Problems and prospects of the Chinese construction industry

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Abstract: China's economic growth is one of the most important sources of growth and stabilization of the world economy. Currently, the state has accelerated investment in new infrastructure programs. In addition to traditional infrastructure projects, the Chinese initiative is aimed at developing new technologies. Despite the new coronavirus pandemic, China's GDP is growing quite fast today. The main support for various sectors of the economy is provided by the state and gives priority to domestic consumption demand, rather than external demand. In the construction industry, investments are increasing in infrastructure projects that contain the idea of modernizing the industry and introducing innovative technologies, including: Bcore CTS construction technology; BIM technologies; 3D printing construction technology; construction technologies using "green concrete", and modular construction technologies continue to improve. The success of China's economic reforms is facilitated by the fact that the state focuses on education, among other things, and this has resulted in many highly skilled workers who are able to effectively solve problems in the construction sector. Education reform and the use of new technologies contribute to the rapid development of the construction industry in China.

In connection with the coronavirus pandemic in China, as in other countries, there was a sharp drop in economic activity. This has affected various sectors of the economy, including the construction sector. In the first quarter of 2020, restrictions led to the suspension of construction and the closure of many state-owned construction enterprises and private companies, as well as a drop in GDP [1].

Unlike traditional infrastructure projects, such as building houses, roads, and ports, the new initiative is focused on high technologies. The main tasks in this direction are:
1) creating a 5G information technology infrastructure;
2) modernization of existing infrastructure;
3) creation of incubators and structures for the promotion of scientific research, development of technologies [2].
According to official data, there is a growing demand for heavy equipment in the Chinese construction industry. This is evidenced by the fact that manufacturers have started to raise prices for it by 5-10%. The Financial Times noted that the construction industry in China showed signs of recovery in activity [3].

After a 51% decline in excavator sales in April 2020, sales increased by 12% in March this year. For example, SANY and Zoomlion, the leaders of the construction industry, raised prices by 5-10% in March. In October 2020, exports from China increased by 11.4% year-on-year ($237.18 billion) (figure 1) [4].

![Figure 1. China Exports.](source)

In August 2020, the Chinese economy showed a certain growth in indicators [5]. According to the latest statistics from the state statistical office of the people's Republic of China, China's economic growth is a prerequisite for the global economic recovery. The international Agency Fitch Ratings presented an estimate of China's GDP growth for 2020 from 1.2% to 2.7% [6].

The Chinese Communist party put forward the idea to form a new concept of China’s development through internal and external economic circulation. Currently, China's government policy prioritizes internal circulation, i.e. domestic consumption demand, rather than the external international market.

The expected growth of imports in China was fully justified in September 2020. According to statistics, China's imports increased by 13.2 compared to the same period in 2019. The increase in imports occurred in the month of June. Also in September, the Chinese government increased the pace of construction of a new type of infrastructure projects based on technological innovations [7].

The coronavirus pandemic has forced China to move rapidly towards a digital economy. New infrastructure has become essential in this process. The construction of a 5G network is a very promising investment for China [8]. In this regard, 20 Chinese provinces in March 2020 decided to invest in this project, as it contains the idea of industrial modernization and the introduction of innovative technologies. Of course, digital technologies should help transform various sectors of the economy, including industry, agriculture, and construction. That is why it is important for China to quickly implement the construction of new infrastructure. A number of new information infrastructure projects related to artificial intelligence, 5G and industrial Internet have been launched in China.

Chinese local governments in cities adhere to the principle in housing construction that housing is intended for living, not for speculation. Despite all efforts aimed at curbing price growth in the construction segment, it can be noted that in 100 major cities, prices for new housing increased by 10.7% in the first 8 months of 2020 in the period from January to August 2020 [9]. Prices for new
commercial housing also increased in four first-line cities—Beijing, Shanghai, Guangzhou, and Renzhen—by 6.3%, and in second-line cities by 9.6% year-on-year [10].

Due to the active growth of construction, demand and prices for building materials increased. According to the state Committee for development and reform of the people's Republic of China, cement production in August this year increased by 6.6% in annual terms compared to July 2020 and the same period last year, its growth rate was 3.6%.

China's GDP is growing quite fast today, but not as much as before, so China is taking effective steps to improve new technologies in construction and other sectors of the economy. Innovations in China's construction are growing by leaps and bounds. China is the absolute leader in this segment, and its position has been significantly strengthened today [11].

In Beijing, it was decided to increase investment in infrastructure projects. The proof of this is the introduction of new innovative construction technologies that help China to lead among other countries:

1. Technology in the construction of Bcore CTS (figure 2).

This technology is taken from the aviation industry, where CTS (Care Tubular Stainless) plates were previously used for the production of space capsules. The merit of Chinese scientists is that they were able to reduce the cost of expensive production of these plates due to the invention of a furnace capable of producing CTS plates in mass volumes. This technology allows you to build small buildings in one night. At the same time, the CTS plate is a very strong building material and consists of two panels held together by pipes. The material itself is 10 times lighter than concrete, including its high anti-corrosion properties and resistance to earthquakes. Today, the production of CTS plates is on stream at Sky City in Changsha, where it is engaged in the construction of the world's tallest building [12].

Figure 2. Bcore CTS Technology.

2. Recent construction records in China during the initial period of the coronavirus pandemic in 2019 showed the original specifics of high-speed modular construction (figure 3), which was very effective and is now used in other countries [13].

Today, modular construction in China is applied to the organization of residential complexes, and is especially in demand when building modular dormitories for low-income families.
3. BIM modeling, one of the most popular technologies in modern construction, contributes to the effective operation of a building over a long period and guarantees its stability (figure 4) [14, 15].

4. Chinese 3D printing construction technology has its advantages, among them: environmental friendliness, speed, minimum losses. Recycled construction and industrial waste is used as building materials, which ensures a low cost of buildings. Construction companies do not disclose the features of this technology and keep it secret (figure 5) [15].
5. traditional construction in China today refers to a new type of cement concrete, which is different in that it is prepared using natural soil, it is called "green concrete" [16]. The composition of such concrete includes construction and industrial waste. It is the new composition of concrete that guarantees a reduction in the cost and time of construction. It can be used in the construction of roads, airports, and forestry. Mass construction using "green concrete" will begin in 2021 (figure 6).

![Figure 6. The building was built using "green concrete»](image)

Construction in China, including high-speed construction, has reached unprecedented heights today. Modern statistics show that in recent years, the country has produced more concrete than the United States in the entire twentieth century. The success of China's economic reforms, according to Professor of Economics Din Zhudzhun from the Confucius Institute, lies in the fact that the state has focused on education, thanks to which many highly qualified workers have appeared who are able to effectively solve problems in the construction sector. It is education reform and the use of new technologies that have helped the rapid development of the construction industry in China.

China's successful containment of the COVID-2019 pandemic has contributed to a faster recovery in the country's economy than in other countries. It should be noted that the PRC has achieved stabilization in construction, taking into account the involvement of innovative construction technologies.

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