

Research on the relationship between the sustainable development of low-carbon technology application industry in the current national economic system

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ABSTRACT

This paper analyzes the role of low-carbon technology application industry in sustainable development by discussing the relationship between the application industry and the national economic system. By systematically studying how low-carbon technologies affect the architecture and function of the national economic system, this paper aims to propose strategies to further promote the development of low-carbon technologies and provide a reference for achieving sustainable economic development.

INTRODUCTION

With the intensification of global warming and ecological pressure, the importance of low-carbon technology industry is becoming increasingly prominent. Driven by global carbon reduction goals and environmental protection policies of various countries, low-carbon technologies have gradually become one of the key pillars of economic development. The concept of low-carbon technology is not limited to reducing emissions, but also involves improving resource efficiency, reducing energy consumption, developing new energy sources, and building greener production and consumption patterns. Its applications are widely used in energy, industry, construction, transportation and other fields, and have a profound impact on the operation mode and sustainable development path of the national economy[1].

In recent years, the low-carbon technology industry has gradually become an important part of the national economic system, and its development is directly related to the effectiveness of the green transformation of the economy and the international competitiveness of the industry. Countries have introduced policies to support the development of low-carbon technologies and gradually establish policy frameworks for a green economy to address the global challenges posed by climate change. China's

Action Plan for Carbon Peaking and Carbon Neutrality clearly states that it will achieve carbon peak by 2030 and carbon neutrality by 2060, so as to achieve a balance between economic growth and environmental protection and contribute to the development of a global low-carbon economy.

1. The relationship between the national economic system and the industrial relationship and the application of low-carbon technology and sustainable development

Low-carbon technologies inject new impetus into economic growth by promoting technological innovation, industrial upgrading, and model innovation. The traditional economic growth model with high energy consumption and high emissions is no longer sustainable, and it must be transformed to green and low-carbon. Low-carbon technologies promote sustainable economic and social development by optimizing the energy structure, reducing dependence on fossil fuels, and promoting fundamental changes in the energy structure [2].

Low-carbon technologies play a vital role in tackling global climate change and driving the transition to a green economy.

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The goal is to achieve clean energy use, efficient resource consumption, and continuous improvement of environmental quality through innovative technologies. It plays a significant role in improving environmental quality and protecting ecosystems, mainly reflected in reducing greenhouse gas emissions, reducing pollutant emissions, and restoring the ecological environment [3], as shown in Table 1 below.

Fields of reference	Types of low-carbon technologies	Traditional techniques	Results & Data
Energy sector	wind energy	Coal-fired power emits about 820 grams of carbon dioxide per kilowatt hour; Fossil fuels produce large amounts of greenhouse gas and particulate matter pollution. (including	Wind energy has almost no carbon emissions.
	Solar technology	including sulphur dioxide, nitrogen oxides)	Extremely low lifecycle carbon emissions: solar power emits about 20 grams of carbon dioxide per kilowatt hour; Virtually zero carbon emissions; High energy efficiency provides support for low-carbon energy structure.
Industrial production field	Cleaner production technologies (e.g. flue gas desulfurization, denitrification	In traditional industrial production, pollutants are emitted directly without	Significant reduction in air pollutant emissions: For example, the

	technology)	treatment, causing air pollution (such as acid rain).	adoption of new sintering flue gas purification technology in China's steel industry has reduced sulphur dioxide emissions by nearly 50%.
Ecological environment restoration	Carbon capture and storage (CCS) technology	The large amount of carbon dioxide directly emitted from industrial production leads to rising concentrations of greenhouse gases in the atmosphere, contributing to global warming.	Carbon dioxide is captured and stored underground to prevent it from entering the atmosphere, effectively alleviating the trend of increasing greenhouse gases.

Table.1. Analysis of the application of low-carbon technologies in various fields

At present, the problems in the research on the sustainable development of low-carbon technology industry and national economic system are mainly manifested in the insufficient investment in technology research and development and the insufficient market driving force and incentive mechanism, and the research and development of low-carbon technology requires high capital and long-term investment, but many countries and enterprises have limited R&D funds and slow innovation speed. Small and medium-sized enterprises, in

particular, find it difficult to afford R&D expenses due to lack of funds. In addition, uncertainty about market returns has kept investors on the sidelines, further hampering technological innovation. The acceptance of low-carbon technologies in many traditional industries is low, and enterprises believe that they are costly, slow to achieve results, and are not willing to implement them. At the same time, the lack of effective incentives in the market makes it difficult for companies to obtain economic returns, and consumers are more inclined to traditional products with lower costs, which affects the promotion of low-carbon technologies.

2.Suggestions for sustainable development and low-carbon technologies to improve the gross national economy

Through financial assistance and improved laws and regulations, enterprises are encouraged to adopt low-carbon technologies [4], and industrial upgrading and innovation are promoted. It will also build an industry-university-research cooperation platform to break through the bottleneck of core technologies, and promote the application of emerging technologies such as artificial intelligence and blockchain in low-carbon fields. The government has reduced the cost of low-carbon technology application through tax exemptions and subsidies, and at the same time promoted the development of the green consumer market and boosted demand growth. Enterprises will inject new momentum into economic growth by empowering the green transformation of traditional industries, while focusing on the development of emerging low-carbon industries such as green energy and intelligent manufacturing.

Conclusion

The current development of the low-carbon technology

industry still faces problems such as insufficient R&D investment, lack of talents, weak market driving force and limited international cooperation, which limit its further promotion and application. In order to achieve the sustainable development of the national economic system, it is necessary to inject new momentum into the low-carbon technology industry through comprehensive measures such as policy support [5], technological innovation, market incentives, talent training and international cooperation, and promote its deep integration with the traditional economy, so as to increase the total economic value and build a green and low-carbon future development pattern[6].

REFERENCES

1. Smith, J. K., & Johnson, A. B. (2023). The role of renewable energy in sustainable urban development. *Journal of Environmental Policy*, 15(2), 89-105.
2. Omer, A. M. (2008). Focus on low carbon technologies: The positive solution. *Renewable and Sustainable Energy Reviews*, 12(9), 2331-2357.
3. Ockwell, D. G., Haum, R., Mallett, A., et al. (2010). Intellectual property rights and low carbon technology transfer: Conflicting discourses of diffusion and development. *Global Environmental Change*, 20(4), 729-738.
4. Liu, Z., et al. (2024). Low-carbon economy and sustainable development: Driving force, synergistic mechanism, and implementation path. *Frontiers in Environmental Science*.
5. Han,, et al. (2024). Can intellectual property rights pilots reduce carbon emissions? *China Economic Review*.
6. Borojo.,et al. (2024). The heterogeneous impacts of environmental technologies and research and development spending on green growth in emerging economies. *Green Growth Studies*.