Economic benefit analysis of building a zero-carbon industrial park

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Abstract： With the severe challenge of global climate change and the proposal of the "two-carbon" goal, the economic benefits of zero-carbon industrial parks, as an important carrier to promote the green and low-carbon transformation in the industrial field, have attracted increasing attention. This paper aims to deeply analyze the economic benefits of the construction of zero-carbon industrial park, explore its internal value, implementation strategy and challenges, and provide reference for relevant policy formulation and enterprise practice. Through literature review, case analysis and other methods, this paper reveals the significant benefits of zero-carbon industrial park in promoting industrial upgrading, improving energy efficiency, attracting green investment and creating employment opportunities, and puts forward targeted implementation strategies.

Key words: zero-carbon industrial park; economic benefit analysis; industrial upgrading; energy efficiency; green investment

1 Introduction

1.1 Research Background

With the increasing severity of global climate change, reducing carbon emissions has become a major issue of general concern to the international community. As one of the world's largest carbon emitters, China is facing huge pressure to reduce carbon. According to the latest research[1], the carbon emissions of 2,543 industrial parks account for as high as 31%, and the parks have become a hard bone in the process of achieving the dual-carbon target. Therefore, the construction of zero-carbon industrial parks and the green and low-carbon transformation of industrial parks have become an important way to achieve the carbon reduction goal [2].

Zero-carbon park refers to a comprehensive demonstration project with carbon neutrality in the whole life cycle of regional planning, construction, management, through the integrated application of technical measures in energy, industry, construction, transportation, waste treatment, ecology and other fields. The significance of building a zero-carbon park is to promote sustainable economic development, achieve the goal of energy transformation and carbon reduction, and also help to improve the corporate image and competitiveness.

1.2 Study purpose and significance

1.2.1 Study Purpose

The purpose of this paper is to deeply analyze the economic benefits of building a zero-carbon industrial park, and explore its important role in promoting the sustainable economic development, realizing the goals of

energy transformation and carbon reduction. Through this study, it can provide reference for the government to formulate relevant policies and make enterprise decisions, and promote the construction and development of zero-carbon industrial park.

1.2.2 Study Significance

(1)Theoretical significance: This study is helpful to enrich and improve the theoretical framework of economic benefit analysis of zero-carbon industrial parks, and to provide new perspectives and methods for research in related fields.

(2)Practical significance: This study is of great significance for guiding the construction practice of zero-carbon industrial parks, and helps to promote the green and low-carbon transformation of industrial parks, and to promote the sustainable economic development.

1.3 Overview of domestic and foreign studies

1.3.1 Overview of domestic studies

In recent years, Chinese scholars have gradually increased their research on zero-carbon industrial parks. Some scholars have discussed the construction path and economic benefits of zero-carbon industrial park from the aspects of energy transformation, industrial structure optimization and technological innovation. For example, some studies have pointed out that, by building an energy management platform, the realization of smart energy management can significantly reduce the energy consumption and carbon emissions of the park. At the same time, by building zero-carbon buildings, the utilization of waste resources, the development of green transportation and the promotion of waste resources .

In addition, some scholars have also analyzed the economic benefits of the zero-carbon industrial park, combined with specific cases. For example, the Ordos Zero Carbon Industrial Park has realized the energy self-sufficiency and zero carbon emission by building the green energy supply system with the "landscape hydrogen storage vehicle" as the core. Through intelligent transformation and digital management, the park has improved the production efficiency and energy utilization efficiency, reduced the production cost, and achieved significant economic benefits.

1.3.2 Overview of foreign studies

Some progress has also been made in the research of zero-carbon industrial parks abroad. Some developed countries have accumulated rich experience in the construction of zero-carbon industrial parks. For example, the Karenburg industrial symbiont in Denmark is a typical zero-carbon industrial park, which realizes resource recycling and zero-carbon emissions through the exchange of material and energy between enterprises. In addition, the Silicon Valley Clean Energy Center in the United States and the Hamburg Port New Town in Germany are also successful cases of zero-carbon industrial parks.

The economic benefit analysis of foreign scholars on zero-carbon industrial park mainly focuses on the following aspects: first, reducing production cost through energy transformation and technological innovation; second, improving efficiency of resource utilization efficiency through resource utilization and waste utilization, reducing carbon emission and environmental pollution through green transportation and green building. These studies provide useful references

for the construction and development of zero-carbon industrial parks.

1.4 Study content and research methods

1.4.1 Study content

(1)Development background and current situation analysis: analyze the current development background and status quo of zero-carbon industrial park at home and abroad, and discuss the necessity and urgency of the construction of zero-carbon industrial park.

(2)Economic benefit analysis of the construction of zero carbon industrial park: the economic benefit of the construction of zero carbon industrial park is analyzed from the aspects of energy transformation, industrial structure optimization and technological innovation, and its important role in promoting sustainable economic development and carbon reduction is discussed.

(3)Implementation strategy: Based on the successful cases and actual situations at home and abroad, the implementation strategies and suggestions for the construction of zero-carbon industrial park are put forward.

(4)Research difficulties: Analyze the limitations and shortcomings of this study, and put forward the future research directions.

1.4.2 Study Methods

(1)Literature review method: By reviewing relevant literature at home and abroad, the research progress of zero-carbon industrial park is sorted out to provide theoretical support for this research.

(2)Case analysis: Select typical zero-carbon industrial parks at home and abroad, and summarize successful experiences and lessons through in-depth analysis of their construction background, implementation strategies and economic benefits.

(3)Comparative analysis method: compare the similarities and differences between the construction of zero-carbon industrial parks at home and abroad, and analyze the reasons and influencing factors behind them.

(4) Quantitative and qualitative analysis method: combined with quantitative data and qualitative analysis, comprehensively evaluate the economic benefits of the construction of a zero-carbon industrial park.

2. Analysis of the development of the zero-carbon industrial park construction

2.1 Development background and its status quo analysis

2.1.1 Development background

(1)Pressure of global climate change: With the increasingly severe global climate change, countries have taken actions to deal with climate change and set carbon emission reduction targets. As an important carrier to promote the green and low-carbon transformation in the industrial field, the zero-carbon industrial park has attracted wide attention.

(2)Leadership of China's "dual-carbon" goal: China has clearly put forward the goal of carbon peak and carbon neutrality, which provides policy guidance and development opportunities for the construction of zero-carbon industrial parks. Governments at all levels have actively responded to the call of the state and introduced a series of policies and measures to support the construction of zero-carbon industrial parks.

(3)Rapid development of green and low-carbon technologies: In recent years, green and low-carbon technologies have achieved rapid development, providing technical support

for the construction of zero-carbon industrial parks. For example, new energy power generation technology, intelligent micro-grid technology, and energy efficiency improvement technology have been widely used in the construction of zero-carbon industrial parks.

2.1.2 Development status

(1)Continuous expansion of the construction scale: With the pressure of global climate change and the guidance of the "two-carbon" target, the construction scale of the zero-carbon industrial park is constantly expanding. A number of zero-carbon industrial park construction projects have emerged at home and abroad, covering new energy, new materials, intelligent manufacturing and other fields.

(2)Increasing policy support: Governments at all levels actively respond to the call of the state and introduce a series of policies and measures to support the construction of zero-carbon industrial parks. For example, provide incentives such as financial subsidies, tax incentives and financial support; strengthen management measures such as planning guidance and supervision services.

(3)Continuous emergence of technological innovation: In the construction of zero-carbon industrial parks, technological innovation keeps emerging. For example, the cost of new energy generation technology and the efficiency are constantly decreasing; the intelligent micro grid technology realizes the efficient utilization and optimal allocation of energy; and the energy efficiency improvement technology effectively reduces the energy consumption and operating cost of the park.

(4)Initial emergence of economic benefits: With the continuous advancement of the construction of zero-carbon industrial park, its economic benefits have initially emerged. For example, through the application of green and low-carbon technologies, the park has effectively reduced energy cost and significantly improved operating efficiency; through the development of green industries, the park attracts a large number of green investment and enterprises; and by providing green products and services, the park meets the market demand for green consumption [3].

However, there are still some problems in the construction of zero-carbon industrial park. For example, some parks lack scientific and systematic planning and construction; some parks have bottlenecks and constraints in the application of green and low-carbon technologies; and some parks have difficulties and challenges in economic benefit evaluation. These problems need to be paid attention to by relevant departments and enterprises.

2.2 Research on innovation points and difficulties

2.2.1 Innovation points

(1)Perspective innovation: From the perspective of economic benefits, this research in-depth analyzes the intrinsic value of building a zero-carbon industrial park, which provides a new perspective for the research in related fields.

(2)Content innovation: This study not only focuses on the direct economic benefits of zero-carbon industrial park, but also deeply discusses its indirect economic benefits, such as industrial upgrading, employment opportunity creation, etc., which enriches the content of economic benefit analysis of zero-carbon industrial park.

(3)Method innovation: This study combines

various research methods such as literature review, case analysis, comparative analysis and quantitative and qualitative analysis, comprehensively evaluates the economic benefits of the construction of zero-carbon industrial park, and improves the scientificity and reliability of the research.

2.2.2 Difficulties

(1)Data collection and processing: Since the construction of zero-carbon industrial park involves many fields and aspects, and the relevant data and information are scattered and complex, it is difficult to collect and process data.

(2)Depth and breadth of case analysis: There are many successful cases in zero-carbon industrial parks at home and abroad, but the background, conditions and implementation strategies of each case are different. Therefore, in-depth analysis and comparison of cases are needed to extract universal and operable experiences and practices.

(3)Accuracy of economic benefit assessment: The economic benefits of the construction of zero-carbon industrial park involve many aspects and factors, such as energy transformation, industrial structure optimization, technological innovation, etc. Therefore, it is necessary to comprehensively consider various factors and influences to ensure the accuracy and reliability of economic benefit assessment.

2.3 Study limitations

(1)Limitations of the research scope: This study mainly focuses on the impact of the construction of zero-carbon industrial park on the economic benefits of enterprises and regional economic development, and does not involve the impact of other aspects, such as environmental impact.

(2)Limitations of data timeliness: Due to the difficulty of data acquisition, the data used in this study may have some timeliness problems, which is difficult to fully reflect the actual situation of the construction of zero-carbon industrial park.

(3)Limitations of the model assumptions: In the construction of the economic benefit evaluation model, this study has made some assumptions and simplifications, which may have a certain impact on the research results.

3. Economic benefit analysis of building a zero-carbon industrial park

3.1 Influence on the economic benefits of enterprises

3.1.1 Cost savings

The construction of zero-carbon industrial park can reduce the energy cost of enterprises by adopting clean energy and improving energy efficiency. For example, by building distributed photovoltaic and wind power projects, companies can use renewable energy sources to generate electricity, reducing their dependence on traditional energy sources, and thus reducing energy costs. In addition, the zero-carbon industrial parks can also reduce the raw material costs and production costs of enterprises by promoting low-carbon technologies and optimizing production processes.

3.1.2 Improvement of efficiency

The construction of zero-carbon industrial park can enhance the brand image and market competitiveness of enterprises. As consumers have increasing demand for environmentally friendly products, enterprises in the zero-carbon industrial park can meet the market demand by producing environmentally friendly products and

improve the market demand to enhance their brand image and market competitiveness. At the same time, the zero-carbon industrial park can also provide more business opportunities and cooperation opportunities for enterprises, and promote the business development of enterprises.

3.2 Promoting the role of regional economic development

3.2.1 Industrial upgrading

The construction of zero-carbon industrial parks can promote the upgrading and transformation of regional industries. By introducing advanced clean energy technology and low-carbon technology, the zero-carbon industrial park can promote the transformation and upgrading of traditional industries and the development and expansion of emerging industries in the region [4]. For example, through the development of emerging industries such as the new energy vehicle industry and the smart grid industry, the optimization and upgrading of the regional industrial structure can be promoted.

3.2.2 Increase in employment

The construction of zero-carbon industrial parks can increase the employment opportunities in the region. With the continuous advancement of the construction of zero-carbon industrial park, a large number of technical personnel and management talents are needed to support the operation and development of the park. At the same time, the zero-carbon industrial park can also drive the development of related industries and create more employment opportunities in the region.

3.3. Construction of the economic benefit evaluation model

3.3.1 Model construction

The economic benefit evaluation model mainly includes the following parts: first, the enterprise cost, including energy cost, raw material cost, production cost, etc.; the second is the enterprise benefit, including sales revenue, brand value, market competitiveness, and third, the regional economic development part, including industrial upgrading, employment increase and so on. By constructing the relationship of these parts, the impact of the construction of zero-carbon industrial park on the economic benefits of enterprises and regional economic development can be calculated.

3.3.2 Model application

In this study, typical zero-carbon industrial park cases were selected for empirical analysis, and the economic benefit evaluation model was applied to evaluate the economic benefits and regional economic development of enterprises in the park. The reliability and validity of the model can be verified by comparing the evaluation results of different cases.

4 Implementation strategy

4.1 Strengthen policy guidance and support

The government should strengthen the policy guidance and support for the construction of zero-carbon industrial parks, improve the policy system, and introduce specific implementation rules and supporting measures. At the same time, the government should also increase the capital investment in the construction of zero-carbon industrial parks, and support the research and development and application of clean energy and low-carbon technologies in the industrial parks.

4.2 Improve the technical level

Enterprises should increase their investment in the research and development of clean energy and low-carbon technologies, and improve their technological level. Through the introduction of foreign advanced technology and independent innovation, to promote the technological progress and industrial upgrading of the construction of zero-carbon industrial park.

4.3 Improve the market mechanism

The government should establish a perfect market mechanism and give full play to the role of the market in resource allocation. Through the formulation of relevant policies and regulations to standardize the market order and promote fair competition, to provide a good market environment for the construction of zero-carbon industrial park.

4.4 Strengthen international cooperation and exchanges

The government and enterprises should strengthen cooperation and exchanges with relevant foreign institutions and enterprises, and introduce foreign advanced experience and technological achievements. By participating in international carbon emission reduction cooperation and exchange activities, we will promote the internationalization process of zero-carbon industrial park construction in China.

5 Summary

This study deeply analyzes the economic benefits of building a zero-carbon industrial park, and discusses its impact on the industrial low-carbon transformation and economic development in China. The research results show that the construction of zero-carbon industrial park can not only reduce the energy cost of enterprises and improve the brand image and market competitiveness of enterprises, but also promote the upgrading and transformation of regional industries and increase employment opportunities. However, the construction of zero-carbon industrial park in China still faces many challenges and problems, such as the policy environment is not perfect, the technical level needs to be improved, insufficient capital investment and the market mechanism is not mature. Therefore, the government and enterprises should make joint efforts to strengthen policy guidance and support, improve technical level, improve market mechanism and strengthen international cooperation and exchanges, so as to promote the sustainable and healthy development of zero-carbon industrial park construction [5].

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