

## 5G in China: Insights from the world's largest market

With a presence in over 350 cities, China has been the most significant user of 5G since its launch. The Ministry of Industry and Information Technology (MIIT) worked to drive economic digitization with a plan to deploy 5G technology in industries and society between 2021 and 2023.

In this report, we take a closer look at the key trends shaping the growth of 5G in China. The key takeaways include:

- 5G package subscribers' (the term "5G Package Subscriber" refers to the total number of 5G users, including all 4G users who have subscribed for a 5G plan) growth has been higher than initial expectations. It is expected to grow from 1.07 billion in 2022 to 1.49 billion by 2027;
- 5G package subscribers account for 62 percent of total in 2022 and are expected to reach 74.3 percent in 2027;
- Average data consumption per 5G user in 2022 for China Mobile is 21.2 GB and for China Telecom it is 24.1 GB;
- Immersive experiences such as live streaming is a key driver for consumers; the Winter Olympics 2022 provided an ideal platform to showcase innovative experiences;
- Enterprises use cases for 5G in industry 4.0 applications are registering good traction; China Mobile is emerging as a global benchmark with extensive deployments of 5G across a wide range of industries;
- Telcos have been able to improve their ARPU or at least stem the decline of ARPU with the aggressive rollout of 5G services.

## Challenges in China's development of 5G

On 31<sup>st</sup> October 2022, China completed three years of commercial availability, with its 5G launch inspiring the global industry. The rapid deployment has posed some challenges which include:

- a. Network infrastructure deployments are impacted due to global logistics related challenges and shortage of microchips caused by COVID-19;
- b. Chinese telcos face challenges in managing increased CAPEX rising to US\$58.3 billion in 2022. This is an increase of 12 percent from 2021 due to higher technology costs and an increase in the number of new base stations needed due to higher-frequency radio waves;

## 5G impact on China's GDP

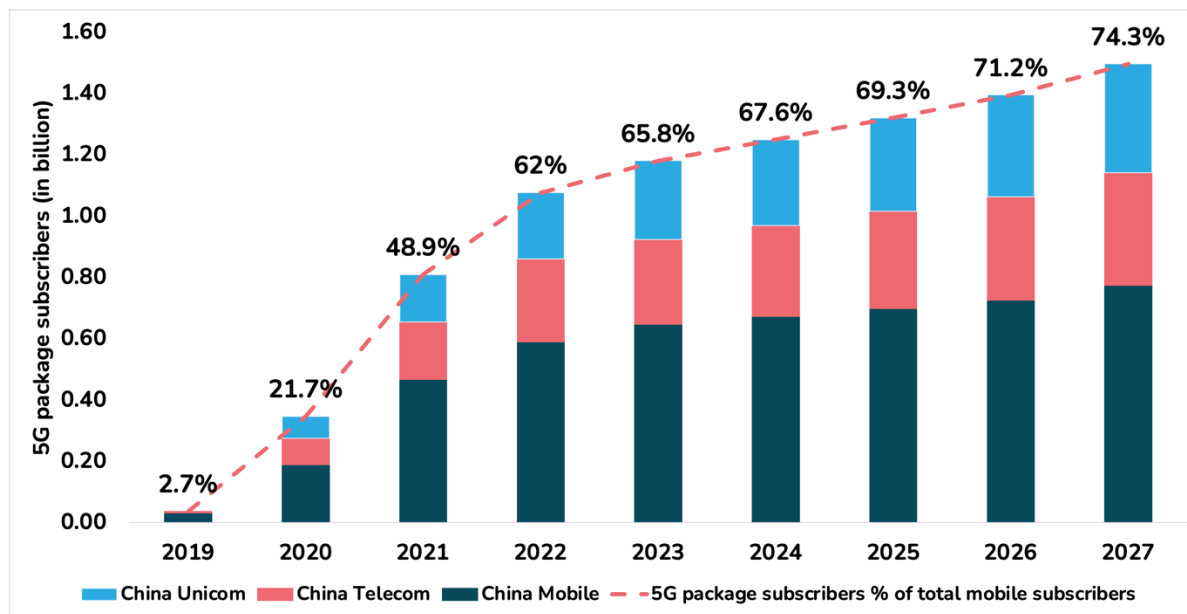
5G with its applications for smart utilities, healthcare, manufacturing, financial services, consumer, and media applications is expected to impact China's GDP to the tune of US\$220 billion by 2030 of which US\$86 billion to be added to the Chinese economy by 5G applications in smart utilities management and US\$63 billion by 5G applications in consumer and media applications.

## Market forecasts and trends

### 5G subscriber projections and penetration rate

Exhibit 1

5G subscriber forecast China (2019-2027)



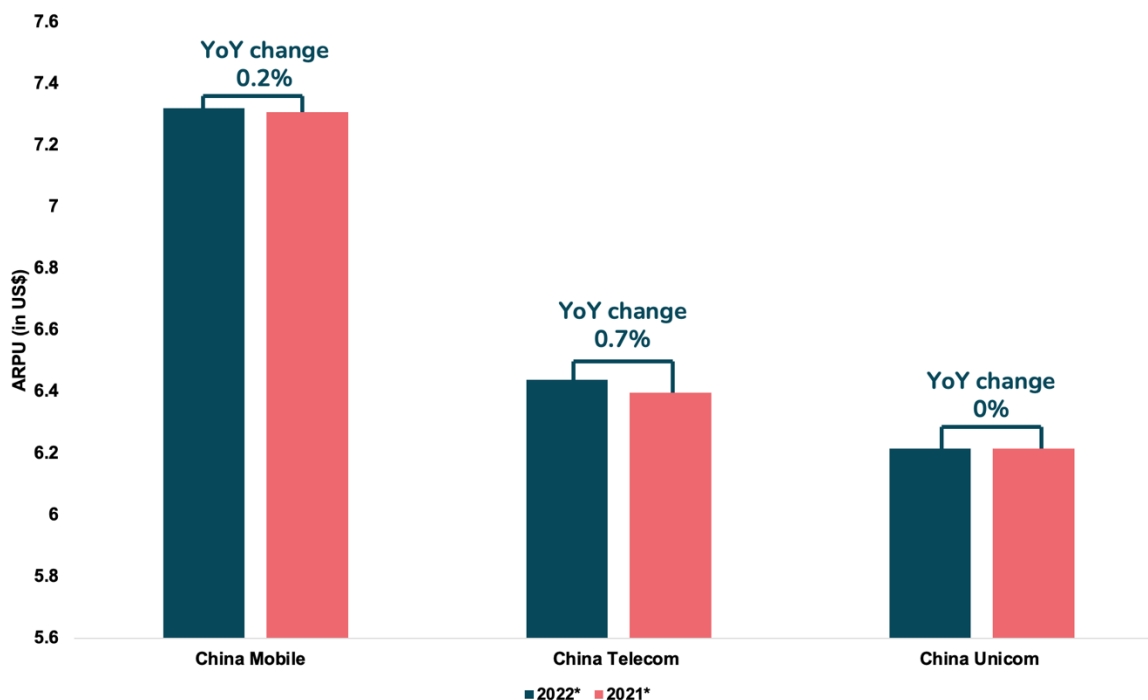
Source: twimbit analysis

In 2020, China had 119 mobile cellular connections per 100 people, compared to 106 worldwide. By 2030, it is expected that China would have 125 cellular connections for every 100 people. In Q3 of 2022, the 5G package subscriber base has reached a penetration of 59 percent.

Although the surge in 5G package subscribers is impressive, China has achieved a similar feat with 4G users, growing from 48 percent to 70 percent between 2013 and 2015.

## Trends in ARPU

Exhibit 2  
Blended ARPU of Chinese telcos (2022-2021)



\*Note: ARPU data are for first half of the respective years.

Source: twimbit analysis

The increase in total 5G package subscribers helped sustain the ARPU.

- Chinese telcos witnessed a stabilisation in blended ARPU due to large scale penetration of 5G.
- China Telecom's 5G ARPU (US\$ 7.4) is 15 percent higher, while China Mobile's 5G ARPU (US\$ 10) is 37 percent higher than the blended ARPU.
- China Mobile's 5G ARPU decreased by 19.5 percent from last year, while China Telecom reported a decline of 8.2 percent in 5G ARPU
- The base plan subscription for 5G gained popularity among subscribers, which increased blended ARPU but decreased 5G ARPU over the years.

## Increase in Mobile data traffic per user (GB per month)

As the total number of 5G package subscribers has increased, the data traffic per user (DoU) per month has also increased.

- China Mobile and China Unicom shows an increase of 11.9 percent and 8.3 percent in mobile data traffic per user.
- The average DoU of China Mobile is 13.1 GB, whereas it is 21.2 GB for 5G package subscribers, reflecting a 56 percent higher consumption.
- The average handset DoU of China Telecom 5G package subscribers is 24.1 GB which is 12.1 percent higher than China Mobile.

## Top consumer use cases of 5G

### #1 High-Definition live streaming of events

**Telecom service provider (TSP): China Unicom; Technology partner: Huawei**

5G technology has significantly changed live streaming.

China Unicom, the official sponsor of the Winter Olympics 2022, offered live high-definition streaming for the events in Beijing from 4<sup>th</sup> February to 20<sup>th</sup> February 2022. More than RMB1.5 billion (USD 228.58 million) was spent on developing and constructing 5G-powered broadband for the Winter Olympics.

As a result, live streaming turned into a more immersive experience.




- Live streaming in VR can now closely replicate the experience of watching live.
- 5G's low latency enables 8K video without buffering, real-time interaction with the live feed and no delay.
- Passengers on the Beijing-Zhangjiakou high-speed rail were able to watch the Winter Olympics in 4K for the first time using the integration of "5G + 4K + high-speed rail".

### #2 Virtual experience using extended reality

**Telecom service providers: China Mobile, China Telecom and China Unicom; Technology partner: Qualcomm**

5G drives the growth of the connected intelligent edge and cloud economy. Today, many devices connect to the cloud due to the proliferation of massive 5G networks.

Hence, it is no surprise that all major telcos are diving deeply into cloud infrastructure development. Qualcomm has partnered with all telcos to provide such an experience to the users using IoT.

 	<p>China Mobile and Qualcomm are working together to build a platform that executes tasks efficiently. Using XR (Extended Reality) will facilitate the creation of effective virtual reality shopping and doctor consultation platforms.</p>
 	<p>China Telecom and Qualcomm use XR to build education and medical supervision platforms. The partnership works to explore potential use cases to power the medical industry. Together, they provided remote medical supervision as a capability for the West China Hospital in Chengdu.</p>
 	<p>China Unicom has partnered with 21 XR companies, including Qualcomm, to build China's 5G XR ecosystem.</p> <p>China Unicom and Qualcomm Technologies are collaborating to make it possible to commercially deploy XR for 5G smartphones, which will contribute to the growth of the 5G XR ecosystem.</p>

## Enterprise 5G markets and top use cases

Enterprise business accounted for 19.3 percent of total revenues of the top 3 telcos in 2021 and 21.5 percent of total revenue for 9M 2022.

### #1 Smart Harbor at Qingdao Port

Telecom service provider: China Unicom

Technology partner: Ericsson; Industry partner: Shanghai Zhenhua Heavy Industries Co., Ltd. (ZPMC)

Exhibit 3  
Qingdao Smart Port in East China



Source: [Ericsson](#)

A smart port leverages AI, the Internet of Things (IoT), Big Data, and Blockchain to improve efficiency. With the 5G network of China Unicom and a latency of less than 1ms, applications such as the remote-controlled ship-to-shore crane, operation communication system, automated rubber red gantry and AGV (automatic guided vehicle) transport systems can work in real-time interaction. The throughput increased to 23.71 million TEU in 2021 from 19.30 million TEU in 2018 (TEU: Twenty-foot equivalent unit).

## #2 Smart mining

**Telecom service provider: China Mobile; Technology partner: Huawei; Industry partner: China National Coal Group Corporation**

In 2020, smart mining became a reality, with China opening its first underground 5G network that is 534 meters deep at Xinyuan Coal Mine. This allowed real-time data uploads and HD video calling support for mine workers to communicate with ground personnel.



## Exhibit 4

### Remote controlled equipment



Source: [Huawei](#)

Since then, China Coal Group has built 6 smart mines and 86 intelligent mining work surfaces among the first batch of intelligent performance coal mines. The coverage rate of intelligent coal mine technology and construction reached 78 percent. Intelligent mines help reduce accidents and need for workforce to be deployed in dangerous conditions.

China Coal Group is promoting a “one mine one policy” and hopes to implement intelligent systems in all coal mines by 2025.

In 2021, China Coal Group witnessed the following;

- Ended coal production of 247 million tons, exceeding the annual financial budget of 14.77 million tons
- Improved uplink and downlink data speed to 1100 Mbps and 300 Mbps with a 20ms latency that will be further reduced to 5ms by 2025.
- Obtained a YoY increase of 2.59 million tons from January to May 2022.

Along with a rise in production, mine workers' fatality and injury rates have decreased by 10 percent and 20 percent, respectively.

### **A case of the Daisy Coal Mine**

In the Daisy Coal Mine, 630 meters underground, coal mining equipment is remotely controlled, and it accomplishes the task (knife mining) handled by 50 people to just 5



minutes. At the mine train loading station, the distant innovative railroad stacking structure completes the train's loading activity in under 50 minutes, and the ergonomics per person is increased by 25 percent.

### **#3 Smart Manufacturing projects**

**Telecom service provider: China Unicom; Technology partner: Huawei; Industry partner: Midea**

An initiative following the 5G Application "Sailing" Action Plan (2021-2023) issued by the MIIT, Midea built the first 5G fully connected smart manufacturing facility in Guangdong. As a result, smart manufacturing projects have implemented initiatives such as smart warehousing, smart vehicle management and AGV.

Changes at Midea Guangdong's manufacturing facility

- AGV provides better logistical efficiency because of real-time data handling, as latency is lower than 4G.
- Seamless wireless connection through 5G to scan items at warehouses.
- Easy wireless monitoring of manufacturing units as wired monitoring was expensive and time-consuming.
- An AI-powered central monitoring system keeps track of all operational activities in one location, including product manufacture, warehouse management, and other tasks.