CHINA
LOW-CARBON TRANSITION TOWARD CARBON NEUTRALITY

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2025 marks ten years since the Paris Agreement was adopted and five years since its full implementation phase began. Over that decade China—now the world's largest producer of renewable-energy equipment, the holder of the largest single-sector carbon market, and a major actor in South–South cooperation—has shifted from pilot projects and policy experimentation to a system-wide low-carbon transition aligned with its dual-carbon goals: peaking CO_2 emissions before 2030 and achieving carbon-neutrality before 2060.

This report takes stock of that transition in five tightly linked sections: first, it examines long-term targets and the "1 + N" policy architecture—showing how China's nationally determined contribution (NDC)[1] and long-term strategy (LT-LEDS)[2] translate political commitments into measurable action; Second, it assesses what has been "unlocked", highlighting four pillars underlining China's low carbon transition: Emission Trading Scheme (ETS), renewables, new-energy vehicles, methane control which have moved from pilots to national roll-out. Third, it analyses key obstacles—coal exit,

1 China. (2022). *Progress Report on the Implementation of China's Nationally Determined Contribution (2022)*. United Nations Framework Convention on Climate Change. Retrieved from https://unfccc.int/sites/default/files/NDC/2022-11/%E4%B8%AD%E5%9B%BD%E8%90%BD%E5%AE%9E%E5%9B%BD%E5%AE%B6%E8%87%AA%E4%B8%BB%E8%B4%A1%E7%8C%AE%E8%BF%9B%E5%B1%95%E6%8A%A5%E5%91%8A%202022.pdf

2 China. (2020). China's Mid-Century Long-Term Low Greenhouse Gas Emission Development Strategy (unofficial translation). United Nations Framework Convention on Climate Change. Retrieved from https://unfccc.int/sites/default/files/resource/China%E2%80%99s%20Mid-Century%20Long-Term%20Low%20Greenhouse%20Gas%20Emission%20Development%20Strategy.pdf

demand-side mitigation, and hard-to-abate industries—to explain why progress lags in these areas. Fourth, it explores non-climate linkages, detailing how pollution control, green finance and "new-quality productivity" embed climate objectives into China's broader development agenda. Fifth, it considers governance and international cooperation, outlining the domestic climate-governance hierarchy and China's dual role as both receiver and provider of international climate finance and capacity building.

CHINA'S NDC AND CARBON NEUTRALITY: TARGETS, PROGRESS, AND PATHWAY

China's updated NDC (2021) anchors a dual long-term vision: peak CO_2 emissions before 2030 and strive for carbon neutrality before 2060. Quantitatively, the NDC commits to: cutting CO_2 intensity by over 65% from 2005 levels by 2030; raising non-fossil energy to around 25% of primary consumption; increasing forest stock by 6 billion m^3 vs. 2005; and bringing wind and solar installed capacity to over 1,200 GW by 2030.

Delivering these goals is organized through a "1+N" policy framework. The "1" is the high-level Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality, complemented by the Action Plan for Carbon Dioxide Peaking Before 2030 (ten key actions across energy, industry, transport, circular economy, technology, sinks, society, and region-specific peaking). The "N" comprises sectoral and provincial implementation plans. Together with the Mid-Century Long-Term Low GHG Emission Development Strategy submitted to the UNFCCC, this provides the strategic spine for the 2060 neutrality pathway.

From the standpoint of institutions and implementation, China's carbon-neutrality target is grounded in a robust vision for low-carbon transition rather than a mere political declaration: first, the long-term vision has been embedded in Five-Year Plans and dedicated action programs, with interim targets, pathways, and divisions of responsibility clearly specified; second, a set of tracking indicators aligned with the NDC—such as carbon-intensity reduction, the share of non-fossil energy, installed wind and solar capacity, and forest stock—has been established, and progress is reported regularly in accordance with greenhouse-gas inventory and statistical protocols.

China reports its progress towards NDC and carbon neutrality in its first Biennial Transparence Report: CO_2 from fuel combustion and industrial process and product use (IPPU) at 11.62 Gt in 2021; CO_2 intensity fell by 50.9% from 2005 levels by 2021; the share of non-fossil energy rose to 17.9% of total energy consumption in 2023; forest stock increased to 19.493 billion m^3 in 2021—surpassing the NDC forest target ahead of schedule; and wind and solar capacity expanded to around 1,050 GW by the end of 2023 and reached about 1,280 GW by Oct-2024, overachieved the 2030 goal of 1,200 GW goal.

In sum, China's NDC sets measurable 2030 milestones while the "1+N" architecture and mid-century strategy translate the 2060 neutrality vision into an implementation roadmap across sectors and regions. Early results—on intensity reduction, carbon sinks, and renewable build-out—indicate momentum toward peaking this decade and laying the foundations for long-term decarbonization.

PROGRESS TO DATE: WHAT HAS BEEN "UNLOCKED" IN CHINA'S LOW-CARBON TRANSITION?

Over the past decade, China has moved from piloting to scaled, system-level implementation across several pillars of the low-carbon transition that now operate at national scope and are broadly aligned with the country's peak-carbon and carbon-neutrality goals. Four areas stand out as effectively "unlocked": (1) a national carbon market with clear rules and growing coverage; (2) rapid renewable-energy deployment underpinned by technology advances and supportive policy; (3) the new-energy vehicle (NEV) industry's leap from policy-nurtured infancy to global competitiveness; and (4) the elevation of methane governance from co-benefit control to a climate priority with an emerging MRV backbone;. Together these pillars have shifted China from isolated initiatives to a more coherent portfolio of market instruments, industrial policy, and regulatory standards capable of delivering durable, economy-wide emissions outcomes.

National Carbon Market (ETS)[3]

China's carbon market evolved from concept to national institution in a little over a decade. Following early legal foundations on energy conservation and renewables, and experience gained through the Clean Development Mechanism, China launched seven sub-national ETS pilots (2013–2014). These pilots tested data accounting methods, allocation approaches, and compliance design—clarifying the balance between fairness and efficiency and building supervisory and penalty mechanisms that later informed national rules.

A national ETS was announced in 2017 and went live for trading in 2021, initially covering 2,162 power generators—about 4.5 Gt CO_2, making it the world's largest single-sector carbon market at launch. Regulatory scaffolding has since been strengthened through climate-related administrative rules, sectoral norms, and technical specifications governing accounting, reporting, verification (MRV), allocation, settlement, trading, and compliance. From 2021 to 2024, the carbon price rose steadily (ranging from roughly CNY 40–100/tCO_2, with an average of about CNY 66/tCO_2), placing it mid-range globally and signaling rising compliance stringency.

In 2025, the national ETS expanded beyond power to include cement, iron & steel, and aluminum smelting, and broadened its greenhouse-gas scope from CO_2 to also include CF_4 and C_2F_6. Coverage rose to an estimated ~8 Gt, exceeding 60% of national emissions. With the market now operating at multi-sector scale, the ETS has effectively "unlocked" a durable market signal that apportions reduction responsibility among high-emitting industries, internalizes carbon costs to steer capital toward efficiency and cleaner processes, and reduces system-wide abatement costs compared with purely administrative controls. Continued progress, however, will depend on improvements in data quality, the tightening of allowances, broader sectoral inclusion, and the orderly linkage with complementary instruments.

3 Zhang X , Yu R , Karplus V J .The development of China's national carbon market: An overview[J].Energy and Climate Management, 2025

Renewable Energy

China's renewable-energy expansion has moved from policy formulation to large-scale system deployment. A series of laws and plans established the initial framework, while the 2022 multi-agency plan and the 2024 guidance accelerated renewable substitution, clarified the relationship between traditional and new energy, emphasized supply–demand balance, and promoted technology R&D, innovative business models, and enabling market mechanisms.

Technological progress has provided the foundation for this scale-up. Hydropower has benefited from digital construction and intelligent O&M; wind power has advanced toward larger, smarter, and more diverse applications; solar has expanded manufacturing scale and achieved significant improvements in crystalline-silicon conversion efficiency, complemented by cost-reducing solar-thermal innovations; biomass power and heating technologies have been optimized; new energy storage technologies (including compressed-air systems) have developed rapidly; and hydrogen electrolysis equipment has scaled up quickly. These advances, combined with manufacturing scale, have contributed to sharp global LCOE declines—over 60% for wind and 80% for solar in the past decade.

Measured by outcomes, China now hosts the world's largest and fastest-growing renewable system. New energy capacity has ranked first globally for years, accounting for roughly 40% of worldwide additions; since 2020, annual new wind and solar capacity has repeatedly exceeded 100 GW, reaching about 290 GW in 2023 (~63% of global additions). By 2023, renewable installed capacity reached 1.516 TW (51.9% of national power capacity). By May 2025, installed renewables had expanded to ~2.09 TW, more than double the end-2020 level. Power generation from renewables rose from ~1.41 to ~3.47 TWh (2015–2024), lifting the generation share from 24.2% to 34.4%. With policy support, grid integration improvements, and storage expansion, renewables have shifted from marginal additions to a core, steadily growing pillar of China's power system and a central enabler of the net-zero pathway.

Persistent challenges remain, particularly the intermittency of renewables. Addressing this issue will require accelerated development of storage technologies, the construction of smart grids, optimization of the power generation mix, and stronger regional power interconnections to cope with variability in renewable output and ensure secure and stable system operation. A further structural difficulty is the geographic mismatch between renewable generation potential, concentrated in resource-rich western regions, and electricity demand, centered in the industrialized and densely populated east. Although China is advancing ultra-high-voltage and long-distance transmission technologies to facilitate cross-regional power flows, the wider deployment of distributed solar and the strategic relocation of energy-intensive industries will also be essential.

New Energy Vehicles (NEVs)

China's new energy vehicle (NEV) industry has evolved from policy-incubated pilots into a globally competitive sector. Since 2007, standards and industrial plans have provided the framework for development. The 2012 plan emphasized pure-electric drive, set a 2020 sales target of at least 5 million cumulative units, and aimed to build internationally competitive capabilities in vehicles, batteries, and key components. Government support combined R&D programs, pilot fleets, and supply-chain cultivation, while firms advanced early and aggressively on product development, core technologies, and intelligent features.

Production and deployment outcomes have been transformative. Annual NEV output rose from fewer than 10,000 units in 2011 to around 9.59 million in 2023, representing a compound annual growth rate of about 71 percent. In 2023 alone, 7.43 million NEVs were newly registered, accounting for roughly 30 percent of all new vehicle registrations, while the overall NEV stock reached approximately 20.4 million vehicles, or 6.1 percent of the national fleet. Charging and swapping infrastructure expanded in parallel, with about 3.39 million charging facilities added in 2023 (bringing the total to 8.60 million) and 3,567 battery-swap stations in operation[4]. Internationally, leading OEMs and battery suppliers extended overseas manufacturing footprints, Chinese firms ranked prominently in global NEV sales and battery installations, and NEV exports reached about 679,000 units in 2022, an increase of around 120 percent year on year.

The NEV ecosystem has now reached national scale. Vehicle platforms, battery supply chains, power electronics, software, and charging and swapping networks are jointly supported by industrial policy, market demand, and rapid technological iteration. This expansion has reduced dependence on niche pilots and enabled tangible oil-demand displacement, generated air-quality co-benefits, and facilitated integration with the power system through vehicle–grid coupling. At the same time, it has reinforced China's clean-technology manufacturing base and enhanced export competitiveness.

Methane Emission Control

China's methane policy began largely outside the climate frame—driven by safety, energy utilization, and pollutant control in coal, agriculture, and waste—but has since been elevated to a climate priority. A turning point came at COP26 with the China–U.S. Glasgow Declaration, followed by China's national methane action plan (2023)[5]—its first top-level blueprint for methane control—which assigned responsibilities across relevant ministries and sectors.

4 Responding to Climate Change:China's Policies and Actions(2024 Annual Report). Ministry of Ecology and Environment of the People's Republic of China. 2024.

5 Action Plan for Methane Emission Control. Ministry of Ecology and Environment of the People's Republic of China. 2023

Since then, China has been constructing a methane MRV architecture: building data-submission platforms, issuing sectoral submission guidelines (coal; oil & gas; waste treatment), piloting submissions, updating emission factors, and running demonstrations on coal-mine gas utilization and coalbed-methane development. It has advanced methodologies for voluntary methane reductions, revised landfill standards to co-control greenhouse gases and odor, and undertaken capacity-building programs for local regulators and firms.

Reported national methane emissions (including LULUCF) stabilized around 1.65–1.70 $GtCO_2e$ (2014–2021) with slight fluctuations. While China remains the world's largest methane emitter due to its economic structure and energy mix, the institutionalization of methane governance—move to MRV, clearer standards, pilots that link safety, utilization, and climate goals—marks a shift from incidental co-benefits to purposeful climate management. What is now "unlocked" is the policy and technical pathway for measurable, reportable, and verifiable reductions, positioning methane as a near-term, high-impact lever in China's broader mitigation strategy.

KEY OBSTACLES OF CHINA'S NET-ZERO TRANSITION

Despite notable progress in China's net-zero transition, actual outcomes in several critical areas are still lagging behind policy targets. This section highlights three typical challenges—coal phase-out, demand-side mitigation, and decarbonization of energy-intensive industries—and analyzes the structural constraints and mechanisms behind them.

The coal phase-out challenge

Transitioning away from coal-fired power is central for China to achieve carbon neutrality. To align with the 2°C and 1.5°C targets, coal's share in energy consumption must fall to less than 10% by 2050. Since 2015, China has introduced policies to improve coal-power efficiency, including "large-for-small replacement" (replacing small, inefficient units with larger, high-efficiency ones), "capacity-neutral replacement", and the accelerated retirement of outdated units. The role of coal-power plants has also been transformed from power generators to flexible power sources. Despite these, coal still accounts for 53.2% of energy consumption in 2024, down from 63.8% in 2015. In fact, 2024 marked a record high in coal power expansion since 2015, with 94.5 GW of new capacity started and 3.3 GW of previously suspended projects resumed[6]. This trend runs counter to the country's net-zero goals.

The persistence of coal power is primarily due to its triple role in China's energy system. First, coal ensures reliable supply amid growing electricity demand. Second, it compensates for the intermittency of renewables in the absence of sufficient flexible generation resources. Third, especially in northern China, coal remains essential for centralized winter heating. These factors combine to make coal power functionally irreplaceable in the short term, reinforcing its continued expansion despite decarbonization goals.

In addition to these functional dependencies, China faces three structural barriers that complicate its coal transition. One major barrier is regional economic reliance on coal, particularly in provinces such as Shanxi, Inner Mongolia, and Shandong, where coal power forms the backbone of local economies and employment. Phase-out could trigger economic decline, prompting resistance from local authorities. A second challenge concerns employment and just transition pressures. Capacity reductions risk mass layoffs. Coal companies face steep resettlement costs, and displaced workers—often single-skilled—struggle to find new employment. A third constraint is the so-called "lock-in effect" of coal assets. China operates the world's youngest and most efficient coal fleet. Premature retirement of these assets could lead to major financial risks, including stranded investments and credit defaults.

A secure transition away from coal power requires

6 Qi Q, Shearer C. When Coal Won't Step Aside: The Challenge of Scaling Clean Energy in China[R]. Centre for Research on Energy and Clean Air & Global Energy Monitor, 2025.

a fundamental shift in its revenue model. Rather than relying primarily on electricity sales, coal plants need to earn income by providing backup capacity and flexibility to support the rapid growth of renewables, while their overall generation gradually declines. Introducing a capacity payment has been one policy instrument to support this shift, enabling plants that undergo technical upgrades to serve as reserve providers instead of baseload generators. Looking ahead, multiple measures will be needed to ensure an orderly phase-out. These include strengthening incentives in the capacity market and linking them with carbon pricing to create clear economic drivers for exit, developing financial tools to restructure coal assets and support worker transitions, and upgrading heating systems so that electric or renewable alternatives can gradually replace the heat currently supplied by coal. Together, these steps can guide coal's role toward backup support in the near term and create the conditions for its safe and sustainable retirement.

Demand-side emission reduction

Demand-side mitigation focuses on three primary pathways: shifting production and consumption patterns, improving technical efficiency, and substituting fuels. Compared to supply-side measures, these approaches offer greater mitigation potential, lower costs, and stronger co-benefits. Scenario analyses suggest that demand-side strategies are critical to peaking final energy consumption by 2030. However, policy progress in this area remains limited. For example, national electricity consumption rose from 5.55 TWh in 2015 to 9.85 TWh in 2025—an increase of nearly 80%. With continued electrification and the rise of green hydrogen, electricity demand is projected to grow further. By 2050, electricity use is expected to rise by 80% under a 2°C scenario and by 95% under a 1.5°C scenario, relative to 2020[7].

7 He, J., Li, Z., Zhang, X., Wang, H., Dong, W., Du, E., Chang, S., Ou, X., Guo, S., Tian, Z., Gu, A., Teng, F., Hu, B., Yang, X., Chen, S., Yao, M., Yuan, Z., Zhou, L., Zhao, X., … Zhang, D. (2022). Towards carbon neutrality: A study on China's long-term low-carbon transition pathways and strategies. ENVIRONMENTAL SCIENCE AND ECOTECHNOLOGY, 9. https://doi.org/10.1016/j.ese.2021.100134

Despite this, China's power system lacks a robust demand response mechanism due to prolonged government-controlled pricing. Tariff signals remain weak, peak-to-valley price differentials are narrow, and user incentives to shift consumption are limited. As a result, demand-side flexibility is insufficient to accommodate large-scale renewable energy integration. Industry accounts for over 60% of electricity consumption, yet the proportion of responsive loads remains well below the 3–5% target set by the National Development and Reform Commission (NDRC). On the residential side, peak-valley pricing pilots are limited to 14 provinces, with pricing spreads too small to motivate behavioral change. Emerging flexible loads such as electric vehicles and data centers have yet to be effectively aggregated, with technical feasibility outpacing policy implementation. Additionally, public awareness and participation in energy-saving and emission-reduction efforts remain weak. There is a clear disconnect between consumer engagement strategies and pricing mechanisms, undermining demand-side momentum and limiting policy effectiveness.

Decarbonization of energy-intensive industries

China's energy-intensive industries—such as iron and steel, cement, and aluminum—account for over 50% of global production and consumption. These sectors emit approximately 3 billion tons of CO_2-equivalent annually, representing over 20% of China's total emissions. Under a carbon neutrality scenario, the iron and steel industry would need to reduce emissions from nearly 1.6 billion tons in 2020 to around 150 million tons by 2060. Similarly, the cement sector must cut emissions from 1.3 billion tons to 120 million tons over the same period. These targets present a considerable decarbonization challenge. Although these industries have been designated as priority areas within China's "1 + N" policy framework—and are slated for inclusion in the national carbon market by 2025—they still face major structural obstacles to deep decarbonization.

One core barrier lies in China's resource structure, which remains heavily coal-dependent. Iron and steel production is still dominated by the blast furnace–basic oxygen furnace (BF–BOF) route, which has nearly triple the carbon intensity of the electric arc furnace (EAF) route. Over 95% of heat used in cement production is derived from coal. In the chemical sector, coal accounts for roughly 80% of feedstock used in synthetic ammonia and methanol, further entrenching the system's high-carbon profile[8]. In addition to energy constraints, these industries face the dual challenge of reducing process-related emissions and substituting energy sources. For example, two-thirds of emissions in cement production stem from limestone decomposition, which cannot be addressed through energy substitution alone. Scalable alternative processes are not yet commercially viable, and deep decarbonization depends on emerging technologies such as alternative materials and carbon capture and storage (CCS), which remain in early stages of development. Furthermore, industrial transformation is also constrained by the long life cycles of capital assets, typically ranging from 30 to 40 years. Accelerated decarbonization risks stranding existing investments. Meanwhile, green industrial products continue to carry a cost premium, limiting market demand and dampening firms' incentives to invest in low-carbon upgrades. In sum, decarbonizing energy-intensive industries hinges on overcoming technological uncertainty, high investment requirements, and limited short-term market signals.

Overall, the challenges of phasing out coal, advancing demand-side mitigation, and transforming energy-intensive industries reflect deeper structural barriers in China's net-zero transition. These sectors are shaped by competing policy objectives, entrenched path dependencies, and institutional constraints. Addressing these obstacles requires a coordinated approach that integrates energy security, economic development, and climate goals—supported by optimized policy frameworks and accelerated technological innovation in decarbonization pathways.

8 Li S, Li W, Lu S, et al. Financing the low-carbon transition in heavy industry[R]. Rocky Mountain Institute, 2023.

LINKAGES WITH NON-CLIMATE ISSUES

In China, climate policy has evolved beyond the traditional confines of environmental protection and is now closely integrated with broader national priorities, including economic development, financial reform, and industrial upgrading. A growing number of government agencies and market actors are actively engaged in climate-related policymaking, facilitating the incorporation of climate goals into mainstream development strategies. This section examines how climate objectives are substantively embedded in the environmental, financial, and economic spheres, using the cases of air pollution control, green finance, and new quality productivity as key examples.

Pollution reduction and carbon synergies

China has long recognized the need to link climate action with air pollution control, establishing a cross-sectoral policy approach centered on "pollution reduction and carbon synergy." Greenhouse gases (GHGs) and conventional air pollutants often share common emission sources and control pathways. This overlap is particularly relevant in developing economies, where decarbonization coincides with ongoing industrialization and urbanization, making coordinated action more effective. In China, the synergistic approach first emerged through the urgent need to tackle $PM_{2.5}$ air pollution. Government measures targeting coal consumption and promoting structural energy shifts have not only improved air quality but also contributed significantly to reducing carbon intensity. These co-benefits have since become a cornerstone of national climate policy.

Policy integration has continued to deepen through the development of a unified accounting framework for GHGs and air pollutants, the incorporation of carbon metrics into environmental impact assessments, and the launch of synergistic governance pilots at both the park and city levels. Between 2013 and 2023, national emissions of sulfur dioxide and nitrogen oxides declined by more than 85% and 60%, respectively, while carbon intensity dropped by over 34%. These results highlight the effectiveness of coordinated environmental and climate policy. The MEE has emerged as a key driver of climate governance, using air quality management as a central policy instrument. Meanwhile, the NDRC, Ministry of Finance, and National Energy Administration are increasingly engaged in climate action through industrial regulation, fiscal mechanisms, and the promotion of clean energy deployment.

Green finance

Green finance is a key component of China's financial supply-side structural reform and a vital tool for addressing climate crisis while guiding the green transformation of the economy. As climate risks increasingly affect the financial system—through physical damage, transition pressures, and asset revaluation—climate considerations have been integrated into financial regulation and macroeconomic stability frameworks. Green finance plays a central role by enabling risk mitigation and directing capital flows toward sustainable development. China has prioritized green finance at the policy level. In 2016, the People's Bank of China, along with the Ministry of Finance, the NDRC, the MEE, and seven other agencies, jointly issued *the Guidelines for Establishing the Green Financial System*. The document called for mobilizing social capital toward green industries through instruments such as green credit, green bonds, and green insurance, while restricting financing for high-pollution, high-carbon projects. Since then, the regulatory framework has steadily evolved. A green finance classification system has been established, and financial tools such as carbon credits and transition finance mechanisms have continued to expand. As a result, China's green finance market has grown rapidly. By the end of 2023, the balance of domestic and foreign currency green loans in China reached 30.08 trillion yuan, the highest in the world, with a significantly lower non-performing loan ratio than general credit. Green bond issuance exceeded 5,479 bonds, totaling 7.78 trillion yuan, making China the world's largest green bond market, surpassing the United States. Financial instruments such as green equity indices, green insurance products, and carbon emissions trading continue to diversify, while investor preferences for environmental sustainability are driving further market expansion. China's green financial system has taken shape, with active participation from central banks, regulatory agencies, securities institutions, and investment entities. Overall, policy momentum remains strong. Nonetheless, key challenges remain. These include the need to standardize green project classification, improve environmental information disclosure mechanisms, and enhance the capacity to price carbon-related risks. Addressing these gaps will be essential to ensuring the long-term credibility and effectiveness of green finance in China.

New quality productivity

In China, climate goals are increasingly driving the emergence of new quality productivity as a core engine of economic transformation. First introduced by President Xi Jinping at the Central Economic Work Conference in late 2023, the concept emphasizes innovation-driven, high-quality development, with a clear declaration that "new quality productivity is, by nature, green productivity." The advancement of green sectors such as new energy, new materials, and green manufacturing is not only a strategy for climate mitigation but also a critical engine for future economic growth. Climate action and industrial upgrading reinforce each other through improvements across supply chains, investment, trade, and employment. Modeling studies show that China's GDP continues to grow steadily under multiple transition scenarios from 2020 to 2050. In a low-carbon pathway, roughly 8 million jobs are expected to be lost in coal power and related supply chains, yet about 15 million jobs are created in non-fossil energy, generating a net gain of around 7 million. More ambitious climate targets under 1.5°C and 2°C scenarios also drive significantly higher investment demand, with total investment projected to reach between RMB 70.51 trillion and 174.38 trillion by 2050—underscoring the scale of financial commitments required.

The scale of growth in green industries already reflects this momentum. Since 2013, China's installed wind power capacity has increased sixfold, while photovoltaic capacity has grown more than 180-fold. By the end of 2024, wind power reached approximately 510 GW and solar power about 840 GW, with utilization rates consistently above 95%. New energy vehicle ownership rose from 580 thousand in 2015 to 31.4 million in 2024, representing 8.9% of all vehicles. Electric vehicles, lithium batteries, and photovoltaic modules, known as the "new three" export categories—surpassed RMB 1 trillion in export value in 2023, becoming a key driver in restructuring China's foreign trade profile.

Under the central government's strategic guidance, agencies including the NDRC, Ministry of Industry and Information Technology (MIIT), Ministry of Science and Technology (MoST), and Ministry of Finance are actively engaged in shaping policies and allocating resources to support green innovation. This has catalyzed coordination across industries, financial markets, and local governments, fostering a unified effort to promote sustainable economic growth.

Overall, climate issues in China are gaining policy momentum by aligning with broader development goals, and stakeholders across sectors are generally supportive. However, climate objectives remain largely embedded within other agendas and have yet to emerge as a standalone policy priority. Looking ahead, stronger policy coordination and institutional safeguards will be essential to elevate climate action as a central, coherent driver across more core areas of national development.

CHINA'S CLIMATE GOVERNANCE ARCHITECTURE[9]

China's climate governance rests on a high-level political consensus that ensures both full implementation and accountability across the system. The Communist Party's Central Committee frames climate change as a strategic priority, sets overarching objectives such as peaking and neutrality, and embeds them in Five-Year Plans and related legislation through the National People's Congress. Provinces and sectors are then held jointly accountable, with performance regularly assessed, creating a strong chain of responsibility down to local levels.

Policy design and day-to-day coordination are anchored in the Ministry of Ecology and Environment (MEE), through its Department of Climate Change (CCD). CCD drafts national strategies and programs, manages the national emissions trading system, monitors progress, and represents China in UNFCCC negotiations. Housing the Office of the National Leading Group, it serves as the standing lead agency for climate policy, ensuring continuity and cross-ministerial coordination.

Mediating and balancing among powerful line ministries is the task of the National Leading Group on Climate Change, Energy Conservation and Emissions Reduction (NLGCCR), an inter-ministerial "leading group" chaired by the Premier. Though informal in institutional form, its strategic role is central: it reviews climate plans, arbitrates ministerial interests across energy, industry, transport, and construction, and approves key submissions such as the NDC. Expert advice supplements this system. Bodies such as the Chinese Academy of Sciences (CAS), Chinese Academy of Engineering (CAE), the National Expert Committee on Climate Change (NECCC), and policy think tanks (e.g., ERI under NDRC; NCSC under MEE) provide technical assessments and policy recommendations. Platforms such as Politburo study sessions and the

9 Teng, F., & Wang, P. (2021). The evolution of climate governance in China: Drivers, features, and effectiveness. Environmental Politics, 1–21. https://doi.org/10.1080/09644016.2021.1985221

China Council for International Cooperation on Environment and Development (CCICED) connect domestic and international expertise to top leadership. While advisory in nature, these expert channels have influenced major commitments and added credibility to decision-making. In short, China's climate governance combines: (i) high-level political consensus to secure implementation and accountability, (ii) an institutional anchor in MEE/CCD to draft and coordinate policy, (iii) a national leading group to mediate across ministries, and (iv) expert panels and think tanks to inform policymaking. This structure provides strong convening authority at the center while distributing implementation across sectors and regions, reinforced by codified monitoring, reporting, and verification procedures.

CHINA'S INTERNATIONAL CLIMATE COOPERATION: BOTH A RECIPIENT AND A PROVIDER

China's international climate cooperation exhibits a dual role. On the one hand, China brings in finance, technology, and capacity-building support through multilateral, bilateral, and development-finance channels. On the other hand, it provides assistance to the broader Global South via South–South cooperation—sharing experience, technology, and equipment to help partner countries strengthen their climate response.

According to China's First Biennial Transparency Report (BTR)[10], during 2020–2022 China received about US$141 million through UNFCCC/Paris Agreement funds (GEF/GCF); around US$2.07 billion in concessional loans and US$9.13 million in grants from multilateral development banks; and approximately US$406 million in bilateral loans and US$1.24 million in grants. These resources supported mitigation, adaptation, capacity building, and technology cooperation, supplying critical external, incremental finance aligned with domestic action. The BTR highlights support focused on Enhanced Transparency Framework (ETF) compliance, policy design capacity, human-resource development, and inter-agency coordination. For example, the EU–China emissions trading cooperation—via policy dialogue, technical workshops, and online training—has improved literacy and compliance capacity among ministries and covered enterprises, while providing analytical inputs for the national ETS design.

On adaptation, China works with multilateral institutions and regional partners on risk assessment, coastal and urban resilience, ecosystem and marine cooperation, and data/method sharing—emphasizing joint research, demonstrations, and knowledge exchange to improve climate-risk management capacity in China and other developing countries.

Under the principle of common but differentiated responsibilities and respective capabilities, China's South–South climate cooperation shares low-carbon and adaptation practice with developing countries through joint research and technology pilots, training and talent programs, policy exchanges, and equipment donations or small demonstration projects tailored to partner needs. The objective is to enhance capabilities through joint research, demonstrations, and knowledge sharing, while ensuring localization and sustainable operation in recipient countries. In areas such as carbon markets, GHG statistics and accounting, urban and coastal adaptation, and ecosystem and marine governance, China co-develops methodologies, shares data platforms and governance tools with partners, helping shift capacity building from project-based upgrades to systemic institution-building. Regional and bi/multilateral platforms amplify diffusion and peer learning. This complements North–South cooperation: on one side, China leverages GEF/GCF and MDB resources to upgrade its own institutions and capacity; on the other, it converts domestic, context-tested approaches into replicable South–South solutions, shortening the policy and technology learning curve for partner countries.

10 China. (2024). The People's Republic of China First Biennial Transparency Report on Climate Change. United Nations Framework Convention on Climate Change. Retrieved from https://unfccc.int/sites/default/files/resource/The%20People%E2%80%99s%20Republic%20of%20China%20First%20Biennial%20Transparency%20Report%20on%20Climate%20Change.pdf

Yet when compared to the scale of China's own low-carbon transition needs, the volume of international climate finance it has received to date remains far below requirements. In practice, China's transition has been financed overwhelmingly by domestic resources, while international funds and cooperation have concentrated mainly on capacity-building. Looking ahead, because climate finance available to developing countries is expected to remain constrained, China will not compete with other developing nations for limited funds. Instead, it will aim to maximize the efficiency and impact of existing flows through South–South cooperation and complementary initiatives.

Moreover, future international cooperation will extend beyond finance and technology transfers. A central priority will be maintaining the stability and efficiency of global green-technology supply chains, which are critical to lowering the cost of key transition technologies. Coordinating fairer and more effective participation of all countries in these supply chains will thus become a core agenda item for climate cooperation, linking global industrial policy with collective decarbonization goals.

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