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Enterprise green supply chain management under the dual-carbon background: A case study of Geely Automobile

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Abstract:

With the severe challenge of global climate change and the increasing constraints of resources and environment, China has put forward the goals of "carbon peaking" and "carbon neutrality" (referred to as "dual carbon"), aiming to promote green economic transformation and high-quality development. Green supply chain management, as an important means to achieve the goal of "double carbon", is gradually becoming a key path for the sustainable development of enterprises. this study takes Geely Automobile as an example, an in-depth analysis of its green supply chain management practice under the background of "dual carbon", discusses its successful experience and existing problems, and puts forward suggestions for further optimization, to provide reference and reference for other Chinese enterprises, and promote the green transformation and sustainable development of the entire industry.

Keywords: dual-carbon background, Green supply chain, Supply chain management, Geely Auto

1. Introduction

Green supply chain management, as a key link to connect the internal and external environment of enterprises, can significantly improve the environmental performance and market competitiveness of enterprises by optimizing the resource allocation and environmental management of all links of the supply chain. Geely Auto, as a leading automobile manufacturing enterprise in China, has carried out many explorations and practices in green supply chain management, achieved remarkable results, and set a model for the industry.

2. Background of Geely Auto‘s green supply chain management

2.1 The proposal for dual carbon target

The proposal of this goal not only demonstrates China's determination to tackle global climate change but also points the way for the green transformation of China's economy and society. Subsequently, the state issued a series of policy documents, proposing to build a "1+N" policy system for peaking carbon neutrality in China to promote the green and low-carbon transformation of various industries.

2.2 Necessity of green transformation of the automobile industry

As an important part of the global economy, the automotive industry is also one of the major sources of carbon emissions. According to the International Energy Agency, global car use is expected to double by 2070, with car ownership growing by 60%. The green transformation of the automotive sector is therefore essential to achieve the "two-carbon" goal. As a leader in China's automotive industry, Geely Auto has actively responded to national policies, promoted the implementation of green supply chain management, and contributed to the realization of green transformation in the industry.

3. Geely Auto‘s practice of green supply chain management

3.1 Green Procurement

3.1.1 Formulate green procurement standards

Geely Auto guides its suppliers in enhancing their environmental awareness and capabilities by setting strict green procurement standards. In the procurement process, Geely Auto focuses on selecting suppliers of environmentally friendly materials, energy-saving equipment, and low-carbon technologies, and promotes the overall development of the supply chain in the direction of green and low-carbon. At the same time, Geely Auto also requires suppliers to provide carbon footprint reports of their products to track and manage carbon emissions throughout the supply chain.

3.1.2 Promote the green transformation of suppliers

Geely Auto actively helps and guides suppliers to carry out green transformation, providing technical support and financial assistance. For example, Geely Auto works with its suppliers to develop environmentally friendly materials and production processes to reduce carbon emissions and resource consumption in the production process. In addition, Geely Auto has incorporated environmental protection requirements into contract terms by signing green procurement contracts, ensuring that suppliers strictly comply with environmental regulations and standards in the production and supply process.

3.2 Green Production

3.2.1 Building green factories

Geely Auto pays attention to energy saving, emission reduction, and environmental protection in the process of building new plants and renovating old ones. Through the use of dry box spray house design, photovoltaic power generation, waste gas incineration, rainwater collection, water reuse, waste heat utilization, and other energy saving and emission reduction technologies and facilities, improve energy efficiency and reduce waste generation. As of 2023, Geely Auto has 17 plants rated as "National Green Factories" and 3 as "Zero carbon factories".

3.2.2 Promote green manufacturing technology

Geely Auto actively promotes green manufacturing technologies, such as lightweight technology, multi-material hybrid body technology, aluminum alloy overlay technology, etc. The application of these technologies not only reduces the weight and energy consumption of the vehicle but also improves its safety and comfort. At the same time, Geely Auto also focuses on the development and application of low-carbon emission engines and powertrains, such as new energy vehicles and hybrid electric vehicles.

3.3 Green Logistics

3.3.1 Optimize logistics transportation mode

Geely Automobile reduces carbon emissions in the logistics process by optimizing the logistics transportation mode. For example, low carbon emissions transport vehicles such as new energy logistics vehicles and electric forklifts are adopted; Optimizing transport routes and loading rates to reduce idling and waiting times; Promoting the use of recyclable packaging materials, and reducing the use of disposable packaging.

3.3.2 Establish a digital logistics management system

Geely Auto realizes real-time tracking and management of logistics information by establishing a digital logistics management system. The system can accurately record and analyze carbon emission data in the logistics process, providing a scientific basis for formulating emission reduction measures. At the same time, the digital logistics management system can also improve logistics efficiency and service quality, and reduce logistics costs and risks.

3.4 Incentive Vehicle Emission Level 1 (Scope1) management measures

3.4.1 Energy saving and clean energy substitution

Geely Auto focuses on energy conservation consumption reduction and clean energy substitution at the manufacturing end. In 2022, Geely Auto's Xi 'a Plant will become the first zero-carbon plant in the domestic vehicle industry, increasing its installed photovoltaic power generation capacity by 179% to 307 MW, and using renewable power for 36% of the total vehicle base's electricity. The annual energy consumption per vehicle and the total greenhouse gas emissions of the vehicle base decreased by 12.1% and 24.8%, respectively, compared with 2020.

3.4.2 Green Factory certification

Geely Auto has 10 vehicle bases rated as national-level green factories. In 2023, the consumption of water resources per vehicle in the vehicle base decreased by 15.4% compared with the previous year, and the production of hazardous waste per vehicle in the vehicle base decreased by 8.4%.

3.4.3 Zero-carbon factory construction

In 2023, Geely Auto completed the certification of two zero-carbon plants in Baoji and Chengdu, achieving its goal of building three or more zero-carbon plants by 2025 ahead of schedule.

3.5 Geely Auto Level 3 Emission (Scope3) management measures

3.5.1 Supply chain sustainable development system

Geely Auto has established a supply chain sustainability system, developed 13 low-carbon materials in 2022, and plans to use recycled materials in 25 future models. By reducing emissions from recycled materials and power batteries, the company has reduced carbon emissions by 0.38 tons per vehicle. Thirty percent of Tier 1 suppliers use renewable electricity, of which 10 percent of Tier 1 core suppliers have achieved 100 percent renewable electricity use.

3.5.2 Full life cycle carbon reduction path

Geely Auto has formulated a carbon reduction path for the whole life cycle around the manufacturing end, the supply end, and the use end of the vehicle. In 2022, Geely

Auto's single-cycle full life cycle carbon emission was 35.2tCO_2e, down 8.1% and 5.6% compared with 2020 and 2021, respectively.

3.5.3 Natural Capital assessment

In 2023, Geely Auto took the Guiyang Plant as a pilot to conduct natural capital assessment research for the first time for the vehicle production base, identify the impact and dependence on natural capital, and formulate sustainable business strategies to reduce resource consumption and environmental pollution and promote the deep integration of nature-related factors into the daily management of the production base.

3.5.4 Circular business model

Geely Auto has accelerated the promotion of a circular business model to build green circular vehicles with a high proportion of renewable resource applications. For example, Lynk & Co 08 has selected suede, a recyclable and renewable polyester material, in the seats, center console, door panels, and other positions, with a recyclable polyester ratio of 45%. The carpet is made of 97% recycled material and the ceiling fabric is made of 100% recycled material.

4. The effectiveness of Geely Auto's green supply chain management

4.1 Significant improvement in environmental performance

Through the implementation of green supply chain management, Geely Auto's environmental performance has significantly improved. For example, in the field of new energy vehicles, Geely Auto's sales have grown rapidly and the penetration rate of new energy has reached more than 35 percent. On the manufacturing side, the proportion of renewable energy in energy consumption and the proportion of renewable electricity in power use of Geely Auto's whole vehicle base have both increased significantly. In terms of the supply chain, the proportion of Tier 1 suppliers using renewable electricity in Geely Auto has reached more than 30%.

4.2 Win-win economic and social benefits

The implementation of green supply chain management has not only improved Geely Auto's environmental performance but also brought significant economic and social benefits. By reducing energy consumption and waste, Geely Auto has reduced production costs and improved resource utilization efficiency. At the same time, the launch of green products has also met consumers' demand for environmental protection and sustainable development, enhancing the brand's market competitiveness and social image. In addition, Geely Auto's green supply chain management has also driven the green transformation of its supply chain partners and promoted the sustainable development of the entire industrial chain.

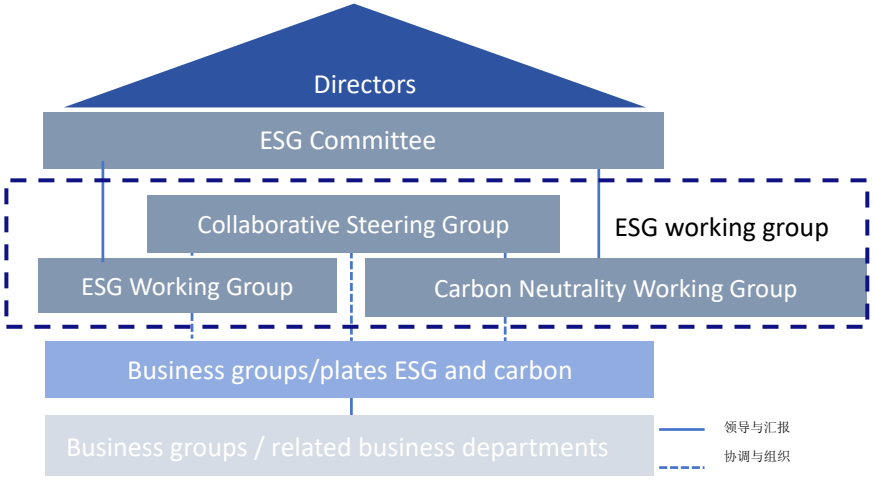

Figure 1 Geely Holding Group sustainable development organizational structure

4.3 Scientific and technological innovation and demonstration leadership

In the practice of green supply chain management, Geely Auto constantly carries out technological innovation and model exploration. For example, the green methanol solution promoted by Geely Holding Group not only realizes the resource utilization of carbon dioxide but also demonstrates the application potential of green methanol in a variety of scenarios. The successful application of green methanol at the Asian Games in Hangzhou has also demonstrated Geely Auto's innovative capabilities and practical results in the field of green energy to the world. These scientific and technological innovations and demon-

stration projects have not only injected new impetus into Geely Auto's development but also provided experience and models for the entire industry to learn from.

4.4 Comparison with European and American enterprises in carbon reduction

4.4.1 Tesla's Green Supply Chain Management

Tesla has taken some steps in green supply chain management, especially in green production. For example, Tesla's Shanghai Gigafactory, through refined management and technology-driven process innovation, recycles 90 percent of the waste generated in the production process, reduces greenhouse gas emissions by 30 percent during bicycle manufacturing, and reduces water consumption by 15 percent during bicycle manufacturing. In addition, Tesla has implemented a policy of 100% recycling of end-of-life lithium-ion batteries and has recovered and reused 300 metric tons of lithium in 2022. However, Tesla also has some problems in China's green supply chain management, such as some suspected suppliers have a record of environmental violations, and Tesla has not actively promoted the rectification of these suppliers.

4.4.2 Geely Auto's green supply chain management

Geely Auto has adopted the practice of full-link carbon reduction in green supply chain management. From design to research and development, from manufacturing to product delivery to scrap recycling, Geely Auto has comprehensively deepened the implementation of full-link carbon neutrality. Geely Auto has also established a supply chain sustainable development system, developed low-carbon materials, and plans to use recycled materials in its models to reduce carbon emissions from bicycles through recycling materials and power battery emission reduction. Geely Auto also tracks and manages the carbon emissions of vehicles, power batteries, and the entire supply chain through its digital carbon management platform.

4.4.3 Comparative analysis

Both Tesla and Geely Auto have achieved certain results in green supply chain management, but Tesla is more passive in pushing suppliers to rectify environmental violations, while Geely Auto is more active in cooperating with suppliers to jointly promote the construction of green supply chains. Tesla is more prominent in green innovation on the product side, such as battery recycling, while Geely Auto has done more work on carbon reduction of the whole industrial chain, including carbon footprint accounting and management of the supply chain. Both companies have their advantages and areas for improvement in green supply chain management, but the common goal is to promote the sustainable development of the entire industry.

5. Problems and challenges faced by Geely Auto's green supply chain management

5.1 The pressure of technological innovation

The implementation of green supply chain management needs the support of continuous technological innovation. However, at present, there are still many technical bottlenecks and problems in green materials, low-carbon technology, energy conservation, and emission reduction. Geely Auto needs to increase investment in research and development, strengthen cooperation with scientific research institutions, universities, and other units, and promote the breakthrough and application of key technologies.

5.2 Improvement of the management system

The implementation of green supply chain management needs to establish a sound management system, including green procurement standards, green production processes, green logistics systems, etc. However, at present, Geely Auto still has certain deficiencies in the improvement of the management system and needs to further strengthen the work in system construction, process optimization, and personnel training.

5.3 Coordination of supply chain partners

The implementation of green supply chain management requires the active participation and coordination of supply chain partners. However, due to the differences in environmental awareness, technical level, and management ability of different enterprises, it is more difficult to cooperate in the supply chain. Geely Auto needs to strengthen communication and cooperation with its supply chain partners to jointly promote the implementation and development of green supply chain management.

6. Optimization Suggestions for Geely Auto's Green Supply Chain Management

6.1 Strengthen technological innovation and R&D investment

Geely Auto should focus on reducing carbon emissions in its operations and improving production efficiency and energy use efficiency through technological innovation. This includes investing in more efficient production equipment, energy-saving technologies, and clean energy solutions such as solar and wind applications to reduce direct emissions. In response to indirect emissions generated from upstream and downstream activities in the supply chain,

Geely Auto should strengthen technological innovation cooperation with its supply chain partners to jointly research, develop, and promote low-carbon materials, clean energy technologies, and circular economy models to reduce carbon emissions throughout the supply chain.

6.2 Improve the green supply chain management system

Geely Auto shall further improve the green supply chain management system, including formulating more stringent green procurement standards, optimizing green production processes, and establishing a digital logistics management system. The green procurement standards, supplier evaluation system, and green logistics management system should be extended to the entire supply chain, requiring and helping suppliers to reduce carbon emissions, establishing a green supply chain traceability system, monitoring and reducing emissions of Scope 3.

6.3 Strengthen collaboration and cooperation among supply chain partners

Establish close cooperation with supply chain partners, jointly develop green supply chain management strategies and objectives, and achieve win-win results by signing green procurement contracts and sharing emission reduction technologies and experience. Promote the establishment of green supply chain alliances, jointly tackle environmental challenges with upstream and downstream enterprises, reduce carbon emissions in Scope 1 and Scope 3 through collective action, and enhance the green competitiveness of the entire supply chain.

6.4 Strengthen green brand building and marketing

Geely Auto's emission reduction achievements and green practices in Scope 1 and Scope 3 are integrated into the brand story, and consumers' awareness and recognition of green brands are enhanced through multi-channel communication. The environmental protection advantages of green products and Geely Auto's leadership in green supply chain management should be emphasized in marketing promotion to attract more consumers who are concerned about sustainable development. At the same time, participate in domestic and foreign green exhibitions and exchange activities, display the emission reduction results of Scope 1 and Scope 3, and enhance the visibility and influence of the company in the green field.

7. Conclusion

Geely Auto has achieved remarkable results in green supply chain management practices under the "dual carbon" background, providing valuable experience and reference for other Chinese enterprises. However, in the face of challenges such as the pressure of technological innovation, the improvement of the management system, and the collaboration of supply chain partners, Geely Auto still needs to continuously optimize and improve its green supply chain management level. Through measures such as strengthening technological innovation and R&D investment, improving the management system, strengthening the collaboration of supply chain partners, and strengthening green brand building and marketing, Geely Auto will further enhance its competitiveness and influence in the field of green supply chain management, and contribute more to achieving the "dual carbon" goal and promoting the green transformation of the industry.

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