

# Selection and Optimization of Industrial Green Development Strategies and Paths: Based on the Analysis of Chinese Industrial Sectors

Ziyu Ren

School of Economics, Beijing Technology and Business University, Beijing, China

ziyuren17@st.btbu.edu.cn

**Abstract.** This article focuses on the research of industrial green development strategy. By analyzing industrial data over the past two decades, it presents the development of industry and the achievements of green development. Research result shows that industry contributes significantly to China's GDP, the green development strategy has begun to yield results, energy consumption growth has slowed down, and resource utilization efficiency has improved. Theoretically, the strategy is supported by the theories of sustainable development and other development economics. Technological innovation and market demand are the key factors for strategic choices. The former drives green development, while the latter prompts enterprises to produce green products. Artificial intelligence technology plays a significant role in industrial enterprise management and other aspects, promoting industrial agglomeration and the construction of green industrial parks, and can also effectively contribute to green industrial development. The conclusion of this study provides evidence for China's industry to achieve green and sustainable development.

**Keywords:** Industrial green development strategy, Developmental economics, Sustainable development, Technological innovation.

## 1. Introduction

In the process of global economic development, industry is a key force driving economic growth and social progress. After the Industrial Revolution, the degree of industrialization has been continuously deepened, which has enhanced people's living and production standards. However, it has also brought about resource and environmental problems. Industrial production mainly relies on non-renewable energy sources, which leads to high energy consumption, low utilization efficiency and serious waste.

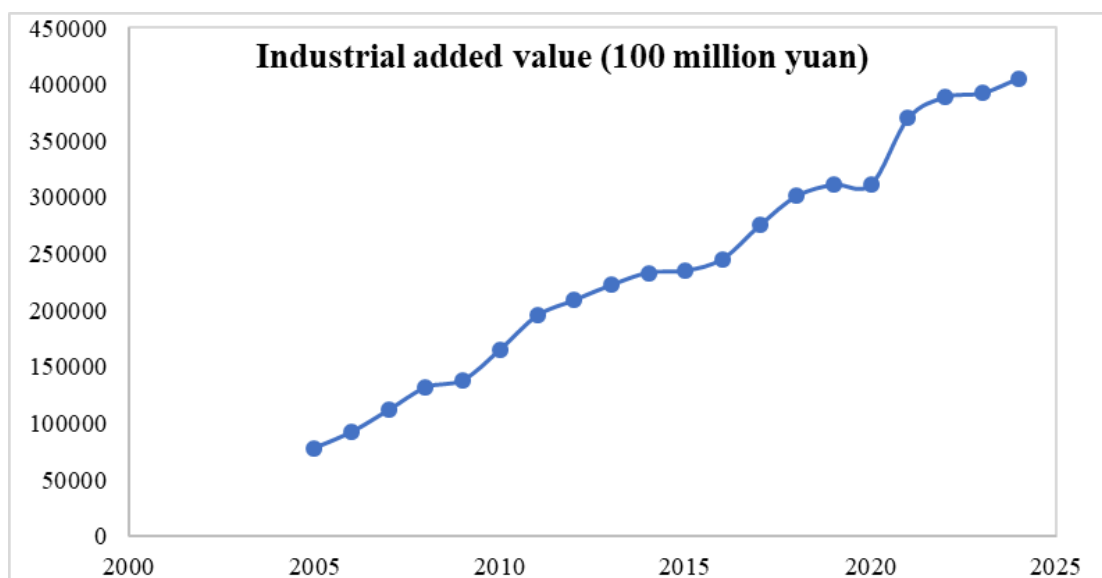
Nowadays, green development has become a global consensus. The United Nations' "2030 Agenda for Sustainable Development" is dedicated to addressing economic, social and environmental challenges. Under the theory of development economics, the rational allocation and effective utilization of resources are among the core elements for achieving sustainable economic growth. The theory of sustainable development emphasizes that economic development should be in line with the carrying capacity of resources and the environment. Under the Earth System view, human activities cannot exceed the carrying capacity; the thought of ecological civilization advocates a transformation of the development model to adapt to it; the low-carbon economy coordinates the relationship between the two through technological innovation, reducing environmental pressure [1]. At the same time, the theory of industrial structure optimization holds a significant position in the development economics system and plays a crucial role. It is the key to building a modern industrial system, promoting the optimization of resource allocation, achieving coordinated development of various industries, improving the overall economic efficiency, promoting sustainable economic growth, and is an important driving force for high-quality economic development [2]. China's industrial green development follows the principles of circular economy, based on clean production, focusing on efficient resource utilization and energy conservation and emission reduction, with low-carbon characteristics, and can establish ecological links with other industries and society, achieving coordinated development of economic, environmental and social benefits [3]. Based on the above background, this article analyzes relevant data of industrial sectors and explores the selection and

path optimization of green development strategies from the perspective of development economics, which has important practical significance. This research helps to reveal the current situation and problems of resource utilization in industrial sectors, and demonstrates the correctness and importance of the current green development strategies, promoting industrial sectors to develop in a more sustainable, green and intelligent direction.

## 2. Industrial Cost-benefit Analysis

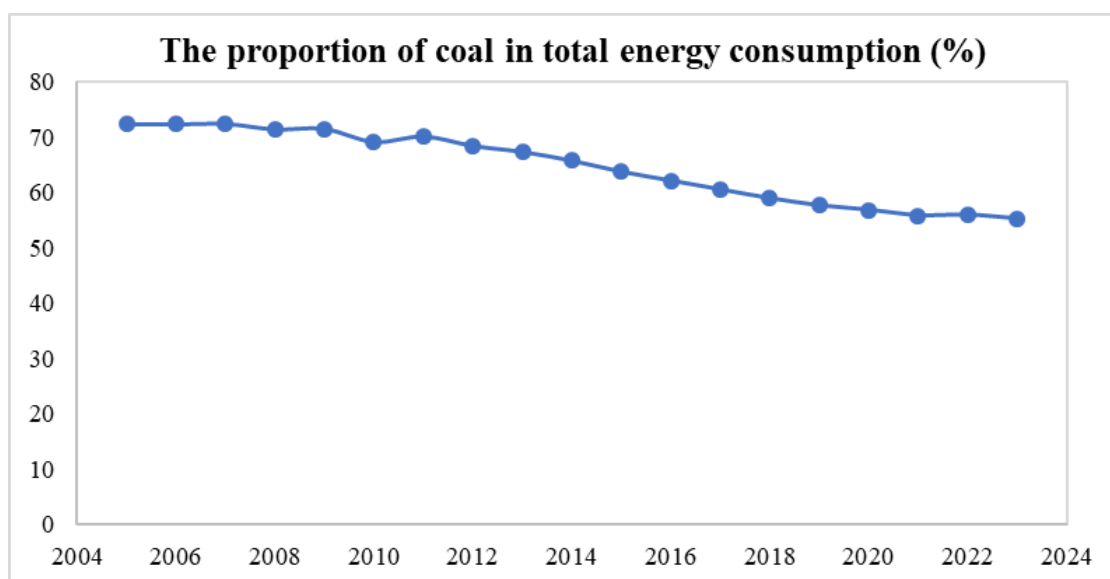
### 2.1. The Overall Situation of Industrial Energy Consumption

Based on the data of industrial added value (in billions of yuan) from 2005 to 2024, it can be seen that although the industrial added value has slowed down slightly in the past three years, it still shows an upward trend (see Fig. 1).



**Fig. 1** Industrial added value (Unit: 100 million yuan) (Photo credit: Original)

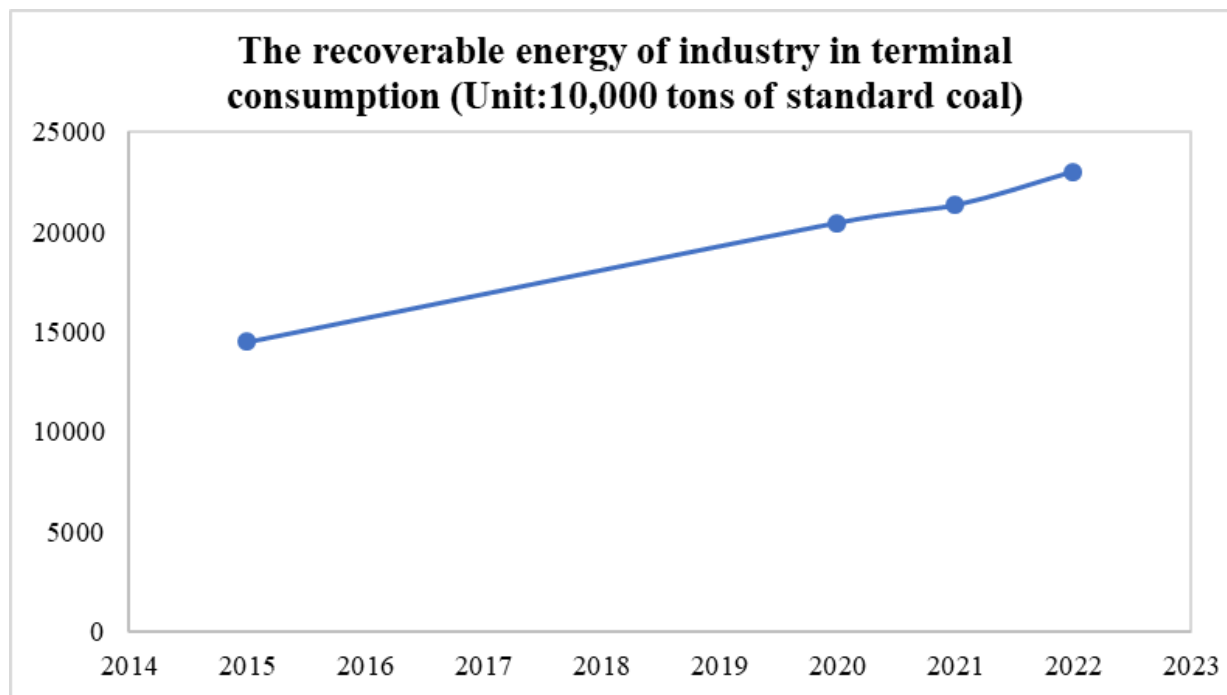
Based on the data of the proportion (%) of coal in total energy consumption from 2005 to 2023, it can be seen that the overall trend of non-renewable energy represented by coal has been continuously declining. This indicates that China's industry is shifting from relying on traditional non-renewable energy to renewable and clean energy, promoting green transformation (see Fig. 2).



**Fig. 2** The proportion of coal in total energy consumption (Unit: %) (Photo credit: Original)

## 2.2. Trend of Industrial Energy Recycling and Utilization

Based on the data of industrial recovery energy in the end-use consumption of the comprehensive energy balance tables for 2015, 2020, 2021 and 2022, the data of industrial recovery energy has been increasing, indicating that there has been progress in resource recycling and utilization in the industrial sector (see Fig. 3). For instance, enterprises, under the circular economy model, transform waste into energy resources, thereby enhancing the efficiency of comprehensive resource utilization and aligning with the green development concept.



**Fig. 3** The recoverable energy of industry in terminal consumption (Unit: 10,000 tons of standard coal) (Photo credit: Original)

Based on the above analysis of the data, it can be seen that currently, industrial enterprises are practicing the industrial green development strategy by reducing their reliance on non-renewable energy sources through the use of renewable energy and by recycling energy. Moreover, China's industrial green development strategy has achieved initial success, with the dependence on non-renewable energy sources in industrial development decreasing. This confirms that China's industrial green development strategy is suitable for the current development situation of China and shows a favorable development trend.

## 2.3. The Influence of Energy Cost on the Economic Benefits of Industry

Energy cost affects the prices of industrial products and subsequently influences their competitiveness in the market. When industrial production costs rise, such as through price hikes in the circulation of production materials and the increase in prices of agricultural and sideline products, the costs of industrial products increase and their prices change accordingly. However, the increase in the ex-factory price of industrial products is lower than that of raw materials, causing industrial profits to flow out and affecting the market competitiveness of products [4]. Enterprises will increase their investment in the research and application of energy-saving technologies and equipment, improving energy utilization efficiency and reducing energy consumption by improving production processes and adopting advanced energy-saving equipment. In conclusion, the industrial green development strategy plays a positive role in environmental protection and the development of industrial enterprises. Under the guidance of the development strategy, industrial enterprises optimize their industrial structure, enhance their competitiveness, and reduce energy consumption, thereby promoting environmental protection.

### **3. Selection of Industrial Green Development Strategy**

The green development strategy is a development strategy that is formulated on the basis of fully considering the carrying capacity of resources and the environment, aiming to achieve coordinated and sustainable development of economy, society and environment [4]. Technological innovation and market demand are the main influencing factors for the choice of the green development strategy. The former provides impetus for green development, while the latter prompts enterprises to produce green products.

On January 8th, 2023, FAW Hongqi held a grand global strategy press conference for new energy vehicles in Guangzhou [5]. It systematically planned the strategic vision, target tasks and path measures, setting "green growth breakthrough" as the key point, and transforming towards green and low-carbon from multiple aspects. Its success lies in the promotion of industrial upgrading through technological innovation and its active assumption of environmental protection responsibilities, contributing to sustainable development.

The above cases have provided valuable experience for industrial green development from multiple aspects such as technological innovation, industrial transformation, and management models, and have significant implications for promoting China's industrial green development. Firstly, strengthen technological innovation and investment in research and development. The Ministry of Education selects outstanding universities to pool resources and achievements, local governments build public transformation platforms and provide services, and create "dual centers" to promote cooperation [6]. Secondly, promote industrial structure adjustment and transformation. Chinese industries should accelerate the elimination of backward production capacity and promote the transformation and upgrading of traditional industries to green industries. Thirdly, attach importance to green management and sustainable development concepts.

### **4. Optimization of the Green Development Strategy Path**

#### **4.1. Technological Innovation Drives Green Development**

##### **4.1.1. Artificial intelligence technology contributes to energy management in industrial enterprises**

In industrial production, energy consumption is one of the main sources of carbon emissions. Through precise energy monitoring and prediction, artificial intelligence can achieve efficient energy allocation and reduce unnecessary energy waste. During the energy extraction stage, it formulates precise extraction plans by analyzing and modeling the collected data, thereby increasing recovery rates and achieving energy conservation and emission reduction [7]. Moreover, artificial intelligence technology can predict equipment failures in advance through real-time monitoring and analysis of energy equipment operation data, and promptly carry out maintenance to reduce equipment depreciation.

##### **4.1.2. Optimizing production processes through artificial intelligence technology**

The intelligent manufacturing technology driven by artificial intelligence can optimize the production process, thereby reducing waste of resources and pollutant emissions. Moreover, by leveraging big data and artificial intelligence algorithms, enterprises can more accurately predict market demands and reasonably arrange production plans and inventory management.

##### **4.1.3. Artificial intelligence technology promotes industrial resource recycling and reuse**

In the field of industrial waste treatment, artificial intelligence technology can achieve intelligent classification and recycling of waste. Moreover, through the analysis and simulation of a large amount of experimental data, artificial intelligence can accelerate the research and development of new materials and processes, improve the level of resource utilization of waste, and reduce the reliance on primary resources.

## 4.2. Promote Industrial Agglomeration and the Construction of Green Industrial Parks

Industrial agglomeration itself plays an important role in regional development, technological innovation and economic growth, etc. Specifically, it promotes technological innovation, drives regional economic development, enhances industrial competitiveness and promotes resource sharing and complementary [8]. This article mainly explores the role of industrial agglomeration in industrial green development. Through reasonable planning and construction of industrial agglomeration areas and green industrial parks, resources can be effectively integrated, production efficiency can be improved, and environmental impacts can be reduced.

Firstly, agglomeration effect has a significant positive impact on green economic development. It can promote the aggregation of production factors and drive the optimization and upgrading of the industrial chain [9]. In the agglomerated areas, enterprises can share infrastructure, achieve resource sharing and recycling, reduce costs, and also build a production chain for resource recycling.

Secondly, the construction of green industrial parks requires scientific planning and layout [10]. The location of enterprises should be reasonably arranged based on product characteristics and environmental impact, taking into account raw material supply and product matching; improve environmental protection infrastructure, and uniformly handle wastewater and waste gas; strengthen daily environmental supervision, and monitor the pollutant emissions of enterprises.

## 5. Conclusion

This article focuses on the industrial green development strategy and analyzes the industrial data over the past two decades. The results are as follows. In terms of the current development status and effects, the industrial sector has made significant contributions to China's gross domestic product (GDP), and the green development strategy has shown initial effectiveness. Energy consumption growth has slowed down, the energy structure has shifted towards renewable and clean energy, and resource utilization efficiency has improved. Theoretical perspectives provide support for this strategy. The theories of sustainable development and industrial structure optimization in development economics have contributed to it. Technological innovation and market demand are the key factors in the selection of the green development strategy. Technological innovation helps in the green development of various fields, and market demand drives enterprises to produce green products. In the implementation cases, the green transformation of FAW Hongqi provides experience, and it enlightens that China's industry should promote green development from aspects such as technological innovation, industrial transformation, and green management. In addition, artificial intelligence technology plays a significant role in energy management, production process optimization, and resource recycling. Measures such as resource sharing, reasonable layout, and strengthened supervision can also promote green development in industrial clusters and the construction of green industrial parks.

This article has limitations in terms of data. On one hand, some data have insufficient time span and are incomplete, thus failing to fully present the long-term trend of industrial green development. On the other hand, the data coverage is relatively narrow, focusing only on industry and lacking comparative analysis with other industries such as agriculture and service sectors. Moreover, the data sources are relatively single, mostly relying on public statistics, making it difficult to gain a deep understanding of the actual green development status of enterprises in their operations.

Based on these shortcomings, future research can be carried out in the following directions. First, analyze other industries, such as agriculture and service industries. Second, further explore the depth and breadth of data, and comprehensively utilize multi-source data to conduct a comprehensive analysis from multiple perspectives on the implementation effect and influencing factors of the green development strategy.

## References

- [1] Qi Ye, Cai Qin. Three Advances in the Theory of Sustainable Development. China Population, Resources and Environment, 2010, 20(04): 110-116.
- [2] Guo Jinnan. Several Theoretical Issues in Industrial Structure Adjustment. Research on Productivity, 1998, (01): 68-71 + 113.
- [3] Zhang Chunxia, Wang Haifeng, Zhang Shourong, et al. Strategic and Countermeasures for Green Development of China's Steel Industry. Iron and Steel, 2015, 50(10): 1-7.
- [4] Jing Zhongxiao. From the Rise of Costs to the Current Industrial Economic Efficiency. Economic Work Newsletter, 1987, (15): 28-29.
- [5] Li Fengjun. Development Plan for Intelligent and Connected Vehicles of China FAW. Automobile Technology, 2018, (10): 2
- [6] Zhang Lin, Yang Pinping. How to Achieve Two-way Pursuit between Advantageous Universities and Advantageous Industries. Xinhua Daily, 2024-09-16, (001).
- [7] Xu Xiaodan, Hui Ning. Research on the Impact of Artificial Intelligence on Industrial Green and Low-Carbon Development. Journal of Shaanxi Normal University (Philosophy and Social Sciences Edition), 2024, 53(06): 74-86.
- [8] Yang Haochang, Li Lianshui, & Liu Jun. The Impact of High-tech Industry Agglomeration on Technological Innovation and Regional Comparison. Science and Research of Science and Technology, 2016, 34(02): 212-219.
- [9] Wang Yuru, Wang Zhaoting, Wang Yingfei. Green Technological Innovation, Industrial Agglomeration and Green Economic Development. Economic Issues, 2025, (04): 101-110.
- [10] Zhou Hong. Research on the Industrial Layout of Tianjin Based on the Theory of Industrial Agglomeration. Tianjin University, 2006.