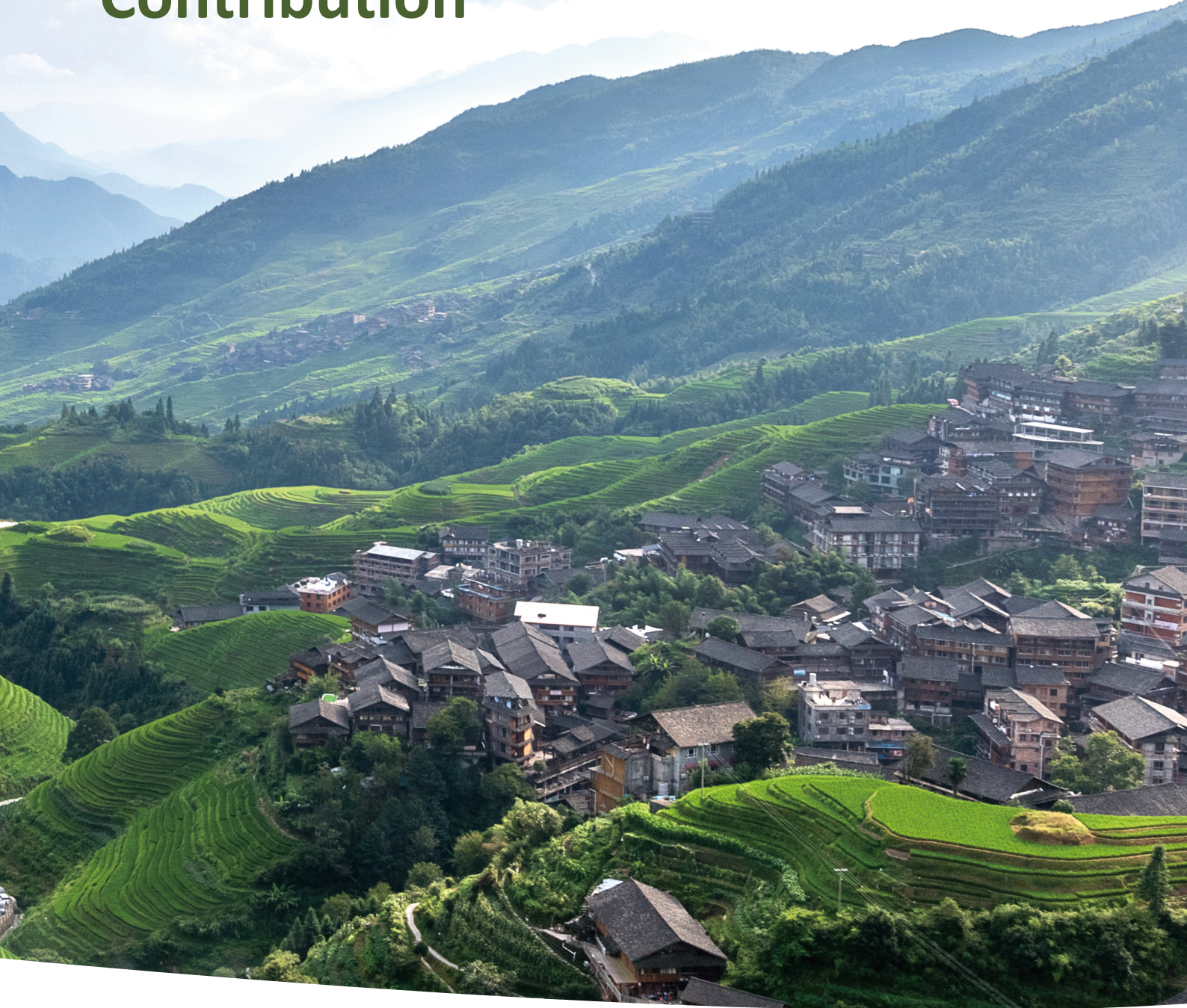


Understanding China's 2021 Nationally Determined Contribution



About iGDP

innovative Green Development Program (registration name: Beijing Green Partnership Consulting Company Limited) is a non-profit consultancy that focuses on green and low-carbon development. It works to strengthen China's low-carbon environmental policy design and implementation through interdisciplinary, systematic and empirical research. We work with all stakeholders to promote a zero-emissions future and tell the story of China's green and low-carbon development.

innovative Green Development Program was initiated by Energy Foundation China. It is the secretariat of China's Green and Low-Carbon Development Think Tank Partnership, sits on China's Green Finance Association Experts Committee, and is a member of the North-East Asian Subregional Programme for Environmental Cooperation's Low Carbon City Platform.

innovative Green Development Program's research, consulting and communications focus on the following areas:

- Energy Transition
- Green Economics
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Contents

Foreword	3
Understanding China's 2021 NDC	4
China's growing proactive participation in international climate governance	4
The NDCs reinforce and reflect China's domestic climate agenda	6
2021 NDC enhanced actions	8
NDC implementation and enhancement	12
China has achieved multiple targets under its first NDC ahead of schedule	12
China's "1+N" climate policy framework is the foundation for NDC implementation.....	14
China's climate action remains robust despite energy challenges	16
Subnational and private sector climate actions are key to China's emission reductions	16
China's Climate Actions Going Forward	
China's 2021 NDC and the global 1.5° target	18
China's current actions fall short of the 2060 carbon neutrality target	18
China has a chance to achieve carbon neutrality by 2050	18
References	19

Foreword

In August 2021, the Intergovernmental Panel on Climate Change (IPCC) once again warned that extreme weather events caused by climate change are intensifying, underlining the importance of strong actions to curb greenhouse gas emissions (IPCC, 2021). Meanwhile, the *2021 Emissions Gap Report* of the United Nations Environment Programme (UNEP) stated that the new national climate commitments and emission reduction measures promised by parties to the Paris Agreement will lead to an increase in global temperature by 2.7° by the end of this century, far exceeding the goal of limiting temperature rise to 1.5° (UNEP, 2021). With extreme weather around the world already affecting the lives of millions, it is imperative to take immediate action to reduce greenhouse gas emissions.

At the 75th United Nations General Assembly in September 2020, President Xi Jinping declared that "China will increase its nationally determined contribution, adopt more powerful policies and measures, strive to peak carbon dioxide emissions before 2030, and strive to achieve carbon neutrality by 2060." On the eve of the 26th United Nations Climate Conference (COP 26), China officially submitted to the secretariat of the United Nations Framework Convention on Climate Change the *New Goals and Measures of China's Implementation of its Nationally Determined Contribution (2021 NDC)* and *China's Mid-century Long-Term Low Greenhouse Gas Emissions Development Strategy (Long-Term Strategy)*. The 78-page 2021 NDC incorporates China's 2030 peaking and 2060 neutrality "dual carbon" goals and presents more detailed and comprehensive cross-sectoral and sub-sectoral policies.

This policy brief provides an overview of China's NDC. It first reviews China's participation in international climate actions, compares China's 2015 and 2021 NDCs, and contextualizes China's climate plans within the country's broader development agenda. It then describes the progress in GHG reduction China has made since submission of its 2015 NDC. The brief concludes with a review of scenario analyses that show what China needs to focus on going forward to achieve its dual carbon goals.



Understanding China's 2021 NDC

China's growing proactive participation in international climate governance

China's role in global climate governance has evolved from passive participation in the early days to active leadership and movement toward the center today (Li et al., 2021; Pan & Zhang, 2018; Teng & Wang, 2021; Zhuang et al., 2018).

With improving living standards and increasing GHG emissions, China's responsibility as a major emitter is increasing (Pan & Zhang, 2018; Zhuang et al., 2018). In 2020, China's per capita GDP reached RMB 72,447 (USD 10,450) (National Bureau of Statistics, 2021), exceeding the average level of middle-income countries. With rapid economic development, GHG emissions have grown significantly. According to the International Energy Agency, China's energy-related carbon emissions rose from 3.097 billion tons in 2000 to 9.876 billion tons in 2019.¹ In 2019, President Xi Jinping stated in his report to the 19th National People's Congress that "China will continue to play the role of a responsible major country, actively participate in the reform and construction of the global governance system," and pointed out that China should "guide international cooperation in addressing climate change and become an important participant, contributor and leader in the construction of global ecological civilization."² *The 2021 NDC* also emphasizes China's important global role in addressing climate change.

Since the establishment of the Paris Agreement in 2015, China's leaders have consistently affirmed their commitment to the global pact. In January 2017, President Xi delivered a speech titled *Building a Community with a Shared Future for Mankind* at the UN headquarters in Geneva, declaring the Paris Agreement a milestone in the history of global climate governance. At the G20 summit in June 2019, the Chinese Foreign Minister, the French Foreign Minister and the UN Secretary-General issued a communiqué reaffirming their commitment to "update their nationally determined contributions in a manner representing progress beyond the current one and reflecting their highest possible ambition, and to publish their long-term mid-century low greenhouse gas emissions development strategies by 2020 in the context of sustainable development."³ At the general debate of the 75th United Nations General Assembly in September 2020, President Xi Jinping said that China would enhance its nationally determined contribution and strive to achieve carbon neutrality by 2060. This was the first time China put forward a long-term vision for addressing climate change. Achieving carbon neutrality before 2060 is now the longest-range development goal in China's social and economic development agenda.

In September 2021, at the 76th United Nations General Assembly, President Xi Jinping stated, "China will vigorously support the green and low-carbon development of energy in developing countries, and will no longer build new overseas coal power projects." In October 2021, during the second high-level dialogue between Chinese and EU leaders, the two sides expressed increased climate ambition while "recognizing the importance to the goals established in the Paris Agreement mitigation of reducing non-CO₂ greenhouse gas emissions (such as methane and HFCs). The two sides also agreed to cooperate on the full implementation of the *Kigali Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer*."⁴ In November 2021, China and the United States issued the *Joint Glasgow Declaration on Enhancing Climate Action in the 2020s*, which states that "both sides are committed to making strong efforts, including improving climate action in the 2020s under the Paris Agreement framework to make temperature limit targets achievable." The *Joint Glasgow Declaration* also states that both sides recognize the "significant role that emissions of methane play in increasing temperatures" and "consider increased action to control and reduce such emissions to be a matter of necessity in the 2020s."⁵

While helping to push forward the Paris Agreement, China has achieved many of the goals in its 2015 NDC ahead of schedule, has established a foundation for China's mid- and long-term climate change actions with its carbon peaking and neutrality "1+N" policy system (described below), and has provided a clear trajectory for periodic NDC updates going forward.

¹ International Energy Agency: <https://www.iea.org/countries/china>

² Xinhua News. (2017). http://www.gov.cn/zhuanti/2017-10/27/content_5234876.htm

³ UN press statement. (2019). <https://www.un.org/sg/en/content/sg/note-correspondents/2019-06-29/press-statement-climate-change-following-the-meeting-between-the-state-councilor-and-foreign-minister-of-china-foreign-minister-of-france-and-the-united>

⁴ Ministry of Ecology and Environment. (2021). https://www.mee.gov.cn/ywdt/szyw/202110/t20211011_956098.shtml

⁵ Ministry of Ecology and Environment. (2021). https://www.mee.gov.cn/ywdt/hjywnews/202111/t20211111_959900.shtml

Figure 1 China's participation in international climate change actions



The NDCs reinforce and reflect China's domestic climate agenda

The goals and actions in both the 2021 and 2015 NDCs have been grounded in China's larger framework of domestic development policy. This has two advantages. First, it means that these goals and actions do not need to undergo further rounds of policymaking deliberation. Second, it strengthens climate policy within China, as GHG reduction actions contribute to China's long-term development goals.

Addressing climate change and reducing GHG emissions align with China's two goals of "jointly building a community with a shared future for mankind" and building an "ecological civilization" with green, low-carbon and high-quality development. Changes in China's economic growth pattern, increasingly prominent environmental problems, frequent extreme weather, and other new economic and environmental factors have provided new internal drivers for China's climate action. At the same time, China's economic development is entering a "new normal": from high-speed to medium-high-speed economic growth, and from extensive and fast growth to high quality and more efficient intensive growth.⁶ With China's new emphasis on the quality and efficiency of economic growth, energy-intensive and high-emission industries require transformation, creating opportunities for GHG emissions reductions.

Environmental problems such as water pollution, air pollution and extreme weather events, which have undermined economic development and public health (Pan & Zhang, 2018), have led China to seek to balance economic dynamism with environmental protection, including climate safety. The 2021 white paper *China's Policies and Actions on Climate Change*, released by the State Council Information Office, states that "since the 18th National Congress of the Communist Party of China, under the guidance of Xi Jinping's ecological civilization thought, China has implemented the new development concept and placed climate change in a more prominent position in national governance. We will continuously reduce carbon emission intensity, continuously strengthen the goals of our nationally determined contribution, make a great effort to improve the response to climate change, promote the comprehensive green transformation of economic and social development, and modernize in a way in which man and nature coexist in harmony."⁷

The 2021 NDC contains similar language, stating, "China will take climate change as an important starting point for promoting high-quality economic development, high-level protection of the ecological environment, promoting the construction of ecological civilization, and integrating our climate change response into national economic and social development plans".⁸

In the 13th Five-Year and 14th Five-Year plan periods, building "ecological civilization" and upgrading the economic structure feature as core components of China's social and economic development goals. These two long-term and overarching policy priorities are reiterated in the *Opinions of the Central Committee of the Communist Party of China and the State Council on Completely, Accurately and Fully Implementing the New Development Concept and Doing a Good Job on Carbon Peaking and Carbon Neutralization (Opinions)* and the *Carbon Peaking Action Plan before 2030*. As such, they are shaping China's dual carbon goals, climate policy measures, and enhanced 2021 NDC.

Taking a cue from these high-level plans, many sectoral development plans have proposed updated, more detailed, stronger and longer-term energy conservation and carbon reduction goals and policy measures. These include the *Energy Production and Consumption Revolution Strategy (2016-2030)*, *Pumped Storage Medium and Long-term Development Plan (2021-2035)*, *Several Opinions on Strict Energy Efficiency Constraints to Promote Energy Conservation and Carbon Reduction in Key Fields*, the *Medium and Long-Term Development Strategy of the Automobile Industry*, and the *New Energy Automobile Industry Development Plan (2021-2035)*.

To coordinate work on the dual carbon goals, China established a Carbon Peak and Carbon Neutrality Leading Group (Leading Group) in 2021. In June 2021, the Leading Group held its first meeting, where Vice Premier Han Zheng, presiding over the

⁶ People's Daily. (2015). <http://jingji.cntv.cn/2015/05/08/ART11431085241418841.shtml>

⁷ White Paper on China's Policies and Actions to Address Climate Change. (2021). http://www.cciced.net/xwzx/hfyw/202111/t20211104_130041.html

⁸ China's Achievements, New Goals and New Measures for Nationally Determined Contributions. (2021). <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/China%20First/China%E2%80%99s%20Achievements,%20New%20Goals%20and%20New%20Measures%20for%20Nationally%20Determined%20Contributions.pdf>

meeting, stated, "It is necessary to closely follow the goals and break-down tasks, strengthen top-level design, guide and encourage local and key areas, industries, and enterprises to scientifically set goals, and develop a plan of action."⁹ Multiple provinces and cities subsequently also established leading groups for carbon peaking and carbon neutralization. In September 2021, the Leading Group¹⁰ office established a Carbon Emission Statistics and Accounting Working Group. This working group coordinates carbon emission statistics and accounting across regions and industries and provides data support for policy implementation and evaluation of the dual carbon goals.

Figure 2 Key strategies and plans that include post-2020 targets and actions



⁹ Xinhua News. (2021). http://www.gov.cn/guowuyuan/2021-05/27/content_5613268.htm

¹⁰ National Development and Reform Commission. (2021). https://www.ndrc.gov.cn/tzggw/jgsj/hzs/sjdt/202108/t20210831_1295530_ext.html

2021 NDC Enhanced Actions

The 2021 NDC and October 2021 *Long-term Strategy* strengthen China's climate change targets and present more detailed and comprehensive sectoral and cross-sectoral policies compared to the 2015 NDC.

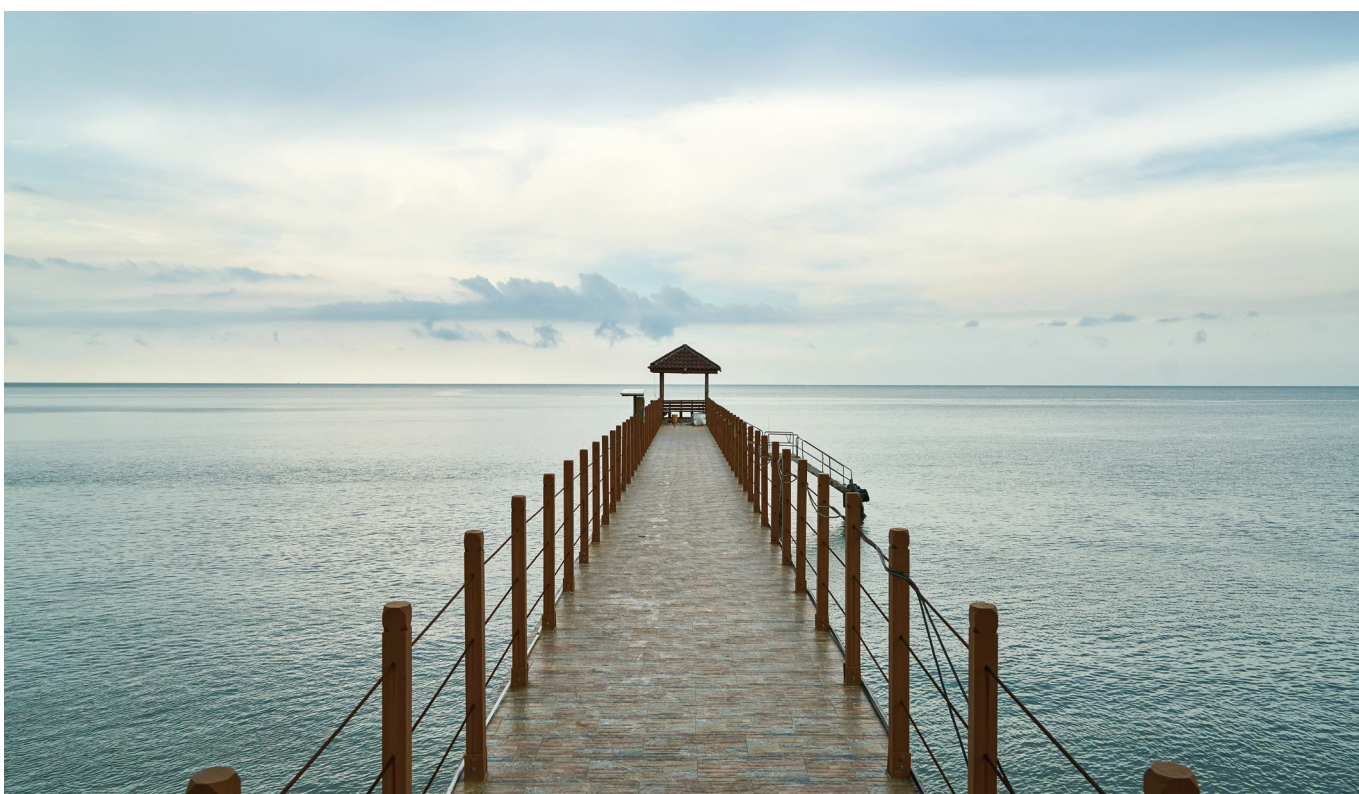
Table 1 2015 NDC vs. 2021 NDC

2015 NDC Key Content		2015 NDC	2021 NDC
Strengthen targets for climate change action		<p>By 2020, China will lower carbon dioxide emission per unit GDP by 40% to 45% from the 2005 level.</p> <p>Achieve the peaking of carbon dioxide emissions around 2030 and make the best effort to peak early; to lower carbon dioxide emissions per unit of GDP by 60% to 65%.</p>	<p>Aim to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060; by 2030, lower CO₂ emissions per unit of GDP by over 65% from the 2005 level.</p> <p>China will research and implement an action plan to control non-CO₂ GHG emissions; continue to improve the technical system for monitoring, reporting and evaluation of non-CO₂ GHG emissions; and gradually establish a sound statistical accounting system, policy system and management system for non-CO₂ GHG emissions.</p>
Low-carbon Energy System	Energy	<p>By 2020, China will increase the share of non-fossil fuels in primary energy consumption to about 15%.</p> <p>Control total coal consumption; enhance the clean use of coal; increase the share of concentrated and highly-efficient electricity generation from coal; lower coal consumption of electricity generation of newly built coal-fired power plants to around 300 grams coal equivalent per kilowatt-hour.</p> <p>Expand the use of natural gas: by 2020, achieving more than 10% share of natural gas consumption in the primary energy consumption and making efforts to reach 30 billion cubic meters of coal-bed methane production.</p>	<p>By 2030, increase the share of non-fossil fuels in primary energy consumption to around 25%, and bring its total installed capacity of wind power and solar power to over 1.2 billion kilowatts.</p> <p>China will strictly control coal-fired power generation projects, and strictly limit the increase in coal consumption over the 14th FYP period and phase it down in the 15th FYP period</p>
Low-carbon Industry System	Industry	<p>Formulate carbon emission control target and action plans in key industries; research and formulate GHG emission standards for key industries.</p> <p>Promote the share of value added from strategic emerging industries reaching 15% of the total GDP by 2020.</p>	<p>Implementation plans of carbon peak for fields and sectors such as energy, iron & steel, non-ferrous metals, petrochemicals and chemicals, building materials, transport and construction.</p> <p>China will adopt a “look back” approach when cutting overcapacity of steel and coal to consolidate its progress and resolutely curb the haphazard development of energy-intensive and high-emission projects.</p>

Low-carbon Industry System	Industry	Phase down the production and consumption of HCFC-22 for controlled uses, with its production to be reduced by 35% from the 2010 level by 2020, and by 67.5% by 2025 and to achieve effective control on emissions of HFC-23 by 2020.	China will continue to push for HFC-23 destruction, study and formulate nitrous oxide emission reduction plans for key industries, promote low-warming-potential power facilities, and strengthen the emission control of HFC, nitrous oxide, and sulfur hexafluoride. China has already deposited its instrument of ratification of the <i>Montreal Protocol (Kigali Amendment)</i> .
	Agriculture	Promote low-carbon development in agriculture, making efforts to achieve zero growth of fertilizer and pesticide utilization by 2020. Control methane emissions from rice fields and nitrous oxide emission from farmland; construct a recyclable agriculture system, promoting comprehensive utilization of straw, reutilization of agricultural and forestry wastes and comprehensive utilization of animal waste.	Efforts will be intensified to enhance the reduction and efficiency of chemical fertilizers and pesticides. Ways to treat and utilize livestock and poultry manure will be refined in order to reduce GHG emissions from livestock and poultry breeding.
Emissions Control in Transport and Buildings	Transport	Develop a green and low-carbon transportation system, optimizing means of transportation, giving priority to the development of public transportation. Encourage the development and use of low-carbon and environment-friendly means of transportation, such as new energy vehicles and vessels.	China will accelerate the construction of a comprehensive transportation network, channel energy into multi-modal transportation, and increase the share of railways and waterways in integrated transportation, constantly reducing the energy consumption and carbon intensity of transportation. At the same time, China will optimize passenger transport, and guide the scale-up and intensive operation of those passenger transport enterprises.
	Building	Promote the share of green buildings in newly built buildings of cities and towns reaching 50% by 2020.	China will apply green building standards to all new urban buildings by 2025.
Increase Carbon Sinks	Forestry	By 2020, China will increase the forested area by 40 million hectares and the forest stock volume by 1.3 billion cubic meters compared to the 2005 levels. By 2030, increase the forest stock volume by around 4.5 billion cubic meters on the 2005 level.	By 2030, increase the forest stock volume by 6 billion cubic meters from the 2005 level.

Others	Waste	Intensify the recovery and utilization of methane from landfills.	<p>China will expedite the development of circular economy.</p> <p>Efforts will be made to improve resource utilization efficiency in manufacturing.</p>
Cross-sectoral Policies	Green finance	<p>Build on carbon emission trading pilots, steadily implementing a nationwide carbon emission trading system and gradually establishing the carbon emission trading mechanism.</p> <p>Improve green government procurement policy systems.</p> <p>Improve the green credit mechanisms.</p>	<p>China will enlarge the coverage of industries, especially to include more the high emission industries, enrich trading varieties, methods and participants, and enhance market activity, contributing to stable and effective operation and sound and sustainable development of the national carbon market.</p> <p>China will study and set up a national low-carbon transition fund.</p> <p>Financial support to high pollution and high emission sectors are to be strictly controlled.</p> <p>The standardization system of green finance will be established and improved.</p>
	MRV	<p>Prepare greenhouse gas inventories at the national and provincial level on a regular basis; establish a greenhouse gas emission reporting mechanism for key enterprises; formulate greenhouse gas emission accounting standards for enterprises in key sectors; build a fundamental statistics and accounting system for greenhouse gas emissions at national, subnational and enterprise levels.</p>	<p>The working mechanism for national and local GHG emission inventories will be improved, and a compliance reporting system with full participation of all sectors will be established.</p> <p>Implement the basic statistical system on tackling climate change and push forward the establishment of an authoritative GHG emission data release mechanism.</p>
Improve Climate Adaptation Ability		<p>China will develop the National Strategy for Climate Change Adaptation 2035.</p>	
	<p>Improve safe operation of infrastructure of water conservancy, transport and energy against climate change.</p>	<p>Enhance the resilience of natural ecosystems to the impacts of climate change with a focus on water resources and terrestrial and marine coastal ecosystems.</p>	
	<p>Properly develop and optimize the allocation of water resources, implementing the strictest water management regulation, building water-saving society in all aspects and intensifying the development and utilization of unconventional water resources, including recycled water, desalinated sea water and rain and flood water.</p>	<p>China will maintain the structural measures for water resource allocation, flood control and drought relief, implement the most stringent water resource management system.</p>	

Improve Climate Adaptation Ability	Enhance resistance to marine disasters and management of coastal zones.	China will strengthen the adaptability of ocean and coastal zones while improving the capacity of climate disaster prediction, warning and prevention.
	Properly lay out functional zones in cities, make overall arrangements in developing infrastructure and effectively safeguard city lifeline system.	China will formulate urban lifeline and industrial emergency plans, and urge sensitive industries to build adaptation infrastructure; raise the awareness of risk planning and introduce nature-based solutions into urban adaptation to climate change, in a bid to comprehensively enhance climate resilience in economic and social aspects.
	Strengthen comprehensive assessment and risk management of climate change and improve the national monitoring, early warning and communication system on climate change	China will strengthen the monitoring and early warning of climate change risks.
International Cooperation	Establish the Fund for South-South Cooperation on Climate Change.	China will promote Belt and Road South-South cooperation on climate change.



NDC implementation and enhancement

An ambitious commitment to address climate change should include at least three elements: (1) a GHG reduction target that meets the overall requirements of the Paris Agreement, (2) a detailed and implementable roadmap for action, and (3) a solid regulatory framework that guarantees the effectiveness of domestic implementation, with the order of importance being (3) > (2) > (1). China's NDC is robust in elements (2) and (3), while there is disagreement over (1) given the principle of common but differentiated responsibilities. The key to gauging the ambition of China's climate actions is not simply the year of carbon peaking or neutrality, but rather the effectiveness of concrete actions and implementation, as described below.

China has achieved multiple targets under its first NDC ahead of schedule

The latest data show that many of the 15 quantitative targets in China's 2015 NDC have seen solid progress. Nine indicators achieved the 2020 target set in the NDC ahead of schedule. For example, CO₂ emissions per unit of GDP (i.e. carbon intensity) in 2019 dropped 48.1% from the 2005 level, meeting the target of reducing carbon intensity between 40% to 45% earlier than planned. In 2019, China's PV installed capacity reached 204 million kilowatts, and the installed wind power capacity reached 210 million kilowatts, both outpacing their 2020 targets. In 2019, the ratio of non-fossil energy to primary energy and the ratio of green buildings in new urban buildings also outpaced the 2020 target. The proportion of natural gas in primary energy consumption and the proportion of added value of strategic emerging industries in GDP are also in line with planning expectations. Data from 2017 and 2018 coal bed gas production and annual geothermal use, however, show that there is still a gap with the 2020 goals in these areas.



Table 2 Performance of key policy targets of China's 2015 NDC

Many Key NDC Policy Targets Exceeded									
Policy Targets	2016	2017	2018	2019	Target 2020	Target 2025	Target 2030	Target 2060	Target Type in Domestic Planning
CO ₂ emissions per unit of GDP fell compared to 2005		46%		48%	40%-45%		>65%		Mandatory
The share of non-fossil fuels in primary energy consumption	13.0%	13.6%	14.5%	15.3%	15%	20%	25%	>80%	Mandatory
Forest stocks increased by 2005 (100 million cubic meters)	Achieved 2020 target in 2013				13	43	60		Mandatory
Average coal consumption of newly-built coal-fired generating units (g standard coal/kWh)	<300				300				Mandatory
The share of natural gas in primary energy consumption			7.6%	8.1%	10% or more		15%		Predictive
Coalbed methane production (100 million cubic meters)			183.6		300				Predictive
Wind power installed (100 million kilowatts)	1.5	1.64	1.84	2.1	2				Predictive
Photovoltaic installation (100 million kilowatts)	1.3		1.74	2.04	Around 1				Predictive
The annual utilization scale of geothermal energy (10,000 tons of standard coal)	1900				5000				Predictive
The added value of strategic emerging industries accounts for the proportion of GDP	8.90%				15%	>17%			Predictive
Reduce the production and consumption of HCFC-22 for controlled use from the 2010 level					35%	67.5%			Mandatory
TControl HFC-23 emissions					Effective control				Mandatory
Fertilizer and pesticide utilization	Zero growth				Zero growth				Predictive
The share of green buildings in newly built buildings			40%	65%	50%	100%			Predictive
The share of public transport in motorized modes in large and medium cities					30%				Predictive

Sources: Documents and press statements from National Bureau of Statistics, Ministry of Ecology and Environment, Ministry of Housing and Urban-Rural Development and China Electricity Council; National White Paper on Climate Change, Statistical Yearbook and special planning including 13th Five-Year Electricity Plan, 13th Five-Year Energy Development Plan, Working Guidance for Carbon Dioxide Peaking and Carbon Neutrality in Full and Faithful Implementation of The New Development Philosophy, Action Plan for Carbon Dioxide Peaking before 2030, etc.

Note: Target type is from China's economic and social development plans and sector-specific plans.

	Beyond expectation		On track		Below expectation		Unclear
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China's "1+N" climate policy framework is the foundation for NDC implementation

Before the submission of its 2021 NDC, China issued a number of policies to support the achievement of the dual carbon climate targets and accelerate the construction of the "1+N" climate policy framework. In October 2021, President Xi Jinping, in his keynote speech at the leader's summit of the 15th Conference of the Parties of the Convention on Biological Diversity (CBD), stated that "to promote the achievement of carbon peaking and carbon neutrality, China will issue implementation plans for carbon peaking in key areas and industries and a series of complementary measures to build a "1+N" climate policy framework for carbon peaking and carbon neutrality."¹¹

Subsequently, China released the *Working Guidance for Carbon Peaking and Carbon Neutrality in Full and Faithful Implementation of the New Development Philosophy and the Action Plan for Carbon Peaking before 2030*, with the former document representing "1" and latter representing "N". These policy documents provide China's roadmap for implementation of its peaking and neutrality goals. In an interview with Xinhua News Agency, China's National Development and Reform Commission indicated that "the Working Guidance, issued by the Party Central Committee and the State Council, serves as '1', setting out the general and long-term guidance and playing a leading role in the '1+N' climate policy framework. The Working Guidance, together with the Action Plan, will constitute the top-level design for carbon peaking and carbon neutrality."¹²

Table 3 China's domestic climate change targets and policies under the "dual carbon" goals

<p>Climate change targets</p>	<ul style="list-style-type: none"> ● By 2025, the energy consumption and carbon dioxide emissions per unit of GDP will decrease 13.5 and 18 percent compared with that of 2020. ● By 2030, lower CO₂ emissions per unit of GDP by over 65% from the 2005 level, and promote the peak of carbon dioxide emissions and achieve a steady decline; energy consumption per unit of GDP will drop significantly. ● Establish a system to control the total volume of CO₂ emissions.
<p>Cross-sector policies</p>	<ul style="list-style-type: none"> ● China will increase the control of methane, hydrofluorocarbons, perfluorocarbons and other greenhouse gases. ● China will make systematic efforts to build markets for trading carbon emission rights, energy-use rights and water-use rights. China will enlarge the coverage of industries, enrich trading varieties, methods, and improve the carbon emission quota allocation management. Carbon sink trading will be integrated into the national carbon emissions trading market. ● China will study and set up a national low-carbon transition fund, and the standardization system of green finance will be established and improved.
<p>Sector-specific policies</p>	<p>Energy</p> <ul style="list-style-type: none"> ● The consumption ratio of non-fossil energy will reach 20 percent of the total by 2025, and over 80 percent by 2060. ● China will strictly control coal-fired power generation projects, and strictly limit the increase in coal consumption over the 14th FYP period and phase it down in the 15th FYP period. China will promote efforts to replace bulk coal and make coal cleaner in an active and orderly manner through multiple measures, and gradually reduce and eventually prohibit burning of bulk coal. ● Oil consumption will reach its peak plateau in the 15th FYP period. ● The installed capacity of hydropower will have increased about 40 million kilowatts both during the 14th FYP and 15th FYP period.

¹¹ Xinhua News. (2021). https://www.cop15news.com/focus/2021-10/12/c_1211401336.htm

¹² Xinhua News. (2021). http://www.news.cn/2021-10/24/c_1127991038.htm

Sector-specific policies		<ul style="list-style-type: none"> ● By 2025, the installed capacity of new energy storage will have reached more than 30 million kilowatts. ● By 2030, the overall scale of pumped storage energy production will have reached 120 million kilowatts; and the capacity of provincial power grids for peak loads will have reached more than 5%.
	Industry	<ul style="list-style-type: none"> ● Accelerate the formulation and revision of mandatory national standards, including energy consumption limits standards and product energy efficiency standards. ● Implement plans of carbon peak for fields and sectors such as iron&steel, non-ferrous metals, petrochemicals and chemicals. ● Energy consumption per unit of industrial value added above a designated scale will decrease by 34% compared with 2015 level, and CO₂ emissions per unit of industrial value added will decrease by 40%. ● China will resolutely curb the haphazard development of energy-intensive and high-emission projects.
	Transportation	<ul style="list-style-type: none"> ● Make urban public transportation a priority, develop non-motorized transport systems including bicycle lanes and walking lanes; shift long-distance cargo from highways to rail and waterways; promote the electrification of urban public transport and logistics distribution vehicles. ● By 2030, the share of new energy and clean energy-powered vehicles will reach about 40%; the carbon emission intensity of commercial vehicles measured based on converted turnover will be cut by about 9.5% compared to the 2020 level, and a comprehensive energy consumption of the national railways per unit of converted turnover will be cut by 10%. China will strive to reach a peak in petroleum consumption for land transportation before 2030.
	Buildings	<ul style="list-style-type: none"> ● To develop smart buildings; promote green building materials, prefabricated buildings and steel frame houses; carry out the demonstration of near-zero energy consumption building projects. ● Green building standards will be fully implemented in towns and cities by 2025. The renewable energy replacement rate of urban buildings will reach 8%, and the coverage of solar panels on the roofs of new public institutions and factory buildings will strive to reach 50%.
	Agriculture and forestry	<ul style="list-style-type: none"> ● By 2025, the forest coverage rate will reach 24.1%, while the forest stock volume to reach about 18 billion cubic meters. By 2030, the national forest coverage rate will reach 25%, while the forest stock volume to reach about 19 billion cubic meters. ● To develop water-saving agriculture and dry farming; implement actions to enhance the reduction and efficiency of chemical fertilizers and pesticides; control agricultural film pollution, and improve its recycling rate; promote the utilization of resources including straw and manure.
	Waste	<ul style="list-style-type: none"> ● The annual utilization volume of bulk solid waste will reach about 4 billion tons by 2025; and it will reach about 4.5 billion tons by 2030. About 450 million tons of nine major renewable resources will be recycled (these are scrap iron and steel, scrap copper, aluminum, lead, and zinc, wastepaper, plastics, rubber, and glass) by 2025; and about 510 million tons by 2030. ● By 2025, the municipal solid waste classification system will be basically sound, and the resource utilization rate of solid waste will increase to about 60%. By 2030, the classification of urban domestic waste will achieve full coverage, and the proportion of domestic waste resource utilization will increase to 65% by 2030.

China's climate action remains robust despite energy challenges

China has been experiencing a tight power supply since September 2021. Some regions have had to implement electricity rationing measures to alleviate power shortages, leading to factory closures and power cuts in residential daily electricity use.¹³

Despite facing pushback on its dual control and carbon reduction policies due to these power shortages, China's newly released climate policies in the second half of 2021 demonstrate a determination to persevere in its peaking and neutrality goals. *Working Guidance*, the top-level design document under China's "1+N" climate policy framework, includes a series of sectoral and issue-specific climate targets and actions. It calls for introducing a carbon cap, setting a target for non-fossil energy consumption share, strictly controlling fossil energy consumption and curbing the development of high energy consumption and high emissions (the "two highs") projects. These specific targets and actions are included in China's *2021 NDC and Long-term Strategy*.

In addition, at the Central Economic Work Conference held in December 2021, China once again emphasized that "achieving carbon peaking and carbon neutrality is an inherent requirement for promoting high-quality development, and should be firmly promoted," and that China would "create conditions to make a transition from 'dual control' of energy consumption and energy intensity to 'dual control' of carbon emissions and carbon intensity."¹⁴

Subnational and private sector climate actions are key China's ambition to reduce emissions

In response to the setting of the dual carbon goals, regions, industries and companies throughout China are actively developing carbon peaking action plans and conducting carbon neutrality research. The table below provides a brief overview of this activity.



¹³ Economic Reference News. (2021). http://www.news.cn/local/2021-09/28/c_1127910546.htm

¹⁴ Xinhua News. (2021). http://www.gov.cn/xinwen/2021-12/10/content_5659796.htm

Table 4 Subnational and non-state climate actions

<p>Regions</p>	<p>Provinces and municipalities are actively making arrangements to achieve the dual carbon goals. As of December 2021, almost all provinces and municipalities have started working on the preparation of carbon peaking and carbon neutrality action plans. For example, Guangdong Province has proposed to conduct research on an action plan to achieve carbon peaking; Shandong Province has launched a provincial carbon peaking and carbon neutrality implementation plan and a carbon peaking action plan; Hunan Province has proposed to develop a 2030 carbon peaking action plan; and Hainan Province has started developing a roadmap to achieve a carbon emissions peak.</p> <p>Subnational governments have also been developing auxiliary policies to support the dual control climate goals. For example, in June 2021, Zhejiang Province released its Action Plan for Science and Technology Innovation of Carbon Peaking and Carbon Neutrality. In September 2021, Tianjin issued a regulation to promote carbon peaking and carbon neutrality, and in November the Ningxia Autonomous Region also released an action plan for technology support of carbon peaking and carbon neutrality.</p>
<p>Private sector</p>	<p>Many companies have responded to the dual carbon goals by proposing carbon neutrality strategies. For example, Tongwei Group, Huaneng, Tencent, BYD, National Energy Group, and JD Logistics have started carbon neutrality studies (Jiang, 2021). In December 2021, Alibaba Group released its Carbon Neutrality Action Plan, announcing the goal of achieving carbon neutrality by 2030.</p> <p>Seventeen petroleum and chemical companies, chemical parks, and the China Petroleum and Chemical Industry Association jointly released the Declaration of China's Petroleum and Chemical Industry on Carbon Peaking and Carbon Neutrality, declaring their commitment and action plans for carbon peaking and carbon neutrality. In addition, 81 Chinese companies have joined the Science Based Carbon Target Initiative (SBTi), an international initiative focusing on setting climate targets for corporate emissions reductions.¹⁵</p>
<p>Financial organizations</p>	<p>In February 2021, six companies, including Southern Power Grid and State Power Investment Group, issued the first batch of carbon neutrality bonds (Duan, 2021). Subsequently, Tianfeng Securities, Securities Times, and the International Institute of Green Finance of the Central University of Finance and Economics jointly released the first initiative to promote carbon neutrality in the securities and futures industry (Hu, 2021).</p> <p>A number of banks have also released action plans to provide financial support for carbon peaking and carbon neutrality. To support carbon peaking and carbon neutrality, The People's Bank of China has formulated an action plan, China Development Bank has released an action plan for implementing a green low-carbon financial strategy, and Guangfa Bank has issued a working plan.</p>
<p>Industry associations</p>	<p>Steel and non-ferrous metal industry associations have made preliminary considerations for promoting carbon peaking and reduction, and several industry associations are promoting research on initiatives in carbon peaking (Sun & Kou, 2021).</p>

¹⁵ Data is from Science Based Targets website: <https://sciencebasedtargets.org/companies-taking-action?country=China#table>

China's Climate Actions Going Forward

China's 2021 NDC and the global 1.5° target

Most existing research agrees on what China's emission trajectory will be up to 2030. With full implementation of current emission reduction policies, China is very likely to meet or exceed its carbon peaking and carbon intensity goals by 2030 (den Elzen et al., 2019; Ge et al., 2018; Liu et al., 2017). However, as indicated by Climate Action Tracker, while China will likely overachieve on its 2030 non-fossil energy and carbon intensity reduction NDC targets, it is still a long way from achieving the 1.5° target in the Paris Agreement.¹⁶ China will need to keep ramping up its ambition to lock in on a 1.5° path.

China's current actions fall short of the 2060 carbon neutrality target

Ongoing policy measures will also need to retain high ambition for China to achieve its 2060 carbon neutrality target. The IEA report *An Energy Sector Roadmap to Carbon Neutrality in China* finds that with only the specific policies already in place or announced by the government to be implemented (the stated policies scenario), energy sector CO₂ emissions begin to decline only gently after peaking by 2030, leaving 6 billion tons of emissions in 2060 despite a decline of more than 35% from 2020 (IEA, 2021). In comparison, under the announced pledges scenario, where all declared pledges would achieve full net zero emissions (regardless of whether the declared commitments are currently supported by specific policies), China's CO₂ emissions could reach net zero by 2060, with a remaining 610 million tons fully offset by negative emissions (IEA, 2021).

Model analysis from Tsinghua University's *Study on China's Long-Term Low Carbon Development Strategy and Transition Pathway* also shows that, under both the policy scenario (policy actions based on China's NDC and continuing the current low-carbon transition trend) and an enhanced policy scenario (taking actions to enhance carbon intensity and energy intensity reductions, increasing the share of non-fossil energy, controlling its total CO₂ emissions and updating the NDC), China's primary energy-related CO₂ emissions would still be at 9.08 and 6.18 billion tons respectively by 2050 (He et al., 2020). Even after a downward trend, China would still be some distance away from carbon neutrality by 2060.

China has a chance to achieve carbon neutrality by 2050

But other scenario analyses show that China could achieve carbon neutrality by 2050 with enhanced policies and technological innovations. A study jointly published by the Energy Transition Commission and the Rocky Mountain Institute shows that it is technically and economically feasible for China to achieve net zero carbon emissions by 2050 (Energy Transition Commission, 2019). Key actions include complete decarbonization of the power sector, full electrification of road transport, and use of electrification, hydrogen, carbon capture and sequestration (CCS), and bioenergy to help decarbonize heavy industry, and measures such as heat pumps and advanced building insulation in the buildings sector.

According to Tsinghua's *Study on China's Long-Term Low Carbon Development Strategy and Transition Pathway*, CO₂ emissions from total primary energy consumption will reach 7.44 billion tons in 2030 and decrease to 1.47 billion tons in 2050 under a "1.5° scenario" (He et al., 2020). In this scenario, the low-carbon transition of the power system with new and renewable energy power and the electrification of the end-use sector would be key to carbon emissions reduction, and the adoption of CCS would also play an important role (Wang et al., 2021). Research on China's carbon emission reduction pathway under a 1.5° target also indicates that China's carbon emissions would fall to 600 million tons by 2050 if more stringent emission reduction targets were adopted and additional emission reduction measures (1.5° scenario) were adopted. Deep decarbonization would also be pushed forward by developing new low-carbon technologies such as big data, Internet of Things (IoT), hydrogen, carbon-negative technologies and by accelerating decarbonization in areas such as electricity, road freight, steel, and chemicals (Wang et al., 2021).

¹⁶ Data is from Science Based Targets website: <https://sciencebasedtargets.org/companies-taking-action?country=China#table>

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