Existing Problems and Countermeasures of Energy-efficiency Residence Exploitation in China

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Abstract. Energy-efficiency residential building, based on the concept of green building, aims to solve the new field of residential problems. The purpose of the development of energy-efficiency residential buildings is to provide livable buildings for people with the lowest energy consumption. It reduces energy consumption throughout the life cycle of the building and contributes to sustainable development. However, this study finds that there are many obstacles in the process of promoting the use of energy-efficiency houses. There is not sufficient government support. Real estate companies avoid the promotion of energy-efficient buildings on a large scale by pursuing the maximization of profits. Buyers are blindly buying due to a lack of energy-saving awareness and related knowledge. To solve these problems, through literature research, this paper shows the progress status of the domestic energy-efficiency houses, excavated the existing obstacles, and attempt to offer specific measures and methods to break the obstacles from the three dimensions of government, enterprises and customers.

1. Introduction

The foundation of energy-efficiency residential buildings comes from the concept of energy-efficiency building and a green economy. Among them, the core of energy-efficiency buildings is the creation of pollution-free and environment-friendly buildings, and realize the optimization of building function for energy consumption. It can mainly be divided into two categories [1]. One is spatial energy-efficiency building, which focuses on construction, land occupation, materials, etc., and pursues environmental protection in various aspects. The other is the operation of energy-efficiency buildings, which concentrates on the later use of the buildings and utilizes various scientific means to realize the energy savings, environmental protection and the maximum utilization of resources during the use of the building. Energy-efficiency residential buildings, are defined as a residential building built from the aspects of energy saving, water saving, green building materials, green construction, etc. [2].

However, as far as China's real estate market is concerned, due to the development cost, maintenance and other issues, the concept of energy-saving building is rarely reflected in the residential exploitation, which leads to the long-term shelving of the building exploitation that can not meet the needs of today's social and economic development and has sustainable development value. Therefore, the application and large-scale promotion of energy-efficient buildings is a topic worthy of research and discussion.

To sum up, this paper will focus on the concept of energy-efficiency building economy, investigate and survey the exploitation status of energy-efficiency residential buildings in real estate.
enterprises, dig out all kinds of existing problems in the exploitation process of enterprises, and attempt to offer some solutions, so as to explore the possibility of large-scale development of green housing communities in real estate enterprises.

Figure 1. 2016-2019 China green building/residential star-level operation identification project[12]

As is shown in Figure 1, since 2016, China has attached great importance to energy conservation and emission reduction in the construction industry. Although the base number is not large, China's green building projects have an obvious upward trend. However, it can also be seen that the government mainly pays attention to the development of energy-efficiency public instead of the residential buildings, therefore, residential projects in the total number of energy-efficiency building projects accounted for less.

2. Present situation of energy efficiency residence development in China

2.1. Increase policy support
The development of green housing in China needs the support of policies. They guide the development of energy-efficiency residences through formulating policies and industry standards. Since the formulation of industry standard "energy-saving design standard for civil buildings (heating residential buildings)" in the 1980s, China's policy support for the development of energy-efficiency residence has been increasing, which has laid a solid foundation for the development of science and technology.

2.2. Continuous improvements of industry standards and evaluation system
In April 2008, China's green building evaluation identification system was formally implemented. So far, China has issued about 20 green building standards, and formed a relatively perfect evaluation system, which provides standards for the development of the industry, and solves disputes and contradictions about green building in the industry with unified norms. In other words, the formulation and promulgation of various standards and evaluation systems have clearly explained to the industry: what is a qualified energy-efficiency building and how to develop it, which points out the direction and road for the development of the industry.
2.3. Continuous improvements of the technical level
During the 11th Five Year Plan period, there are only 3 national sciences and technology public relations projects on energy efficiency building in China[3], which obviously lags behind the level of science and technology in developed countries. After the 12th Five Year Plan period, the development of energy efficiency building has received nationwide attention, with the support of various policies, the number of science and technology projects on it has increased significantly, and the technology development has become increasingly mature.

After that, during the 13th Five Year Plan period, the number of related projects has reached about 50, and the investment in scientific research has also grown. It can be seen that China's energy-efficiency building scientific research has been paid more and more attention by the state, and has obtained numerous support. It has successfully realized the breakthrough and progress of technological level, and provided a solid guarantee for the industrialization of energy efficient housing in the future.

2.4. Low market coverage
According to the data of the National Bureau of Statistics, by the end of 2018, the cumulative construction area of China's real estate was 8.223 billion square meters, and the construction area of energy efficiency buildings was 3.2 billion square meters, which contributed 38.9% of the total. And most of them are hotels and office buildings, while residential buildings only account for a relatively small proportion, so there is still a considerable rising space. In addition, the development of energy-efficiency residence in China is unbalanced, which is mainly concentrated in the cities with a developed economy and technology, while there is little energy-efficiency residence exploitations in less developed areas.

3. The existing problems of energy-efficiency residence exploitation
According to the current analysis of energy-efficiency residential building in China, the development of green housing in China has good policy and technical support, and its utilization rate is also on the rise. However, there are still many practical problems, such as unbalanced progress and high development cost, which affect the development process of energy-efficiency residential buildings.

3.1. Social perspective

3.1.1 The non-significance of social topic effect. When consumers make consumption decisions, social topic effect plays an important role, such as the "School District Housing effect" brought by the topic of "district enrollment". The degree of collective discussion on something is easy to have a long-term consumption impact among consumers, thus affecting the market development ability of a product. However, indexing on topics such as school district housing that are more relevant to the public interest, energy conservation has not attracted much attention.

3.1.2 Unfavorable factors of the mainstream thinking of house purchase. When customers are shopping, mainstream consumer thinking greatly affects consumers' preferences. In terms of the current stage of social development in China, the main purpose of a house purchase is still to solve the basic survival problems. The mainstream thinking of consumers in house purchase behavior is still: safety, beauty, traffic, location, price and other basic attributes of houses. As for residential energy saving and emission reduction, such additional functions rarely enter into the mainstream thinking of consumers, which leads to the residential buildings with "energy-saving and green" as the selling point can not use the characteristic functions to obtain objective profits.
3.2. Real estate enterprise perspective

3.2.1 Market status affects developers' decisions. For real estate developers, the market reaction to a product directly affects the developer's decision. In the past 40 years since the reform and opening-up, China's construction development and housing rental and sale present a prosperous situation of supply and sales, the housing market has been an area of intense concern. However, for energy-efficiency residential buildings, it is not difficult to realize that the market activity of this product is not high. In addition, at present, the energy-saving factor has not been included in the trading mechanism of China's construction market [5], the trading rules of the construction market have not been updated, and developers can only rely on financial incentives to profit from financial institutions to a large extent. This series of phenomena cannot fundamentally change the trading mechanism, activate the market and promote market-oriented development of energy-efficiency buildings.

3.2.2 The negative influence of exploitation costs. For developers, short cycle, less investment, and extraordinary income is the consistent goal of the enterprise. The interest and income are used as important stander to measure the selection of building type, building material and other issues. However, as for energy-efficiency residential buildings, their accessory nature cannot bring valuable market returns, and the development cost is higher than that of ordinary residential buildings, making energy-efficiency residential buildings difficult to become the first choice of developers.

Depending on the survey, the average cost of developing an energy-efficiency house is 5% to 10% higher than the average cost of developing an ordinary house[6]. Analyzed from the perspective of cost and interest, developers may reduce the enthusiasm of exploiting energy-efficiency residence, or even completely ignore the related products of it, in order to pursue the maximum short-term interests.

![Figure 2. 2008-2012 Green building average exploitation cost increment in Shanghai in different ratings[13]](image)

As shown in Figure 2, compared with ordinary construction costs, the higher the grade of Shanghai's green building projects, the higher the unit incremental cost. The highest can even exceed 300 yuan per square meter. In the real estate industry with fierce market competition, exploitation above the average social cost will directly lead to profiting reduction or even loss.

3.2.3 Consumers' lack of understanding of energy-efficiency residence. In the early stage of production and marketing of a product that covers a new idea or technology, it is very important to publicize the product in order to make the innovation of the product become a new selling point.
However, for energy-efficiency residential buildings, both the government and the enterprise did not carry out effective investment in product publicity. First of all, in terms of government, though the government has published various beneficial policies, the government mainly focuses on the construction procedure, and has not invested enough in the promotion of these buildings.

In the case above, ordinary residents are not certain about the basic concept and effect of energy-efficiency housing, and their understanding of it is only perceptual. It makes customers unable to fully understand the advantages and prospects of energy-efficiency residence.

4. The countermeasures of existing problems

4.1. The countermeasures for governments

4.1.1 Adopt market incentive policies. The high price of energy-efficient buildings has been the main obstacle to its sales. Therefore, the government should focus on "increasing the income of energy-efficiency residential buildings and reducing the cost". In the case that it is difficult to reduce the cost through scientific and technological progress in a short time, the government should solve the problem through policy-based incentives. For example, for developers, certain policy subsidies can be given to enterprises, or tax reduction and loan interest rate reduction can also serve as adopted to help developers reduce exploitation costs.

And for consumers, in order to stimulate consumer demand, the government can take measures to solve the problem. Such as increasing energy-efficiency housing subsidies, or reducing the mortgage interest rate especially for energy-efficiency housing.

4.1.2 Promote the publicity of energy-efficiency residences. The inability to expand the popularity of energy-efficiency houses among customers is one of the pain points hindering the market-oriented development of energy-efficient buildings. In addition, scholar Huang Ning's paper "Australian Polices and Measures on Green Building Development and comparisions with Counterpart in China" [7] also confirmed the deficiency of China's government in promoting energy-efficiency buildings. To this end, the government should publicize energy-efficiency residence vigorously and eliminate the misunderstanding of consumer to it.

4.2. The countermeasures for developers

4.2.1 Establish a sense of sustainable development and pay attention to long-term benefits. Although the construction cost of energy-efficiency houses is higher than that of ordinary houses, in the long run, the cost reduction brought by energy-efficiency house in operation, maintenance and energy saving is much higher than the cost increment in the early exploitation.

Therefore, China's real estate enterprises need to start from their own changes, take the initiative to establish the awareness of sustainable development, pay more attention to the development of energy-efficiency residences to bring more benefits, as well as the contribution of them to society and the environment. Developers should take the initiative to take responsibility, promote the development of energy-efficiency residential buildings instead of only focusing on short-term profits, and blindly waiting, relying on incentive policies and subsidies from the government.

4.2.2 Pay attention to government incentive policies to reduce costs. In order to make energy-efficient buildings become mainstream, in addition to effective policies, policy users also need to actively implement them. For developers, the most important thing to promote the large-scale exploitation of energy-efficiency housing is to actively pay attention to the relevant policies and the latest industry standards issued by the government, additionally, in view of the high cost of energy-efficiency residential development, the government has also actively introduced the relevant financial policies to help developers control their costs.
Therefore, developers should adopt a positive attitude, take the government's preferential policies as the support, construction standards as the guide, to carry out large-scale exploitation and operation of energy-efficiency buildings with much lower costs.

4.3. The countermeasures for costumers
Through verification, it can be seen that when consumers purchase, they will produce specific consumption behaviors for some products with special attributes. For green products, there is such a thing as "Green Buying Behaviors" that refers to the process in which consumers make final decisions on purchasing activities based on the characteristics of green products and their own awareness of environmental protection[8].

However, for the energy-efficiency residences, because of their large volume, high price characteristics, it is not easy to trigger the purchase behaviors of consumers. In addition, in the development of the green housing market, consumers are often in a more passive situation. Only on the premise that the government and enterprises first perfect products, market system, and fully guarantee the interests of consumers, can consumption be stimulated.

To sum up, individual consumers need to actively change their thinking, increase their understanding of energy-saving and emission reduction lifestyle, and increase their confidence in energy-efficiency residences. In addition, consumers also need to pay attention to the policies and business dynamics related to energy-efficient buildings. Comprehensively understand the beneficial effects that energy-efficiency residences can bring, mentally accept and expect them to provide the most basic possibility for the implementation and reality of energy-efficiency residences marketization tasks.

5. Conclusion
Although the energy-efficiency residence is a hot topic in the current real estate industry, and has the support of basic policies and technologies. In terms of the exploitation and development status of it in China, it is still difficult to large-scale develop and marketize the energy-efficiency residence. Compared with green office buildings or other energy-efficiency public buildings, energy-efficient housing is developing very slowly. After research, this paper excavates the existing problems from the perspectives of society, developers and consumers, and finds that: the mainstream social thinking of house purchase does not pay attention to the function of energy conservation and emission reduction; Developers are reluctant to develop because of the high cost; Consumers know less about energy-efficiency housing, have no purchase demand etc. And from the perspective of policy, developer behavior and consumer behavior, this paper gives the following solutions: the government's policy to improve the incentive; Developers cooperate with policies to control costs; Consumers take the initiative to understand the functions and advantages of energy-efficiency residence, and other relevant solutions, to help promote the industrial development of the product, and promote the product into the mainstream market.

In summary, the development of energy-saving residential buildings can not be achieved overnight. It needs the cooperation of the government, enterprises and consumers to promote it from the aspects of policy perfection, product development, and demand stimulation. In the following research, the author will conduct in-depth research on the basis of this paper. Starting from the application degree and effect estimation of various measures, the author will discuss the implementation of the measures, revise and update them, so as to enhance the practical significance of this project. It is believed that under the influence of the idea of sustainable development, with people's further attention to environmental protection and energy crisis, energy-efficiency housing, as an important role in the reform of high-energy consuming industries, will surely break through the bottleneck and become the mainstream of the housing market.
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