

Application and Impact Analysis of ESG Practices in the New Energy Electric Vehicle Industry

Sasa Lyu

*Faculty of Business Administration, University of Macau, Macau, China
2206825075@qq.com*

Abstract. Under the global goals of carbon neutrality and sustainable development, the new energy vehicle (NEV) industry has become a key driver of transportation decarbonization. As China moves from a technology follower to a global leader, integrating Environmental, Social and Governance (ESG) principles into corporate strategy has become crucial for long-term competitiveness. This paper examines ESG practices in the NEV industry through case studies of BYD and Tesla. Results show that BYD perform strongly in battery recycling and carbon reduction, while Tesla leads in environmental innovation but faces challenges in social responsibility and governance transparency. Overall, ESG has evolved from a social responsibility concept into a strategic tool for sustainable competitiveness. Although China's NEV industry outperforms the A-share average in ESG performance, it still lags in pollution control and community engagement. Future progress depends on technological innovation, institutional improvement, and supply chain collaboration to promote high-quality and sustainable industry development.

Keywords: ESG, New Energy Vehicles, Sustainability, BYD, Tesla

1. Introduction

The global climatic changes are gaining severity with every passing day, and the new energy industry has become a major force in low-carbon economic development. New energy vehicles have been taken as the core decarbonization driver of the transport sector under a global carbon neutrality and sustainability agenda and as China's industrial upgrading and main battleground area enhancement of international competitiveness. China's new energy vehicle industry has experienced three transformative phases. Technology layout phase from the 1990s to 2008 (the "863 Program" establishes the "Three Verticals and Three Horizontals" roadmap), policy-driven phase between 2009 and 2019 ("Ten Cities, Thousand Vehicles" launch and "Double Credit" policy accelerate industrialization-in fact, China becomes a global leader in NEV sales since 2015), and now current global leadership phase exports more than 1.2 million units in 2023-the highest worldwide-and includes battery core technology(CATL's CTP, BYD's Blade Battery) intelligent system core technology(lidar, city NOA) plus beginning success at brand premiumization(YangwangU8,NIO ET7).

According to the International Energy Agency (IEA), global EV sales surpassed 17 million units in 2024, accounting for over 20% of total vehicle sales. The 3.5 million EVs sold in 2024 alone

exceeded the entire global EV sales volume of 2020, nearly tripling within three years and demonstrating exponential growth. Amid this transformative wave, China's new energy vehicle industry has achieved leapfrog development—transitioning from catching up to leading the pack—by evolving from initial technology introduction and policy guidance to market-driven innovation leadership [1].

As the industry matures, ESG factors have evolved into key metrics for evaluating a company's overall strength and long-term competitiveness, greatly impacting its social reputation and brand value. Government support and policies, such as purchase subsidies and tax exemptions, have propelled China to the forefront of the new energy vehicle market. The 2023 subsidy withdrawal poses challenges, increasing uncertainty.

2. The theoretical foundation of ESG

ESG (Environmental, Social, and Governance) is a framework for evaluating a company's non-financial performance. It assesses a company's capacity for long-term, sustainable development across three dimensions: environmental impact, social responsibility, and corporate governance.

Unlike traditional CSR, which emphasizes "whether charitable activities were undertaken," ESG centers on "whether operational risks can be mitigated and long-term value enhanced." It is not merely an extension of "corporate social responsibility" but has evolved into a tool investors use to assess whether a company possesses sustainable, risk-controlled operational capabilities.

Within the environmental dimension, key metrics include corporate emissions, energy consumption, recycling practices, and the impacts on the product lifecycle. Social metrics focus on labor safety, human rights, supply chain stability, and community impact, while governance metrics emphasize board structure, disclosure practices, and compliance with regulations. These three pillars are not merely "moral expectations" but are viewed as tangible variables determining a company's future stability—avoiding fines, weathering reputational crises, reducing supply disruptions and legal risks—all fundamentally protect the company's future cash flow.

ESG's significance in corporate operations manifests through three primary impacts: First, its effect on financing and capital costs. Investment institutions increasingly incorporate ESG as a screening criterion. Companies with higher ratings typically secure funding more readily at lower costs, while those with poor ESG performance risk being labeled high-risk by capital markets. Second, it impacts operational and compliance risks. Issues like high carbon emissions, frequent accidents, or governance chaos often lead to fines, shutdowns, or reputational crises. ESG oversight serves as "proactive risk management," enhancing a company's resilience in the face of unexpected events. Third, the impact on market access and competitive dynamics. Increasingly, multinational supply chains mandate ESG as an entry requirement. Companies that fail to meet disclosure and audit standards for emissions, labour safety, or governance may be excluded from markets—even if they have cost advantages.

Collectively, ESG is not merely an external "evaluation rhetoric" but an operational constraint driven by capital and regulatory logic. It compels companies to look beyond immediate profits and proactively address risks that could erode future value—a key reason ESG has become integral to corporate research and investment decisions.

3. Application of ESG in the new energy vehicle industry

In new energy vehicle sustainable development, the Environmental (E) aspect of ESG prioritizes a low-carbon, closed-loop lifecycle. Power batteries, key to electric vehicle carbon footprint, account

for 40% of manufacturing emissions. Standardized disposal of end-of-life batteries is a major challenge. CATL recycled 130,000 tons of waste batteries in 2024, yielding 17,000 tons of lithium salts, repurposing $\geq 80\%$ capacity batteries into energy storage. BYD powered Hangzhou Asian Games venues with its tiered energy storage from the Foshan factory, serving 2,000 households weekly. AI visual recognition and robotic disassembly achieve 99.3% metal recovery. The Xiangyang facility will enhance lithium, cobalt, and nickel purity to 99.2% and 99.9% via pulsed vacuum metallurgy, with zero wastewater discharge. Industry recycling aligns with State Council policy, projecting a global power battery recycling market of 189.5 billion yuan by 2030, growing at a 33% compound annual growth rate. Full-chain carbon reduction is critical: Geely targets a 42% emissions reduction by 2030 compared to 2023, with its Shenzhen factory generating 120 million kWh annually via photovoltaic power. BYD's Brazilian factory meets 40% of electricity needs with 52,000 solar panels, cutting annual emissions by 32,000 tons. Companies optimize product carbon footprints technologically; the BYD Haise 07EV achieved a five-star C-GCAP certification, with 15% lower energy consumption per 100 kilometers than the industry average.

Practices in the Social (S) dimension focus on supply chain responsibility and public value creation, serving as a crucial pillar for ESG implementation in the new energy vehicle industry. Given the sector's heavy reliance on mineral resources, sustainable supply chain management has a direct impact on ESG outcomes. CATL has established the "CATL Carbon Chain" system to enable full traceability of raw materials, while BYD has signed "Green Cooperation Agreements" with core suppliers, mandating 100% green electricity usage by 2027. Currently, 50% of suppliers meet this standard, effectively circumventing green trade barriers, such as the EU's new Battery Regulation, which requires exported batteries to carry a "battery passport" documenting complete lifecycle data starting in 2027. At the public value level, companies integrate social responsibility into their products and services. BYD's second-generation batteries utilize lithium iron phosphate technology, enabling the production of "lead-free vehicles" across over 2 million cumulative models while expanding charging infrastructure to underserved areas. By 2024, its new energy vehicles had accumulated 150 billion kilometres of driving, equivalent to planting 504 million trees for carbon sequestration. Geely reduces urban travel volume through its "new energy + shared mobility" model while continuously investing in product safety and health. It has established an end-to-end quality control system and utilizes low-allergenic materials in vehicle interiors, striking a balance between user experience and social value.

Enhancing governance (G) provides the institutional foundation for ESG implementation, directly impacting the core competitiveness of new energy vehicle manufacturers. Leading companies are establishing systematic ESG governance frameworks. Geely has established a cross-departmental carbon neutrality task force and incorporated carbon reduction targets into its board performance evaluations, ensuring a deep alignment between its ESG strategy and corporate development. Regarding information disclosure, the quality of industry ESG reporting continues to improve. Among the 2024 ESG Top 50 companies, over one-third achieved an A rating, with a product management dimension score of 69.2—exceeding the CSI 300 average. This provides transparent ESG performance benchmarks for investors and regulators. Simultaneously, ESG practices foster positive interactions between enterprises, policy, and capital: green finance initiatives support projects like battery recycling with preferential credit access and reduced financing costs. Companies with higher ESG ratings, such as CATL, gain capital recognition by transforming into energy circularity service providers, achieving valuation premiums and delivering significantly superior long-term returns compared to their peers.

Although the current average ESG score (56.65 points) in the new energy vehicle sector exceeds the A-share market average, it still lags behind the CSI 300 (66.05 points), indicating room for improvement in areas like pollutant emission control and community responsibility fulfillment. Future industry breakthroughs in deepening ESG application require three dimensions: institutional innovation to overcome structural bottlenecks in battery recycling systems, technological breakthroughs to reduce material regeneration costs, and supply chain collaboration to achieve full-chain carbon reduction. Ultimately, this will transform ESG into a core competitive advantage globally, propelling the new energy vehicle industry from "scale expansion" to "sustainable high-quality development."

4. BYD

BYD's 2024 sustainability goals include a 50% reduction in operational carbon emissions intensity by 2030, and carbon neutrality across the entire value chain by 2045. In 2024, BYD's new energy vehicles exceeded 150 billion kilometers, equivalent to planting 504 million trees. Over 410 energy-saving projects saved the equivalent of 210,000 tons of CO₂ emissions. An investment of RMB 1.41 billion ensured 100% compliance with pollutant discharge standards.

Environmental performance is a critical ESG disclosure metric that positively impacts corporate value. Disclosed ecological data—including energy utilization rates, water conservation metrics, and energy efficiency indicators—directly impacts corporate costs and indirectly influences enterprise value. In its 2023 Social Responsibility Report, BYD prioritized environmental disclosures, focusing on energy management, water resource stewardship, and waste treatment. For its 2023 greenhouse gas emissions assessment, BYD strictly adhered to environmental regulations, including the Environmental Protection Law of the People's Republic of China and the Air Pollution Prevention and Control Law of the People's Republic of China. As an environmental advocate, BYD regularly conducts comprehensive verification of its greenhouse gas emissions data. It commissions third-party institutions to perform validation and calculation in accordance with the Shenzhen Municipal Government's Guidelines for Verification of Organizational Greenhouse Gas Emissions. The calculation results are presented in Table 1. The formula used is $E=Q \times EF$ (E: Carbon dioxide emissions; Q: Electricity purchased/Natural gas consumed/Gasoline consumed/Diesel consumed; EF: Emission factor).

Table 1. The evaluation of greenhouse gas emissions in 2023

Category	Measuring unit	2023
Greenhouse Gas Emissions of Scope 1 (Carbon Dioxide Equivalence)	Tonne	931,916
Greenhouse Gas Emissions of Scope 2 (Carbon Dioxide Equivalence)	Tonne	11,409,539
Total Amount of Greenhouse Gas Emission (Carbon Dioxide Equivalence)	Tonne	12,341,455
Density of Greenhouse Gas Emission	Tonne/Turnover of Ten Thousand Yuan	0.20490

BYD's environmental investments, exceeding RMB 1.2 billion in 2023, focus on waste reduction via technology and assessment improvements. The company achieved 100% compliance in pollutant emissions (wastewater, exhaust gases, noise) through categorized solid waste management and packaging reuse. Wastewater and exhaust gas are managed with tailored treatment solutions,

ensuring regulatory compliance. Noise reduction is achieved through technological upgrades to auxiliary facilities and implementation of sound insulation measures [2].

BYD champions sustainable innovation in new energy vehicles via battery recycling, cascading utilization, and public transit electrification. Taizhou Fudi Battery Co., Ltd., est. April 2022, specializes in battery production and recycling, prioritizing cascading utilization to extend battery lifespan, cut waste, and diminish reliance on raw materials like nickel. BYD also leads public transit electrification, mitigating urban air pollution and emissions from diesel buses. The company globally implements rail, taxi, and e-bus solutions, partnering with policymakers and operators. These initiatives effectively reduce carbon emissions, lower operational costs, and improve air quality—aligning with the United Nations Sustainable Development Goals (SDGs) [3].

BYD's 2024 sustainability efforts included RMB 29.965 million in charitable donations, highlighted by a RMB 3 billion education fund focusing on scholarships and NEV tech education. Support was extended to vulnerable populations, notably through the "BYD Great Love and Sincerity Aid Program," which aided 34 children with cerebral palsy across four cities in 2024, and has cumulatively assisted 1,067 children, enhancing both rehabilitation and public awareness.

By 2024, BYD employed 968,872 individuals, emphasizing employee development with 57,800 personnel trained internally. The company's zero-cost employee stock ownership plan exceeded RMB 1.8 billion, benefiting nearly 12,000 employees. Recognized as a top employer, BYD implements a stock repurchase plan, unlocking shares annually based on performance targets. BYD enhances employee welfare by addressing housing, transportation, education, and healthcare needs, supported by the BYD Medical Fund and comprehensive wellness checkups. Collaborations with schools, including Shenzhen Yadi School, aid in children's education, improving employee satisfaction and stability.

5. Tesla

Tesla demonstrates strong environmental performance but relatively weaker social and corporate governance practices [4].

Regarding the environment, Tesla announced in April 2024 the construction of a new large-scale battery facility in Shanghai's Lingang Free Trade Zone. This facility will produce Megapacks—large-scale commercial electrochemical energy storage systems, essentially "giant power banks." This storage capacity approaches 40 gigawatt-hours, equivalent to the annual electricity consumption of 13,000 households or 40 medium-sized factories. Individually, each Megapack unit stores 3.9 megawatt-hours with an inverter power rating of 1.5 megawatts. A single Megapack can fully charge 65 Model 3 vehicles.

Tesla's mission to expedite the global transition to sustainable energy is realized through electric vehicles, solar products, and energy storage, implementing carbon management across the product lifecycle. Its vertically integrated model and the Shanghai Gigafactory's efficiencies lower energy consumption per vehicle. Localized supply chains and supplier ESG adherence enhance sustainability and transparency. Battery recycling and rare earth alternatives are explored to reduce resource consumption. An advanced data management system, leveraging vehicle and energy product data, informs emission reduction strategies and precise carbon accounting. Tesla's Supercharger network achieved 100% renewable energy by 2022, supporting zero-carbon transportation infrastructure.

Socially, Tesla offers competitive compensation and diverse training programs to foster employee growth [5]. However, previous reports of prolonged, high-intensity workloads at its factories sparked controversy over workplace conditions. Although subsequent process optimizations and

increased rest periods were implemented, the company's image remains impacted. In philanthropy, Tesla actively engages in education by donating equipment and hosting lectures to foster student interest in electric vehicles. It participates in environmental conservation through afforestation around its factories. Nevertheless, construction and operations at certain facilities have disrupted local ecosystems, drawing criticism from residents and environmental groups.

Regarding corporate governance, Tesla's board integrates ESG strategy into long-term planning, considering environmental, social, and governance factors in decision-making [6]. A dedicated team advances ESG initiatives, and the company regularly publishes ESG reports disclosing progress and challenges—a commendable level of transparency. Nevertheless, some investors and experts question the independence of its governance structure. Concerns persist that management decisions may prioritise commercial interests—such as capacity expansion and market share competition—at the expense of environmental and social responsibilities in the pursuit of profits.

6. Conclusion

Amid global "dual carbon" goals and sustainable development, the new energy vehicle industry has emerged as a core force in decarbonizing transportation. China has notably transitioned from catching up to leading the world, dominating global sales, mastering core technologies such as power batteries and intelligent systems, and driving brand upgrades.

ESG is now vital for industry competition, influencing the entire product lifecycle. Environmentally, companies such as BYD and Tesla prioritize battery recycling, decarbonization, and energy efficiency. Socially, supply chain responsibility and public value creation are key. Governance relies on transparent frameworks and ESG reporting. While BYD excels across ESG metrics, including carbon neutrality goals and employee welfare, Tesla leads in environmental areas but lags in social responsibility and governance.

Overall, while the new energy vehicle sector's ESG performance exceeds the A-share market average, it still lags behind benchmarks like the CSI 300 Index, with room for improvement in pollution control and community responsibility. Moving forward, technological breakthroughs (such as reducing material recycling costs), supply chain collaboration, and institutional innovation will be key drivers of progress. These will empower companies to transform ESG into core competitiveness, propelling the industry's transition from scale expansion to high-quality, sustainable development.

References

- [1] IEA. (2025). Trends in electric car markets – Global EV Outlook 2025. IEA. <https://www.iea.org/reports/global-ev-outlook-2025/trends-in-electric-car-markets-2>
- [2] Zhang, J. (2024). ESG Information Disclosure in China's New Energy Vehicle Industry: A Case Study of BYD. In SHS Web of Conferences (Vol. 208, p. 02012). EDP Sciences.
- [3] Guo, Y. (2025). The Impact of ESG on New Energy Vehicle Companies. In SHS Web of Conferences (Vol. 218, p. 01011). EDP Sciences.
- [4] JINSHUO, L. (2024). A STUDY OF THE FACTORS INFLUENCING CORPORATE PERFORMANCE FROM AN ENVIRONMENTAL PERSPECTIVE: A CASE STUDY OF TESLA, INC (Doctoral dissertation, SIAM UNIVERSITY).
- [5] Chen, Y. (2023). The Influence of Human Resource Management on Enterprise Benefits. *Journal of Education, Humanities and Social Sciences*, 23, 708-714.
- [6] Oladele, O. K. (2025). The Influence of Strategic Management on Sustainable Business Development.