

# Research on the Construction of a Fine Management Evaluation System for Engineering Projects under the Low Carbon Concept

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**Abstract.** In recent years, the development of a low-carbon economy has become a global consensus. Construction companies must adopt a low-carbon and refined project management model to reduce carbon emissions in the construction industry and promote the transformation and upgrading of the construction industry. Based on the analysis of the current problems in engineering project management under the low-carbon concept, the article clarifies the concept and significance of fine management of engineering projects under the low-carbon concept, and constructs a framework and evaluation system for fine management of engineering projects under the low-carbon concept.

**Keywords:** Low-carbon; Engineering projects; Fine management; Evaluation system.

## 1. Introduction

In recent years, the rapid development of the global economy, frequent human industrial activities and increasing carbon emissions have led to global warming and environmental damage. At present, all countries are fully aware of the importance of environmental protection, and are vigorously developing a low-carbon economy and creating a low-carbon society. China also proposes to establish and improve the economic system of green and low-carbon carbon cycle development. The construction industry, as one of the pillar industries of China's national economy, has a large energy consumption and resource waste during construction. Data shows that the carbon emissions of the construction industry account for about 50% of the national carbon emissions. The low-carbon transformation of the construction industry is imminent. A major problem in the transformation process is that there are many links in the construction process, and it is difficult to achieve refined full process management.

## 2. Problems in project management under the low-carbon concept

### 2.1 Management system not adjusted and updated in a timely manner

Many construction units have safety management systems and quality management systems, but few enterprises have low-carbon construction management systems, and the existing management systems are no longer suitable for the requirements of refined management, seriously affecting the management effectiveness of engineering projects. The lost goal of low-carbon management is difficult to achieve, seriously restricting the low-carbon transformation of the construction industry.

### 2.2 Weak low-carbon awareness among personnel

Due to the lack of systems, the low-carbon awareness of enterprise leaders, engineering project managers, construction personnel, etc. is weak, resulting in a lack of application of new technologies and materials in project management. Expensive measures are often taken to ensure the quantity and quality of the project, such as blindly increasing labor and equipment in order to catch up with the schedule during construction, leading to increased costs and management difficulties.

## **2.3 Backward management concepts and unreasonable organizational structure**

Many construction companies do not attach great importance to energy conservation and emission reduction, and do not pay attention to full lifecycle management in project management. They only choose environmentally friendly materials for so-called low-carbon management during the construction implementation process. At present, many construction enterprises have project companies and departments under their management, resulting in unclear rights, responsibilities, and benefits. Each department shifts responsibility to each other, resulting in busy management and reduced production efficiency. Therefore, in order to carry out low-carbon and refined management, the organizational structure must first be reasonably adjusted.

## **3. The concept and significance of fine management of engineering projects under the low-carbon concept**

### **3.1 Concept of Fine Management of Engineering Projects under the Low Carbon Concept**

The refined management mode of engineering projects under the low-carbon concept refers to the use of optimized site selection planning, BIM design and management, selection of low-carbon and environmentally friendly materials, improvement of resource utilization, and other scientific and technological means throughout the entire life cycle of construction projects, including the planning and design stage, construction management stage, and later operation and maintenance stage, to minimize energy and resource waste and reduce pollution at all stages as much as possible. By utilizing automation, digitization, and programming methods, management becomes more clear and detailed, thereby reducing carbon emissions, optimizing the impact of engineering projects on the environment, and achieving the unity of economic benefits, environmental benefits, and social benefits. Due to the many links involved in the entire process management, it is also difficult to manage. Therefore, under the low-carbon concept, it is more necessary to introduce the concept of refined management in the management process of engineering projects.

### **3.2 Significance of Fine Management of Engineering Projects under the Low Carbon Concept**

Firstly, theoretically speaking, studying the fine management of engineering projects under the low-carbon concept helps to supplement and enrich the current theory of fine and low-carbon management of engineering projects, and has certain reference value and significance for China's construction industry to achieve low-carbon transformation.

Secondly, in practice, it can help construction enterprises identify the loopholes and shortcomings in current project management, guide them to take appropriate measures, means, and methods for low-carbon and refined management throughout their entire life cycle, achieve the goal of reducing carbon emissions, improving economic and social benefits, and help construction enterprises achieve faster industrial transformation and upgrading.

## **4. Construction of a refined management framework for engineering projects under the low-carbon concept**

### **4.1 Definition of Fine Management Stage for Engineering Projects under the Low Carbon Concept**

Based on the value chain theory and preliminary research results, the refined management of engineering projects under the low-carbon concept is divided into five basic stages, namely the bidding and tendering stage of engineering projects, the preliminary planning stage of engineering projects, the construction and implementation stage of engineering projects, the completion and

delivery stage of engineering projects, and the later operation and maintenance stage of engineering projects.

#### **4.2 Definition of Fine Management Activities for Engineering Projects under the Low Carbon Concept**

Based on the above five basic stages, combined with the theory of low-carbon and refined management, all management activities throughout the entire life cycle of construction projects are reclassified and classified, including nine basic management activities: quality refined management, progress refined management, cost refined management, safety refined management, information refined management, resource refined management, technology refined management, low-carbon refined management, and organizational refined management.

### **5. Construction of a refined management evaluation system for engineering projects under the low-carbon concept**

#### **5.1 Survey questionnaire design, distribution, and collection**

On the basis of the framework construction, in order to better subdivide evaluation indicators and determine the weights of each indicator, a survey questionnaire was adopted to ensure the correctness and comprehensiveness of future evaluation data. The survey subjects include professionals with rich project management experience in the construction industry, real estate, and construction enterprises, as well as teachers and students from various universities.

The survey questionnaire was distributed through a combination of online and offline methods, using offline distribution of paper questionnaires and telephone interviews. Samples were distributed and collected online through email and questionnaire stars, and a total of 105 valid questionnaires were collected.

#### **5.2 Preliminary Construction of a Fine Management Evaluation System for Engineering Projects under the Low Carbon Concept**

Through a questionnaire survey, a system of indicators for nine basic management activities was constructed, including 1 primary indicator, 9 secondary indicators, and 56 tertiary indicators.

#### **5.3 Optimization and Improvement of the Fine Management Evaluation System for Engineering Projects under the Low Carbon Concept**

After the preliminary construction of the indicator system was completed, industry experts were invited to score the applicability of the second and third level indicators. Based on the scoring results, the evaluation system was optimized as follows: firstly, technology fine management was integrated into low-carbon fine management, mainly because the two have commonalities, which enhances the importance of low-carbon management; The second is to partially delete and merge the third level indicators, resulting in 1 first level indicator, 8 second level indicators, and 32 third level indicators after optimization, as shown in the table below.

Table 1. Evaluation Index System for Fine Management of Engineering Projects under the Low Carbon Concept

Primary Indicators	Secondary indicators	Third Level Indicators
	1. Fine Quality Management	1.1 Total Quality Management
		1.2 Standardized Operations
		1.3 Job Balancing
		1.4 Error Prevention Device
	2. Fine Management of Progress	2.1 Concurrent Engineering
		2.2 Just in Time Production

The Economic Management Effect of Engineering Projects under the Low Carbon Concept		2.3 Last Planner
	3. Fine Cost Management	3.1 Value Engineering
		3.2 Job Cost Management
		3.3 Cost Kanban Management Method
	4. Fine Safety Management	4.1 Safety Management of Production Machinery and Equipment
		4.2 Management of Safety Protection Devices
		4.3 Popularization of Safety Protection Knowledge
		4.4 Occupational Disease Prevention
	5. Fine Management of Resources	5.1 Joint Development of Low Carbon Technology Innovation
		5.2 Low Carbon Financing
		5.3 Building a Low-carbon Supply Chain
		5.4 On Time Procurement
	6. Fine Information Management	6.1 Construction and Application of Project Management System
		6.2 Construction and Application of Engineering Material Purchase, Sales and Inventory System
		6.3 Office Automation
		6.4 Automatic Collection and Intelligent Analysis System for Carbon Emission Data
	7. Low Carbon Fine Management	7.1 Development and Implementation of Special Management Measures for "Six Sections and One Environmental Protection"
		7.2 Selection and Application of Low-carbon New Technologies and Processes
		7.3 Selection and Application of Low Carbon New Materials and New Energy
		7.4 Selection and Use of Environmentally Friendly Mechanical Equipment
		7.5 Onsite 6S Management
	8. Organizational Fine Management	8.1 Energy Quota Assessment and Reward and Punishment System
		8.2 Employee Low-carbon Knowledge Training and Assessment
		8.3 Team Building, Self-management, and Evaluation
		8.4 Construction of Harmonious Relationships among Internal Stakeholders
		8.5 Building Harmonious Relationships with External Stakeholders

## 6. Conclusion and outlook

Through preliminary research, a refined management evaluation system for engineering projects under the low-carbon concept has been established. The next step will be to construct an evaluation

model, and then apply the evaluation system and evaluation model to actual projects for empirical analysis. The evaluation system will be further improved to improve its applicability and accuracy, making it more theoretical and practical, To improve the level of refined management of engineering projects under the low-carbon concept in construction enterprises, and thereby promote the early realization of low-carbon transformation in the construction industry.

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