

Implementation Path of China's Green Economic Policies under the "Dual Carbon" Goals

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Abstract. The introduction of China's "dual carbon" goals-peaking carbon emissions by 2030 and achieving carbon neutrality by 2060-has marked a strategic shift towards a green and low-carbon development model. Green economic policies have become a fundamental support in this transition. Establishing clear and operable pathways for policy implementation is now a key issue in realizing the dual carbon vision. This paper takes green economic policy as its research focus and analyzes the institutional design and implementation pathways under the dual carbon framework. Beginning with the national "1+N" policy architecture, the study explores four major domains: energy structure adjustment, industrial upgrading, carbon market mechanisms, and the promotion of green lifestyles. By examining policy documents, regional and sectoral practices, and current challenges, the study reveals the systemic logic behind China's green transformation and identifies critical constraints in regional enforcement, technical capacity, and interest coordination. Based on these findings, the paper proposes several policy recommendations, including strengthening interregional collaboration, promoting technological breakthroughs, and improving market-based instruments. The analysis aims to enhance understanding of the governance logic underpinning China's green economy and offers theoretical and practical insights for supporting high-quality green development.

Keywords: dual carbon goals, green economy, policy implementation, carbon market, low-carbon transition.

1. Introduction

In recent years, as global climate change intensifies, green development has become a key direction for policy transformation in many countries. In 2020, China officially proposed the dual goals of "carbon peaking" and "carbon neutrality," aiming to peak carbon emissions before 2030 and achieve carbon neutrality before 2060. These goals represent not only a climate commitment, but also a systemic shift in the country's energy structure, industrial models, and policy frameworks. Against this backdrop, green economic policy has become a core tool for achieving the dual carbon targets. Its function goes beyond emission control-it serves as a guiding force to restructure the economy toward sustainability.

Green economic policy covers a wide range of domains, including energy use, industrial structure, technological innovation, financial services, and social behavior. Rather than a single

policy, it constitutes an integrated system that requires strong coordination and effective implementation. China has preliminarily established a green policy system encompassing various sectors. From renewable energy development to industrial upgrading, carbon trading mechanisms, and lifestyle changes, the policy framework has taken shape. The effectiveness of these policies will not only determine whether China's carbon goals can be achieved on time but will also influence the success of its green transformation at a strategic level.

Existing studies have explored various aspects of green policies under the dual carbon framework. Some scholars emphasize the role of digitalization in promoting corporate green transformation [1]. Research highlights the importance of regional legislative cooperation in emission reduction [2]. Some scholars focus on promoting low-carbon consumption among residents [3]. Some Chinese scholars analyze the impact of industrial carbon structure changes [4]. Some scholars provide a systematic overview of the challenges and opportunities faced by China in this process [5]. Other scholars have examined the effectiveness of carbon trading mechanisms, the role of green finance [6-8]. And the feasibility of carbon tax policies, offering rich theoretical and policy references for this research [9,10].

However, most studies concentrate on individual areas-energy, enterprise, finance, or regulation-while lacking a comprehensive analysis of the entire policy chain. Especially under the dual carbon framework, there remains a gap in understanding the connection between top-level design and practical implementation, as well as the translation of policy objectives into operational mechanisms. Therefore, this paper adopts a systems-based perspective to analyze the implementation pathways of China's green economic policies under the dual carbon goals. It integrates case studies across regions and industries to summarize key practices and offer feasible policy suggestions.

This paper is structured as follows: Section 2 introduces the overall policy framework and goal decomposition; Section 3 examines four major implementation paths-energy restructuring, industrial transformation, carbon market development, and green lifestyle promotion; Section 4 identifies key challenges in policy execution and proposes corresponding strategies; and the final section presents the conclusion and policy outlook.

2. Policy framework under the dual carbon goals

In advancing the dual carbon strategy, China has gradually developed a multi-level green policy system that spans government departments and industrial sectors. This system is structured from top-level strategic design to specific implementation plans, forming a relatively comprehensive framework to ensure that emission reduction targets can be effectively executed.

2.1. Top-level design: institutional coordination and policy arrangement

Following the announcement of the carbon peaking and carbon neutrality goals, the Chinese central government issued several key policy documents to clarify the direction and timeline of the national transition. Among them, the Action Plan for Reaching Carbon Peaking Before 2030 and the 14th Five-Year Plan for Modern Energy System Development are representative. These documents outline specific targets, timetables, and major tasks in sectors such as energy, industry, transportation, and buildings, providing concrete guidance for implementation at all levels.

To facilitate policy coordination and integration, the government has established the "1+N" institutional framework. In this structure, "1" refers to the central guiding document, while "N" denotes a set of supporting policies across various fields and regions, such as energy restructuring

plans, green industry guidelines, and green mobility action plans. This approach expands the policy's reach and promotes interdepartmental cooperation.

Moreover, mechanisms for oversight and support have also been progressively developed. For instance, the Ministry of Ecology and Environment has issued unified standards for greenhouse gas monitoring and verification. Meanwhile, financial authorities such as the Ministry of Finance and the People's Bank of China have introduced policies on green credit and carbon finance to provide funding support for green projects. These institutional arrangements help ensure that policies are both enforceable and aligned across different levels of government.

2.2. Goal decomposition: regional and sectoral differentiation

Considering China's vast geographic diversity, varying resource endowments, and uneven development levels, the formulation of green policies emphasizes a differentiated approach. At the regional level, more developed eastern provinces are encouraged to achieve carbon peaking earlier. For example, Shanghai and Guangdong have both announced detailed road maps for achieving peak emissions before 2030 and have initiated pilot projects such as zero-carbon industrial parks and near-zero-carbon communities. In contrast, western regions such as Inner Mongolia, Qinghai, and Gansu are focusing on developing large-scale renewable energy bases and transforming them into hubs for clean energy.

At the sectoral level, emission reduction efforts prioritize high-emission industries such as steel, cement, chemicals, and power generation. Policies promote both capacity replacement and technological upgrading. For instance, the steel industry is advancing the use of hydrogen-based steelmaking, while the cement sector is adopting clinker substitution and cleaner production techniques. These measures aim to reduce emissions intensity while enhancing energy efficiency.

To support localized implementation, many provinces have issued their own dual carbon action plans, with specific emission reduction timelines and intensity targets. For example, Beijing launched the "Ten Carbon Peaking Actions," Shandong is promoting a coordinated coal and renewables strategy, and Yunnan is leveraging its hydropower resources to build a green energy brand. These region-specific strategies demonstrate that the national policy is not uniformly applied but rather adapted to local conditions, thereby improving both feasibility and effectiveness.

3. Implementation pathways of green economic policies

To achieve the dual carbon goals, clear top-level planning must be matched with specific, operable implementation strategies. In practice, China's green economic transformation is primarily advancing through four key pathways: restructuring the energy system, promoting low-carbon industrial transformation, improving the carbon market mechanism, and encouraging green lifestyles. Together, these pathways form a relatively complete and evolving implementation framework.

3.1. Greening the energy structure: building a clean energy system

As energy production and consumption account for the majority of China's carbon emissions, adjusting the energy structure is a central task in green economic policy. The government is promoting both the expansion of renewable energy and the cleaner use of coal-fired power.

In terms of renewable energy, China has launched large-scale wind, solar, hydropower, and nuclear projects. Western provinces such as Gansu, Qinghai, and Xinjiang have constructed major

“wind-solar power bases,” leveraging their advantageous natural conditions. For example, the wind power base in Jiuquan, Gansu, has become one of the largest in the country. Large hydropower stations like the Three Gorges and Baihetan contribute stable electricity output, helping to balance the intermittency of wind and solar sources. Coastal provinces such as Guangdong and Zhejiang are also accelerating nuclear power development to support local demand.

Meanwhile, cleaner use of coal is still a necessary transitional strategy. Since coal remains the dominant energy source in the short term, the government has promoted ultra-low-emission retrofitting in coal-fired power plants. In Shandong, many plants have upgraded desulfurization, denitrification, and dust removal systems. Some have adopted Carbon Capture, Utilization, and Storage (CCUS) technologies. For instance, a project by Yankuang Group captures up to 100,000 tons of CO₂ annually, demonstrating the potential for emission reduction without eliminating coal use entirely.

3.2. Industrial low-carbon transition: promoting green upgrading

The industrial sector is a major source of carbon emissions in China, particularly in energy-intensive industries. Without substantial transformation, the country’s carbon targets cannot be achieved. Therefore, policies are targeting two directions: upgrading traditional industries and fostering emerging green industries.

For traditional sectors, steel, cement, and chemicals are focal points of green transformation. Baowu Steel Group, for instance, has applied hydrogen-based steelmaking technologies in multiple plants, replacing coal and reducing emissions. The building materials sector is adopting alternative raw materials and pursuing green certification programs. Policy tools such as the Industrial Green Development Plan and Energy Efficiency Improvement Plans guide enterprises in setting emission reduction goals and adopting advanced technologies.

At the same time, new green industries are receiving strong policy and financial support. Strategic sectors such as New Energy Vehicles (NEVs), green batteries, and environmental equipment are developing rapidly. Companies like BYD and CATL have emerged as global leaders, supported by favorable industrial policies. In 2023, China produced and sold over nine million NEVs, illustrating the growing momentum of green manufacturing.

In addition, the integration of digital technologies into green manufacturing is becoming more common. Many enterprises are adopting carbon emission monitoring systems and energy efficiency platforms to optimize resource use. This combination of “digital + green” provides more practical and scalable solutions for enterprise transformation.

3.3. Improving the carbon market: advancing market-based emission reduction

China launched its national carbon market in 2021, starting with the power generation sector and covering over 2,000 major emitters. The carbon market has since become the largest in the world by volume, playing an increasingly important role in the country’s emission reduction strategy.

Carbon allowances are allocated based on historical emissions and industry benchmarks. Enterprises that emit more than their quotas must purchase additional allowances through the market, while those with surplus can sell their excess. Trading platforms in Beijing and Shanghai offer various mechanisms including spot trading, futures, and China Certified Emission Reductions (CCERs), increasing both flexibility and market liquidity.

To enhance market efficiency, financial institutions have introduced a range of carbon finance products. Banks such as Industrial Bank have developed carbon pledge loans, green bonds, and

leasing services that allow enterprises to access funding based on their emission reduction performance. These innovations reduce financial pressure on companies while incentivizing greener practices.

As regulations mature, more high-emission sectors-such as cement, chemicals, and non-ferrous metals are expected to be integrated into the carbon market. This evolution is shifting carbon trading from a policy-mandated compliance system to a market-driven mechanism, increasing the overall efficiency of emission reductions.

3.4. Promoting green lifestyles: encouraging public participation

The success of green economic transition depends not only on governments and enterprises, but also on active public participation. Changing traditional consumption and lifestyle patterns is therefore a necessary component of policy implementation.

The government first leads by example in the public sector through green procurement. Administrative agencies prioritize environmentally friendly products when purchasing official vehicles and supplies, and during public building renovations. Cities like Beijing and Shenzhen have largely replaced conventional public buses with electric vehicles. Energy retrofitting of public buildings is also underway to improve overall efficiency.

On the residential side, local governments are promoting low-carbon behaviors through incentives and education. A notable example is the “Carbon Inclusive” platform in Shenzhen, which rewards residents for behaviors such as waste sorting, energy conservation, and green commuting. Accumulated carbon points can be redeemed for goods or services, encouraging sustained engagement.

Other cities are experimenting with similar mechanisms, including personal carbon accounts and community carbon budgets. These tools link individual actions with emission targets, making low-carbon living both achievable and rewarding.

4. Challenges and policy recommendations

While China’s green economic policy system has made significant progress under the dual carbon strategy, practical implementation still faces multiple challenges. These challenges are primarily concentrated in three areas: disparities in local implementation capacity, technical bottlenecks, and the difficulty of restructuring traditional industrial interests. Without effective responses, these issues may hinder the realization of national carbon goals. Accordingly, this chapter offers targeted policy recommendations based on a systematic analysis of these problems.

4.1. Key challenges

China’s vast regions vary significantly in terms of economic development, resource endowments, and industrial structures. These differences directly influence how local governments understand, interpret, and implement green policies. In general, eastern provinces benefit from stronger fiscal resources, technical expertise, and administrative capacity. As a result, they have made rapid progress in developing green industries, adopting renewable energy, and building low-carbon urban infrastructure.

In contrast, central and western regions, as well as the industrial northeast, face substantial barriers to implementation. These areas often lack sufficient financial resources, infrastructure, and skilled personnel. For example, the aging industrial bases in the northeast struggle with outdated

facilities and rigid industrial structures, making low-carbon transformation particularly challenging. Such regional disparities may delay national progress toward carbon peaking and increase the cost of overall policy coordination.

Green transformation relies heavily on technological advancement. However, several key low-carbon technologies remain underdeveloped or costly. For instance, although wind and solar power capacity has expanded rapidly, issues such as intermittency and grid integration persist. Energy storage technologies—such as battery storage and pumped hydro—are still expensive and not widely deployed at scale.

In the hydrogen sector, challenges related to hydrogen production, storage, and transportation continue to hinder its large-scale application. Similarly, CCUS technology, though piloted in some projects, is not yet cost-effective or mature enough for widespread use. These technological limitations constrain the depth and speed of emission reduction efforts.

The green transition inevitably affects the interests of traditional energy and high-emission industries. In regions heavily dependent on coal, oil, and heavy industry, local governments must balance carbon reduction goals with economic growth, employment stability, and fiscal revenue. For example, coal-rich provinces such as Shanxi and Inner Mongolia rely on resource-based revenues and face employment risks during the transition.

If insufficient support mechanisms are in place, local governments and enterprises may adopt a passive or resistant stance toward green transformation. This not only undermines national efforts but also risks social and economic instability in transition-affected regions.

4.2. Policy recommendations

To address uneven regional development, China should establish and expand ecological compensation mechanisms across regions. Central fiscal transfers, paired with interprovincial support and redistribution of ecological benefits, can help underdeveloped areas enhance their policy capacity. A notable example is the cross-regional compensation scheme between Zhejiang and Anhui in the Xin'an River Basin, which encourages upstream environmental protection while ensuring downstream development needs.

Moreover, local governments should be granted flexibility to develop region-specific carbon peaking timelines and implementation plans. A one-size-fits-all approach should be avoided. Differentiated, locally adapted policies will improve feasibility and execution efficiency.

Technology innovation is the cornerstone of a successful green transition. It is recommended that the central government increase investments in low-carbon R&D, focusing on areas such as energy storage, hydrogen production, advanced photovoltaic materials, smart grids, and CCUS. Enhanced collaboration between universities, research institutes, and enterprises should be encouraged through the establishment of national laboratories, pilot zones, and industrial application platforms.

Enterprises should also be incentivized to conduct real-world demonstrations of green technologies. Through policy instruments such as special funds, tax incentives, and knowledge-sharing mechanisms, the government can reduce the financial risks of innovation and accelerate technology deployment across sectors.

China's carbon market should expand its sectoral coverage to include cement, chemicals, and non-ferrous metals. A more flexible and transparent allowance allocation system will improve market liquidity and enhance the carbon price signal. At the same time, a multi-level green finance system should be developed, integrating green credit, bonds, insurance, and investment instruments to attract more private capital to green projects.

On the regulatory side, the government can introduce tools such as carbon performance evaluation and carbon budgeting to incorporate emission targets into performance appraisals for governments and enterprises. Additionally, to mitigate the social impact of industrial restructuring, the state should establish vocational retraining programs and reemployment support policies to help displaced workers transition into new roles within the green economy.

5. Conclusion

Under the guidance of China's dual carbon strategy, the country's green economic policy system is gradually taking shape and becoming more comprehensive. This paper has conducted a systematic analysis of the overall policy framework, implementation pathways, and key challenges associated with the green transition, aiming to clarify the logical structure and practical outcomes of policy execution.

Using a combination of policy analysis and case studies, the study presents a panoramic view of the green policy system under the dual carbon goals. The findings show that green economic policies serve as a core mechanism for realizing carbon peaking and neutrality. At the top-level design stage, the national "1+N" policy architecture provides a unified target framework and institutional foundation across major sectors such as energy, industry, transportation, and finance. At the implementation level, four pathways are being actively pursued: energy restructuring through the expansion of renewables and cleaner use of coal; industrial transformation via green upgrades and support for emerging sectors; development of a national carbon market to promote market-based emissions control; and advocacy for green lifestyles to encourage public participation in the transition.

Although initial progress has been achieved, several persistent challenges remain. These include disparities in local implementation capacity, technological constraints, and complex interest structures in traditional industries. To address these, the paper proposes three key strategies: establishing interregional ecological compensation mechanisms to support underdeveloped areas; accelerating the research and deployment of core low-carbon technologies; and improving carbon market design alongside the development of green finance instruments to stimulate broader participation from enterprises and society.

Green economy development is not only a pathway to carbon neutrality but also a foundation for high-quality economic growth. In the future, as policies become more refined, technologies continue to mature, and public environmental awareness deepens, China is expected to play a more active role in global green development. Ultimately, the green transition will entail a deep restructuring of governance systems and industrial models. Only by building a long-term, effective policy framework, a stable technological foundation, and a broad social consensus can the dual carbon goals be achieved in a steady and practical manner.

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