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# Research on the Necessity of Sustainable Development of E-commerce Enterprise in Shandong from the Perspective of Green Ecology

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**Abstract:** As an important way to adapt to the national sustainable development strategy in the new era, the role of green enterprise development cannot be ignored. In recent years, the rapid expansion of the digital economy has brought unprecedented opportunities and environmental challenges, making the integration of ecological considerations into business operations essential. Exploring this mode has become one of the important directions of contemporary business research, particularly within the rapidly evolving e-commerce sector. This research begins with the fundamental concept of the green enterprise, systematically defining its core characteristics and operational mechanisms within the context of modern digital trade. Subsequently, it discusses the current situation and the critical necessity of fostering green e-commerce enterprises specifically in Shandong Province, a major economic hub facing significant transitional pressures. By conducting a comprehensive analysis of the regional market dynamics and environmental policies, this study identifies and evaluates the existing problems hindering sustainable transformation, such as high carbon footprints in logistics, excessive packaging waste, and a lack of green consumer awareness. Finally, the paper explores and proposes a robust future development strategy tailored for e-commerce enterprises in Shandong. These strategic recommendations emphasize the adoption of green supply chain management, the implementation of eco-friendly packaging solutions, and the enhancement of corporate environmental responsibility. Ultimately, this research provides valuable theoretical insights and practical guidelines for policymakers and business leaders aiming to achieve a harmonious balance between economic profitability and ecological sustainability in the e-commerce industry.

**Keywords:** green enterprise; sustainable development; e-commerce; green ecology; development strategy

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## 1. Ecology and green enterprises

With the continuous development of economies around the world, the commercial green revolution has quietly swept across the globe. As the foundation for sustainable development, the green development of enterprises has become the trend of business development in the new era. The development of enterprises no longer comes at the expense of consuming a large amount of resources and energy, but rather places greater emphasis on creating a comfortable environment. Numerous green enterprises have emerged as classic cases and development benchmarks in business operations, showcasing innovative strategies that prioritize environmental sustainability while maintaining economic growth and competitiveness in the global market [1].

### 1.1. Ecological perspective

The ecological perspective theory, which emerged in the 1970s, is an open system that not only encompasses various theories of human behavior but also integrates social work practice theories. This theory advocates for the use of holistic thinking and offers an integrated and compromising perspective on social work practice [2]. Furthermore, the

ecological perspective generally refers to a theory that emphasizes interactive relationships. It reflects the influence of social work and individuals on the environment, often highlighting behaviors related to green and low-carbon environmental protection in business operations. This approach underscores the importance of sustainable practices and the interconnectedness of social and environmental systems.

### 1.2. Introduction of green enterprises

The concept of green enterprises is centered around the idea of integrating environmental sustainability into the core strategy, operational model, and value proposition of a business. Unlike the traditional focus on "pollution control" or mere "compliance," green enterprises internalize environmental responsibility as a competitive advantage and a foundation for long-term survival. If the "ecological perspective" serves as a worldview and strategic framework for understanding the relationship between business and nature, then the "green enterprise" embodies this worldview in practical terms. It seeks to address the question: How can businesses actively restore or at least avoid harming the health of the natural ecosystem while generating economic value? Green enterprises are characterized by more than just the production of "green products"; they represent a strategic positioning that permeates all business functions. Key elements include environmental responsibility throughout the entire life cycle, decarbonization and resource efficiency as core strategies, and a focus on transparency and stakeholder engagement [3]. The evolution process of green enterprises is illustrated in the following figure (As shown in Table 1).

**Table 1.** The evolution stages of green enterprises

Stage	Feature	Driving factor
1. Compliance and risk management	Passively complying with environmental protection regulations and handling "three types of waste" aims mainly at avoiding fines and litigation risks.	Regulatory pressure, public opinion
2. Ecological efficiency	By implementing "decarbonization" measures such as energy conservation and consumption reduction, as well as reducing packaging, we can not only minimize environmental impact but also cut costs.	Cost savings, operational efficiency
3. Differentiation and branding	Highlight the green attributes as a marketing feature to attract environmentally-conscious consumers and gain premium pricing.	Consumer preferences, brand value
4. Innovation of business model	Completely restructure the business model (such as product-as-service, industrial symbiosis), and integrate environmental value into the core of the value proposition.	Systematic competition, new market opportunities
5. Regeneration and net positive benefits	Enterprise operation not only avoids any harm, but also actively restores natural capital, making the environmental condition better due to the existence of the enterprise.	Systemic risk, mission-driven

Generally speaking, green enterprises are those that integrate environmental considerations and management into every aspect of their business operations, with sustainable development as their mission. They achieve significant results in their long-term development by emphasizing the full and rational utilization of resources. This approach can significantly reduce or even eliminate the negative impacts of their products or services on the environment and human health during both production and consumption phases. Furthermore, green enterprises play a crucial role in the multi-level

recycling and comprehensive utilization of waste, contributing to a circular economy. By adopting such practices, these enterprises not only enhance their environmental performance but also create economic value, demonstrating that environmental responsibility and business success can go hand in hand. This holistic approach ensures that green enterprises remain at the forefront of sustainable development, setting a benchmark for others to follow [4, 5].

## **2. The current situation of green enterprise development in Shandong**

Since the 18th National Congress of the Communist Party of China, significant emphasis has been placed on ecological civilization construction as part of the broader strategic framework. This focus has been instrumental in guiding the development of a harmonious coexistence between humans and nature. In Shandong, the Green Enterprise Professional Committee was established to promote green, informatized, and intelligent management of enterprises. Following the 20th National Congress, the importance of ecological civilization was reaffirmed, leading to the rapid development of Shandong's green industrial and supply chains [6]. The "Three-Year Action Plan for Accelerating the Construction of Green Manufacturing System (2021-2023)" has been pivotal in supporting green technologies and integrating ecological design into enterprise operations, thereby achieving green production.

The development of green enterprises in Shandong is driven by the global trend towards green consumption. This trend has led to a deeper understanding of green concepts, making the development of green products and markets an essential strategy for enterprises [7]. By aligning with sustainable development strategies, enterprises can better balance economic and ecological development, ensuring that both enterprise and consumer interests are met. This approach not only alleviates the tension between economic growth and environmental protection but also fosters harmonious interactions between people and nature.

Currently, many production enterprises in Shandong have a limited understanding of "green operation," often only at a superficial level. This lack of deep comprehension leads to hesitancy among managers regarding the adoption of green product development and management practices. To effectively implement sustainable development concepts, it is crucial for managers to broaden their understanding of green operations. By integrating green thinking into business and management philosophies, enterprises can better align with sustainable development goals and enhance their operational strategies.

Shandong Province faces a significant challenge in balancing its high energy consumption and emissions with stable economic growth. The region's economic development is constrained by the need to control energy consumption while simultaneously pursuing growth. In this context, developing green enterprises is not merely a long-term goal but a critical necessity for the survival and sustainability of the regional economy. By prioritizing green development, Shandong can address these internal conflicts and pave the way for a more sustainable economic future [8].

Shandong's industrial structure is heavily reliant on traditional heavy chemical industries, which are major contributors to carbon emissions. This reliance results in energy consumption and emissions levels that exceed national averages. Unlike provinces with more diversified industrial bases, Shandong's focus on heavy industries creates a rigidity in pollutant emissions. To address this, the development of green enterprises is essential. By integrating green technologies into traditional industries, Shandong can reduce pollution and emissions while maintaining its industrial foundation. This transformation is not optional but necessary to alleviate the environmental burden and ensure sustainable industrial growth.

Shandong's energy structure is undergoing significant changes, moving away from a coal-dominated system. Despite coal's historical dominance, recent developments have seen new and renewable energy sources surpass coal power in installed capacity. This shift indicates a move towards cleaner energy sources, which necessitates a corresponding

transformation in enterprise energy consumption structures. As the power system becomes cleaner, enterprises must adapt to maintain cost competitiveness and compliance. Developing green enterprises aligns with this energy transition, ensuring that businesses remain competitive in a changing energy landscape.

Shandong's ecological base presents inherent vulnerabilities, with significant areas of land desertification and low forest coverage. These ecological challenges are compounded by the overlap of desertified land with key agricultural and industrial areas, increasing the conflict between ecological and production spaces. Protecting sensitive ecological areas is becoming increasingly urgent. Developing green enterprises is crucial not only for economic benefits but also for maintaining ecological security. This approach balances ecological protection with economic development, providing a model for sustainable growth in regions with similar ecological constraints.

The relationship between green transformation and economic growth in Shandong is not a zero-sum game. Instead, they are mutually reinforcing, as demonstrated by the success of initiatives like the Lianshan Painting Cluster. By adopting green practices, enterprises can reduce emissions and costs while increasing efficiency and competitiveness. The decrease in energy consumption per unit of GDP and the rise in high-tech industry output value highlight the potential for green growth to drive economic advancement [9, 10]. Green transformation is thus an opportunity for growth, enabling enterprises to innovate and explore new markets while adhering to environmental standards.

The necessity of developing green enterprises in Shandong is rooted in the intertwined nature of its economy and ecology. The province's historical reliance on industrial structures, coupled with its coal-dominated energy system and ecological vulnerabilities, creates a complex development challenge. Green enterprises are key to addressing these challenges, offering a path to break free from high-carbon dependencies and fostering new economic momentum. As Shandong approaches a significant economic milestone, the success of its green transformation will not only impact its development quality but also serve as a model for other regions [11]. This transformation is crucial for maintaining global competitiveness and ensuring sustainable growth.

### **3. The future development strategies of green enterprises in Shandong**

Green enterprises play a crucial role in fostering an environmentally friendly society. The development of these enterprises necessitates a multifaceted approach, aiming to harmonize economic, social, and environmental benefits. Both governmental bodies and the enterprises themselves must proactively explore strategies that integrate environmental protection into future production, management, and market expansion [12]. In light of the current development status and challenges faced by green enterprises in Shandong Province, several countermeasures are proposed to address these issues effectively.

1. Enhancing green awareness and fulfilling environmental protection responsibilities are essential. In March 2023, a forum focused on green, low-carbon, high-quality development was held in Jinan, highlighting Shandong's commitment to providing platforms for entrepreneurs across various industries to transition towards green and low-carbon development. This initiative aims to attract talent and facilitate resource connections, investment, and business expansion. Enterprises must prioritize green awareness and actively fulfill their environmental responsibilities during business development. This involves adopting the scientific development concept, fostering a sustainable development mindset, and establishing comprehensive responsibility systems. Clearly defining departmental responsibilities and effectively managing the interplay of various influencing factors are also crucial.
2. Implementing environmental protection measures and establishing a green framework are vital steps. Enterprises should actively integrate sustainable development concepts throughout all production processes and cycles. By promoting efficient resource recycling, carbon emissions in production can be minimized,

creating a new green development closed loop. This approach not only supports green development but also encourages continuous technological advancement. By developing new application scenarios for emerging technologies and fostering a new technological revolution, enterprises can build a robust industrial development ecosystem. This strengthens the competitive advantages of green enterprises and facilitates the construction of a new green development pattern.

3. The role of government leadership is pivotal in strengthening green cooperation. As of now, the number of green enterprises in Shandong Province remains below one hundred, with minor variations in green and low-carbon evaluations among them. Future enterprise development must continue to emphasize the government's leadership role, leveraging governmental management functions and reflecting the state's role. Formulating strict environmental protection policies ensures that enterprises meet their responsibilities and obligations, balancing economic and environmental benefits, as well as social and environmental development. This approach aims to unify multiple benefits, achieving sustainable enterprise development. Additionally, fostering active cooperation among green enterprises is crucial. By integrating cutting-edge environmental protection measures and advanced management practices, enterprises can jointly develop while maintaining ecological balance, controlling production costs, and achieving sustainable economic growth.
4. Promoting green culture and nurturing enterprise talent are essential for long-term success. Integrating green and sustainable development concepts into corporate culture involves regular green education and awareness campaigns, ensuring that these ideas permeate every level of the enterprise. Creating a green cultural atmosphere encourages employees to understand the importance of sustainable development, leading to a shift in mindset. Under the influence of corporate green culture and an environmentally conscious business environment, more individuals will prioritize environmental protection in their work. This approach is more likely to secure long-term enterprise revenue and achieve a balanced, coordinated development between society and the environment.

#### 4. Conclusion

Green enterprise operation represents a dynamic and enduring strategic choice for businesses. As China's reform and opening-up policies continue to evolve, there is a growing recognition of the critical importance of environmental protection [1]. The enhancement of the nation's comprehensive strength, coupled with advancements in science and technology, is expected to create a more conducive environment for future business operations. In this context, it is imperative for enterprises to swiftly acknowledge the importance of green development. By adopting various strategies to align with the green trend, businesses can embark on a sustainable development path. The author is confident that the focus on green enterprise operations will not only accelerate the country's economic growth but also significantly improve the human living environment, making it increasingly suitable for future generations.

#### References

1. L. Anderloni and A. Tanda, "Green energy companies: Stock performance and IPO returns," *Research in International Business and Finance*, vol. 39, pp. 546-552, 2017.
2. X. Tan, Y. Yan, and Y. Dong, "Peer effect in green credit induced green innovation: An empirical study from China's Green Credit Guidelines," *Resources Policy*, vol. 76, p. 102619, 2022.
3. X. Xing, J. Wang, and L. Tou, "The relationship between green organization identity and corporate environmental performance: The mediating role of sustainability exploration and exploitation innovation," *International Journal of Environmental Research and Public Health*, vol. 16, no. 6, p. 921, 2019.
4. F. Han, X. Mao, X. Yu, and L. Yang, "Government environmental protection subsidies and corporate green innovation: Evidence from Chinese microenterprises," *Journal of Innovation & Knowledge*, vol. 9, no. 1, p. 100458, 2024.
5. K. Abdur Rouf, "Green microfinance promoting green enterprise development," *Humanomics*, vol. 28, no. 2, pp. 148-161, 2012.

6. F. Rahmana and A. Bawono, "Sustainable development toward sustainable enterprise," *Management Science Letters*, vol. 11, no. 2, pp. 657-668, 2021.
7. S. Zheng and S. Jin, "Can enterprises in China achieve sustainable development through green investment?," *International Journal of Environmental Research and Public Health*, vol. 20, no. 3, p. 1787, 2023.
8. M. Brychko, Y. Bilan, S. Lyeonov, and D. Streimikiene, "Do changes in the business environment and sustainable development really matter for enhancing enterprise development?," *Sustainable Development*, vol. 31, no. 2, pp. 587-599, 2023.
9. F. Bai, Y. Huang, Q. Zhang, and M. Shang, "Unleashing the power of green culture: Exploring the path to sustainable development performance in enterprises," *Sustainable Development*, vol. 32, no. 4, pp. 3226-3247, 2024.
10. I. Vinichenko, E. Kobets, and Y. Tesliuk, "Formation of sustainable development of the enterprise."
11. D. Barbian, "What makes an enterprise sustainable? Or: is 'Green' really 'Green?'," in *European Conference on Intellectual Capital*, Academic Conferences International Limited, Apr. 2013, p. 38.
12. X. Hu, S. M. Khan, S. Huang, J. Abbas, M. C. Matei, and D. Badulescu, "Employees' green enterprise motivation and green creative process engagement and their impact on green creative performance," *International Journal of Environmental Research and Public Health*, vol. 19, no. 10, p. 5983, 2022.

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