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China's urbanisation in the new technological revolution

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By the end of 2019, China's urbanisation rate had reached 60.6 per cent, indicating its entrance into the mid-to-late stage of urbanisation. Facing the future, China must grasp the vast opportunities to promote urbanisation along a healthy trajectory, clarifying its driving mechanisms, studying new trends and characteristics and properly responding to existing risks and challenges.

The process of China's urbanisation

China's urbanisation development model is endogenous to its economic development path and the transformations of its industrial structure. Under the strategy of giving priority to the development of heavy industry during the planned-economy period, China's urbanisation experienced a rapid process of industrialisation, resulting in a large number of industrial cities. Nevertheless, urbanisation at this stage was constrained by some institutional mechanisms, preventing it from enjoying the benefits from the global third technological revolution after World War II. Since the period of reform and opening up and with the establishment and improvement of the socialist market economy with Chinese characteristics, the economy has been integrated into the global economic system and has developed rapidly. Cities in China have come to make full use of the diffusion and spillover effects of foreign advanced technologies to transform and upgrade their industrial structure.

The tortuous development stage of urbanisation, 1949–1978

When the People's Republic was founded in 1949, China's urban population was 57.65 million, accounting for 10.6 per cent of the country's total population. From 1949 to 1957, due to the strategy of prioritising the development of heavy industry, many cities were built and expanded around 694 key industrial projects. In 1958, the Great Leap Forward campaign triggered the migration of large numbers of rural people to China's cities. During the Cultural Revolution, China's economic and social development were severely disrupted and the urbanisation process was reversed (Figure 4.1). At this stage, the process of urbanisation mainly revolved around the geographic distribution of major industries, especially the location of key national defence projects. Population size and industrial structure were subject to strict controls by the central planning system. Cities were regarded mainly as administrative centres, and their importance for economic growth and social governance was neglected.

Figure 4.1 Changes in China's urbanisation rate, 1949–1978

Source: National Bureau of Statistics.

The smooth start of urbanisation, 1978–2000

From 1978 to 1984, China adopted a new development mode of ‘strictly controlling the expansion of large cities, encouraging the growth of small cities and developing rural towns’ (State Infrastructure Commission of the People’s Republic of China 1980). The growth of township enterprises promoted urbanisation by encouraging peasants to leave their farms and work in factories in towns. In 1984, the reform of China’s urban economic system was initiated. Many villages were transformed into towns, and large segments of the rural population moved into small towns. After Deng Xiaoping’s ‘Southern Tour’ in 1992 and the socialist market economy reforms in 1994, China began to implement urban-driven regional development and a ‘coastal city first’ development strategy. From 1990 to 2000, the number of cities rose from 467 to 663, the urban population increased from 300 million to 460 million and the urbanisation rate increased from 26.4 per cent to 36.2 per cent (Figure 4.2). At this stage, advanced economies in the world had successively entered the era of comprehensive informatisation, and China also seized the huge industrial development potential brought about by this revolution in information technology. Using its advantages in low labour and land costs in coastal areas, China took the lead to develop related industries, and the electronic information industry quickly became important in many coastal cities.

Figure 4.2 Changes in China’s urbanisation rate, 1978–2000

Source: National Bureau of Statistics.

The rapid development stage of urbanisation, 2000–2011

After China joined the World Trade Organization (WTO) in 2001, it rapidly developed into an important global manufacturing base, accelerating its urbanisation process. Between 2000 and 2011, China's urbanisation rate increased from 30.89 per cent to 51.27 per cent—the fastest period of urbanisation witnessed during the 40 years of reform and opening up (Figure 4.3). Referring to the urbanisation model, the Twelfth Five-Year Plan in 2011 proposed that China 'rely on large cities and focus on small and medium-sized cities to gradually form urban clusters with large radiation effects'. With the deep integration of China's industrial development into the international division of labour and participation in global market competition, the focus of industrial policy shifted to comprehensively supporting technology and product upgrades in capital-intensive industries, nurturing technology-intensive industries and continuing to expand the scope of opening up. The proportion of tertiary industries steadily increased from 39.8 per cent to 45.5 per cent, surpassing secondary industries for the first time (Figure 4.4). The process of urbanisation and the upgrading of the industrial structure progressed synchronously, and the quality of urbanisation gradually improved.

Figure 4.3 Changes in China's urbanisation rate, 2001–2011

Source: National Bureau of Statistics.

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Figure 4.4 Changes in China's industrial structure, 2001–2011

Source: National Bureau of Statistics.

New urbanisation development stage, from 2012

Since the Eighteenth National Congress of the Chinese Communist Party, China's economic and social development have entered a new era. The Central Urbanisation Work Conference held on 12 December 2013 proposed following the new urbanisation path characterised by intensive, intelligent, green and low-carbon development. Significant breakthroughs have been made in the construction of pilot free-trade zones and the opening up of inland border areas. A number of central inland regional cities—such as Chongqing, Chengdu, Wuhan and Zhengzhou—have entered a period of rapid growth. In 2013, China proposed the Belt and Road Initiative to further expand its economic axis and development corridors and become a new driving force for urbanisation. In 2016, the Thirteenth Five-Year Plan proposed 'taking urban agglomerations as the main form' of urbanisation and accelerating their construction and development. China's urbanisation rate increased from 52.6 per cent in 2012 to 60.6 per cent in 2019 (Figure 4.5). A new round of global technological change has been accelerating, and a series of new technologies, industries and models has emerged in China. The proportion of tertiary industries rose from 45.5 per cent to 53.9 per cent, showing that China's urbanisation has entered a new pattern dominated by service industry development (Figure 4.6).

Figure 4.5 Changes in China's urbanisation rate, 2012–2019

Source: National Bureau of Statistics.

Figure 4.6 Changes in China's industrial structure, 2012–2019

Source: National Bureau of Statistics.

China's urbanisation achievements

The urbanisation level is steadily increasing

During the 40 years of reform and opening up, China's urbanisation level increased rapidly. From 1978 to 2019, the urbanisation rate increased from 17.9 per cent to 60.6 per cent, and the total urban population reached 848 million (Figure 4.7). The urban area of Chinese cities increased from 178,100 sq km in 2008 to 208,900 sq km in 2018, while the built-up area increased from 30,400 sq km in 2004 to 58,500 sq km in 2018 (Figure 4.8).

Figure 4.7 Urban population and urbanisation rate in China, 1949–2018

Source: National Bureau of Statistics.

Continuous optimisation of urban patterns

The number and scale of Chinese cities have expanded rapidly. At the end of 2017, there were 14 cities with a registered household population of more than 5 million, 16 cities with a population of 3–5 million and 219 cities with a population of 0.5–3 million (Figure 4.9). The urbanisation pattern has been continuously optimised and the construction of the three major urban agglomerations—Beijing–Tianjin–Hebei, the Yangtze River Delta and the Pearl River Delta—has accelerated. The ‘19 + 2’¹ urban agglomeration pattern was formed and has developed steadily.

1 The ‘19 + 2’ urban agglomerations are: Beijing–Tianjin–Hebei, Yangtze River Delta, Pearl River Delta, Shandong Peninsula, West of the Taiwan Strait, Harbin–Changchun, Southeastern Liaoning, Central China, Middle of the Yangtze River, Chengdu–Chongqing, Guanzhong Plain, Beibu Gulf, Middle Shanxi, Hohhot–Baotou–Erdos–Yuzhong, Middle Guizhou, Middle Yunnan, Lanzhou–Xining, Ningxia, North Mount Tianshan, as well as Lhasa and Kashgar.

In 2016, the abovementioned three most influential urban agglomerations were home to 18 per cent of the population on 2.8 per cent of the country's land area, and produced 36 per cent of national gross domestic product (GDP).

Figure 4.8 Urban and built-up areas in China, 2004–2019

Source: National Bureau of Statistics.

Figure 4.9 Number of China's prefecture-level cities, 2000–2019

Source: National Bureau of Statistics.

The comprehensive competitiveness of China's cities has increased significantly

After 70 years of urbanisation, China's urban economy has continued to expand. The urban industrial structure has been continuously optimised, while overall competitiveness has increased significantly. In the *Global Urban Competitiveness Report* for 2019–20, jointly released by the Chinese Academy of Social Sciences and the United Nations Human Settlement Program (CASS and UN-Habitat 2019), 103 of the 291 cities in China ranked higher than previously for competitiveness. Among them, Shenzhen, Shanghai, Hong Kong, Beijing and Guangzhou entered the world's top-20 competitive cities.

The appearance of cities and residents' lives have improved rapidly

Figure 4.10 Changes in China's urban per capita housing area, 1978–2019

Source: National Bureau of Statistics.

With the advancement of urbanisation, shortages of public services and infrastructure such as urban water, power and gas supplies, drainage, sewerage and garbage disposal have been greatly alleviated, and residents' travel and living conditions have been greatly improved. In 2017, the area of country's urban road network reached 7.89 billion m². By the end of 2018, 35 cities had established rail transit networks, operating 185 lines, with a total length of 5,761.4 km. At the end of 2017, the urban water supply penetration rate was 98.3 per cent, the gas penetration rate was 96.3 per cent, the sewage treatment rate reached 95.5 per cent, the domestic

garbage treatment rate reached 99.0 per cent and the treatment rate of sewage was 97.7 per cent. In 2018, China's urban average per capita housing area reached 39 square metres, on top of a 3.7-fold increase between 1949 and 1978 (Figure 4.10).

Continuous improvements in urban public services and governance systems

Today, China has essentially established a sustainable social insurance system with wide coverage and basic guarantees. Health and other urban public services have been continuously improved, while the process of guaranteeing more equal access to basic public services has been steadily advancing. The number of urban residents participating in pension insurance increased from 57.1 million in 1989 to 435 million in 2019, and the number of people participating in basic medical insurance likewise increased, from 42.9 million in 2007 to more than 1 billion in 2019 (Figure 4.11). Many cities in China are in the process of establishing cross-department, cross-industry and cross-regional-government information-sharing and business collaboration, accelerating the modernisation of urban governance.

Figure 4.11 The number of Chinese urban residents participating in pension insurance and basic medical insurance, 1989–2019

Source: National Bureau of Statistics.

The new industrial structure is dominated by the service industry

With reference to the changes in the industrial structure of developed economies at different stages of development, the value added of tertiary industry in the United States, the United Kingdom and France has come to account for more than 70 per cent of their respective GDP. On the other hand, advanced manufacturing in Germany and Japan developed well, and their proportion of secondary industry is significantly higher than that of other advanced economies. In 2019, the service industry accounted for 53.9 per cent of GDP in China, indicating it is the primary leader of the country's urbanisation. It is expected that the value added of China's tertiary industry in 2020, 2035 and 2050 will increase to 55.3 per cent, 63 per cent and 70 per cent of GDP, respectively. Overall, the process of urbanisation from 2020 to 2050 will see China's industrial structure undergo major adjustments and transformations. The potential for tertiary industry development is still large, while primary and secondary industries will continue their downward trend. A new type of industrial structure characterised by producer services and the integration of primary, secondary and tertiary industries will be gradually stabilised.

The impact of the new technological revolution on China's urbanisation

The new technological revolution and high-quality development of China's economy are highly intertwined and can provide major opportunities for ongoing urbanisation. This will not only effect the degree and speed of urbanisation, accelerating the development of metropolitan areas and urban agglomerations, but it will also improve levels of urban governance, gradually narrowing the gap both between regions and between urban and rural areas, while simultaneously promoting high-quality development.

Providing impetus for high-quality urbanisation

The main mechanism by which the new technological revolution will impact the high-quality development of cities will be the development of new production factors and industries, as well as the promotion of high-tech industries and productive services. Judged according to the current fields of application, digital technologies typified by big data, cloud computing, artificial intelligence and so on have already been put into large-scale commercial use. Additionally, smart manufacturing, new-energy vehicles, smart cities and mobile phone technology have rapidly multiplied and become new economic engines. The use of modern logistics and information

and other technologies can further reduce the cost of urban–rural exchanges and promote the transfer of technology to the countryside, thereby improving agricultural productivity and efficiency, which is conducive to the continued transfer of rural surplus labour to the city.

Shenzhen is a typical example of high-quality urbanisation driven by the technological revolution. In 2019, Shenzhen was awarded approximately 12,000 patents from the Patent Cooperation Treaty (PCT)—the highest ranking in China. According to the *Report on High-Quality Development of Chinese Cities in 2020*, published by the 21st Century Economic Research Institute (2020), Shenzhen also ranks as the top city for high-quality development in China. Shenzhen has provided strong financial support for technological innovation, successfully aggregating technological industries and related employment. Another example is the Yangtze River Economic Belt urban agglomeration. An empirical study by Yang and Yang (2019) used indicators such as economic vitality, innovation efficiency, green development, people's quality of life and social harmony to show how the level of high-quality development in the Yangtze River Economic Belt has improved significantly. In terms of driving factors, technological innovation can significantly improve the level of a city's high-quality development, and it has a significantly higher promotional effect than other factors. Moreover, there is also an overlay effect for the urban clusters in the lower reaches of the Yangtze River where development quality is already high.

Promoting low-carbon, green and sustainable urban development modes

The new technological revolution is leading the low-carbon and green development of Chinese cities through industrial restructuring, which enhances the position of Chinese cities in the global value chain and industrial division of labour. Information technology and manufacturing are deeply integrated. Big data are generated through intelligent manufacturing. By changing the relative combination of production factors, the global industrial chain and division of labour will also be shifted. Second, the new technological revolution improves labour productivity and energy factor inputs. Reductions in carbon emissions in a single city are achieved without simply transferring high-emission industries to other cities, but by improving labour productivity and energy factor inputs through technological progress. Third, the new technological revolution changes the original production mode, which was extensive in scale but lacking in customisability. Intelligent, incremental manufacturing and other technologies can help realise customisation by incorporating user needs into production. Finally, the concept of green transportation will reshape citizens' behaviour. New transportation modes such as electric vehicles, the Internet of Vehicles and share-bicycles significantly lower the carbon emissions from urban transportation systems.

Empirical studies show that, during China's rapid urbanisation, industrial upgrading and rising incomes contributed to lower energy intensity in all regions (World Bank 2007). The China National Petroleum Corporation (CNPC 2017) estimated that non-fossil fuels will account for 35 per cent of primary energy generation in China by 2050, and carbon emission intensity will fall to 18 per cent of 2010 levels. Innovation in energy technology will see the levelised cost of electricity (LCOE) of photovoltaic power and wind power drop by 71 per cent and 58 per cent, respectively (Chen 2018). For example, the Xiong'an New Area has created a zero-carbon smart green-energy system and recently achieved 'carbon neutrality'. This was realised by taking advantage of its own geothermal energy and fully adopting technology systems such as multiple energy coordination, source-network-load-storage coordination, as well as centralised and distributed coordination via the energy internet. It is expected that zero carbon emissions can be achieved in the Xiong'an New Area through full reliance on renewable energies after 2040 (Guo and Gao 2018). New-energy electric vehicles (EVs) are the main breakthrough for China's automobile industry to overtake. Since 2014, the EV industry in China has reached sales of more than 1 million, ranking it first in the world (Chen 2009; Zhou 2018). According to Zheng et al. (2019), from 2011 to 2017, the top-five provinces for EV sales had reduced their carbon emissions by 612,000 tonnes (combined total).

Promoting the industrial and population capacities of cities

Most of the new types of businesses represented by the digital economy are located in large cities. They have become places of high efficiency, high concentrations of job opportunities, platform economies and innovative enterprises—all of which bring challenges to the capacities of cities. The new technological revolution has brought about continued improvements in metropolitan transportation systems: first, by replacing traditional radial modes of expansion of central and peripheral areas of a city. Interconnection and interoperability help to accelerate the co-urbanisation of metropolitan areas. Second, traffic congestion in large cities is eased, significantly increasing their population carrying capacity, thus making better use of the scale and density effects of population agglomeration. Third, the complementary effects of the functional division and spatial allocation of labour and other resources within the city are maximised, promoting the coordinated development of industry (Liu 2001).

Figure 4.12(a) The spatial expansion of Shanghai City, 1991

Source: School of Transportation Engineering, Tongji University.

Figure 4.12(c) The spatial expansion of Shanghai City, 2015

Source: School of Transportation Engineering, Tongji University.

Figure 4.12(b) The spatial expansion of Shanghai City, 2000

Source: School of Transportation Engineering, Tongji University.

Taking Shanghai as an example, from 1990 to 2015, the amount of urban construction land increased by more than 1,500 sq km, and more than RMB1 trillion was invested in the construction of a comprehensive transportation system including hubs, highways, expressways and rail transit, to meet the transportation demands of expanding production activities (Figure 4.12). Urban residents' average daily travel increased from 4.5 km in 1995 to 6.9 km in 2014—a rise of more than 50 per cent (School of Transportation Engineering 2019). This increase indicates that residents have accessed more employment opportunities and more public services over a larger area. For example, Deng (2015) indicated that the Guangzhou–Zhuhai intercity rail improved the spatial agglomeration rate of primary and secondary industries by 20 per cent because they were particularly reliant on physical transportation. The increase in

the population density of cities is as high as 2,246 people per sq km. It can be seen that intercity rail transit plays a very important role in promoting the overall development of urban agglomerations.

Improving the capacity of urban governance

Since the beginning of the reform and opening-up period, China's urban governance has undergone a transition from governments having overall control of the allocation of resources, through the planned economy to the application of institutional innovation and advanced technologies. The widespread application of digital and smart technologies in cities has promoted changes in urban management and improved the supply and efficiency of public services.

Let us take Hebi City, Henan Province, as an example. As a prefecture-level city in central China, Hebi is socioeconomically small compared with developed cities in the Yangtze and Pearl river deltas, and it lags on various economic indicators. However, with the local government's emphasis on the modernisation of urban governance and the construction of 'smart Hebi' and other digital government projects, the city's telecommunications business has grown rapidly and stimulated the development of thriving tertiary industries. The public's satisfaction with their participation in governance, levels of online services, emergency response times and public safety has reached above 88 per cent (Niu 2017). In addition, urban governance models such as 'grid management' have been successfully explored in many parts of China. As of 2012, more than 90 cities had adopted or were in the process of implementing grid management.

Resolving inequalities in the process of urbanisation

According to the 'China Comprehensive Social Survey 2008 to 2015', China's inequality of opportunity index fell from 0.254 in 2008 to 0.176 in 2015 (Li 2019: Figure 4.13). However, from a global perspective, the impact of China's inequality of opportunity on income inequality is still relatively high, and the rural inequality of opportunity index (0.1738 in 2015) remained higher than that of urban areas (0.0805 in 2015). There are obvious differences in environmental factors (gender, place of birth, social status of father, and so on) between urban and rural areas that result in inequality of opportunity. The inequality of opportunity caused by unequal access to education has decreased significantly in rural areas, but it is still higher than in urban areas.

Figure 4.13 China's income inequality index and the proportion of inequality of opportunity

Source: Li (2019).

The new technological revolution will help close the urban–rural inequality gap in several ways. First, advances in agricultural technology (related to animal breeding, fertiliser use, irrigation, and so on) have a direct effect on increasing agricultural output and rural residents' incomes. The adoption of information and communication technologies (ICTs) such as mobile devices can also lower transaction costs, increasing market opportunities for the rural population (World Bank 2019). Second, significant improvements in rural education and investment in human capital will reduce the urban–rural income gap (Wang and Fan 2005). Finally, the revolution in information technology and the resulting changes to business and social security models will help boost rural economies (Picot and Lorenz 2010). The internet has a significant blocking effect on the income gap between urban and rural residents in China (Guo and Zhang 2019), of which inclusive digital finance is a very good example (Jia 2019).

However, various problems of inequality and imbalance may eventually become even more prominent. First, the extent to which technological changes can promote industry differs between cities, and the populations of unsuccessful cities will likely decrease rapidly. Second, the manufacturing industry is still an important sector for absorbing employment in China's central and western regions. In the short and medium terms, these regions may continue to suffer from the income-damaging effects of industrial transformation and face competition from emerging countries in Southeast Asia and Africa when undertaking industrial transfers from eastern China. The income gap between China's western and eastern regions may thus

be widened. Finally, repetitive or low-skill work will be replaced with automation technologies. Due to the polarisation of service industry incomes, increases in market concentration and an increase in income gaps within large companies brought about by the technological revolution, income inequality within cities may be exacerbated in the short term.

The trend and outlook for China's urbanisation

China has now entered the late stage of its urbanisation acceleration period. According to general development laws, the leading industries driving urbanisation will shift to those in the service sector. Metropolitan areas will become the main spaces for population agglomeration, and population migration will gradually shift from rural–urban to intercity migration. Urban development will shift from rapid quantitative expansion to high-quality development. From the perspective of the macro-socioeconomic landscape, China will enter the ranks of upper-middle-income countries by 2035. Its economic, social and industrial structures will experience major changes, entering the high-quality development stage driven by service industries and led by consumption. China's road to urbanisation will be marked by improved quality and efficiency, scientific development models, continuous optimisation of urban systems and modernisation of governance systems.

The general trend of urbanisation between 2020 and 2050

By 2019, the urbanisation rate in China reached 60.6 per cent—higher than previous estimates by the Chinese Academy of Social Sciences (CASS). International experience shows that when countries achieve middle-income status, urbanisation rates will reach approximately 50 per cent, while all high-income countries display urbanisation rates above 70 per cent. According to our forecast, China's urbanisation rate will reach 72.4 per cent in 2035 and its per capita GDP will reach US\$36,000 (World Bank, DRC and People's Republic of China 2014). Morgan Stanley's *The Rise of China's Super-Cities: New Era of Urbanisation* report predicted that China's urbanisation rate would reach 75 per cent by 2030. At the stage of high-quality and high-income development, China's economic and industrial structures will be more balanced and effective, innovation will play a more important role as a driver of development and the mechanism for urban agglomeration—in which large and small and medium-sized cities develop synergistically—will become more formalised.

China's urbanisation has entered a stage focused on the pursuit of high-quality development

Ray M. Northam (1979) showed that the urbanisation process could be summarised as a slightly flattened S-shaped curve. He took a rate of above 70 per cent as the indicator of the terminal stage of urbanisation (Table 4.1), while arguing that when the urbanisation rate exceeds 70 per cent, economic development will be dominated by tertiary and knowledge-intensive high-tech industries. Population growth will shift to a 'low birth rate and low mortality rate' pattern, the population growth rate will stabilise and differences between urban and rural areas will become smaller. According to the experiences of developed countries, the main driver of the terminal stage of urbanisation is the third technological revolution, represented by information technology, and globalisation. The information technology revolution then magnifies the differences between regions within a country and enterprises allocate resources and organise production nationally according to these differences. At this stage, there will be new divisions of production between cities.

At China's current stage of urbanisation, the competitiveness of cities and the vitality of their leading industries increasingly depend on the advantages acquired by the development of education, scientific research and institutional mechanisms, while the traditional advantages of geography and natural resources have already been relatively weakened. The various systems and policies of the city have taken basic shape and urban management has increasingly become subject to legal and standardised processes, making adjustment and reform difficult. For example, Zhao et al. (2015) compared the level of innovation in Shenzhen and Shanghai and found that, although Shanghai has more abundant educational resources, greater investment in social research and development and economic aggregates, Shenzhen is better than Shanghai in terms of patent output, the performance of strategic emerging industry development and innovative enterprise development. The main reasons for these differences are that Shenzhen has a better commercial atmosphere, a higher degree of marketisation, a more complete industrial support system, a more innovative and business-friendly financial system and more inclusive cultural environment. Therefore, in the late stage of urbanisation in China, more intensive institutional reforms are needed to further enhance cities' competitiveness and industrial vitality.

Table 4.1 Characteristics of and problems with the three stages of urbanisation

	Level and speed of urbanisation	Drivers of urbanisation	Industrial structure	Problems and trends
Initial stage	10–30%; population slowly gathers in cities	Light-industry development	Mainly agriculture, supplemented by light industry	Insufficient infrastructure, the urban death rate exceeds the rural rate
Accelerating stage	30–50%; population accelerating towards urban agglomeration	Heavy and chemical industry development	Heavy and chemical industries	Traffic congestion, housing shortages, environmental degradation, and suburbanisation trend
	50–70%; urban population growth slows	Producer and life services	Equal emphasis on heavy and chemical industries and service industry	Urban infrastructure and sanitation conditions begin to improve
Late stage	70% or above; the proportion of urban population in the total stabilises	Informatisation and globalisation	Service and high-tech industries	Coexistence of agglomeration and dispersion

China's urbanisation development prospects

At present, China's urbanisation has entered the new era of its development, and 2020–50 will be a crucial period. In the first half of urbanisation, the development of cities was focused chiefly on growth rates. However, with the transformation and upgrading of urban industries, cities will in future focus on the requirements for high-quality development, including improving the quality and efficiency of urbanisation and forming a low-carbon, green and efficient urban development model, while continuing to modernise urban governance.

Urbanisation quality and efficiency have improved significantly

The new technological revolution will improve the quality and efficiency of development of Chinese cities. Cities with an economy of scale and complete infrastructure will attract innovative elements such as technology, knowledge, human talent and funds. Relying on a city's huge consumer market, industry can smoothly shift from labour intensive to knowledge and technology intensive, thus enhancing regional economic vitality. A number of new industries, enterprises and products will emerge and effectively guarantee the long-term competitiveness of the city.

The urban development model is more scientific and reasonable

By 2050, China's urban spatial resources will likely be better utilised, urban planning will be more refined and the urban environment more liveable. Cities will no longer blindly expand in size or rely on land transfers to promote urban construction. In the future, the development of Chinese cities will ideally be focused on social, economic and ecological quality. City managers should also be more focused on guiding urban spatial planning, maintaining a reasonable and moderate development intensity and sustaining harmony between humans and nature. They should establish a sustainable investment and financing model and the focus of investment will have to shift to enhancing the city's overall competitiveness and meeting a higher level of residents' needs. The investment and financing system will be market-oriented and use policy funds such as local bonds, local fiscal revenue and development finance to attract social capital.

Continuous optimisation of urban systems and patterns

From 2020 to 2050, the main body of spatial development will be urban agglomerations, and the effect of the coordinated development of large, medium and small cities will be fully manifest. By 2050, China's three major urban agglomerations are expected to be home to 30 per cent of the population and generate more than 60 per cent of GDP. At the same time, in areas where resources and environmental carrying capacities are stronger—such as Chengdu–Chongqing, the Central Plain and the middle reaches of the Yangtze River in China's west and centre, as well as Harbin–Changchun in the north-east—several urban agglomerations will have been cultivated to promote a balance between population and economic distribution. It is estimated that, by 2050, China's 19 urban agglomerations will attract more than 80 per cent of the country's urban population and occupy about 65 per cent of the country's urban construction land.

The modernisation level of the urban governance system is improved

Deep integration of the internet, big data, artificial intelligence and other technologies with urban governance systems can greatly improve China's urban management, improve the intelligence, convenience and proximity of public services and effectively resolve various 'urban diseases'. City management centres will encourage more citizens to participate in urban management and community self-governance activities. Social security, education, medical care and infrastructure will be further improved.

Strategic choices to promote high-quality development of Chinese cities

According to the 'three-step' deployment proposed at the Nineteenth National Congress of the Chinese Communist Party, a 'well-off society' will be built by 2020, socialist modernisation will have been achieved by 2035 and a modernised socialist country will have been established by 2050. In the next stage of urbanisation, China must establish goals of high-efficiency, low-carbon, green and inclusive development for industry, socioeconomic systems, markets and technology to construct a new path of urbanisation. The development and application of new technological innovation represent a new opportunity for China, while the potential of its huge domestic market and the institutional dividend brought about by new rounds of reform and opening up are unique driving mechanisms of urbanisation.

Strengthening the supporting effect of industries

At the end of 2018, the added value of China's service industry accounted for only 53.3 per cent of GDP, which was still far below the average level of 74 per cent for developed countries. The service industry is the largest contributor to employment. In the process of urbanisation, population agglomeration, changes in lifestyle and improvements in living standards will serve to expand the demand for consumer services. The optimal allocation of production factors, the linkage of the three industrial sectors and refinement of the social divisions of production will also expand the demand for services. In addition, with further improvements in technology and mechanisation levels in agriculture and changes in agricultural production organisation and business models, agricultural productivity will continue to increase, providing a relatively sufficient labour force for the urban sector.

Active integration in the new technological revolution to enhance cities' innovation capability

After years of hard work, China's overall levels of technological advancement and capacity for innovation have been significantly improved. Some important fields are among the best in the world and some industries are now positioned at the high end of the global value chain. Applications and breakthroughs are showing up in the new generation of information technology, typified by advances in artificial intelligence, quantum information, mobile communications, the Internet of Things and blockchain technology. Since the 2018 Central Economic Working Conference, policies and implementation plans related to the 'new infrastructure' have been

deployed and promoted. On the demand side, new infrastructure will help stabilise growth and employment, serve consumption upgrades and better meet the Chinese population's need for a better life. On the supply side, new infrastructure will create the basic conditions for innovation and development, especially as China moves to seize the heights of global technological innovation. For example: since 2014, Shanghai has accelerated the construction of a 'science and innovation centre with global influence' and introduced a series of measures such as '22 Options on Scientific and Technological Innovation' and 'Implementation Opinions on Promoting the Development of New Generation Artificial Intelligence'. In May 2020, the Shanghai Municipal Government issued the 'Shanghai Action Plan for Promoting New Infrastructure Construction (2020–2022)', involving 48 major projects and an estimated total investment of RMB270 billion.

Making full use of the development potential of a large domestic market

To advance the process of urbanisation, China must make full use and unleash the potential of its massive domestic market. The increase in the level of urbanisation and public services has led to the continuous expansion of urban consumer groups and the upgrading of the consumption structure and potential, which have provided continued impetus for economic development. There is still a lot of room for regional rebalancing in the urbanisation process. The Yangtze River Delta, Pearl River Delta and other regions embarked early on a high-quality development track, while the development advantages of megacities such as Beijing, Shanghai, Guangzhou and Shenzhen continue to increase. Additionally, large cities such as Hangzhou, Nanjing, Wuhan, Zhengzhou, Chengdu and Xi'an have also already formed new regional growth poles.

Unlocking the institutional dividends brought by the new round of reform and opening up

In the middle and late stages of urbanisation, the institutional barriers that hinder development still exist and the institutional dividends of reform and opening up are still vast. First, it is necessary to realise the marketisation of migrant workers and the equalisation of basic public services through the reform of the household registration system (*hukou*) to rapidly increase China's total factor productivity. Second, the factor market should be reformed by removing the barriers to the free flow of labour, land, capital, technology, information and other factors. The interactive two-way flow of factors between urban and rural areas should be actively encouraged. Next, industrial competitiveness should be promoted by reforming monopolistic

industries, breaking both administrative and natural monopolies. The principle of competitive neutrality should be introduced to improve industrial competitiveness. Finally, the international competitiveness of Chinese cities can be improved by implementing a proactive opening policy. This includes seizing the opportunity of a new round of major projects exemplified by the Belt and Road Initiative, the Hainan Free Trade Island and Shanghai Free Trade Zone, as well as the opening and further expansion of the service and high-end manufacturing industries.

Conclusions

China's urbanisation model is endogenous to its economic development path and model of industrial structural change. Since the period of reform and opening up, China's economy has rapidly integrated into the global economic system and its urban industrial structure has undergone transformation and upgrading. The new technological revolution and high-quality development of China's economy will provide significant opportunities for high-quality urbanisation in China. In the next stage, China must establish a goal of high-efficiency, low-carbon, green and inclusive urbanisation for industry, socioeconomic systems, markets and technology to build a new urban development path. The new technological revolution will effectively transform and upgrade cities' traditional manufacturing industries and generate a large number of new industries that are technology and knowledge intensive, especially in the services sector. China's huge domestic market potential and the institutional dividends brought by the new round of reform and opening up will be a unique driving force of urbanisation.

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