

Chapter 3

China 's Strategies for Aligning C-19 Recovery and Stimulus Measures with Low-carbon Green Growth

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1. Background	45
2. COVID-19 Crisis and its Impact on China	45
3. China's Stimulus Packages	51
4. China's Green Recovery Packages	52
5. New Ambitious Climate Commitment and Potential Impact	63

1. Background

The coronavirus disease (COVID-19) outbreak in 2020 is a major public health emergency in China, with the fastest transmission, widest range of infections, and the highest difficulty in control and prevention. It not only had a marked impact on the economy, but tested the country's governance ability. The shutdown of factories and disruption of upstream and downstream industrial chains caused by the pandemic have triggered a global rethinking of industrial layout and added uncertainty to the policy choices for China's economic recovery. This paper summarises the effects of the COVID-19 crisis and China's economic resilience, and analyses its stimulus policies and measures, as well as its new climate commitment and potential impact.

2. COVID-19 Crisis and its Impact on China

Since the outbreak of COVID-19, China has launched high-level measures to prevent the spread of the pandemic, strictly restricting the movement of people, and bringing the pandemic under control within a relatively short period of time.

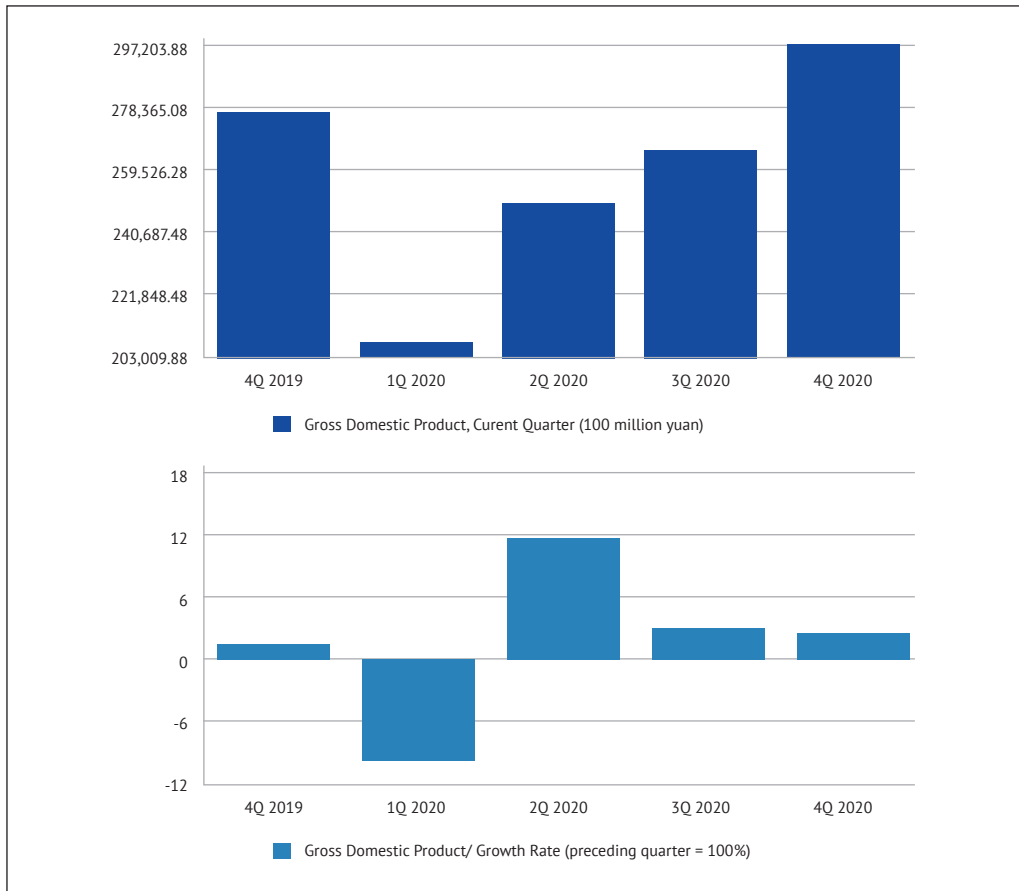
China's economic performance in the first and second quarters was in the doldrums due to the impact of the pandemic, but it began to recover in the second quarter (Figure 3.1). In the first quarter, China's gross domestic product (GDP) reached CNY2.0554 trillion, down 6.8% year-on-year in terms of comparable prices; the added value of the primary industry was down 3.2%, the secondary industry down 9.6%, the tertiary industry

down 5.2%. In the second quarter, GDP grew 3.2%, up 10 percentage points from the first quarter. In the fourth quarter, China's GDP already rose more strongly than a year earlier.

In terms of personal income and employment, the cumulative per capita disposable income was only CNY8,561 in the first quarter, sharply down from the previous quarter (Figure 3.2). The pressure on employment had increased significantly due to the increased number of loss-making companies in the first quarter (Figure 3.3). From January to April, only 3.54 million new urban jobs were created, 1.05 million fewer than the same period last year (Figure 3.4). The urban unemployment rate stood at 6.0% in April, 0.1 percentage point higher than in March. However, as prevention continues to improve, the employment situation shows positive changes. By the end of April, the number of migrant workers had returned to 90% of its usual level. With the implementation of various policies to stabilise employment and ensure people's livelihoods, such as social security reductions, refunds of unemployment insurance, and subsidies for ensuring job stability, people's income and employment situation have gradually improved.

From the perspective of industrial production, from January to April, the value added of industrial enterprises decreased by 4.9% year-on-year, and the profits of industrial enterprises decreased by 27.4%. Amongst them, manufacturing fell 5.4%, while high-tech manufacturing was up 0.5%; electricity, heat, gas and water production and supply fell 3.9%; the production of basic raw materials and new products maintained growth, and the output of natural gas, crude oil, 10 kinds of non-ferrous metals, ethylene and crude steel increased by 10.3%, 2.0%, 2.6%, 0.7%, and 1.3%, respectively.

Figure 3.1 China's Quarterly GDP And GDP Growth Rate

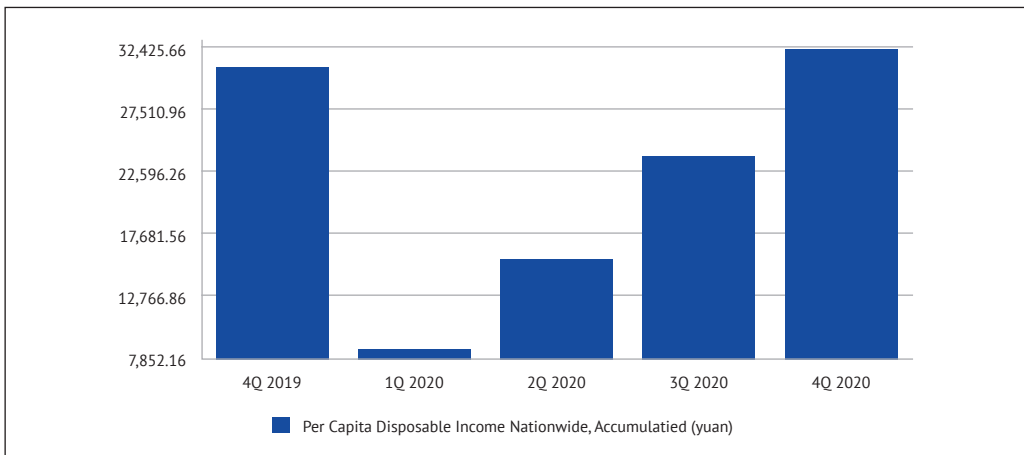


Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=Bo1> (accessed 13 September 2021).

With the accelerated resumption of work and the orderly restoration of economic and social order, the short-term impact of the pandemic on industrial production was gradually being eliminated (Figure 3.5). By the end of May, the average operation rate of scale industrial enterprises had reached 99.1%, and the resumption rate of small and medium-sized enterprises had exceeded 89%. In August, the high-tech manufacturing sector grew by 7.6% year-on-year, significantly faster than the growth of the above-scale industries. Production of new energy vehicles increased by more than 30% in the same month, while output of service robots and smartwatches all increased by more than 70%.

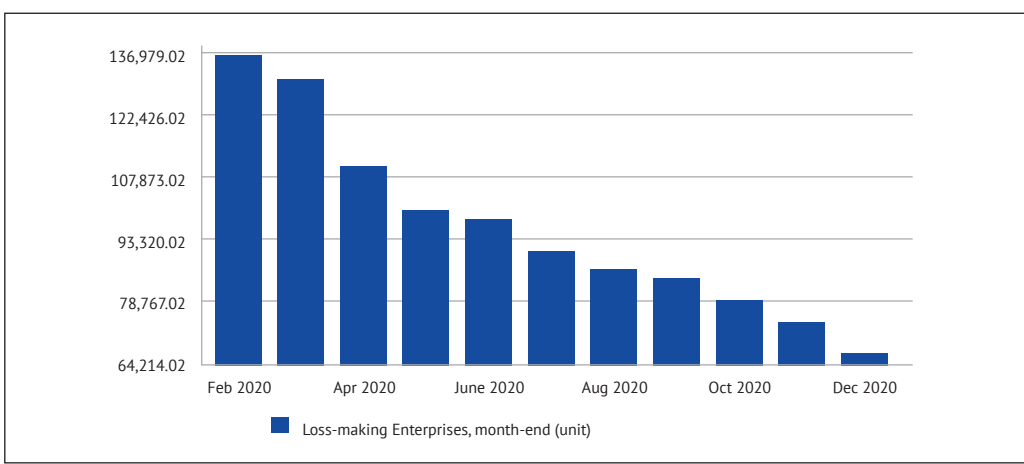
From January to April, fixed asset investment (excluding rural households) reached CNY13.682 trillion (Figure 3.6), down 10.3% from a year earlier, with the tertiary industry accounting for 67.8% of total investment, while investment in computer and equipment manufacturing, e-commerce services, and professional services grew by 15.4%, 25.6%, and 12.5%, respectively. Some areas of livelihood security, such as the production and supply of electricity, heat, gas, and water, saw an increase in investment. The actual use of foreign investment was down by 6.1% year-on-year from January to April, but the actual use of foreign capital in high-tech industries grew by 2.7%. Amongst

Figure 3.2 China's Quarterly Cumulative Per Capita Disposable Income (in yuan)



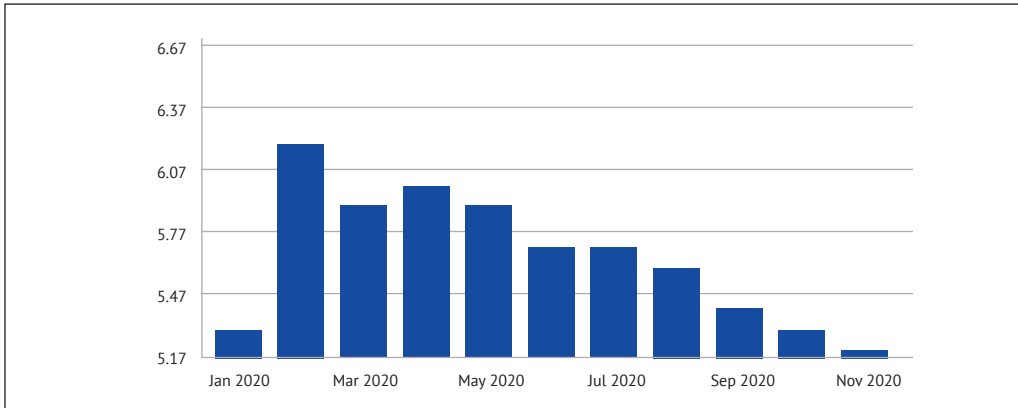
Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=Bo1> (accessed 13 September 2021).

Figure 3.3 The Monthly Number of Loss-Making Enterprises During the Pandemic



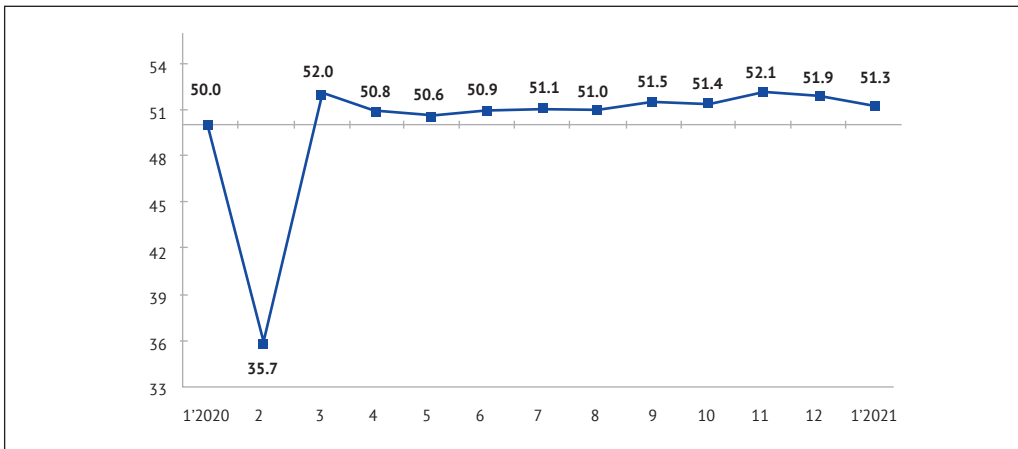
Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=Bo1> (accessed 13 September 2021).

Figure 3.4 China's Urban Unemployment Rate during the Pandemic (%)



Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=B01> (accessed 13 September 2021).

Figure 3.5 China's Manufacturing Purchasing Managers Index During the Pandemic



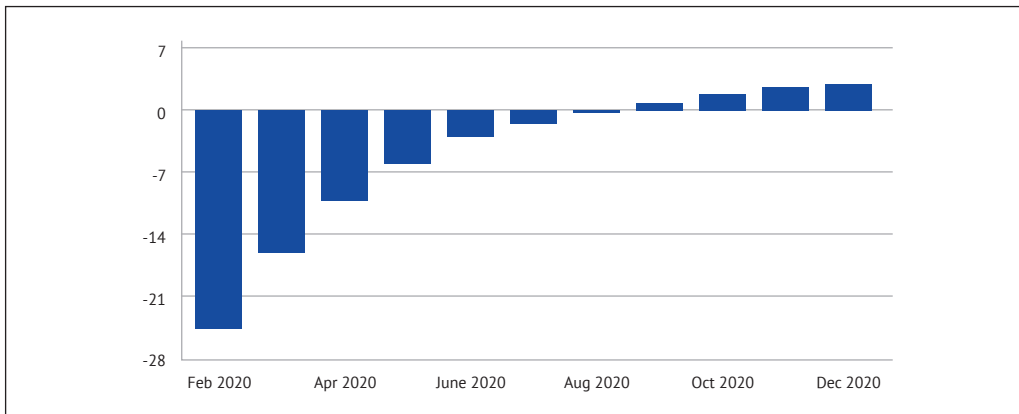
Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=B01> (accessed 13 September 2021).

them, information services, e-commerce services, and professional and technical services grew by 46.9%, 73.8%, and 99.6%, respectively.

As for consumption, from January to April, total retail sales of consumer goods reached CNY10.675 trillion (Figure 3.7), down 16.2% year-on-year. Amongst them, catering revenue was down 41.2%, and retail sales of goods down 13.1%, while commodities closely related to people's life showed an increasing trend, with grain and oil, food, beverages, and medicine growing

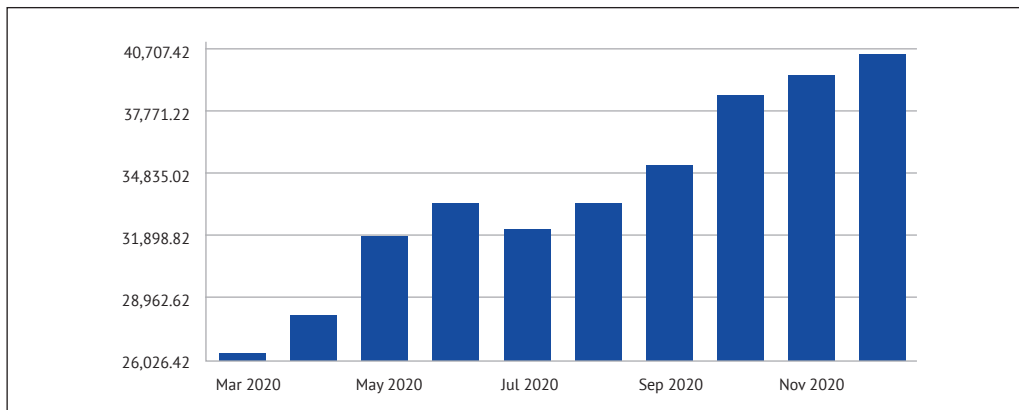
by 13.8%, 6.3%, and 4.3% respectively. Online retail and other emerging forms of consumption continued to maintain rapid growth (Figure 3.8). From January to April, online retail sales reached CNY2.575 trillion, up 8.6%. With the gradual elimination of pandemic factors and steady recovery of logistics and transportation, consumer demand gradually recovered, and China's consumer market will maintain a long-term stable and sustainable development trend. New forms of consumption, such as new retail sales and contactless

Figure 3.6 Cumulative Growth of Investment Actually Completed in Fixed Assets (%)



Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=Bo1> (accessed 13 September 2021).

Figure 3.7 Monthly Total Retail Sales of Consumer Goods (CNY100 Million)



Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=Bo1> (accessed 13 September 2021).

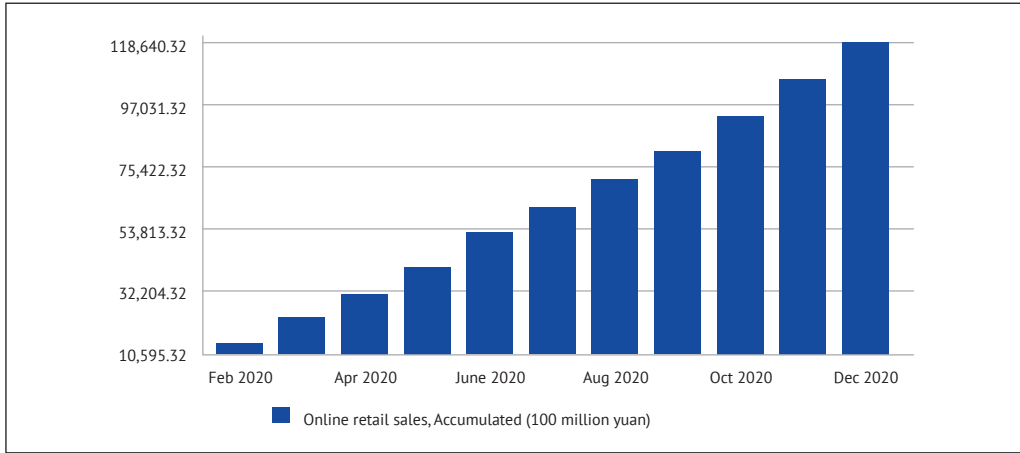
consumption based on the digital economy, have developed rapidly, further strengthening economic recovery.

China’s foreign trade was severely impacted by the pandemic. In US dollar terms, imports and exports from January to May totalled US\$165 billion, down 8.0%, with exports down 7.7%, and imports down 8.2% (Figure 3.9). Since then, COVID-19 has had less and less

impact, and the growth of both imports and exports turned positive in June. From January to July, China-ASEAN trade has surged by 6.6% to CNY2.41 trillion. In addition, China’s trade with the EU and Japan are also growing. It is worth noting that the total trade volume between China and the US fell by 3.3% to CNY2.03 trillion.

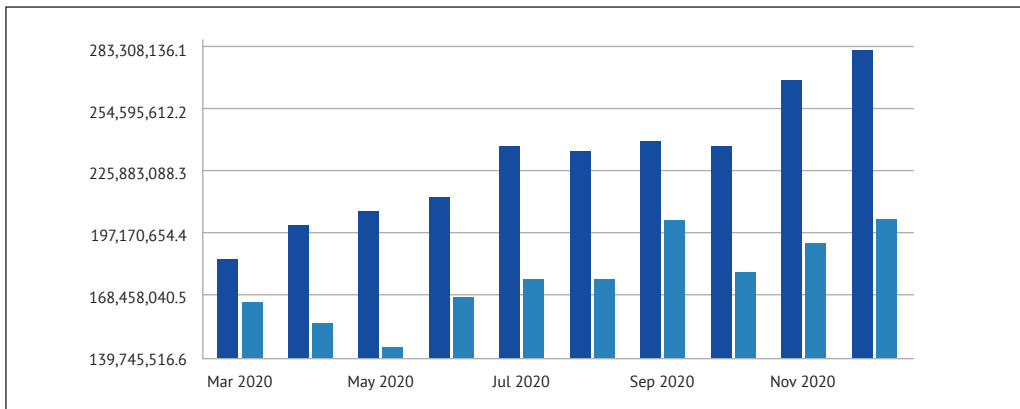
From the energy and power industry, installed capacity of wind and solar power has maintained rapid growth, and was less impacted by the pandemic.

Figure 3.8 Accumulated Online Retail Sales (CNY100 million)



Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=Bo1> (accessed 13 September 2021).

Figure 3.9 Exports and Imports During the Pandemic (thousand US\$)



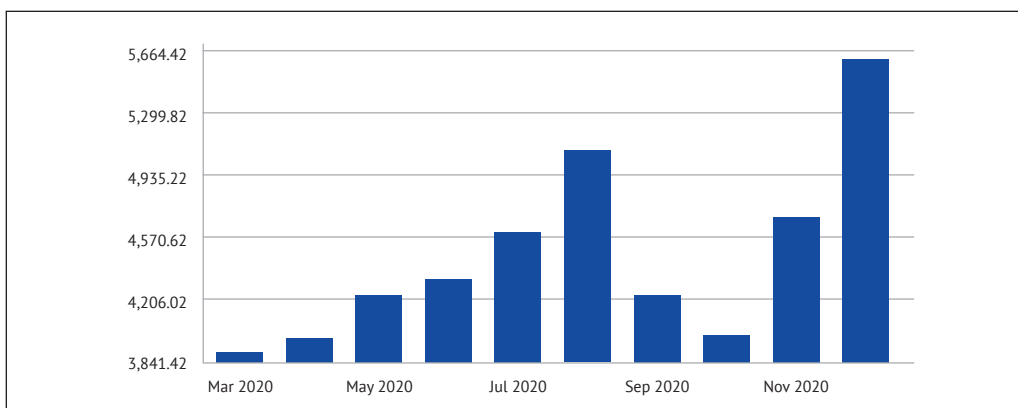
Note: Export on the left in red, and import on the right in blue.

Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=Bo1> (accessed 13 September 2021).

By the end of August, China’s installed power-generating capacity reached 2.07 billion kW, up 5.8% year-on-year. Hydropower generated 360 million kW, up 2.7%. Thermal power reached 1.22 billion kW, up 3.9% (Figure 3.10), of which coal-fired power generation reached 1.06 billion kW, up 3.2%, and gas-fired power 95.31 million kW, up 6.4%. Nuclear power reached 48.77 million kW, up 3.8%, wind power 220 million kW, up 12.2%, and solar power 220 million kW, up 17.0%. From

January to August, major power generation enterprises in China invested CNY255.5 billion in power projects, up 47.4% year-on-year, of which investment in clean energy accounted for 92.7%: by category, hydropower reached CNY55.2 billion, up 15.7%, thermal power reached CNY26.7 billion, down 33.2%, and nuclear power reached CNY20.2 billion, down 4.9%, while wind power reached CNY132.9 billion, up 145.4%.

Figure 3.10 Output of Thermal Power Generation During the Pandemic (100 Million kWh)



Source: National Bureau of Statistics 2021.2 <https://data.stats.gov.cn/english/easyquery.htm?cn=B01> (accessed 13 September 2021).

In general, thanks to the government’s policy efforts to stabilise growth, China’s economy has achieved a V-shaped rebound, with GDP growth of -6.8% in the first quarter, 3.2% in the second quarter, 4.9% in the third quarter, and 6.1% in the fourth quarter. According to the Statistical Communique of the People’s Republic of China on 2020 National Economic and Social Development issued by the National Bureau of Statistics on 28 February 2021, the annual GDP of the People’s Republic of China reached CNY10.1598 trillion, an increase of 2.3% over the previous year, the only economy with positive growth. The forecasts of the International Monetary Fund (IMF), the World Bank, and the Organisation for Economic Co-operation and Development for China’s GDP growth in 2021 are 8.2%, 6.9%, and 6.8% respectively, showing global confidence in China’s economic recovery. But at the same time, it needs to be noted that some indicators about China are still weak, and the impact of the pandemic needs time to be made up. Due to the huge impact of the

pandemic on the world economy, external risks and challenges facing China are significantly increasing, and China’s economic recovery is still under pressure.

3. China’s Stimulus Packages

Due to proactive and effective preventive measures, China’s economy has been able to get back on track in the short term. Thus, China’s current stimulus plan was not as drastic as the one implemented in the 2008 financial crisis. In response to the pandemic, China increased its policy stimulus by looking at the specific pandemic situation and economic situation step by step. At the meeting of the Political Bureau of the CPC Central Committee held on 17 April 2020, the ‘six guarantees’ were put forward for the first time, namely, to ensure people’s employment, basic livelihood, market entities, food and energy security, stability of industrial and supply chains, and the construction of grassroots.

Based on the policies already introduced, China’s stimulus plan has three main aspects: the first is the policy of rescuing the corporate sector, including reducing taxes and fees, and supporting the corporate rescue; the second is direct

assistance to the household sector, including cash vouchers and cash handouts, including tax cuts; and the third is to stimulate growth and domestic demand, such as speeding up the issuance of special local bonds to promote infrastructure construction.

In the Government Work Report 2020, the central government deficit broke 3% for the first time, and increased from 2.8% in 2019 to 3.6% of GDP in 2020, with expectations to be CNY3.76 trillion. The quota of special bonds issued by local governments will be expanded to CNY3.75 trillion, of which CNY600 billion will be allocated from the central government budget to support the development of new infrastructure and the new economy. A total of CNY1 trillion of special national debt will be issued to combat the pandemic. China continued to cut taxes and fees, reducing burdens by a total of CNY2.5 trillion.

To support local economies, the central government's transfer payments reached CNY8.4 trillion, an increase of 13% over 2019:

- CNY3.3 trillion transfer to local governments for education, old-age pension, medical insurance, basic public services, and other areas where the central and local governments share fiscal responsibility;
- Additional CNY3.7 trillion transfer to local governments in areas with severe economic difficulties;
- CNY0.8 trillion used to support government investment; and
- CNY0.6 trillion used for the one-time transfer payment plan to ensure people's basic living standards.

In general, the impact of the pandemic on China's economy is temporary and will not change its long-term fundamentals. Through a series of policy hedgings, the impact of the pandemic on the economy can be minimised.

To the end of the year, data from the Ministry of Finance show that expenditure in China's general public budget in 2020 will reach CNY24.59 trillion, an increase of CNY671.4 billion over 2019, of which central government expenditure will reach CNY3.51 trillion and local fiscal expenditure will reach CNY21.05 trillion. The expenditure in the general public budget mainly includes education, social security and employment, agriculture, forestry and water conservancy, urban and rural communities and health care. In 2020, China spent CNY3.63 trillion on education, CNY3.26 trillion on social security and employment, and CNY2.39 trillion on agriculture, forestry and water conservancy, along with CNY0.631 trillion on energy conservation and environmental protection (see Table 3.1).

4. China's Green Recovery Packages

China has continued to focus on green initiatives while tackling the pandemic. The Ministry of Ecology and Environment (MEE) has adopted economic and market measures to promote the adjustment and optimisation of industrial, energy, transport, and land use structures. It has also introduced a series of green measures, including carbon pricing, clean energy subsidies, and targets for new energy vehicles penetration.

Table 3.1 Major Expenditures of China's General Public Budget in 2020

Major expenditures	Amount (trillion)	Changes
Education	3.633	↑ 4.4%
Social security and employment	3.258	↑ 10.9%
Agriculture, forestry, and water conservancy	2.390	↑ 4.4%
Urban and rural communities	1.991	↓ 20%
Health care	1.920	↑ 15.2%
Transportation	1.219	↑ 3.2%
Debt servicing	0.982	↑ 16.4%
Science and technology	0.900	↓ 4.9%
Energy conservation and environmental protection	0.631	↓ 14.1%
Culture, tourism, sports, and media	0.423	↑ 3.6%

Source: Ministry of Finance of the People's Republic of China, 2021.

Climate goals and policy framework

Over the past few years, 'green development' and 'ecological civilisation' have become an indispensable part of China's development vision (Chai et al., 2018). The concept of 'green development' should also be fully taken into account as China strives to complete the building of a moderately prosperous society by 2020. The Chinese government announced four principal climate goals before the pandemic:

- to achieve peak carbon dioxide emissions around 2030, making best efforts to peak early;
- to lower carbon dioxide emissions per unit of GDP by 60%–65% from the 2005 level by 2030;

- to increase the share of non-fossil fuels in primary energy to around 20% by 2030; and
- to increase the forest stock volume by around 4.5 billion cubic meters from 2005 levels by 2030.

These goals were highlighted in the Intended Nationally Determined Contribution that China submitted to the United Nations Framework Convention on Climate Change in June 2015, as well as in other official documents. All these goals are implemented through a policy infrastructure that includes Five-Year Plans, guidance documents and regulations issued by relevant ministries, and financial support provided through diverse channels (Table 3. 2) (Zouji et al., 2016).

Table 3.2 China's Policy Framework in Addressing Climate Change

Policy development	<ul style="list-style-type: none"> - Implementing proactive national strategies on climate change, including strengthening laws and developing long-term strategies and roadmaps for low-carbon development - Improving regional strategies on climate change, including control of emissions and carbon intensity at the urban development zone level - Innovating a low-carbon development growth pattern through low-carbon pilots in provinces and cities - Promoting international cooperation on climate change, such as by actively engaging in international cooperation and establishing a Fund for South-South Cooperation on Climate Change
Energy system changes	<ul style="list-style-type: none"> - Building a low-carbon energy system, including the shift away from coal and the development of renewables and nuclear power
Support for science and technology	<ul style="list-style-type: none"> - Building an energy-efficient and low-carbon industrial system, including the promotion of low-carbon industries, control of industrial emissions and the promotion of recycling systems - Enhancing support for science and technology, including strengthening research and development on low-carbon technologies - Improving statistical and accounting systems for GHG emissions, including regular GHG inventories at national and provincial levels
Sectoral plans	<ul style="list-style-type: none"> - Controlling emissions from the building and transportation sectors, through low-carbon urbanisation planning and optimised green transportation systems - Increasing carbon sinks in forests, wetlands, and grasslands - Enhancing overall climate resilience, through infrastructure development and improved assessment and risk management of climate change
Incentives and behaviour	<ul style="list-style-type: none"> - Increasing financial and policy support, such as funds, financing mechanisms, preferential taxation policies, green government procurement systems and green credit mechanisms - Promoting carbon emissions trading markets, building on emissions-trading pilots - Promoting a low-carbon way of life, by supporting low-carbon choices in daily life - Increasing broad participation of stakeholders, in order to increase public- and private sector awareness of low-carbon development

GHG = greenhouse gas.

Source: Authors, based on National Development and Reform Commission's reports, <https://en.ndrc.gov.cn/policies/> (accessed 13 September 2021).

To accelerate the green low-carbon development, and promote China's carbon dioxide emissions to peak around 2030, in October 2016, the State Council issued a Work Plan to Reduce Greenhouse Gas Emissions during the 13th Five-Year Plan period. Eight key areas have been identified for the control of greenhouse gas (GHG) emissions, and detailed arrangements have been made for key work, policies, and measures in each area (Table 3.3).

The work plan clearly requires all provinces to incorporate carbon dioxide reduction into their economic

and social development plans, annual plans and government work reports and formulate specific work plans. As of June 2018, all 31 provinces have issued relevant plans or plans for controlling GHG emissions. In order to strengthen target responsibility, China formulated accountability assessment measures for provincial governments to control GHG emissions. From 2018 to 2020, the annual assessment shall be completed before the end of July each year. The final assessment of the 13th Five-Year Plan shall be completed by the end of June 2021.

Table 3.3 Eight Key Areas to Control Greenhouse Gas Emissions During The 13th Five-Year Plan Period

Promote low-carbon transformation of the energy system through the energy revolution	<ul style="list-style-type: none"> - In 2020, total energy consumption control was within 5 billion tonnes of standard coal, coal control was around 4.2 billion tonnes, natural gas consumption ratio reached 10%, the per unit GDP energy consumption fell by 15% compared to 2015, and the proportion of non-fossil energy reached 15. - Per unit of CO₂ emission of large power generation enterprises was within 550 grams of CO₂ per kWh.
Building low-carbon industries to promote low-carbon transformation.	<ul style="list-style-type: none"> - In 2020, the proportion of service industry and strategic emerging industry in GDP reached 56% and 15%, respectively. - Unit value added of industry CO₂ emissions in 2020 dropped 22% compared to 2015; farmland nitrous oxide emissions to peak around the year 2020 and part of the heavy chemical industry to reach peak quantitative targets, etc. - To carry out pilot demonstration projects for carbon capture, utilisation, and storage, as well as carbon sequestration projects in forests, grasslands, wetlands, oceans, and other ecosystems - To put forward more detailed emission reduction requirements for other GHGs, including hydrofluorocarbons.
Creating low-carbon urbanisation to drive consumption transformation	<ul style="list-style-type: none"> - The plan puts forward specific tasks from aspects of urban and rural construction and management, transportation system construction, waste disposal, and low-carbon lifestyles. - The plan puts forward tasks and requirements for implementing the low-carbon concept and exploring an intensive, intelligent, green, and low-carbon new urbanisation model.
Promote low-carbon development fulling considering regional differences	<ul style="list-style-type: none"> - To reflect the characteristics of differentiated policies, the Plan puts forward different GHG emission control requirements for different regions. - It encourages some regions to set peak targets and carry out total emissions control work. - It identifies pilot projects as an effective means of exploring regional low-carbon development models.
To build a national carbon market	<ul style="list-style-type: none"> - First, establish a national carbon emission trading system, establish a national and local management system, and implement the carbon emission quota and control system; - Second, allocate emission allowances to key enterprises, improve trading institutions, rules, and varieties, and establish a market regulation and offset mechanism, as well as a risk prevention mechanism; - Third, strengthen capacity building for basic support, build a national carbon emission trading registration system, a disaster preparedness system, and a GHG emissions accounting, reporting, and verification system.
Increase investment in science and technology to promote low-carbon innovation	<p>The plan emphasises the support for low-carbon technology research and development, demonstration, and application, including:</p> <ul style="list-style-type: none"> - encouraging use of funds to speed up the government and market to promote low-carbon technology progress and industrialisation; - regularly updating low-carbon technology popularisation directory and promotion listing; and - strengthening low-carbon technology centralised demonstration applications.
Strengthen capacity building and consolidate relevant infrastructure	<ul style="list-style-type: none"> - The plan calls for efforts to improve the system of laws, regulations, and standards for addressing climate change, including formulation of a climate change law and the improvement of standards, labelling and certification systems for low-carbon products. - It requires strengthening the GHG emissions accounting and statistics, improving measurements and monitoring.
Deepening international cooperation and climate governance	<p>Relevant requirements on the follow-up negotiation and implementation of the Paris Agreement and international cooperation on climate change have been put forward to deepen China's climate diplomacy.</p>

GDP = gross domestic product; GHG = greenhouse gas.

Source: Author based on Work Plan to Reduce Greenhouse Gas Emission during the 13th Five-Year Plan Period, http://www.gov.cn/zhengce/content/2016-11/04/content_5128619.htm (accessed 13 September 2010).

In general, during the 13th Five-Year Plan period, China adhered to supply-side reform and eliminated much inefficient production capacity (Gallagher et al., 2019). As of the end of 2019, China's carbon intensity has been reduced by about 48.1% compared with 2005, and non-fossil energy accounted for 15.3% of primary energy consumption, fulfilling China's commitments by 2020 ahead of schedule. The energy consumption per unit of industrial added value has dropped by more than 15% in 2019 compared with 2015, which is equivalent to saving 480 million tonnes of standard coal, and saving energy costs of about CNY400 billion. Green buildings account for about 60% of newly built civil buildings in cities and towns. In terms of transportation, the government guides the popularisation of new energy vehicles through the dual driving of double integral policy and new-energy automobile industry policies. In terms of architecture, China has issued green building evaluation standards and logo certification. In terms of agriculture and land use, China has seen the largest net increase in forest area in the past decade.

National low-carbon pilots

The launch of the national low-carbon pilots is a major recent Chinese measure to address climate change and promote low-carbon urbanisation. China has carried out low-carbon provincial, municipal, community, park, community, and other multi-level and all-round low-carbon pilot demonstrations. The pilot provinces and cities have accelerated the transformation of low-carbon technologies to upgrade traditional industries, actively promote low-carbon development in key areas such as industry, energy, construction

and transportation, and build a modern industrial system featuring low emissions on the basis of major projects.

- By October 2017, 73 low-carbon pilot provinces and cities had set their carbon emission peak targets in different ways. Amongst them, 37 pilot provinces and cities put forward preliminary targets to achieve peak carbon emissions around 2020 or 2025, respectively. Of these cities, 21 formed an Alliance of Peaking Pioneer Cities to peak energy-related CO₂ emissions before 2030.
- A total of 29 pilot provinces and cities have set up special funds for low-carbon development, providing financial support for research and low-carbon technologies, construction of low-carbon projects and demonstration of low-carbon industries.
- All have carried out regional GHG inventories. Of these, 10 have established the GHG emission statistical accounting system for key enterprises, and 17 cities built carbon emission data management platforms, so as to grasp the timely carbon emission status of districts, counties, key industries, and key enterprises.

Fourteen pilot provinces and cities have identified and certified low-carbon products to promote. In addition, some pilot provinces and cities have established low-carbon research institutes, expert committees, promotion associations, etc.

The construction of near-zero carbon emission zone demonstration projects is another important national task for controlling GHG emissions. It is also an important starting point for deepening trials in low-carbon provinces and actively exploring a near-zero carbon emission development model. Progress has been made in some

local areas (Table 3.4), although a series of outstanding problems still exist, such as inadequate conceptual understanding, inconsistent construction standards and imperfect supporting measures, from the perspective of local construction practices (Liu, 2018).

Table 3.4 Progress Made by Some Near-Zero Carbon Emission Zones

	Characteristics and Progress
Guangdong province	<ul style="list-style-type: none"> - Priority has been given to six areas, not only including cities and towns, new areas and industrial parks proposed by the state, but also include industries, communities and enterprises and public institutions. - Specific targets corresponding to the three major time nodes of 2018, 2020, and 2025 were clearly set.
Zhejiang province	<p>From the second batch of provincial low-carbon pilot projects to carry out near-zero carbon emission demonstration construction, which include:</p> <ul style="list-style-type: none"> - six zero carbon emission pilot cities and towns; - four near-zero carbon emission communities; and - one New Energy near-zero carbon emission park. <p>Four near-zero carbon emission transportation enterprise pilot projects</p> <p>Ningbo city has launched a series of demonstration projects, including a zero-carbon industrial cluster, a zero-carbon port and logistics system, distributed power generation market trading, the utilisation of LNG cold energy, zero-carbon public buildings, and the promotion of electric vehicles.</p>
Beijing	<ul style="list-style-type: none"> - Priority to renewable energy and conventional energy systems security. - Building green low-carbon heating system in the key administrative areas, promoting the application of solar energy and the building integration, to achieve the intelligent coupling operation of the new energy, renewable energy, and the conventional energy system. - By 2020, the proportion of new energy and renewable energy utilisation in the sub-central administrative and office areas will reach over 40%.
Hainan province	<ul style="list-style-type: none"> - Haikou city has decided to set up Jiangdong New Area on the east coast, focusing on building a zero-carbon new city. - Through the zero-carbon industry platform and facility environment, to build 'zero-carbon traffic', 'zero-carbon building', 'zero-carbon energy', 'zero-carbon family'.
Shaanxi province	<p>Pilot demonstration will be carried out mainly in industrial and mining areas, agricultural parks and civil buildings, according to the characteristics of the three different regions.</p> <ul style="list-style-type: none"> - Renewable energy will be used to replace fossil energy in industrial and mining areas, and carbon capture, utilisation, storage, and emission reduction technologies will be implemented. - The pilot production facilities in the agricultural park will realise all renewable energy power supply and heating, green energy for daily use, etc. - In the field of civil building, the roof and south facade of the building will be equipped with solar photovoltaic system, mining and distributed grid connection mode, so as to achieve spontaneous and self-use of electricity, waste heat and gas heating of nearby industrial and mining enterprises.

LNG = liquefied natural gas.

Source: Author based on official websites of Chinese Ministries.

Renewable energy

Renewable energy and electric mobility are amongst the most effective tools in the fight against climate change.

In order to speed up the construction of safe, efficient, clean low-carbon energy systems and promote the renewable energy development, in May 2019, the National Development and Reform Commission (NDRC) and National Energy Administration (NEA) jointly issued the 'Notice on Establishing Guarantee Mechanism' for renewable energy power consumption to set the responsibility for each province, and conduct comprehensive monitoring, evaluation, and formal assessment from 2020.

According to the latest report issued by NEA in the end of 2019, 10 provinces' weight of the minimum gross consumption liability are more than 30%, with nine more than 15%. The allowable weight of the eastern and central provinces is better than others. At the same time, the five national clean energy demonstration provinces, namely Zhejiang, Sichuan, Ningxia, Gansu and Qinghai, have appropriately raised the allowable weight, so as to better play a leading and exemplary role. It is estimated that the proportion of renewable energy power consumption will reach 28.2% and the proportion of non-hydropower consumption will reach 10.8% in 2020, an increase of 0.3 and 0.7 percentage points, respectively, over 2019.

In February 2020, the Ministry of Finance, NDRC and NEA jointly issued the 'Opinions on Promoting the Healthy Development of Non-aqueous Renewable Energy Power Generation', and confirmed that, starting from 2020, new offshore wind power and solar thermal projects

will no longer be included in the scope of central financial subsidies, and local governments can provide support in accordance with actual conditions. According to the fund collection situation and electricity consumption growth and other factors, it is estimated that the additional subsidy amount will be CNY5 billion in 2020, which can be used to support new wind, photovoltaic, and biomass power generation projects. NDRC and NEA will further clarify the categories of subsidies that can be granted to renewable energy power generation in 2020, and introduce specific management measures accordingly to ensure total subsidies for new projects less than CNY5 billion.

In July, 2020, the Ministry of Finance issued another import 'Notice on Issuing the Additional Subsidy Budget for Renewable Energy Electricity Price in 2020', clarifying that the total national renewable energy subsidy budget for 2020 will be approximately CNY92.4 billion, a year-on-year increase of 7%. Of this, about CNY90.6 billion has been issued previously, and about CNY1.7 billion will be issued currently, accounting for about 18% of the total subsidy budget in 2020. State Grid has received about CNY77.1 billion, accounting for about 83%; China Southern Power Grid has received about CNY6.6 billion, accounting for about 7%; and local power grids have received about CNY8.7 billion, accounting for about 9%. For the distribution of different types of power generation projects: wind power projects received about CNY39.6 billion, accounting for about 43%; photovoltaic projects received about CNY47.3 billion, accounting for about 51%; biomass projects received about CNY5.5 billion, accounting for about 6%.

In November 2020, the Ministry of Finance issued the 'Budget Notice on Additional Subsidy Funds for Renewable Energy Electricity Prices in 2021'. According to the notice, electricity price subsidies for renewable energy will total CNY5.954 billion in 2021. On November 9th, the NEA's Comprehensive Department issued the 'Notice on the Work Concerning the Interconnection of New Energy Power Generation Projects in 2020', requiring the State Grid, China Southern Power Grid and Inner Mongolia Power Grid to ensure the interconnection on schedule for the new energy power generation projects that meet the conditions of grid connection. There is also action in the provinces. For example, on November 18, the Beijing Development and Reform Commission, together with three ministries and commissions, supported six major solar engineering projects, including the renovation and integrated application of photovoltaic power generation buildings.

These policies will increase the proportion of photovoltaic power generation in the application of urban renewable energy and promote the green development of energy. With the continuous promotion of the policy, it is a good time for developing renewable energy.

New energy vehicles

Since 2017, the Chinese government has implemented various policies to foster the renewable energy industry. In 2018, the NEA took pains to rectify the chaos in the new energy automobile industry. It established a 'retreat, adjustment, and withdrawal' mechanism to allow the subsidies policy to gradually withdraw from 2018 to 2020. The subsidy policy was originally scheduled to expire at the end of 2020. To smooth

the intensity and pace of subsidy decline, on April, 2020, Chinese authorities jointly issued the 'Notice on Improving the Promotion and Application of New Energy Vehicles' financial subsidy policy, specifying that the new energy vehicle subsidy policy will be extended to the end of 2022.

This new notice optimises and adjusts the subsidy policy using multi-dimensional aspects, i.e. extending the period to 2022, optimising the technical indicators, setting the ceiling and threshold, etc. In terms of the new policy, the subsidy standards for 2020/21/22 will decline 10%/20%/30% on the basis of the previous year, and in the public transportation sector the decline will be 0%/10%/20%. Further, in order to support the development of the new energy automobile industry and promote automobile consumption, from January 2021 to December 2022, new energy automobiles purchased will be exempted from vehicle purchase tax.

Fuel cells are also supported by the policy. Fuel cell vehicles are expected to play a role as important as electric cars in China's new energy vehicle blueprint. China has set a goal to have 5,000 such vehicles on its roads by 2020, 50,000 by 2025, and 1 million by 2030. As of the end of 2019, China has promoted more than 6,500 fuel cell vehicles and 50 operating hydrogen stations, and still has around 130 hydrogen stations under construction. However, the fuel cell vehicles face two key problems: lack of core technology and key components, and insufficient infrastructure. Considering current technological progress for a driving range of 500 km, fuel cell vehicles will be more expensive than electric cars by 2025. Therefore, China selected some cities to focus on the core technology

of fuel cell vehicle key components and carry out fuel cell industrialisation demonstrations. The demonstration period is 4 years, and the model cities will be given a reward for compensation.

Carbon pricing

China's pilot carbon market started trading in 2013. The Chinese government launched its development plan for a national emissions trading system in late 2017. According to the deployment of the Plan, 2018 is the infrastructure construction period, which will mainly carry out the infrastructure construction of the carbon market, including the establishment of a sound institutional system, construction of basic support systems, and capacity building. 2019 is the simulated operation period, and the power generation industry quota simulation trading is mainly carried out. Currently, China's pilot carbon market has grown into the world's second-largest in terms of quota trading volume. As of the end of August 2020, the cumulative trading volume of the seven pilot carbon markets was 406 million tonnes, with a cumulative trading volume of approximately CNY9.28 billion. According to the average transaction price of the seven pilot carbon markets in 2019, Beijing carbon market has the highest transaction price, which is about CNY80/tonne. Shanghai is second only to Beijing, which is about CNY40/tonne. The average transaction price of Hubei carbon market is about CNY30/tonne. The total volume of transactions and the average price of transactions improved. The emissions trading system is expected to become the most important policy instrument to motivate companies to reduce GHG emissions in the coming decade.

Green finance

At the national level, the pace of building a green financial system has been accelerated, including the establishment of a unified standard, the promotion of green financial reform and innovation pilot zone pilot experience, and active support for the development of the green bond market (Table 3.4).

By the end of the first quarter of 2020, the balance of green loans in the pilot green financial reform zones was nearly CNY200 billion, accounting for 13.2% of the total loans in the pilot zones and 3.2 percentage points higher than the national average. The outstanding balance of green bonds was CNY57.5 billion, up 115% year on year. The total number of green projects in the pilot zone exceeded 2,000, and the cumulative investment in green projects exceeded CNY1.67 trillion.

Green loans

In July 2020, the Central Bank of China issued a 'Notice on the Issuance of the Green Finance Performance Evaluation Plan for Deposit-Related Financial Institutions in the Banking Sector'. The Plan is an amendment to the July 2018 version. It expands the coverage of assessment, gives overall consideration to the development of green loans and green bonds, and leaves room for further assessment of new forms of business such as green equity investment and green trusts. The performance evaluation indicators of green finance include quantitative and qualitative indicators, of which the weight of quantitative indicators is 80% and that of qualitative indicators is 20%. The quantitative indicators include the balance proportion of green finance business, the balance share

of green finance business, the year-on-year growth rate of the balance of green finance business, and the proportion of the risk balance of green finance business.

Green bonds

From 2016 to 2019, Chinese financial institutions and companies raised US\$24.36 billion by issuing green bonds in overseas markets. In the first half of 2020, 101 domestic green bonds were issued, with an issuance scale of CNY108.2 billion, a year-on-year increase of 20.24%. The number and scale of green corporate bonds continued to lead the way, accounting for 43.56% and 32.12%, respectively. In May 2020, the People's Bank of China and NDRC proposed merging China's green bond standards and removing 'fossil-fuel-related projects' from the list of projects available to raise funds from green bonds.

Green Development Fund

The establishment of the National Green Development Fund is a part of improving the economic policy system for ecological and environmental protection (Table 3.4). It is China's first dedicated environmental fund, approved by the State Council, and jointly established by the Ministry of Finance, Ministry of Ecological Environment, and Shanghai City, with registered capital of CNY88.5 billion. In July, 2020, China's MEE officially launched the national green development fund.

The main objectives of the Fund are to implement the national decisions and plans, increase government trust and transfer profits, guide non-governmental funds to invest in key areas, solve financing difficulties,

support industrial development, and promote the accelerated development of ecological civilisation. The fund will adopt a variety of investment methods such as project investment, equity investment, equity participation or establishment of sub-funds.

As noted, the fund has already raised CNY88 billion (US\$12.59 billion) in its first phase, which will focus on environmental protection and pollution prevention along the Yangtze River Economic belt, implement major national strategies such as promoting the development of the Yangtze River Economic Belt, and pay attention to key areas of green industry development.

Environmental information disclosure

In recent years, listed companies have made great progress in the disclosure of key pollutant-discharging units. According to data from Shanghai Securities News Co., 58 A-share listed companies have publicly disclosed information about environmental penalties since 2019. Air pollution and water pollution are the 'worst-hit areas' due to the fact that steel, coal, chemical, and other industries with major pollution sources are the focus of supervision and have stricter environmental information disclosure requirements. Currently, MEE and the China Securities Regulatory Commission are taking the lead in drafting mandatory disclosure requirements for listed companies and issuers of debt, which are expected to be released by the end of this year. On 28 June 2020, the Shenzhen Special Economic Zone Green Financial Development Regulation (draft) was adopted, which emphasises the need to strengthen the system construction of information disclosure and standardise the content and manner of information disclosure (Table 3.5).

Table 3.5 Main Green Finance Policies Issued Since 2019

Time	Issuing authority	Contents
March 2019	NDRC	Green Industry Guidance Directory (2019 edition)
March 2019	Ministry of Justice, NDRC	jointly issued 'Opinions on Accelerating the Establishment of Green Production and Consumption Regulations and Policy System'
November 2019	NDRC	Overall Plan for Green Living Initiative
May 2019	PBC	Notice of the People's Bank of China on Supporting the Green Finance Reform and Innovation Pilot Zone to Issue green Debt Financing Instruments
March 2020	General Offices of the Central Committee and the State Council	issued the Guidance on Building a Modern Environmental Governance System, which included strict implementation of the Environmental Protection Tax Law in the environmental governance system.
April 2020	Ministry of Finance, Ministry of Industry and Information Technology, Ministry of Science and Technology, NDRC	Notice on Improving the Fiscal Subsidy Policy for the Promotion and Application of New Energy Vehicles, which explicitly extends the implementation period of the fiscal subsidy policy for new energy vehicles to the end of 2022.
June 2020	The Shenzhen Municipal People's Congress	Notice on Shenzhen Special Economic Zone Green Financial Development Regulation (draft). It is the first local green finance legislation in China.
July 2020	the Ministry of Finance, MEE and the City of Shanghai	jointly launched the National Green Development Fund
July 2020	PBC, NDRC, and China Securities Regulatory Commission	Notice on issuance of directory of projects supported by green bonds (2020 edition) for public comment. The coal-related projects will be excluded from directory for the first time
July 2020	PBC	Notice on the Green Finance Performance Evaluation Plan for Deposit Financial Institutions in the banking industry (Draft for Comments)
September 2020	NDRC	Notice on Organizing the Construction of Green Industry Demonstration Base
September 2020		The Guangdong-Hong Kong-Macao Greater Bay Area Green Finance Alliance was jointly established by Guangzhou, Shenzhen, Hong Kong, and Macao
September 2020		Bank of China issued the first blue bond in the world. On October 30, Industrial Bank Hong Kong Branch successfully issued a three-year US dollar fixed interest rate blue bond in the international capital market.
October 2020	MEE, NDRC, PBC, the Banking and Insurance Regulatory Commission and the China Securities Regulatory Commission	jointly issued a guideline on promoting investment and financing in addressing climate change.
Until the end of 2020		the number of Chinese banks adopting the Equator Principle has expanded to six, with the join of Chongqing Rural Commercial Bank, the Mianyang Commercial Bank and the Bank of Guizhou
On 1 March 2021	PBC Shenzhen Central Branch	China's first green finance laws and regulations, as well as the world's first comprehensive bill to regulate green finance -- 'Shenzhen Special Economic Zone Green Finance Regulations' was formally implemented

MEE = Ministry of Ecology and the Environment, NDRC = National Development and Reform Commission, PBC = People's Bank of China.

Source: Author based on official websites of Chinese Ministries.

5. New Ambitious Climate Commitment and Potential Impact

In the speech to the UN General Assembly on 22 September 2020, President Xi Jinping announced that China will scale up its Nationally Determined Contribution to tackling climate change by adopting more vigorous policies and measures in an effort to peak carbon dioxide emissions before 2030 and reach carbon neutrality before 2060. The announcement is amongst the most significant signs of progress concerning countries' efforts to mitigate climate change since agreeing to the Paris Agreement in 2015. To achieve the targets, top policymakers should take more targeted approaches when drafting the 14th Five-Year Plan. Five sectors – energy, transport, industry, construction, agriculture, and land use – need to work together to make a low-carbon transition under the guidance of the carbon neutrality target. From the perspective of a realisation path, the following green stimulus packages needed:

The first kind of green stimulus measures should focus on the further optimisation of China's energy structure and promote key technologies independent of fossil fuels, including:

Reasonable control of the scale of coal-fired power plants and means for decommissioning them. At present, China's power generation and industrial energy use are dominated by coal, and the two-carbon emissions account for 44% and 20% respectively. China's industrial emissions peaked in 2012, and emissions from the electricity and heat production and transportation sectors are still increasing. In order to achieve the goal

of carbon neutrality, it is necessary to reasonably control the total scale of coal-fired power plants and promote the peak power generation of coal-fired power plants as soon as possible. Most of China's coal-fired power plants were built before 2015. Based on the 30-year life expectancy, they are expected to be decommissioned before 2045. This requires the replacement of about 1 billion kW of coal-fired units with different zero-carbon technologies in the next 20 years.

Optimise the pattern of natural gas supply. Given that the proportion of natural gas in the primary energy consumption structure in 2030 is increased to 15%, China's natural gas consumption in 2030 may be twice that in 2019. In the short to medium term, China must strengthen the diversification of natural gas sources, and at the same time, reduce the intensity of natural gas emissions through vigorous development of carbon capture and storage technology.

Photovoltaic power generation should play a leading role in achieving China's carbon neutrality goal. Compared with other renewable energy sources, photovoltaic power generation is cheaper and easier to achieve. In the past 10 years, the cost of photovoltaic power generation in China has dropped by 90%. The price of module silicon wafers in China has dropped from CNY100 to about CNY2 in 10 years (according to the original specifications), making the cost of photovoltaic power generation as low as 'a dime per kilowatt-hour.'

- There is also much to be done to adjust the energy structure through consumer stimulation. For example, the green industry can be promoted through the repurchase

of old home appliances and the consumption encouragement of energy-efficient home appliances. The United Nations Environment Program pointed out in the COVID-19 response report recently released that countries should consider promoting sustainable consumption and production in their intervention measures against the impact of the pandemic.

The second category of green stimulus measures focuses on further electrification and low-carbonisation of the transportation industry:

- The renewable energy and new energy vehicle industries will see an accelerated shift in investment activities.
- Renewable energy enterprises have more opportunities to expand their business overseas given its advantages in renewable energy production, as well attracting overseas consumers with lower prices.
- Measures to continue this momentum through the consumer side can also include: similar to the consumption of home appliances, encouraging the consumption of new energy vehicles by buying back old fuel vehicles, supporting residents to scrap old, high-emission vehicles, and supporting the replacement of new energy vehicles.

The third category of green stimulus measures should promote the development of key technologies (such as renewable and nuclear power generation and new energy vehicles), and combine emerging technologies such as energy storage, hydrogen energy, and fuel cells:

- It is expected that during the 14th Five-Year Plan period, the newly installed capacity of wind power and solar power will exceed 100 million kW. A power system with a high proportion of renewable energy needs the support of long-term energy storage technology.
- To reduce emissions from the transportation sector, it is necessary to accelerate the deployment of new energy vehicles and hydrogen fuel cell vehicles, and actively promote the progress of biofuels, hydrogen, electrification, and other technological routes in the aviation and maritime fields.
- China can consider increasing investment in transportation electrification, rather than continuing to increase investment in the oil and gas industry. By developing electric vehicles and promoting the electrification of trucks, China will reduce China's dependence on oil and gas imports. Since the cost of electrification of transportation is much lower than the development cost of upstream oil and gas production, this will be a more stable approach in the long run.

The fourth category of green stimulus measures should focus on proactive guidance and support measures, like green finance, carbon market, capacity building, etc.:

- Supporting investments in such industries as green buildings, clean transportation, and renewable energy. In the estimation of Boston Consulting Group (Chen et al., 2020), to achieve the carbon neutral goal, China needs a cumulative investment of CNY90–100 trillion between 2020 and

2050, accounting for about 2% of the total cumulative GDP over the 30-year period. The central bank can provide a favourable liquidity environment for bond issuance.

- Carbon pricing could be a key driver of efforts to accelerate energy conservation and emissions reduction. It is expected that the national carbon market will complete the first transaction in the power generation industry from 2020 to 2021, include 80% of key emission units, and gradually introduce national certified voluntary emission reductions. It may expand to other industries whose mid-year comprehensive energy consumption reaches 10,000 tonnes of standard coal, such as petroleum processing and coking industry, chemical raw material and chemical product manufacturing, non-metallic mineral products industry, paper and paper products, and civil aviation, etc. The GHG category includes not only the direct carbon emissions from fossil fuel combustion, but also the indirect carbon emissions caused by the use of electricity and heat. During this period, the national carbon market will also explore the trading of allowance derivatives and paid allocation of allowances.
- In the long run, providing workers with skills upgrades creates a higher-skilled workforce and helps a country gain a competitive edge in some advantageous projects. Well-trained workers have a spillover effect on the whole chain of economic production and have a positive impact on the economy.

In general, China's climate actions and commitments during the pandemic will give a strong boost to global confidence and determination in reducing greenhouse gas emissions. The pandemic has also provided an opportunity for China to speed up their transition into a more energy-friendly future. While considering the domestic and world situation, there are various challenges, such as a highly competitive domestic market, possible subsidy cuts, slowing global demand, the US-China trade war in the short run, and costly energy restructuring, Insufficient human capital reserve, financial gaps, technological hurdles, etc in the long term. Achieving decarbonisation by 2060 will require a significant and rapid shift from China's current economic structure and energy system, and need good top-level policy design and active climate action in the next 5 years.

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