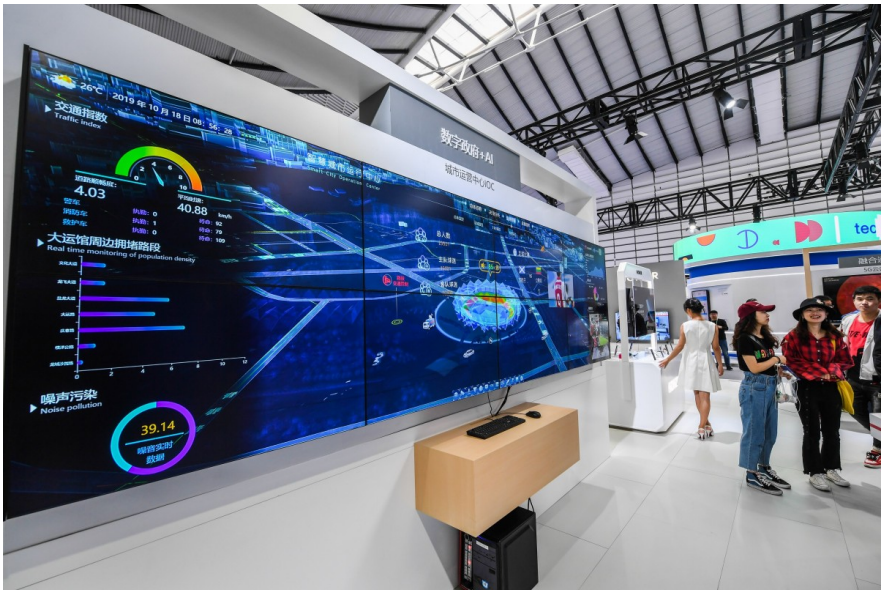
Covid-19 unlocks the potential of smart cities in China

The Health Code app in China has helped to reduce infection cases quickly and avert a larger loss of life. It is one of the functions of a 'smart city'. This note discovers the potential of smart cities and the economic value of the technology in China



Technology is an economic growth facilitator

Technology is a facilitator of economic growth in economic theory. And we are in the middle of another technology revolution. The digital economy will contribute 48% of GDP in China in 2035, up from 23% in 2020, according to the Boston Consulting Group (p.10). The sector “Information Transmission, Software and Information Technology Services” grew 14.8% in 2019. We estimate that this growth rate could accelerate to 22% per year on average between 2020 and 2025 (even taking technology friction with the US into account) due to the implementation of 5G, consumer AI, the industrial Internet of Things, smart cities, and the Internet of Vehicles.

Covid-19 showcases the advantages of smart cities

This note will focus on the potential for smart cities in China. We have chosen this topic because smart cities are no longer just a concept. Indeed, in a surprising silver lining to the Covid-19

pandemic, smart city apps have shown they can help China contain the spread of the virus, helping to turn the economy from contraction in 1Q20 to growth in 2Q20. We saw some smart city apps in Wuhan during the Covid-19 pandemic, and later, in other parts of China. Similar apps that identify potential Covid-19 cases have emerged in some other countries.

In China, the smart system for Covid-19 is called the Health Code, with red, yellow, or green symbols to identify whether a person is potentially a high-risk candidate for Covid-19 infection or not.

The colour code system began as one of the functions of a very popular payment app originally for the app's staff in China, then later developed as a national standard function in some popular apps. The app's new Covid-19 function indicates whether a person can enter public places, e.g. the wet markets, or public transportation, based on calculations on whether that person has had contact with or gathered around people who are identified as confirmed Covid-19 cases. The calculations use input from sensors and surveillance cameras installed in the street and also on smart street lights. The Health Code has avoided the need to over-tighten social distancing measures that could result in a huge economic loss while at the same time identifying possible infection cases, and it's managed to reduce infection rates in cities where it has been used.

The benefits of smart cities

This is only one example of a smart city management system. But it's helped to accelerate other smart city applications, as the government has gained confidence in these systems during this public health crisis. Other examples include applications for better traffic management when there is an accident, sewage leak alarms and apps for flood control and crime reduction.

The building blocks of smart cities are the telecommunications networks, smartphones, sensors, and surveillance cameras built on street lights, traffic signals, and buildings, big data centres and AI computation to analyse the data and find a solution.

The current market for "smart city" technology in China is estimated at CNY181 billion by the IDC in 2020, which is equivalent to just 0.18% of GDP but will increase to 0.3% of GDP in 2025 by our estimates. The market value does not net out the potential saving of lives and prevention of economic loss from outcomes such as flood or disease prevention/reduction, which could be huge.

We believe that without the help of smart city technology, China would not have emerged from the recession created by Covid-19 as quickly as it did (2Q20). Though not all of the recovery was the result of the success of smart city applications helping to end China's lockdowns, in suppressing the spread of Covid-19, smart city apps did contribute to this growth. In this sense, smart cities are a relatively cheap enhancement in city management to increase the efficiency of urban crisis management and prevention. They can also facilitate driverless cars by enhancing transport signals and sensor management.

The table below shows that there is a positive relationship between the development of smart cities and GDP per capita of selected cities in China. High GDP per capita facilitates better smart city management, and smart city management can also help poorer cities to improve GDP through the convenience of city management.

Smart cities in China

Selected cities in China experience different stages of smart cities in 2020
(bracket is GDP per capita in CNY in 2019)

Mature	Developing	Emerging
▪ Shenzhen (200K)	▪ Guiyang (82K)	▪ Zhengzhou (113K)
▪ Nanjing (167K)	▪ Chongqing(75K)	▪ Kunming (93K)
▪ Hangzhou (152K)	▪ Chengdu (103K)	▪ Dalian (46K)
▪ Shanghai (157K)	▪ Ha'erbin (55K)	▪ Haikou (72K)
▪ Guangzhou (157K)	▪ Nanchang (100K)	▪ Shijiazhuang (53K)
▪ Beijing (160K)	▪ Wuhan (77K)	▪ Xining (28K)
▪ Ningbo (146K)	▪ Changsha (137K)	
▪ Hefei (116K)	▪ Fuzhou (107K)	
▪ Qingdao (120K)	▪ Xiamen (80K)	
	▪ Nanning (61K)	

Source: ING based on the Annual Report on the Development of the Internet of Cities in China (2020)

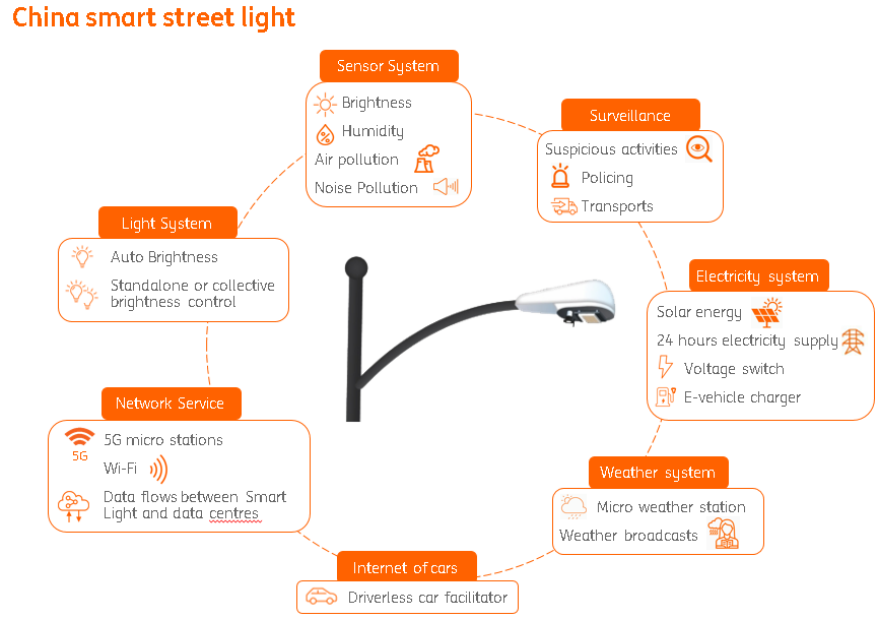
Source: ING

Smart street lights are at the heart of China's smart cities

The number of smart street lights required in China is estimated at 13 million assuming a 30% penetration rate of all street lights in 2025. This would take the market for smart street lights from an estimated CNY11.8 billion in 2019, according to the Annual Report on the Development of the Internet of Cities in China (2020) (p.114-115), to CNY59 billion by 2025 (ING estimate). Most of the investment will be via public-private partnerships with local governments. We believe that the speed of building smart cities in Beijing, Shanghai, Guangzhou, Shenzhen, Hangzhou will be faster than the national average as they have already had more local government investment, according to the annual report on the development of the internet of cities in China (2020) (p.113). Moreover, the economic value of smart cities is likely to be higher than the cost of the investment. Covid-19 has demonstrated the benefit of smart cities in limiting the damage from crises when they occur, and they could help to prevent crises, too.

When the network of smart street lights increases further, it will also likely expand to cover more functions. In addition to basic lighting, it could include surveillance cameras, auto-police calling when the data shows abnormalities, traffic management, weather information collection and display, sewage system fault detection, Wi-Fi hotspots converting telecommunication signals from 4G/5G, e-vehicle chargers, signal senders and as a facilitator for driverless cars.

Functions of smart street lights in China



Source: ING

5G+AI parking

Parking in a busy traffic city has been a big problem for city management. For example, Shenzhen has combined 5G and AI to enhance the efficiency of car park usage. There are more than 3.5 million motor vehicles but there are only 1.69 million parking spaces in car parks. To solve this problem, the local government is partnering with corporates to enhance the efficiency of the usage of existing parking spaces in hospitals, tourism spots, transportation hubs, airports, commercial districts, and a large stadium. For example, drivers can seamlessly book a parking space at a hospital at the same time as scheduling a doctor's appointment. Drivers do not need to worry about whether there is enough parking space and arrive early to wait for a space or to occupy the parking space for longer than needed. Drivers also know if all of the parking spaces are occupied at the time of the doctor's appointment and can choose other transportation.

Auto-valet parking is also increasing in popularity. This is not only to help drivers save time in the car park but also to increase the number of car parks in limited floor space. This makes parking less expensive as land becomes increasingly valuable in big cities. Robots and sensors installed in the car parks work together to find a space and park the car for drivers. This needs a precise indoor location system using combined technology of 5G and AI. For example, there is a 20-storey auto-valet car park building, which has 387 parking lots in a high-rise building which takes up only 638 square metres in Chongqing city. This city's GDP was over CNY2 trillion in 2019, the fifth largest city by GDP in China. The land price for this high rise parking facility costs CNY3.4 million instead of CNY61.5 million for the same number of parking lots in an ordinary car park. The saved land costs should bring down the cost of parking and, at the same time, provide a more convenient parking service.

China's own global navigation satellite positioning system

In July 2020, the Beidou navigation satellite positioning system, the Chinese version of GPS, covered the entire globe. This solves the issue of China's reliance on US GPS, which could

someday be a target in the US technology war. As smart cities rely tremendously on navigation positioning functions, it would be disastrous if navigation positioning did not work. In addition, it is essential for China to have its own navigation system to avoid total reliance on a US system. What's more Beidou - which has taken 30 years to develop, according to the Economist - has an accuracy to 10cm while GPS offers just 30cm. To facilitate smart city functions, Beidou has to pair with smartphones for coonsumer navigation. China's satellite navigation service is estimated to provide a market value at CNY 400 billion, equivalent to around 0.4% of China GDP in 2020. Though not all the market value is related to smart cities, navigation is a large component.

Costs of smart cities

The cost of such technological advancement is a bit more complicated though than just the investment cost.

With more technology applications, there is bound to be disruption to existing activities and the labour they require. If smart cities help driverless cars to take off, the thousands of drivers of taxis or delivery drivers that find low skilled employment in China's cities could be displaced and struggle to find alternative employment. New jobs will certainly arise from the implementation of smart city technology, but will likely require different skills and knowledge to those being displaced. The government will need to assist those whose employment is disrupted to find alternatives.

Risks

There is also the risk of disruption when cities that have become reliant on smart-city technology experience technical glitches - for example, if the smart traffic lights stop working and cause gridlock. This might just be a technical problem resulting from, for example, bad weather affecting sensors. But it could also potentially be vulnerable to system hackers. Once people get used to the convenience of smart city technology, this could result in a shock to the public and to local governments if the smart city system collapses. In China, as cities become increasingly reliant on smart street lights, contingency plans to cope with failure will become very important.

Conclusion

Our 'guesstimate' is that by 2030, Beijing, Shanghai, Guangdong, Shenzhen and Hangzhou could be experienced practitioners of smart city technology. And by 2035, most locations in China could enjoy some smart city functions. This means that the Chinese economy could achieve urbanisation at a faster speed. But before we reach 2030, the technology war between China and US could delay more sophisticated functions of smart cities that need advanced semiconductors. This is likely to be the biggest hurdle for China as it strives to lead the world in smart city applications, and China is investing in its own advanced semiconductor chips. The more successful China is in achieving technological growth, the more difficulties it is likely to face from the technology war.