

The Impact of Green Buildings on the Development of Civil Engineering

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Abstract

With the increasing awareness of environmental protection, green buildings have become a key direction in the development of civil engineering today, which not only brings technological innovation but also promotes the sustainable development of the entire industry. This article explores the important role of green buildings in promoting the development of civil engineering, and conducts in-depth research on the proposal, characteristics, and application status of green building concepts both domestically and internationally. The impact of green buildings on the design, construction, and operation stages of the civil engineering industry development is also discussed. This reflects the increasingly important role that green buildings play in the field of civil engineering, and their ideology leads society to rethink the harmonious coexistence between humans and nature.

Keywords

Green building, Civil engineering, Sustainable development, Resource efficiency, Technological innovation.

1. INTRODUCTION

With the increasingly serious global environmental problems, green building, as a sustainable building mode, has attracted more and more attention. Green building emphasizes to minimize the negative impact on the environment and make full use of renewable resources in the whole life cycle of the building. The popularity of this concept has had a far-reaching impact on the field of civil engineering, and promoted the field to develop in a more environmentally friendly and efficient direction. As an important part of the construction industry, the development of civil engineering is affected by the concept of green building. In terms of technological innovation, green buildings promote the research and application of new materials, new processes and new technologies in the field of civil engineering, and improve the energy efficiency and durability of buildings. In terms of sustainability, green building emphasizes the harmonious symbiosis between building and environment, and urges civil engineers to fully consider environmental factors in design and construction, so as to realize the sustainable development of the project.

2. PROPOSAL AND CHARACTERISTICS OF GREEN BUILDING CONCEPT

In today's society, global environmental problems have become increasingly prominent, and sustainable development has become an important issue of social development. The concept of green building came into being under this background, aiming to achieve the harmonious coexistence of resource conservation, environmental protection and human health through the optimization of architectural design and operation. The concept of green building stems from the pursuit of sustainable development. With the acceleration of industrialization, human

consumption of natural resources has increased sharply, and environmental problems have become increasingly prominent. In order to meet this challenge, people began to explore how to find a balance between economic development and environmental protection. As a new architectural concept, green building provides new ideas and solutions for sustainable development through its unique advantages and characteristics. Through the optimization of resource conservation, environmental protection, healthy and comfortable living environment, green buildings not only create a better living environment for mankind, but also make a positive contribution to the sustainable development of the earth. [1] In the future, with the continuous progress of science and technology and the increasing attention of society to environmental protection, green buildings will be more widely used and developed in the world.

2.1. Green building concept

Green building refers to a high-quality building that can save resources, protect the environment, reduce pollution, provide healthy, applicable and efficient use space for human beings, and realize the harmonious coexistence between human and nature within the whole life of the building. [2] The idea of green building mainly includes energy conservation, environmental protection, recycling and low carbon. In terms of energy conservation, it mainly emphasizes reducing resource waste, making full use of renewable energy such as solar energy and wind energy, and adopting energy-saving building envelope, heating and air conditioning measures to improve energy efficiency. In terms of environmental protection, it mainly emphasizes reducing environmental pollution, reducing the emission of carbon dioxide and other gaseous substances, and reducing the load of buildings on the environment through reasonable architectural design, material selection and construction technology. In terms of applicability, it mainly emphasizes meeting the requirements of architectural design functions and providing healthy, applicable and efficient indoor space. For example, technical measures such as natural ventilation, natural lighting and renewable energy utilization are adopted to improve the quality of indoor environment and the comfort of buildings. In terms of recycling, it mainly emphasizes the recycling of building materials, reduces the generation of construction waste, and promotes the sustainable use of resources. In terms of low-carbon, it mainly focuses on reducing the impact of buildings on global climate change, and achieving low-carbon development through measures such as reducing energy consumption and greenhouse gas emissions. The concept of green building is an important part of the current global sustainable development, and it is also the development direction of the future construction industry. The promotion of green buildings can promote resource conservation and environmental protection, and realize the sustainable development of human society.

2.2. Characteristics of green building

The first is sustainability and environmental protection: the design concept of green building is people-oriented, the pursuit of sustainable development, through the optimization of building design and operation process, to save resources, protect the environment, reduce pollution, and recycle all kinds of waste.

The second is energy conservation and high energy efficiency: green buildings usually use efficient energy systems, such as solar energy, wind energy and other renewable energy, to reduce dependence on fossil fuels and reduce carbon emissions.

The third is health and comfort: green building design takes into account the health needs of residents and provides a healthy and comfortable space environment, including the improvement of indoor air quality, appropriate water quality and sound, light and heat environment.

The fourth is natural harmony: green buildings emphasize the harmonious coexistence with the natural environment, such as the use of three-dimensional greening and other ways to

integrate the building into the natural environment, while protecting and maintaining the surrounding ecosystem.

The fifth is the use of natural materials: green buildings tend to use natural materials without chemical treatment, such as wood, bark, bamboo, etc., and ensure that they are harmless to the human body through inspection and treatment.

The sixth is the integration with the surrounding environment: the external design of green buildings emphasizes the harmony and unity with the surrounding environment, protects the natural ecological environment, and meets the needs of residents and communities in function.

To sum up, green buildings not only pay attention to environmental protection and energy conservation in the design and operation process, but also strive to create a healthy and comfortable living environment, and show respect and protection for nature and environment in the whole life cycle.

2.3. Application status of green building

2.3.1 current situation of green building in China

Resource shortage is one of the basic national conditions in China, so green energy-saving building is more important in China. However, green energy-saving buildings are far from being popularized. Compared with developed countries, building energy efficiency in our country started late, and there are still many deficiencies in the policy. The corresponding infrastructure and management technology are relatively backward. The concept of green building also needs to be more widely popularized. Therefore, the development of green building in China is more of a paper design than a real application in real life. [3] The demonstration project for the early stage of the 2008 Olympic Games -- Tsinghua University ultra-low energy consumption demonstration building can be said to be a green building. This building combines nearly 100 energy-saving technologies and uses seven different energy-saving systems, each part of which can be replaced at any time. According to Jiang Yi, an academician of the Chinese Academy of engineering and professor of Tsinghua University, this building is a scientific demonstration building, and does not need to use every front-line technology in the actual energy-saving process. However, in many areas of China, buildings still use energy consuming heating and cooling equipment. In some poor and backward areas, people's awareness of green energy conservation is not strong, and they can't correctly understand the advantages of green buildings. In some urban centers, there are still many buildings with high energy consumption. Most of these buildings are older buildings, and most of them are people living at the bottom of the city, which also brings many challenges to the development of green buildings.

2.3.2 development status of foreign green buildings

In 1969, design with nature, written by American scholar LAN L. mchang, came out, marking the birth of green architecture. In the 1960s, American Italian architect Paul Soleri first proposed the new concept of "ecological architecture" (green building) by integrating the two independent concepts of ecology and architecture.

Europe is the vanguard of green building in the world, and there are many aspects worth studying in energy saving and emission reduction technology and green building design. For example, "energy active building foundation system", "displacement type fresh air system and decentralized external wall fresh air device", "ceiling radiant cooling and heating system", "concrete floor radiant cooling and heating system", "double-layer overhead ground", "high-efficiency solar photovoltaic power generation", "intelligent breathing double-layer glass curtain wall" and other technologies have been basically mature, with low operation cost, good energy-saving effect and large development space.

Denmark's green building is a model of sustainable building in Europe, with advanced concept of environmental protection and energy conservation, and the latest initiative and

passive energy conservation method has been proposed. The so-called active energy-saving method refers to the full use of solar energy and wind energy as power, and the role of outdoor air, groundwater, sea water, etc. to regulate the temperature of buildings; The so-called passive energy-saving method mainly depends on the design of the building itself, such as the structure and building materials of the building, to increase the utilization of natural energy from the side and reduce the consumption of excessive energy. [4] For example, increase the transparency of buildings to reduce the energy consumption due to fluorescent lighting. In Denmark, the famous double-U buildings have significant energy-saving effects. The offshore windmill park on Lorraine island and the "sun and wind" residential area in Ortiz are typical examples of energy-saving.

3. IMPACT OF GREEN BUILDING ON THE DEVELOPMENT OF CIVIL ENGINEERING INDUSTRY

In recent years, the social awareness of environmental protection is increasing, and green building has become an important trend in the construction industry. Green building, with its unique environmental protection characteristics and sustainability, is expected to occupy a more important position in the civil engineering industry in the next few years. At the same time, with the progress of technology and the reduction of cost, the application scope of green building will be further expanded. Green building not only promotes the development and technological innovation of civil engineering industry, but also provides an effective way to achieve energy conservation, environmental protection and sustainable development. By responding to challenges and seizing opportunities, the civil engineering industry will continue to grow in the future and create a better living environment for mankind. Therefore, understanding and studying this field is of great significance for us to better adapt to the changing and optimized lifestyle.

3.1. Impact of green building on civil engineering design stage

The core concept of green building is sustainable development. In the design stage, we must fully consider the impact of the building on the environment and how to make the building continue to function in its life cycle. This requires designers to consider long-term sustainability in site selection, planning, and material selection. In the design stage, the use of renewable energy such as solar energy and wind energy should be considered to reduce the dependence on fossil fuels.

Green building emphasizes the harmonious coexistence with the natural environment. In civil engineering design, attention should be paid to the use of renewable resources, such as solar energy and wind energy, while reducing the dependence and impact of buildings on natural resources such as soil and water resources. By increasing green vegetation, establishing ecological roofs, vertical greening and other means, the quality of the ecological environment of buildings can be improved.

Although the initial investment of green building may be relatively high, its long-term operation cost is low and has higher market value. Therefore, how to balance short-term and long-term economic benefits should be fully considered in the design. Use advanced energy-saving technologies, such as thermal insulation materials, solar water heaters, LED lighting, etc., to improve the energy efficiency of buildings. Optimize the water supply and drainage system, and adopt technologies such as rainwater collection and wastewater recovery to reduce the waste of water resources.

Green building has a far-reaching impact on the civil engineering design stage. It not only improves the sustainability of the building, but also brings more efficient and more environmentally friendly architectural design methods. In order to achieve sustainable

development and meet the challenges of global climate change, we should actively promote and apply the concept and technology of green building to create a better future.

3.2. Impact of green building on civil engineering construction stage

With the increasing awareness of environmental protection in society, green building has become an important development direction of modern construction industry. Green building, with its unique environmental protection concept and efficient resource utilization, not only improves our living environment, but also has a far-reaching impact on the civil engineering construction stage.

In the construction of modern civil engineering, there are many challenges. First, the construction process consumes a lot of resources, causing great pressure on the environment; Secondly, the construction process may cause environmental pollution, such as noise, dust, sewage, etc; In addition, there are certain potential safety hazards in the construction, such as insufficient safety protection of workers, and nonstandard construction management. [5]

The introduction of green building has brought many positive effects to the civil engineering construction stage. First, the use of green building materials and construction methods can effectively improve resource utilization efficiency and reduce energy consumption; Secondly, green building emphasizes environmental protection, which can effectively reduce the environmental pollution in the construction process; Finally, the design concept of green building helps to improve construction safety and reduce the occurrence of safety accidents. [6]

Taking Evergrande green residential project as an example, the prefabricated construction method was adopted in the construction process of the project, which greatly reduced the consumption of building materials and construction time, and effectively controlled the noise, dust and other pollution during the construction process. In addition, the project also uses renewable energy such as solar energy and wind energy to achieve energy self-sufficiency. In order to better implement the concept of green building, we need to take a series of coping strategies and measures. First, strengthen policy guidance and technical support, and encourage enterprises to adopt green construction methods; Secondly, improve the environmental protection awareness and skill level of employees; Finally, establish a perfect green building evaluation system and standards.

3.3. Impact of green building on civil engineering operation stage

With the increasingly serious global environmental problems, green building, as a sustainable way of building, has attracted extensive attention. Green building is gradually changing the traditional civil engineering mode with its unique concept, characteristics and current situation. The operation stage of civil engineering is the stage of building use and maintenance, and its main function is to ensure the normal use and safety of buildings. At this stage, the impact of buildings on the environment and energy consumption are the main considerations. The traditional civil engineering operation mode often ignores the impact of buildings on the environment, resulting in large energy consumption and serious environmental pollution. [7]

Green building has obvious advantages in the operation stage of civil engineering. First, green buildings adopt energy-saving design, which can effectively reduce energy consumption, reduce carbon emissions and relieve energy pressure. Secondly, the environmental protection design of green buildings can reduce environmental pollution, reduce environmental damage and protect the ecological environment. In addition, the intelligent design of green buildings can improve operation efficiency, reduce labor costs and improve overall benefits. [8]

Taking the green office building of pixel building in Melbourne, Australia as an example, the building fully adopts green building technology in the process of design, construction and operation. By adopting energy-saving design and intelligent system, the building can reduce energy consumption by 30% and carbon emissions by 25% in the operation phase.

With the development of science and technology and people's increasing attention to environmental issues, green buildings will be more widely used in civil engineering in the future. For example, the use of new materials and new technologies to improve building energy efficiency; Using intelligent system to realize intelligent management of building energy; Use renewable energy to reduce dependence on traditional energy. Only by continuous exploration and innovation can we promote the wide application of green building in civil engineering. Green building technology can effectively reduce energy consumption, reduce carbon emissions, protect the ecological environment and improve the overall efficiency. Although facing many challenges, with the development of science and technology and the promotion of policies, green buildings will be more widely used in the future. Understanding and applying innovative green technologies will help to improve the sustainability and competitiveness of civil engineering operation phase.

4. CONCLUSION

In the past decades, we have witnessed the rise of green buildings in the world. This architectural form with the core concept of environmental protection, energy conservation and sustainability has not only changed our traditional cognition of civil architecture in engineering practice, but also led the society to rethink the harmonious symbiotic relationship between man and nature in concept.

The importance of green building stems from its far-reaching impact on the environment, society and economy. At the environmental level, green buildings greatly reduce the energy consumption and environmental pollution in the production of building materials and construction process, improve the energy efficiency of buildings, and reduce the carbon emissions in the operation process. At the social level, green buildings provide a healthier and more comfortable living and working environment and improve people's quality of life. In terms of economic benefits, the energy-saving design of green buildings reduces the long-term operation cost of energy, making the building more in line with the long-term development needs of the market.

However, despite the advantages of green building, its promotion and application still face many challenges. The maturity of technology, cost control, market acceptance and supporting laws and policies are all issues we need to face and solve. But it is these challenges that have brought us unlimited opportunities. With the continuous progress of science and technology and the increasing development of society, we have reason to believe that green building will become the dominant trend in the field of civil engineering in the future. [9]

Looking forward to the future, the idea of sustainable development will play an increasingly important role in the field of civil engineering. We need to continue to innovate and practice, driven by technology, to promote the wide application of green building in design and construction.

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