Further Reflections on Deepening the Strategic Transformation Pathway to Carbon Peak and Carbon Neutrality Postprint

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Abstract

The achievement of carbon peaking and carbon neutrality goals will trigger extensive and profound systemic transformations across the economic and social landscape. The "dual carbon" transformation pathway constitutes a systematic action roadmap driven by the integration of objectives, technologies, capital, policies, and multiple other factors. As societal understanding of "dual carbon" initiatives continues to deepen, China' s "dual carbon" endeavors face systemic challenges in comprehensive deepening and implementation. This article summarizes the new achievements in low-carbon transformation guided by "dual carbon" objectives and the "1+N" policy framework for dual carbon, analyzes the transformation requirements and challenges for achieving dual carbon goals, and proposes several recommendations for systematically advancing the deepening implementation of dual carbon targets across economic systems, energy systems, territorial spatial patterns, buildings and transportation, consumption patterns, technological innovation, financial systems, trade and supply chains, governance systems, and international cooperation.

Full Text

Preamble

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Title: Insights on Further Deepening Carbon Peaking and Carbon Neutrality Strategy and Pathways

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Abstract

Achieving carbon peaking and carbon neutrality goals will bring about extensive and profound systemic changes across the economy and society. The dual-carbon transition pathway represents a systematic action roadmap driven by integrated factors including targets, technologies, funding, and policies. As societal understanding of dual-carbon work continues to deepen, China' s dual-carbon efforts face the challenge of comprehensively advancing systematic implementation. This article summarizes the new achievements in low-carbon transition under the guidance of dual-carbon goals and the dual-carbon "1+N" policy framework, analyzes the transition requirements and challenges for achieving these goals, and proposes several recommendations for systematically promoting the deepening implementation of dual-carbon targets across economic systems, energy systems, territorial spatial patterns, buildings and transportation, consumption patterns, technological innovation, financial systems, trade and supply chains, governance systems, and international cooperation.

Keywords: carbon peaking, carbon neutrality, low-carbon transition, ecological civilization, green development

1. New Progress in Low-Carbon Transition Under Dual-Carbon Goal Guidance

1.1 Progress and Achievements of China' s Low-Carbon Transition

Under the guidance of dual-carbon goals, China' s low-carbon transition has achieved remarkable results. In 2022, the country' s carbon dioxide emissions per unit of GDP had cumulatively decreased by 51.2% compared to 2005 levels, while energy consumption per unit of GDP dropped by 26.5% compared to 2012. The proportion of non-fossil energy consumption reached 17.5% . By 2021, China' s forest coverage had reached 24.02%, with forest stock volume increasing by 5.79 billion cubic meters compared to 2005 . Notable achievements have also been made in green and low-carbon energy transformation. As the world' s largest energy consumer with demand still rising, China' s energy endowment of being "rich in coal, poor in oil, and scarce in gas" makes it difficult to fundamentally shift away from coal-dominated energy structure in the short term, increasing the difficulty of low-carbon transition. However, China has vigorously developed non-fossil energy in recent years, accelerating the pace of green and low-carbon energy transformation. The share of coal in primary energy consumption decreased from 72.4% in 2005 to 56.2% in 2022, while the

proportion of non-fossil energy rose from 7.4% in 2005 to 17.5% in 2022. In 2022, China' s renewable energy generation reached 2.7 trillion kilowatt-hours, equivalent to the European Union' s total electricity consumption in 2021 . Renewable energy installed capacity reached 1.213 billion kilowatts, ranking first in the world. In terms of energy consumption intensity, from 2012 to 2021, the average annual reduction in energy consumption per unit of GDP reached 3.3%, equivalent to saving approximately 1.4 billion tons of standard coal .

Low-carbon transition in industry, transportation, and buildings is also advancing in an orderly manner. In the industrial sector, industrial structure adjustment and comprehensive green and low-carbon transformation have achieved new accomplishments. In 2020, carbon dioxide emissions per unit of industrial added value decreased by approximately 22% compared to 2015. The added value of high-tech manufacturing accounted for 13.4% of industrial added value above designated size. Green and low-carbon industries such as wind power and photovoltaics have developed rapidly, with technological levels and manufacturing scale ranking among the world' s top positions. In 2022, China' s photovoltaic supply chain accounted for over 80% of global production across all segments, including polysilicon, wafers, cells, and modules . In the transportation sector, infrastructure and comprehensive transport structure have become significantly greener and more low-carbon. In 2022, new energy vehicle sales reached 6.887 million units, exceeding the combined sales of the European Union and the United States, with ownership exceeding 13.1 million vehicles—approximately half of the global total. In the building sector, energy efficiency and renewable energy utilization standards have been gradually improved, with green energy-efficient buildings experiencing leapfrog growth. By the end of 2022, energy-efficient buildings accounted for over 64% of urban civil building area, with new green buildings comprising approximately 90% of that year' s new construction, and cumulative green building floor area exceeding 10 billion square meters . In the circular economy sector, in 2021, the resource utilization rates of bulk solid waste, straw, and waste paper reached 56.8%, 88.1%, and 54.1%, respectively . Additionally, in agriculture, forestry, and ecological carbon sinks, China has actively promoted synergistic work between climate change response and ecological environmental protection, consolidating and enhancing ecosystem carbon sink capacity. In 2021, annual carbon sequestration by forest and grassland vegetation reached 349 million tons, absorbing 1.28 billion tons of CO_2 equivalent annually .

1.2 Dual-Carbon "1+N" Policy Framework

In October 2021, China released the *Opinions on Fully, Accurately, and Comprehensively Implementing the New Development Philosophy to Achieve Carbon Peaking and Carbon Neutrality* (hereinafter referred to as the *Opinions*) and the *Action Plan for Carbon Peaking Before 2030* (hereinafter referred to as the *Action Plan*), serving as the overarching guiding documents for the dual-carbon "1+N" policy framework. Subsequently, various departments introduced a se-

ries of policy documents to comprehensively implement dual-carbon target tasks. The current dual-carbon "1+N" policy framework has been basically established.

The "1" in the dual-carbon "1+N" policy framework consists of the *Opinions* and *Action Plan*, while the "N" comprises implementation plans for key areas and industries, as well as related policy support schemes[3] (Figure 1). The dual-carbon "1+N" policy framework will provide comprehensive, multi-level guidance for China' s dual-carbon work. Policy design covers all key areas and sectors related to carbon emissions, including energy, industry, urban-rural construction, transportation, and pollution-carbon reduction synergy, as well as action plans for key industries such as steel, non-ferrous metals, petrochemicals, and building materials. The framework emphasizes support measures including technological innovation, fiscal support, price reform, talent development, and other safeguards to provide solid guarantees for dual-carbon work. It reflects broad societal participation and is a vivid manifestation of national governance system and capability modernization, involving various ministries, local governments, industries, parks, enterprises, and individuals. The "1+N" policy framework also seeks to promote broader cooperation, including green energy development under the Belt and Road Initiative, as well as international cooperation policy designs across various industries and departments. Table 1 summarizes some key quantitative targets within the "1+N" policy framework. While the "1+N" policy framework provides an overall framework and work priorities for dual-carbon efforts, the long-term and arduous nature of this work presents new requirements, necessitating that its pathways and policies maintain resilience amid changing domestic and international situations and undergo continuous dynamic adjustments[3].

2. Analysis of Transition Needs and Challenges Under Dual-Carbon Goals

2.1 Transition Needs Under Dual-Carbon Goal Guidance

Achieving dual-carbon goals requires profound and systematic changes in mindset and development models. The entire transition strategy implementation requires goal-oriented top-level design, systematic planning, and step-by-step implementation—a dynamic interaction between theory and practice that must comprehensively handle synergies among different objectives and actors, continuously addressing developmental problems and challenges through "learning by doing." This requires not only long-term policy signals and resilient management with dynamic adjustment mechanisms but also learning through practice to continuously update cognitive systems and action plans, thereby reducing transition risks and costs.

Achieving dual-carbon goals necessitates scientifically understanding and implementing these objectives while coordinating climate, security, and transformation development. Dual-carbon goals guide China' s development model and economic structure transformation and will comprehensively drive green innova-

tion. To achieve these goals, we must base our efforts on China' s current reality of coal-dominated energy consumption, large manufacturing scale, rapid socio-economic development, high correlation between economic growth and energy demand growth, short timeframe from carbon peaking to carbon neutrality, and the broader context of intertwined traditional and non-traditional security risks globally, coordinating climate, security, and transformation.

Achieving dual-carbon goals centers on comprehensive green transformation, with reducing carbon dioxide and other greenhouse gas emissions as the fundamental approach and carbon sinks and negative emission measures as supplements. Achieving carbon neutrality requires substantially changing China' s energy consumption structure, with the core of this transformation being the comprehensive green transformation of the economy and society, including shifts in energy security concepts, optimization and upgrading of industrial structure, iterative innovation of green and low-carbon technologies, and modernization of governance systems and capabilities. The key to future climate and development competition lies in "who can achieve better and faster green transformation," and accelerating comprehensive green transformation to enhance low-carbon competitiveness will help China gain new commanding heights and comprehensive advantages. Meanwhile, the importance of climate adaptation continues to rise, making enhanced future low-carbon competitiveness a strategic priority.

China' s roadmap for low-carbon energy transition in the near and medium term needs further clarification. While China has established long-term goals and directions for energy low-carbon transition, including achieving over 80% non-fossil energy consumption by 2060 to gradually replace fossil energy' s dominant position, the reality of coal-dominated energy resource endowment and long-term reliance on coal presents numerous challenges. China's coal power units are generally young, and early retirement faces high risks of asset stranding and just transition issues. The high degree of interconnection between coal and industrial industries increases the difficulty of coal reduction. Building a high-proportion renewable energy power system faces challenges including insufficient flexibility, imperfect market mechanisms, and incomplete smart grid technologies. How to ensure coordinated alignment between reliable low-carbon energy substitution and the gradual exit of fossil energy is a key issue facing China' s near- and medium-term energy low-carbon transition.

China' s basic research and development capabilities remain relatively weak, with insufficient reserves of key low-carbon, zero-carbon, and negative-carbon technologies. China has fewer original scientific and technological achievements and pays insufficient attention to disruptive systemic low-carbon, zero-carbon, and negative-carbon technologies. Various institutional mechanisms hinder the transformation of scientific and technological achievements, and innovation factors have not yet achieved efficient allocation. Technological innovation is the core and key to achieving deep carbon emission reductions[4]. In the future, as international economic interest games and trade protection deepen, technology transfer and cooperation will face greater resistance.

2.2 Problems and Challenges in Further Deepening Dual-Carbon Goals

The current unstable international political and economic situation has strengthened voices and actions to build green trade, industrial, and technological barriers. Multiple crises including the COVID-19 pandemic and the Russia-Ukraine conflict have had comprehensive impacts on the global economy and society, while the international geopolitical landscape and climate change response strategies are also undergoing profound transformation. Some developed economies, seeking competitive advantages and commanding heights in green industries and technologies, have erected high protectionist barriers in technological innovation, product trade, and standards. The multi-domain climate competition accompanying climate cooperation also requires gradual attention from all parties.

China faces a short timeframe to achieve carbon peaking and carbon neutrality, with its emission reduction pathway still uncertain. China remains in a stage of medium-to-high-speed economic growth. Against this backdrop, proposing that carbon emissions peak before 2030 and then rapidly decouple from economic growth, achieving carbon neutrality within just 30 years, requires an average annual reduction of 8%–10% after 2030[5]. If internal and external environmental factors cause fluctuations and extensions in the carbon peaking platform period, an even more intense structural transformation path will be required. As a developing country, this poses higher demands on China' s economic structure transformation, technological innovation, and capital investment.

Key institutions and capacities to ensure dual-carbon goal achievement remain to be improved. The legal system for climate change response and dual-carbon work has not yet been established, and the dual control system for total carbon emissions and intensity has not been implemented. Local governments' capacity to implement dual-carbon target tasks urgently needs improvement, with "slogan-style carbon reduction" not uncommon. A unified and standardized greenhouse gas emission accounting system has not been established, market-based policy mechanisms have not effectively played their role in resource allocation, and a climate-friendly investment and financing system urgently needs to be put in place.

3. Several Recommendations for Systematically Promoting Deepening Implementation of Dual-Carbon Goals

The dual-carbon transition pathway is a systematic action roadmap driven by integrated factors including targets, technologies, funding, and policies. Grasping the dual nature of opportunities and challenges, handling various fundamental relationships, and addressing both short-term high-cost, high-difficulty issues and medium- to long-term systemic challenges are crucial for achieving dual-carbon goals[2]. Accelerating comprehensive green and low-carbon transformation of the economy and society requires overall coordination and top-level

design to explore dual-carbon development pathways and supporting synergistic policy systems that suit China' s reality.

3.1 Transform Production Methods and Establish a Green, Low-Carbon, Circular Economy

Looking to the future, development remains key to solving all of China' s problems, making the necessity and urgency of transforming development models even more prominent. Accelerate industrial structure adjustment and optimization, and continue promoting energy conservation and carbon reduction in high-energy-consuming industries. Deep decarbonization will give rise to a new industrial revolution, with new competitive advantages forming around industrial upgrading centered on decarbonization. Accelerate industrial transformation and upgrading to increase the proportion of green and low-carbon manufacturing. Considering the decreasing costs of new energy, breakthroughs in process reengineering technologies, and gradual improvement of carbon pricing mechanisms, progressively complete the green and low-carbon transformation, structural upgrading, and relocation of high-energy-load industries, such as scientifically formulating decarbonization roadmaps for the steel industry and defueling pathways for the petrochemical industry.

Develop carbon emission reduction-oriented circular economy. Through green design and green low-carbonization of product life cycles and supply chains, leverage the synergistic effects of pollution reduction, green expansion, and growth. Improve extended producer responsibility systems that connect enterprises, governments, and consumers through renewable resource targets and incentive mechanisms. Pay attention to emerging industrial waste issues during the transition process, such as the treatment and disposal of decommissioned new energy facilities and electric vehicle batteries, and innovate resource utilization technologies and models for greenhouse gases like carbon dioxide. Conduct life cycle assessments of infrastructure and products. Deepen pilot work on "zero-waste cities" and expand to regional urban agglomerations.

3.2 Build a New Energy System with Clean, Low-Carbon, Safe, and Efficient Characteristics

Building a "clean, low-carbon, safe, and efficient" new energy system is a process of complementary integration where traditional fossil energy and clean energy rise and fall relative to each other. It includes both efficient utilization of fossil energy and large-scale development and utilization of new energy, as well as transformation and upgrading of high-energy-consuming industries—a dynamic and complex systematic project. Therefore, combining carbon peaking and carbon neutrality timelines with China' s energy resource endowment conditions, we must adhere to the principle of establishing before breaking, advancing green and low-carbon transformation of the energy system while ensuring energy security.

Promote the construction of a new power system with new energy as the mainstay, developing large-scale, high-proportion renewable energy and supporting policies. Deepen power system reform, exploring energy market and pricing mechanisms adapted to new-generation energy and power systems. Accelerate clean energy base construction, and actively yet prudently deploy distributed energy, smart grids, new energy storage, and multi-energy complementarity clean power technologies. Extend and improve application scenarios, supporting "renewable energy + poverty alleviation," "renewable energy + agriculture," and "renewable energy + ecological restoration" project development to provide systematic support for renewable energy deployment. Meanwhile, orderly develop green hydrogen manufacturing and related industries, rationally layout energy storage facilities, safely and orderly develop nuclear power, and explore diversified applications of nuclear energy.

Gradually advance structural adjustment and efficient utilization of fossil energy. Control fossil energy consumption growth, vigorously implement the "three reforms and linkages" for coal power units, and comprehensively compare the safety, economy, and sustainability of different coal power transformation pathways to formulate better systematic transformation plans. Focus on quality improvement and efficiency enhancement—energy conservation and efficiency improvement remain priority choices for current energy strategy and carbon emission reduction[6]. Orient toward terminal electrification to reduce the proportion of oil and gas used as fuels. Simultaneously, pay attention to comprehensive assessment of different energy combinations and pathways, exploring implementation routes based on science.

3.3 Form a Territorial Spatial Pattern Conducive to Carbon Neutrality

Establish a nature protected area system with national parks as the mainstay, comprehensively considering coordinated optimization of regional spatial structure, energy structure, and industrial structure to achieve harmonious coexistence between humans and nature. Coordinate regional differences, combining energy resource endowment, new energy development costs, industrial chain support, and logistics conditions while considering local industrial transformation strategies to build an industrial spatial layout adapted to carbon neutrality needs and establish regional low-carbon transformation partnerships. Coordinate territorial spatial layout among urban space, agricultural space, and ecological space, promote integration of use control and dual-carbon goals, and formulate mixed land use policies conducive to large-scale, high-proportion renewable energy development.

Scientifically assess climate mitigation strategies based on land use, including impacts of bioenergy and afforestation on food production and security. Provide nature-based solutions, develop nature-positive economies, reduce costs and improve sustainability, and further improve integrated ecosystem management. Encourage development of and stakeholder participation in various types

of protected areas, including social public welfare protected areas. Systematically improve ecosystem carbon sink and adaptation capacities, and improve the statistical accounting system for natural carbon sinks[7].

3.4 Build a Safe, Convenient, Green, Low-Carbon, Intelligent, and Shared Comprehensive Transportation System

Plan a green transportation system oriented toward public transit development, accelerate intercity rail transit construction, and promote shared transportation and urban slow-traffic systems. Vigorously advance vehicle electrification and intelligence, focusing on enhancing infrastructure flexibility alongside electric vehicle development. Explore innovations in different vehicle technologies and business models, including battery charging/swapping and hydrogen refueling/swapping. Scientifically formulate a timetable for phasing out fuel-powered vehicles. Simultaneously, vigorously develop multimodal transport to increase the proportion of railway and waterway transportation for bulk goods and medium- to long-distance freight. Emphasize construction of urban green and resilient road infrastructure to improve transportation system adaptation and disaster prevention capabilities.

Reshape intensive, intelligent, low-carbon, resilient, and sustainable urban-rural infrastructure. Develop zero-carbon buildings and renewable energy-integrated buildings, and promote energy-saving technological transformation of existing buildings. Using housing security projects and old city renovation as leverage, demonstrate and promote new zero-carbon building technologies such as photovoltaic storage, direct current, and flexibility (PEDF) and building-integrated photovoltaics. Gradually promote electrification and clean upgrading of urban buildings and rural housing, exploring green, safe, and efficient new construction methods such as prefabricated buildings[8].

3.5 Shape Sustainable Consumption Patterns

China is transitioning from a production-oriented to a consumption-oriented society and needs to shape sustainable consumption patterns that align with its resource endowment and cultural characteristics. Guide terminal energy use toward electrification, clean energy, intelligence, and marketization, and promote low-carbon travel modes. Continuously improve integrated waste classification, collection, and treatment, conduct pilot programs for "zero-waste cities" and "zero-waste communities," summarize experiences, accelerate promotion, and develop comprehensive environmental energy services. Leverage the guiding role of green standards and labels, upgrade progressively by category, grade, and stage, promote best consumption practices, and emphasize green consumption fashion promotion and education. Establish institutional and incentive regulations for efficient, cascade, renewable, and circular utilization of energy and resources to improve comprehensive utilization efficiency, such as deposit systems for plastic product consumption and recycled plastic proportion indicators. Scientifically consider the distribution of green costs and benefits, promote enterprises to

assume social responsibilities including nature-positive benefit sharing, and reasonably distribute consumers' green burden. Advance innovative applications of digital intelligence technologies in green consumption.

3.6 Build a Technology Innovation System and Dynamic Upgrade Path for Carbon Neutrality

Actively plan and catalyze dual-carbon technological innovation and iteration. Strengthen top-level design, give full play to the advantages of the new national system, and systematically layout low-carbon, zero-carbon, and negative-carbon technology innovation systems across fields. Actively conduct scientific assessment, technological innovation policy, and decision-making consultation, particularly strengthening comprehensive comparative assessments of different technology iterations and routes to formulate categorized field technology roadmaps and dynamic adjustment mechanisms[4]. Strengthen basic research, accelerate breakthroughs in key core technologies for multi-energy integration and high-energy-consuming industrial process reengineering, and advance early-stage deployment, R&D innovation, and commercial promotion of key generic technologies, frontier leading technologies, and disruptive technologies. Accelerate development of new energy technologies, including new energy storage, next-generation advanced nuclear energy, and carbon capture and utilization technologies. Promote integrated application of digital intelligence and green low-carbon technologies to comprehensively and substantially improve energy utilization efficiency. Through carbon neutrality vision guidance, gradually cultivate new development momentum in high-tech, low-carbon fields with strong development potential and driving effects, such as digital economy, clean energy, and smart cities. Emphasize the construction of a technology standard system for carbon neutrality, balancing requirements for carbon reduction, quality, and product life cycles.

3.7 Establish a Green Financial System to Support Low-Carbon Transition and Innovation

Strengthen the foundational capacity, institutions, and standards of the green climate finance system to promote orderly, step-by-step development of green finance. Based on national conditions, development stages, and alignment with international rules, explore the formulation of China' s climate information disclosure mechanisms, data information systems, green finance classification standard systems, and long-term carbon pricing mechanisms. Utilize comprehensive "pricing" instruments, including taxation, pricing, compensation, procurement, and other incentive measures, to shape diversified green climate investment and financing mechanisms. Adopt a gradual green and low-carbon investment and financing model that clarifies macro policies to release long-term signals while establishing micro mechanisms for fine management. Explore the development of transition finance, promote the establishment of green transformation development funds, and facilitate just transition. Establish and improve environmental,

social, and corporate governance management mechanisms, clarify investment orientation, and reduce transaction costs. Simultaneously strengthen supervision to prevent greenwashing, reasonably avoid green debt risks, and prevent capital stranding.

3.8 Build Sustainable Trade Models and Green Supply Chains

Promote the construction of sustainable trade, investment, and international cooperation systems. Adjust trade policies according to low-carbon development needs to reduce exports of resource- and energy-intensive products. Explore sustainable trade models under reshaped globalization and dual-circulation patterns, build green value chains for bulk soft commodities, and promote intelligent certification and full-chain traceability of deforestation-free products. Pay attention to international hot topics such as oceans, plastics, food, biodiversity protection, and emerging pollutants, as well as their interactions with trade.

Build a safe, resilient, and sustainable new energy supply chain. Based on new energy industry development realities, prospectively consider the optimized layout of global new energy supply chains and industrial chains for critical minerals, materials, and components. Ensure supply security of key mineral raw materials in renewable energy supply chains, such as lithium, cobalt, copper, nickel, and rare earth metals, while simultaneously developing alternative technologies. Conduct international cooperation on key renewable energy technologies, develop industrial and supply chain partnership circles around the Belt and Road Initiative, and actively respond to U.S. and European local clean energy manufacturing and supply chain competition.

3.9 Build a Sound Governance System to Promote Dual-Carbon Goal Implementation

Form a legal and regulatory system that promotes systematic dual-carbon transformation, and coordinate the formulation and revision of relevant laws and regulations. Further improve the dual control system for energy consumption and accelerate pilot programs for the dual control system for total carbon emissions and intensity to provide a practical foundation for institutional transformation as soon as possible. Improve dual-carbon management institutions and mechanisms, optimize inter-departmental management coordination mechanisms, and emphasize local dual-carbon capacity building to promote consensus among local and industry actors on low-carbon transformation pathways and implementation methods. Form effective and adaptive planning, policy, and support systems. Formulate medium- and long-term transformation strategies and plans. Emphasize information disclosure, data platforms, and measurement, reporting, and verification system construction, continuously improving transparency throughout the process. Improve carbon market operation mechanisms, establish coordination mechanisms among carbon markets, green certificate trading, and electricity markets, explore the feasibility of carbon tax and other fiscal policies, optimize and simplify various regulatory procedures, and effectively re-

duce institutional and compliance costs. Establish a high-quality, full life-cycle low-carbon standard, labeling, and benchmarking system for carbon neutrality to leverage the guiding role of standards.

4. Conclusion

China' s development achievements are obvious to all. At this historical crossroads, China faces unprecedented challenges and a new domestic and international development environment, with no mature carbon neutrality experience or fixed model to copy. Compared with developed economies, China has a tighter timeline and exceptionally arduous tasks to achieve dual-carbon goals, requiring profound transformation of economic structure, technological innovation, capital investment, capacity enhancement, and consumption patterns. Following a green and low-carbon transformation development path with Chinese characteristics is a continuous process of inheritance, practice, learning, improvement, and perfection, requiring constant adjustment of relevant policies and pathways in practice. This necessitates both top-level design and "crossing the river by feeling the stones."

China' s ecological civilization construction and green transformation development require future-oriented robust development strategies, comprehensive solutions, and supporting measures under a new framework. This requires not only top-down management and guidance from the government but also bottom-up exploration and participation from other stakeholders to jointly identify optimal pathways for different periods and gradually build an institutional and governance system centered on promoting structural innovation, continuous environmental quality improvement, and comprehensive green and low-carbon transformation. Under new circumstances, following a green transformation development path with Chinese characteristics not only addresses China' s own development but also strives to lead global green transformation, reshape green industrial, supply, and value chains from a global perspective, actively build green partnerships, and contribute to global sustainable development and the achievement of global carbon neutrality goals. Particularly by joining hands with other developing economies, sharing China' s best practices in green and low-carbon transformation, and conducting extensive cooperation, China can demonstrate its responsibility and commitment as a major country.

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Note: Figure translations are in progress. See original paper for figures.