Pursuing Green Development: From the 14th to the 15th Five-Year Plan

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Abstract: *Guided by Xi Jinping Thought on Ecological Civilization, this paper systematically reviews and interprets the historic achievements of China's green development during the 14th Five-Year Plan (FYP) period, drawing strategic implications for the 15th FYP. The analysis demonstrates that, during the 14th FYP period, China successfully broke free from the conventional "pollute first, treat later" trajectory presupposed by the Environmental Kuznets Curve. Through multidimensional breakthroughs—including leapfrog progress in energy structure decarbonization, fundamental improvements in ecological quality, the systemic rise of green productive forces, modernization of environmental governance, and strengthened global ecological leadership—China achieved an initial decoupling of economic growth from resource consumption and environmental degradation, thereby contributing distinctive Chinese insights to global sustainable development. As the 15th FYP period represents the decisive window for achieving carbon peaking, this paper proposes a coherent implementation framework anchored in the institutional transition toward the "Dual Control" of carbon emissions, encompassing total volume and intensity, driven by the accelerated integration of "green-intelligent-resilient" new quality productive forces, and supported by expanded, leadership-oriented global cooperation. The proposed framework aims to provide Provide reference in theory and practice for advancing a comprehensive green transformation of the economy and society, ultimately painting a new picture of Chinese modernization characterized by harmony between humanity and nature.*

Keywords: *Green development; Comprehensive green transition; 14th Five-Year Plan; 15th Five-Year Plan; New quality productive forces*

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1. Introduction

Throughout the history of the global economic development theory, the Environmental Kuznets Curve (EKC) has long held a dominant position. This classic EKC hypothesis posits an inverted U-shaped relationship between environmental degradation and per capita income.

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At lower income levels, environmental pressures typically intensify with economic growth. In contrast, at higher income levels, certain pollution indicators may decline due to technological progress, industrial restructuring, and strengthened environmental regulation (Grossman & Krueger, 1991). This framework implicitly endorses a "pollute first, treat later" development path, serving as an intellectual rationale for the industrialization trajectories of many developed countries. Moreover, it led numerous developing economies—implicitly benchmarking themselves against Western modernization—to conflate modernization with Westernization, thereby failing to forge a mutually beneficial pathway that could advance economic growth and ecological protection simultaneously.

Xi Jinping Thought on Ecological Civilization, as a core component of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, constitutes a comprehensive and logically coherent theoretical system for ecological governance. It is anchored in the core principle of harmony between humanity and nature; grounded in the foundational tenet that "Lucid waters and lush mountains are invaluable assets"; oriented toward the value that a sound ecological environment is the most inclusive form of public well-being; structured by the systemic perspective that mountains, rivers, forests, farmlands, lakes, grasslands, and deserts form a community of life; and safeguarded by commitment to protecting the environment with the strictest systems and most rigorous legal frameworks. The theoretical innovation of this thought manifests in three fundamental transcendences. First, it transcends the narrow Western environmental-economic view that frames ecological protection as a growth burden by repositioning it as an intrinsic requirement for high-quality development. Second, it overcomes the traditional development-economics dichotomy that pits economic growth against environmental protection, revealing their dialectical unity. Third, it transcends fragmented governance approaches by advancing a systemic, holistic, and synergistic vision for the construction of ecological civilization. This theoretical depth and coherence have enabled China to launch and sustain a profound, nationwide green transformation.

In the new era, guided by Xi Jinping Thought on Ecological Civilization, China has broken away from the linear evolutionary paradigms of traditional industrialization theories. By advancing Chinese modernization characterized by the harmony between humanity and nature—and driven by the synergistic logic of leapfrog development, innovation-led growth, and systems thinking—China has forged a new path of green development. During the 14th FYP period (2021-2025), China manifested a developmental miracle defined by the "Five-Pronged Synchronization" of industrialization, informatization, urbanization, agricultural modernization, and green transformation. By adopting a parallel-track development strategy, China has bypassed the traditional "serial-track" model, achieving coordinated progress across multiple dimensions of modernization through temporal compression. Fundamentally, China has articulated a framework of green productive forces grounded in the axiom that "protecting the ecological environment is equivalent to protecting productive forces, and improving the ecological environment is equivalent to developing productive forces." By internalizing green development as a core variable within the economic growth function, China has orchestrated a structural transition from factor-driven expansion to innovation-led growth. In contrast to the benchmark assumptions of neoclassical growth theory—which prioritize capital accumulation and labor inputs while treating ecological

constraints as externalities—China's New Development Philosophy institutionalizes innovation and ecological sustainability as primary orientations. Furthermore, through the aggressive promotion of green technological innovation and the iterative refinement of environmental governance systems, China has substantially enhanced the "green density" (i.e., the ecological efficiency of its economic output). In doing so, they have achieved a progressive relative decoupling of economic expansion from resource depletion and environmental degradation.

Additionally, the systemic operationalization of the principle that "lucid waters and lush mountains are invaluable assets" during the 14th FYP period signifies a qualitative leap in ecological civilization theory and a profound breakthrough in mechanisms for realizing ecological value. Local pilot programs, such as "ecological banks," have effectively bridged the gap between natural resources and financialized assets (Qin et al., 2025); "carbon inclusion mechanism" schemes have effectively incentivized a pro-environmental behavioral shift among the public[1]; A suite of innovations for the value realization of ecological products has been effectively implemented nationwide. Notably, these efforts have systematically quantified and marketized previously "non-market" natural endowments—clean air, pristine water, and scenic landscapes—ensuring that the stewards of these ecological assets receive tangible rewards. This, in turn, has injected robust endogenous momentum into the sustainable growth of green industries.

From a global perspective, China's presidency of the COP15 and its leadership in securing the Kunming-Montreal Global Biodiversity Framework provide a distinctly Chinese blueprint for global conservation[2]. Proposed by China, the Community with a Shared Future for Mankind transcends the narrow parochialism of nation-state interests, offering a transformative paradigm for South-South cooperation and North-South dialogue. Recently, China's green development trajectory has provided multifaceted insights and vital empirical contributions to global environmental governance, offering novel conceptual frameworks and practical benchmarks for international governance mechanisms (Huan, 2025). Notably, China's massive afforestation initiatives have contributed approximately one-quarter of the world's newly added green cover, establishing China as the global leader in the scale and velocity of ecological restoration. Collectively, these achievements suggest that the Chinese model of green development possesses significant replicability and heuristic value for the international community.

Building upon this series of profound theoretical innovations and extensive practical explorations, we systematically review the comprehensive and pioneering achievements of China's green development during the 14th FYP period under the scientific guidance of Xi Jinping Thought on Ecological Civilization, while synthesizing the invaluable experience and insights accumulated along the way. At this historical juncture, the 15th FYP period marks a critical phase in laying the foundation for achieving socialist modernization. Guided by the strategic deployments of the 20th CPC Central Committee's Fourth Plenum, China will prioritize its efforts with the comprehensive

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[1] Source: Shanghai Municipal Bureau of Ecology and Environment, "Measures for the Administration of Carbon Inclusion in Shanghai," October 30, 2025, https://www.shanghai.gov.cn/gwk/search/content/5c8129b3a2b340ad8a05947183c22587.

[2] Source: Xinhua News Agency, "Interpretation of President Xi Jinping's Keynote Speech at the Leaders' Summit of the 15th Conference of the Parties to the Convention on Biological Diversity (COP15)," October 13, 2021, https://www.gov.cn/xinwen/2021-10/13/content_5642189.htm.

green transformation of development as the overarching link. Moreover, the deep integration of "green, intelligent, and resilient" attributes will be at the core, along with the "Dual Carbon" (carbon peaking by 2030 and carbon neutrality by 2060) goals as the strategic driver. The nation aims to achieve strategic and systematic breakthroughs in key domains: constructing a new energy system, cultivating new quality productive forces, optimizing territorial spatial patterns, innovating policy support mechanisms, and deepening cooperation in global environmental governance. Collectively, these breakthroughs will lay a more solid green foundation for realizing a new vision of Chinese modernization defined by the harmonious coexistence between humanity and nature.

2. Historic Achievements of Green Development During the 14th FYP Period

During the 14th FYP period, China upheld the principle that "lucid waters and lush mountains are invaluable assets," elevating ecological civilization construction to a prominent position in national governance. By advancing economic and social development in close coordination with ecological and environmental protection, China achieved a leapfrog transition—from a primary focus on winning the tough battle against pollution to the comprehensive construction of a Beautiful China. Following the pathway set forth by the 20th CPC National Congress—emphasizing the coordinated advancement of carbon reduction, pollution abatement, ecological expansion, and economic growth—China employed powerful institutional instruments such as Central Ecological and Environmental Protection Inspections to firmly enforce the principle of "shared responsibility between Party and government, and dual responsibilities for specific posts." As a result, green has become the defining hallmark of high-quality development. In contrast, green development has solidified as a foundational logic and a shared value pursuit across society.

2.1 Major Achievements

First, in the realm of the energy revolution, China has achieved leapfrog progress in its clean and low-carbon transition while substantially strengthening its energy security. As the primary front line of green transformation, the energy sector delivered breakthrough progress and historic achievements during the 14th FYP period. China has built the world's largest and fastest-growing renewable energy system, with the share of installed renewable power capacity rising from approximately 40% at the end of the 13th FYP period (2016-2020) to around 60% by 2025[3]. Moreover, annual additions of wind and solar power capacity have repeatedly surpassed 100 million kilowatts, reaching an unprecedented scale and pace. In 2024, China's installed renewable power capacity surpassed coal-fired capacity for the first time, marking a fundamental structural turning point in the national electricity supply system. Since then, the "green intensity" of energy consumption has risen markedly. Additionally, the share of non-fossil energy in China's total energy consumption increased from 15.9% in 2020 to 19.8% in 2024, reflecting a steady annual

[3] Source: National Energy Administration (NEA) of China, "Press Conference on the Grid-Connected Operation of Renewable Energy in the First Three Quarters of 2025," October 31, 2025, https://www.nea.gov.cn/20251031/7be6728f6d8a48a4955a24a45013b37f/c.html.

gain of approximately 1 percentage point and exceeding the targets set under the 14th FYP[4]. Importantly, this transition has progressed steadily while firmly safeguarding energy security. During the first four years of the 14th FYP, China's domestic energy production accounted for more than 90% of its incremental consumption, with nearly half of the newly added power generation coming from renewables. Across society, one in every three kilowatt-hours of electricity now comes from green sources, and more than half of the world's new energy vehicles operate in China—vividly demonstrating that the nation's "energy rice bowl" is held more securely and sustainably. At the same time, technological innovation has provided powerful support: China accounts for over 40% of global new energy patents and leads the world in key indicators such as photovoltaic conversion efficiency, single-unit capacity of offshore wind turbines, and installed scale of new energy storage—delivering robust technological momentum for the ongoing energy transition[5].

Second, in terms of environmental quality improvement, the nationwide battle to prevent and control pollution delivered historic, systemic results, markedly enhancing public satisfaction with the ecological environment. During the 14th FYP period, China deepened and broadened its pollution control efforts, yielding striking improvements in environmental quality and steadily rising public approval of ecological conditions. In terms of air quality, average fine particulate matter (PM2.5) concentrations in China's prefecture-level and above cities fell from 35 μg/m³ in 2020 to 29.3 μg/m³ in 2024—a reduction of 16.3%. The proportion of days with good or excellent air quality increased to 87.2%, heavy pollution episodes declined sharply, and blue skies with white clouds became the norm. Regional governance produced amplified results: PM2.5 levels in the Beijing-Tianjin-Hebei region and surrounding areas dropped by 18% relative to 2020, while concentrations in the Fenwei Plain fell by 20%. Parallel gains were realized in China's aquatic environment. For the first time, the share of surface water monitoring sections meeting excellent quality standards (Grades I-III) exceeded 90%, reaching 90.4%. Moreover, the main streams of the Yangtze and Yellow Rivers maintained stable Grade II water quality, and black and odorous water bodies in cities at or above the prefectural level were essentially eliminated. This allowed for clear waters and green riverbanks, an increasingly familiar sight. In the soil domain, China successfully managed pollution risks by achieving a stable, safe utilization rate above 90% for contaminated arable land in 2024, while effectively safeguarding the safety of key construction land—thereby upholding the essential baseline of environmental security for human settlements[6].

Third, in terms of ecological restoration, China achieved comprehensive and systemic optimization of its national territorial spatial pattern. During the 14th FYP period, China's ecological restoration and territorial spatial planning underwent a historic transformation—

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[4] Source: National Energy Administration (NEA) of China, "Pursuing Green Innovation: Accelerating Energy Transition During the 14th FYP," October 31, 2025, https://www.nea.gov.cn/20251017/293d07cfb51f483eab7e7ab0b279b343/c.html.

[5] Source: CCTV.com, "World's Largest and Fastest-Growing: Chronicling China's Global Leadership and Milestone Achievements in High-Quality Energy Development," August 26, 2025, https://news.cctv.com/2025/08/26/ARTIRdW8JSyhgc2BZ3THuGSL250826.shtml.

[6] Source: The National People's Congress of the People's Republic of China, "Report of the State Council on the State of the Environment and the Achievement of Environmental Protection Targets for 2024," April 28, 2025, http://www.npc.gov.cn/c2/c30834/202504/t20250428_444977.html.

from quantitative accumulation to qualitative leaps, from localized interventions to nationwide coordination, and from reactive remediation to proactive, forward-looking governance. At the core of this shift was the establishment of a "Multi-Plan Integration" governance system, anchored in territorial spatial planning and enforced through strict land-use regulation. As such, this institutional reform resolved the long-standing fragmentation of planning regimes and associated spatial conflicts. Through rigorous scientific assessment and precise delineation, more than 30% of China's terrestrial land area was placed under Ecological Conservation Red Lines—designated as inviolable "red lines" for protection[7]. Notably, this structural optimization demarcated boundaries among production, living, and ecological spaces, creating permanent "safety islands" for core ecological function zones and environmentally sensitive or fragile areas. Moreover, it provides a robust foundation for natural self-recovery and long-term ecological succession. For the first time, the accelerated development of a protected area system centered on national parks achieved institutionalized, holistic protection and systematic management of the nation's most vital natural heritage, ushering in a new era of state-recognized, legally guaranteed ecological conservation[8]. In parallel, the national ecological security barrier system was further consolidated. A strategic framework for major ecological protection and restoration projects—centered on the "Three Regions and Four Belts" (Qinghai-Tibet Plateau ecological barrier, key ecological zones of the Yellow and Yangtze rivers, Northeast Forest Belt, northern sand-control belt, southern hilly and mountainous belt, and coastal zone)—has largely taken shape, strengthening the backbone of national ecological security[9]. Collectively, through the systematic optimization of territorial spatial patterns and integrated ecological restoration, China has historically reversed the trajectory of ecological degradation and constructed a forward-looking green spatial framework. Thus, it lays a solid ecological foundation for the nation's long-term sustainable development and the shared global endeavor of building a beautiful planet.

Fourth, in terms of green productive forces, China's industrial structure underwent profound restructuring, while new growth engines achieved a historic leap forward. During the 14th FYP period, China harnessed high-level ecological and environmental protection to accelerate the development of *new quality productive forces*, enabling simultaneous gains in both the economic value and green intensity of growth. First, China's energy consumption per unit of GDP declined by 11.6% cumulatively, equivalent to approximately 1.1 billion tons of carbon dioxide emissions avoided. This notable pace of efficiency improvement has placed China among the leading economies worldwide. Second, industrial restructuring yielded striking results: environmental impact assessment (EIA) approvals for "Two-High" projects (high-emission, high-pollution industries) continued to decline. In contrast, approvals for high-technology and green sectors—

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[7] Source: CCTV.com, "The Ecological Conservation Red Line System Demonstrates Great-Power Responsibility, Fortifying the 'Three Regions and Four Belts' National Ecological Security Barrier,"August 15, 2023, https://news.cctv.com/2023/08/15/ARTIwgomjIfud0wsiV9lyMgd230815.shtml.

[8] Source: The National People's Congress of the People's Republic of China, "National Park Law of the People's Republic of China," September 24, 2025, http://www.npc.gov.cn/npc/c2/c30834/202509/t20250912_447755.html.

[9] Source: China Development and Reform Press, "The Story of Seven Visual Blueprints for the Final Phase of the 14th FYP: Safeguarding National Ecological Security," October 30, 2025, https://www.ndrc.gov.cn/wsdwhfz/202510/t20251030_1401268.html.

particularly wind power and new energy vehicles (NEVs)—expanded rapidly. In the first half of 2025, year-on-year growth in EIA approvals for these green categories reached 44.4% and 31.3%, respectively[10]. Third, the green manufacturing system advanced rapidly, according to a news released by the Ministry of Industry and Information Technology in September 2025, the number of national-level green factories rising to 6,430[11]. Green and low-carbon industries also emerged as powerful new drivers of foreign trade. The export value of the so-called "New Three"—electric vehicles, lithium-ion batteries, and photovoltaic products—grew 2.6 times compared with 2020. China now supplies more than 70% of global photovoltaic modules and 60% of wind power equipment[12]. In 2024, China's NEV output exceeded 13 million units, securing its position as the world's largest producer and seller for the tenth consecutive year and vividly demonstrating the formidable momentum of green technological innovation and industrial competitiveness[13].

Fifth, in the context of modernizing national governance, China's regulatory capacity underwent an intelligent transformation, bolstered by the robust implementation of market-based mechanisms. During the 14th FYP period, China's ecological and environmental governance framework advanced markedly toward modernization. First, China established the world's most expansive and integrated ecological monitoring network, comprising approximately 33,000 monitoring stations nationwide. By integrating unmanned aerial vehicles (UAVs), AI-driven acoustic recognition, and automated lights-out laboratories, the Chinese government digitized the sampling and analytical life-cycle. Importantly, this technological leap has substantially enhanced both monitoring efficiency and data precision[14]. Furthermore, China's intelligent enforcement systems have fundamentally reshaped environmental supervision. By deploying an integrated "space-air-ground-water-land-sea" detection framework—utilizing satellite remote sensing and infrared imaging—authorities transitioned to non-intrusive, off-site oversight. Consequently, between January and August 2025, on-site inspections across China decreased by 30%, while the accuracy of problem detection increased by 10-25 percentage points, thereby facilitating the successful rectification of more than 260,000 environmental violations[15]. Second, the evolution of China's market-oriented environmental mechanisms achieved milestone breakthroughs. The China National Carbon Emissions Trading Market—now the world's largest in terms of covered greenhouse gas emissions—maintained stable and effective operations. By December 31, 2025, the market's cumulative allowance-trading volume reached 865 million tons, representing a total

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[10] Source: The Information Office of the State Council, "State Council Information Office Press Conference Series: 'High-Quality Completion of the 14th FYP' — Achievements in Economic and Social Development during the 14th FYP," July 9, 2025, https://www.gov.cn/lianbo/fabu/202507/content_7031379.htm.

[11] Source: China Industry and Information Technology News, "MIIT: China Has Cultivated a Total of 6,430 National Green Factories and 491 Green Industrial Parks," September 9, 2025, https://www.cnii.com.cn/yw/202509/t20250909_683782.html.

[12] Source: The State Council of the People's Republic of China, "China's Actions on Carbon Peaking and Carbon Neutrality," November 8, 2025, https://www.gov.cn/zhengce/202511/content_7047492.htm.

[13] Source: Xinhua News Agency, "China's Production and Sales of New Energy Vehicles Rank First Globally for the 10th Consecutive Year," September 9, 2025, https://www.gov.cn/yaowen/liebiao/202509/content_7039823.htm.

[14] Source: Guangming Online, "UAV Sampling and 'Darkroom' Laboratories: China's Ecological Monitoring Enters the 2.0 Era of Intelligence," September 19, 2025, https://kepu.gmw.cn/eco/2025-09/19/content_38297532.htm.

[15] Source: Jiang Xiaoping, "Ministry of Ecology and Environment: Over 260,000 Environmental Issues Rectified During the 14th FYP," September 19, 2025, https://news.cnr.cn/native/gd/20250919/t20250919_527368311.shtml.

transaction value of 57.66 billion yuan. In parallel, the China Certified Emission-Reduction (CCER) framework—the national voluntary carbon credit system—progressed steadily. By year-end 2025, 33 voluntary projects were officially registered, yielding 17.76 million tons of verified emission reductions[16].

Sixth, in the domain of global contributions, China has emerged—through resolute action and an open stance—as a key participant, major contributor, and leading force in advancing global ecological civilization. During the 14th FYP period, China formally committed to carbon peaking and carbon neutrality goals and established the comprehensive "1+N" policy framework, converting high-level pledges into systematic, concrete action ('1' denotes the overarching master plan and 'N' refers to a suite of supporting implementation measures). First, China achieved its 2030 Nationally Determined Contribution (NDC) target for renewable energy installed capacity ahead of schedule. In doing so, it injected powerful momentum into the global climate response. Through exports of green products, China enabled other countries and regions to also reduce carbon emissions by approximately 4.1 billion tons over the period[17]. Second, in international cooperation, China actively advanced multilateral climate processes while expanding South-South collaboration through initiatives such as deepening the Green Belt and Road and launching the Kunming Biodiversity Fund to support biodiversity conservation in developing countries. Third, China's innovation and manufacturing strengths in green technology sectors—including electric passenger vehicles, lithium-ion batteries, and solar cells—have delivered high-quality, inclusive green products and services worldwide, enriching global green supply and translating the vision of "building a clean and beautiful world" into a tangible reality.

2.2 Invaluable Experience and Fundamental Insights

China's green development path during the 14th FYP period represents a systemic transformation that embeds ecological civilization across all dimensions and processes of economic, political, cultural, and social development. Guided by ecological priority and green development, it constitutes a new model of high-quality growth. The achievements of the 14th FYP have laid a robust material foundation for the 15th FYP transition and generated valuable experience that provides clear methodological guidance for implementing a comprehensive green transition during the 15th FYP period.

First, with respect to the material foundation, a series of landmark achievements has created a solid platform for further progress. In the energy sector, the rapid rise in renewable energy capacity and China's 10 consecutive years of ranking first globally in new energy vehicle production and sales provide strong industrial and technological underpinnings for building a new energy system and advancing a green transportation revolution. In environmental quality, the sharp decline in PM2.5 concentrations and the fundamental improvement in river water quality demonstrate the effectiveness of large-scale, high-intensity governance strategies and integrated policy instruments.

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[16] Source: Gao Jing, "China's National Carbon Market Maintained Stable and Orderly Operation in 2025," January 1, 2026, https://www.news.cn/fortune/20260101/f1a3e548d93c4fc7bcf00efc409daaed/c.html.

[17] Source: Xinhua News Agency, "China's Actions on Carbon Peaking and Carbon Neutrality," November 8, 2025, https://www.gov.cn/zhengce/202511/content_7047492.htm.

In ecological protection, sustained increases in forest cover and the comprehensive delineation of Ecological Conservation Red Lines have established essential spatial safeguards for green expansion and ecological security barriers. Together, these accomplishments demonstrate that China now possesses the capacity to address environmental challenges through development and to generate new growth drivers through green transformation.

Second, the hard-won experiences from the 14th FYP provide vital compass points for achieving a truly comprehensive green transition. China has shown that institutional innovation forms the bedrock of lasting change. The rigorous Central Ecological and Environmental Protection Inspections have held local leaders accountable with unyielding resolve, while the national carbon market has turned emissions cuts into market-driven incentives. These mechanisms demonstrate that only the strictest systems and rule-of-law frameworks can overcome entrenched resistance and drive deep transformation. Technological innovation stands as the powerful engine at the heart of it all. By propelling green and low-carbon industries to become surging new forces in foreign trade, China has demonstrated how scientific and technological breakthroughs cultivate new quality productive forces and forge fresh edges in global competition. As such, it turns cutting-edge ideas into tangible advantages that benefit both domestic growth and the world. Systems thinking emerges as the indispensable guiding method. In key domains, China has successfully implemented the principle of coordinated progress across carbon reduction, pollution control, green expansion, and economic growth. This validates the viability of synergistic, multi-goal governance and points to a clear path for scaling up such coordination more broadly and in greater depth during the 15th FYP period. Drawn directly from China's pioneering practice, these insights constitute invaluable intellectual capital—essential for steering the comprehensive green transition with confidence and clarity.

Taken together, these remarkable achievements and profound experiences have built a robust foundation for realizing a Beautiful China and a distinctive form of modernization in which humanity lives in true harmony with nature—extending well beyond the 15th FYP period into the longer future. In doing so, they deliver China's enduring and substantial contribution to humanity's shared quest for sustainable development worldwide.

3. Distinctive Strategic Features of China's Green Development Based on the 15th FYP Recommendations

The Report to the 20th CPC National Congress explicitly states that "Promoting green and low-carbon transformation of economic and social development is a critical link in achieving high-quality development," thereby defining the intrinsic relationship between green transition and high-quality development.

Building on this foundational principle, the *Recommendations of the Central Committee of the Communist Party of China for Formulating the 15th Five-Year Plan for National Economic and Social Development* (hereinafter referred to as the *Recommendations*)—Adopted at the Fourth Plenary Session of the 20th Central Committee of the Communist Party of China—designate "accelerating the comprehensive green transition of economic and social development and building a Beautiful China" as a major strategic task and overarching objective for the period. The

deliberate use of the term "comprehensive" marks a historic turning point. During the 15th FYP period, China's ecological civilization endeavor is set to advance from targeted breakthroughs and pilot initiatives to a profound, systemic transformation of the entire economic and social development model.

3.1 Profound Theoretical Connotations of the Comprehensive Green Transition

First, the transition is distinguished by its comprehensiveness. It transcends the conventional view that confines green transformation to production sectors such as energy and industry, instead requiring its integration across all dimensions and throughout the economic, political, cultural, and social development. Notably, this requires fundamental changes in industrial and energy structures, spatial patterns, production modes, consumption behaviors, and even core value systems. For example, the *Recommendations* call not only for constructing a new energy system but also for strengthening incentive mechanisms for green consumption and cultivating sustainable lifestyles—reflecting a systematic reconfiguration of the full development chain and every stage within it.

Second, the transition is defined by the systemic nature of its governance pathway. The Plenary Session emphasized "using carbon peaking and carbon neutrality as the driving force to synergistically advance carbon reduction, pollution control, green expansion, and economic growth," thereby revealing the coordinated logic at the heart of comprehensive green transformation. Rather than pursuing isolated, linear governance focused on single objectives, this approach treats climate mitigation (carbon reduction), environmental quality improvement (pollution abatement), ecological capacity enhancement (green expansion), and sustained economic vitality (growth) as an integrated, mutually reinforcing whole. By aligning planning and coordinated policy instruments, it seeks to deliver simultaneous environmental and economic benefits (Zhou, 2025). Furthermore, this demands a shift away from fragmented approaches—"addressing carbon in isolation" or "treating pollution separately"—toward a new paradigm centered on holistic, systemic, and source-oriented governance.

Finally, the transition embodies the fundamental nature of its strategic positioning. The Plenary Session identified "achieving major new progress in the construction of a Beautiful China" as one of the principal goals of economic and social development during the 15th FYP period, while framing green transformation as a "strategic move to shape new advantages in international cooperation and competition." This elevation signifies a profound shift in which green development is no longer merely a constraint or side condition but a core driver of national competitiveness. Advancing this comprehensive green transition represents a profound revolution in the very concept of development ,aimed at fundamentally resolving the structural and root contradictions underlying ecological challenges while generating powerful new momentum driven by green productive forces—positioning China to lead the global shift toward sustainable modernization.

3.2 The Transitional and Decisive Significance of the 15th FYP

The Fourth Plenary Session of the 20th CPC Central Committee analyzed the profound shifts in China's development landscape during the 15th FYP period, identifying it as a pivotal transition toward the basic realization of socialist modernization. For the "Beautiful China" initiative

and green development, these five years represent a strategic milestone—a critical juncture for consolidating past progress and achieving a fundamental shift in ecological quality.

First, the "consolidation of past achievements" is reflected in a solid foundation and a markedly elevated starting point**.** During the 14th FYP period, China's ecological civilization construction achieved milestone progress. Key indicators—including average PM2.5 concentrations in prefecture-level and above cities and the proportion of surface water sections meeting excellent quality standards—were met or exceeded ahead of or on schedule. The pace of green and low-carbon transformation also accelerated significantly, establishing the world's largest and fastest-growing clean energy system. The core institutional framework for ecological civilization—often metaphorically described as the "four beams and eight pillars"[18]—has largely taken shape, establishing a comprehensive system of laws, mechanisms and accountability structures for environmental governance. Importantly, institutional innovations such as the Central Ecological and Environmental Protection Inspection system and the national carbon emissions trading market have played decisive roles. These historic accomplishments have laid a robust, practical, institutional, and confidence-building foundation for advancing a higher-level and more comprehensive green transition during the 15th FYP period.

Second, the "initiation of future breakthroughs" signifies formidable challenges and a decisive historical battle. Despite remarkable progress, the structural, root-cause, and trend-related pressures confronting China's ecological and environmental protection efforts have not yet been fundamentally alleviated. The heavy industrial bias of the industrial structure, the coal-dominated energy mix, and the road-dominated transportation system remain largely unchanged. Despite substantial improvements, environmental quality gains remain fragile, and the critical inflection point from quantitative improvement to qualitative transformation has yet to materialize. Most crucially, the 15th FYP represents the final five-year planning period before the 2030 carbon peaking deadline. Thus, China must utilize the 15th FYP period to decisively seize the window of opportunity for deep structural adjustments in energy, industry, and transportation. By transitioning total carbon emissions into a plateau and peaking phase, China aims to decouple economic growth from its rigid reliance on fossil fuel consumption and reverse the upward trajectory of pollutant emissions. Doing so will lay a decisive foundation for basically realizing the Beautiful China vision by 2035 (Zhuang & Wang, 2025). Furthermore, green transition during this period constitutes a time-sensitive and arduous campaign whose outcome will directly determine the realization of China's medium- and long-term national strategic objectives.

3.3 Systemic Deployment and Institutional Safeguards in Key Areas

To turn the strategic blueprint for a "comprehensive green transition" into tangible outcomes, the *Recommendations*—outline a systematic implementation pathway. First, China is orchestrating a qualitative transformation of its energy supply structure**.** This involves developing non-fossil

[18] The "four beams and eight pillars" metaphor refers to the core structural components of China's ecological civilization institutional system, encompassing key laws, mechanisms, and responsibilities (e.g., property rights for natural resources, ecological compensation, strict enforcement systems, and accountability frameworks) that form the foundational "architecture" for long-term environmental governance.

energy sources to transition them from a supplementary role to the primary pillar of the national energy mix. Key priorities include accelerating the deployment of large-scale clean energy bases (Northwest wind and solar, Southwest hydropower, and coastal offshore wind and nuclear power) while expanding distributed energy systems. The objective is to meet most of the incremental electricity demand through new clean energy by the end of the 15th FYP. Simultaneously, while ensuring national energy security, China will advance the clean and efficient use of fossil fuels. Coal-fired power will transition from a baseload source to a supporting and regulatory role, providing essential grid stability and backup capacity. Second, the development of a "New-Type Power System" serves as the critical framework for this transition. This system addresses the systemic challenges of renewable integration—ensuring green power is reliably generated, seamlessly integrated into the grid, and efficiently utilized at the consumption end. Strategic tasks include the intelligent, flexible upgrading of the power grid to enhance its capacity for integrating high shares of renewable energy. Additionally, China will scale up flexibility resources, such as pumped-storage and new energy storage technologies, while leveraging demand-side response potential. By fostering "source-grid-load-storage" coordination, these initiatives will enhance the power system's resilience and efficiency.

4. Key Pathways and Policy Framework for China's Green Development in the 15th FYP

Overall, the Fourth Plenary Session of the 20th CPC Central Committee elevated the "acceleration of a comprehensive green transition in economic and social development" to the strategic core of the 15th FYP. This landmark decision represents a major strategic choice—grounded in a new historical orientation, guided by an evolving understanding of development laws, and responsive to the public's heightened expectations for a better environment. To translate the ambitious blueprint for a comprehensive green transition and the building of a "Beautiful China" into tangible practice, the implementation strategy for the 15th FYP must be anchored by a systematic, scientifically grounded, and highly operational framework. China must move beyond single-dimensional policy instruments and instead foster synergy across multiple domains: governance systems, market mechanisms, technological innovation, spatial planning, and global cooperation. By mobilizing these integrated forces, China will generate a powerful synergy to drive the comprehensive green transformation of its economic and social development.

4.1 Deepening Institutional Innovation and Building a Comprehensive Incentive-Constraint Framework

The 15th FYP period represents a pivotal juncture in China's "New Journey" toward a modern socialist country. It serves as the decisive "assault phase" for the nation's comprehensive green transformation**.** Ensuring that this ambitious top-level design is translated into effective practice requires profound institutional innovation as its primary engine. A centerpiece of this era is China's strategic shift from the "Dual Control of Energy Consumption" to the "Dual Control of Carbon Emissions"—encompassing both total volume and intensity. This systemic transformation redefines the country's development philosophy, governance modalities, and incentive structures.

Consequently, establishing a robust, incentive-compatible, and high-efficiency "Universal Incentive-Constraint Framework" stands as the foremost institutional imperative for China's green transition during the 15th FYP period.

First, the Chinese government must refine its multifaceted toolkit across three primary domains. In fiscal and taxation policy, measures should be more targeted and robust, leveraging special funds, tax incentives, and green government procurement to prioritize China's "New Energy System," the green upgrading of traditional industries, and the R&D and demonstration of low-carbon technologies. Furthermore, financial policies must proactively promote instruments such as transition finance and carbon derivatives, develop products tailored to the decarbonization pathways of China's high-carbon industries, and expand green insurance and guarantees to mitigate systemic transition risks (Wang et al., 2025). Lastly, pricing policies should deepen market-oriented reforms, ensuring that water, electricity, and gas prices accurately reflect resource scarcity, environmental externalities, and market dynamics, for example, through mechanisms such as the nationwide implementation of tiered electricity pricing for energy-intensive sectors.

Second, a systematic and robust performance evaluation framework must be established. The core of this system lies in developing a scientific, equitable, and dynamic mechanism for allocating and managing carbon emission budgets. On the one hand, implementation must follow a "place-based and evidence-based" approach. This model must integrate regional development stages (per capita GDP, industrialization levels), structural characteristics (share of carbon-intensive industries, renewable energy potential), resource endowments (forest carbon sinks, CCUS geological suitability), and mitigation potential (technology substitution costs). For instance, provinces in China's western region—which are rich in renewable resources but economically less developed—could be granted more flexible initial total budgets paired with stringent intensity-reduction mandates. This supports "decarbonized growth" via green power industries. Conversely, major industrial provinces with structural rigidities should face more challenging budgets, complemented by technical and financial assistance, reflecting the principle of "common but differentiated responsibilities" (CBDR) at the sub-national level. Furthermore, these budget cycles should align with China's FYP periods, with potential mechanisms for inter-temporal "banking and borrowing" to enhance flexibility. On the other hand, the evaluation must be anchored in a system of "strong incentives and hard constraints" to ensure a decisive "baton effect." The fulfillment of "Dual Control" targets for carbon emissions should serve as a decisive "one-vote disqualification from merit evaluation" criterion in the comprehensive assessment and promotion of leading officials. Its weighting should be increased to align with traditional core indicators such as GDP growth and social stability; in ecologically sensitive zones, a "one-vote disqualification" policy for environmental failure should be strictly enforced. Exemplary regions should receive preferential access to green special transfer payments, ecological compensation funds, and higher quotas for local government green bonds. Conversely, regions that exceed their budgets should face punitive measures, such as deductions from transfer payments and the suspension of fiscal subsidies for energy-consuming projects.

Third, advancing enterprise-level carbon management is essential to activate market signals and strengthen endogenous momentum. As enterprises are the ultimate executors of

decarbonization, the regulatory framework must be upgraded from managing "key energy-consumers" to overseeing "key carbon-emitters." This transition imposes compulsory requirements for periodic carbon accounting and reporting, with carbon performance metrics—such as carbon intensity per unit of product and carbon productivity—serving as core regulatory indicators. China's National Carbon Emissions Trading System (ETS) remains the central policy instrument. By gradually tightening free-allowance allocations, expanding sectoral coverage, and introducing paid allocation and auction mechanisms, the system can ensure carbon prices accurately reflect abatement costs, generating sustained and robust price signals. Simultaneously, financial institutions should use corporate carbon performance to develop differentiated green credit, bond, and insurance products, ensuring that low-carbon performers receive lower financing costs and creating a market-based, self-reinforcing incentive loop.

Fourth, rigorous project-level carbon evaluation must be implemented to strengthen source-based entry controls and prevent high-carbon lock-in. To achieve carbon peaking, it is imperative to strictly prevent the "lock-in effect" associated with new high-carbon investments at the incremental source. This requires elevating life-cycle carbon-emission assessments to the status of Environmental Impact Assessments (EIA) and Energy Conservation Reviews, establishing them as a mandatory precondition for the approval of all new construction, expansion, and major technological renovation projects in China. For major projects whose carbon intensity exceeds advanced industry benchmarks, or whose implementation would cause regional carbon emissions to exceed allocated budgets, a "one-vote disqualification" mechanism should be applied. Alternatively, the projects must be mandated to implement equivalent, enforceable emission-reduction substitution schemes.

Fifth, a product carbon footprint system must be established to drive the transformation of supply chains and consumption patterns. Market demand is the primary catalyst for the green transition. Therefore, China must accelerate the development of a unified, authoritative framework for carbon footprint accounting, certification, and labeling that covers major industrial and consumer products. By quantifying total emissions across the entire life cycle—from raw material acquisition and production to transportation, use, and disposal—and conveying this data through intuitive labeling, invisible carbon impacts are rendered tangible to market selection. This system will incentivize large-scale purchasers and brand owners to prioritize low-carbon options, thereby transmitting upstream emission-reduction pressure through green supply chain management and fostering coordinated decarbonization across the entire value chain. Furthermore, the government can play a leading role in cultivating this market through green public procurement and targeted consumption subsidies.

Collectively, these five dimensions are mutually reinforcing and sequentially integrated, forming a rigorous institutional network for China's green governance. As such, this framework ranges from macro-level target decomposition to micro-level product guidance, bridging the gap between administrative performance evaluation and market-driven incentives. Furthermore, it encompasses the full spectrum of management from source-based prevention to full life-cycle oversight.

4.2 Leveraging New Quality Productive Forces as the Core Engine: Strengthening "Green-Intelligent-Resilient" Empowerment

Technological innovation serves as the "engine" of China's green transition. Amid intensifying global competition in green technologies, the development of new quality productive forces must be prioritized to ensure autonomous control of core technologies and their deep integration into industrial upgrading. Guided by a strategic framework of "Green, Intelligent, and Resilient" (GIR) integration, China must achieve critical breakthroughs across several key pathways during the 15th FYP period.

First, China must construct a "smart and resilient" new-type energy system as the primary arena for Green-Intelligent-Resilient (GIR) synergy. From a "green" perspective, the central task is to substantially increase the share of non-fossil energy in the national energy mix, while driving coal consumption to its peak, and then reducing it steadily. Regarding the "intelligent" dimension, priority should be given to building a new-type power system centered on smart grids and efficient source-grid-load-storage interaction; by leveraging artificial intelligence to forecast renewable energy output and optimize dispatch strategies, China can enable the "plug-and-play" integration and aggregated management of massive distributed energy resources. From a "resilient" perspective, it is essential to simultaneously develop long-duration regulation capabilities, such as large-scale energy storage and hydrogen energy, to bolster the power system's capacity to withstand extreme weather and cyberattacks, thereby fostering a security paradigm of multi-energy complementarity and regional mutual assistance. In parallel, China's energy governance and market mechanisms must be reformed with a focus on digitalization and resilience to ensure a market system capable of accommodating a high share of renewable energy.

Second, China must implement a "Precision-Intelligent" dual control system for carbon emissions, aligning green ambitions with intelligent execution and robust safeguards. To achieve a comprehensive transition to the "Dual Control" of carbon emissions, smart technologies must be integrated with resilient governance principles. Under the "green" objective, China should establish a unified, nationwide carbon accounting and performance assessment system covering all regions, sectors, and enterprises. Regarding "intelligent" execution, the government should leverage the Internet of Things (IoT) and blockchain to build real-time, trustworthy carbon-monitoring networks and predictive models, enabling a transformative shift from retrospective results-based accounting to proactive, process-oriented intelligent control. Finally, to provide "resilient" safeguards, China's carbon market must incorporate effective price-stabilization mechanisms to manage volatility, and differentiated transition pathways for diverse regions and industries are essential to avoid the systemic risks of a "one-size-fits-all" approach, thereby ensuring a smooth and orderly low-carbon transition.

Third, China must cultivate "integrated and efficient" green and low-carbon industries, characterized by an intrinsic green essence, intelligent operational processes, and systemic resilience. As an inherent requirement for developing new quality productive forces, this industrial transformation focuses first on "greenness" as its core, aiming to build a structure characterized by high technological intensity, low resource consumption, and minimal environmental impact. Second, "intelligence" defines the transformation process. By integrating the Industrial Internet,

artificial intelligence, and digital twins, China can achieve flexible, fine-grained production that significantly enhances energy and material efficiency. Finally, "resilience" serves as a critical systemic attribute. This involves diversifying industrial and supply chain layouts and strengthening backup capacities in critical sectors. By expanding resource recycling and circular-economy industries to reduce external resource dependence, China's green industrial system can develop robust shock-absorption and rapid-recovery capabilities necessary to withstand global disruptions.

Fourth, China must advance "digital-twin-enabled" ecological and environmental zoning regulation, characterized by green baselines, intelligent tools, and spatial resilience. As the cornerstone for optimizing territorial development and protection, this framework first establishes "greenness" as the spatial baseline by stringently enforcing Ecological Protection Red Lines within the "Three Zones and Three Lines" framework (which defines urban, agricultural, and ecological spaces, along with three mandatory control boundaries (red lines for ecological protection, permanent basic farmland, and urban development boundaries). Second, "intelligence" serves as a management tool. By constructing digital twins of river basins or regions, China can dynamically simulate and assess the environmental impacts of development activities, thereby enabling intelligent optimization and real-time updating of spatial regulation schemes. Finally, "resilience" constitutes the spatial objective. By aligning the distribution of productive forces with natural ecosystem patterns, zoning regulations protect and enhance ecosystem integrity and connectivity. In doing so, it strengthens the long-term ecological security of the national territorial space and provides a sustainable carrying capacity for future development.

It must be further emphasized that national territorial space is the essential carrier of development, and its utilization patterns directly determine the upper limits of resource and environmental carrying capacity. During the 15th FYP period, it is imperative to ensure the rigorous enforcement of the ecological and environmental zoning system, positioning it as both a "hard constraint" and a strategic "proactive initiative" in balancing development with protection. The core task is to deepen the application of the "Three Lines and One List" framework—comprising ecological protection red lines, environmental quality bottom lines, resource utilization ceilings, and ecological environmental access lists—by fully integrating these metrics into the "Single Map" of national territorial spatial planning. This framework must function as a mandatory criterion for regional industrial layouts, structural adjustments, resource development, urban construction, and the siting of major projects. On this basis, China should implement differentiated spatial development strategies to guide productive forces toward regions with ample environmental capacity, favorable market conditions, and robust development potential—thereby fostering a green, low-carbon, and high-quality development paradigm aligned with the nation's carrying capacity.

4.3 Expanding Global Collaboration to Shape a Favorable External Environment and New Competitive Advantages

First, China should proactively articulate and demonstrate the global significance of its green development. The international impact of China's green transition lies in its profound redefinition of "latecomer advantage," demonstrating that developing nations possess immense "leapfrog

potential" in their developmental trajectories—far beyond conventional technological catch-up. Traditional theories of latecomer advantage emphasize technical imitation, capital inflows, and structural transfers, often tacitly accepting a high-pollution industrialization path as an inevitability. China's experience reveals that the latecomer advantage lies in leveraging it, harnessing the latest technological revolutions (such as renewables and digitalization) and frontier governance concepts (such as Ecological Civilization) to forge an entirely new path deliberately. This is the essence of China's strategy to "overtake on the curve" and "change lanes for development." In the energy sector, for instance, China did not follow a strictly linear progression from coal to oil and gas before reaching renewables. Instead, by leveraging robust industrial coordination and massive market scale, China pursued the clean utilization of coal while simultaneously building the world's most comprehensive and competitive supply chains for photovoltaics, wind power, and power batteries—thereby capturing the "commanding heights" of the global energy transition. This "path-creating" latecomer advantage offers a realistic alternative for other developing nations to escape the "pollute first, treat later" trap; it proves that environmental quality need not be sacrificed for primary industrialization, as green elements can be embedded directly into the growth engine from the outset. For developed economies, China's model dismantles the false dichotomy between "modernization" and "Westernization." As such, this demonstrates the socio-political and economic viability of a green development path for a nation with a massive population (Huang, 2022). While some Western environmental theories posit a static trade-off between ecological protection and economic growth—assuming only high-income societies can afford "green costs"—China's approach remains rooted in the reality of a developing giant with 1.4 billion people. China's green transition is never "environmentalism for its own sake" divorced from development; rather, it is anchored in the conviction that "lucid waters and lush mountains are invaluable assets," and focuses on realizing the value of ecological products to achieve high-quality, inclusive growth.

Second, China must persistently advance the Green Belt and Road Initiative (BRI) as a flagship platform for leading global ecological governance. China has actively promoted green infrastructure, renewable energy, and sustainable finance cooperation along the Belt and Road Initiative, thereby empowering partner developing countries to accelerate their low-carbon transitions. The BRICS Partnership on New Industrial Revolution (PartNIR) has broad global representativeness. It serves as a core platform during the 15th FYP period for China to establish BRICS industrial capacity centers and to guide the evolution of this partnership. Its collaborative model also provides a powerful demonstration and leading example for the rise of the Global South. Simultaneously, China occupies a pivotal position in shaping global green industrial and supply chains. Dominating world markets in photovoltaic modules, wind power equipment, and new energy vehicles (NEVs), China supplies premium green products worldwide and supports partner nations in building their own green industries through technology transfer, joint capacity cooperation, and industrial collaboration. These multifaceted contributions have made "green" the defining foundation of international cooperation—a legacy that must be further strengthened, institutionalized, and amplified throughout the 15th FYP period.

Third, as green transformation advances in an open global context, China must further demonstrate its global responsibility and leadership by coordinating domestic and global priorities.

As a key participant, contributor, and leader in global ecological civilization, China should adopt an increasingly proactive stance in global environmental governance throughout the 15th FYP period. This involves firmly upholding the UNFCCC and the Paris Agreement as the primary multilateral channels while honoring its "Dual Carbon" commitments through concrete actions that bolster global climate leadership (Zhang et al., 2021). Concurrently, China should leverage multilateral platforms—including the G20, BRICS, the Shanghai Cooperation Organization (SCO), and the Belt and Road International Green Development Coalition—to turn its vast market scale and industrial strengths into influence over international rules and standards in green infrastructure, energy, and finance. In particular, amid the rise of unilateralism and "green trade barriers," China must employ a strategy that combines cooperation with principled countermeasures. On the one hand, it should strengthen bilateral and regional cooperation in green technology, trade, investment, and promote mutual recognition. On the other hand, it must engage in principled, advantageous, and measured countermeasures against the instrumentalization of climate issues that seek to undermine China's legitimate development.

In conclusion, China's comprehensive green transition strategy during the 15th FYP period is poised to cultivate a deep-seated and novel form of competitive advantage—one that transcends the zero-sum logic of traditional geopolitical rivalries. Ultimately, China's green transition will serve as a "stabilizing anchor" and a "source of momentum" in major-country strategic interactions, anchoring global cooperation while driving the next wave of sustainable development.

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