

Exploration of Green Construction Concepts and Practices in Construction Project Management

Guang-Hui Wang*

ASCITY Design Co., Ltd., Hangzhou, Zhejiang, 310015, China

*Correspondence to: Guang-Hui Wang, ASCITY Design Co., Ltd., Hangzhou, Zhejiang, 310015, China, E-mail: 117957237@qq.com

Abstract: With the increasingly prominent global environmental issues, the application and practice of green construction concepts in construction project management have become particularly important. This article delves into the connotation, necessity, implementation strategies, and challenges of green construction concepts, and proposes corresponding countermeasures and suggestions in line with the current development trends in the construction industry. Through the exposition in this article, the aim is to provide valuable references for both theoretical research and practical implementation in relevant fields, and to promote the construction industry towards a greener, more environmentally friendly, and sustainable direction.

Keywords: Construction Project Management; Green Construction; Environmental Protection; Sustainable Development

Introduction

As an important pillar industry of the national economy, the development of the construction industry is directly related to the prosperity of the national economy and the stability of society. However, traditional construction methods often come with problems such as excessive resource consumption and severe environmental pollution, which exert tremendous pressure on the ecological environment. In this context, the concept of green construction has emerged as an important direction for the transformation and upgrading of the construction industry. Green construction not only focuses on engineering quality and progress but also emphasizes reducing negative impacts on the environment

during the construction process, achieving a win-win situation for both economic and environmental benefits. Therefore, a thorough exploration of the application and practice of green construction concepts in construction project management is of great practical significance and profound historical mission.

1. The Connotation and Characteristics of Green Construction Philosophy

The concept of green construction refers to the process of maximizing resource conservation, environmental protection, and pollution reduction through scientific management and technological innovation throughout the entire process of construction projects, aiming to achieve sustainable development in the construction industry. It covers multiple aspects including energy



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License (<https://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, sharing, adaptation, distribution and reproduction in any medium or format, for any purpose, even commercially, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made.

conservation, land conservation, water conservation, material conservation, and environmental protection. It requires construction enterprises to actively use green building materials, processes, and equipment while ensuring engineering quality and safety, thereby improving resource utilization efficiency and reducing energy consumption and emissions during construction. The characteristics of green construction are mainly reflected in the following aspects: Firstly, it emphasizes the efficient use of resources, reducing resource consumption through measures such as optimizing design schemes and selecting efficient energy-saving equipment. Secondly, it emphasizes environmental protection, reducing negative impacts on the environment through measures such as controlling construction noise, reducing dust and wastewater emissions. Thirdly, it focuses on sustainable development by promoting green building practices, using renewable energy sources, and encouraging the long-term development of the construction industry.

2. Analysis of the Necessity of Green Construction

(1) Urgent Need for Environmental Protection: The construction industry is a major consumer of resources and a significant contributor to environmental pollution. Implementing green construction practices helps reduce the environmental damage caused by construction waste, noise, dust, and other factors, thereby protecting the ecological environment. (2) Promotion and Guidance of Policies and Regulations: With the continuous improvement of environmental protection regulations and the vigorous promotion of green building practices by the government, green construction has become a norm and a development trend that the construction industry must adhere to. (3) Inevitable Requirement of Market Competition: The green building market has enormous potential, and companies with green construction capabilities will gain a competitive advantage in the market, winning the favor and trust of more clients. (4) Important Manifestation of Social Responsibility: Construction enterprises, as members of society, have a responsibility to create a better living environment for society through green construction, achieving a harmonious unity between economic benefits and social benefits.

3. Implementation Strategies and Suggestions for Green Construction

3.1 Development of Scientific and Rational Green Construction Plans

Comprehensive and meticulous planning before construction is crucial to ensuring the effective implementation of green construction. The core of this planning lies in the development of scientific and rational green construction plans. These plans should not only clearly define the specific goals of green construction but also outline in detail the measures needed to achieve these goals, specifying the responsible individuals for execution and supervision. The goals of green construction should be both specific and clear, including reducing energy consumption, minimizing waste generation, controlling construction noise, and dust pollution, among others. To achieve these goals, the plan should detail how to optimize construction processes, select environmentally friendly materials and equipment, and implement energy-saving measures. Furthermore, consideration should be given to how to utilize renewable energy, promote green building materials, and innovate in technology to further enhance the environmental performance and overall quality of the construction. In terms of measures, the plan should cover various aspects such as construction management, material utilization, energy use, water resource protection, and waste disposal^[1]. For example, strengthening construction management to reduce material waste and loss, optimizing the energy use structure to improve energy efficiency, implementing rainwater collection and utilization systems to conserve water resources, and properly classifying and treating construction waste to reduce environmental pollution, among others. The designation of responsible individuals is also an indispensable part of green construction plans. Clear responsibility should be assigned to supervise and manage the implementation of each measure, ensuring that all measures are effectively implemented. At the same time, it is necessary to establish corresponding assessment mechanisms to periodically evaluate the performance of responsible individuals to ensure the smooth realization of green construction goals.

3.2 Strengthening Material Management and Innovative Applications

In construction engineering, the selection and

management of materials are crucial for achieving green construction. To reduce environmental burdens during construction, priority must be given to the use of environmentally friendly and energy-efficient building materials. These materials not only have lower energy consumption and emissions but also reduce pollution to the environment during construction. By strengthening material management, we can accurately calculate the required quantity of materials to avoid excessive procurement and waste. At the same time, strict adherence to material acceptance and usage systems ensures that each unit of material is fully utilized, thereby reducing material loss. In addition to traditional environmentally friendly materials, we should actively promote the application of new green building materials. These new materials often have higher performance and lower energy consumption, providing better insulation, heat insulation, sound insulation, and other effects for buildings. Additionally, they generate less waste during production and use, helping to reduce the environmental pressure of construction waste. Technological innovation is also a crucial means of promoting green construction^[2]. By introducing advanced construction technologies and processes, we can further optimize construction processes and reduce energy consumption and emissions during construction. For example, using prefabricated modular construction technology can reduce on-site wet work and lower noise and dust pollution, while employing information technology for construction management can improve work efficiency and material utilization rates.

3.3 Optimizing Construction Processes and Technological Innovation

The selection of construction processes and the application of innovative technologies in construction engineering have a decisive impact on the realization of green construction. To achieve goals of energy conservation, emission reduction, and reduced environmental pollution, priority must be given to adopting advanced construction technologies and processes. By introducing modern machinery and automation technology, construction efficiency can be significantly improved, reducing energy consumption and emissions in manual operations and material handling. For instance, using efficient concrete mixing and pumping technologies not only improves construction quality but also significantly reduces

energy consumption and material waste. Additionally, actively promoting new construction methods such as prefabricated modular construction and modular construction can reduce on-site wet work and further decrease environmental pollution and energy consumption. However, merely relying on existing technologies is insufficient. To achieve the long-term development of green construction, emphasis must be placed on technological innovation and research and development. Through collaboration with universities, research institutions, and other entities, joint research and development of new green construction technologies and materials can be conducted, driving continuous progress and development of green construction technologies. These new technologies and materials should not only have higher environmental performance but also meet the growing demands and functional requirements of construction. Furthermore, establishing a comprehensive system for construction processes and technological innovation is crucial for achieving green construction. Regular assessment and updating of existing construction technologies and processes are necessary to ensure they remain at the forefront of the industry.

3.4 Strengthening On-Site Management and Environmental Monitoring

The construction site is a crucial location for the practical application of green construction principles. Therefore, strengthening on-site management and environmental monitoring is essential. To address potential pollutants such as dust, noise, and wastewater generated at construction sites, strict control measures and management methods must be implemented to ensure they do not adversely affect the surrounding environment. For dust control, measures such as setting up barriers, dust suppression through watering, and covering exposed soil can effectively reduce dust generation and dispersion. To mitigate noise pollution, besides selecting construction equipment with low noise levels, construction schedules should be arranged reasonably to avoid high-noise operations during residents' rest hours. Regarding wastewater treatment, establishing dedicated wastewater collection and treatment systems is necessary to ensure that wastewater is treated before discharge to prevent water pollution. Additionally, establishing

a comprehensive environmental monitoring system is vital to guaranteeing green construction practices^[3]. Advanced monitoring equipment and technology should be utilized to conduct real-time monitoring of environmental impact indicators at the construction site. These indicators include but are not limited to air quality, noise levels, and wastewater discharge. Through real-time monitoring, issues can be promptly identified, and corresponding measures can be taken to ensure that construction activities consistently meet environmental protection requirements.

3.5 Establishing a Comprehensive Monitoring, Evaluation, and Feedback Mechanism

To ensure the effective implementation of green construction principles in the construction industry, it is essential to establish a comprehensive monitoring, evaluation, and feedback mechanism. This mechanism aims to regularly, systematically, and scientifically monitor and evaluate the implementation effectiveness of green construction, in order to promptly identify problems and take corresponding improvement measures. The monitoring and evaluation work should cover all aspects of green construction, including but not limited to material usage, energy consumption, wastewater discharge, noise and dust control, among others. By regularly collecting and analyzing relevant data, we can accurately understand the actual effects of green construction and assess whether they meet the predetermined environmental protection goals and requirements. In this process, the use of advanced monitoring technology and equipment is crucial as they can provide accurate and reliable data support, serving as a strong basis for subsequent decision-making and improvement. Additionally, establishing a sound feedback mechanism is vital to ensuring continuous improvement in green construction. Once problems or shortcomings are identified, relevant information must be promptly fed back to the construction team and management, enabling them to take swift measures for correction and improvement^[4]. Furthermore, strengthening communication and collaboration with government agencies, industry associations, and other institutions is also crucial for promoting the dissemination and application of green construction principles. Through close cooperation with these institutions, we can jointly

develop and promote green construction standards and specifications, share successful experiences and innovative technologies, and drive the entire construction industry towards a more environmentally friendly and sustainable direction.

4. Challenges and Strategies for Green Construction

4.1 Cost Control and Economic Benefits

While green construction offers significant long-term environmental and social advantages, the initial investment is often substantial. To mitigate these costs, construction firms must meticulously manage each aspect, ensuring efficient resource utilization and waste reduction. Moreover, technological innovation is paramount, as it can lead to higher efficiency and lower environmental impact. Government support is also crucial for enhancing the market competitiveness of green construction. Through policy incentives, funding support, and promotional campaigns, the government can raise public awareness and acceptance of green construction, thereby bolstering its market position. In essence, construction companies need to optimize costs through management and technological innovation, while the government should actively promote green construction, fostering its flourishing development.

4.2 Lack of Technical Talents and Training Needs

Green construction, being an advanced construction model, increasingly requires specialized talents. To bridge this gap, companies must intensify internal talent development and external talent recruitment to ensure they possess a team with professional knowledge and skills. Additionally, close cooperation and exchanges with universities and research institutions are essential. These institutions can provide cutting-edge research results and technical support, aiding companies in continuously improving the technological level of green construction. Through this collaborative model of industry-academia-research-application, we can jointly advance the research, innovation, and application of green construction technology, laying a solid foundation for the green development of the construction industry. Furthermore, this cooperation model facilitates a virtuous cycle of talent development, continually infusing new vitality and innovation into the field of green construction.

4.3 Imperfect Policies and Institutional Safeguards

Currently, green construction in China's construction industry is still in its developmental stage, and related policies and regulations urgently need improvement. As the primary driver of green development, the government should expedite the legislative process of green construction, formulate clear policy support, and incentive measures. This will not only create a conducive development environment for green construction but also guide enterprises to actively participate in and implement green concepts. Moreover, establishing a robust green construction standard system and certification mechanism is critical^[5]. These systems and standards will offer clear guidance for enterprises, ensuring the consistency and standardization of green construction practices. Through government policy guidance and institutional safeguards, we can collectively promote the widespread application and profound development of green construction in the construction industry, contributing to the creation of a beautiful China.

Conclusion

This article has elucidated the importance and role of green construction in construction project management by analyzing its connotation, necessity, implementation strategies, and challenges. Looking ahead, with the continuous advancement of technology and the increasing awareness of environmental protection, green construction will play an even more crucial role in the construction industry. In the future, the construction industry will place greater emphasis on

efficient resource utilization, environmental protection, and sustainable development. Simultaneously, with the emergence and widespread application of new materials, technologies, and processes, green construction will exhibit a more diverse, intelligent, and efficient development trend. Therefore, we should continue to strengthen research and exploration efforts on the concept and practice of green construction, contributing to the promotion of the construction industry towards a greener, more environmentally friendly, and sustainable direction.

References

- [1] Li Haizhou. Analysis of the Current Situation of Construction Project Management and Control Measures[J]. *Jushe*, 2022(16):142-144.
- [2] Bao Yongping. Elaboration on the Innovation of Construction Project Management and Green Construction Management[J]. *Jushe*, 2022(16):133-135.
- [3] Zhang Li. Several Thoughts on the Construction Project Management Mode under the Concept of Green Construction[J]. *Industrial Innovation Research*, 2022(10):127-129.
- [4] Wang Shaojun. Exploration of Innovation in Construction Project Management and Green Construction Management[J]. *Construction and Development*, 2021, 3(12).
- [5] Liu Bo. Analysis of Influencing Factors and Countermeasures of Construction Project Management[J]. *Huafei Design*, 2022(60):56-58.