Research on the Development of Green Building Industry in China

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Abstract. Architecture is important to people's lives and production. However, while various buildings play an active role, the problems of environmental pollution and excessive energy consumption caused by construction are gradually emerging. If the problems are not resolved, they will have an adverse impact on people's sustainable development. Under such circumstances, green building industry can be produced and developed. The problems of construction pollution and excessive energy consumption in China are also very serious. Under the above background, this paper has carried out research on the development of green building industry in China. In terms of specific content, this article analyzes the reasons for the development of green building industry in China, explores the development status and problems of green building industry in China, and finally puts forward some suggestions for promoting the better development of green building industry in China.

1. Introduction

Since ancient times, architecture has played an important role in people's lives and production. In terms of life, the performance of the building affects people's living experience to a great extent. In terms of production, people also need to use a certain place to complete various tasks. The construction of the workplace naturally belongs to the category of the construction industry. Moreover, the construction industry is usually labor-intensive. Therefore, the development of construction industry plays an important role in promoting employment.

However, while buildings play a positive role, they also bring some negative effects. Among them, the relatively important problems are environmental pollution and excessive energy consumption. Taking the environmental pollution as an example, the relevant data show that in the overall environmental pollution, the construction-related water pollution, air pollution and greenhouse gas emissions account for 40% - 50% of the proportion, and the amount of construction waste accounts for 48% of the total amount of urban solid waste [1]. The construction related pollution accounts for a large proportion of overall environmental pollution.

In recent years, the problems of environmental pollution and excessive energy consumption have become more serious. If the problems are not properly resolved, they will have an adverse impact on people's sustainable development. In actual work, people pay more and more attention to the governance of the two problems, and are also trying to implement various measures to improve the environment and save energy. As a major aspect of environmental pollution and excessive energy consumption, architecture should be the focus of attention in the process of pollution control and energy saving. Under such circumstances, green building industry can be produced and developed.

Green building usually means to minimize environmental pollution and resource consumption in the whole process of building construction, use and demolition, and to meet people's needs for comfort and
beauty in building. Green building is the inevitable trend of the future development of the construction industry. It not only promotes the development of the construction industry, but also plays a positive role in reducing environmental pollution and realizing sustainable development. In China, building energy consumption is also serious, only less than 5% of existing buildings are not included in the list of high energy consumption buildings [2]. Therefore, in the future, China should pay more attention to the development of green building industry.

In this context, this paper studies the development of green building industry in China. At the same time, it needs to be explained that the analysis of some problems in this paper requires the help of some relevant data. However, due to the inconsistency in the publication time of these data, the years selected by the data may be different. In order to be more uniform, this paper starts from the most recent year of the data that can be queried, takes 5 years as the range of data selection, and analyzes the relevant problems with the help of the data within the 5 years.

2. Reasons for the development of green building industry in China

2.1. The need for sustainable development

Human development has always been closely linked to the nature. People need to obtain various resources for production and life from the nature. At the same time, the nature also affects people's production and life in its own unique way. The bad natural environment not only affects the production and life of contemporary people, but also is not conducive to future generations to obtain the resources needed for production and life from nature.

Since the reform and opening up, China's economy has achieved rapid development. However, the problems of environmental pollution and excessive energy consumption have also become serious. Figure 1 shows the energy consumption of China's construction industry from 2013 to 2017. It can be found that during the five years, the energy consumption of China's construction industry has increased year by year. However, the data is only for the construction industry. The pollution and energy consumption are not just problems in the construction industry. Take building energy consumption as an example. In the composition of building energy consumption, the energy consumption generated by building operation occupies a large proportion. Energy consumption in building operation usually refers to the energy consumed to maintain a good indoor environment of the building, including heating, air conditioning, etc. As people have higher demands on the building environment, energy consumption in building operation is also expanding. If other aspects of building energy consumption are added to the data shown in Figure 1, the number will be greater.

People's production and life interact with the nature. At present, the problems of environmental pollution and excessive energy consumption caused by construction are problems of the contemporary people on the surface. However, the restoration of nature and the accumulation of energy take a long time, and some of the energy is non-renewable. Therefore, the environmental pollution and excessive energy consumption caused by construction will also adversely affect the production and life of future generations. The result is not consistent with the concept of sustainable development. Green buildings are different from traditional buildings and have some advantages that traditional buildings do not have. Therefore, the green building industry is conducive to reducing environmental pollution caused by construction and saving energy consumption. Then the green building industry is conducive to the long-term good development of the nature and people's sustainable production and life.
2.2. The need to improve social comprehensive benefits

Green building can be divided into "green" and "building" literally. Among them, "green" is the result of comparison with traditional building, emphasizing the characteristics of building in environmental protection, energy saving and sustainable development. "Building" embodies the essence of green building, indicating that although it is different from traditional building, it still belongs to the field of building. Therefore, the development of green building industry is conducive to the better development of building market.

In fact, the development of green building industry can also produce many other good benefits. For example, promoting economic development. Green building is not only the development content of construction industry. Its development is also conducive to the development of many other industries, in particular, it has brought great opportunities and market share to solar energy and other related enterprises [3]. On the whole, it is conducive promoting the economic growth. In addition, the development of green building industry is also conducive to the improvement of economic quality. At present, China's economic development model gradually changes from extensive to intensive. This transformation can better meet the needs of sustainable development. The concept of "land saving, water saving, material saving, energy saving and environmental protection" contained in green building industry is the embodiment of intensive development.

For another example, the green building industry is conducive to improving people's living and working environment. At present, people's requirements for building environment are constantly improving. However, faced with the reality of environmental pollution and the lack of consideration for natural environment, it is difficult for the traditional buildings to meet people's needs for the environment. The green buildings consider the impacts of the natural environment. Therefore, the green buildings are conducive to providing people with a more comfortable environment with minimal environmental pollution and energy consumption.

In addition, the role of green building industry in environmental protection and energy consumption reduction also helps to reduce financial pressure to solve environmental pollution and excessive energy consumption. Due to the limited space, this paper only lists part of the social comprehensive benefits of green building industry. However, these examples above also prove that in order to improve the comprehensive benefits of society, China needs to develop green building industry.

3. Development status of green building industry in China

3.1. Rapid development

The research and application of green buildings in China started relatively late. In the 1980s and 1990s, China has made a preliminary exploration for green building industry. After entering the 21st century, the development of green building industry in China has accelerated. In 2006, China published the "Green Building Evaluation Standard", which is China's first evaluation standard for green buildings. It marks a specific direction for the development of green building industry in China. In 2007, China also
introduced the "Technical Rules for Green Building Evaluation (Trial)" and "Management Measures for Green Building Evaluation Marks" to further promote the development of green building industry in China. In 2014, after eight years of practice, China revised the original evaluation standards and published the second version of the evaluation standards. In 2019, in order to promote the better development of green building industry, China published the third versions of the evaluation standards. The above policies play an important role in promoting the development of green building industry in China. In addition, China’s cumulative green building area in 2016 was 10 times that of 2012. The above data show that the green building industry in China is developing rapidly.

3.2. Great development potential
Urbanization usually refers to the process of changing the social form from rural to urban with the progress of productivity. Relevant data show that by the end of 2018, the urbanization rate of China's permanent population reached 59.58%, 48.94 percentage points higher than the 10.64% at the end of 1949. The data show that the urbanization level of China has been greatly improved in recent years. However, compared with developed countries abroad, China's urbanization rate is still relatively low. Therefore, in the future, China should continue to strengthen the construction of urbanization.

To some extent, the strengthening of urbanization reflects the expansion of urban construction needs. Figure 2 shows the area of urban construction land in China from 2014 to 2018. It can be found that China's urban construction land area has increased year by year during the five years. The expansion of construction land area also reflects the expansion of China's demand for the construction industry and buildings.

With the concept of sustainable development, at present, all aspects of production and life in China are more emphasis on the green method. The same is true of urbanization. In the future process of urbanization, China will pay more attention to the relationship between urbanization and the nature. Reduce environmental pollution and energy consumption in the process of urbanization. Therefore, green building industry will have great development potential in the future.

4. Problems in the development of green building industry in China

4.1. There is a deviation in the understanding of green buildings
Green buildings emphasize the coordination between the buildings and the nature. The development direction is to minimize the environmental pollution and energy consumption. At the same time, improve people's experience of buildings. However, there is a deviation in the understanding of green buildings. Some people equate green buildings with high-tech buildings. Therefore, in the process of developing green building industry, they put too much emphasis on the use of high technology. The pursuit of the surface form of green buildings will not only waste resources, but also increase investment costs. And the increase of investment cost will restrict some people to engage in green building industry. In addition, the relatively large investment cost often represents the high market price of green buildings. Price is one of the considerations for consumers to buy or use buildings. If the price of green buildings is high,
consumers will usually tend to buy or use traditional buildings. This phenomenon is not conducive to the expansion of the green building market.

4.2. Low utilization of information technology

At present, information technology has played an active role in many aspects of people's production and life. Moreover, with the help of information technology, the convenience of people's production and life has been improved. Therefore, green building industry should also use information technology to achieve better development. However, at present, the utilization of information technology in promoting the development of green building industry is relatively low.

5. Suggestions for the development of green building industry in China

5.1. Train talents and strengthen publicity

The development of green building industry is inseparable from the role of talents. Compared with traditional buildings, green buildings take more consideration of natural environment and energy consumption in the process of design, construction and operation, which requires relevant talents to have not only knowledge of construction, but also knowledge of natural environment and energy. Therefore, the school can specifically set up courses related to green building industry, and pay attention to training compound talents.

At the same time, through the above analysis, it can be concluded that the deviation of some people's understanding of green buildings has an adverse effect on the expansion of the green building market. Therefore, in the future, China should continue to strengthen publicity on green buildings. At the same time, pay attention to increase the training of construction personnel, and through continuous learning, let the green buildings form an atmosphere in the construction industry [4]. The above measures are conducive to helping people establish the correct green building concepts.

5.2. Improve the utilization of information technology

To improve the utilization of information technology in green building industry, it is necessary to solve the problems of the types of information technology, how to use information technology, and the expected effect. Each industry has its own development characteristics. Therefore, even if it is the application of information technology, the types of software and data formats are different. When promoting the use of information technology in green building industry, the construction methods in other fields cannot be copied. Software development and data collation should conform to the characteristics of green building industry. During the use of information technology, certain use standards should be formulated to ensure the reasonable use of related technology and data. In addition, the relevant people should timely evaluate the effects of information technology. At the same time, the information technology should be improved to meet the development needs of green building industry.

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