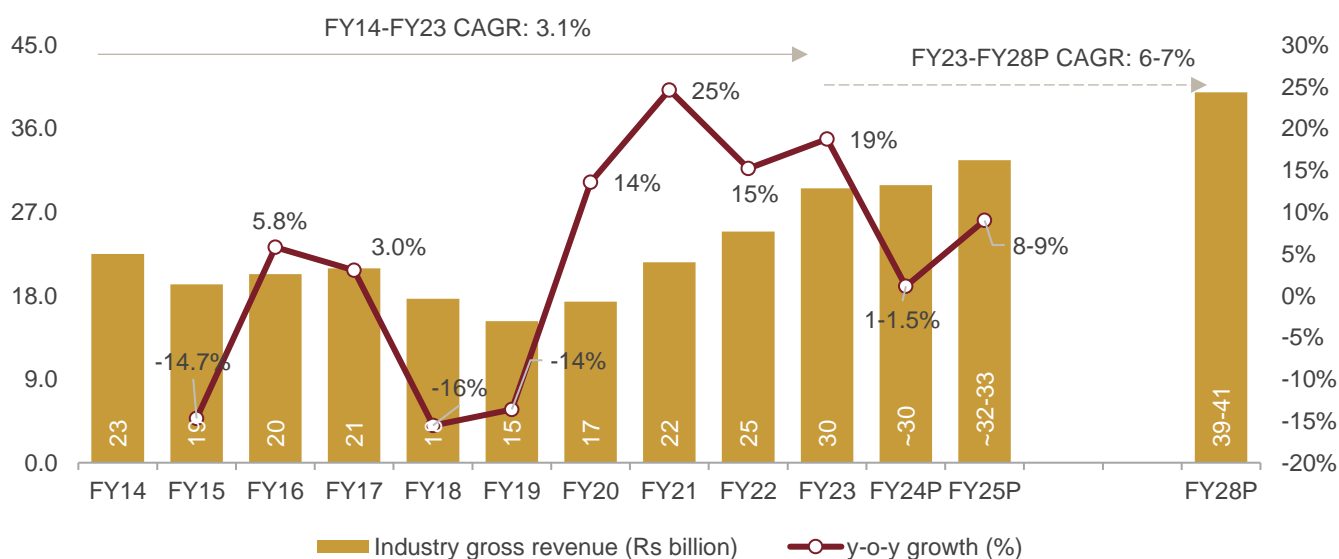
Northeast telecom industry’s revenue to log 6-7% CAGR between fiscals 2023 and 2028

Gross revenue of the Northeast circle increased at 3.1% CAGR, from Rs 22.5 billion in fiscal 2014 to Rs 29.6 billion in fiscal 2023, lower than pan-India telecom industry CAGR of ~5.6%.

Revenue dropped in fiscal 2018 in line with the overall Indian telecom industry following Reliance Jio’s entry, which led to a sharp reduction in ARPU. This, in turn, negatively impacted overall industry revenue. However, revenue improved fiscal 2020 onwards due to the increase in tariffs and the pandemic-caused transition to the online medium, which increased data consumption.

The Northeast circle telecom industry is expected to clock 6-7% CAGR between fiscals 2023 and 2028 to reach Rs 39-41 billion, supported by rise in teledensity, higher internet penetration and a potential increase in ARPU in the region.

Total gross revenue in Northeast



P: Projected

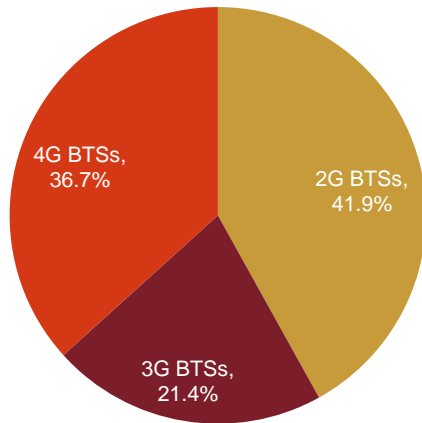
Source: TRAI, CRISIL MI&A

Number of mobile towers and BTSs to increase at 10-12% CAGR between fiscals 2023 and 2025

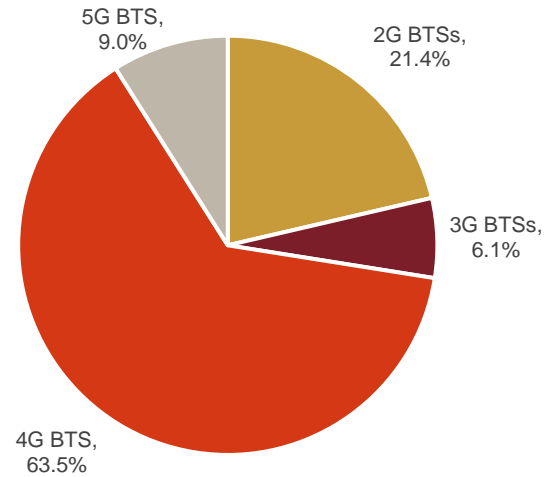
In the Northeast, the number of towers and BTSs is estimated at ~11,000 and ~38,000, respectively, as of fiscal 2023. The share of Northeast BTSs as a percentage of the total grew to 1.5% in fiscal 2023 from 1.2% in fiscal 2014.

The 4G BTSs dominate with 63.5% share as of November 2023. Notably, 5G BTSs claimed a substantial share of 9.0%. This share is expected to increase further going forward, as the focus is now shifting from extending connectivity to remote villages and towns to enhancing connectivity across urban/metro areas. This could lead to a potential increase in 5G and 4G BTSs in Tier 2 and 3 towns in the future.

BTS – technology-wise in Northeast



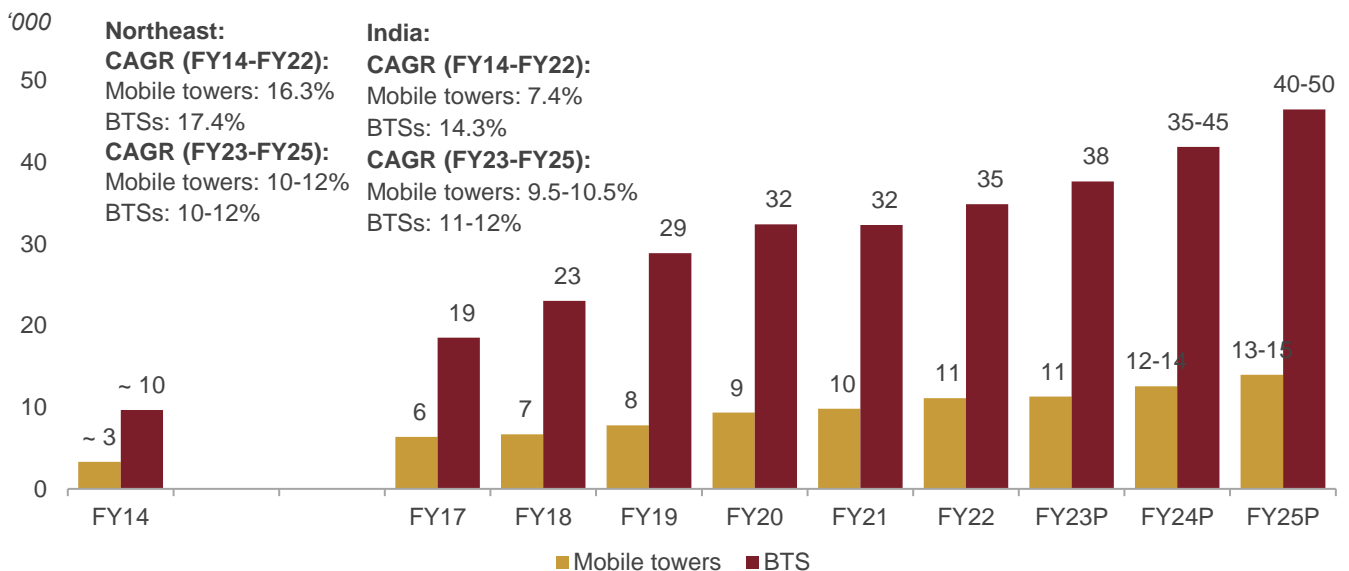
BTS share and type in Northeast (Nov 2023)



Source: DoT, TRAI, CRISIL MI&A

The number of towers and BTSs is projected to increase at 10-12% CAGR between fiscals 2023 and 2025 to 13,000-15,000 and 40,000-50,000, respectively, driven by increase in pan-India capex. This is expected to result in Rs 30-40-billion network capex in the Northeast over fiscals 2023-2025. The Northeast is among the key regions to receive funds for the expansion of mobile networks, with 26.2% share in overall USOF funding. As many as 2,207 towers were installed in the region under the USOF scheme till December 2023.

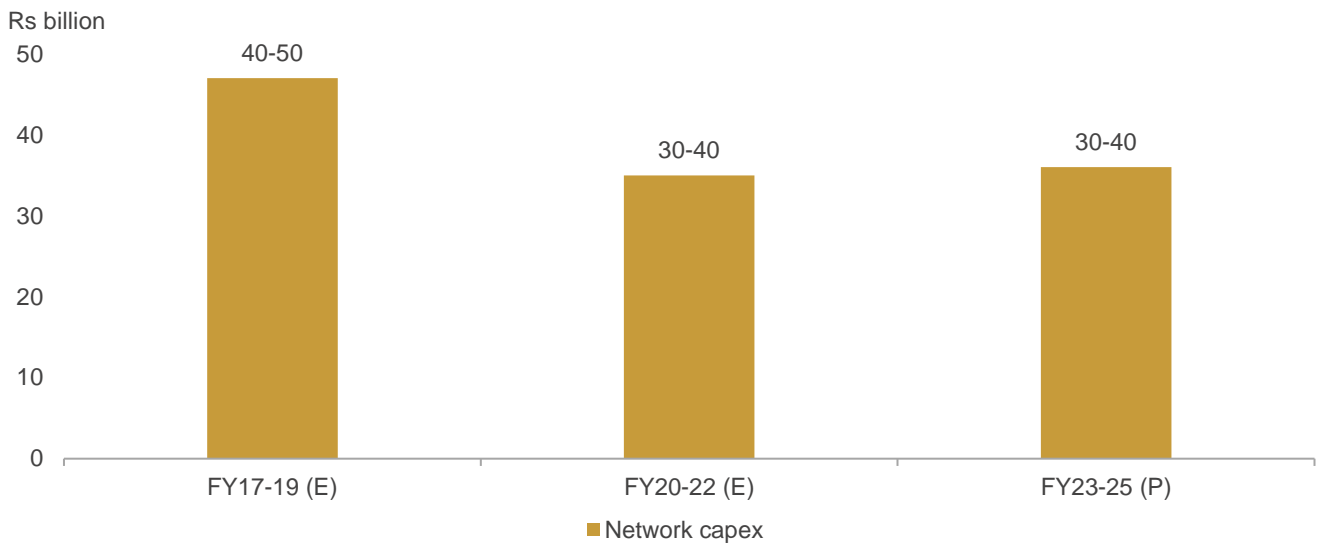
Number of BTSs and mobile towers in Northeast



P: Projected

Source: DoT, CRISIL MI&A

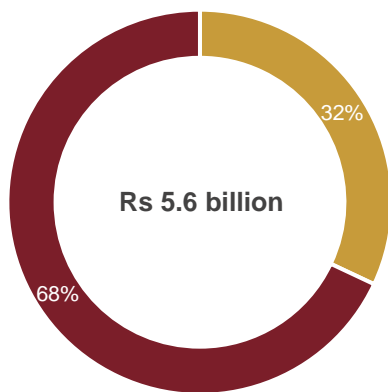
Network capex for Northeast



E: Estimated, P: Projected
Source: CRISIL MI&A

Capex totalled Rs 40-50 billion during fiscals 2017-2019, followed by Rs 30-40 billion in the subsequent three fiscals 2020-2022. Capex has moderated in line with the pan-India trend, with easing of competition in the industry. During fiscals 2017-2019, industry players' cumulative capex peaked, including towards spectrum and network investments. Massive capex and ultra-low tariffs forced smaller players to exit, resulting in a three-player market structure in fiscal 2019. Going forward, investments are expected to moderate with improvement in technology and better utilisation of the existing assets.

Player-wise bids for Northeast circle at 2022 spectrum auction



The Northeast witnessed bid amounts worth Rs 5.6 billion in the spectrum auction of 2022. Jio's contribution was 68%, compared with Bharti Airtel's/ Bharti Hexacom's 32%.

■ Bharti Airtel (Bharti Hexacom) ■ Reliance Jio

Source: DoT, CRISIL MI&A

KPIs for Northeast telecom market

Wireless ARPU exhibited double-digit CAGR in this region

Wireless ARPU in the Northeast surged from Rs 74 in fiscal 2019 to Rs 170 in fiscal 2023, clocking an impressive 23.1% CAGR, well above the all-India CAGR of 19% to Rs 142.

The higher growth in the Northeast indicates a substantial increase in revenue generated per user, attributable to factors such as increased data usage, tariff adjustments and high dependence of the region's population on wireless technology due to lack of wireline technology infrastructure.

ARPU (wireless services/full mobility services)

Wireless ARPU (Rs)	FY14*	FY15*	FY16*	FY17*	FY18*	FY19	FY20	FY21	FY22	FY23	CAGR (FY14-FY23)	CAGR (FY19-FY23)
Northeast	123	123	134	94	82	74	94	124	154	170	3.7%	23.1%
India	113	120	125	83	76	71	91	104	127	142	2.6%	19.0%

Note: * FY14-FY18 figures are GSM ARPU

Source: DoT, TRAI, CRISIL MI&A

Prepaid customers dominate wireless services

In the Northeast circle, prepaid customers dominate, with a 97.1% share in wireless services as of fiscal 2023, higher than the 91.9% share of prepaid customers pan-India. The share of prepaid customers in the Northeast circle has been reducing marginally, moving towards postpaid since fiscal 2016, due to better postpaid bundled tariff offerings by the telecom players. Despite having a higher share of prepaid customers compared with the pan-India market, the Northeast's overall ARPU is higher than the pan-India average, as highlighted in the table above.

In contrast, in developed markets such as the US and Germany, the share of postpaid customers is higher — 69-70% and 54% as of 2023, respectively. Even in countries such as Thailand and Brazil, the share of postpaid customers (including point of sales and mobile to mobile) is higher than in India – 30% and 57%, respectively, in 2023. This demonstrates significant potential for postpaid uptake. Indeed, the shift in customers towards postpaid has been gathering pace since fiscal 2020, owing to better postpaid bundled tariffs.

Despite a higher share of prepaid customers than the pan-India market, Northeast's overall ARPU is higher than the pan-India average. Given the potential shift from prepaid to postpaid customers and higher postpaid ARPU, overall ARPU for the Northeast market has the potential to outperform pan-India ARPU growth.

Percentage of prepaid customers — Northeast

Prepaid share	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23
Northeast	97.0%	97.6%	98.0%	98.0%	98.0%	98.4%	98.6%	98.6%	97.7%	97.1%
India	95.9%	95.6%	95.4%	95.4%	95.5%	94.4%	95.4%	95.0%	93.1%	91.9%

Note: Percentage share is as of the March quarter of the respective fiscals

FY14-FY18 numbers represent GSM prepaid share and FY19-FY23 numbers represent wireless prepaid share; the remaining share is of postpaid customers. GSM is a technology for providing wireless services

Source: DoT, TRAI, CRISIL MI&A

MoU in Northeast tracked pan-India trends in the last decade

MoU indicates the average communication time, both incoming as well as outgoing, per consumer. Between fiscals 2014 and 2023, MoU grew from 402 minutes to 971 minutes for Northeast at 10.3% CAGR, similar to India's MoU CAGR of 10.4%. However, between fiscals 2019 and 2023, Northeast experienced a higher MoU CAGR (10.3%) than the national average (8.1%), indicating better connectivity and usage in the region. During fiscals 2014 and 2023, Northeast's MoU growth was in line with pan-India.

MoU

Total MoU# (minutes)	FY14*	FY15*	FY16*	FY17*	FY18*	FY19	FY20	FY21	FY22	FY23	CAGR (FY14-FY23)	CAGR (FY19-FY23)
Northeast: Wireless MoU	402	358	341	376	582	656	690	787	956	971	10.3%	10.3%
India: Wireless MoU	389	383	381	405	584	692	750	818	955	946	10.4%	8.1%

Note: *FY14-FY18 figures are GSM MoU

#Total MoU = total usage (from and outside home service area) per customer per month

Source: DoT, TRAI, CRISIL MI&A

Northeast average wireless data usage on a par with all-India average

In 2017, the average monthly wireless data usage per customer in the Northeast was lower at 3.6 GB compared with 4.1 GB for the country. However, in 2018, it clocked 6.9 GB/customer/month, moving closer to India's 7.4 GB and becoming at par with India usage in 2023 — signifying a significant increase in data consumption.

Average wireless data usage (GB) per customer per month

Service area	2017	2018	2023
Northeast	3.6	6.9	18.4*
India	4.1	7.4	18.4

*Estimated for Northeast based on 2017 and 2018 trends and insights from industry interaction for increased data consumption in the region

Source: DoT, TRAI, CRISIL MI&A

Key growth drivers for Rajasthan and Northeast markets

These two regions are expected to see improvement in teledensity and adoption of smartphones in rural areas through investments in network infrastructure along with the below-mentioned factors.

Factors	Description
Growth of digital payments	<p>Increase in digital transactions indicates strong growth potential for telecom and data services in the region. PhonePe – which is among the key fintech player in digital payment space – registered strong growth in demand for Rajasthan and Northeast region.</p> <p>Rajasthan: The number of UPI, wallet and card-via-PhonePe transactions totalled 3,231.8 million in the third quarter of 2023 (cumulative of three quarters) and 2,859 million in 2022. Based on the average quarter number of 2023, growth is estimated at 105% over 2019-2023. Total transaction value grew to Rs 5,053.2 billion in the third quarter of 2023 (cumulative of three quarters) from Rs 422.2 billion in 2019.</p> <p>Northeast: The number of UPI, wallet and card-via-PhonePe transactions totalled 89 million at the end of the third quarter of 2023 (cumulative of three quarters) and 77.8 million in 2022. Based on the average quarter number for 2023, CAGR is estimated at 98% over 2019-2023. Total transaction value grew to Rs 182.7 billion in the third quarter of 2023 (cumulative of three quarters) from Rs 6.0 billion in 2019.</p>

Factors	Description
Rise in data consumption	<p>CRISIL expects average data usage in India to grow to 24-25 GB/customer/month by fiscal 2025, driven by the usage of higher bandwidth applications by retail consumers.</p> <p>The Ericsson Mobility Data Traffic Outlook projects a 16% CAGR in mobile data consumption, rising from 31 GB per month in 2022 to 75 GB per month in 2029 for the India market, at par with the global average data consumption CAGR of 18%.</p>
Increase in TV and smart TV penetration	<p>As per BARC data for 2022, TV penetration for the Northeast and Rajasthan was 60% and 52%, respectively, lower than the pan-India penetration of ~69%. But with a rise in per capita income and internet penetration in these regions, TV penetration is expected to increase.</p> <p>Smart TVs also support the telecom industry's growth in the region. Northeast's cloudy and rainy weather conditions do not allow DTH services to perform at their best. This may make internet-based services such as OTT and other offerings more lucrative for the population there.</p> <p>At the all-India level, colour TV sales increased 6% in fiscal 2023 to 14.4 million units, with smart TVs comprising over 80% of these sales. CRISIL expects colour TV sales to log 5-6% CAGR between fiscals 2023 and 2027, reaching 17.4 million units, supported by a shorter replacement cycle, multiple ownership of TV units and rise in penetration of units in rural areas. Also, the OTT market in India is expected to clock 11-14% CAGR between fiscals 2023 and 2025 expanding to Rs 240-250 billion. It is driven by the rise in smart TV and smartphone penetration, India-specific content by OTT channels, and media consumption behaviour change.</p> <p>The rise in smart TVs and OTT apps and changing content consumption habits augur well for sustained demand for high-speed internet, which could be further supported by wired broadband and 5G wireless / FWA connections.</p>
Growth in demand for e-education	<p>Smart classroom and ICT infrastructure in the education sector is also expected to aid the telecom industry's growth. <i>Online education and video content will drive data service demand from the e-education segment.</i></p> <p>Under Samagra Shiksha, the 'Strengthening of ICT infrastructure' component envisages covering all government and aided schools from classes VI to XII and teacher education institutions. The Cabinet Committee on Economic Affairs has approved continuation of the Samagra Shiksha Scheme for five years, i.e., from fiscals 2022 to 2026, with a total financial outlay of Rs 2,942.83 billion, including the central share of Rs 1,853.98 billion. Across India, till November 2022 (since inception), ICT labs have been approved in 120,614 schools and smart classrooms in 82,120 schools across the country.</p>
IoT devices – e-meters	<p>Increased penetration of affordable devices, combined with cloud computing, analytics and rising consumer expectations are driving the rapid growth of the IoT market in India. Industry experts see major developments and demand for IoT in sectors such as healthcare, manufacturing, supply chain, education and smart homes.</p> <p>For instance, telecom revenue is expected to be supported by partnership services to power companies for deploying smart meters in Rajasthan and Northeast. As per the National Smart Grid Mission dashboard on December 12, 2023, ~2 million smart consumer meters have been sanctioned across various schemes. In Rajasthan, 0.43 million distribution transformer (DT) meters and 27,128 feeder meters had been sanctioned, while the corresponding numbers for the Northeast circle, at 56,470 and 3,632, respectively.</p> <p>Power utilities across the globe have embarked on smart metering or advanced metering infrastructure (AMI), which requires two-way communications between the smart meter and the discom's information system. Various communication technologies, either individually or in combination, have been used by utilities worldwide for AMI. Major utilities in North America, Australia, Japan, Europe, South America and South Korea have opted for the radio frequency, or RF, mesh solution for their last-mile connectivity. RF mesh is reported to have higher reliability and large data handling capacities in comparison with other communication technologies.</p>

Factors	Description
Market dominance (entry barrier)	<p>In Rajasthan, the top two players have an overall revenue market share of 86.4%. Similarly, in the Northeast, the top two have a share of 92.2% for the first half of fiscal 2024.</p> <p>Similar trends were seen in customer market share, with two top players in Rajasthan having a share of ~74%, and similarly in Northeast, the top two have a share of ~80% for the first half of fiscal 2024. Such high consolidation poses challenges for new telecom players in Rajasthan and the Northeast.</p> <p>Over the years, existing telecom companies in these regions have built extensive coverage through network infrastructure, which is hard to replicate for a new telecom company. These telecom companies have developed expertise in addressing challenges related to geography, low population density, power and other unpredictable factors. This expertise positions these companies to offer superior services to consumers compared with new players in the industry, supporting revenue growth and expansion.</p>

Challenges faced by telecom players in Rajasthan and Northeast

Entry barriers for the telecom industry are high due to high capex intensity, significant spectrum acquisition cost and consolidated nature of the industry. For a new telecom player in the Rajasthan and Northeast circles, the entry barriers are even higher on account of the geographic challenges in laying down and maintaining telecom infrastructure in areas with low population density and hilly terrain. The operational challenges faced by existing players are summed up below.

Challenges	Description
Hilly terrain	<p>The difficult hilly terrain poses significant challenges in laying and maintaining telecom infrastructure such as towers, fibre cables, and power cables, leading to higher costs and logistical difficulties.</p> <p>The rugged terrain, dense forests and hilly landscape of the Northeast make building a network structure difficult. Only 30-35% of the region's area is plain land. States in the region, such as Arunachal Pradesh, Meghalaya, Mizoram and Nagaland, are characterised by an extremely tough terrain with relatively poor rail, road, electricity and telecom infrastructure. The region's vulnerability to earthquakes and flooding adds to the difficulty in establishing and maintaining robust communication networks.</p> <p>Similarly, arid deserts and challenging terrains in Rajasthan pose logistical difficulties in laying cables and installing network infrastructure.</p>
Power infrastructure	<p>Inconsistent power supply affects the reliability and stability of telecom services, especially in remote areas. Telecom network infrastructure requires secure electrical power supply for optimum performance.</p> <p>The Northeast recorded the highest transmission and distribution (T&D) losses of 23.55% in fiscal 2022, surpassing the all-India figure of 17.6%, according to the CEA electric power survey. Rajasthan reported marginally higher T&D losses of 20.9%, compared with the all-India figure. Telecom service providers ran 3.9% or 1,328 sites only on diesel generators (DGs) as of December 2022 due to the non-availability of commercial power supply in Northeast.</p> <p>Though most villages in Northeast have power connectivity, commercial power supply in these areas is of substandard quality. Additionally, due to erratic power outages, high capex and inordinate processing delays in extending last-mile power connectivity to telecom sites in such remote and hilly regions, sites are commissioned using DG sets. Obtaining environmental clearance for the installation of DG sets also entails substantial time and costs under the green telecom initiative.</p>
Geopolitical stability	<p>Northeast's geopolitical dynamics, including border disputes, security concerns and friction between social groups, create additional challenges for telecom infrastructure development. This also disrupts operational efficiencies and causes delays.</p>
Lower population density	<p>As per Census 2011, the population densities of Rajasthan and Northeast were 200 per sq km and 175 per sq km, respectively. This compared with India's population density of 382 per sq km. Such low density poses economic viability challenges for companies aiming to develop wireline projects.</p> <p>Sparsely populated regions increase the cost per customer for setting up network infrastructure. Also, the dispersed population in remote areas within these regions adds to challenges in building network infrastructure, requiring tailored strategies to cover a wide range of locations.</p>

Challenges	Description
Natural calamities	Frequent natural calamities such as flooding and other weather-related disruptions can damage telecom infrastructure, causing service outages and hindering consistent connectivity.
Lack of qualified workforce	The scarcity of skilled and trained workforce specialised in telecom technologies poses a challenge in efficiently managing and maintaining telecom services in these regions. A skilled labour workforce becomes all the more important in the case of new technologies such as 5G.

Source: CRISIL MI&A

Rajasthan and Northeast circles

Rajasthan and Northeast have seen lower telecom penetration compared to rest of the country on account of infrastructural challenges in these regions. With increased focus on developing infrastructural facilities in both, telecom penetration in both circles have also improved, surpassing the pan-India level. The circles are expected to see 1.0-1.5% growth in telecom customers between fiscals 2013 and 2028, as low telecom density implies there is headroom for growth. Demand-side drivers such as a rise in per capita income and evolving data consumption behaviours are supported by supply-side investments in telecom infrastructure. Consolidated markets in these circles will enable focusing on customer conversion, upgrades and further data monetisation. Any potential tariff increases over the period will add to the revenue growth momentum.

Telecom parameters across Rajasthan, Northeast and pan-India

Parameter	Rajasthan	Northeast	India
Telecom customers (million) (as of first half of FY24)			
Telecom customers	66.4	12.6	1,181.1
Wireline	0.9	0.2	31.0
Wireless	65.5	12.4	1,150.2
Rural	35.1 [^]	6.5 [^]	522.7
Urban	31.4 [^]	6.1 [^]	658.5
Telecom density (%) (as of first half of FY24 / *FY23)			
Teledensity	81.5	79.6	84.7
Wireline	1.0 [*]	1.4 [*]	2.2
Wireless	78.4 [*]	78.4 [*]	82.5
Rural	57.2 [*]	63.1 [*]	57.9
Urban	140.8 [*]	111.0 [*]	133.9
Wireless MoU (as of FY23)			
Wireless MoU (minutes)	926	971	946
Internet customers (million) (as of FY23)			
Internet customers	46.9	9.7	881.3
Rural customers	22.2	5.0	358.0
Urban customers	24.7	4.7	523.3
Internet density (as of FY23)			
Internet density (%)	57.8	61.2	63.5

Parameter	Rajasthan	Northeast	India
Rural teledensity (%)	37.3	48.4	39.8
Urban teledensity (%)	114.4	85.4	107.1
Wireless ARPU (as of FY23)			
Wireless ARPU (Rs)	145	170	142
BTS (as of FY23)			
Number#	136188	37014	2542213
# of BTS per 100 population	~0.2	~0.2	~0.2
Revenue (Rs billion) (as of FY23)			
Gross revenue	127.6	29.6	2,679.6

Note:

[^]First half of FY24 split of urban and rural telecom customers for Northeast and Rajasthan circles calculated based on FY23 percentage share of urban and rural telecom customers for the two circles, respectively

*As of FY23

#BTS FY23 number calculated based on BTS additions in FY23 and base number of FY22

@@ Wireless ARPU is calculated based on gross revenue for cellular licence and wireless customers, excluding ILD and NLD gross revenue, for comparison with circle ARPU

Wireless ARPU = (Average gross revenue of first and second quarters of FY24/Average wireless customers as of June and September 2023)/3

Source: TRAI, CRISIL MI&A

7 Competitive landscape assessment

In this section, CRISIL has analysed key players operating in the Indian telecom industry. Data has been obtained from publicly available sources, including annual reports and investor presentations, of listed players, as well as regulatory filings, rating rationales, and/or company websites and social media pages. Financials in this section have been re-classified by CRISIL, based on annual reports and financial filings by relevant players. Please note CRISIL calculated numbers may differ from company reported numbers on account of different methodology.

Note: The list of peers considered in this section is not exhaustive, but indicative. Peers have been selected based on product and service offerings and a comparable revenue range.

Overview of key operational parameters

Geographical presence (as of FY23)

Players	Wireless services	5G presence — FY23
BSNL	All India (except Delhi and Mumbai)	N.A.
Bharti Airtel	All India (22 circles)	3,500+ cities/towns
Bharti Hexacom (Airtel)	Rajasthan and Northeast (2 circle)	486 census towns
Vodafone Idea	All India (22 circles)	N.A.
Reliance Jio	All India (22 circles)	2,300+ cities/ town

N.A.: Not available

Source: CRISIL MI&A

Spectrum holdings

Players	FY21	FY22	FY23
BSNL	786.8 MHz	704.0 MHz	704.0 MHz
Bharti Airtel	2,107.1 MHz	2,092.1 MHz	22,027.7 MHz
Bharti Hexacom (Airtel)	202.0 MHz	202.0 MHz	2,010.0 MHz
Vodafone Idea	1,768.4 MHz	1,768.4 MHz	8,005.2 MHz
Reliance Jio	1,732 MHz	1,732 MHz	26,768 MHz

Note: Bharti Airtel includes Bharti Hexacom (Airtel) spectrum as well.

Source: TRAI, Company filings, CRISIL MI&A

Mobile towers

Players	FY21	FY22	FY23	H1FY23	H1FY24
BSNL	N.A.	N.A.	~68,049	N.A.	N.A.
Bharti Airtel	216,901	237,577	275,069	253,998	295,318
Bharti Hexacom (Airtel)	17,188	18,786	21,672	19,965	23,748
Vodafone Idea	180,484	184,794	184,382	184,756	183,565
Reliance Jio	N.A.	N.A.	N.A.	N.A.	N.A.

Note: Tower numbers as of exit quarter of respective fiscal year/ half year

NA – Not reported by player in company filings

Source: Company annual reports, NITI Aayog, CRISIL MI&A

Wireless telecom customers – overall India

	Total wireless customers (million)						Customer market share (%)				
	FY21	FY22	FY23	H1 FY23	H1 FY24	CAGR (FY21-23)	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Airtel	352.4	360.3	370.9	364.2	377.8	2.6%	29.8%	31.6%	32.4%	31.8%	32.8%
Vodafone Idea	283.7	260.8	236.8	249.1	227.5	-8.7%	24.0%	22.8%	20.7%	21.7%	19.8%
BSNL / MTNL	121.9	117.0	106.0	112.1	95.6	-6.7%	10.3%	10.2%	9.3%	9.8%	8.3%
Reliance Jio	422.9	404.0	430.2	420.0	449.2	0.9%	35.8%	35.4%	37.6%	36.7%	39.1%

Calculated number may differ from company reported number on account of different methodology

Source: TRAI, CRISIL MI&A

Wireless revenue of telecom players – pan-India (adjusted gross revenue)

	Total adjusted gross revenue (Rs billion)						Revenue market share (%)				
	FY21	FY22	FY23	H1 FY23	H1 FY24	CAGR (FY21-23)	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Airtel	557.7	683.2	792.9	386.5	430.6	19.2%	32.8%	35.4%	36.1%	35.8%	37.1%
Vodafone Idea	353.1	353.3	376.5	189.9	188.5	3.3%	20.8%	18.3%	17.2%	17.6%	16.2%
BSNL / MTNL	136.6	120.5	119.1	59.2	57.7	-6.6%	8.0%	6.3%	5.4%	5.5%	5.0%
Reliance Jio	652.2	770.6	905.2	442.8	483.6	17.8%	38.4%	40.0%	41.3%	41.1%	41.7%

Note: Data collated for adjusted gross revenue reported by wireless telecom players for UL, UASL, WLL, Mobile and NLD licenses as per TRAI document

Figures for Bharti Airtel are arrived at by adding Bharti Airtel and Bharti Hexacom figures

Source: TRAI, CRISIL MI&A

Revenue per tower per month

(Rs.)	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Hexacom (Airtel)	220,362	236,173	248,493	259,371	235,122
Bharti Airtel	207,236	215,381	223,996	242,932	233,333
BSNL	N.A.	N.A.	N.A.	N.A.	N.A.
Vodafone Idea	193,702	173,687	190,624	189,662	194,044
Reliance Jio	N.A.	N.A.	N.A.	N.A.	N.A.

NA: Not available as data on the number of towers is not reported by respective companies

Note: Revenue from mobile services is considered for BHL and Bharti Airtel, and revenue from sales of services considered for BSNL. Due to lack of segmental revenue, revenue from operations is considered for Vodafone Idea. Revenue from Bharti Airtel, BSNL, and Vodafone Idea is considered on a consolidated basis.

Revenue per tower per month = (Revenue from operations or mobile services / no. of towers / no. of months)

Calculated number may differ from company reported number on account of different methodology

Source: Company filings, CRISIL MI&A

Total wired broadband customers

Wired broadband customers (million)	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Hexacom (Airtel)	0.1	0.1	0.2	0.2	0.3
Bharti Airtel	3.1	4.5	6.1	5.3	7.0
BSNL	6.8	3.9	3.6	3.9	3.7
Vodafone Idea	N.A.	N.A.	N.A.	N.A.	N.A.
Reliance Jio	2.6	5.3	8.3	6.8	9.8

Note: Wired broadband customers as of March quarter of respective fiscal years

For Bharti Hexacom (Airtel), numbers represent home customers

Source: TRAI, CRISIL MI&A

Total wired broadband customers market share

Wired broadband customers (%)	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Hexacom (Airtel)	0.3%	0.5%	0.7%	0.6%	0.7%
Bharti Airtel	13.6%	16.6%	18.3%	17.1%	19.1%
BSNL	30.0%	14.1%	10.7%	12.7%	10.1%
Vodafone Idea	N.A.	N.A.	N.A.	N.A.	N.A.
Reliance Jio	11.4%	19.4%	24.9%	22.2%	26.4%

Note: Wired broadband customers as of March quarter of respective fiscal years

For Bharti Hexacom (Airtel), numbers represent home customers

Source: TRAI, CRISIL MI&A

Total wired broadband customers as % of total telecom customers

Wired broadband customers (million)	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Hexacom (Airtel)	0.4%	0.4%	0.7%	0.7%	1.0%
Bharti Airtel	0.9%	1.2%	1.6%	1.4%	1.8%
BSNL	5.4%	3.2%	3.2%	3.3%	3.7%
Vodafone Idea	N.A.	N.A.	N.A.	N.A.	N.A.
Reliance Jio	0.6%	1.3%	1.9%	1.6%	2.1%

Note: Wired broadband customers as of March quarter of respective fiscal years

For Bharti Hexacom (Airtel), numbers represent home customers

Source: TRAI, CRISIL MI&A

Observations

- Bharti Airtel registered the highest wireless customer CAGR, of 2.6%, between fiscals 2021 and 2023. As of the first half of fiscal 2024, Bharti Airtel had 377.8 million wireless customers with a customer market share of 32.8%
- In terms of adjusted gross revenue, Bharti Airtel had a 36.1% share as of fiscal 2023, with its revenue logging a CAGR of 19.2% between fiscals 2021 and 2023. In terms of adjusted gross revenue, Bharti Airtel had a 37.1% share as of the first half of fiscal 2024 and ranks #2 after Reliance Jio

- Bharti Airtel reported 376.2 million VLR customers and a VLR market share of 35.9% at a pan-India level for September 2023. Reliance Jio reported the highest VLR market share of 40.1%, with 420.3 VLR customers for September 2023.

Pan-India: Operator-wise VLR customers

Month	VLR customers (in million)				
	Bharti Airtel	Reliance Jio	Vodafone Idea	BSNL	MTNL
Sep-23	376.2	420.3	199.8	50.0	0.6
Aug-23	375.5	417.1	199.4	50.6	0.7
Jul-23	375.9	415.9	202.3	51.7	0.6
Jun-23	372.8	414.5	202.8	52.0	0.8
May-23	372.7	412.2	205.3	52.7	0.6
Apr-23	370.3	407.3	207.1	53.3	0.6
Mar-23	369.6	402.6	207.9	53.7	0.6
Feb-23	367.1	397.6	208.3	53.9	0.6
Jan-23	366.3	394.5	209.1	54.3	0.6
Dec-22	365.0	391.0	209.6	54.7	0.6
Nov-22	359.0	388.0	209.7	55.0	0.7
Oct-22	358.0	391.0	211.7	55.5	0.6
Sep-22	359.0	386.1	212.2	56.1	0.6
Aug-22	357.7	384.6	214.3	56.2	0.6
Jul-22	356.2	382.2	216.9	57.3	0.6
Jun-22	357.2	383.2	218.7	57.8	0.7
May-22	354.9	383.3	220.0	58.9	0.6
Apr-22	352.7	378.9	222.3	59.3	0.6

Note: Rank #1 is highlighted in bold-green colour

VLR customer is calculated based on proportion of VLR customer in total wireless customers for the player reported by TRAI in monthly subscription report.

VLR data is used to determine the number of active users on a mobile network. VLR is acronym of Visitor Location Register. The dates of peak VLR for various TSPs are different in different service areas. VLR is a temporary database of customers who have roamed into the particular area that it serves. Each base station in the network is served by exactly one VLR; hence, a customer cannot be present in more than one VLR at a time. VLR customer data calculated by TRAI is based on active customers in VLR on the date of the peak customer number in the VLR of the particular month for which data is being collected. Data is to be taken from the switches having a purge time of not more than 72 hours.

Source: TRAI, CRISIL MI&A

Pan-India: Voice call volume

	Minutes on network (trillion minutes)					Minutes on network per customer per month				
	FY21	FY22	FY23	H1FY23	H1FY24	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Airtel	3.6	4.1	4.3	2.1	2.3	882.8	959.6	991.1	985.5	1,022.4
Bharti Hexacom (Airtel)	0.3	0.3	0.3	0.2	0.2	804.9	903.6	962.7	947.4	1,010.4
Vodafone Idea	2.2	1.9	1.7	0.9	0.8	611.0	581.9	578.4	574.0	593.0
Reliance Jio	3.8	4.5	5.1	2.5	2.7	787.5	910.3	1,011.6	1,002.7	1,011.7

Note: NA — not available, as not reported by player

Minutes of network is as reported by respective players

Formula used: Minutes on network / (average of TRAI reported wireless customers for start and end of the period) / number of months in the period

Calculated number may differ from company reported number on account of different methodology

Source: Company filings, CRISIL MI&A

Pan-India: data volume

	Data traffic/ total GBs on network (billion GB)					Data customers (million)				
	FY21	FY22	FY23	H1FY23	H1FY24	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL [#]	N.A.	N.A.	N.A.	N.A.	N.A.	32.5	30.1	28.3	28.4	N.A.
Bharti Airtel [@]	32.5	45.2	54.1	26.0	30.7	188.6	208.4	232.7	219.1	245.9*
Bharti Hexacom (Airtel) ^{^@}	2.5	3.5	4.3	2.0	2.4	13.9	15.4	17.3	16.1	18.6*
Vodafone Idea [@]	18.2	21.5	22.7	11.1	12.1	139.9	135.7	136.2	135.2	137.2*
Reliance Jio [#]	62.5	91.4	113.3	54.1	69.5	425.5	409.3	438.6	426.8	459.7 ^{\$}

Note: Data Customers as of the exit quarter of each respective fiscal year/half year as reported by TRAI

[#] Data customers of Reliance Jio and BSNL represent the internet customers base as reported by TRAI. Data traffic includes wireless and wireline data traffic for Reliance Jio and BSNL

[@] For Bharti Airtel, Bharti Hexacom (Airtel) and Vodafone Idea, includes only wireless data traffic

^{*}Data customers of Bharti Airtel, Bharti Hexacom (Airtel), and Vodafone Idea is as reported by the respective companies

[^]Bharti Hexacom (Airtel) numbers as reported by company for Rajasthan and Northeast circles.

^{\$} As reported by the player and represents total customers

NA: Not Available, as of January 14, 2023 latest data available from TRAI is of the June quarter and similar data is reported by the respective company

Source: Company filings, CRISIL MI&A

Data customers as % of total telecom customers — pan-India

	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL*	25.9%	24.8%	25.5%	24.4%	N.A.
Bharti Airtel^	52.8%	56.9%	61.5%	59.1%	63.7%
Bharti Hexacom (Airtel)^	50.6%	55.8%	60.7%	57.5%	63.4%
Vodafone Idea^	49.2%	51.9%	57.4%	54.1%	60.1%
Reliance Jio*	99.8%	99.8%	99.8%	99.8%	N.A.

Note: Internet customers as of exit quarter of each of the respective fiscal / half fiscal as reported by TRAI

NA: Numbers not available from TRAI or company filings

^ Numbers as reported by the company

*Internet customer base of respective companies as reported by TRAI

Calculated number may differ from company reported number on account of different methodology

Source: Company filings, TRAI, CRISIL MI&A

Pan-India: Data usage

	Data usage per customer per month (GB)				
	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	N.A.	N.A.	N.A.	N.A.	N.A.
Bharti Airtel®	16.1	19.0	20.5	20.3	21.4
Bharti Hexacom (Airtel) ®	16.8	19.9	21.7	21.5	22.4
Vodafone Idea®	10.9	13.0	13.9	13.7	14.8
Reliance Jio*	12.8	18.2	22.3	21.6	25.8 [§]

Note: Data usage per customer per month: (Total GBs on network / Average of data customers for start and end of the period / number of months in the period)

NA: Numbers not available from TRAI or company filings

@ For Bharti Airtel, Bharti Hexacom (Airtel), and Vodafone Idea, includes only wireless data traffic

*For Reliance Jio, internet customers as reported by TRAI are considered for calculation. Data usage also includes wireline usage. This wireline usage was ~280 GB for fiscal 2023 as reported by the company.

§: Customers as reported by the player used for calculating data usage per customer

Calculated number may differ from company reported number on account of different methodology

Source: Company filings, CRISIL MI&A

Postpaid customer base

	Postpaid customer base %				
	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Hexacom (Airtel)	2.7%	2.7%	2.7%	2.6%	3.0%
Bharti Airtel	5.2%	5.5%	5.9%	5.6%	6.3%
BSNL	N.A.	N.A.	N.A.	N.A.	N.A.
Vodafone Idea*	7.8%	8.2%	9.9%	8.9%	10.5%
Reliance Jio	N.A.	N.A.	N.A.	N.A.	N.A.

Note: *For Vodafone Idea, monthly churn % represents blended churn %

Post-paid customer base % as of exit quarter of each of the respective fiscal / half fiscal

NA: Not Available, as similar data is not reported by the respective companies.

Source: Company filings, CRISIL MI&A

Monthly churn

	Monthly churn %				
	FY21	FY22	FY23	H1 FY23	H1 FY24
Bharti Hexacom (Airtel)	1.8%	2.7%	2.7%	3.0%	2.5%
Bharti Airtel	2.2%	2.8%	2.8%	3.3%	2.9%
BSNL	N.A.	N.A.	N.A.	N.A.	N.A.
Vodafone Idea*	3.0%	3.4%	3.8%	4.3%	4.1%
Reliance Jio	1.3%	N.A.	~2%	N.A.	1.7%

Note: *For Vodafone Idea, monthly churn % represents blended churn %

Monthly churn % as of exit quarter of each of the respective fiscal / half fiscal

NA: Not Available, as similar data is not reported by the respective companies

Source: Company filings, CRISIL MI&A

Total telecom customers — Rajasthan

	FY21	FY22	FY23	H1 FY23	H1 FY24
Total telecom customers (million)					
BSNL	6.6	6.8	6.4	6.7	5.9
Bharti Hexacom (Airtel)	22.0	22.0	22.6	22.3	23.2
Vodafone Idea	12.3	11.1	10.3	10.6	11.3
Reliance Jio	25.8	24.0	25.1	24.5	26.0
Total	66.8	63.9	64.4	64.1	66.4
Wireless telecom customers (million)					
BSNL	6.4	6.5	6.1	6.4	5.7
Bharti Hexacom (Airtel)	22.0	21.8	22.4	22.1	23.0
Vodafone Idea	12.2	11.1	10.3	10.6	11.3
Reliance Jio	25.7	23.7	24.8	24.2	25.6
Total	66.3	63.2	63.6	63.3	65.5
Wireline telecom customers (million)					
BSNL	0.25	0.29	0.28	0.29	0.27
Bharti Hexacom (Airtel)	0.08	0.14	0.20	0.17	0.23
Vodafone Idea	0.01	0.02	0.02	0.02	0.01
Reliance Jio	0.12	0.23	0.33	0.28	0.38
Total	0.47	0.69	0.84	0.77	0.92

Note: Customers as of March quarter of the respective fiscals. Customer market share calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

Total telecom customers market share— Rajasthan

	FY21	FY22	FY23	H1 FY23	H1 FY24
Total telecom customers (%)					
BSNL	10.0%	10.7%	9.9%	10.4%	9.0%
Bharti Hexacom (Airtel)	33.0%	34.4%	35.1%	34.8%	34.9%
Vodafone Idea	18.4%	17.4%	16.0%	16.6%	17.0%
Reliance Jio	38.7%	37.5%	39.0%	38.2%	39.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Wireless telecom customers (%)					
BSNL	9.7%	10.4%	9.6%	10.1%	8.7%
Bharti Hexacom (Airtel)	33.1%	34.5%	35.3%	34.9%	35.1%
Vodafone Idea	18.5%	17.5%	16.1%	16.8%	17.2%
Reliance Jio	38.8%	37.6%	39.0%	38.3%	39.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Wireline telecom customers (%)					
BSNL	52.3%	42.4%	33.3%	37.1%	29.3%
Bharti Hexacom (Airtel)	17.5%	20.2%	23.4%	22.0%	25.4%
Vodafone Idea	1.6%	2.3%	1.8%	2.0%	1.4%
Reliance Jio	25.1%	32.7%	39.5%	36.7%	40.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Customers as of March quarter of the respective fiscals. Customer market share calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

Wireless telecom customers — Rajasthan

	Wireless customers (million)						Customers' market share				
	FY21	FY22	FY23	H1 FY23	H1 FY24	CAGR (FY21-23)	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	6.4	6.5	6.1	6.4	5.7	-2.3%	9.7%	10.4%	9.6%	10.1%	8.7%
Bharti Hexacom (Airtel)	22.0	21.8	22.4	22.1	23.0	1.1%	33.1%	34.5%	35.3%	34.9%	35.1%
Vodafone Idea	12.2	11.1	10.3	10.6	11.3	-8.5%	18.5%	17.5%	16.1%	16.8%	17.2%
Reliance Jio	25.7	23.7	24.8	24.2	25.6	-1.8%	38.8%	37.6%	39.0%	38.3%	39.1%

Note: Wireless customers as of March quarter of the respective fiscals. Customer market share calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

Adjusted gross revenue of telecom players — Rajasthan

	Revenue (Rs billion)						Revenue market share				
	FY21	FY22	FY23	H1 FY23	H1 FY24	CAGR (FY21-23)	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	3.1	3.1	2.9	1.5	2.1	-2.8%	4.0%	3.3%	2.7%	2.9%	3.6%
Bharti Hexacom (Airtel)	25.4	33.6	43.5	20.8	24.3	30.7%	32.7%	36.7%	39.5%	38.8%	40.3%
Vodafone Idea	9.7	10.2	11.6	5.7	6.1	9.4%	12.5%	11.1%	10.6%	10.6%	10.1%
Reliance Jio	39.4	44.8	52.1	25.6	27.8	15.0%	50.7%	48.8%	47.3%	47.7%	46.1%

Source: TRAI, CRISIL MI&A

Rajasthan operator-wise VLR or active customers

Month	VLR customers (in million)					
	Bharti Hexacom (Airtel)	BSNL	Vodafone Idea	Reliance Com.	Reliance Jio	Total Rajasthan
Sept- 23	23.2	2.5	10.4	0.0	24.4	60.5

VLR customer is calculated based on proportion of VLR customers in total wireless customers for the player reported by TRAI in monthly subscription report.

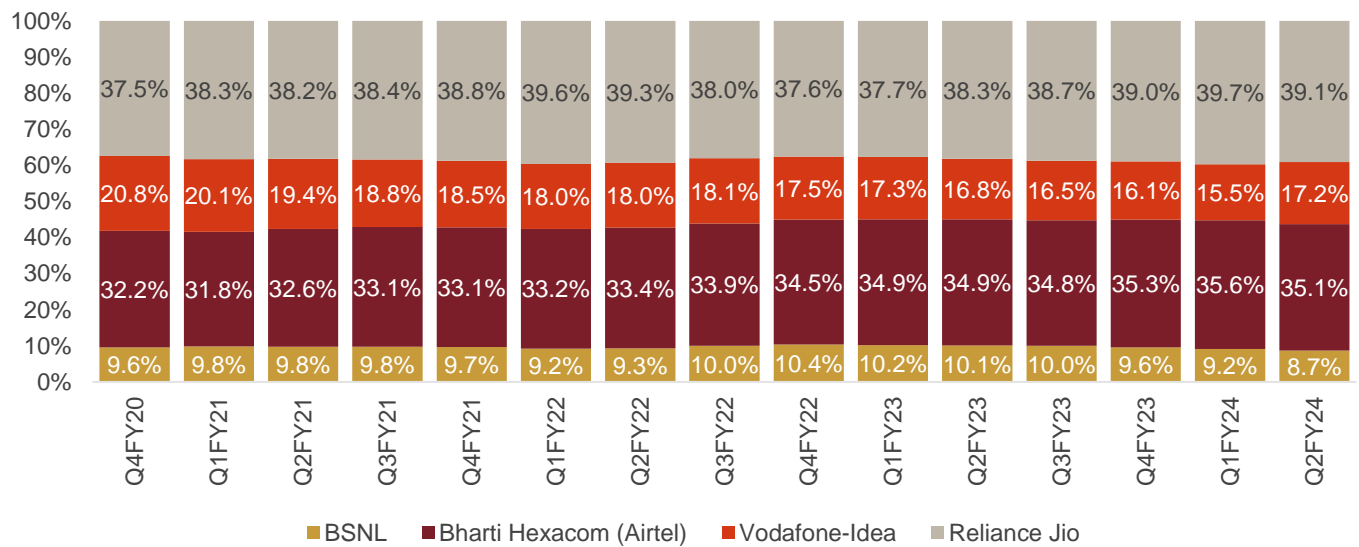
Source: TRAI, CRISIL MI&A

Observations

- In the Rajasthan circle, Bharti Hexacom (Airtel) clocked the highest revenue CAGR of 30.7% between fiscals 2021 and 2023. Bharti Hexacom (Airtel) had the second-highest adjusted gross revenue in fiscal 2023 at Rs 43.5 billion, after Reliance Jio
- Bharti Hexacom (Airtel) is among the top two players in the Rajasthan circle with a customer market share (CMS) of 35.1% and revenue market share (RMS) of 40.3% in the first half of fiscal 2024. Bharti Hexacom ranked second, trailing Reliance Jio by a difference of 420 basis points in CMS and 582 basis points in RMS. Between fiscal 2021 and the first half of fiscal 2024, the market share gap between Bharti Hexacom and Reliance Jio has narrowed over time
- For the first halves of fiscals 2024 and 2023 and for fiscals 2023, 2022 and 2021, Bharti Hexacom (Airtel) reported a CMS of 35.1%, 34.9%, 35.3%, 34.5% and 33.1% for the Rajasthan circle, respectively, ranking close second across all periods. In Rajasthan circle, Bharti Hexacom (Airtel) has reported consistent growth in customer market share from 33.1% in fiscal 2021 to 35.1% in first half of fiscal 2024
- For the first halves of fiscals 2024 and 2023 and for fiscals 2023, 2022 and 2021, Bharti Hexacom (Airtel) reported an RMS of 40.3%, 38.8%, 39.5%, 36.7% and 32.7% for the Rajasthan circle, respectively, ranking close second across all periods and narrowing rapidly close to Reliance Jio.
- In Rajasthan circle, Bharti Hexacom (Airtel) has reported consistent growth in revenue market share from 32.7% in fiscal 2021 to 40.3% in the first half of fiscal 2024
- In fiscal 2023, Bharti Hexacom (Airtel) had a presence in 486 census towns with an aggregate of 28.4 million wireless customers and a CMS of 35.3% and 48.0% in the Rajasthan and Northeast circles, respectively

- As of the first half of fiscal 2024, Bharti Hexacom (Airtel) was present in 486 census towns with an aggregate of wireless 29.1 million customers and a CMS of 35.1% and 49.4% in the Rajasthan and Northeast circles, respectively
- Bharti Hexacom (Airtel) reported the second highest number of VLR or active wireless customers of 23.2 million with a VLR market share of 38.3% in the Rajasthan circle, following Reliance Jio with 24.4 million such customers with a VLR market share of 40.4% as of September 2023
- Bharti Hexacom (Airtel) recorded consistent growth in its customer base in the Rajasthan circle from 20.5 million customers, with a CMS of 31.8%, in the first quarter of fiscal 2021 to 23.0 million customers, with a CMS of 35.1%, in the second quarter of fiscal 2024. Bharti Hexacom (Airtel) consistently gained customer market share in 11 of the past 14 quarters, gaining a cumulative market share of 327 basis points. In comparison, Reliance Jio, its nearest competitor, gained market share in nine of the past 14 quarters, but with a cumulative gain of 77 basis points. Vodafone Idea experienced a cumulative market share loss of 290 basis points since the first quarter of fiscal 2021

Quarter-wise wireless customer market share of telecom players in Rajasthan circle



Note: Customer market share is calculated based on the customer base as of March quarter of the respective fiscal
Source: TRAI, CRISIL MI&A

Total telecom customers – Northeast

	FY21	FY22	FY23	H1 FY23	H1 FY24
Total telecom customers (million)					
BSNL	1.4	1.4	1.4	1.5	1.3
Bharti Hexacom (Airtel)	5.4	5.6	5.9	5.8	6.1
Vodafone Idea	1.4	1.1	0.9	1.0	0.9
Reliance Jio	4.3	3.9	4.3	4.1	4.3
Total	12.6	12.1	12.6	12.3	12.6
Wireless telecom customers (million)					
BSNL	1.4	1.4	1.4	1.4	1.3
Bharti Hexacom (Airtel)	5.4	5.6	5.9	5.8	6.1
Vodafone Idea	1.4	1.1	0.9	1.0	0.9
Reliance Jio	4.2	3.8	4.1	3.9	4.1
Total	12.5	11.9	12.4	12.1	12.4
Wireline telecom customers (million)					
BSNL	0.07	0.08	0.07	0.08	0.07
Bharti Hexacom (Airtel)	0.00	0.00	0.00	0.00	0.00
Vodafone Idea	0.00	0.00	0.00	0.00	0.00
Reliance Jio	0.03	0.08	0.14	0.11	0.16
Total	0.10	0.16	0.21	0.19	0.23

Note: Customers as of the March quarter of the respective fiscals. Customer market share is calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

Total telecom customers market share – Northeast

	FY21	FY22	FY23	H1 FY23	H1 FY24
Total telecom customers (%)					
BSNL	11.5%	11.9%	11.4%	11.9%	10.6%
Bharti Hexacom (Airtel)	43.3%	46.6%	47.2%	46.9%	48.5%
Vodafone Idea	11.2%	9.1%	7.5%	8.3%	6.9%
Reliance Jio	34.1%	32.4%	33.8%	32.9%	34.0%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Wireless telecom customers (%)					
BSNL	11.0%	11.4%	11.1%	11.5%	10.2%
Bharti Hexacom (Airtel)	43.6%	47.2%	48.0%	47.7%	49.4%
Vodafone Idea	11.3%	9.2%	7.6%	8.4%	7.0%
Reliance Jio	34.1%	32.1%	33.3%	32.5%	33.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Wireline telecom customers (%)					
BSNL	65.8%	48.7%	34.1%	40.2%	30.0%
Bharti Hexacom (Airtel)	0.0%	0.0%	0.0%	0.0%	0.0%
Vodafone Idea	0.3%	0.2%	0.2%	0.2%	0.2%
Reliance Jio	33.9%	51.1%	65.6%	59.6%	69.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Customers as of March quarter of the respective fiscals. Customer market share is calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

Wireless telecom customers – Northeast

Players	Total customers (million)						Customers' market share				
	FY21	FY22	FY23	H1 FY23	H1 FY24	CAGR (FY21-23)	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	1.4	1.4	1.4	1.4	1.3	-0.2%	11.0%	11.4%	11.1%	11.5%	10.2%
Bharti Hexacom (Airtel)	5.4	5.6	5.9	5.8	6.1	4.5%	43.6%	47.2%	48.0%	47.7%	49.4%
Vodafone Idea	1.4	1.1	0.9	1.0	0.9	-18.2%	11.3%	9.2%	7.6%	8.4%	7.0%
Reliance Jio	4.2	3.8	4.1	3.9	4.1	-1.6%	34.1%	32.1%	33.3%	32.5%	33.3%

Note: Wireless customers as of March quarter of the respective fiscals. Customer market share is calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

Adjusted gross revenue of telecom players – Northeast

	Revenue (billion)						Revenue market share				
	FY21	FY22	FY23	H1 FY23	H1 FY24	CAGR (FY21-23)	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	0.8	0.8	0.8	0.4	0.5	-2.8%	5.1%	3.8%	3.2%	3.1%	3.6%
Bharti Hexacom (Airtel)	6.9	10.1	13.2	6.4	6.7	38.0%	42.0%	48.5%	52.5%	52.2%	52.1%
Vodafone Idea	1.4	1.3	1.3	0.7	0.5	-4.8%	8.6%	6.2%	5.1%	5.5%	4.2%
Reliance Jio	7.3	8.6	9.9	4.8	5.2	16.2%	44.2%	41.4%	39.2%	39.2%	40.1%

Source: TRAI, CRISIL MI&A

Northeast operator-wise VLR or active customers

Month	VLR customers (in million)					
	Bharti Hexacom (Airtel)	BSNL	Vodafone Idea	Reliance Com.	Reliance Jio	Total Northeast
Sept- 23	6.3	0.7	0.8	0.0	4.3	12.0

VLR customer is calculated based on proportion of VLR customers in total wireless customers for the player reported by TRAI in monthly subscription report.

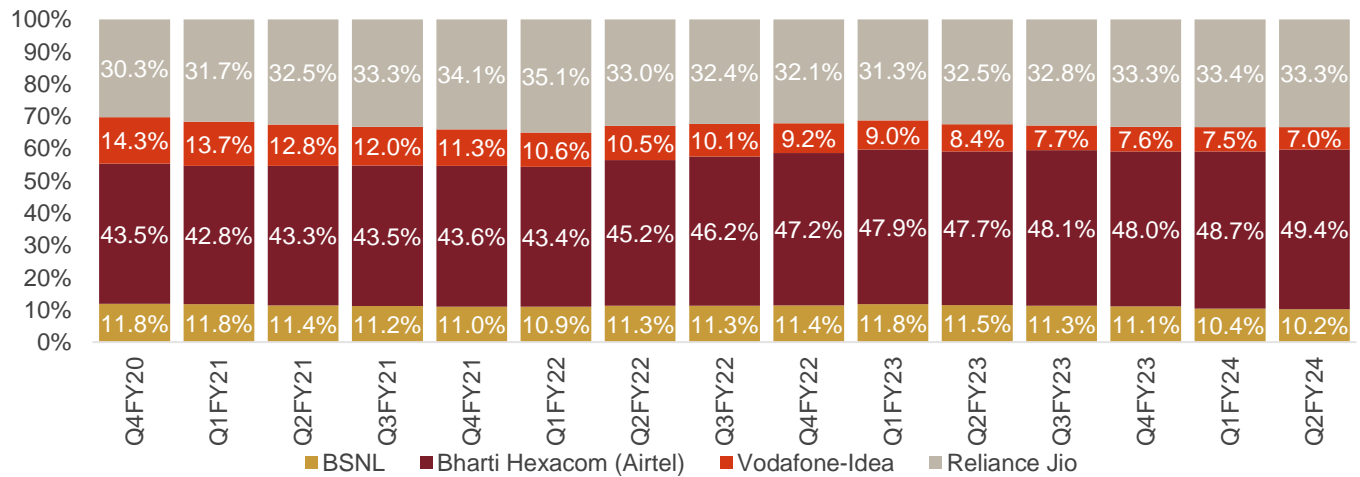
Source: TRAI, CRISIL MI&A

Observations

- Bharti Hexacom (Airtel) is a market leader in terms of CMS and RMS in the Northeast circle with a CMS of 49.4% and RMS of 52.1% as of the first half of fiscal 2024
- In the Northeast circle, Bharti Hexacom (Airtel) logged 38.0% CAGR between fiscals 2021 and 2023 in terms of gross revenue. The telecom company ranked first in terms of adjusted gross revenue in fiscal 2023, followed by Reliance Jio
- For the first halves of fiscals 2024 and 2023 and fiscals 2023, 2022 and 2021, Bharti Hexacom (Airtel) reported an RMS of 52.1%, 52.2%, 52.5%, 48.5% and 42.0% for the Northeast circle, respectively, ranking first in all periods except fiscal 2021, when it ranked second

- In Northeast circle, Bharti Hexacom (Airtel) reported consistent growth in revenue market share, from 42.0% in fiscal 2021 to 52.1% in first half of fiscals 2024
- For the first halves of fiscals 2024 and 2023 and fiscals 2023, 2022 and 2021, Bharti Hexacom (Airtel) reported a CMS of 49.4%, 47.7%, 48.0%, 47.2% and 43.6% for the Northeast circle, respectively, ranking first across all periods.
- In the Northeast circle, Bharti Hexacom (Airtel) has reported growth in customer market share from 43.6% in fiscal 2021 to 49.4% in the first half of fiscal 2024
- In the Northeast circle, Bharti Hexacom (Airtel) reported the highest number of VLR or active wireless customers of 6.3 million with a VLR market share of 52.0%, followed by Reliance Jio with 4.3 million customers with a VLR market share of 35.5% for September 2023
- Bharti Hexacom (Airtel) recorded consistent growth in its customer base in the Northeast circle from 5.1 million customers, with a CMS of 42.8%, in the first quarter of fiscal 2021 to 6.1 million customers, with a CMS of 49.4%, in the first half of fiscal 2024. Bharti Hexacom (Airtel) consistently gained CMS, achieving market share gains in 10 out of past 14 quarters with a cumulative market share gain of 661 basis points. In comparison, Reliance Jio gained market share in nine out of past 14 quarters with a cumulative market share gain of 165 basis points. Vodafone Idea experienced a cumulative market share loss of 668 basis points since the first quarter of fiscal 2021

Quarter-wise wireless customer market share of telecom players in the Northeast circle



Note: Customer market share is calculated based on the customer base as of March quarter of the respective fiscal
Source: TRAI, CRISIL MI&A

Total telecom customers – Rajasthan and Northeast

	FY21	FY22	FY23	H1 FY23	H1 FY24
Total telecom customers (million)					
BSNL	8.1	8.3	7.8	8.1	7.3
Bharti Hexacom (Airtel)	27.5	27.6	28.6	28.1	29.3
Vodafone Idea	13.7	12.2	11.2	11.6	12.1
Reliance Jio	30.1	27.9	29.4	28.6	30.3
Total	79.3	76.0	77.0	76.4	79.0
Wireless telecom customers (million)					
BSNL	7.8	7.9	7.5	7.8	6.9
Bharti Hexacom (Airtel)	27.4	27.4	28.4	27.9	29.1
Vodafone Idea	13.7	12.2	11.2	11.6	12.1
Reliance Jio	29.9	27.6	28.9	28.2	29.7
Total	78.7	75.1	75.9	75.5	77.9
Wireline telecom customers (million)					
BSNL	0.31	0.37	0.35	0.36	0.34
Bharti Hexacom (Airtel)	0.08	0.14	0.20	0.17	0.23
Vodafone Idea	0.01	0.02	0.02	0.02	0.01
Reliance Jio	0.15	0.31	0.47	0.40	0.54
Total	0.57	0.85	1.05	0.96	1.15

Note: Customers as of March quarter of the respective fiscals. Customer market share is calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

Total telecom customers market share – Rajasthan and Northeast

	FY21	FY22	FY23	H1 FY23	H1 FY24
Total telecom customers (%)					
BSNL	10.2%	10.9%	10.2%	10.7%	9.2%
Bharti Hexacom (Airtel)	34.6%	36.3%	37.1%	36.7%	37.1%
Vodafone Idea	17.2%	16.0%	14.6%	15.2%	15.4%
Reliance Jio	37.9%	36.7%	38.1%	37.4%	38.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Wireless telecom customers (%)					
BSNL	9.9%	10.5%	9.8%	10.3%	8.9%
Bharti Hexacom (Airtel)	34.8%	36.5%	37.4%	37.0%	37.3%
Vodafone Idea	17.3%	16.2%	14.8%	15.4%	15.6%
Reliance Jio	38.0%	36.7%	38.0%	37.3%	38.2%
Total	100.0%	100.0%	100.0%	100.0%	100.0%
Wireline telecom customers (%)					
BSNL	54.7%	43.6%	33.4%	37.7%	29.5%
Bharti Hexacom (Airtel)	14.3%	16.3%	18.6%	17.7%	20.2%
Vodafone Idea	1.4%	1.9%	1.5%	1.6%	1.1%
Reliance Jio	26.7%	36.3%	44.8%	41.3%	46.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

Note: Customers as of March quarter of the respective fiscals. Customer market share is calculated based on the customers as of the March quarter of the respective fiscal

Source: TRAI, CRISIL MI&A

ARPU (Rs) (As reported by companies in their filings and presentations)

Operators	FY21	FY22	FY23	H1FY23	H1FY24
BSNL	N.A.	N.A.	N.A.	N.A.	N.A.
Bharti Airtel	145	178	193	190	203
Bharti Hexacom (Airtel)^{\$}	135	155	185	182	195
Vodafone Idea¹	107	124	135	131	142
Reliance Jio²	138	168	179	177	182

Note: ARPU numbers are for exit quarter of respective fiscal years / half years for example, FY23 number is for Q4FY23 and H1FY24 number is for Q2FY24

^{\$} As shared by company

¹ Blended ARPU as reported by the player; may include wireless and wireline

² As reported by the company, may include revenue from wireline, broadband, FTTH and other telecom services.

Source: Company filings

Observations

- Bharti Airtel and Bharti Hexacom (Airtel) has consistently reported higher ARPU than its peers from fiscal 2022 to the first half of fiscal 2024

CRISIL’s approach to computing ARPUs

In view of the limitations reported by companies in availability of data, CRISIL MI&A has computed ARPUs and linked ratios at circle level using TRAI data.

The methodology used for computation of ARPU and linked ratios is as follows:

- Circle ARPU is calculated on gross revenue and does not include ILD and NLD revenue
- Blended ARPU (across all circles) includes NLD revenue
- Gross revenue may include revenue from wireline, broadband, FTTH and other telecom services
- The following formulae have been used for calculation of blended ARPU (across all circles)
 - ARPU for fiscal year = (Sum for quarterly gross revenue for four quarters reported by TRAI / Average TRAI-reported wireless customers at the start of the first quarter and end of the fourth quarter) / 12
 - ARPU for half fiscal year = (Sum for quarterly gross revenue for two quarters reported by TRAI / Average TRAI-reported wireless customers at the start of the first quarter and end of the second quarter) / 6

Note: The ARPUs and linked ratios computed by CRISIL MI&A may not match the numbers reported by the companies in their filings and investor presentations due to differences in approach. Hence both company-reported numbers and CRISIL MI&A-computed numbers have been provided.

Wireless ARPU (Rs) – Rajasthan and Northeast (basis circle gross revenue)

Operators	Rajasthan					Northeast					Rajasthan + Northeast				
	FY21	FY22	FY23	H1 FY23	H1 FY24	FY21	FY22	FY23	H1 FY23	H1 FY24	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	52	47	49	45	74	56	101	100	131	76	53	56	58	60	74
Bharti Hexacom (Airtel)	142	162	195	189	204	160	191	232	227	226	146	168	203	197	209
Vodafone Idea	124	125	149	146	151	129	126	152	152	154	124	125	149	146	151
Reliance Jio	144	152	181	179	186	169	179	209	207	218	148	156	185	183	190

Note: The above ARPU is calculated on gross revenue and has considered only circle revenue. It does not incorporate ILD and NLD revenue. Gross revenue may include revenue from wireline, broadband, FTTH and other telecom services. The calculated wireless ARPU may not match player-reported ARPU since the method of calculation may differ. CRISIL has used the following formula for calculation of ARPU:

ARPU for fiscal year = (Sum for quarterly gross revenue for four quarters reported by TRAI / Average TRAI-reported wireless customers start of the first quarter and end of the fourth quarter) / 12

ARPU for half fiscal year = (Sum for quarterly gross revenue for two quarters reported by TRAI / Average TRAI-reported wireless customers start of the first quarter and end of the second quarter) / 6

** As reported by BSNL to TRAI, reported gross revenue is higher as compared with preceding and succeeding quarters*

Source: TRAI, CRISIL MI&A

Exit quarter Wireless ARPU (Rs) – Rajasthan and Northeast (based on circle gross revenue)

Operators	Rajasthan					Northeast					Rajasthan + Northeast				
	Q4FY 21	Q4FY 22	Q4FY 23	Q2 FY23	Q2 FY24	Q4FY 21	Q4FY 22	Q4FY 23	Q2 FY23	Q2 FY24	Q4FY 21	Q4FY 22	Q4FY 23	Q2 FY23	Q2 FY24
BSNL	52	59	51	44	70	55	244	77	153	76	53	91	56	64	71
Bharti Hexacom (Airtel)	143	183	206	191	209	163	216	240	229	230	147	190	213	199	213
Vodafone Idea	119	138	155	145	154	118	139	156	152	152	119	138	155	146	153
Reliance Jio	138	170	183	181	186	161	200	213	212	222	141	174	187	185	191

Note: The above ARPU is calculated on gross revenue and has considered only circle revenue. It does not incorporate ILD and NLD revenue. Gross revenue may include revenue from wireline, broadband, FTTH and other telecom services. The calculated wireless ARPU may not match player-reported ARPU since the method of calculation may differ. CRISIL has used the following formula for calculation of ARPU

ARPU for quarter = (Quarterly gross revenue reported by TRAI / Average of TRAI reported wireless customers for the starting and ending quarter) / 3

* As reported by BSNL to TRAI, reported gross revenue is higher as compared with preceding and succeeding quarters

Source: TRAI, CRISIL MI&A

Observations

- Bharti Hexacom (Airtel) has reported higher ARPU in Rajasthan and Northeast circle than its peers, from fiscal 2022 to first half of fiscal 2024

Blended ARPU (across all circles) (Rs)

Operators	Across circle gross revenue with NLD revenue				
	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	97	105*	254*	189*	125
Bharti Airtel	197	205	229	228	229
Vodafone Idea	163	159	184	179	198
Reliance Jio	162	165	192	190	195

Note: The above ARPU is calculated on gross revenue and has considered only circle revenue and NLD revenue. Gross revenue may include revenue from wireline, broadband, FTTH and other telecom services.

The calculated wireless ARPU may not match with player reported ARPU (Table: ARPU (Rs) (Reported)) as the method of calculation may differ. CRISIL has used the following formula for calculation of ARPU

* As reported by BSNL to TRAI, reported gross revenue is higher as compared with preceding and succeeding quarters

ARPU for fiscal year = (Sum for quarterly gross revenue for four quarters reported by TRAI / Average TRAI-reported wireless customers at the start of the first quarter and end of the fourth quarter) / 12

ARPU for half fiscal year = (Sum for quarterly gross revenue for two quarters reported by TRAI / Average TRAI-reported wireless customers at the start of the first quarter and end of the second quarter) / 6

Source: TRAI, CRISIL MI&A

Exit quarter blended ARPU (across all circles) (Rs)

Operators	Across circle gross revenue with NLD revenue				
	Q4FY21	Q4FY22	Q4FY23	Q2 FY23	Q2FY24
BSNL	105	157*	256*	277*	131
Bharti Airtel	194	220	229	232	233
Vodafone Idea	159	171	190	180	200
Reliance Jio	148	181	193	191	197

Note: The above ARPU is calculated on gross revenue and has considered only circle revenue and NLD revenues. Gross revenue may include revenue from wireline, broadband, FTTH and other telecom services.

The calculated wireless ARPU may not match with player reported ARPU (Table: ARPU (Rs) (Reported)) as the method of calculation may differ. CRISIL has used the following formula for calculation of ARPU

* As reported by BSNL to TRAI, reported gross revenue is higher as compared with preceding and succeeding quarters

ARPU for quarter= (Quarterly gross revenue reported by TRAI / Average of TRAI-reported wireless customers for the starting and ending quarters) / 3

Source: TRAI, CRISIL MI&A

Blended ARPU (across all circles) (Rs)

Operators	Across circle gross revenue without NLD revenue				
	FY21	FY22	FY23	H1 FY23	H1 FY24
BSNL	70	145*	228*	165*	97
Bharti Airtel	165	192	212	211	211
Vodafone Idea	131	134	156	152	168
Reliance Jio	151	152	191	192	192

Note: The above ARPU is calculated on gross revenue and has considered only circle revenue. Gross revenue may include revenue from wireline, broadband, FTTH and other telecom services.

* As reported by BSNL to TRAI, reported gross revenue is higher as compared with preceding and succeeding quarters

The calculated wireless ARPU may not match with player-reported ARPU (Table: ARPU (Rs) (Reported)) as the method of calculation may differ. CRISIL has used the following formula for calculation of ARPU

ARPU for fiscal year = (Sum for quarterly gross revenue for four quarters reported by TRAI / Average TRAI-reported wireless customers at the start of the first quarter and end of the fourth quarter) / 12

ARPU for half fiscal year = (Sum for quarterly gross revenue for two quarters reported by TRAI / Average TRAI-reported wireless customers at the start of the first quarter and end of the second quarter) / 6

Source: TRAI, CRISIL MI&A

Revenue for Bharti Hexacom Ltd (adjusted gross revenue)

Revenue parameter	FY21	FY22	FY23	H1 FY23	H1 FY24
Revenue from Rajasthan circle (Rs billion)	25.4	33.6	43.5	20.8	24.3
Revenue from Rajasthan circle, as a percentage of total revenue	78.6%	76.9%	76.7%	76.6%	78.3%
Revenue from Northeast circle (Rs billion)	6.9	10.1	13.2	6.4	6.7
Revenue from Northeast circle, as a percentage of total revenue	21.4%	23.1%	23.3%	23.4%	21.7%

Source: TRAI, CRISIL MI&A

An overview of key financial parameters

H1 FY24 financial position (Rs million) - Standalone

	Revenue from operations			Ebitda			PAT		
	H1 FY23	H1 FY24	Growth	H1 FY23	H1 FY24	Growth	H1 FY23	H1 FY24	Growth
BSNL	83,213	83,598	0.5%	207	5,773	2683.6%	(35,892)	(29,526)	N.M
Bharti Airtel	412,850	459,084	11.2%	232,510	252,187	8.5%	17,785	17,499	-1.6%
Bharti Hexacom	31,670	34,202	8.0%	13,482	17,936	33.0%	1,952	691	-64.6%
Reliance Jio	443,940	487,920	9.9%	226,470	257,220	13.6%	88,530	99,210	12.1%
Vodafone Idea	208,893	212,271	1.6%	82,974	81,948	-1.2%	(148,345)	(165,667)	N.M

Revenue from operations is as reported

Ebitda = Total revenue – total expenses before interest tax, depreciation and extraordinary items. Ebitda includes other income.

Ebitda margin = ebitda / total revenue

PAT is after considering extraordinary expense/ income

Ratios calculated as per CRISIL MI&A standards and may not match company reported numbers

Source: Company filings, CRISIL MI&A

Observations

- In the first half of fiscal 2024, Bharti Airtel's revenue has grown the fastest at 11.2% Rs 459,084 million. During the same period, Ebitda has grown at 8.5% to Rs. 252,187 million
- Bharti Airtel is India's largest integrated communications solutions provider in terms of consolidated operating revenue as of fiscal 2023. Bharti Airtel is a blue-chip company listed on the Indian stock exchanges and had a market capitalisation of Rs 6.4 trillion (including its partly paid shares) as of January 15, 2024
- Bharti Airtel is a global communications solutions provider with over 500 million customers in 17 countries across South Asia and Africa. Bharti Airtel is among the top global mobile operators in terms of numbers of customers

Revenue from operations - standalone

Revenue from operations (Rs million)	FY21	FY22	FY23	CAGR (FY21-23)
BSNL	174,518	168,092	191,278	4.7%
Bharti Airtel	643,259	707,950	847,201	14.8%
Bharti Hexacom	46,023	54,052	65,790	19.6%
Reliance Jio	698,880	769,770	907,860	14.0%
Vodafone Idea	416,727	382,207	419,171	0.3%

Revenue from operations is as reported

Source: Company filings, CRISIL MI&A

Earning before interest, tax, depreciation and amortisation (Ebitda) and margin - Standalone

Ebitda (Rs million)	FY21		FY22		FY23		CAGR (FY21-23)
	Ebitda	Ebitda %	Ebitda	Ebitda %	Ebitda	Ebitda %	
BSNL	11,769	6.3%	9,437	5.0%	15,588	7.5%	15.1%
Bharti Airtel	303,720	45.5%	353,045	49.4%	464,325	53.2%	23.6%
Bharti Hexacom	11,544	24.5%	19,028	34.6%	29,259	43.5%	59.2%
Reliance Jio	314,610	44.7%	378,570	49.0%	470,340	51.6%	22.3%
Vodafone Idea	166,869	39.8%	155,310	40.5%	165,466	39.2%	-0.4%

Ebitda = Total revenue – total expenses before interest tax, depreciation and extraordinary items. Ebitda includes other income

Ebitda margin = Ebitda / total revenue

Ratios calculated as per CRISIL MI&A standards and may not match company reported number

Source: Company filings, CRISIL MI&A

Profit after tax (PAT) and margin - standalone

PAT (Rs million)	FY21		FY22		FY23		CAGR (FY21-23)
	PAT	PAT%	PAT	PAT%	PAT	PAT%	
BSNL	(74,411)	-39.9%	(69,816)	-36.6%	(81,616)	-39.4%	N.M
Bharti Airtel	(251,976)	-37.8%	(38,637)	-5.4%	(896)	-0.1%	N.M
Bharti Hexacom	(10,339)	-22.0%	16,746	30.5%	5,492	8.2%	N.M
Reliance Jio	120,150	17.1%	148,170	19.2%	182,070	20.0%	23.1%
Vodafone Idea	(463,145)	-110.5%	(282,372)	-73.7%	(293,078)	-69.5%	N.M

Note: NM: Not meaningful, as initial value or final value or both are negative

PAT is after considering extraordinary expense/ income

Ratios calculated as per CRISIL MI&A standards and may not match company reported number

Source: CRISIL MI&A

Observations

- Bharti Hexacom (Airtel) registered the highest revenue CAGR of 19.6% and Ebitda CAGR of 59.2% between fiscals 2021 and 2023 among the telecom players
- In fiscal 2022, Bharti Hexacom (Airtel) had the highest PAT margin of 30.5%, supported by extraordinary income, followed by Reliance Jio with 19.2%. During the same period, Bharti Hexacom (Airtel) had the fourth-highest Ebitda margin
- Bharti Hexacom (Airtel) reported Ebitda margin of 43.5% in fiscal 2023 among the telecom players, whereas Bharti Airtel had the highest Ebitda margin of 53.2%

Return ratios - Standalone

	RoCE (%)			RoE (%)			Asset turnover (times)		
	FY21	FY22	FY23	FY21	FY22	FY23	FY21	FY22	FY23
BSNL	(6.2)	(6.8)	(4.5)	(14.4)	(15.6)	(13.0)	0.1	0.1	0.1
Bharti Airtel	3.9	5.3	8.6	(32.6)	(5.2)	(0.1)	0.4	0.4	0.4
Bharti Hexacom	(1.4)	4.1	10.5	(52.1)	45.7	13.0	0.4	0.5	0.5
Reliance Jio	9.1	9.6	8.6	6.6	7.5	8.4	0.6	0.5	0.5
Vodafone Idea	(4.7)	(4.6)	(3.6)	N.M	N.M	N.M	0.4	0.3	0.3

Note: Ratios calculated as per CRISIL MI&A standards and may not match company reported numbers

RoCE = Profit before interest and tax (PBIT) and before extraordinary items / Average [share capital + equity reserves + total debt + lease liabilities + deferred payment liabilities]

PBIT includes other income

Asset turnover = Operating income / gross block

RoE = PAT (including extraordinary income) / (share capital + equity reserves)

NM – not meaningful as denominator is negative

Source: CRISIL MI&A

Observations

- In fiscal 2023, Bharti Hexacom (Airtel) had the highest RoE of 13.0% on a standalone basis

Coverage and leverage ratios - Standalone

	FY21		FY22		FY23	
	Net debt/ Ebitda	ICR	Net debt/ Ebitda	ICR	Net debt/ Ebitda	ICR
BSNL	31.2	(0.5)	43.3	0.4	18.4	0.6
Bharti Airtel	4.1	2.8	3.6	3.2	3.9	4.0
Bharti Hexacom	6.7	2.4	4.7	3.5	2.8	5.0
Reliance Jio	1.1	7.9	2.3	8.5	3.4	11.5
Vodafone Idea	11.9	0.9	13.6	0.7	14.3	0.7

Note: Ratios calculated as per CRISIL MI&A standards and may not match company reported numbers

Net debt/ Ebitda = [total debt + lease liabilities + deferred payment liabilities – cash and cash equivalents – marketable securities] / Ebitda

Interest coverage ratio (ICR) = PBDIT net of other financial charges divided by interest expenses including interest on lease

Source: CRISIL MI&A

Observations

- In fiscal 2023, Bharti Hexacom (Airtel) had the second-highest interest coverage ratio of 5.0, while Reliance Jio had the highest interest coverage ratio of 11.5
- Bharti Airtel has a strong financial-risk profile, aided by strong debt-protection metrics and financial flexibilities, as per CRISIL's rating rationale. It is rated AA+ by CRISIL Ratings as of July 2023

8 Annexures

Annexure 1:

Evolution of the Indian telecom sector

Year	Key trends in the Indian telecom sector
1995-1998	India introduced mobile telecom services in late 1995. But high tariffs and low demand limited growth. The industry had just 0.88 million customers by March 1998, of which more than half were from Delhi and Mumbai circles.
1999-2003	The National Telecom Policy 1999 reshaped the industry by shifting from fixed fee licence to revenue sharing, fostering more players. The sector saw transformation in 1999. Growth accelerated over fiscals 1999-2003. Service providers added 1.7 million customers in fiscal 2001, 2.9 million in fiscal 2002 and 6.7 million in fiscal 2003. By fiscal 2003, the total number of mobile customers surged to 13.8 million.
2004-2009	In fiscal 2004, the sector entered a significant growth phase with 20 million new customers added. Key drivers included the implementation of the calling party pays (CPP) regime in May 2003 (making incoming calls free) and Reliance Infocomm's service launch with low entry price offers. Service launches by new entrants and expansion by existing players propelled monthly additions beyond 15 million for the first time in January 2009.
2010-2011	In fiscal 2010, customers surged with new operators offering affordable tariffs. Tata Teleservices' mid-2009 GSM launch kicked off a price war with its per-second billing, offering services at as low as one paisa per second. 2010 saw a 3G and broadband wireless access (BWA) spectrum auction that sold all 71 3G blocks and 44 BWA blocks put on auction across 22 circles.
2012-2014	In fiscal 2012, customer net additions fell to 108 million from 227 million in fiscal 2011 because of rising teledensity, decline in use of multiple SIM cards and moderate growth in rural net additions. Also, in February 2012, the Supreme Court ordered cancellation of all 122 unified access service licences issued in January 2008. In fiscal 2013, the mobile customer base sharply declined from 919.2 million (March 2012) to 867.8 million (March 2013). Operators deactivated inactive customers, focusing on revenue-earning customers. Fiscal 2014 saw growth, with major operators adding 37 million customers. Three round of spectrum auctions were held in November 2012, March 2013 and February 2014 for 1800 MHz, 800 MHz and 900 MHz bands.
2015-2020	In fiscals 2015 and 2016, net additions continued owing to affordable smartphones and rising disposable income. The entry of Reliance Jio in 2016 sparked aggressive price wars, consolidating the industry to five players. Pricing stability prompted the discontinuation of lifetime validity plans and the introduction of minimum recharge plans in fiscal 2019, resulting in SIM consolidation. Auctions of 2100 MHz, 1800 MHz, 900 MHz and 800 MHz spectrum bands were held in March 2015 and 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz and 2500 MHz bands in October 2016. Notable regulatory reforms during the period included spectrum liberalisation, relaxation of spectrum cap and spectrum sharing guidelines. Additionally, the government approved spectrum charges at 3% of AGR and revised ITC charges during the period. Furthermore, the TRAI also favoured net neutrality and penalised predatory tariff through an amendment to the Telecommunication Tariff Order in 2018.
2020-2023	With the onset of the pandemic in March 2020, communication services became crucial as corporates had to resort to work from home and schools went online. As a result, the customer base widened, which, however, moderated owing to subsequent tariff increases. The period saw spectrum auctions of 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz and 2500 MHz bands in March 2021 and spectrum auctions of 600 MHz, 700 MHz, 800 MHz, 900 MHz, 1800 MHz, 2100 MHz, 2300 MHz, 2500 MHz, 3300 MHz and 26 GHz bands in July 2022. Noteworthy regulatory reforms during the period included scrapping of termination charges for local and national long-distance calls, rationalisation of AGR definition, removal of 3% floor on SUC, and approval of 4G saturation project. In December 2023, the government passed the Telecommunications Act, 2023, which amended and consolidated the laws relating to development, expansion and operation of telecommunication services and telecommunication networks. Prominent provisions under this Act includes monetary fine and imprisonment for obtaining SIM cards through fraud, mandatory user consent for receiving promotional messages, administrative allocation of spectrum without auctions for certain specified purposes, and non-interception of press messages of correspondents accredited to the Centre or state governments.

Source: CRISIL MI&A

Circles as per DoT telecom license

Circles	Area covered
Andhra Pradesh	Andhra Pradesh, Telangana
Assam	Assam
Bihar	Bihar, Jharkhand
Delhi	Delhi
Gujarat	Gujarat, Union Territory of Daman and Diu, Dadra & Nagar Haveli
Himachal Pradesh	Himachal Pradesh
Haryana	Haryana
Jammu & Kashmir	Jammu & Kashmir, Ladakh
Karnataka	Karnataka
Kerala	Kerala, Lakshadweep
Maharashtra	Maharashtra, Goa
Madhya Pradesh	Madhya Pradesh, Chhattisgarh
Northeast	Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, Manipur, Tripura
Odisha	Odisha
Punjab	Punjab, Chandigarh
Rajasthan	Rajasthan
Tamil Nadu	Tamil Nadu, Pondicherry
Uttar Pradesh	Uttar Pradesh, Uttarakhand
West Bengal	West Bengal, Sikkim, Andaman & Nicobar Islands

Circle-wise RMS wireless as of H1FY24

Circle	Bharti Airtel	Vodafone Idea	BSNL	MTNL	Reliance Communications	Reliance Jio
Andhra Pradesh	44.0%	10.7%	4.1%	0.0%	0.1%	41.2%
Assam	45.7%	4.8%	2.6%	0.0%	0.0%	46.9%
Bihar	42.1%	3.0%	1.7%	0.0%	0.0%	53.1%
Delhi	38.7%	13.7%	2.3%	3.1%	0.2%	42.1%
Gujarat	21.9%	27.2%	2.8%	0.0%	0.0%	48.1%
Haryana	33.5%	16.5%	4.2%	0.0%	0.0%	45.8%
Himachal Pradesh	40.9%	3.2%	7.4%	0.0%	0.0%	48.4%
J&K	47.5%	1.4%	3.6%	0.0%	0.0%	47.4%
Karnataka	54.1%	8.6%	4.6%	0.0%	0.1%	32.7%
Kerala	24.8%	32.7%	10.9%	0.0%	0.1%	31.5%
Kolkata	30.4%	23.0%	7.0%	0.0%	0.0%	39.7%
Madhya Pradesh	22.6%	13.5%	2.8%	0.0%	0.0%	61.0%
Maharashtra	29.8%	20.2%	1.4%	0.0%	0.1%	48.5%
Mumbai	32.8%	23.8%	8.1%	4.0%	1.1%	30.2%
Northeast [#]	52.1%	4.2%	3.6%	0.0%	0.0%	40.1%
Odisha	35.9%	2.5%	5.3%	0.0%	0.0%	56.3%
Punjab	40.0%*	15.5%	4.5%	0.0%	0.0%	40.0%*
Rajasthan [#]	40.3%	10.1%	3.6%	0.0%	0.0%	46.1%
Tamil Nadu	41.4%	15.8%	5.0%	0.0%	0.1%	37.7%
UP (E)	41.5%	8.6%	2.9%	0.0%	0.0%	46.9%
UP (W)	34.8%	16.1%	3.2%	0.0%	0.0%	45.9%
West Bengal	30.5%	13.3%	2.3%	0.0%	0.0%	54.0%

[#] These two circles are operated by Bharti Hexacom Ltd

Reliance Jio leads the circle with a margin of 0.006%

Source: DoT, TRAI, CRISIL MI&A

Circle-wise CMS wireless as of H1FY24

Circle	Bharti Airtel	Vodafone Idea	BSNL	BSNL (VNOs)	MTNL	Reliance Jio
Andhra Pradesh	40.4%	13.4%	8.1%	0.0%	0.0%	38.2%
Assam	45.0%	7.1%	12.5%	0.0%	0.0%	35.4%
Bihar	43.7%	8.4%	5.8%	0.0%	0.0%	42.1%
Delhi	31.8%	29.9%	0.0%	0.0%	3.0%	35.2%
Gujarat	17.5%	32.6%	6.7%	0.0%	0.0%	43.2%
Haryana	25.5%	26.5%	16.0%	0.0%	0.0%	32.0%
Himachal Pradesh	40.0%	4.6%	18.0%	0.0%	0.0%	37.4%
J&K	48.4%	2.5%	6.7%	0.0%	0.0%	42.4%
Karnataka	48.3%	10.0%	6.7%	0.0%	0.0%	34.9%
Kerala	19.6%	32.9%	22.7%	0.0%	0.0%	24.8%
Kolkata	23.7%	23.2%	9.1%	0.0%	0.0%	44.1%
Madhya Pradesh	20.3%	20.9%	6.4%	0.0%	0.0%	52.4%
Maharashtra	22.8%	25.0%	6.6%	0.0%	0.0%	45.6%
Mumbai	29.5%	32.9%	0.0%	0.0%	0.8%	36.8%
Northeast [#]	49.4%	7.0%	10.2%	0.0%	0.0%	33.3%
Odisha	34.4%	4.6%	17.3%	0.0%	0.0%	43.6%
Punjab	35.4%	19.2%	11.8%	0.0%	0.0%	33.6%
Rajasthan [#]	35.1%	17.2%	8.7%	0.0%	0.0%	39.1%
Tamil Nadu	37.0%	20.9%	9.8%	0.2%	0.0%	32.2%
UP (E)	36.7%	17.9%	8.1%	0.0%	0.0%	37.3%
UP (W)	29.4%	25.5%	8.0%	0.0%	0.0%	37.2%
West Bengal	30.7%	24.1%	4.2%	0.0%	0.0%	41.0%
Total	32.8%	19.8%	8.1%	0.0%	0.2%	39.1%

Note: Market share is calculated based on the wireless customer base; VNOs: Virtual network operators

These two circles are operated by Bharti Hexacom Ltd

Source: DoT, TRAI, CRISIL MI&A

Annexure 2:

Glossary

Parameter	Formula
Operational	
Telecom Customer market share (CMS)	Total customer base of the operator as of exit quarter / Total telecom customers as of exit quarter
Telecom revenue market share (RMS)	Adjusted gross revenue of the telecom wireless access service provider / Total adjusted gross revenue for telecom wireless access service providers License considered – UL, UASL, Basic+WLL, Mobile, NLD
Wireless CMS	Total wireless customer base of the operator as of exit quarter/ Total wireless telecom customers in as of exit quarter
Wireless RMS for circle	Adjusted gross revenue of the telecom wireless access service provider in the circle / Total adjusted gross revenue for telecom wireless access service providers in the circle License considered – UL, UASL, Basic+WLL, Mobile Please note – NLD is not applicable at circle level
Internet penetration	Number of internet users / total population
Data customers share	Number of internet users / total telecom customers
VLR customer	Proportion of VLR customers for the month * total wireless customers for the player reported by TRAI in monthly subscription report
Revenue per tower per month	Revenue from operations or mobile services / no. of towers / no. of months
Minutes on network per customer per month	Minutes on network / average of reported wireless customers for start and end of the period / number of months in the period
Data usage per customer per month	Total GBs on network / average reported data customers for the start and end of the period / number of months in the period
Wireless Average revenue per user (ARPU)	Sum for quarterly gross revenue for four quarters reported by TRAI /Average TRAI reported wireless customers of the starting and ending quarter/ number of months
Exit Quarter Wireless ARPU	Quarterly gross revenue reported by TRAI / Average TRAI reported wireless customers of opening and closing quarter/ 3
Blended ARPU	Sum for quarterly gross revenue for four quarters reported by TRAI /Average TRAI reported wireless customers of the starting and ending quarter/ number of months
Exit Quarter Blended ARPU	Quarterly gross revenue reported by TRAI / Average TRAI reported wireless customers of opening and closing quarter/3
Financial	
Ebitda	Ebitda = Total revenue – total expenses before interest tax, depreciation and extraordinary items. Ebitda includes other income
RoCE	Profit before interest and tax (PBIT) and before extraordinary items / Average [share capital + equity reserves + total debt + lease liabilities + deferred payment liabilities] PBIT includes other income
Asset turnover	Operating income / gross block
RoE	PAT (including extraordinary income) / (share capital + equity reserves)

Parameter	Formula
Net debt / Ebitda	[Total debt + lease liabilities + deferred payment liabilities – cash and cash equivalents – marketable securities] / Ebitda
Interest coverage ratio (ICR)	PBDIT net of other financial charges divided by interest expenses including interest on lease

Note: Ratios calculated as per CRISIL MI&A standards and may not match company reported numbers

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