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- Executive Summary -

China's Economy	The PBOC moves to control financial risk
Though the Chinese economy is recovering steadily, the PBOC has indicated it will prioritize policy continuation and normalize monetary policy in stages while maintaining stability. Moves to prudently exit from the crisis response are driven by the emergent negative impact of large-scale easing and a pressing need to tackle financial risk. Property bubbles are seen as a major financial risk, so from mid-2020, the PBOC has implemented measures to constrain these bubbles as it seeks to calm real-estate markets. The PBOC will continue to prudently adjust liquidity moving forward as it tries to cautiously normalize monetary policy while examining the impact of policies to constrain bubbles and while monitoring the pace of the economic recovery and improvements in the corporate debt situation.	
Industrial and Regional Policies	**New Opportunities and Challenges for Economic Development in China as It Shifts from Low-Carbon to Carbon-Neutral Growth**
In light of the growing global trend of decarbonization, this paper confirms that China has made bold announcements and pledges to the international community of measures and targets that have been upgraded on numerous occasions, introduces the background and rationale for these policy revisions, reviews the achievements and challenges of its environmental policies to date, and examines the sustainability of China's development and the future challenges it will face on the pathway to achieving peak CO2 emissions by 2030 and carbon neutrality by 2060 (China's 2030/2060 goals).	

The PBOC moves to control financial risk

−The PBOC is prudently seeking an exit from the crisis response while controlling real-estate bubbles−

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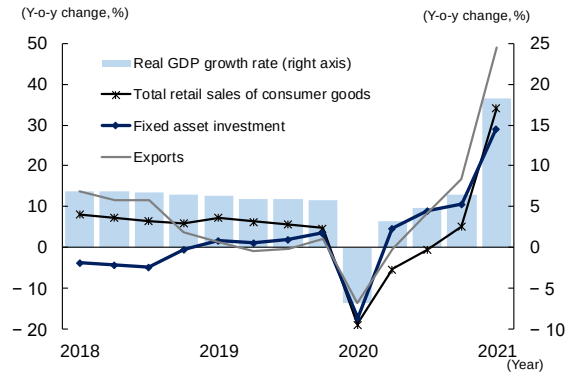
1. Introduction

At +18.3% year-on-year, China's real GDP growth rate grew sharply over January–March 2021 (October–December 2020: +6.5% year-on-year), partly in reaction to the slump that occurred last year (Fig. 1). Exports grew sharply on the global economic recovery and strong demand for telecommunications and electronic equipment on the rise of remote working. With Covid-19 infections spreading across China's northeast and elsewhere from mid-January to mid-February, the government asked people not to return to their home provinces over the Lunar New Year holiday (February 11–17), so workers in the export sector remained in the cities. This meant that production could begin again soon after the holidays ended, with this also helping to boost exports. Investment continued to grow thanks to expanded spending on real-estate development and infrastructure investment. Manufacturing investment also continued to improve in the hi-tech sector and so on. As the jobs and earning environment improved, the retail sector continued to bounce back, with this improvement also encompassing customer-facing services like dining out and lodging. Though threatened by new Covid-19 waves overseas and deteriorating US/China relations, the Chinese economy is steadily returning to pre-pandemic levels.

As the economy steadily recovers, all eyes will be focused on the process of monetary policy normalization. When the pandemic surged in the first half of 2020, the authorities introduced large-scale monetary easing as part of efforts to tackle the crisis. The People's Bank of China (hereinafter "PBOC") implemented several measures. It cut reserve requirement ratios (RRR) in a targeted manner and conducted open-market operations, for example. It also boosted liquidity through monetary policy tools such as the Medium-term Lending Facility (MLF), for instance, and it guided lending rates lower by cutting the MLF rate (this forms the basis of the Loan Prime Rate (LPR), which in turn serves as a guide for bank lending rates) (Fig. 2). At a politburo meeting held at the end of

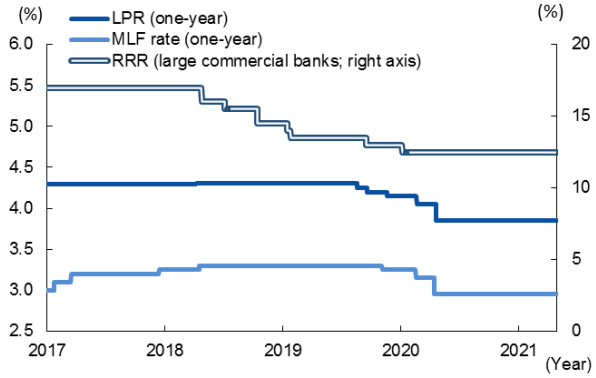
Figure 1: Major Chinese economic indicators



Note: The figures for the total retail sales of consumer goods and fixed asset investment are real figures (calculated by MHRT). The export figures are dollar denominated.

Source: Prepared by MHRT based on materials from China's National Bureau of Statistics (NBS), General Administration of Customs (GACC), and CEIC data

Figure 2: RRR, MLF rate and LPR

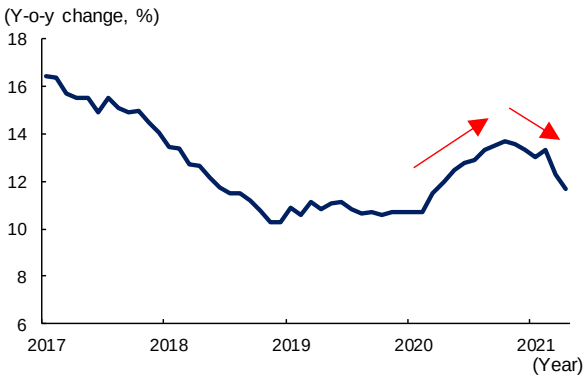


Note: 1 The RRR denotes the base ratio for large commercial banks
2 The LPR denotes the average LPR rate of 18 major banks

Source: Prepared by MHRT based on materials from the People's Bank of China and CEIC Data

July 2020, the government said these easing measures were a response to the crisis and would thus be normalized in stages going forward[1], with policy subsequently tweaked away from easing to a more neutral stance. In the wake of this monetary policy transitions, total social financing growth also began to shrink slightly from October onwards (Fig. 3).

Figure 3: Total social financing



Source: Prepared by MHRT based on materials from the People's Bank of China and CEIC Data

However, the Chinese government is proceeding cautiously when it comes to monetary policy normalization. The Central Economic Working Conference of December 2020 and the National People's Congress (hereinafter "NPC") of March 2021 both talked about "maintaining coordination, stability and sustainability" of macro policies while "avoiding sharp policy shifts," thus indicating the authorities will prioritize policy continuation while maintaining economic stability. In fact, the MLF rate has remained unchanged since a 0.2%pt cut in April 2020, with the LPR also static.

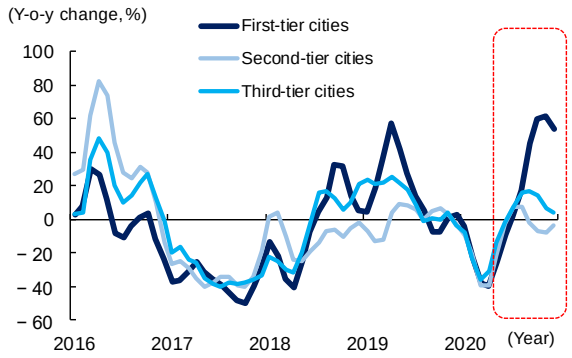
The response to financial risk lies behind the PBOC's cautious stance when it comes to monetary policy normalization. Ma Jun, a member of the PBOC's monetary policy committee, has said that downside risks to the Chinese economy (other than those related to Covid-19) were concentrated in the financial domain[2]. As this suggests, the PBOC is wary of falling into a vicious circle whereby financial risks increase sharply when policy is tightened rapidly to cope with the emerging downsides of large-scale easing. Guo Shuqing, head of the Banking and Insurance Regulatory Commission (hereinafter "BIRC") and Communist Party secretary of the PBOC, has said a real-estate bubble is the biggest "grey rhino" threatening financial stability[3]. In response, the authorities have ramped up measures to tackle real-estate bubbles since last year. This report will examine the direction of monetary policy from here on while analyzing the PBOC's measures to tackle real-estate bubbles.

2. The PBOC has steadily strengthened moves to control real-estate bubbles

An overheating property market lies behind the PBOC's concern about real-estate bubbles. From mid-2020 onwards, investment in property development expanded, while housing sales accelerated (Fig. 4) and house prices rose (Fig. 5), particularly in first-tier cities, with the authorities growing more concerned about funds flowing into property markets on large-scale easing. The PBOC subsequently announced a series of measures, including (1) restrictions on fundraising by property development companies, (2) caps on the total amount of property loans banks can extend, and (3) tougher restrictions on speculative fund inflows. These measures are explored in more detail below.

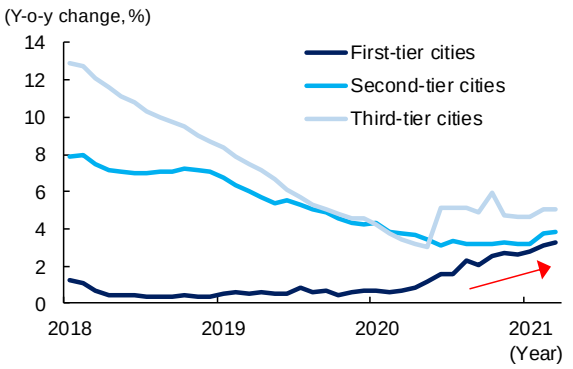
[1] 新华网, "中共中央政治局召开会议 决定召开十九届五中全会 分析研究当前经济形势和经济工作 中共中央总书记习近平主持会议" (July 30, 2020)
[2] 马骏, "货币政策应适度转向", 财经 (February 1, 2021)
[3] 郭树清, "坚定不移打好防范化解金融风险攻坚战", 求是 (August 16, 2020)

Figure 4: The floor space of residential buildings sold in 30 cities



Note: Backward 3-month moving average
Source: Prepared by MHRT based on materials from Wind

Figure 5: House prices in 100 cities



Source: Prepared by MHRT based on materials from Wind

(1) Restrictions on fundraising by property development companies: Depending on their financial situation, firms could face restrictions on their interest-bearing debt growth allowances

The first thing the PBOC did to correct the lopsided flow of funds into real-estate markets was to introduce tougher restrictions for property developers. At a joint meeting with officials from the Ministry of Housing and Urban-Rural Development in August 2020, the PBOC announced "Three Red Lines" concerning fundraising by property developers (Table 1). These place ceilings ("red lines") on property developer liability-to-asset ratios and so on, with interest-bearing debt restrictions applied to companies that breach these red lines. From September 2020, the "Three Red Lines" were applied to 12 major property developers on a trial basis, but the PBOC has said it will steadily broaden the scope of the "Three Red Lines,[4]" so they will probably grow to encompass the entire property development sector going forward. However, the 12 firms targeted for the trial have until the end of June 2023 to clear all three "Red Lines," so it seems the "Three Red Lines" is a comparatively long-term strategy aimed at curbing leveraged expansion by property developers and promoting sound corporate finances while minimizing the risks that arise from property development, such as defaults or the suspension of real-estate projects due to

Table 1: The Three Red Lines

The Three Red Lines	● Liability-to-asset ratio (excl. advances received): >70% ● Net debt ratio: >100% ● Cash to short-term debt ratio: < x1
Classifications	● No red lines breached = Green ● One red line breached = Yellow ● Two red lines breached = Orange ● Three red lines breached = Red
Restrictions on interest-bearing debt growth	● Green: Debt allowed to grow by up to 15% y-o-y ● Yellow: Debt allowed to grow by up to 10% y-o-y ● Orange: Debt allowed to grow by up to 5% y-o-y ● Red: Debt not allowed to grow

Note: Net debt ratio = (interest-bearing debt – cash equivalent) ÷ net assets
Source: Prepared by MHRT based on materials from Huatai Securities, "三道红线"下房地产的 15 个预判", (October 19, 2020), and other reports

changes in the financing environment.

[4] The People's Bank of China "2020 年第三季度金融统计数据新闻发布会文字实录" (October 14, 2020)

(2) Caps on the total amount of property loans banks can extend: The PBOC has set five ratio ceilings according to bank size

The PBOC has also introduced caps on the amount of loans that banks can extend to the real-estate sector. At the end of December 2020, the PBOC released the "Circular on the Establishment of a Real Estate Loan Concentration Management System for Banking Institutions" (hereinafter "the Circular"). This categorizes banks into five groups according to size, with a ceiling set for each group with regards to the ratio of property loans and personal mortgage loans to total RMB loan balances (Table 2). The Circular states that the purpose of the new regulations is to "decrease the dependence of the financial system on the real-estate sector while enhancing the stability of financial institutions." As Figure 6 shows, the proportion of the total loan balance accounted for by loans to the real-estate sector had been steadily growing and it remained at a high level as of the end of 2020.The Circular states that banks who breach the ceilings by no more than 2%pt or over 2%pt will be given up to two years or four years respectively to bring their ratios within the ceilings. The Circular also talks about "maintaining the basic stability of property loan and personal mortgage loan ratios," so it should be seen as a mid- to long-term measure aimed at steadily lowering the weight of the real-estate sector in the financial system while keeping a lid on excessive property loan growth. This comes after the NPC and other bodies expressed the opinion that lending structures should be optimized, with more financing poured into the scientific and technological innovation and green industries, for example, and more loans extended to small and micro businesses.

Furthermore, though the growth of personal mortgage loans has outpaced RMB loans (Fig. 7), the pace of this growth will probably slow gently when the new rules are implemented, so the Circular will probably help to cool overheating house prices too.

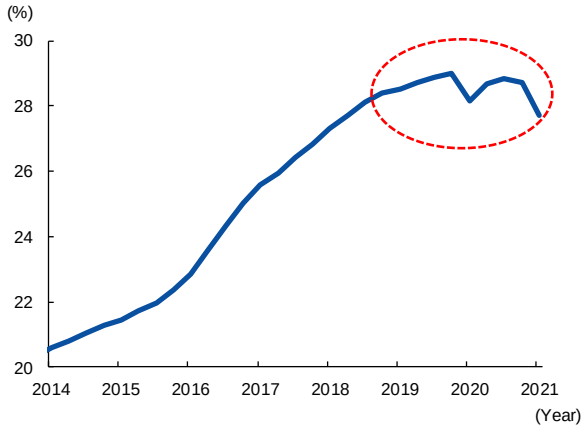
Table 2: Ratio ceilings for real-estate loans

Bank Type		Maximum real-estate loan share	Maximum personal mortgage share
1	Large banks	40%	32.5%
2	Medium-sized banks	27.5%	20.0%
3	Small banks and non-county rural commercial banks	22.5%	17.5%
4	County rural commercial banks	17.5%	12.5%
5	Village banks	12.5%	7.5%

Note:
1 Maximum real-estate loan share = Real-estate loan balance ÷ RMB loan balance; Maximum personal mortgage share = Personal mortgage loan balance ÷ RMB loan balance.
2 Large banks = Industrial and Commercial Bank of China, China Construction Bank, Agricultural Bank of China, Bank of China, China Development Bank, Bank of Communications, and Postal Savings Bank of China.
3 Medium-sized banks = China Merchants Bank and 16 other banks
4 County rural commercial banks are rural commercial banks that only operate at county level within a certain administrative zone or rural commercial banks that have branches in other administrative zones but have assets of less than RMB 10 billion.
5 The ceilings for groups 3–5 can be tweaked in either direction by 2.5%pt depending on the location.

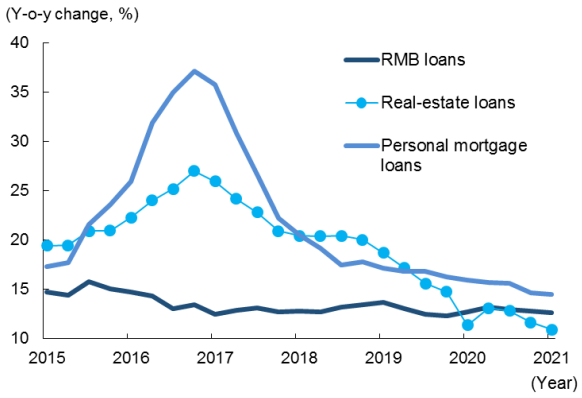
Source: Prepared by MHRT based on materials from the PBOC and various reports

Figure 6: The share of the RMB loan balance accounted for by real-estate loans



Source: Prepared by MHRT based on materials from the People's Bank of China and CEIC Data

Figure 7: Real-estate loans and personal mortgage loans

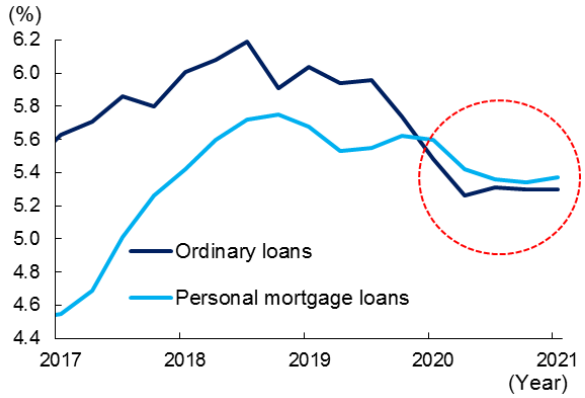


Source: Prepared by MHRT based on materials from the People's Bank of China and CEIC Data

(3) Tougher restrictions on speculative fund inflows: The PBOC has moved to prevent sole proprietor loans from flowing into real-estate markets

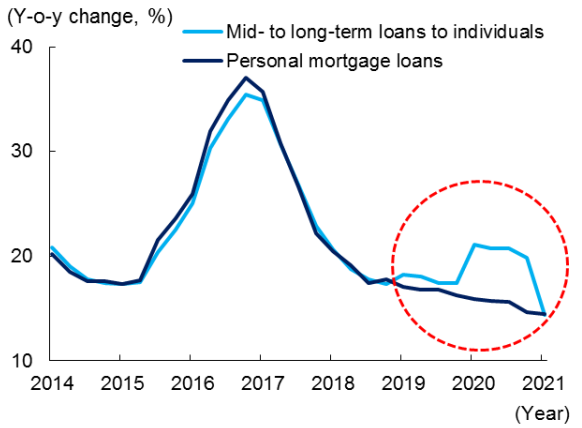
The PBOC has also introduced measures to curb speculative funds from flowing into real-estate markets. In 2020, the PBOC guided lending rates lower as part of moves to support corporate cash flows. This saw ordinary lending rates (aimed primarily at businesses) dipping below personal mortgage rates (Fig. 8). At the same time, though the personal mortgage loan balance has grown at a slower pace, mid-to long-term loans aimed at individuals (including personal mortgage loans and loans to sole proprietors (hereinafter "sole proprietor loans")) grew sharply entering 2020 (Fig. 9). As a result, this led to concerns that sole proprietor loans would be diverted to property speculation, with house prices subsequently rising. In April 2020, the PBOC began inspecting sole proprietor loans. This process began in Shenzhen but it was then extended, mainly to first-tier cities like Shanghai and Beijing[5]. Then, in March 2021, the PBOC and the Banking and Insurance Regulatory Commission, etc.

Figure 8: Ordinary lending rates and personal mortgage loan rates



Source: Prepared by MHRT based on materials from the People's Bank of China and CEIC Data

Figure 9: Mid- to long-term loans to individuals and personal mortgage loans



Source: Prepared by MHRT based on materials from the People's Bank of China and CEIC Data

announced a joint circular on preventing sole proprietor loans from flowing into real-estate markets[6]. This circular

[5] 财新网, "经营贷排查会压垮社融吗？", "财新网" (April 20, 2021)
[6] 中国银保监会办公厅, 住房和城乡建设部办公厅, and 中国人民银行办公厅, "关于防止经营用途贷款违规流入房地产领域的通知" (March 26, 2020)

announced stricter monitoring of sole proprietor loans, including reviews of the terms and usages of these loans, tougher control of items mortgaged by sole proprietor loans, and the stricter supervision and control of real-estate agencies (which appear to facilitate the diversion of sole proprietor loans).

These tougher restrictions on sole proprietor loans differ from the other two measures mentioned above in the sense that they represent short-term tightening aimed at preventing speculative fund inflows. Though only introduced in April 2020, they had already succeeded in slowing the growth of sole proprietor loans by the first quarter of 2021.When added to existing penalties levied on speculative behavior[7], from here on these moves will probably serve to curb speculative behavior using sole proprietor loans.

3. The PBOC continues to pursue monetary policy in a prudent manner

As outlined above, the PBOC has introduced tougher measures from mid-2020 aimed at controlling real-estate bubbles. (1) Restrictions on fundraising by property development companies and (2) caps on the total amount of property loans banks can extend are mid- to long-term initiatives aimed at preventing excessive fund flows into the real-estate sector while decreasing risks across the entire financial system. These moves were prompted by the Chinese government's prudent risk control measures and its policy of "appropriately handling the relation between the economic recovery and preventing risk." Given the current state of the Chinese economy and the focus on monetary policy normalization, it would send a strong message to the markets if the authorities utilized some other active monetary policy tools (such as rate hikes). This could lead to sharp fluctuations in asset prices and possibly to "substantial economic losses[8]," as mentioned by Sheng Songcheng, former head of the PBOC's Financial Survey and Statistics Department. Furthermore, the easing measures implemented in 2020 pushed the debt-to-GDP ratio (macroleverage rates) up to historic highs (Fig. 10) and there are concerns that any sudden tightening might hit the output and business performance of firms with financing problems[9]. As such, it seems the PBOC has implemented macroprudential mid-to-long measures to enhance the soundness of the financial system while ensuring a stable supply of credit to the real economy as it seeks to control overheating real-estate markets and decrease risk.

In its Monetary Policy Report for Q1 2021[10], the PBOC reiterated that stability remained a priority. This suggests the PBOC will continue to prudently adjust liquidity while controlling financial risk (related to real-estate bubbles and so on) as it pursues monetary policy normalization. The deputy head of the PBOC has talked about introducing new policy tools to tackle real-estate bubbles[11], so if current policies are not impactful enough and fail to eradicate concerns about bubbles, the PBOC will probably introduce some new measures. It will also pursue monetary policy normalization while examining the impact of policies to constrain bubbles and while monitoring the pace of the economic recovery and any improvements when it comes to corporate debt. One way of gauging how well the normalization process is going would be to monitor the movements of the (seven-day) interbank repurchase rate for depositary financial institutions (the so-called "DR007") (Fig. 11). When it comes to movements of short-term rates (a target for liquidity provision), the PBOC has spoken of the need to focus on policy rates as well as "the weighted average of DR007, which is the main indicator of market rates, and the average of DR007 over a period of time.[12]" With the PBOC's report mentioning the DR007 as a reflector of liquidity conditions, it seems

[7] 财新网, "广东 2.77 亿元资金违规入楼市 银行界人士称自查难度大", (March 16, 2021), "深圳排查 1772 亿元经营贷业务 收回 21 笔违规贷款" (March 19, 2021), "上海银保监局：123 笔、3.39 亿元贷款资金违规入楼市" (April 7, 2021)

[8] 新华财经, "盛松成：不宜快速收紧货币政策 需警惕人民币过快升值" (March 18, 2021)

[9] The Central Economic Working Conference and the NPC discussed "maintaining the overall stability of macroleverage rates," thus signaling an intention to avoid any sharp deleveraging that might prompt an economic downswing.

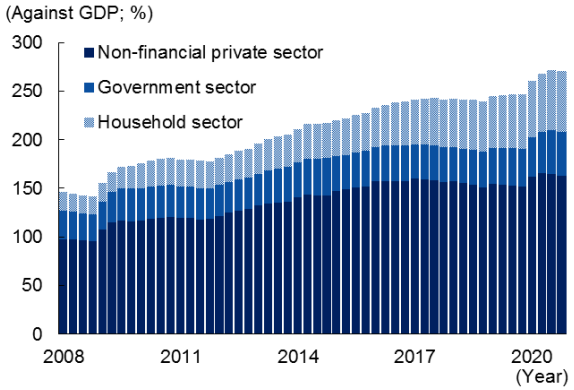
[10] The People's Bank of China, "2021 年第四季度货币政策执行报告" (May 11, 2021)

[11] The PBOC has talked about introducing "household debt-to-income ratios and risk weights for property lending" as new ways to measure real-estate risk. (The People's Bank of China, "中国宏观审慎政策框架建设与管理实践", October 21, 2020)

[12] The People's Bank of China, "2020 年第四季度货币政策执行报告" (February 8, 2021)

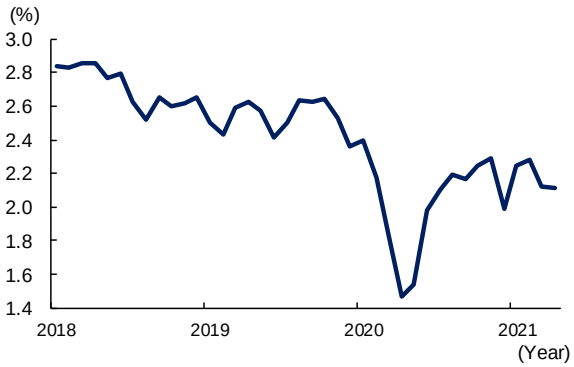
this indicator will play an important role in shaping the direction of monetary policy going forward. A glance at the monthly weighted average of DR007 shows the indicator edging up after bottoming out in April 2020, though it has still not recovered to pre-pandemic levels. Observers will need to monitor when the PBOC will start guiding the DR007 higher as it starts to bring monetary policy back into a neutral position.

Figure 10: Macroleverage rates



Source: Prepared by MHRT based on materials from Research Center for National Balance Sheet (CNBS)

Figure 11: Interbank repo rate (seven-day)



Note: The rate for depositary institutions; monthly average.

Source: Prepared by MHRT based on materials from the People's Bank of China and CEIC Data

New Opportunities and Challenges for Economic Development in China as It Shifts from Low-Carbon to Carbon-Neutral Growth

— Achieving the "2030/2060 goals" to ensure sustainability

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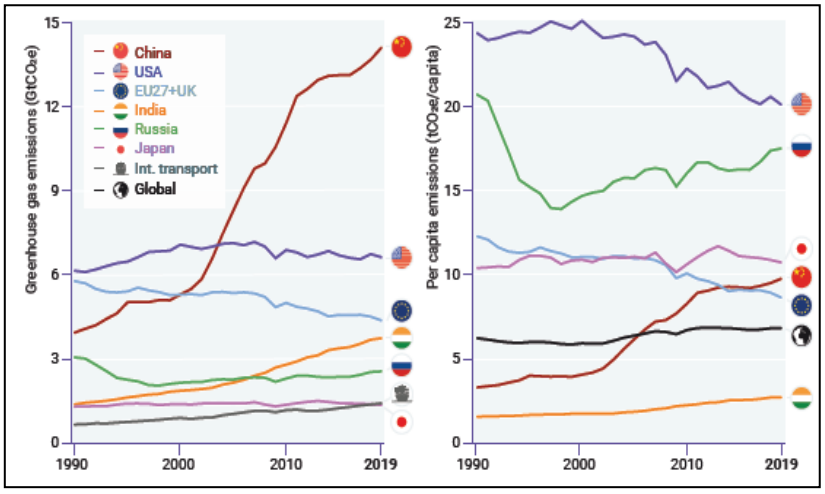
1. Introduction

In response to the acceleration of global warming, or rather the long-term climate change crisis, global efforts to promote decarbonization and international competition in environmental measures are accelerating. The vector of digital innovation, which holds the key to the fourth industrial revolution, is also beginning to turn toward fast-tracking the promotion of carbon neutrality. As the world's largest emitter of greenhouse gases (**Figure 1**, accounting for more than a quarter of the world's total emissions, and approaching Japan for third place on a per capita basis) and the world's leading digital innovator, China has been extremely proactive in promoting measures to combat global warming and has been actively involved in international negotiations on climate change; it is also developing more diverse policies than ever on the pathway to a low carbon/carbon neutral economy (**Table 1**). Specifically, the newly-initiated 14th Five-Year Plan (2021–2025; FYP), which succeeds the 13th FYP (2016–2020) during the span of which China made remarkable achievements in environmental protection, raises the position of low carbon-oriented policy and continues the transition towards decarbonization, whilst also offering prospects for the development of a long-term blueprint on carbon neutrality by 2035 and a widening campaign for digital and green innovation.

Figure 1: Absolute greenhouse gas emissions of major emitters (left) and per capita emissions (right)



Source: Excerpted from the United Nations Environment Programme (UNEP), *Emissions Gap Report 2020* (https://www.unep.org/emissions-gap-report-2020)

Table 1: Major policies on low-carbon and decarbonization in China in recent years

No.	Name of Policy/Plan	Promulgating Authority	Date of Announcement
1	National Plan for the Implementation of the 2030 Agenda for Sustainable Development	State Council	Sep. 2016
2	13th FYP Work Plan for Greenhouse Gas Emission Control	State Council	Oct. 2016
3	13th FYP for National Ecological Protection	Ministry of Ecology and Environment	Nov. 2016
4	Environmental Protection; 13th FYP Outline for Science and Technology Development (2016–2020)	Ministry of Ecology and Environment, Ministry of Science and Technology	Nov. 2016
5	13th FYP for National Ecological & Environmental Protection (2016–2020)	State Council	Nov. 2016
6	Plan for the Construction of Innovation-driven Demonstration Zones to Promote SDG Implementation in China	State Council	Dec. 2016
7	13th FYP for Energy Conservation and Emission Reduction	State Council	Jan. 2017
8	Extended Producer Responsibility System Implementation Plan	State Council	Mar. 2017
9	Guiding Opinions on Promoting Green "Belt and Road" Construction	Ministry of Ecology and Environment, NDRC, etc.	Apr. 2017
10	The Belt and Road Ecological and Environmental Cooperation Plan	Ministry of Ecology and Environment	May 2017
11	Guiding Action Plan for Circular Economic Development	NDRC, etc.	May 2017
12	State Council decision on revisions to the "Regulations on Environmental Management of Construction Projects"	State Council	Aug. 2017
13	State Council Opinions on Comprehensively Strengthening Ecological and Environmental Protection and Resolutely Fighting for Pollution Prevention and Control	State Council	Jun. 2018
14	Three-Year Action Plan for Winning the Blue-Sky War (2018–2020)	State Council	Jul. 2018
15	Three-Year Action Plan for the Successful Accomplishment of the Pollution Prevention Strategy for Industry and Telecommunications (2018–2020)	Ministry of Industry and Information Technology	Jul. 2018
16	Opinions of the CPC Central Committee and the State Council on Accelerating the Construction of Ecological Civilization	Ministry of Ecology and Environment	Apr. 2019
17	Guidelines on Implementing Carbon Neutrality in Large-Scale Projects (Trial)	Ministry of Ecology and Environment	May 2021
18	China's Policies and Actions for Addressing Climate Change (2019)	Ministry of Ecology and Environment	Nov. 2019
19	National Measures for the Administration of Carbon Emission Trading (Trial)	Ministry of Ecology and Environment	Jan. 2021
20	Guiding Opinions on Accelerating the Establishment and	State Council	Feb. 2021

No.	Name of Policy/Plan	Promulgating Authority	Date of Announcement
	Improvement of the Green and Low-carbon Circular Development Economic Systems		
21	The 14th Five-Year Plan and Vision 2035	NPC	Mar. 2021
22	Guidelines for Verification of Corporate Greenhouse Gas Emission Reports (Trial)	Ministry of Ecology and Environment	Apr. 2021
23	Green Bond Endorsed Project Catalogue (2021 edition)	PBC, NDRC, CSRC	Apr. 2021
24	Notice on the promulgation of the "Special Supervision Measures for Ecological and Environmental Protection"	Central Supervision Office of Ecological & Environmental Protection	May 2021

Note: This table covers major low-carbon and decarbonization-related policy documents from 2016 to the present (with the exclusion of their regional versions), but does not include all relevant policies.
Source: Compiled from Chinese governmental websites

In light of the growing global trend of decarbonization, this paper confirms that China has made bold announcements and pledges to the international community of measures and targets that have been upgraded on numerous occasions, introduces the background and rationale for these policy revisions, reviews the achievements and challenges of its environmental policies to date, and examines the sustainability of China's development and the future challenges it will face on the pathway to achieving peak CO2 emissions by 2030 and carbon neutrality by 2060 (China's 2030/2060 goals).

2. China's pledges on greenhouse gas reduction to achieve more challenging targets

As mentioned at the beginning of this report, China has been an active participant in international negotiations on climate change to combat global warming, and in recent years has taken a leadership role in promoting the establishment of a difficult international framework.[1] At the same time, China has raised its targets on greenhouse gas emissions reductions several times (**Table 2**), and has committed to doing its utmost to cut emissions in line with the scale of its emissions and its leading role in climate change mitigation. In order to achieve these internationally pledged reduction targets, China has linked its ongoing policies on climate change to its five-year plans for national economic and social development. For example, China beat the Nationally Determined Contribution (NDC) targets for 2020 it set in December 2009, which has been acknowledged as a contribution to international efforts to combat climate change and is believed to have given China the confidence to set more challenging targets. In June 2015, immediately prior to the inauguration of its 13th FYP, China submitted its targets on emissions reductions to the United Nations. So successful were the country's achievements on energy conservation and emissions reductions over the course of that

[1] National Center for Climate Change Strategy and International Cooperation, "Study on China's Strategy and Countermeasures to Promote International Cooperation on Global Climate Change Management," September 2020, etc.

FYP, that in September and December last year, China announced that it aims to hit peak carbon dioxide emissions by 2030 and to achieve greenhouse gas (GHG) neutrality – carbon neutrality, in other words – by 2060, in statements on its so-called "2030/2060 goals" that were greeted with welcome surprise by the global community. China's statement on its unwavering commitment to combating climate change, coinciding as it did with the announcement of the United States withdrawal from the Paris climate agreement by the Trump administration, undoubtedly enhanced the country's engagement and presence in the global fight against climate change.

Table 2: China's commitments to fighting climate change

Date	Major pledges
June 2007	*Targets for 2010* → Reduce energy consumption per unit of GDP by around 20% of 2005 levels. → Increase the share of renewable energy in energy consumption to 10%. → Increase shale gas extraction to 10 billion cubic meters. → Reduce nitrogen dioxide (NO2) in industrial production processes to 2005 levels. → Increase forest cover to 15%.
December 2009	*Targets for 2020* → Lower carbon dioxide emissions per unit of GDP by 40%-45% of 2005 levels. → Increase the share of non-fossil fuels in energy consumption to 15%. → Increase forest area and forest stock volume by 40 million hectares and 1.3 billion cubic meters, respectively, compared to 2005 levels.
June 2015	*Targets for 2030* → Aim to hit peak CO2 emissions by around 2030. → Lower carbon dioxide emissions per unit of GDP by 60% to 65% of 2005 levels. → Increase the share of non-fossil fuels in energy consumption to 20%. → Increase forest stock volume by 4.5 billion cubic meters compared to 2005 levels.
September 2020 December 2020	*Targets for 2030* → Aim to achieve peak carbon dioxide emissions by 2030. → Lower carbon dioxide emissions per unit of GDP by over 65% of 2005 levels. → Increase the share of non-fossil fuels in energy consumption to around 25%. → Increase forest stock volume by 6.0 billion cubic meters compared to 2005 levels. → Increase installed capacity of wind and solar power to more than 1,200 gigawatts
	Targets for 2060 → Aim to achieve carbon neutrality by 2060.

Source: Compiled from Chinese government documents and various media sources

In committing to the 2030/2060 goals that Chinese president Xi Jinping has made to the international community in the form of an official statement and accompanying document, China has put itself under obligation to honor these commitments, but with less than a decade to go until 2030 and just thirty years between 2030 and 2060, it has set itself the shortest timeline between peak CO2 emissions and achieving carbon neutrality of any nation worldwide (**Table 3**). This will be an extraordinarily heavy undertaking for China. In this sense, China has effectively "burnt its bridges," or, in setting such high targets, has backed itself into a corner with the expectation that it

will achieve decarbonization even with maximum effort and at a cost to its own interests and that it can link this to a higher order of sustainable development.

Table 3: Target dates for peak CO2 emissions and carbon neutrality in major countries (regions)

Country / Region	Year of peak CO2 emissions	CO2 emissions at peak (billion tons)	Emissions per capita (tons)	Target for carbon neutrality
Russia	1990	3.188	21.58	-
U.K.	1991	0.807	14.05	2050
EU	2006	4.854	10.28	2050
U.S.	2007	7.416	24.46	2050
Canada	2007	0.742	22.56	2050
Brazil	2012	1.028	5.17	2050
Japan	2013	1.408	11.17	2050
South Korea	2013	0.697	13.82	2050
China	2030	12.00	8.5	2060

Source: Compiled from National Center for Climate Change Strategy and International Cooperation, OECD and World Resources Institute data. The EU's target for carbon neutrality may vary among its member states. All figures for China are estimates.

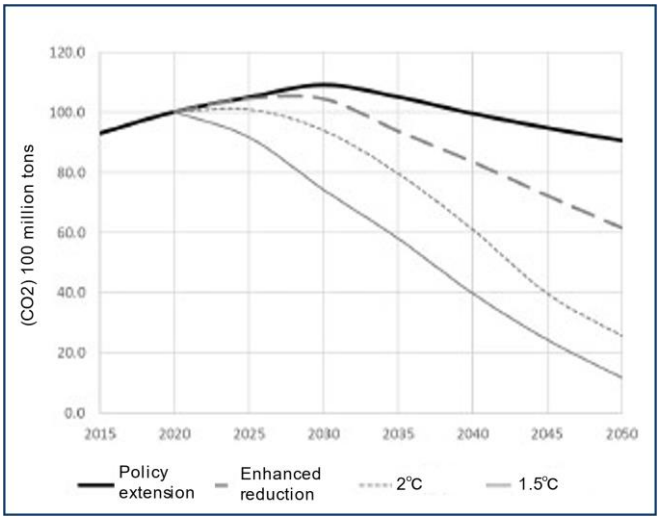
3. Scenarios for achieving carbon neutrality in China and key areas for action

At the Virtual Leaders' Summit on Climate that was held in April this year, newly-inaugurated President Joe Biden indicated that he will be reinstating the United States to the Paris climate agreement, whilst the United Kingdom, Japan and other nations made an impression by announcing ambitious new climate targets. Chinese President Xi Jinping reiterated his nation's targets on emissions reductions and announced a new steeper target to reduce coal consumption. As the world's largest developing country, China's stance on climate change has been to commit – as far as possible – to its obligations and responsibilities, but there are signs that the US, the EU and other developed nations are seeking to impose further emissions reductions obligations on China that go beyond the framework for developing countries, and this may well become an issue over time.

That China's 2030/2060 goals have been set on the basis of the most stringent scenario assumptions was made clear in research findings from a study led by the Institute of Climate Change and Sustainable Development (ICCSD) at Tsinghua University released in October last year. In the study, four scenarios were set and analyzed: (1) policy extension, (2) enhanced reduction, (3) 2°C global temperature rise, and (4) 1.5°C global temperature rise, with the results putting peak carbon emissions from energy sources at around 2030 for scenario (1), before 2030 for scenario (2), around 2025 for scenario (3), and before 2025 for scenario (4) (**Figure 2**). The study further projects that energy-derived CO2 emissions in 2050 will fall to 9.0 billion tons under scenario (1), 6.2 billion tons under scenario (2), 2.9 billion tons under scenario (3), and

1. 5 billion tons under scenario (4), with CO2 emissions including those from non-energy sources under scenario (4) projected to be 1.7 billion tons, with 0.8 billion tons absorbed by forests, etc. and 0.9 billion tons captured and sequestered by CCS/BECCS, bringing CO2 emissions to virtually zero and real GHG emissions from non-CO2 sources to 1.3 billion tons. Professor He Jiankun, chair of the ICCSD's academic committee and the deputy director of National Expert Committee on Climate Change, argues that China must go with scenario (4) if it is to achieve its 2030/2060 goals. To achieve this, he concludes that the share of coal in primary energy consumption must be reduced from 58% in 2019 to less than 5% in 2050, the share of non-fossil energy increased from 15% to more than 85%, and the share of non-fossil power sources in electricity generation increased from 33% to more than 90%.[2] There is a strong probability that the Chinese government will set policy based on scenario (4), which means that its decarbonization policy decisions will based on the most stringent criteria (global warming of 1.5°C). Moreover, although China's deadline (2060) for achieving carbon neutrality is some ten years later than the estimates based on the GHG emission reduction targets of the world's major countries (regions) (**Figure 3**), the report points out that China will have to put considerably more energy into reducing its GHG emissions than any of the world's developed nations.

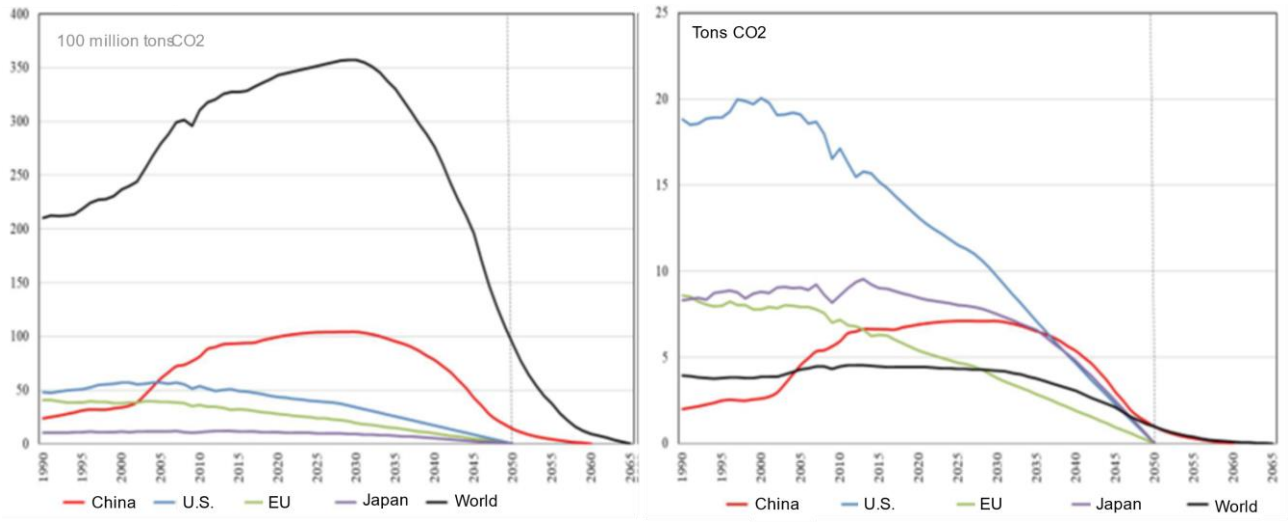
Figure 2: A comparison of China's CO2 emissions under 4 different scenarios



Source: Excerpted and adapted from *Findings from Research on China's Long-term Low-carbon Development Strategy and Transition Pathways*, Institute of Climate Change and Sustainable Development, Tsinghua University

Figure 3: China will have to work harder than any country/region in the world to reduce both its net GHG emissions (left) and GHG emissions per capita (right)

[2] This study, which has involved numerous researchers from universities and government research institutes, is regarded as being of vital import and its findings have been published and cited in various forms, thus providing an important basis for government policy decisions. Prof. He Jiankun's most recent research paper "碳达峰碳中和目标导向下能源和经济的低碳转型" is published in "Environmental Economics Research," Vol. 1, 2021.



Source: Excerpted and adapted from *Findings from Research on China's Long-term Low-carbon Development Strategy and Transition Pathways*, Institute of Climate Change and Sustainable Development, Tsinghua University

Table 4 presents the shifts in key performance indicators under the reinforced policy scenario through 2030 (when China aims to have CO2 emissions peak), and demonstrates that even this will not put China on track to achieving its 2030/2060 goals.

Table 4: Scenario analysis of energy consumption and CO2 emissions for the enhancement of China's NDC targets

Performance indicator		2005	2010	2015	2020	2025	2030
Annual GDP growth rate			11.3	7.9	5.9	5.3	4.8
5-year reduction of energy intensity of GDP (%)			19.1	18.5	14.3	14.0	14.0
Energy consumption (100 million tce)		26.1	36.1	43.4	49.4	55.0	59.8
Energy consumption mix	Coal (%)	72.4	69.2	63.7	57.0	51.0	45.0
	Oil (%)	17.8	17.4	18.3	18.5	18.0	17.0
	Natural gas (%)	2.4	4.0	5.9	8.5	11.0	13.0
	Non-fossil fuels (%)	7.4	9.4	12.1	16.0	20.0	25.0
Energy consumption per unit of production		2.32	2.25	2.16	2.03	1.90	1.75
CO2 emissions		60.6	81.3	93.7	100.3	104.5	104.6
Reduction in CO2 emissions per unit of GDP (%)			21.5	21.2	19.7	19.4	20.6
Percentage reduction on 2005 levels (%)					50.3	60.0	68.2

Source: Excerpted and adapted from *Findings from Research on China's Long-term Low-carbon Development Strategy and Transition Pathways*, Institute of Climate Change and Sustainable Development, Tsinghua University

4. Achievements and challenges of low-carbon development initiatives to date

As we have seen above, China has imposed extremely stringent decarbonization targets on its own country, and it will only be able to come close to achieving these targets if it implements the reductions that require the most effort, but it goes without saying that this will require the implementation of comprehensive environmental and

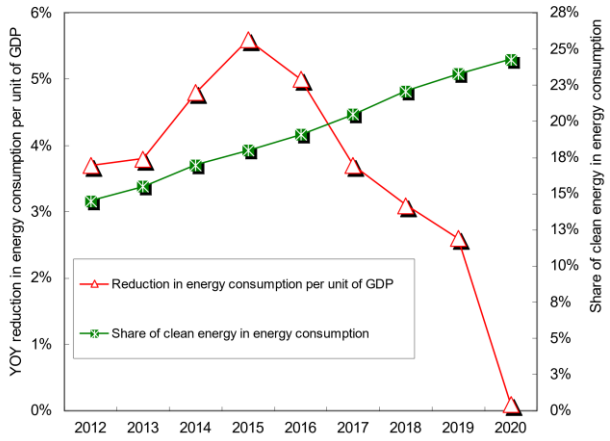
energy measures and industrial technology policies under a system of national unity.

This section examines trends in the development of China's energy conservation and new energy sectors as it moves towards a low-carbon economy, as well as trends in the closely related environmental protection industry and in emissions trading, which plays a crucial role in the process of decarbonization. It then offers an overview of China's achievements in this area and the challenges it faces, with the aim of providing some indication of the feasibility of its achieving the 2030/2060 goals.

Figure 4 shows that China is essentially achieving government targets on reductions in energy consumption per unit of GDP, although the reductions made during the span of the 12th FYP were relatively substantial whilst those made during the span of the 13th FYP were smaller. The chart also shows China to be well on track in its efforts to increase the share of clean energy consumption, an achievement in the road to low-carbon growth that is frequently emphasized by the Chinese government, although the share of clean energy in energy production remains at the 15% level and while it is important that efforts are made to increase this ratio substantially moving forward, there can be little doubt that reducing coal power, which accounts for more than 50% of the energy mix, will be the most difficult policy challenge for Beijing.

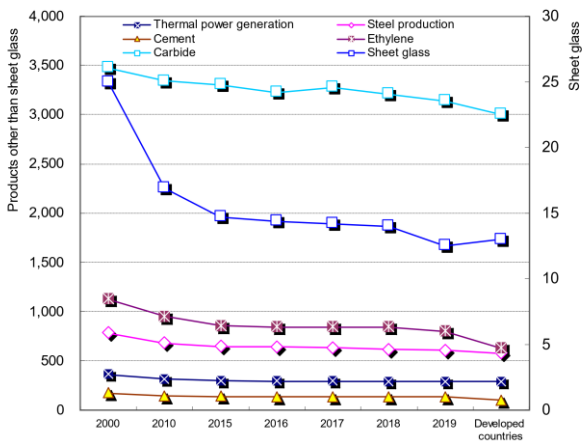
Figure 5 shows trends in energy consumption per unit of production for major products in China's energy-intensive industries, which are one of the key CO2 emitters, and evidences steady reductions across all sectors that are contributing to considerable energy savings and to reductions in emissions of carbon and other GHGs. However, whilst this is manifestly the result of policy on energy conservation and emissions reduction, China continues to lag significantly behind the levels achieved in the world's developed economies in many sectors and product categories, suggesting that there is still considerable leeway for innovation-led improvements in energy efficiency and carbon emissions reductions in China's manufacturing industry.

Figure 4: The ongoing decrease in energy consumption per unit of GDP and growth in clean energy consumption in China



Source: Compiled from the *Statistical Bulletin 2016* and *Statistical Bulletin 2020*, National Statistical Bureau

Figure 5: The declining trend in energy consumption in energy-intensive industries in China

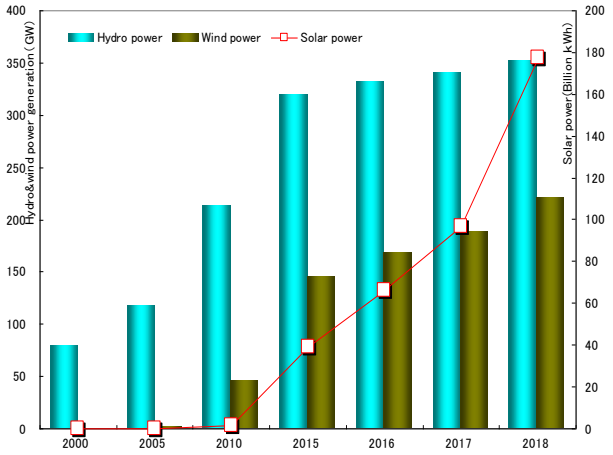


Source: Compiled from the *China Statistical Yearbook 2020*, National Bureau of Statistics, and the World Resources Institute website, etc. Units vary and are omitted as appropriate.

As **Figure 6** shows, China is also making steady progress on the development and consumption of major renewable energy resources (water, wind and solar power), with increases in wind and solar power generation being particularly conspicuous. It is now the top producer of both solar and wind energy worldwide.

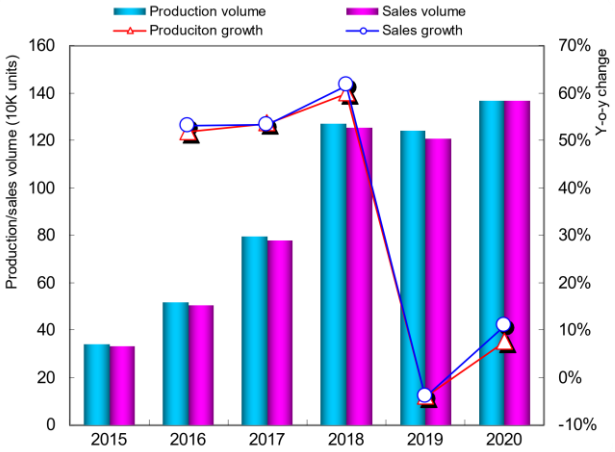
The development of new energy vehicles (NEVs), an important low-carbon and decarbonization initiative, has been particularly pronounced in China, where both production and sales returned to positive growth year on year last year, even in the wake of the coronavirus pandemic, putting China at the forefront of the global new energy vehicle market (**Figure 7**). It is also true that the development of electric vehicles, which has become a major trend globally, owes a significant amount to a strategic shift in China, the world's largest market, that has been steadily reinforced.

Figure 6: Development and use of renewable energy is on the rise



Source: Compiled from respective editions of the *China Energy Statistical Yearbook*

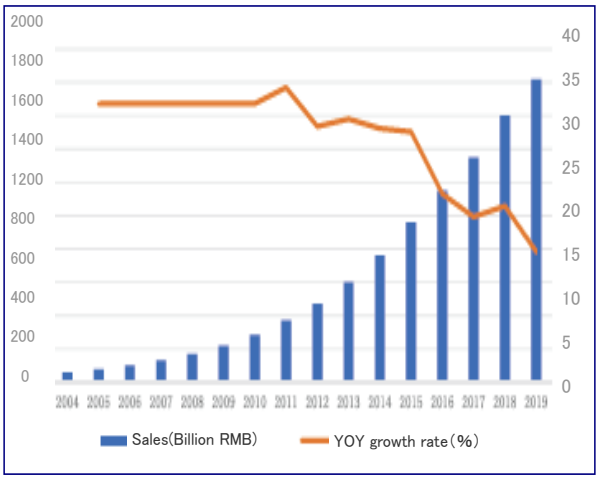
Figure 7: Production and sales of new-energy vehicles (NEV) in China



Source: Compiled from China Association of Automobile Manufacturers and National Bureau of Statistics data

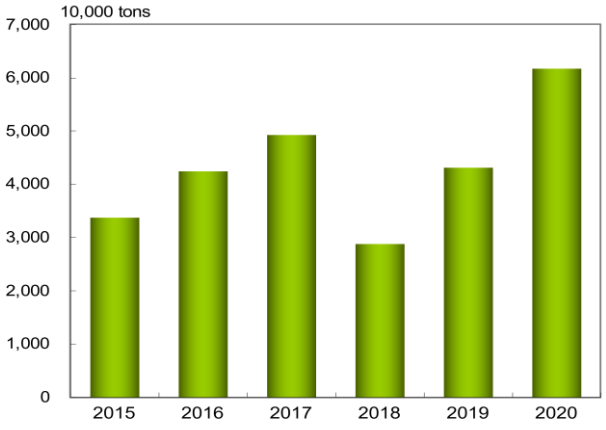
On the other hand, the growth of the environmental protection industry, emissions trading, and green bond markets, as shown in **Figures 8, 9, and 10**, is noteworthy as an area where progress on low-carbon and carbon neutral development can be linked to market mechanisms and institutional support strengthened. The environmental protection industry is an emerging and fast-growing industry that has experienced double-digit growth in recent years, albeit at a slower pace, and is expected to maintain high growth momentum in the future. Emissions trading is now in full swing in China after a relatively long period of trial operation, but this is an industry with tremendous potential and growth is expected to continue. Online trading is expected to begin by the end of June this year, making it the largest market in the world with more than 4 billion covered emissions. There are currently carbon markets in seven provinces/cities in China. As of March 2021, some 3,000 companies from more than 20 industries have participated in the trading, trading a cumulative total of 440 million tons, and the total trading value has reached 10.5 billion yuan (about 179.7 billion yen). (JIJI News Bulletin, May 28, 2021)

Figure 8: Environmental protection industry sales in China (2004–2019)



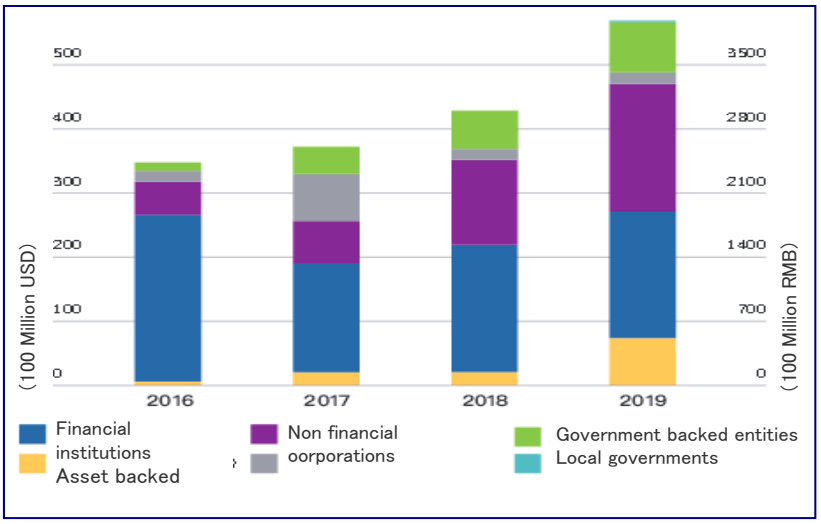
Source: Amended and excerpted from the *2020 China Environmental Protection Industry Development Status Report*

Figure 9: Volume of CCER contracts trading on China's national carbon market



Note: The temporary suspension of CCER project applications by the NDRC in March 2017 led to a sharp decline in contract volume in 2018, but it has since picked up.
Source: Compiled from the China Carbon Trading website, etc.

Figure 10: China's diversifying and expanding green bond issuers



Source: Excerpted and adapted from the *China Green Bond Market 2019 Research Report*, Climate Bonds Initiative

Support for projects related to environmental protection and energy conservation through the issuance of green bonds has also been expanding rapidly in China in recent years. Moreover, these projects are increasingly being operated as public-private partnerships (PPP). China's green bond market is also growing rapidly and there has been a marked expansion in issuances from government-backed entities and local governments. The People's Bank of China issued the 2022 edition of the "Green Bond

Endorsed Project Catalogue" in April this year (**Table 1**-23), suggesting that there is increasing support for this movement from the organs of government.

As the above figures demonstrate, it would seem that China's various initiatives on the pathway to low-carbon and carbon-neutral development have served not only to strengthen policy formulation, but have also, through the steady conduct of audits on actual multi-channel implementation, led to remarkable development in related sectors in recent years. To this end, China will need to supplement its new institutionally-designed national and regional five-year plans with more results-focused plans targeting specific industries and sectors and an authoritative roadmap aimed at achieving its 2030/2060 goals, and there are reports that work on an action plan that will put China on track to fulfilling its 2030/2060 goals is already underway. Respective sectors and regions are expected to begin setting targets and drafting action plans that meet their specific requirements over the coming years and months.

5. Conclusion: Major challenges to achieving and the outlook for China's 2030/2060 goals

It is a fact that achieving the 2030/2060 goals will present various challenges and difficulties, and as with Japan's ambitious goal, it will be necessary to gain the understanding and support of the power and manufacturing industries, which are particularly large emitters, if China is to succeed.

At a press conference held on April 19 this year, a spokesperson for China's National Development and Reform Commission announced that the country intends to fast-track the promotion of a blueprint for peaking carbon emissions and achieving carbon neutrality, focusing on eight key initiatives. The eight key initiatives are as follows:

1. Promote the optimization and upgrading of China's industrial structure and continue making improvements in green/low-carbon development levels in industry.
2. Focus on adjusting the energy mix and promote the substitution of renewable energy resources.
3. Adhere to and improve the dual control system for energy consumption, and make all-out efforts to save energy in priority areas.
4. Strengthen science and technology research and development initiatives to promote the achievement of significant breakthroughs in green and low-carbon technologies.
5. Develop and improve green and low-carbon policy systems and marketization mechanisms, adhering to a policy of leveraging both government and market strengths.
6. Strengthen the protection and restoration of the ecological environment and improve the capacity of the ecological system to absorb carbon dioxide.

7. Promote energy conservation to all citizens and create a trend in green and low-carbon lifestyles.
8. Strengthen international exchange and cooperation, promote the construction of a green Silk Road, and participate in and lead global climate and environmental governance.

These eight key initiatives reveal the key points of the Chinese government's response measures. Future policy is expected to prioritize concentrated structural adjustment of energy in terms of both production and consumption, strengthening the development of science and technology (promoting R&D) (in particular, an emphasis by industry, government and academia on orienting the power and manufacturing industries towards energy conservation and emissions reductions through the promotion of DX [digital transformation]), fostering energy conservation and low-carbon awareness and behavior among all citizens, and getting involved in the governance of the global environment by emphasizing international exchange and cooperation. In order to stay on course, it will be necessary to promote green and digital innovation in various fields and to emphasize international cooperation and alliances, and it seems likely that this will lead to an increase in the number of business and investment projects conducted through joint participation and partnership between Chinese and foreign companies over the coming years. Sino-Japanese environmental and energy conservation cooperation and environmental businesses, which have a particularly strong track record of cooperation and potential for development, are also expected to grow substantially with green digital innovation as their mainstay, as they can contribute to the conservation of the global environment and sustainable development of the world economy without being affected by complicated international politics and conflicts of interest between specific countries and regions.

There are already signs of international competition and a mix of cooperation and confrontation between the US and China, based on current trends in global decarbonization strategies. The only way to cope with the crisis of global warming and achieve the ideal of coexistence and coprosperity for all humanity, however, is to promote cooperation on a global scale, strengthen effective governance of the global environment, and improve sustainability on a global scale. As long as this is the case, there will be no end to international cooperation and compromise to achieve this goal.

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