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Problems and countermeasures of green building development in cold areas

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Abstract: In the process of rapid development of the society, there is inevitably a waste of resources especially for construction industry. Thus, the demand for green buildings increases swiftly. In the cold areas, the winter lasts for a long time, and several months' heating results in the increase of carbon emissions, which has a great impact on our environment, so it is necessary to develop green buildings. Starting from the concept of green building, this paper expounds the development status of green buildings in the cold area, illustrates the importance of developing green buildings in cold areas, and analyzes the problems faced by the development of green buildings in cold areas, and puts forward some suggestions.

1. Green building concepts

In recent years, China's social economy has developed rapidly accompanied by some serious environmental pollution and ecological damage. The premise of sustainable development is to protect the ecological environment and reduce pollution, and green building is the key to achieve the goal of sustainable development. Green building is the environmentally friendly trend for the development of the construction industry [1].

The green building evaluation standard defines the concept of green building as: "green building means to maximize the conservation of resources, environmental protection and pollution reduction, and to provide health for people throughout the life cycle of the building. Applicable and efficient applicable space, harmonious and symbiotic architecture with nature. The term "green" in "green buildings" does not refer to the general sense of three-dimensional greening, roof gardens, but represents a concept or symbol that buildings are environmentally friendly and can make full use of environmental natural resources. Under the condition of not destroying the basic ecological balance of the environment, building can be called sustainable development building, ecological building, returning to nature building, energy saving and environmentally friendly building, etc.

2. The development of green buildings in cold areas

2.1. The development status of green buildings abroad

In the early 1960s, the American architect Paul first put forward the new concept of ecological building, and then it was gradually accepted by various countries, the development of green building becoming a consensus in all the countries. In the mid-1970s, some countries began to implement the building energy saving standards, and gradually improved the energy saving standards, green buildings began to be a government behavior. The convening of the United Nations Conference on

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Environment and Development in 1992 resulted in a worldwide consensus on the important idea of "sustainable development". Green Building has gradually become a system and has been popularized in many countries, which has become an important tendency of architecture development in the world. To make the concept of green building practical and operable, developed countries have also developed a green building evaluation system adapted to the characteristics of different countries one after another. Through the quantitative description of energy saving effect, environmental impact and economic performance of green building, a basis for policymakers and designers was provided. The American green building association established and implemented the LEED system in 2003, and now it is one of the most comprehensive criterion for evaluating green buildings. LEED (Leadership in Energy and Environmental Design) is a tool for evaluating green buildings, and some states and countries in the United States have listed it as mandatory standards. The scores required for LEED certification of the corresponding grading scale are shown in table 1.

Table 1. LEED rating scale.

LEED Grade	Score
Platinum Certification	52-69
Gold Medal Certification	39-51
Silver award certification	33-38
Conformity certification	26-32
Unqualified	Below 25

2.2. The development status of green buildings in China

In the last decade, green buildings in our China have developed from less to more, from local to national, from single building to urban area. Since the release of "green building action plan" in 2013, governments at all levels have constantly issued incentive policies for green building development [2]. The number of green signs in the country has been growing in a blowout trend, and several green ecological demonstration urban areas have emerged, which means green buildings in China have entered a new stage of development. At the end of December 2015, a total of 3979 green building evaluation and identification projects have been evaluated in China. The total area is 460 million square meters and the total LEED certificated building area is 34 million 620 thousand square meters. The cumulative LEED certificated and the registered building area is of 163 million 720 thousand square meters, and a total of 3144 projects in China have participated in the LEED rating. Among them, the number of logo design projects is 3775, a construction area of 430 million square meters, accounting to 94.9% of the total. Shenyang has 8 LEED certified buildings currently, including the Shenyang brilliance BMW factory main office building obtaining LEED-NC registration, Shenyang Huang Cheng Heng Long LEED-CS gold, Shenyang Olympic sports Wanda plaza hotel one-star design, etc. On January 29th, 2018 the "work Plan for promoting the Sustainable and healthy Development of the Construction Industry in Shenyang" was officially announced. According to the plan, the proportion of green buildings in cities and towns in Shenyang will reach 40% in 2018, and more than 50% by 2020. The project area of annually green building is shown in figure 1, and the development of green building evaluation logo in 2008-2015 is shown in figure 2.

There are many local accreditation agencies in Jiangsu, Shenzhen, Shandong, Shaanxi and Hebei, but the number of green buildings in the cold areas is very low, as shown in figure 3.

LEED assessment certificate in China started in 2003, and the project began to register in 2004. In 2005，the Century Wealth Center of Beijing won the first LEED certificate in 2005，and in 2006, Shanghai Intel Exhibition Hall has become the first LEED certificate project in China (LEED gold grade). As of March 2015, China had received 654 applications for LEED certificate. Since 2003 LEED assessment standard has made great progress, but the LEED certificate is not completely in line with the national conditions in China. It still has its limits, and we should draw lessons from the

essence of the LEED evaluation system, to develop and adapt to the situation of our country's green building evaluation standard.

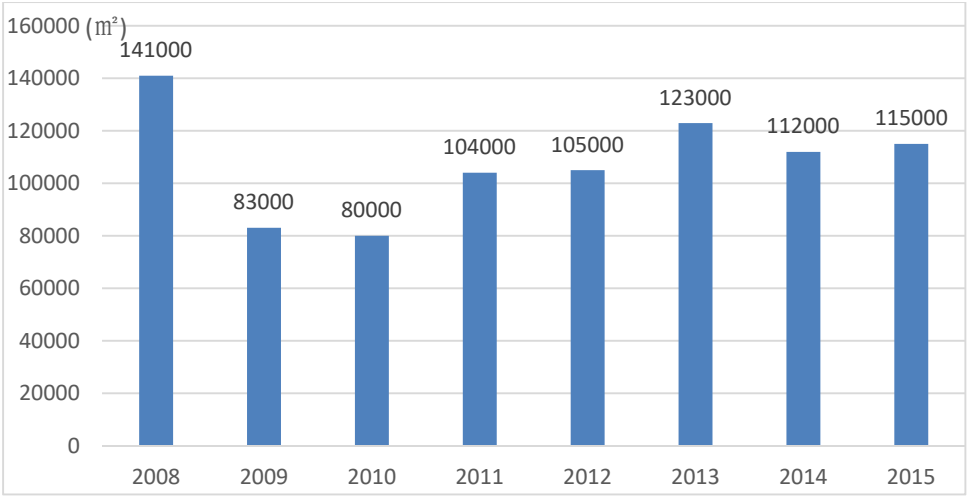


Figure 1. Area of declared green building project in 2008-2015.

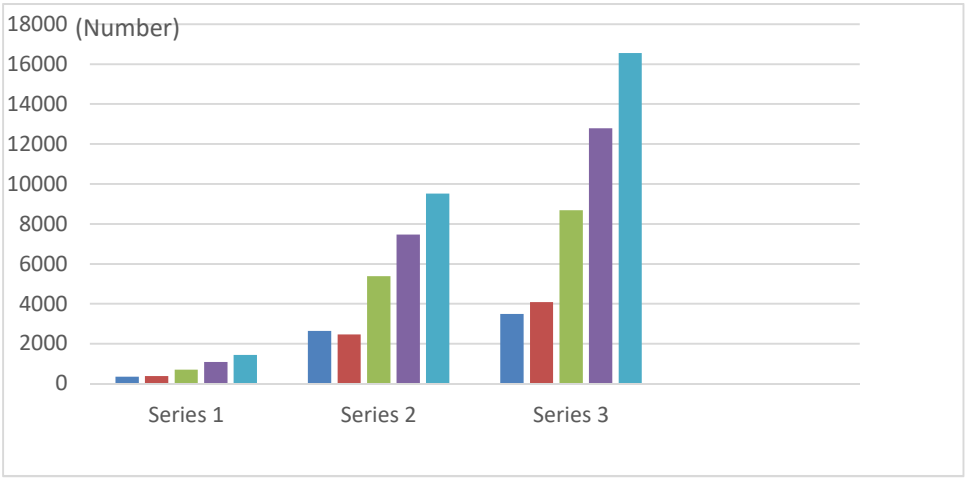


Figure 2. Development of green building evaluation and marking project in 2008-2015.

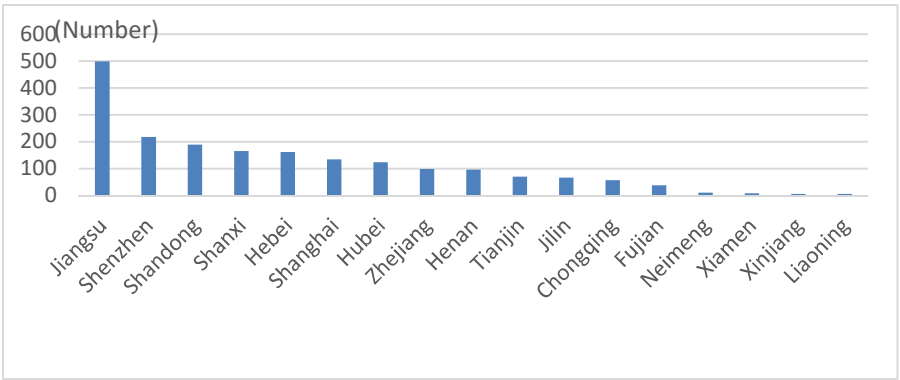


Figure 3. The national green building marks the number of evaluation institutions in 2008-2015.

Due to the unique climatic and environmental characteristics, residential buildings in cold areas in China ought to achieve maximum economic and social benefits in accordance with the local climate, environment characteristics and technical and economic levels, with limited resources and minimum energy consumption costs to meet the growing demand. Meanwhile, we should try our best to reduce or eliminate the inherent energy consumption of buildings, and more importantly, the joint efforts of the whole society.

3. The importance of green building in cold areas

3.1. Promoting sustainable development

Promoting green building design can effectively lessen the waste of resources and waste of energy, and can promote the development of science and technology of green building, and the application of new building methods, in the construction process, effectively reduce the pollution to the environment, so as to make the green building design to get effectively promoted, eventually realize the sustainable development advocated by the Chinese government [3].

3.2. Effective ways to improve environmental quality

In the cold areas, due to the low temperature, it is very different from the southern part of China. With the global warming and the influence of urban heat island, the air conditioners popularity in the cold areas has increased dramatically, and the energy consumption of air conditioners has increased year by year. Therefore, the energy efficiency of residential buildings in cold areas should be based on the actual needs of building energy efficiency, taking into account the diversity and instability of climate factors, energy-saving design methods and technical measures integrated into the overall construction design as much as possible should be considered seriously, and such problems as the shape coefficient, the palisade structure heating preservation, thermal-resistance, window wall area ratio and other issues supposed to be in mind as well, so that energy saving ideas for buildings will spread into a large number of buildings [4]. Green building is of great significance in energy conservation and emission reduction, improving people's living environment and promoting the construction of resource-conserving and environment-friendly society. The application of renewable energy buildings and green building materials are beneficial to the sustainable development of the society.

3.3. Important measures to transform urban and rural construction patterns

At present, the construction of urban and rural areas in China is still in an extensive and inefficient form, and there are some problems in the development of urbanization. The first is the areas development level difference, the second is the quality development difference. The housing departments in charge of urban and rural construction should strictly control quality certificate standards management, strengthen the quality of green building assessment certificate criteria, and check the certificated project during the process and afterwards to enforce the implementation of the project and promote to build up the green building assessment certificating market in which all the companies are self-disciplined, the industrial level supervised, the government inspected with other management means of combining the green building evaluation quality supervision system. Take the green building concept to guide urban and rural construction industry.

4. Developing green building problems in cold areas

4.1. Lack of awareness of green building concept and professionals

Although some scholars in China are very enthusiastic about green building, quite a lot of designers are not familiar with green building design, meanwhile the green building design will incur the construction cost and make the design work more complicated, all these will reduce the practice of green building enthusiasm by the designer. For the real estate developers, it may be possible to raise prices in the name of green buildings. Consumers also have misunderstandings about green buildings.

They believe that green buildings are just high cost, high green coverage and high technology with the buildings. This is pretty a one-sided view. The incremental cost of green building is indeed higher, but from the perspective of the whole life span, its cost will not necessarily be higher than the ordinary building and even be much lower [5]. Considering the comprehensive ecological benefits and comfortable living conditions, the green buildings have higher performance price ratio.

4.2. Cost problem of green building

From the perspective of the development of green building in the cold areas in China, the initial investment is higher, the economic benefit is relatively lower, and the cost recovery period is longer. For the risk of investment, investors tend to chase short-term profits and quick return of their capital, they will not really apply green buildings to actual construction. The contructors lack of the theoretical knowledge of green building technology reduces the possibility of technology implementation and increases the investment cost of green building. In all the stages from the investment, design to construction, the green buildings require more strict standards than ordinary buildings. More attention should be paid to resources at all the time all the way, this will lead to the risk of the green building problems in a more pregnant way.

4.3. Green building technology is not mature yet

There are rarely many researches on green building in cold areas, and nor are the energy saving technology, energy-saving building materials and the products. Plus, the high using cost, uncompleted variety of products and the complicated supporting construction technology will arise some engineering problems make developers lack interest to try the green buildings. Not to mention the new technology, new material of supporting the green building. The more foreign advanced equipment and technologies adopted, the higher cost of green buildings will incur, this will go against the promotion of the green buildings.

5. Countermeasures

5.1. Strengthen employee training and the green building concept disseminated

In the cold areas and even in the whole country, the concept of green building is not fully popularized. Therefore, it is necessary for the whole society to have a clear understanding of the green building, to strengthen the propaganda and to disseminate the green building concept. We should also enhance the independent research and development and technological innovation ability to let people realize the importance of green building, which can improve the status of China in the international community [6]. It can also carry out the construction of green building related disciplines through colleges and universities, increase the related courses of green buildings, and cultivate various professional and technical talents who can meet the needs of green building development. By regularly organizing green building related training, we can improve the green building application ability of employees at different levels in the whole industry, and in the assessment of building qualification or industry qualification, we should appropriately increase the assessment of green building knowledge and improve the green building quality of employees.

5.2. Establish incentive policy system by government

Since the operation and technical equipment cost of green building is high, the developers are not likely to participate. The local governments should make the green building as indicators and standards into the overall planning, controlled detail planning, construction detailed planning and planning that should be implemented into the specific projects. Although our country has already issued the building energy saving code, the enforcement of building energy saving laws and regulations is still not widespread, and all aspects need to be further improved. So, we should set up the law, the enforcement and supervision agencies or departments to create and encourage a good

environment for the development of green buildings. The government also should have some incentive policies and financial support to the green buildings.

5.3. Learn advanced technical experience

From the point of view of overall green building design in cold areas, many of the building designs have not reached the standards of the green building. Because China lacks green building construction technology, we need to learn the advanced technology and technical experience from developed countries like European countries, America, Japan and so on, who have already attached great importance to energy saving building, such as the solar energy utilization technology, natural and mechanical ventilation, a new type of heating and air-conditioning equipment, new thermal insulation materials and so on. We should cooperate with foreign advanced green building areas and use new building energy saving materials to improve Chinese green building technology as soon as possible.

5.4. Avoid risks and increase profits

To developers, project orientation and design concept should be clearly defined before signing the contract with the design institute. The designer should carry on the detailed investigation on the construction site to establish a perfect green building design database, strengthen employee training, consult and collect all kinds of information, exercise brainstorm and innovation. To supervising engineers, standardized supervising criteria and the capability should be enhanced to check the contractor's green construction scheme, ensure constructors to follow the green construction plan in an orderly manner, and guarantee the quality and quantity to be completed on time. At the same time, take the advantage of modern technics like BIM to practice contract management between the developer and the designer, to predict and avoid the future risks and variations [7]. For all parties in the construction process, strengthen management to reduce construction mistakes increase profits is a win-win goal forever.

6. Conclusion

Above all, green building is the inevitable developing trend in cold areas, it has a great significance to establish a green building system in the cold areas, using new energy saving technology to make environmentally-friendly buildings is consistent with the strategy of sustainable development. Green building development in cold areas is not easy, with the help of the state and local government, the effort of developer, designer, engineer and contractor, the buildings in cold areas will be more energy saving and environmentally friendly.

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