Research on risk Management of green Building development

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Abstract; With the improvement of residents' requirements for housing quality and the increasing tension of energy, more and more attention has been paid to green buildings. Green buildings can effectively use resources, change the current situation of excessive consumption and waste of energy, and at the same time, enable residents to experience more environmental protection and excellent living conditions. Although green building has a good development space in our country, the development time is short, lack of development experience. This paper expounds the connotation of green building, analyzes its development status, and introduces the general methods of risk identification, risk assessment and risk response. This paper discusses the risk factors of green building development in China, compares and analyzes the risk factors, and puts forward some general measures to deal with the risks.

1.Introduction
In the 1960s, the architect Paul Soleri combined the two words Ecology and Architecture into Arcology (Ecological Architecture), and the concept of "green architecture" was born from this. With the increase of residents' requirements for housing quality and the increasing shortage of energy, more and more institutions and residents are interested in and paying attention to green buildings.

Green building is based on modern architecture technology, ecology technology, material science technology, advocates energy saving and environmental protection, and advocates the integration of zero-polluting buildings and construction technology. As early as the 1970s, Western countries began to advocate green buildings. After the oil crisis, American scholars believed that on the one hand, oil may be exhausted in the near future, and on the other hand, they would solely exploit and use existing resources such as oil. The pollution caused is also multifaceted. After statistics, they found that building energy consumption is 40% of the overall human energy consumption, so it is very feasible to optimize energy consumption from the improvement of building technology, and the concept of green building can be mentioned and developed.

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In China, the definition of green building was clarified in the "Green Building Evaluation Standards" formulated in 2006. Green building means that during the whole life cycle of design and construction,
the coordination between the building and the environment is fully considered, and natural resources such as light energy and wind energy are used as much as possible to save resources and protect the environment. Green building provides people with a safe, healthy and comfortable living space. It takes human, nature and architecture as a whole and develops harmoniously and sustainably.

Compared with the development of foreign green buildings, green buildings in China started late. In 1990, the world's first green building evaluation standard was released in the UK. In 2000, the U.S. Green Building Council developed the Energy and Environmental Design Guide—LEED; the Chinese Ministry of Construction announced China’s first comprehensive evaluation standard on March 16, 2006. The azimuth, multi-angle, and comprehensive green building evaluation standard—"Green Building Evaluation Standard", this standard starts from the whole life cycle of the design and construction of residential buildings and public buildings, and comprehensively evaluates green buildings.

2. Characteristics of green building risk management
Consistent with the risks of traditional engineering projects, the risks of green buildings emphasize the adverse consequences of risks to green building projects. However, since the target system of green buildings has changed and expanded compared with general building targets, the risk consequences may affect the economic, environmental, and social targets in the green building target system, making the risks of green buildings more prominent than traditional buildings.

In the whole life cycle of green building design and construction, all aspects have higher requirements than general buildings, and at the same time increase the risks and difficulties of green building project management. The risk management of green buildings spans a large time span and runs through the entire life cycle of design and construction. In addition, the level of property service management and the reuse of building materials after the expiration of the building's service life are all considered. Since the development of green buildings in my country started late, the public's awareness of green buildings is not high. Compared with general buildings, the characteristics of green buildings, such as energy-saving, environmental protection, regionality and livability, determine that their risk factors have higher uncertainties, and therefore have greater risk management difficulties.

There is a shortage of engineers and technicians engaged in the development, design, and construction of green buildings in China, and they have less experience in development, design, and construction. The technologies adopted by green buildings in each region are not exactly the same, and the design and construction cycle is long. In construction risk management, uncertain factors cannot be discovered in a timely and effective manner. Risk management risk identification and risk response have limitations, and systematic and dynamic management must be implemented.

3. The goal of green building risk management
Green building risk management is to identify, evaluate and respond to risk factors during the design and construction of green buildings to reduce the probability of risks during the design and construction of green buildings and prevent potential losses. The goals of green building risk management are divided into two levels, including overall goals and hierarchical goals. The overall goal is to ensure the success of the design and construction of green buildings during the overall life cycle; the hierarchical goal is the concrete embodiment of the overall goal, including economic goals, social goals, and environmental goals. The economic goal is to ensure the maximization of economic benefits through the control of quality, schedule, and construction period during the overall life cycle; the environmental goal is to ensure the long-term coordination of green buildings and the environment, save resources, reduce energy waste, and protect the environment; The social goal is to improve the image of green buildings, enable the public to have a fuller understanding of green buildings, and increase their awareness and recognition.

4. Analysis of Green Building Risk Management Process
(1) Risk identification of green buildings. Green building development has a long period of time and requires high process control of quality, schedule, and construction period. Therefore, the analysis of risk factors requires a combination of long-term analysis and regular analysis. Based on past experience
and practice, combined with risk management goals and plans, risk factors and potential losses are identified. The method of risk identification must be combined with the actual project to choose the correct method for analysis, including Delphi method, brainstorming method, interview method, SWOT analysis method, fault tree analysis method and scenario analysis method.

The risk drivers of green buildings can be summarized in the following aspects: social risks, economic risks, safety risks, natural risks, design risks, construction period risks, and policy risks that may cause cost risks, resulting in capital pressure, fiscal crisis and cost overruns, etc. Potential losses; safety risks, technical risks, management risks, natural risks, construction period risks and other possible quality risks, resulting in potential losses such as acceptance failures, project rework, and certification failures; certification failures that may be caused by green certification risks and environmental risks; Potential losses; safety risks, technical risks, management risks, policies and regulations, design risks, social risks may cause construction period risks, which may cause potential losses such as cost overruns, schedule pressures, and certification failures; early planning risks may lead to cost overruns and certification failures; Potential losses such as difficulty in maintenance; Operational risks may cause potential losses such as increased costs, waste of resources, environmental damage, etc.; Sales risks may cause potential losses due to decline in sales (see table 1). Compared with general buildings, green buildings have increased the star-level certification of green marks and the process control of the construction environment, thereby increasing the risks of design, construction, supervision and environment during the whole life cycle of design and construction. Qualified, safety hazards, cost over budget, certification failure, etc.

(2) Risk assessment of green buildings. Risk assessment is based on risk identification, analysis of risk factors and then quantitative assessment of the impact and loss possibility caused by each risk factor. Risk assessment methods include expert scoring method, qualitative risk evaluation method, and decision tree analysis method, etc. Through risk assessment, the degree of loss that may be caused by different risk factors can be predicted, and then the risk response method can be determined.

| Table 1 Risk Drivers of Green Buildings |
|----------------------------------------|
| Risk driver                            | Potential loss                     |
| Social risk, economic risk, security risk, natural risk, design risk, construction period risk, policy risk may cause cost risk | Financial pressure, financial crisis and cost overruns |
| Security risk, technical risk, management risk, natural risk, construction period risk | Acceptance failure, project rework, certification failure |
| Green certification risk and environmental risk | Authentication failed |
| Security risks, technical risks, management risks, policies and regulations, design risks, social risks | Cost overruns, schedule pressure, certification failure |
| Early planning risk | Cost overruns, certification failures, difficult maintenance |
| Operational risk | Cost increase, waste of resources, environmental damage |
| Sales risk | Sales decline |

(3) Risk response to green building. The ultimate goal of risk management is the response to key risk factors. Risk response refers to the risk avoidance, risk reduction, risk sharing and risk bearing methods formulated according to the nature of risk and the risk bearing capacity of decision makers, so as to reduce the loss of risk. Among them, risk avoidance can completely eliminate the risk by avoiding the influence of future events. Risk reduction is the use of policies or measures to reduce the risk to an acceptable level; Risk sharing is the transfer of risk to well-funded independent institutions; Risk tolerance is the decision to maintain the current level of risk through risk factor assessment.

5.conclusion
Because green buildings run through the entire life cycle of design and construction, risk management runs through a large span of time, and requires high environmental protection and ecological resource
utilization. Moreover, combined with its characteristics of energy saving, environmental protection, regionality and livability, the risk management process highlights the risk analysis of environmental resource protection and green certification. Therefore, we should respond to the risks of quality, safety, cost, construction period, green certification, and environmental protection that affect the development of green buildings, and in combination with the requirements of my country's green building design and construction industry standards, in the follow-up development process. Thus, it can improve the development speed of green building in China, increase the public's awareness of green building, and reduce the unpredictability of green building cognition in all aspects.

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