

Reduce global warming caused by carbon emissions through green buildings

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Abstract. Global warming, a significant challenge that humanity faces in the 21st century, is like an arrow on a taut string, ready to be released. According to relevant data, the average temperature of the Earth has been rising at a visible rate in the past few decades. This change has already had a tremendous impact on human life, the ecological environment, and economic development. Behind this, the excessive emission of carbon dioxide is undoubtedly the culprit. How to reduce carbon emissions to alleviate global warming has become an issue that humanity must face. However, the development of green building is not something that can be achieved overnight; it requires the joint efforts of all of us. In China, significant progress has been made in the development of green buildings, but it also faces certain challenges. We have reason to believe that as long as we adhere to our beliefs and continue to explore, green buildings can certainly play a greater role in reducing carbon emissions and mitigating global warming.

Keywords: green development, sustainability, environment, pollution, methods, carbon emission, global warming.

1. Introduction

1.1. Current Situation and Challenges of Global Warming

Currently, global warming has become an issue that cannot be ignored. The Earth's temperature is rising year by year, and extreme climate events are occurring frequently, posing significant challenges to human society and the natural ecological environment. Ren Yan, a scholar, has pointed out that nowadays, global climate warming and the reduction of carbon emissions have become major issues of concern in society. The construction industry, as one of the three main energy-consuming sectors, is also a significant source of CO₂ and other greenhouse gases. For buildings of the same type, energy consumption can vary by up to several tens of times, and the resulting greenhouse gas emissions gap is also considerable, indicating a great potential for carbon emission reduction in the construction industry [1]. Against this backdrop, green building has emerged as one of the key strategies to address the issue of global warming.

1.2. Definition and Importance of Green Building

Green construction is an essential means of guiding engineering construction to protect the environment, save energy and resources, and promote sustainable development. It refers to the full process of

architectural design, construction, operation, maintenance, and demolition, where ecological protection, energy conservation, health and comfort, and long-term efficiency are all thoroughly considered. The goal is to reduce the negative impact of buildings on the environment and resources and enhance the sustainable development capacity of buildings[2]. The importance of green buildings lies in their ability not only to reduce carbon emissions but also to provide healthy and comfortable living spaces for people, protect the ecological environment, and achieve sustainable resource utilization.

Next, this article will delve into the definition and elements of green building, analyze its role in reducing carbon emissions, and demonstrate the practical effects of green building through case studies. Finally, we will look into the prospects for the development of green building, in hopes of providing a reference for the development of green building in our country.

2. Elements of green building

Green building is an architectural, construction, and operational approach aimed at reducing environmental impacts and improving the health and comfort of occupants. Its core elements include high energy efficiency, high resource utilization efficiency, minimal environmental impact, and design concepts and technological applications that benefit the health of occupants. High energy efficiency in green buildings is achieved through optimized design, the use of efficient materials and technologies, and reduced energy consumption. High resource utilization efficiency involves the environmental friendliness of building materials and recycling, which aims to reduce the consumption and waste of resources. Green building also focuses on minimizing environmental impacts, including reducing greenhouse gas emissions, rational water resource use, and ecological protection.

Green building emphasizes improving occupant comfort and the health of the living environment. By using non-hazardous materials, optimizing indoor air quality, and natural lighting, a healthy and livable environment is created. These elements together form the foundation of green building, guiding the entire process of construction from design to construction and operation, to achieve continuous positive impacts on the environment[3].

2.1. Energy saving and emission reduction

Energy saving and emission reduction are the cornerstones of green building. In the design and construction of buildings, by adopting advanced energy-saving technologies and materials, optimizing the energy structure of buildings, improving energy utilization efficiency, and reducing energy consumption, the energy consumption of buildings can be decreased. At the same time, green building also pays attention to the treatment and resource utilization of construction waste, reducing carbon emissions during the construction process, as well as carbon emissions during the use of the building.

2.2. Ecology and environmental protection

In the design and construction of buildings, green building emphasizes respect and protection for the natural environment, focuses on ecological balance, and actively adopts environmentally friendly materials to reduce environmental damage.

2.3. Health and comfort

In the design and construction of buildings, green building fully considers human needs and focuses on factors such as indoor air quality, water quality, and lighting to provide a safe, healthy, and comfortable living and working environment.

2.4. Durability and efficiency

Durability and efficiency are the pursuits of green building. In the design and construction of buildings, green building emphasizes the durability and lifespan of buildings to reduce maintenance costs and resource consumption. At the same time, green building also emphasizes efficient functionality and space utilization to improve the efficiency and economic benefits of buildings.

3. The role of green buildings in reducing carbon emissions

3.1. Ways of energy conservation and emission reduction

3.1.1. Design optimization

In terms of design optimization, green buildings stand at the forefront of The Times with an innovative attitude that breaks through the traditional thinking framework. Its pursuit is not only the beauty and practicality of architecture, but also the internal quality of harmonious coexistence with the environment. Through the use of natural ventilation, sunlight analysis, spatial layout and other design techniques to achieve a seamless connection between indoor and outdoor environments, in order to reduce the over-reliance on air conditioning, lighting and other equipment, to minimize energy consumption.

3.1.2. Selection of building materials

In the selection of building materials, green buildings adhere to the concept of "drawing from nature and returning to nature", and strive to reduce the burden on the environment during the life cycle of buildings. Green buildings give priority to renewable, recyclable, low carbon emission building materials, such as bamboo, recycled brick, green concrete, etc. These materials not only reduce the consumption of natural resources, but also easy to recycle after the demolition of the building, truly "low carbon, green and sustainable". In a green building project, more than 70% of the building materials meet the green building standards, greatly reducing carbon emissions.

3.1.3. Energy utilization and recovery

When it comes to energy use and recycling, green buildings are like careful stewards, maximizing energy use. The use of new energy technologies such as ground source heat pumps, solar photovoltaic panels, and wind power makes green buildings contribute to the surrounding environment while meeting their own energy needs. For example, a green building convenient ground source heat pump technology, to achieve winter heating, summer cooling needs, annual energy consumption reduced by nearly 40%, remarkable results.

3.2. Green building and carbon sink

3.2.1. Vegetation Greening

Green buildings regard vegetation greening as an important means to regulate urban climate and improve the quality of ecological environment. Its extensive afforestation around the building not only beautifies the environment, but also has multiple effects such as regulating temperature, reducing noise and purifying the air. Data show that one mu of green space is equivalent to absorbing about 10 tons of carbon dioxide, which is equivalent to reducing 26 tons of carbon emissions [4].

3.2.2. Roof garden and vertical greening

Roof gardens and vertical greening are smart ways for green buildings to create a green environment in a limited space. The roof garden not only increases the green area, but also effectively regulates the temperature and humidity inside the building and reduces energy consumption. Vertical greening is to create green space in high-rise buildings, so that the building and nature are integrated. For example, a green building project has created a garden of about 500 square meters on the roof, planting dozens of plants, which not only beautifies the urban landscape, but also reduces the building's energy consumption.

3.2.3. Ecological landscape design

Ecological landscape design is the awe and respect of green buildings to the natural environment. In green buildings, ecological landscape is no longer a simple decoration, but an important part of building a harmonious coexistence between man and nature. Through the introduction of rainwater collection,

infiltration and circulation systems, green buildings achieve efficient use of water resources. At the same time, the use of ecological sand pit, artificial wetland and other technologies to achieve the natural purification of rainwater and domestic sewage, further reducing the burden on the environment.

Through these measures, green buildings can contribute significantly to reducing carbon emissions. However, the development of green buildings is also facing challenges such as high cost, difficult technology and difficult promotion. In the future, the development of green buildings in China needs the joint efforts of the government, enterprises and the public to continue to promote technological innovation, policy support, publicity and popularization. We look forward to the extensive promotion of green buildings in our country, contributing Chinese wisdom and Chinese strength to global carbon emission reduction [4].

4. Case study of green building practice



Figure 1. Ezhou District Green Ecological Residential Area

Here is the true portrayal of the Ezhou District Green Ecological Residential Area: a vibrant green building complex. The sunshine filters through the blue sky and shines on the lush vegetation, while the leaves rustle in the breeze, seemingly telling the story of this area.

The Ezhou District Green Ecological Residential Area, as a typical case of green building practice, has become a focus in the global green building field due to its unique architectural style and environmental protection philosophy. Everything in this residential area revolves around four core elements: energy saving and emission reduction, ecological protection, health and comfort, and durability and efficiency.

Firstly, in terms of energy saving and emission reduction, design optimization is key. The buildings in the Ezhou District Green Ecological Residential Area were designed with full consideration of natural light and ventilation to reduce energy consumption. Additionally, the selection of building materials is also an important way to save energy and reduce emissions. The residential area extensively uses low-carbon and environmentally friendly building materials such as bamboo and recycled bricks, greatly reducing carbon emissions during construction. Moreover, the application of energy utilization and recycling technologies, such as geothermal energy utilization and rainwater collection and recycling, further reduces energy consumption and carbon emissions.

Secondly, green buildings are inextricably linked to carbon sequestration. The Ezhou District Green Ecological Residential Area incorporates a large number of greening designs, such as vegetation, rooftop gardens, and vertical greening, which increase the green area of the residential area and enhance its carbon sequestration capabilities. At the same time, the integration of ecological landscape design

ensures that the residential area harmoniously coexists with the natural environment, further strengthening the carbon sequestration function.

During the practice of the Ezhou District Green Ecological Residential Area, challenges and opportunities coexist. Although green buildings have significant advantages in reducing carbon emissions, they face issues such as high costs and insufficient maturity of technology in the promotion process. However, with the continuous advancement of technology and the growing awareness of environmental protection, the development prospects for green buildings are broad.

As an important area of Wuhan City, Ezhou District has made significant progress in green building in recent years. Here are some highlights of Ezhou's green building:

1. Wuhan Union Hospital Golden Lake Campus: As the first medical project in Hubei to obtain the National Ministry of Housing and Urban-Rural Development's two-star green building label, Wuhan Union Hospital Golden Lake Campus achieved significant energy saving and emission reduction by optimizing roof and wall insulation, as well as energy-saving technologies for doors and windows, which significantly reduced the annual load indicators of heating and air conditioning.

2. Zoumaling Micro Green Space: This abandoned construction project department has been carefully transformed into a vibrant pocket park, not only beautifying the environment but also providing a leisure area for community residents. The construction of the park considered the reuse of urban construction waste, practicing the concept of sustainable development.

3. Wuhan Green Building Engineering Quality Testing Co., Ltd.: Founded in 2020, Wuhan Green Building Engineering Quality Testing Co., Ltd. provides green building engineering quality testing services, as well as related technical consulting, design, and research and development services, offering technical support for the development of green buildings.

4. Ecological Construction Results: Through the greening projects such as "Greening Ezhou" and "Hanjiang River Embankment Greening and Forestation", Ezhou District has increased the urban green coverage, forming a city surrounded by green roads and parks. In addition, the East Lake District has also built a number of pocket parks, such as the Sakura Stream Park and the Comfortable Living Scenery Park, providing residents with more opportunities to get close to nature.

In summary, the East Lake District has made active efforts in green building, focusing not only on the energy saving and emission reduction of the buildings themselves, but also on the integration with urban ecological construction, improving the quality of life for residents. China's green building development is at a critical period, and the successful case of the green ecological residential area in the East Lake District has provided us with valuable experience. In the future, we have reason to believe that green building will play an increasingly important role in reducing carbon emissions and addressing global warming. Let us all look forward to a green, low-carbon, and beautiful future together.

5. Conclusion

5.1. *The contribution of green buildings in reducing carbon emissions*

Just like trees grow, buildings reduce carbon. Green buildings, like a leaf boat, cool the earth in the turbulent carbon sea. They take energy saving and emission reduction as the theme, ecological environmental protection as the soul, health and comfort as the core, and durable and efficient as the goal, creating a green sky for mankind. According to statistics, green buildings can reduce carbon emissions by nearly 70% compared to traditional buildings. [5] However, in our country, as an active advocate and practice of green building, remarkable results have been achieved. We have seen the proliferation of green buildings across the country and the significant contribution it has made to reducing carbon emissions in our country.

5.2. *Prospects and challenges of green building development*

However, the road to green building development has not been smooth. It faces many challenges, such as technological innovation and breakthrough, policy support and promotion, market acceptance and recognition, and public awareness and participation. This is a war without smoke and requires the efforts

of each and every one of us. At the same time, we also see broad prospects for the development of green buildings. With the progress of science and technology, green building technology will be more mature; With the inclined policy, green buildings will get more support; With the recognition of the market, green building will become a new economic growth point; With the awakening of the public, green buildings will become a new pursuit of people's lives.

5.3. Prospects for the development of green building in our country

Looking forward to the future, the development of green buildings in China will be more rapid. We look forward to the wide promotion of green buildings across the country and expect it to become an important part of our low-carbon economy. We believe that in the near future, green buildings will become a beautiful business card of China's construction industry, and make greater contributions to China and even the world's carbon emission reduction. Let's work together to make green buildings everywhere in our lives and contribute our share to the sustainable development of the planet.

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