Proceedings of CONF-MCEE 2026 Symposium: Geomaterials and Environmental Engineering
DOI: 10.54254/2755-2721/2026.MH30524

Carbon Market Expansion and the Low-Carbon Transition of China's Automotive Industry

Shuo Wang

School of Civil Engineering, Sichuan Agricultural University, Chengdu, China
han29re@gmail.com

Abstract. Dealing with climate change is a serious issue for humanity in this century. China is a developing country with a large population and industrial industries, so it has an inescapable responsibility in the face of this issue. Therefore, its government has specifically introduced relevant policies to address this problem; thus, the Chinese Carbon Emission Trading Exchange (CCETE) was established. Therefore, the automotive industry will face dual emission reduction pressures from the market and policies. However, there is a lack of relevant research, and it is urgent to fill the gap. This article takes CCETE as the starting point, analyzes its impact on the automotive industry, and, based on relevant policies, explores the indirect effects of carbon markets through policy transmission, supply chain costs, and changes in market demand. It looks forward to the direct costs and transformation pressures brought about by the inclusion of quota management in commercial vehicles and manufacturing processes after expansion. In addition, this article reveals pathways such as carbon price fluctuations, evaluates the differential impact on traditional automakers and New Energy Vehicle (NEV) enterprises, and proposes a strategic path to achieve low-carbon transformation using green finance and reputation incentives. Research and interpret relevant market rules, analyze the transmission effect of carbon constraints in upstream industries, and sort out policy overlay constraints. The conclusion shows that the carbon market will drive up costs and force the greening of supply chains, and companies need to lay out low-carbon technologies in advance.

Keywords: China Carbon Emission Trading Exchange (CCETE), Automotive Industry, Low-Carbon Transformation

1. Introduction

Climate change is a major global challenge facing humanity today. With the 21st United Nations Climate Change Conference underway, the international community is calling for strong action from major emitters. Since entering the new century, China has been actively responding to and cooperating in solving environmental problems. China's proposal of emission reduction targets is an important measure of its participation in building a community with a shared future for mankind

In 2011, China launched its twelfth Five-Year Plan (Develop a national development plan with a five-year timeframe as a period) and decided to establish a carbon emissions trading market, and seven developed Chinese cities, including Beijing and Shanghai, were selected as policy pilots to

© 2026 The Authors. This is an open access article distributed under the terms of the Creative Commons Attribution License 4.0 (https://creativecommons.org/licenses/by/4.0/).

DOI: 10.54254/2755-2721/2026.MH30524

establish carbon dioxide trading markets [1]. In December 2017, relevant departments in China issued the National Carbon Emission Trading Market Construction Plan (Power Generation Industry [2]. This means that China has officially launched the above-mentioned plan. This article analyzes the impact of policies related to this goal on electric vehicle enterprises operating in China through research and interpretation, and provides relevant suggestions for enterprise decision-making for reference.

2. Policy interpretation

2.1. Interpretation of trading rules in carbon rights trading market

The environmental issues mentioned earlier are based on a policy driven by real market about greenhouse gas. The government sets the total amount of carbon emissions reduction, issues quotas, and establishes a trading market. If a company exceeds its emissions, it needs to purchase additional quotas. If its actual emissions are lower than the obtained quotas, it can sell the excess quotas to obtain profits. From the effect of pilot provinces, this policy can effectively promote carbon reduction (including reducing carbon emissions, improving carbon emission efficiency, strengthening carbon emission intensity, etc.), among which carbon emission efficiency is a key indicator of the synergy between economy and environment, emphasizing the achievement of economic output increase and carbon emission reduction under constant input [3]. The Chinese government issued relevant regulations on market management on January 25, 2024, and decided to implement them from May 1 of that year. It clarifies the main links of carbon emissions trading and related activities, as well as the legal responsibilities of each party and strengthens the relevant provisions on legal supervision and management and imposes severe punishment on illegal and irregular behaviors [4].

2.1.1. Mandatory emission quota trading

Mandatory emission quota trading can be divided into three main stages, namely quota issuance stage, quota trading stage, and fund settlement stage. In the mandatory emission quota trading system, the government first sets emission targets and then distributes them to market entities such as enterprises in the form of quotas. Carbon emitting units offset their actual emissions with government quotas during the carbon emission cycle. If the quota is greater than the actual emissions, the surplus quota can be sold. If the quota is insufficient, they need to purchase emission quotas from quota buyers. Figure 1 is a schematic diagram of the mandatory emission quota trading process.

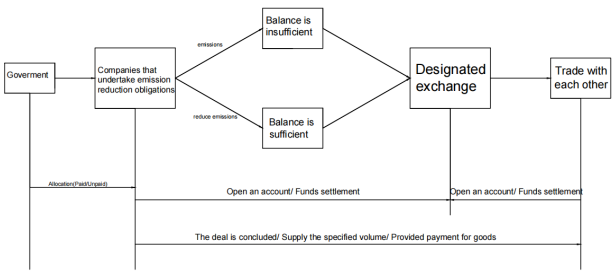

Figure 1. Schematic diagram of the mandatory emission quota trading process (photo/picture credit: original)

DOI: 10.54254/2755-2721/2026.MH30524

2.1.2. China Certified Emission Reduction

China Certified Emission Reduction (CCER) refers to the voluntary emission reductions recognized by the country, as well as other types of voluntary emission reductions (VERs) issued by international organizations and regions. Taking CCER as an example, there are four stages: project development stage, project registration stage, emission reduction issuance stage, and emission reduction trading stage.

Simply put, a company applies for registration after developing a voluntary emission reduction project, and after approval, the authorized institution conducts emission reduction effect testing on it within a certain period. After technical approval, the voluntary emission reduction is issued for subsequent trading. Figure 2 shows the schematic diagram of the voluntary emission reduction trading process.

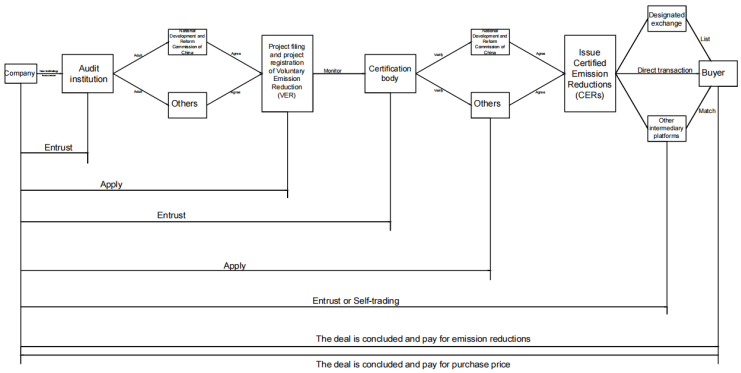

Figure 2. Schematic diagram of the voluntary emission reduction trading process (photo/picture credit: original)

2.2. Interpretation of carbon rights trading market policies

The implementation of this policy is the core tool for China to achieve environmental protection goals, which incentivizes enterprises to reduce emissions and optimize resource allocation through market-oriented mechanisms, which incentivizes enterprises to reduce emissions and optimize resource allocation through market-oriented mechanisms.

China's carbon market opened on July 16, 2021, with the first batch covering the power industry and approximately 2162 enterprises, involving 4.5 billion tons of carbon dioxide emissions, accounting for about 40% of the country's emissions [5]. The policy system is centered around the Measures for Carbon Emission Trading (Trial), which clarifies quota allocation, trading rules, verification, and punishment. Enterprises receive free quotas. Based on historical emissions or industry benchmarks, excess emissions require the purchase of quotas, while emissions reductions can be sold through platforms such as the Shanghai Environment and Energy Exchange [6]. The first performance cycle (as of the end of 2021) lasted for 114 trading days, with a performance rate of 99.5%. The cumulative trading volume was about 179 million tons, and the trading volume exceeded 7.661 billion yuan. The carbon price remained stable in the range of 40-60 yuan/ton, with an overall stability and upward trend [7].

DOI: 10.54254/2755-2721/2026.MH30524

3. The correlation between China's Carbon Emission Trading Exchange (CCETE) and the automotive industry

3.1. The pattern of automobile manufacturers operating in China

China has a huge automobile consumption market that cannot be compared to any other country in the world. Under the existing market structure, the main competitors can be divided into three categories: domestic brands, joint venture brands, and imported brands. As cities promote the development of New Energy Vehicles (NEVs), the NEV industry has gradually developed. In the past decade, increased car-making forces have sprung up like mushrooms after rain. Combining with the focus of this article, automobile companies are classified according to their business scope, that is, companies that mainly produce traditional energy vehicles and new energy vehicle companies.

3.2. Correlation

China's environmental policies require clear emission reduction targets for relevant enterprises. Although the current national carbon market mainly covers some companies whose operations can cause serious pollution such as electricity, and the automotive companies has not yet been fully included, the policy signal is clear that the automotive companies, may be included in the market or face similar carbon constraint mechanisms in the future. For example, the 2024 government work report proposes to expand the coverage of the national carbon market industry, and proposals related to the automotive industry have been discussed, indicating the possibility of its gradual inclusion. At the same time, as the power industry is upstream of the automotive industry, the impact of carbon emission rights on the power industry will indirectly affect the automotive industry.

3.3. 1+N Policy System

The 1+N Policy System is a top-level policy framework developed by China to achieve its environmental goals, where 1 refers to the core guidance document, which clarifies the overall goal, timetable, and roadmap for carbon peaking. N represents a series of supporting policy documents covering specific implementation plans in different fields, industries, and regions to ensure the implementation of dual carbon targets. For the automotive industry, the 1+N policy system clarifies the goals of promoting new energy vehicles, low-carbon commercial vehicles, and green transformation of the supply chain through various documents. Overall, the 1+N system provides clear policy guidance and incentive mechanisms for various fields, including the automotive industry, through coordinated planning and layered implementation, ensuring the achievement of the dual carbon goals.

4. The impact of CCETE pilot on automotive enterprises

4.1. Indirect effects

The indirect impact of the carbon market has a significant effect on the automotive industry through policy transmission, supply chain pressure, and market environment changes. Firstly, the operation of the CO2 exchange has strengthened the guidance of national emission reduction policies,the automotive industry is facing increasingly strict low-carbon regulatory requirements. Although they have not yet directly participated in carbon trading, automobile companies need to respond to the 1+N policy system and the guidance of the Ministry of Industry and Information Technology on

DOI: 10.54254/2755-2721/2026.MH30524

carbon footprint accounting for new energy vehicles. For example, the 2024 Chinese government work report clearly proposes to expand the coverage of the carbon market industry, and proposals related to the automotive industry have been discussed, prompting car companies to lay out emission reduction technologies in advance to cope with possible compliance costs in the future. Secondly, automobile manufacturing relies on high emission materials such as steel and aluminum, and some of these upstream industries have been included in the carbon market. The carbon trading system has played a positive role in reducing corporate carbon emissions while also pushing up compliance costs [8]. Due to quota restrictions, production costs have increased.

The expansion of the carbon emissions trading exchange will seriously affect small and medium-sized steel mills. The rollout of carbon monitoring and emissions trading schemes will curb steel output, resulting in reduced production volumes and higher vehicle prices [9]. At the current stage, higher compliance costs may hinder the improvement of green innovation efficiency in upstream automotive enterprises.

In addition, scholars such as Li analyzed existing data by fitting a new energy vehicle trading selection model under the emissions trading system. Research indicates that the functioning of the carbon market has heightened the environmental consciousness of the public and consumers. and market demand is gradually tilting towards low-emission products such as new energy vehicles and hydrogen vehicles [10]. Research has found that the market share of products marketed under the label of sustainable development is constantly expanding, reaching 16.1%, with a market growth rate of 7% compared to other products 1 times [11].

4.2. Direct impact

In terms of direct impact, although the current carbon trading market only restricts high carbon industries and the automotive industry has not yet been fully integrated into the national carbon market, some sub-industries and links have begun to establish direct connections with the carbon trading system. Before the carbon market covered the automotive industry market, China adopted a dual credit policy. This policy stipulates that automobile manufacturers need to meet specific standards for corporate average fuel consumption, credits (CAFC credits), and new energy vehicle credits (NEV credits). If a company fails to meet the credit requirements, it must purchase credits from other companies to fill the gap, known as the dual credit policy [12]. This policy aims to promote the rapid development of the new energy vehicle industry, while also overcoming the drawbacks of industry support policies such as dependence on enterprise subsidies and government financial pressure, and further optimizing the structure of the new energy vehicle industry [13,14]. Automobile companies produce new energy vehicles to earn carbon credits, while producing traditional energy vehicles consumes carbon credits. They use economic leverage to incentivize companies to actively reduce emissions to achieve indirect emissions reduction.

The national carbon market is expected to gradually cover more high-emission industries between 2025 and 2030, and the automotive industry (especially commercial vehicles and manufacturing) may be included in the quota management system. At that time, some Chinese car companies will face dual policy constraints of carbon emissions and carbon credits, namely the carbon cost generated by emitting carbon dioxide in the car production process and the credit cost generated by producing traditional energy vehicles. Chinese traditional fuel car companies will also face higher transformation pressure while facing carbon tax barriers. Scholar Jiang Xiaoli has confirmed through the establishment of mathematical models that factors such as transformation pressure will directly affect the decision-making of car companies in competition. For example, to balance policy and market demand, it is necessary to appropriately reduce the production of fuel

DOI: 10.54254/2755-2721/2026.MH30524

vehicles to cope with downward pressure on prices and increase investment in new energy vehicles [15]. At the same time, some new energy vehicle companies will also face carbon costs arising from the improvement of the carbon trading market, which will further constrain the emissions during the production process of new energy vehicle products. At the same time, green financial tools promoted by the carbon market, such as carbon bonds and green loans, can be utilized to obtain financial support for low-carbon technology investment.

In addition, the expansion of the carbon market is a motivation for automotive companies to enhance their good reputation. The amount of carbon emissions is a green signal for both automobile companies and society, attracting investors' attention. Automobile companies with higher emission reductions are considered to better fulfill their social responsibilities. As mentioned earlier by scholars such as Li, under this incentive, companies may increase investment to adopt various low-carbon methods for production and operation, continuously improving their reputation and brand effect [10].

5. Conclusion

Under the dual influence of policy and market changes, Chinese automotive companies will face unprecedented strategic choices. This article explains the rules of China's carbon emissions trading market through the interpretation of relevant policy documents issued by the Chinese government, aiming to clarify the government's intentions and provide automotive companies with clearer policy guidance; At the same time, the academic views of various scholars on the carbon market were summarized, and the impact of the coverage of China's carbon trading market on Chinese automotive companies was analyzed. Based on the current situation, suggestions were made for the strategic deployment of automotive companies. The conclusions are as follows. Firstly, the carbon market will strengthen emission reduction policies in the future, and the automotive industry will face stricter regulations, requiring early deployment of emission reduction technologies. At the same time, the increase in upstream material costs will lead to an increase in automotive manufacturing costs. Secondly, market conditions drive automotive companies to develop new energy-related projects, but companies can use their green economy-related products to generate revenue, and their emission reduction performance will enhance their green reputation, attracting and incentivizing more market investment.

References

[1] People's Publishing House. (2010, October 8). Outline of the twelfth five year plan for national economic and social development of the People's Republic of China. Retrieved October 16, 2025, from https: //www.gov.cn/xinwen/201103/content_7044615.htm

[2] Ministry of Ecology and Environment of the People’s Republic of China. (2017, December 20). National carbon emission trading market construction plan (power generation industry). Retrieved October 16, 2025, from https: //www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/201904/P020190419528391772305.pdf

[3] He, Z., Cui, X., & Zhu, P. (2025). Carbon trading pilot policies, investment efficiency, and corporate carbon emission efficiency. Journal of Zhengzhou University of Light Industry and Technology (Social Sciences Edition), 1–9. Retrieved September 13, 2025, from https: //link.cnki.net/urlid/41.1460.C.20250902.1341.002

[4] Ministry of Ecology and Environment of the People’s Republic of China. (2024, July 21). National carbon market development report (2024). Retrieved October 16, 2025, from https: //www.mee.gov.cn/ywdt/xwfb/202407/t20240722_1082192.shtml

[5] Ministry of Ecology and Environment of the People’s Republic of China. (2021, December 31). The first national compliance cycle successfully ends. Retrieved November 12, 2025, from https: //www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202112/t20211231_965906.shtml

DOI: 10.54254/2755-2721/2026.MH30524

[6] Ministry of Ecology and Environment of the People's Republic of China. (2020, December 31). Management measures for carbon emission trading (trial). Retrieved October 16, 2025, from https://www.mee.gov.cn/gzk/gz/202112/t20211213_963865.shtml
[7] Ministry of Ecology and Environment of the People's Republic of China. (2023, January 1). Report on the first performance cycle of national carbon emission rights. Retrieved November 5, 2025, from https://www.mee.gov.cn/ywgz/ydqhbh/wsqtkz/202301/t20230101_1009228.shtml
[8] Hu, Y., & Ding, Y. (2020). Can the carbon emission trading mechanism balance enterprise efficiency and green efficiency? China Population, Resources and Environment, 30(03), 56–64.
[9] Liu, J. (2025). Research on the impact of carbon emission trading on enterprise performance (Master's thesis, Nanjing University of Information Science and Technology).
[10] Li, W., Li, Y., Dong, J., & Aruhan. (2023). Consumer choice behavior of new energy vehicles under carbon trading mechanism. Systems Engineering, 41(01), 15–26.
[11] Gu, M. (2024). Digitization+Green and low carbon achieving sustainable development of Chinese automobile enterprises. Shanghai Automotive, (07), 1–4.
[12] Sun, Y., Li, P., & Wang, H. (2024). Research on the impact mechanism of carbon trading policy on corporate reputation: A mediating effect test based on green innovation. Journal of Kunming University of Science and Technology (Natural Science Edition), 49(5), 170–184.
[13] Xiong, Y., & Qin, S. (2023). What kind of innovation has the new energy vehicle industry policy promoted? Science Research Management, 44(03), 102–111.
[14] Xu, X., & Chen, H. (2020). Exploring the innovation efficiency of new energy vehicle enterprises in China. Clean Technologies and Environmental Policy, 22(8), 1671–1685.
[15] Jiang, X. (2025). Research on product strategy selection and social welfare of automobile manufacturers under the dual credit policy (Master's thesis, Nanjing University of Information Science and Technology).