Climate Target Setting in China's 14th Five-Year Plan

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Abstract

Climate Change is an unprecedented challenge for the global community. Progress on reducing greenhouse gas emissions in China is crucial as part of the global efforts for any meaningful response to climate change. Under the new circumstances, China’s 14th Five-Year Plan (2021-25) will set new targets to address climate change. This short article outlines China’s target-based approach, its role in climate governance, and its progress in implementing the nationally determined contributions (NDCs) under the Paris Agreement. It assesses China’s progress toward these long-term goals as well as the challenges and opportunities for China today and into the future. The article was delivered at a conference organized by the New Zealand Contemporary China Research Centre in Wellington, New Zealand, in November 2019.

Introduction

China's 14th Five-Year Plan (2021-2025) (FYP) is being drafted over 2019 and 2020. Climate change issues were first introduced to the FYP when climate change mitigation was included for the first time in the 12th FYP (2011-2015). Climate change featured extensively in the 13th FYP, emphasizing greening and the development of the environmental technology industry, ecological living, and ecological culture. In the upcoming FYP, climate change will be a key component of the plan's targets and actions once again. This short article overviews China's climate policies, actions, and challenges as well as its contributions and approach to address global climate change.

The article consists of six short sections. First, it outlines the experience of developed countries and identifies the historical loci of carbon emissions. Second, it discusses China's experience within the global pattern of carbon emissions. Third, it overviews China's commitments under UNFCCC - Nationally Determined Contributions (NDCs) and shows how these are integrated into China's national climate change policy. Fourth, it explores the potential and challenges of addressing climate change. Fifth, it sets out possible future targets to address climate change at the international, national, and regional levels. The article concludes with a short discussion and suggestions for the future.

The Experience of Developed Countries

To address climate change, we need clear targets or goals to be incorporated into the FYP. Under the Paris Agreement, China committed to peak its carbon emissions by around 2030 and endeavored to peak earlier. Experiences worldwide, particularly in developed economies, allow us to examine historical cases and determine what action is possible and to what extent.

In general, the emission peak is a natural process characterized by different factors. The earlier a country starts the process of industrialization, the longer it takes to reach the emission peak. For example, it took the United Kingdom nearly 200 years to peak its emissions in the early 1970s. As the Second Industrial Revolution representative, the US achieved its emission peak in 2005, using over 150 years. The later comers, such as Japan and Korea, used around 60 years, and China will peak in a shorter time.

Besides, in the early stage of industrialization, given the backward experiences and traditional dominance of fossil fuels in the energy mix, emissions increase in line with growth in energy demand. However, due to different geospatial constraints, population dynamics, and evolving energy as well as industrial structure, emissions peak successively in a varied pattern.

It is important to understand why the turning point starts. With the large territory space for physical expansion and relatively high rate of population growth, emissions in the US fluctuated at a high level and peaked in around 2005, lagging behind others. Europe and Japan represent another typical category, with limited or no physical space for economic expansion and population stabilization or decline. Since energy consumption and GHG emission are motivated by people's demand, geospatial constraints and decreasing population dynamics in the EU and Japan can explain their downward emission trend, but why does an economy such as the United States, which has ample space for development and a growing population, peak? The answer is a low-carbonizing energy structure and improving energy efficiency. As long as the rate of low carbonization exceeds the scale expansion rate, the decoupling of economic growth from carbon emissions becomes achievable. Even though President George W. Bush rejected the Kyoto Protocol and the Trump Administration has pulled out of the Paris Agreement, US emissions, both in aggregate and per capita terms, have been declining over that period. This trend is a clear and natural process regardless of US federal policy.

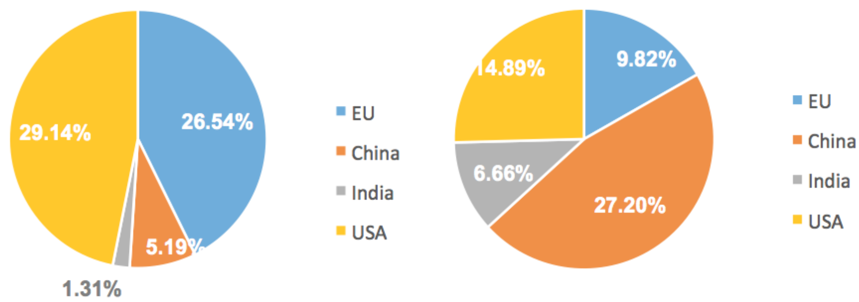
The low-carbon development orientation in the developed countries is also worth learning from. The Paris agreement is historically significant as it gives countries long-term targets and an aim to make net-zero emissions by or after 2050. The developed countries consider and transfer the targets as a long-term market signal and an immediate restriction. For example, European governments, such as the UK, France, Finland, and Germany, have already made it clear that around 2035, gasoline vehicles will no longer be on the market. Announcements like this will drive investors to avoid investing in gasoline automobile manufacturing and research in gasoline engines, so the long-term targets set in the Paris Agreement are promising.

National circumstances across countries differ substantially. In some countries, the economic structure is not heavily industrially oriented, while others are resource dominant. Some countries can make an earlier transition to a zero-carbon economy, whereas others may take more time. Some countries may not need to make big changes while others will. Many countries are reluctant to make the transition, as they are concerned about their quality of living and development. China has a per capita income of $8000, and people want to improve their quality of life. However, carbon is not necessary for the quality of life; rather, energy is. Understanding that and finding ways of getting energy without relying on carbon will be crucial for China's national strategy to lower emissions while improving the quality of life. China's energy consumption and emissions will go up along with the process of development, as was the experience of other countries, but it will not go up endlessly. It will peak and then decline as in other countries.

China's Experience within the Global Pattern of Carbon Emissions

As figure 1 shows, China is now the biggest carbon emitter and the largest energy consumer in the world, which is unsurprising because of economic growth and having the largest population. In 1990, when climate negotiations started, the developing world's emissions were negligible in both aggregate and per capita terms. We had divided the developed and developing countries clearly, and nearly 70% of emissions were from the developed (Annex 1) countries. Besides, the OECD countries club in 1971 accounted for over 70% of emissions, but this has fallen to less than a third today, showing a changing world pattern. Specifically, the 'big four emitters' are now the US, China, India, and the EU. In 1970, the US and the EU accounted for 30% and over 25% of global emissions, respectively, and China, as the world's most populous country, had only taken up 5%. Nowadays, the emitter landscape has changed completely. Accounting for nearly 30% of global emission, the circumstance of China is similar to that of the US 40 years ago, while US emissions are 15%, the EU is below 10%, and India's emission share has moved from less than 1% to 7%.

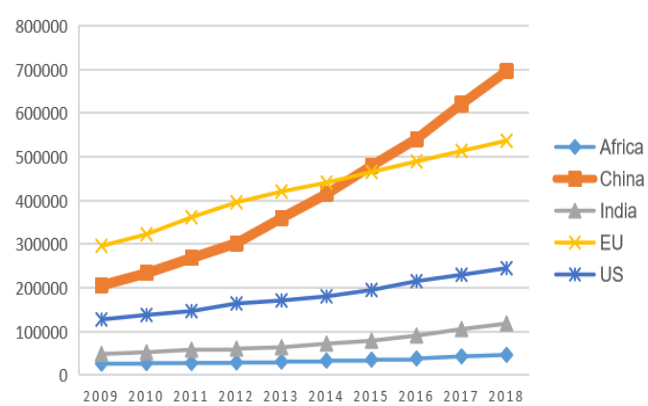
Figure 1: Global Share of the Four Major CO2 Emitters in 1970 and 2016

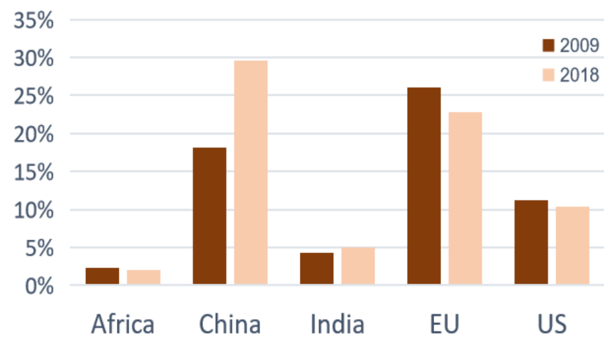


Source: IEA, Global Carbon Atlas, [www.globalcarbonatlas.org/en/CO$_2$-emissions](www.globalcarbonatlas.org/en/CO2-emissions)

Moreover, the developed countries had acquired advanced technology and development experience at the turn of the century. However, they did not take advantage of that to take the lead in climate change mitigation. The pace and speed of increasing renewable energy generation are much more extraordinary in developing countries. If one looks at total renewable energy capacity installed and renewable electricity generated, China was somewhat lower than the EU ten years ago and exceeds it now. Developed countries were expected to take the lead to demonstrate the potential of renewable energy, but in fact, developing counties are doing this and showing that renewable energy is feasible and will be the dominant energy service.

Figure 2: Renewable Energy Development in Selected Countries: total renewable energy CAP(capacity)(MW)





Source: Renewable Energy Statistics 2019, International Renewable Energy Agency.

In the past, since oil is crucial for automobiles and road transport, it had been viewed as an indispensable part of energy security. When we are approaching the 2020s, it is broadly recognized that heavy reliance on oil impacts a country's energy security. China is looking to address this with renewable energy. For example, over 1 million electric vehicles (EV) were produced and sold in 2018, and it can be expected to have over 2 million EVs on the road by 2020. This reduces dependence on oil and offers benefits to consumers. Moreover, the economics of EV make this attractive, as it is calculated that they cost less than 1 US cent per kilometre on a 100-kilometre drive whereas the cost of gasoline-powered cars is at least ten times higher than that. EV batteries, however, remain a problem. Driving ranges are improving with ranges of approximately 300 km, and recharging stations are now everywhere. EV is an excellent economic and environmental move.

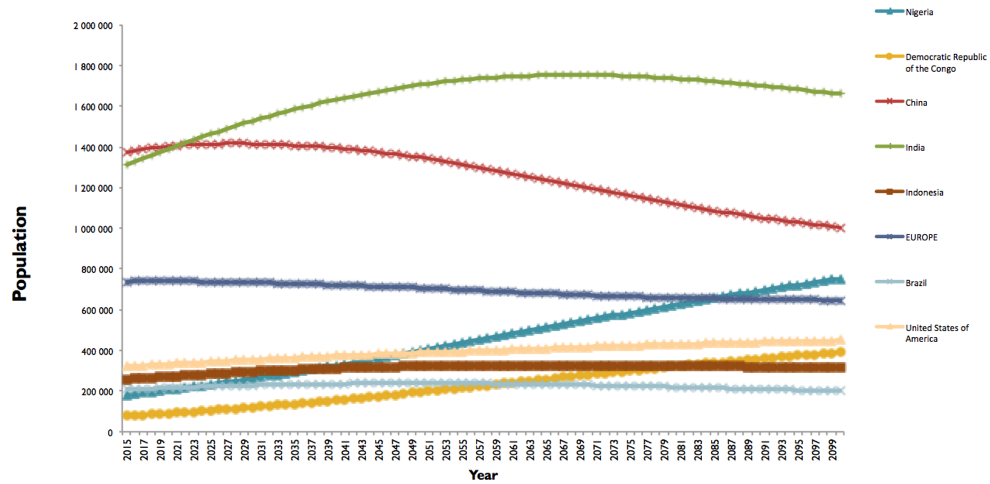
Turning to hydropower, we see that this is only suitable if the topographical conditions allow it. In China, the Three Gorges Dam can provide 22 gigawatts of electricity, and the Yangtze River can provide over 50 gigawatts generation capacity in total. This capacity is aided by the Himalayas' steep height difference, feeding down from the top to the lower plains of China's eastern seaboard. A similar story is found in forest recovery. Many parts of China experienced environmental degradation during industrialization and urbanization, while China is now seeing a natural recovery. This is because land that was previously used has now been freed up. In particular, over the past 25 years, China's forest area has increased at the fastest rate of any country in the world, and there is an expectation that forestation and forest sinks will continue to increase. However, this trend is not pervasive, as many parts of China, such as Beijing, are arid with only 500mm average annual precipitation.

China's successes in renewable energy and climate change mitigation have led many to say that China should do even more. Others have argued that climate change mitigation is something that China wants to do but should not be something that others force upon it. Successful mitigation needs to be done for China's benefit and interest and with due consideration of China's national conditions. In terms of per capita GDP, China is 20% less than the world average. Moreover, according to World Bank classifications, to qualify as a high-income country, per capita income should be approximately $12,500 annually. China is still a developing country with an upper-middle-income standard at $9000, similar to Thailand and the Philippines. Hence, citizens' living standards require further improvement, and the financial resources available for climate change is not abundant compared with the developed countries.

Moreover, China is the second-largest economy, but its economic importance is not reflected evidently in those organizations that manage the global economy. For example, in the International Monetary Fund (IMF), the United States has the veto power. However, as the second-largest economy, China only holds a voting share of 6%, not even close to the 16% that the economy represents. This indicates how far domestically China can go and how much China can contribute to global climate change efforts.

The ultimate driver of climate change is people because people drive demand and energy consumption. Population size is therefore essential. If per capita energy consumption remains the same, then energy use would be double for a country with twice the population size. The quality of living is already saturated in developed countries like New Zealand, Japan, and Europe. For example, there are already roughly 550 automobiles per 1000 people, so there is no need to have more automobiles. The figure in China is approximately 300 automobiles per 1000 people, already close to saturation due to the high population density. Therefore, if the quality of living is improving, then the per-capita emissions will also increase. Walking and bicycles do not use fossil fuels except in production, but cars need fossil fuels in both their production and use. Population numbers and population quality of living are, therefore, two key factors determining energy use.

Figure 3: World Demographic Trends, 2015 (7.35 billion) to 2100 (11.2 billion, assuming medium rate of fertility)



Source: United Nations World Population Prospects (2018), UN Department of Economic and Social Affairs, Population Division.

The United Nations medium fertility rate shows that China's one-child policy has resulted in an aging and shrinking population. There is a concern that China will lack enough young people to take care of the old as the population shifts from 1.4 billion to 1.07 billion (see figure 3). Europe and Japan also experience the same demographic trend, but Africa is entering a population explosion. The world population is currently 7.5 billion and projected to rise to 11 billion by the end of the century, among which 4 billion will come from Africa. Africa currently has 1 tonne per capita emissions. Even if this low rate remained, with the doubling of its population the additional emissions are enormous. This is an issue we need to think about globally.

Nationally Determined Contributions (NDCs)

This section overviews the evolution of China's international and domestic commitments to address climate change. The Chinese government made a national pledge in the Copenhagen Accord, endeavoring to realize a reduction in carbon intensity and share of non-fossil energy in the energy mix. In particular, China pledged to: reduce carbon dioxide emissions per unit of GDP by 40% to 45% by 2020 compared to the 2005 level; increase the share of non-fossil fuels in primary energy consumption to around 15% by 2020; increase forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic meters by 2020 from the 2005 levels.

At that time, China was not confident in targeting renewable energy share because renewable energy was expensive. The plan instead was to include nuclear energy, as it is also believed to be zero carbon, to meet the target. This changed with the 2011 earthquake and nuclear disaster in Japan, which helped spur China's pivot to renewable energy. China is seeking an increasing share of non-fossil fuels (nuclear included) and forest coverage and is on track to achieve these targets. The intensity target, for example, was reached in 2018, 45.8% lower as compared to the 2005 level while the non-fossil fuels target of 15% is nearly achieved this year (2019)1, and by 2020, it will likely be achieved.

Under the Paris Agreement, all parties are required to make Nationally Determined Contributions (NDCs). China made it clear that its carbon dioxide emissions will peak by around 2030 and is making best efforts to peak earlier, but how early remains to be seen. China also committed to lowering carbon dioxide emissions per unit of GDP by 60 to 65 percent compared to 2005 levels; increasing the share of non-fossil-fuel (renewable and nuclear) energy sources in the energy mix to around 20 percent; increasing forest stock volume by around 4.5 billion cubic meters from 2005 levels. Increasing the share of non-fossil fuels in primary energy consumption from 15% in 2020 to 20% by 2030 is a huge challenge as is the goal regarding forest stock and forest sinks.

Table 1: China's National Plan on Climate Change (2014-2020)

#	Climate Change Targets
1.	Reduce carbon dioxide emissions per unit of GDP by 40% to 45% compared to the 2005 level.
2.	Increase the share of non-fossil fuel in primary energy consumption to 15%.
3.	Increase forest coverage by 40 million hectares and forest stock volume by 1.3 billion cubic meters.
4.	Raise the effective utilization coefficient of farmland irrigation water to above 0.55.
5.	Bring more than 50% of manageable land desertification under control by 2020.

[1] China Environment Status Bulletin 2020, Ministry of Ecology and Environment, June 2020. Beijing.

6.	Achieve a 10% proportion of natural gas consumption and the utilization of 360 billion cubic metres by 2020.
7.	Achieve installed capacity of 350 GW of hydropower, 58 GW of nuclear power, 200 GW of wind energy, 100 GW of solar energy, and 30 GW of bioenergy by 2020.
8.	Have the large power generation enterprise group control the carbon emission from the power supply at 650 g/kWh by 2015.
9.	Decrease by about 3% compared to 2010 levels the national thermal power unit's carbon dioxide emissions by 2015.
10.	Have green buildings in urban areas account for 50% of new buildings by 2020.
11.	Decrease carbon dioxide emissions per unit of industrial added value by about 50% compared with 2005 by 2020.
12.	Increase the share of public transit to 30% in large and medium-sized cities by 2020.
13.	Decrease carbon emissions from passage turnover and freight turnover per unit by about 5% and 13%, respectively, by 2020.

Source: compiled by Author from sources including: National Economic and Social Development Plan for the 13th Five Year Period (2015-2020), National Energy Plan for the 13th Five Year period (2015-2020), National Renewable Energy Plan for the 13th Five Year Period (2015-2020), and National Plan on Climate Change (2014-2020).

The Chinese approach is very practical and effective. Indicators in the FYP have clear aims to address climate change and are quantitative measures. They show how international pledges are incorporated into China's national plans. All targets are dis-aggregated and translated into sectoral and regional FYPs. These can be found in the national climate change action plan, the energy development FYP, the renewable energy FYP. Table 1, for example, outlines the key parts of China's National Plan on Climate Change (2014-2020). All these plans are highly detailed and show the actions to be taken. Targets in the past may not be compatible with the Paris agreement ambitions, so China is enhancing these measures and thinking about what opportunities and challenges can realistically be tackled in the next FYP.

The Challenge of Addressing Climate Change

This section overviews two challenges that China faces in addressing climate change and shows how policymakers are trying to turn each into an opportunity. China's first challenge is reducing the use of coal. China has been a coal-dominated economy, with a coal dominated energy mix. In 2010, coal comprised 70% of energy usage, but this dropped to 58% in 2019, but this is still much higher than the world average, which is just over a quarter. Moreover, China's 11% reduction in coal usage from 2000 to 2010 is highly impressive as compared with a global reduction in coal usage of 2% during the same period of time. Yet coal still dominates China's energy mix, even with this rapid reduction. Therefore, the reliance on coal remains a major challenge, but it can also be viewed as an opportunity.

China is still the world's factory, producing 900 million tonnes of raw steel annually, accounting for 50% of the world's total. This industry, in particular, is very energy-intensive. Many products are made in China. For example, 2 billion mobile phones, 900 million tonnes of raw steel and 28 million automobiles have been produced annually in the last few years. All of these activities require energy to manufacture. There is currently no need and no room for further capacity expansion of these industries that are already operating in saturated markets. In the manufacturing sector, we can assume instead that the quality of goods will increase while the quantity will fall. Energy consumption in the manufacturing and industrial sector will then decrease. That is an opportunity as China can change the energy mix and improve energy efficiency, speeding up efforts to reduce coal reliance and emissions.

The second challenge is geography. Over half of China's land is not suitable for habitation, such as the arid land of the Gobi Desert or the highlands of the Himalayas with an average height of over 4000 metres. Therefore, China's population is concentrated in the coastal areas where it is possible to have a scaled economy and roll out high tech solutions. Water is also scarce in many regions, but solar is plentiful. Here again, the challenge of the Gobi's aridity also provides an opportunity for investing in large-scale renewable energy.

China has experienced a steep learning curve of renewable energy development. In 2005, solar energy cost 4 RMB per kilowatt-hour (kWh). By 2010 this had halved to 2 RMB. By 2015, the cost dropped by more than half again to 0.91 RMB. The decreasing price is not because of subsidies but rather because the economies of scale and advances of technologies have made the costs ever lower and solar becomes competitive. Solar PV panels are now cheaper than coal-powered electricity, which is very encouraging. The highly competitive nature of the Chinese electricity market makes these achievements more remarkable. A similar trend is apparent in wind energy, and its turbine prices have dropped by 78% over the period 1998-2017. In short, a steep learning curve has created opportunities for the development of renewable energy, which can be considered to apply in many regions of China, depending on the geography and local conditions.

Choices and Targets to Address Climate Change

This section explores the international, domestic, and regional approaches that underpin China's targets for addressing climate change. Starting with the international, we can see that the big four (China, USA, EU, and India) have varied climate change circumstances. The EU and the USA have peaked their emissions and are now declining continuously. China's emissions plateaued around 2013, with slight fluctuations, but not higher than that level. This indicated that China has great potential to achieve peak emissions before 2030, and with strong action taken, this target will be probably much earlier. In terms of per capita emissions, China is close to the EU level. India is a different case again because India's emissions are low but increasing very fast.

These differences raise the question of paying attention to the difference between total and per capita emissions. We should recognize a developing country profile internationally and pay more attention to per capita emissions measures. These also point out the importance of increasing the scale and lowering the price of zero-carbon energy, creating carbon sinks and improving demand-side issues such as batteries in electric vehicles.

International cooperation and information sharing are important for reducing global emissions. When the Belt and Road Initiative (BRI) was launched in 2013, for example, recipient countries believed that coal was the fastest and most cost-effective source for electricity supply. With an advanced and efficient coal electricity production, China has made quite a lot of investment in coal-powered electricity facilities abroad, which was criticized heavily by other industrialized powers. Green energy can provide energy, but the cost may be too high, especially in the early stages of development. Coal technologies from China are more advanced than other developing countries. 1kWh in China uses 270 grams of coal (30%) below the world average. More recently, China is greening the BRI to ensure investment focuses more on renewables. Some countries have rejected hydropower, which makes solar and wind energy possible choices. Other investments in wastewater treatment, air pollution control, and other conventional pollution occur under strict scrutiny. We can expect the BRI to be greener and greener and encourage other countries to promote similar outcomes.

Domestically, official actions are oriented towards achieving zero-carbon. The share of renewable energy in the energy mix is not competitive, but the installed capacity and electricity generation are huge. Given the clean and low-carbon characteristics of renewable energy, China's technology and production capacity in renewable energy not only conforms to the national interests but also supports the development of the international renewable energy market. In terms of energy saving, eliminating out-dated manufacturing capacity, and improving energy efficiency are vital components. For example, China promotes energy-saving and low carbonization in the construction area, and new buildings in China are much more energy-efficient than the European ones. On average, in Beijing, per square metre emissions in terms of energy use in buildings have halved over the last decade. Moreover, reducing out-dated capacity in coal and promoting purely electric vehicles are indications of a carbon emission reduction strategy. With these efforts, many simulations and analysis show by 2025 that it should be possible to achieve a total emissions peak.

Regionally, different approaches should be introduced: providing differentiated targets, adapting to local conditions (nature-based solutions), strengthening regional synergies, and adjusting the industrial design to work with and maximize these differences. In China, energy resources are rich while unevenly distributed, and the energy-demanding region remains the coastal region. The West and Southwest of China are very rich in renewable resources but are far away from the demand centres. China, therefore, has very long-distance electric power transmission capacity. For example, from Gansu to Shanghai is over 2000 kilometres; the three gorges dam is 1200 kilometres from Beijing and 800 kilometres from Guangzhou. To facilitate the development of renewable energy, long-distance power transmission infrastructure could extend to include solar-generated power from the West moving to the East. This is a type of regional coordination. With the same transmission model, we can also expect that energy-intensive industries such as heavy manufacturing can move to the western part of China. For example, in Xinjiang and Gansu, 15% of solar capacity is wasted due to insufficient local consumption and limited power transmission capacities. Therefore, moving heavy industry to these regions is reasonable and will provide further energy savings. Coal is not easy to phase out immediately, but the process can be sped up through these measures.

Discussion and Suggestions

Due to the saturated market, relatively high development, and living quality, it is possible for China to go faster towards a zero-carbon future. Coal use is declining, but its phase-out will be a long process, different from the US, Germany, or the United Kingdom. Hence, China is unable to take the global lead in reducing total emissions and per capita emissions. However, with the transition from high-speed growth to high-quality development, the decreasing growth rate of total energy consumption, and a cleaner and more low-carbon energy structure, the low-carbon development process can be accelerated. The emissions peak can be reached at the end of the 14th FYP, 5 years in advance of 2030. The scale, cost, and potential of China's renewable energy presents many strengths and high competitiveness that is a valuable experience for the world.

A commitment to zero-carbon emissions in the whole country is not realistic but is promising in some regions. In Qinghai province, an experiment showed that it was possible to achieve two weeks of continuous power using renewable energy only. Qinghai is not very populous with 6.5 million people, but it still shows zero-carbon promise, which will be further developed. China’s zero-carbon revolution on the consumption side also has great potential, such as the manufacture of purely electric vehicles and renewable energy technology. Moreover, China's efforts and performance in climate resilience and adaptation are worth recognition. Again, this experience can be of relevance and value to other countries.

In the 14th FYP, we have suggested that we can make the pace faster without harming the economy. Instead, we argue that measures to address climate change can have a positive impact on the economy. Therefore, China is likely to be more aggressive in its efforts to manage climate change in the next FYP. Identifying the targets, expanding the share of renewable energy to achieve a net-zero carbon future will be a central part of the 14th FYP (2021-2025). China will continue to moderate the demand side factors, promote renewable energy’s regional deployment, work hard toward greater climate resilience and look toward greater experience to share internationally.

About the Author

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