Influence and Contribution of Green Building on Urban Economy

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Abstract. Nowadays, the excessive demand for buildings in cities leads to environmental pollution, population explosion, and low urban production efficiency. It is urgent for cities to meet the requirements of new standard buildings and new urban planning. As the bearer of urban functions and the inheritor of urban culture, architecture plays an important role in the city. There is a strong correlation between architecture and urban economic development, and even the development of other aspects of the city. In September 2020, China clearly put forward the goals of "carbon peak" in 2030 and "carbon neutrality" in 2060. At the same time, as of November 2023, 145 countries have announced or are considering achieving the goal of net zero emissions. Under the background of energy conservation and emission reduction, how to develop the urban economy and how to build green buildings has become a problem of the times. This paper integrates the relevant data, takes green building as the entry point, takes the Leadership in Energy and Environmental Design (LEED) green building certification system of the United States (hereinafter referred to as LEED) as the green building certification standard, and analyzes the development of green building in China and its impact and contribution to China's urban economy. It is expected that this paper can inspire the construction of green buildings and the related thinking of urban economic development.

Keywords: Green building, LEED, Urban Economy.

1. Introduction

With the accelerated process of urbanization, the economy has developed rapidly, but the attendant problems also emerge in endlessly. Such as environmental pollution, lagging urban planning, low urban productivity and other issues. City is the product of human settlement activities. It is an organic whole composed of space system, transportation system, greening system and engineering technology system. In this system, architecture plays a vital role in urban development [1]. In recent decades, the progress of urbanization has accelerated, many buildings have sprung up, and the rural population has rapidly gathered in large and medium-sized cities, resulting in the problem of land shortage. Even though the scope of the city has gradually expanded, it still feels cramped. To create more use space in a smaller land area, buildings must be developed to high-rise buildings. Therefore, architecture is the inevitable product of urban development. Architecture can be more valuable only under the nourishment of the city's huge economic strength, and the city can develop rapidly because of the emergence of architecture [1]. However, with the development of the times, such a development model is no longer applicable to the current concept. People's unlimited desire for construction and development has destroyed the earth's natural environment in a certain sense. Forced by the harsh facts, people are increasingly aware that the development of construction and environmental protection are inseparable, and people begin to rethink the problems of construction and environmental protection. At the same time, architectural design must be combined with life, and the adjustment of urban society can no longer keep pace with the growing pace of high-rise buildings. The total population and building density of a city are so dense that many urban problems and urban space that cannot be properly used will inevitably occur, which will have a negative impact on the survival of individuals and enterprises [2]. The opinions of the Communist Party of China (CPC) Central Committee and the State Council on Further Strengthening the management of urban planning and construction (hereinafter referred to as the "opinions") proposed to create a livable urban environment that "further improve the average green space area of urban parks and the green space rate of urban built-up areas, change the excessive pursuit of high-intensity development, high-density

construction and reform, and large-area hardening in urban construction, and make the city more natural, more ecological, and more distinctive". The latest standard for green building in China is the national standard "green building evaluation standard" numbered gb/t50378-2019. The concept of "green city" is gradually clear. This paper will combine with the current situation of China, elaborate the significance of the development of green building, and evaluate the development of green building in China based on the American Leadership in Energy and Environmental Design (LEED) building standard, and make a certain connection between green building and urban economic development.

2. Current situation of Chinese cities

2.1. Excessive Building Demand

Over construction usually refers to the number of buildings that exceed the expected transaction volume within the specified building standards. In economics, this concept means that the housing transaction volume exceeds the actual demand of the housing market.

The current situation of China's domestic real estate market is that the transaction volume in many cities and regions has exceeded the actual demand of the market, which means that housing construction has been "excessive". However, the actual situation is more complicated. Due to the decline of house prices and the capital turnover of developers, many projects have been suspended or left unfinished, and people's confidence in real estate has been shaken. Therefore, the buyer has doubts about whether to buy the house, so he chooses to wait and see. However, the decrease in the number of home buyers does not mean that people's housing needs have been met, nor does it mean that there is a surplus of houses.

In addition, with the economic development and the improvement of people's living standards, the main buyers of once small family houses are now more inclined to buy large-area houses to improve the living environment and comfort, and people's demand for family types has not been fully met.

2.2. Environmental Pollution

The environmental pollution problems China is facing at present mainly include air pollution, water pollution, land desertification and other problems, which pose a serious threat to public health, sustainable development and ecosystem.

Air pollution is a prominent problem in China's current environment. According to the data, in February 2024, the average concentration of PM2.5 in 339 cities above prefecture level in China was 45 μ g/m3, a year-on-year decrease of 2.2%. However, in Beijing and other regions, there are still serious air pollution problems that have not been solved.

The problem of urban sewage treatment is also increasingly serious. With the acceleration of urbanization, wastewater discharge has risen sharply, and the wastewater treatment capacity of most cities cannot meet this growing demand. According to the data of the National Bureau of statistics, only 52% of urban sewage has been effectively treated, and the remaining wastewater is directly discharged into the water body, causing serious damage to the water supply environment.

2.3. Population Issues

China's population is showing a trend of fewer children and aging. Fewer children refer to the first negative population growth in China in nearly 61 years in 2022, which represents that population development has entered a new stage from population growth to population reduction. International experience shows that it is difficult to recover the fertility rate, which means that people may face a situation of negative population growth in a long period of time. Aging refers to the population over 60 years old. The problem of population aging is still intensifying, and the proportion of urban elderly population is rising, which puts forward higher requirements for social security systems such as pension and medical care.

3. Definition of Green Building

Combined with the current situation in China, the development of green building is urgent, and the construction of green building can effectively solve the problems faced by most cities. Green building refers to a building that can save resources, protect the environment and reduce pollution to the maximum extent, provide people with healthy, applicable and efficient use space, and live in harmony with nature in the whole life cycle of the building. For example, in the process of architectural design, construction and construction, people should make full use of renewable resources, reduce the negative impact of construction on the environment, meet the development needs of human society for green environmental protection, and highlight the environmental protection and green performance in the development of the construction industry [3].

The "green" of green buildings does not refer to the general three-dimensional greening or roof garden, but represents a concept or symbol, that is, buildings can make full use of environmental natural resources and do not damage the basic ecological balance of the environment. The core of green building is to seek the harmonious unity of building environment and nature, and promote environmental management and sustainable development. Buildings account for a large part of global energy consumption, greenhouse gas emissions and resource consumption, so the adoption of green building practices is crucial to mitigate these impacts [4].

4. Development of Green Building Certification System in the World

Promoting the development of green building has become the consensus of many countries and regions in the world. All countries are actively exploring and studying, and constantly improving the evaluation system of green ecological buildings. In 1990, the United Kingdom first launched the green building certification standard system BREEAM, which is the earliest human evaluation and certification system for green buildings. Subsequently, various countries have launched green building certification systems that adapt to their national conditions, among which LEED launched by the United States in 1998 has the most extensive impact. LEED, as the most authoritative and influential green building certification system in the world, promotes the concept of sustainable development worldwide and leads the development direction of the green building industry [5].

5. Development of LEED in China

China's green building evaluation system started relatively late. In January 2017, the first t/asc 02-2016 "health building evaluation standard" was issued and implemented. This is a node where the construction and evaluation of healthy buildings have just started.Indoor air pollution, poor environmental comfort, poor aging adaptability and other issues are very prominent [6]. Wangqingqin and others pointed out in the development concept, current situation and trend of healthy buildings in China that "in terms of current development, the cross relationship between various fields and buildings and health needs to be continuously and deeply studied; some key issues of healthy buildings, especially those reflected in the operation effect, need to be further studied and explored" [7]. The latest standard for green building in China is the national standard "green building evaluation standard" numbered gb/t50378-2019, which will be implemented from August 1, 2019. The original green building evaluation standard (gb/t50378-2014) shall be abolished at the same time. In recent years, LEED has provided a high reference value for China's green building evaluation system.

China has now become the world's largest LEED certification market after the United States, with more than 1000 certification projects. For example, Chaoyang School, the second experimental primary school in Beijing, is the first leed-school platinum project in mainland China. It comprehensively uses 12 green energy-saving measures, such as green lighting, indoor air quality monitoring system, renewable energy technology, and fresh air system, so that the school is basically free from noise pollution, and the air quality meets the national level II and above standards [8]. Another example is the Nike logistics center in Suzhou, which is the first LEED platinum storage

center in China. It uses efficient lighting, on-site solar heating system and natural lighting. It is estimated that up to 4.4 million kilowatts of electric energy can be saved every year and 4200 tons of carbon dioxide emissions can be reduced. There is also a real-time display in the building that shows the power saved so far [8].

LEED has made remarkable achievements since it entered the Chinese market in 2003. The types and distribution of projects applying for LEED certification show a diversified trend. LEED building evaluation standard and China's green building evaluation standard complement each other and jointly promote the vigorous development of China's green building industry [5].

6. Influence of Green Building on Urban Economy

6.1. Government

The overall energy consumption of the city will be reduced, and the investment needs for conventional energy development will also be reduced, which is beneficial to the public finance. The new construction technology, building materials and equipment applied in green building construction will improve the economic and social benefits such as urban GDP and create employment opportunities. The government needs to evaluate these benefits as one of the policy bases. At the same time, environmental benefits are very important. At present, this parameter is mainly measured by the carbon emissions reduced by the policy. From the perspective of cost, the cost of government includes the economic cost provided by all policies (public finance cost of incentive policy, administrative cost of policy implementation and management, government information cost, etc.) [9].

6.2. Construction Unit/Developer

The cost faced by the construction unit/developer is the production cost that should meet the policy requirements, that is, incremental cost. Incremental cost refers to the difference between the total cost of production technology applied in accordance with the requirements of green building construction policy and the benchmark construction cost [9]. The cost is reflected in the initial investment cost and future operation cost. The benefits that the construction unit/developer can get are: the economic incentive benefits (various financial policy subsidies, preferences, etc.) from the government, and the additional selling price or rent from consumers (willing to pay extra expenses to enjoy the economic and environmental benefits of green buildings) [9].

6.3. Staff

The development of green buildings has created a huge demand for skilled labor in related industries. They need to use professional knowledge and technology to design and build green buildings, including but not limited to the following four aspects. First, building energy conservation. Green buildings usually use energy-saving technologies, such as advanced thermal insulation materials, efficient HVAC systems, solar panels and other renewable energy devices. The installation and maintenance of these systems require skilled workers [4]. Second, green roof installation. The green roof is designed to absorb rainwater and provide thermal insulation, which requires special installation skills. Workers need to know how to install and maintain these systems [4]. Third, the treatment of advanced materials. The use of these sustainable materials requires corresponding knowledge and ability [4]. Fourth, improve indoor air quality. The installation of air filtration system requires skilled workers to ensure that the building performance will not be affected due to improper installation [4].

6.4. Consumer

The biggest benefit of consumers/users is the energy cost saved through energy conservation. If the government provides direct economic incentives to consumers, they may have the benefit of fee

and tax relief [9]. Consumers/users need to pay for the additional operation and maintenance costs brought by new building materials and equipment on the property management fee. If the market is promoted and the economic benefits brought by green building construction to users are clear, consumers may be willing to make additional expenditure to enjoy low-carbon economic benefits [9].

6.5. Investor

Green building investment is attractive to investors and institutions with a sense of social responsibility. These investors may be more willing to invest in green building projects or provide financing for green building projects, which can reduce the investment cost of developers [4]. Moreover, green buildings are generally more resistant to climate risks and environmental challenges, which makes more investors realize that these properties may be safer investments in the face of future uncertainty [4].

7. Conclusion

As the consensus of the times, the development of green buildings has achieved long-term development in China, and there are relevant evaluation standards and policies to support the development. Green building also has a profound impact on urban economic development, such as promoting the development of related industries, promoting regional economic growth, and creating employment opportunities. These changes affect the vast majority of interest communities and groups in the city, including but not limited to the government, relevant professionals, investors and consumers. A green city in line with the development of the times depends on the participation of many people in the city, the government's overall planning and arrangement of relevant policies, relevant experts' guidance in theory and technology, relevant practitioners' funding and market orientation, and many residents' most fundamental and practical opinions, so that the city can achieve sustainable development.

LEED, as the world certified green building certification system, has been widely practiced in China, and plays an important role in the development of China's green building evaluation system. However, LEED still has limitations in China, such as the inconsistency between the evaluation criteria and China's national conditions, and the quantification of evaluation terms. Although China has made great achievements in green building at present, there is still a certain distance from how to walk out of its own path.

In the future, China will continue to learn from the world's experience because of reality, and strive to practice and develop China's green building evaluation standards. Public attention and support are essential. Only in this way can the green building industry get further development, and the green building evaluation system will be more perfect and more reference value.

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