

Mitigating China's Greenhouse Gas Emissions in the Last Decade: Clear Target or Blurred Path?

Liu Xiaobao*

Abstract: Emissions trading is deemed as a policy instrument of efficiency to mitigate greenhouse gas emissions. China contributes a large share of the global greenhouse gas emissions, making it necessary for China to seek ways to mitigate those emissions. China started its emissions trading pilot scheme in 2013 and consequently launched its national market online in 2021. China's target to mitigate its greenhouse gas emissions is clearly manifested in building its carbon market. However, the process of rule-making lags behind the development of the carbon market, which makes the path of China's carbon market somewhat blurred. Currently, there is merely a ministerial regulation issued by the Ministry of Ecology and Environment serving as the skeletal legal framework having low legal authority. The present rules of China's carbon market are largely in the form of policies, which results in uncertainty and unstable expectations in the market. The development of China's carbon market should be rule-based. There are several factors to take into consideration to steadily accelerate the development of China's carbon market. Meanwhile, it is necessary for China to cooperate with other countries for environmental governance and to address the potential challenges.

Keywords: Emissions Trading Scheme, China's Carbon Market, China's Policy of Climate Change, Cooperation of International Carbon Market

The advances in environmental sciences promote awareness of the relationship between economic development and environmental protection.¹ With the catastrophic downgrading of the global environment, increasing amounts of evidence

* Liu Xiaobao, PhD. Candidate, Law School, University of International Business and Economics; Lecturer, School of Humanities and Social Sciences, Inner Mongolia Agricultural University. Email: liubao4288869@126.com.

This research is supported by the Research Program of Humanities and Social Sciences at Universities of Inner Mongolia Autonomous Region titled "Research on the Corporation Environmental Compliance under Peak Carbon Emissions" (Grant No.: NJSY22525) and the Program for Innovative Research Team in Universities of Inner Mongolia Autonomous Region titled "Innovative Research Team on the Ecological Safety Assurance of Grasslands in Inner Mongolia" (Grant No.: NMGIRT2218).

1 Steve Cohen, Economic Growth and Environmental Sustainability, <https://news.climate.columbia.edu/2020/01/27/economic-growth-environmental-sustainability/> (Last Visited on April 25, 2022).

prove the fact that greenhouse gas (GHG) emissions from human activities have been the primary driver of climate change.² The global cooperation on GHG emissions mitigation, ever since the adoption of the United Nations Convention on Climate Change (UNFCCC) in 1992 and the Kyoto Protocol thereafter in 1997, has moved onto a fast but dichotomized track, which categorized the parties to the UNFCCC into “developed countries” and “developing countries” assuming “common but differentiated responsibility”. Under such a framework, developed countries have to bear mandatory responsibility to mitigate GHG emissions while developing countries bear the responsibility voluntarily, which makes for a disequilibrium in global GHG emissions mitigation.³ It was not until the adoption of the Paris Agreement in 2015 that this disequilibrium was finally corrected and parties to the UNFCCC were invited to submit their respective statements of “Nationally Determined Contribution” in which a holistic mitigation pledge was made by parties, no matter their status as developed or developing countries.⁴ China, as the world’s largest developing country, did not need to bear the compulsory responsibility to mitigate GHG emissions before the adoption of the Paris Agreement. However, it is noteworthy that China ranked high among the top GHG emitters in some recent annual statistics,⁵ which creates the necessity to clarify how China has been mitigating its GHG emissions in the last decade. This paper aims to comment on the performance of China’s mitigation of GHG emissions, with a special focus on the emissions trading system based upon the historical review in the last decade. It concludes with some suggestions for the path for the future.

I. HISTORICAL REVIEW OF CHINA’S MITIGATION OF GHG EMISSIONS IN THE LAST DECADE

Tracing the origins of emissions trading, we see that it was one of the key

2 Rosa, Eugene A., et al., *The Human (Anthropogenic) Driving Forces of Global Climate Change*, In Riley E. Dunlap and Robert J. Brulle (Eds.), *Climate Change and Society: Sociological Perspectives*, New York, 2015, p. 32.

3 Amanda M. Rosen, *The Wrong Solution at the Right Time: The Failure of the Kyoto Protocol on Climate Change*, *Politics and Policy*, No. 1, 2015, pp. 34-35.

4 Daniel Bodansky, *The Paris Climate Change Agreement: A New Hope?* *American Journal of International Law*, No. 2, 2016, pp. 288-289.

5 According to the World Bank, China had a total GHG emissions of 12,705,090 kt of CO₂ equivalent in 2019 and the global total GHG emissions in 2019 were 46,287,620 kt of CO₂ equivalent. <https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE?locations=CN> (Last Visited on April 25, 2022).

mechanisms under the Kyoto Protocol, which was originally designed to be implemented among developed countries so that they could purchase surplus allowance to offset their own emissions beyond their allocated allowance.⁶ After several decades, emissions trading is admittedly a policy instrument of efficiency and of increasing importance in countries and regions, being based on a market mechanism to control GHG emissions and alleviate the massive climate change to some extent.⁷ Having weighed the advantages and disadvantages, China opted for emissions trading as a solution to tackle climate change arising from GHG emissions. China's Emissions Trading Scheme (ETS) went from the pilot stage and on to become a national carbon market.

Historically, China's ETS was put onto the agenda in 2011 in the 12th Five-year Plan for National Economy and Social Development (Plan) which sketched the outline of China's ETS.⁸ In October 2011, the National Development and Reform Commission (NDRC) issued a notice approving the establishment of 7 ETS pilots in Beijing, Tianjin, Shanghai, Chongqing, Hubei Province, Guangdong Province and Shenzhen.⁹ Three years later, in 2014, the 7 ETS pilots were implemented in the market for the mitigation of GHG emissions within the region. Besides these pilots approved by NDRC, the Fujian Province set up its ETS voluntarily in 2016.¹⁰ Undeniably, these provincial and municipal level ETS pilots promoted enterprises within the respective regions and aided the transfer of surplus allowance, providing experiential knowledge for the establishment of China's national ETS which was, thereafter, officially launched in 2021.

It took about 4 years for China's ETS to go from conception to fruition. However, as a whole, there are some conspicuous features, experiences and challenges emerging from the pilot stage of China's ETS. In terms of the features, pilots in Wuhan and Shanghai are mainly devoted to the mitigation of

6 Sebastian Oberthür and Hermann E. Ott, *The Kyoto Protocol: International Climate Policy for the 21st Century*, Springer-Verlag Berlin Heidelberg, 1999, pp. 187-188.

7 Christian Almer and Ralph Winkler, Analyzing the Effectiveness of International Environmental Policies: The Case of the Kyoto Protocol, *Journal of Environmental Economics and Management*, March 2017, p. 139.

8 See Section 1 of Chapter 21 in the 12th Five-year Plan for National Economy and Social Development, released on March 16, 2011, http://www.gov.cn/2011llh/content_1825838_7.htm (Last Visited on April 25, 2022).

9 See Circular No. [2011]2601 issued by NDRC, <https://zfxgk.ndrc.gov.cn/web/iteminfo.jsp?id=1349> (Last Visited on April 25, 2022).

10 Xinhua Agency, Fujian Province Officially Launched Its Emissions Trading Market, http://www.gov.cn/xinwen/2016-12/22/content_5151566.htm (Last Visited on April 25, 2022).

Table 1. Statistics of Transaction in the 7 ETS Pilots (As of December, 2021)

Pilot	Opening Date	Total Volume (Million Ton)	Sum (Billion RMB)	Average (RMB/Ton)
Beijing	November 28, 2013	16.40	1.03	56.42
Tianjin	December 26, 2013	18.66	0.41	21.96
Shanghai	November 26, 2013	17.78	0.54	30.71
Shenzhen	June 18, 2013	49.21	1.18	24.08
Guangdong	December 19, 2013	176.02	3.61	20.56
Hubei	April 2, 2014	76.37	1.75	22.99
Chongqing	June 19, 2014	9.71	0.06	18.28

Source. Center for Energy and Environmental Policy Research, Review and Outlook of China's Carbon Market 2022, Forecasting and Prospects Research Report, CEEP-BIT-2020-006, January, 2022, p. 11.

GHG emissions in the manufacturing industry, while Shanghai covered the service industry (aviation industry) and Chongqing set up the offset pilot of carbon sink in forestry. As for the experiences and challenges, firstly, it's well worth pointing out the lack of data reliability which is largely due to the fact that there was no monitoring mechanism of CO₂ before, thereby making it considerably difficult to obtain reliable emissions data of enterprises in the very early stages of the ETS. Admittedly, lack of data reliability may result in unfairness in transactions or in the market as a whole. Secondly, there was no compulsory participation for the covered entities in these ETS pilots. The prescribed entities participated voluntarily and the administrative authorities oversaw the operation of the market, which made it difficult to make the market sustainable and prosperous. Thirdly, the carbon price in each ETS pilot differed. As mentioned above in Table 1, the highest average carbon price was 56.42 in Beijing and the lowest was 18.28 in Chongqing, which made it difficult to use carbon price as an indicator to measure market activity. However, based on the design of these ETS pilots, it is understandable why later China's national ETS in 2021 (to be analyzed later) primarily covered the power sector. It is relatively easy to obtain the emissions data during power generation, which comes from the burning of coal. Honestly, coal is a typical type of primary energy and the burning of coal is the main source of atmospheric carbon. At present, coal power accounts for over 60% of China's power sector, which highlights the necessity to attach priority to cover the power sector within the national ETS.¹¹

11 Union of China's Power Enterprises, 2021 Report of the Economic Operation of China's Power Sector, <http://lwzb.stats.gov.cn/pub/lwzb/tzgg/202205/W020220511403033990320.pdf> (Last Visited on July 15, 2022).

President Xi Jinping stated that China's national ETS would be launched in 2017 in the US-China joint presidential statement on climate change,¹² which further advanced the creation of China's ETS. Once again, in China's 13th Plan released in 2016, the establishment of a unified national ETS was proposed,¹³ after which the NDRC issued the plan for developing the national ETS for the power generation industry.¹⁴ With the experience gained from the ETS pilots, as well as the foundations laid by relevant policies, China announced the establishment of a national carbon market in December 2017, which was eventually launched on July 16, 2021, primarily targeting the power sector.¹⁵

The national ETS operates parallel to the local ETS pilots. The exchange and registry system of the national ETS are located in Shanghai and Wuhan, respectively, two cities emerging as the pillars of the national ETS. Currently, the key emitters covered by the national ETS are power generation enterprises (including captive power plants in other industries) that emitted the equivalent of 26,000 tons of CO₂ (comprehensive energy consumption of about 10,000 tons of standard coal) from 2013 to 2019.¹⁶ The power generation industry became the first industry to be covered in the national ETS, which included exactly 2,225 key emitters (Figure 1) emitting more than 4.5 billion tons of CO₂.¹⁷ It is noteworthy that this is the first time that China assigned compulsory obligation to mitigate GHG emissions wholly and directly to enterprises, which is meant to accelerate the creation of a green economy and help these enterprises better

12 US-China Joint Presidential Statement on Climate Change, <https://obamawhitehouse.archives.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change> (Last Visited on April 25, 2022).

13 See Section 1 of Chapter 46 in China's 13th Five-year Plan for National Economy and Social Development, released on March 17, 2016, http://www.gov.cn/xinwen/2016-03/17/content_5054992.htm (Last Visited on April 25, 2022).

14 NDRC, *Plan for Developing the National ETS for Power Generation Industry*, No. [2017]2019, released on December 18, 2017, https://www.ndrc.gov.cn/xxgk/zcfb/ghxwj/201712/t20171220_960930.html?code=&state=123 (Last Visited on April 25, 2022).

15 Xinhua Agency, National Emissions Trading Market Officially Launched Online, http://www.xinhuanet.com/fortune/2021-07/16/c_1127660932.htm (Last Visited on April 25, 2022).

16 See the stipulation of Article 8 of Interim Measures for Carbon Emissions Trading Management, i.e., [A]ny GHG emitter that meets the following conditions shall be included in the list of key GHG emitters (hereinafter referred to as key emitters): 1. It belongs to the industries covered by the national carbon emissions trading market; 2. The amount of annual GHG emissions reaches 26,000 tons of carbon dioxide equivalent.

17 People's Daily, The Largest Carbon Market in the World Launches Promoting China's Carbon Neutrality Goal and Green Development, http://www.gov.cn/xinwen/2021-07/22/content_5626497.htm (Last Visited on May 10, 2022).

monitor and regulate their emissions by utilizing the market for reversed coercion.¹⁸ The national ETS and local ETS pilots supplemented each other to advance the overall level of China's GHG emissions mitigation.

China's ETS started from the pilot stage and matured on to the national stage. Lessons were learned from the problems that occurred in operation/implementation of the local ETS pilots so that such problems would be avoided or tackled with ease when the national ETS was built.¹⁹ The target of the national ETS and local ETS pilots was clearly that China shall commit to mitigating GHG emissions and contribute to the global mitigation of GHG emissions. However, the path of China's mitigation of GHG emissions being somewhat blurred is largely due to the characteristic of being driven by policies, while China's target to mitigate GHG emissions, in contrast, is quite clear.

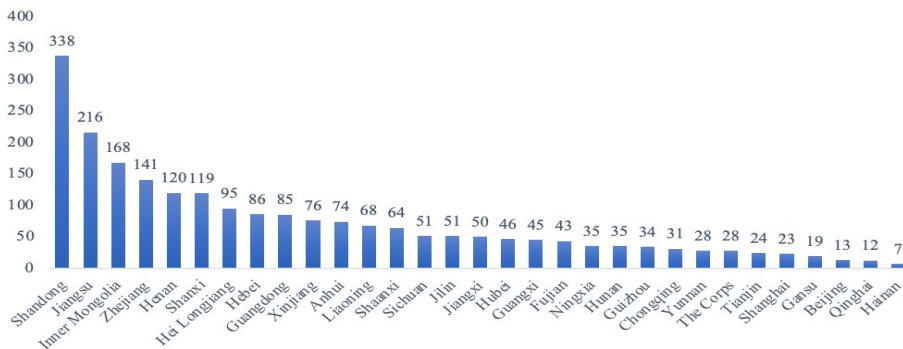


Figure 1. Number of Covered Entities of Each Province in National ETS

Note. The Corps means the Xinjiang Production and Construction Corps.

II. CHINA'S ETS CONVEYS CLEAR AND MULTIFACETED TARGETS

A. China's ETS Contributes to Global Mitigation of GHG Emissions

ETS is deemed as a cost-effective mechanism to control GHG emissions from

18 Center for Energy and Environmental Policy Research, Review and Outlook of China's Carbon Market 2022, Forecasting and Prospects Research Report, CEEP-BIT-2020-006, January, 2022, p. 6.

19 Wang Ke and Li Shiyang, China's Carbon Market: Reviews and Prospects (2022), *Journal of Beijing Institute of Technology (Social Science Edition)*, No. 2, 2022, pp. 38-39; Gørild Heggelund, Iselin Stensdal and Maosheng Duan, China's Carbon Market: Potential for Success? *Politics and Governance*, Vol. 10, 2022, p. 268.

power sector and other industries, which serves as the main mechanism for China to contribute to global mitigation of GHG emissions. Considering China's voluntary duty to mitigate GHG emissions under the Kyoto Protocol, it is a great contribution that China has made to the global mitigation of GHG emissions.²⁰ However, it is noteworthy that cost-effectiveness is not the only target for China. Firstly, despite China bearing a voluntary duty to mitigate GHG emissions, it is an undeniable fact that China now ranks first among the top emitters across the world. Mitigation of GHG emissions will not only benefit the global mitigation of GHG emissions, but shall also be a way for China to act as a responsible country. Secondly, ever since the Reform and Opening-up Policy in 1979, China's economy has gone through a period of rapid development. However, the rapid development was largely based on the unrestricted, even irrational, exploitation of the environment since the very beginning, resulting in massive pollution and damage. Admittedly, the building of ETS in China facilitates a green transition.²¹ As was announced, China is planning to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060. Undoubtedly, it is more challenging for China to achieve carbon neutrality than other developed economies largely owing to the fact that China's economic growth and GHG emissions have not been decoupled.²² Thirdly, owing to the integrity of the environment, even when environmental pollution occurs in one or some of the countries across the world, the negative influences permeate globally. It is rational to take some precautionary measures to control the pollution and damage to the environment before it is too late. ETS as a cost-effective approach sets mandatory total carbon targets and allows free trading of the carbon emissions allowance, providing economic incentives for emissions entities to reduce carbon emissions.

B. China's MRV for ETS

An effective system for monitoring, reporting and verification (MRV) is the

20 Liwei Liu, et al., China's Carbon-emissions Trading: Overview, Challenges and Future, *Renewable and Sustainable Energy Reviews*, Vol. 49, 2015, p. 255.

21 Han Wang, et al., Can a Carbon Trading System Promote the Transformation of a Low-carbon Economy under the Framework of the Porter Hypothesis? — Empirical Analysis Based on the PSM-DID Method, *Energy Policy*, Vol. 129, 2019, p. 939.

22 Jun Liu, et al., China's National ETS: Global and Local Lessons, *Energy Reports*, No. 8, 2022, p. 429.

cornerstone of any successful ETS. A key feature of a robust MRV system is that it should be built on general monitoring and reporting principles such as completeness, accuracy, consistency and transparency. Such a robust MRV system is essential for the functioning of China's national ETS. Some challenges can be identified in the current MRV framework design that need to be overcome. Specifically, the greatest challenge is in respect of the ambiguity in the legal status of relevant policies and regulations.²³ Initially, the authority over climate change issues belonged to NDRC before it was assigned to the Ministry of Ecology and Environment (MEE) in 2018.²⁴ NDRC drafted the Guidelines for the Accounting and Reporting of GHG Emissions for Key Enterprises in 2012, and issued the guidelines in three batches from 2013 to 2015. The guidelines covered a total of 24 industry sectors, and were used to collect data for the design and operation of the system. The MEE issued the Interim Guidelines for Reporting and Verification of Enterprises GHG Emissions in 2021. In fact, the abovementioned guidelines mainly focus on reporting with little relation to monitoring or verification. Both the guidelines issued by NDRC and MEE are ministerial regulations in essence which are not so legally binding as legislations issued by the National People's Congress. Moreover, the limited legal binding force results in the reluctance of enterprises to submit their GHG emissions reports, which adds to the difficulty in implementation of the guidelines. As for China's ETS, the allowances are granted by benchmarks that rely heavily on the reporting. The quality of the MRV activities will largely be dependent on the willingness of the provinces, municipalities and participants to obey and implement the requirements. There is likely to be insufficient legal impetus and power to enforce the guidelines, which could have an adverse effect on the overall quality of the MRV system. The other challenges revolve around the inconsistency of monitoring and reporting guidelines, the competency of the independent third-party verifiers, etc.

23 Renhu Tang, et al., Key Challenges for the Establishment of the Monitoring, Reporting and Verification (MRV) System in China's National Carbon Emissions Trading Market, *Climate Policy*, Vol. 18, No. S1, 2018, S108.

24 According to the Institutional Reform Plan of State Council in 2018, the former Ministry of Environmental Protection was reorganized as Ministry of Ecology and Environment, http://www.gov.cn/xinwen/2018-03/17/content_5275116.htm (Last Visited on June 15, 2022).

C. China's ETS Spurs China's GHG Offset Market

China GHG Voluntary Emissions Reduction Program was officially launched in 2015 before which the preparatory research and development of China's voluntary emissions reduction was initiated by NDRC in 2009, and relevant rules were issued in 2012.²⁵ After years of trial implementation, this program has become an indispensable part of China's local ETS pilots. The offset credit from the program is named China Certified Emissions Reduction (CCER), which was adopted by the guidelines for carbon neutrality in large-scale programs issued by MEE in 2019²⁶ as a recommended voluntary emissions reduction credit and also by the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as one of the eligible emissions units. According to the statistics as of April, 2020, there are a total of 9 exchanges, 12 verification bodies and 200 emissions reduction methodologies which have been certified or approved.²⁷ However, regimes differ with respect to the origin, use and scope of the CCER among the ETS pilots.²⁸ For example, Shenzhen specifies that all CCER have to be generated inside China but outside Shenzhen. Hubei requires that CCER have to be generated within the Hubei provincial region. CCER is an important supplementary mechanism for China's ETS and strengthens the emissions reduction channels from the perspective of carbon sources or carbon sinks. Additionally, CCER can indirectly avoid the windfall profits by grandfathering and reflecting the polluter pays principle.²⁹

D. China's ETS Holds Emitters Responsible for Their Emissions

Emissions trading and carbon tax are the two principal approaches for putting a price on GHG emissions. Obviously, emissions trading leads to cost-effective

25 The Interim Measures on the Management of the GHG Voluntary Emissions Reduction Program in June, 2012, and Guidelines on Validation and Verification of GHG Voluntary Emissions Reduction Projects in October, 2012, both constitute the basic rules for China GHG voluntary emissions reduction.

26 Trial Implementation Guidelines for Carbon Neutrality of Large-scale Events, No. [2019]19.

27 EDF, *Analytical Report on the Status of the China GHG Voluntary Emissions Reduction Program*, <https://www.edf.org/climate/status-chinas-voluntary-carbon-market> (Last Visited on June 5, 2022).

28 Zhongxiang Zhang, Carbon Emissions Trading in China: The Evolution from Pilots to a Nationwide Scheme, *Climate Policy*, Vol. 15, No. S1, 2015, S110.

29 Lixu Li, et. al, How Will the Chinese Certified Emissions Reduction Scheme Save Cost for the National Carbon Trading System? *Journal of Environmental Management*, Vol. 244, 2019, p. 108.

emissions reductions. Emitters, i.e., the enterprises, will invest in low-carbon technologies that reduce emissions as long as the price is lower than the market price for emissions. Although emitters get the allowance for free, if they emit more than the allocated quota, they have to buy allowances from other emitters who emit lower than their allotted quota. The cost of buying extra allowances will add to the total cost of production for the enterprises, which makes it advisable to reduce the emissions for a lower cost. The ETS, in such a way, prompts emitters to adopt low-carbon emitting technologies to improve productivity, which on one hand promotes efficiency of enterprises without decelerating economic growth, and on the other hand reduces GHG emissions.³⁰ Notably, it is not the only target of China's ETS to strike a balance between mitigation of GHG emissions and maintaining economic growth. China's ETS can also help to increase the awareness of the need for environmental protection among emitters. Emitters pay for the extra allowances once they emit more than their allocated quota, which vividly reflects the polluter pays principle. Honestly, the polluter pays principle helps correct market failure and social injustice by shifting pollution costs from the public at large to the emitting enterprises, and ultimately reduces total GHG emissions.³¹ China's ETS alleviates the country's responsibility of mitigating GHG emissions by assigning it partially to enterprises so as to cause them to be actively engaged in reducing their emissions.

As analyzed above, ETS is conducive to enhancing the awareness and responsibility of enterprises, and may add to the total cost for enterprises. However, it may not necessarily be the case that enterprises solely bear the burden of mitigating GHG emissions, which is then passed on to consumers eventually. It is a common phenomenon that many states cover sectors such as power, traffic and building as key areas for attention to mitigate GHG emissions. Without criticism for such sectoral coverage, the undeniable fact is that the goal of manufacture is to satisfy consumption during which GHG emissions are a by-product. With the launch of China's national ETS, enterprises in the power sector

30 Jingbo Cui, et al., *The Effectiveness of China's Regional Carbon Market Pilots in Reducing Firm Emissions*, *Proceedings of the National Academy of Sciences of the United States of America*, Vol. 118, No. 52, 2021, p. 4.

31 Zahar Alexander, *Implementation of the Polluter Pays Principle in China*, *Review of European, Comparative & International Environmental Law*, No. 3, 2018, p. 293.

have to reduce their GHG emissions or pay for extra emissions. The cost of production for these enterprises shall eventually determine the charge of electricity for consumers. There is no predetermined absolute cap on the total number of emissions allowances in China's ETS. The allowances are determined according to the actual electricity and heat output over the compliance period and predetermined CO₂ emissions intensity benchmarks.³² China's CO₂ emission per unit of coal power generation is about 832 g/kWh,³³ assuming the carbon price is 200 RMB/ton, the cost of carbon per kWh is about 0.16 RMB. However, considering the 70% free allowances, the actual cost of carbon will be much lower, which is considered to be little influence on the charge of electricity. But with the limiting of free allowances, the charge of electricity will be influenced in the future. Admittedly, ETS helps to enhance the awareness of the need for environmental protection among enterprises by requiring payments for extra emissions. However, enterprises may pass such cost on to consumers, which makes it necessary to call for changes in consumers' behavior.³⁴

III. LOW HIERARCHY AND POLICY-DRIVEN: A DEPICTION OF CHINA'S BLURRED PATH

Based on the chronological review of the establishment of China's ETS above, it's necessary to look at the rule-making in respect of the operation of the ETS which serves as a cornerstone of the operation of ETS. In summary, the rules of ETS are low with respect to hierarchy and take the form of policy in majority.

A. National Policies for ETS Are in Embryo, Thus Making the ETS Unstable

The carbon emissions right is a virtual right stipulated in relevant national policies.³⁵ Consequently, the existence, characteristics and scope of this right are

32 IEA, *The Role of China's ETS in Power Sector Decarbonization*, https://iea.blob.core.windows.net/assets/61d5f58d470242bd46b659be3008ecc9/The_Role_of_China_ETS_in_Power_Sector_Decarbonisation.pdf (Last Visited on July 15, 2022).

33 China Electricity Council, *Report of the Development of China's Power Sector 2021*, <https://cec.org.cn/detail/index.html?3-298428> (Last Visited on July 15, 2022).

34 Lin Boqiang, *Realizing Carbon Neutrality, Behavior of Consumers Should Not Be Ignored*, <https://m.21jingji.com/article/20210108/a9940125a4c2bffa74c40e7d553d13ef.html> (Last Visited on July 15, 2022).

35 In Article 42 of the Interim Measures for Carbon Emissions Trading Management, carbon emissions right refers to the allowances granted by the authority.

actually dependent on national policies. China's ETS, as a new policy instrument, works in coordination with China's carbon neutrality goal. China's carbon neutrality goal works as a holistically guiding policy for the decades ahead. Interestingly, such a goal is somewhat ambiguous in nature, making the policies of ETS volatile and able to adjust according to changing goals. However, the overall plan for China's carbon neutrality goal has already been set, while the detailed policies for its realization are still in an embryo stage and lack stability. A clear example in recent years is the "movement of GHG emissions mitigation" under which some regions with the desire to complete the dual control of energy consumption and energy intensity carried out stringent policies, such as massively shutting down of coal mines, drastically controlling coal power, so as to achieve the carbon emissions peak earlier.³⁶ Under such a circumstance, the rise in coal prices directly led to coal supply shortage in power plants which inevitably caused a negative influence on the economy and society. Clearly, the domestic policies to reduce coal and coal power can help mitigation of GHG emissions but the carbon price fluctuates adding to the instability of China's ETS. The recent Russia-Ukraine crisis caused a sudden rise in the price of crude oil and created tension in the global energy supply.³⁷ China had to increase the supply of coal and coal power in response to the crisis. To sum up, considering the changes in domestic and international affairs, China shall adjust its policies of energy supply to maintain national security.

As a matter of fact, policies are volatile in nature. They may be of help as they can adjust timely and easily. They may also be a burden as they are ambiguous and uncertain. The uncertainty of policies leads to instability in the carbon market, which constitutes a risk for investment as well.³⁸ But the uncertainty of policies has its own advantage, in that it leaves room for flexibility. As for China, it is of great significance to sustain economic growth at a moderate

36 Xinhua Agency, *Why There Are Power Cuts in Several Places? Will There Be a Stable Power Supply?* http://www.news.cn/politics/2021-09/29/c_1127914464.htm (Last Visited on July 16, 2022).

37 Global Times, *European Energy Crisis Looms amid Russia-Ukraine Tensions, Incurring an Estimated GDP Loss of 1-2% on the Bloc*, <https://www.globaltimes.cn/page/202204/1257467.shtml> (Last Visited on July 16, 2022).

38 Pan Dandan, *The Relationship between Law and Policy: Structural Constraints of the Application of Policy*, *Hunan Social Science*, No. 3, 2013, pp. 68-69.

pace so as to balance the relationship between economic growth and environmental protection. Policies are likely to be an optimal solution for the time being, which makes China reserve the right of overall control and react as necessary when circumstances change. China is still at an early stage of ETS construction. If the policies change frequently, China's ETS cannot run smoothly and may suffer losses thereby, which emphasizes the necessity for the stability of policies.

B. An Overarching Legislative Framework Needs to Be Built

Basically, the overall legislative framework of China's ETS has not been completed yet. A supplementary policy framework "1+N" is still in the process of formation. As a matter of practice, policies prevail over legislations and policies that are long practiced can turn into legislations. Consequently, there is no national legislation for carbon emissions trading. As for the current rules, no matter in ETS pilots or the national ETS, most rules are governmental decrees or even just regulatory documents, among which the main rules for China's ETS are drafted by MEE, while the rules for voluntary emissions reduction are drafted by NDRC, and local ETS pilots have their own rules. Obviously, the legislative hierarchy of current rules for the carbon market is low and there is no general *lex superior*, which makes it hard to lay stringent restrictions on carbon emissions trading.

1. Diversified Rules of ETS Pilots

The overall structure for operation in each of the ETS pilots is basically the same. However, when it comes to the rules, there exist some apparent differences. In one word, there is no *lex superior* for these ETS pilots and each pilot takes different forms of rules. Shenzhen took a lead role as its Standing Committee of People's Congress (SCPC) passed the "Certain Provisions for Carbon Emissions Management of Shenzhen Special Economic Zone" in October, 2012, one year before its ETS pilot.³⁹ SCPC of Beijing passed its "Decision on Implementation of Carbon Emissions Trade Pilot with Strict Control of the Total Volume of Carbon Emissions" in December, 2013, at nearly the same

39 The Certain Provisions for Carbon Emissions Management of Shenzhen Special Economic Zone was passed during the 18th session of the 5th Standing Committee of Shenzhen People's Congress on October 30, 2012, http://sf.sz.gov.cn/fggzsjcx/content/post_7263430.html (Last Visited on July 18, 2022).

time as its ETS pilot.⁴⁰ Meanwhile, Shanghai, Guangdong, Tianjin, Hubei and Chongqing did not go the same way. On the contrary, the local governments issued governmental decrees to oversee the operation of ETS pilots within these regions. Generally speaking, in terms of the hierarchy of sources of law in China, *lex superior* derogates *lex inferior*; i.e., the legislations of People's Congress is superior to decrees of the government. Therefore, whether in theory or in practice, the governmental decrees are legally weaker than the legislations passed by People's Congress, which makes it necessary for pilots, apart from Shenzhen and Beijing, to raise their rules to the level of legislations of the local People's Congress. But in other respects, the content of the early versions of rules in each of the pilots were simple and rough, and to some extent even repetitive. In Shenzhen for example, there are merely 10 articles in the 2012 version of the rules with 2 articles concerning the purpose (Article 1) and time for the entering into force of the rules (Article 10), leaving only 8 articles to build up the whole mechanism to regulate the operation of the ETS pilot. Strictly speaking, the early versions of ETS regulations were mainly principles, making them somewhat impractical for implementation. In order to clarify the rules, thereby making them feasible for ETS operation, the "Interim Measures for Carbon Emissions Trading Management" drafted by Shenzhen Bureau of Environment Protection in accordance with the "Certain Provisions for Carbon Emissions Management of Shenzhen Special Economic Zone" made in 2012 was passed as a governmental decree in 2014, which has been revised recently after implementation for about 8 years.⁴¹ Rules in other pilots roughly follow the same way. Generally, the rule-making process for ETS operation is led by administrative authorities, especially the Bureau of Ecology and Environment.⁴² The administrative authorities are in charge of overseeing the daily operation of ETS and have better knowledge of how to regulate it well. The

40 The Decision on Carrying out Carbon Emissions Trade Pilot with Strict Control of the Total Volume of Carbon Emissions was passed during the 8th session of the 14th Standing Committee of Beijing People's Congress on December 27, 2013, http://district.ce.cn/zt/zlk/wj/201312/31/t20131231_2027605.shtml (Last Visited on July 18, 2022).

41 The revised version of Measures of Carbon Emissions Trading Management was passed on May 29, 2022 and entered into force on July 1, 2022. The new rule deleted "interim" as was in the original version. http://meeb.sz.gov.cn/xxgk/zcfg/zcfg/szbfggz/content/post_9927705.html (Last Visited on July 20, 2022).

42 The Bureau of Ecology and Environment is the former bureau of environment protection which is established according to the Institutional Reform Plan of State Council in 2018.

administrative authorities may release commands to regulate covered entities of ETS when necessary. Such a command-and-control approach is more flexible and reflects the real needs of the operation of ETS. As mentioned before, the rules of China's ETS appear in the form of policies more than legislations. Policies, especially the "1+N" approach, outlined the framework for the development of China's ETS in the future. Local administrative authorities can draft their policies or rules in conformity with the national policies.

Table 2. Current Rules in ETS Pilots

Pilots	Regulation
Beijing	Measures for Carbon Emissions Trading Management of Beijing (Interim)
Tianjin	Interim Measures for Carbon Emissions Trading Management of Tianjin
Shanghai	Trial Implementation Measures for Carbon Emissions Management of Shanghai
Shenzhen	Certain Provisions for Carbon Emissions Management of Shenzhen Special Economic Zone Measures for Carbon Emissions Trading Management of Shenzhen
Guangdong	Trial Implementation Measures for Carbon Emissions Management of Guangdong Province
Hubei	Interim Measures for Carbon Emissions Trading Management of Hubei Province
Chongqing	Interim Measures for Carbon Emissions Trading Management of Chongqing

2. Rules for National ETS

Notably, the construction of ETS has been given great significance since the 12th Plan in 2011, paving the way for China's ETS in the 13th Plan in 2016 that proposed to promote the construction of a nationally unified ETS. On one hand, with respect to the pivotal role of the Plan, it serves as a blueprint for China's overall development periodically every 5 years. The inclusion of ETS in the Plan reflects not only the determination of China to take an active part in global mitigation of GHG emissions, but also a new vision of economic development in harmony with environmental protection via the construction of ETS. On the other hand, the Plan, being a policy in nature, promotes the overall course of the ETS legislation but meanwhile makes related legislation being policy-driven consequently.

With the completion of 7 ETS pilots in mid-2014, the NDRC issued "Interim Measures for Carbon Emissions Trading Management" in December, 2014, which proposed some principles for the operation of ETS.⁴³ As the main

43 NDRC, *Interim Measures for Carbon Emissions Trading Management* (No. 17), http://www.gov.cn/gongbao/content/2015/content_2818456.htm (Last Visited on July 22, 2022).

administrative authority in charge of the comprehensive construction and operation of ETS, the NDRC issued some documents thereafter from 2015 to 2017 until the institutional reform of the State Council in 2018 whereupon the duty was assigned to the MEE. The MEE began to draft the “Interim Regulation for Carbon Emissions Trading Management” in April, 2019, which was eventually adopted being somewhat different from the original version as the “Interim Measures for Carbon Emissions Trading Management” in January, 2021 that is in time for the national ETS launched 6 months later. Obviously, the MEE intended to make the rules for ETS as “regulations” which are superior in hierarchy than mere “measures”. But it turned out to be a “measure”, which reflects the difficulty of the promotion of China’s ETS. Honestly, the national level rules of ETS are a manifestation, to a certain degree, of China’s policies concerning ETS construction. A subtle relationship exists between the policies and the rules, in that the policies prevail over the rules and the rules, in turn, implement the policies in a compulsory manner. The flexibility of policies fits in well with the uncertainty amid China groping its way towards a green and low-carbon society.⁴⁴ However, it is unarguably true that the policies do not in any way equal rules which are clear and precise for implementation.

C. Observation of Current Rules of China’s ETS

China proposed the comprehensive advancement of rule-based governance in late 2014. Matters like the ETS should be built and operated in accordance with law. However, there exists no law in the strict sense, but just some policies and ministerial regulations. Such policy-dominant governance cannot provide a reasonable degree of certainty to enterprises, especially when investors are making their decisions.⁴⁵ Moreover, as for the unified national market established in 2021, it simply covers the power sector without a clear schedule of expansion to other sectors, although the authority announced the future development of ETS to cover sectors such as cement, steel and chemicals, etc. However, compared to the EU, ETS in the first phase (2005-2007) included some

44 Nai, P., Luo, Y. and Yang, G., The Establishment of Carbon Trading Market in People’s Republic of China: A Legislation and Policy Perspective, *International Journal of Climate Change Strategies and Management*, No. 2, 2017. p. 144.

45 Maozhi Deng and Wenxiu Zhang, Recognition and Analysis of Potential Risks in China’s Carbon Emission Trading Markets, *Advances in Climate Change Research*, No. 1, 2019, p. 37.

12,000 installations, representing approximately 40% of EU CO₂ emissions, covering energy activities (combustion installations with a rated thermal input exceeding 20 MW (megawatts), mineral oil refineries, coke ovens, etc.), production and processing of ferrous metals, mineral industry (cement clinker, glass and ceramic bricks) and pulp, paper and board activities.⁴⁶ As mentioned above, China's carbon neutrality goal is a holistic framework embracing various sectors to mitigate GHG emissions, while China's ETS primarily focuses on the mitigation of GHG emissions in the power sector.

Reasons for the above problems can roughly be as follows. Firstly, industrial activities contribute to economic growth and result in some negative externalities.⁴⁷ If China's government imposed strict restrictions on industrial activities, it is of high probability that it will influence China's economic growth to some extent. As explained above, policies being not the same as rules are volatile, the former being more flexible so that local governments or even enterprises can have the autonomy to react appropriately and in a timely manner to climate change. Secondly, US policies of GHG emissions mitigation are not clear either. As the recent case *West Virginia et al. v. EPA et al.* shows, the supreme court held that capping CO₂ emissions at a level that would force a nationwide transition away from the use of coal to generate electricity may be a sensible "solution" to the crisis of the day. But it is not plausible that Congress give Environmental Protection Agency (EPA) the authority to adopt on its own such a regulatory scheme.⁴⁸ This case is thought to be a setback in the fight against climate change.⁴⁹ Similarly, if China's government prescribed explicit and stringent rules for enterprises to mitigate GHG emissions, which will in turn add to the cost of production for the enterprises,⁵⁰ China's enterprises will suffer grave disadvantages in competition with foreign enterprises. Moreover, it is also controversial as to how cost of mitigation of GHG emissions will be distributed

46 European Commission, *The EU ETS Handbook*, https://ec.europa.eu/clima/system/files/2017-03/ets_handbook_en.pdf (Last Visited on July 22, 2022).

47 Carson, R. T., *The Environmental Kuznets Curve: Seeking Empirical Regularity and Theoretical Structure*, *Review of Environmental Economics and Policy*, Vol. 4, No. 1, 2010, pp. 3-23.

48 *West Virginia et al. v. EPA et al.*, 597 U.S. (2022), p. 31.

49 UN News, *US Supreme Court Ruling on Environmental Protection "a Setback in Our Fight against Climate Change"*, <https://news.un.org/en/story/2022/06/1121782> (Last Visited on July 17, 2022).

50 Tang Maogang, et al., *Effects of Carbon Emission Trading on Companies' Market Value: Evidence from Listed Companies in China*, *Atmosphere*, No. 13, 2022, p. 240.

among states globally. Historically, the US went through the stage of industrialization earlier than China. According to the principle of common but differentiated responsibility, the distribution of responsibility on mitigation of GHG emissions should be in accordance with historic emissions and the capability of each of the nation states. In the Paris Agreement, states regardless of being developed or developing are invited to submit their Nationally Determined Contribution (NDC) to express their commitments to curb climate change. But it is quite clear that the content of NDC is not necessarily the same, which leaves the autonomy with states to decide their own specific commitments for mitigation and adaptation.⁵¹ China has updated its NDC in October, 2021, with some revisions on China's mitigation targets.⁵² It is understandable that China's preference for policies over laws on the subject of GHG emissions mitigation is largely due to the fact that China is still a developing country with a population of up to 1.4 billion. It is facing multiple challenges including economic development, improvement of living standard, and environmental protection, coupled with the glaring problem of unequal/lopsided and inadequate development across regions.

However, such policy-driven governance also leads to some disadvantages. To start with, policies are less predictable than rules in essence. The rule-based governance shall contribute to improving the predictability of government behavior, which provides stability for markets and attracts more investment.⁵³ In the second place, a policy-driven governance may not promote the interaction and cooperation of international carbon markets. Take the EU ETS as an example — it was established in accordance with the ETS Directive 2003/87/EC which provides clear rules for the operation of EU ETS. The linkage of carbon markets as stipulated in Article 6 of the Paris Agreement provides an advanced

51 Stellina Jolly and Abhishek Trivedi, Principle of CBDR-RC: Its Interpretation and Implementation through NDCS in the Context of Sustainable Development, *Washington Journal of Environmental Law & Policy*, No. 11, 2021, pp. 311-312.

52 China's updated NDC goals are as follows: aims to have CO₂ emissions peak before 2030 and achieve carbon neutrality before 2060; to lower CO₂ emissions per unit of GDP by over 65% from the 2005 level, to increase the share of non-fossil fuels in primary energy consumption to around 25%, to increase the forest stock volume by 6 billion cubic meters from the 2005 level, and to bring its total installed capacity of wind and solar power to over 1.2 billion kilowatts by 2030.

53 Wang Yingming, Ye Feifei and Yang Longhao, Extended Belief Rule-based System with Joint Learning for Environmental Governance Cost Prediction, *Ecological Indicators*, Vol. 111, 2020, p. 9.

legal architecture for the global carbon market.⁵⁴ EU ETS is subject to an absolute cap and covers a broad range of sectors, while China's ETS follows a restrictive cap and currently covers only the power sector. Hence, it is of foreseeable difficulty to promote cooperation between the two markets for the time being, let alone the linkage of the two markets. The ETS Directives provide the legal basis for EU ETS operation. Moreover, the carbon price in EU ETS is now six to seven times higher than the price in China's ETS. Thirdly, there are such shortcomings in policies that they can hardly be enforced by the judicial system. As a common practice, laws go ahead of the building of the carbon market, such as the ETS Directive 2003/87/EC for EU ETS, the Global Warming Solutions Act for the California carbon market, the National Greenhouse and Energy Reporting Act, 2007, for the Australian carbon market, etc.⁵⁵ However, the building of China's carbon market heavily relies on policies and the evolution of a legislative framework is lagging behind, which in turn hinders judicial activities during the building of China's carbon market. All in all, the policy-driven governance fits in well with the present development of China's ETS, but there should be a transition to the rule-based governance in the long run.

IV. OUTLOOK OF CHINA'S MITIGATION ON GHG EMISSIONS

Admittedly, it is a complex work to build and operate a national carbon market. There's still a long way to go for China's carbon market to play a main role in achieving China's ambitious goal of carbon neutrality by 2060.

A. Laws with High Authority Needed for China's ETS to Play a Significant Role

Obviously, as analyzed above, the building of China's ETS is a complicated work in which different authorities have passed relevant rules to promote its operation. These rules constitute the regulatory framework for China's ETS.

54 Daniel M. Bodansky, et al., Facilitating Linkage of Climate Policies through the Paris Outcome, *Climate Policy*, No. 8, 2016, p. 2.

55 Lv Zhongmei and Wang Guofei, Construction of China's Carbon Market: Judicial Problems and Counter-measures, *Gansu Social Science*, No. 5, 2016, pp. 161-162.

But these authorities are on the same administrative level according to China's administrative law, which means that these rules are not superior over each other. Specifically, MEE issued the "Interim Measures for Carbon Emissions Trading Management," providing for the power sector to be the first industry to compulsorily mitigate GHG emissions. The National Energy Administration (NEA) is responsible for securing national power stability.⁵⁶ As mentioned above, coal power accounts for about 60% of China's power generation. According to the rules of MEE, it is necessary to lower the percentage of coal power in the country so as to mitigate GHG emissions. Admittedly, the alternative energy sources, such as wind power and solar power, emit less GHG, though some obvious shortcomings still exist. For example, wind power directly comes from the wind, which makes it not feasible for all regions. When the wind is not strong enough for power generation, the power supply will stop. Therefore, an obvious dilemma arises because the rules of MEE focusing on environmental protection and the rules of NEA emphasizing power supply stability may sometimes contradict each other, which highlights the necessity for laws with high authority. Similarly, in lawsuits during the operation of China's ETS, these ministerial rules may encounter the dilemma of being declined to be enforced when they are inconsistent with laws passed by National People's Congress, such as the Civil Code.

Apart from laws with high authority, the demand for design and implementation of carbon market mechanisms necessitates the legislation thereof. The rule-based governance shall guarantee the efficient operation of the carbon market.⁵⁷ There ought to be a three-tier rules system in which a national regulation on emissions trading lays the foundation, relevant administrative measures of MEE serve as the macro rules, and specific rules of exchange function as the micro rules.⁵⁸ For the time being, the top priority should be given to a national

56 See Profile of the National Energy Administration, <http://www.nea.gov.cn/gjnyj/index.htm> (Last Visited on July 22, 2022).

57 Xiaofan Zhao, et al., Back to the Future: Can Chinese Doubling down and American Muddling through Fulfill 21st Century Needs for Environmental Governance? *Environmental Policy and Governance*, Vol. 30, No. 2, 2020, p. 61.

58 Beilei Hou and Zi Ling, Exploring China's National Carbon Emissions Trading Scheme, <https://www.chinalawinsight.com/2021/07/articles/environment-2/exploring-chinas-national-carbon-emissions-trading-scheme/> (Last Visited on July 15, 2022).

level emissions trading regulation among the rules facilitating the carbon market. It is essential to ensure the authority of the carbon market through rules of higher authority.⁵⁹ There should be uniform legal standards for qualifications of the entities included. It is equally important to specify the rights, obligations and responsibilities of the parties in the carbon market. Moreover, detailed provisions regarding the operation of the carbon market, such as the criteria for trading, procedure and content, should also be specified, which are meant to provide sound legal foundation and structural assurance for a national carbon market. A national regulation is indispensable for all entities to hold steady expectations towards the carbon market in terms of the mechanism itself, or the operation.⁶⁰ Apart from the national regulation, MEE, as the governing authority of China's carbon market, should also set down some supplementary/additional rules for further clarifications. It is crucial to draft and implement a national plan for distribution of carbon emissions rights, rules for reporting of GHG emissions of enterprises, and so on, which are of great significance for China's carbon market. MEE should also formulate some technical rules to regulate the registration, trading and clearance of carbon emissions rights. Last but not least, there should be continuous effort to improve the rules for the trading of carbon emissions rights. Local ETS pilots have passed their rules for trading of carbon emissions rights, which have laid the foundation for the national ETS.⁶¹ The trading rules for a national ETS are a duplicate of the local ETS pilots to some extent. As a centralized and unified trading platform for national carbon emissions rights, rules for the national exchange should be further improved covering various aspects such as trading, member management, investor competency, risk control, non-compliance, information, etc. Strict implementation of all these rules would contribute to the supervision of trading and ensure the smooth operation of the market.

Among other things, there are some other aspects to be specified concerning the carbon market. Firstly, whether the CCER will be rebooted or an offset

59 Paul Latimer and Philipp Maume, Carbon Market Regulation: Markets and Laws, *Yearbook of International Environmental Law*, No. 1, 2015, p. 69.

60 Newell, et al., Carbon Markets 15 Years after Kyoto: Lessons Learned, New Challenges, *Journal of Economic Perspectives*, No. 1, 2013, p. 135.

61 Dong Jun, Ma Yu and Sun Hongxing, From Pilot to the National Emissions Trading Scheme in China: International Practice and Domestic Experiences, *Sustainability*, No. 8, 2016, p. 522.

mechanism is applied, will influence the operation of China's carbon market. Between 2012 and 2017, the carbon price of regional exchanges ranged from 10 to 40 RMB a ton, with most at around 20 RMB. CCER prices were linked with allowance prices. But the regional markets couldn't play a full role in price discovery because they were fragmented and had small trading volumes, so the carbon price remained low. As the number of CCER projects grew, unhealthy competition on price became a problem. In March, 2017, the NDRC announced that due to low trading levels and irregularities in some projects, no new CCER projects would be approved, although existing projects would continue to trade. However, credits are essential for a complete carbon market. To stimulate emissions cuts and help China achieve its dual carbon targets, more market actors need to get involved, not just those receiving carbon allowances.⁶² Equally important are issues of how many CCERs can be used for offsetting and what kind of carbon credits will be involved. Secondly, there should be a clear schedule on what industries will be covered in the future so that investors will have time in advance to make preparations. Thirdly, there remain concerns on how to deal with the pressure of international competition faced by the export sensitive industries. Whether the government will intervene duly in the market or not will influence the willingness and participation of the enterprises. It is crucial to set floor price in case the carbon price is too low, and similarly to introduce an appropriate mechanism like the circuit breaker in the stock market when the carbon price is too high.

B. Paths to Improve China's Carbon Market

Firstly, a carbon pricing mechanism should be improved, which calls for the introduction of more trading methods.⁶³ The present ETS pilots adopt the listing trading mode of over-the-counter non-standardized commodities, which does not allow for collective bidding, thus leading to the risk of price manipulation by finalizing a large number of transactions in a short period of time at the opening.⁶⁴ So, a bidding mechanism is needed, which adopts free quotation and

62 Xu Nan, 'Rebooting China's Carbon Credits: What Will 2022 Bring?' <https://chinadialogue.net/en/climate/rebooting-chinas-carbon-credits-what-will-2022-bring/> (Last Visited on July 20, 2022).

63 Ji Changjing, Hu Yujie and Tang Baojun, 'Research on Carbon Market Price Mechanism and Influencing Factors: A Literature Review', *Nat Hazards*, 2018, p. 762.

64 Li Hao and Lei Ming, 'The Influencing Factors of China Carbon Price: A Study Based on Carbon Trading Market in Hubei Province', *IOP Conference Series Earth and Environmental Science*, No. 5, 2018, p. 8.

pooled trading in connection with the principle of price priority and time priority.⁶⁵ Moreover, a market maker mechanism and an appropriate investor mechanism should be considered to allow institutional and individual participation in the market so that the current rules allow individuals to open up accounts even when there are few carbon financial products. These two mechanisms shall improve trading efficiency and promote price discovery. The varieties of carbon market transactions should be enriched continuously. Carbon futures, carbon options and other derivatives trading should be developed on the basis of carbon spot trading.⁶⁶ Derivatives have the functions of hedging and risk transfer, which helps market participants effectively hedge the risks caused by the fluctuation of carbon emissions rights prices.⁶⁷ At the same time, diversified carbon derivatives are also conducive to the optimization of the structure of market participants and the expansion of trading volume, which will also further enhance the pricing efficiency and accuracy of the derivatives market. Furthermore, enterprises should be encouraged to use carbon pricing for risk management. There should be support for enterprises to use internal carbon pricing to manage long-term climate risks and to integrate investment decisions with climate objectives.⁶⁸ Financial institutions should use internal carbon pricing for climate risk management. Banking institutions can use carbon pricing methods for loan approval, and assess the carbon footprint of investment portfolios, by using the main parameters including carbon pricing, climate risks, and climate policies.

Secondly, the carbon offset mechanism should be treated with prudence.⁶⁹ Policies related to carbon offset mechanisms need to be revised. In order to improve China's voluntary GHG emissions reduction trading system, relevant

65 René A. Carmona and Max Fehr, Auctions and Relative Allocation Mechanisms for Cap-and-trade Schemes, <https://carmona.princeton.edu/download/fe/Auction.pdf> (Last Visited on July 22, 2022).

66 Zhou Kaile and Li Yiwen, Carbon Finance and Carbon Market in China: Progress and Challenges, *Journal of Cleaner Production*, Vol. 214, 2019, p. 540.

67 International Swaps and Derivatives Association, *Role of Derivatives in Carbon Market*, <https://www.isda.org/a/soigE/Role-of-Derivatives-in-Carbon-Markets.pdf> (Last Visited on July 22, 2022).

68 Nava Subramaniam, et al., Integration of Carbon Risks and Opportunities in Enterprise Risk Management Systems: Evidence from Australian Firms, *Journal of Cleaner Production*, Vol. 96, 2015, p. 414.

69 Alex Y. Lo and Ren Cong, After CDM: Domestic Carbon Offsetting in China, *Journal of Cleaner Production*, Vol. 141, 2017, p. 1392.

management rules should be revised as soon as possible, taking into account the latest situation at home and abroad. The detailed rules of the offset mechanism under the national carbon market system should be issued in time so as to clarify the conditions for the use of the offset mechanism, including clear regulations on the types of credits that can be used for offsetting, the types of projects, the issuance time, the geographical scope, the scope of GHG, the offset ratio, the verification and certification of emissions reductions. Equally important, CCER standards should be improved so as to complement the national carbon market as an extension.⁷⁰ The CCER registration system needs further improvement, which is meant to clarify the interface mechanism between the CCER registration system and other related platforms, including the national carbon emissions rights registration system, the carbon emissions trading system, the clean settlement system, and the CORSIA registration system, etc.

Thirdly, in order to prevent the risks brought by sharp market fluctuations, the government should play a leading role in ensuring the stability of the national carbon market, such as setting the maximum price and reserved price for the auction, maintaining the carbon price within a reasonable range, and flexibly adjusting the offset mechanism in conjunction with market changes.⁷¹

C. Steady Promotion of the Creation of China's Carbon Market

The creation of a national carbon market requires systematic and long-term work. The formulation of a clear roadmap covering the near, medium and long term goals is needed to promote the creation of a national carbon market step-by-step to achieve China's goal of carbon neutrality. In the first stage, relevant policies should be improved with a special focus on the compatibility between the relevant policies, laws and the creation of a national carbon market.⁷² In the second stage, the rapid development of the national carbon market is based on the completion of the institutional system of relevant policies, laws and regulations. It is a

70 Zhang Ning, Pang Jun, The Economic Impacts of Introducing CCER Trading and Offset Mechanism into the National Carbon Market of China, *Climate Change Research*, Vol. 55, 2022, p. 2.

71 Xu W., The Impact and Influencing Path of the Pilot Carbon Emission Trading Market — Evidence From China, *Frontiers in Environmental Science*, No. 9, 2021, p. 10.

72 International Energy Agency, *Implementing Effective Emissions Trading Systems*, IEA, 2020, Paris, <https://www.iea.org/reports/implementing-effective-emissions-trading-systems> (Last Visited on July 22, 2022).

key period for the achievement of carbon peak targets, as well as a turning point from relative emissions reduction to absolute emissions reduction, during which the national carbon market is also in transition from relative amount control to total amount control.⁷³ The total amount control effectively connects the carbon peak targets of each province. In the third stage, the national carbon market is in its mature period and its central task is to strengthen the total amount control, continuously tightening the allowances and pushing the carbon price upwards steadily. However, Chinese government also needs to give accurate signals to the energy sector about the transition in order to avoid over-investment or under-investment caused by investors misinterpreting the policy. The best tool for releasing signals is law, not policy, which always tends to maintain a certain degree of flexibility and ambiguity. When the Chinese government first announced the 3060 targets that China will peak its carbon emissions in 2030 and achieve carbon neutrality by 2060, there was a huge influx of investment into the renewable energy sector in China, leading to over-investment, which the State Council soon had to rectify.

Moreover, the industries and entities covered need expansion. Firstly, the national carbon market currently only covers the power sector, which necessitates the expansion of the industry coverage so as to eventually involve 8 high-energy-consuming industries including power, petrochemicals, chemicals, building materials, iron and steel, non-ferrous metals, paper and domestic civil aviation.⁷⁴ Secondly, MEE and other four ministries issued the “Guidance on Promoting Investment and Financing to Address Climate Change” in 2020 which proposed the gradual expansion of the range of entities covered to involve investment institutions and individuals when appropriate.⁷⁵ In such circumstances, relevant standards for entry of investment institutions and individuals should be drafted to meet the needs thereof.

73 Yuliia Oharenko, Can National ETS Help China Meet Its Climate Policy Targets? <https://sdg.iisd.org/commentary/guest-articles/can-national-ets-help-china-meet-its-climate-policy-targets/> (Last Visited on July 22, 2022).

74 Weiqing Huang, et al., Review of Recent Progress of Emission Trading Policy in China, *Journal of Cleaner Production*, Vol. 349, 2022, p. 10.

75 Yi Wu, China's Green Finance Market: Policies, Incentives, Investment Opportunities, <https://www.china-briefing.com/news/chinas-green-finance-market-policies-incentives-investment-opportunities/> (Last Visited on July 22, 2022).

D. Mechanisms to Identify and Prevent the Risks of China's Carbon Market

Admittedly, there's a need to establish a unified market supervision mechanism to ensure the normative operation of China's carbon market.⁷⁶ It is important to clarify the boundaries of different administrative authorities to execute their powers. MEE is responsible for the comprehensive coordination, organization and implementation, supervision and management of carbon emissions management and trading, including the scope of the trading entities, quota allocation, carbon emissions reporting and verification, etc. It also reviews the relevant business rules formulated by the trading institutions and registration and settlement institutions, oversees the relevant processes involved in the participation of enterprises in carbon trading, and specifies the corresponding penalties. The national financial regulatory authorities are mainly responsible for formulating relevant carbon financial management systems and monitoring the risks of financial institutions involved in carbon trading.⁷⁷ Apart from the supervision mechanism, there is also an urgent need to improve information disclosure in the carbon market.⁷⁸ The present state of information disclosure needs to be improved with regard to transparency and accessibility of transaction information, except in confidential cases. There also exist other problems, such as over conservative attitude towards information disclosure, little substantive information and insufficient information concentration.

Moreover, there should be legal basis for carbon audits so as to enhance the formulation and implementation of policies for carbon audits. Besides, carbon accounting is as important as carbon audits.⁷⁹ Relevant accounting rules need to be specified from multiple perspectives such as carbon confirmation, measurement, reporting and disclosure, which are of help for the standardized

76 Cao Mingde, Legal Problems and Legislative Recommendations for China's Emissions Trading, *Studies in Law and Business*, Vol. 28, No. 5, 2021, p. 45.

77 Tang Rehu and Lin Lishen, Status-quo, Challenges and Prospects of China's National Carbon Market, *Management of Chinese Power Enterprises*, No. 3, 2022, p. 23.

78 Yujie Hu, Xiaoyi Li and Baojun Tang, Assessing the Operational Performance and Maturity of the Carbon Trading Pilot Program: The Case Study of Beijing's Carbon Market, *Journal of Cleaner Production*, Vol. 161, 2017, p. 1273.

79 Eric Knachel and Brad Porter, Accounting Considerations for Environmental Objectives, <https://dart.deloitte.com/USDART/home/publications/deloitte/heads-up/2021/esg-objectives> (Last Visited on July 22, 2022).

guidelines for carbon accounting.

E. International Cooperation for China's Carbon Market

International cooperation is beneficial for the operation of China's carbon market, as China can learn lessons regarding the development of carbon markets as well as explore ways to contribute to global mitigation of GHG emissions.⁸⁰

First of all, it is believed that carbon leakage is caused by the differences in emissions reduction policies among countries. Although the asymmetrical emissions reduction mechanisms have changed after the Paris Agreement, the differences in emissions reduction policies between developed countries and developing countries still exist. China, as the largest developing country in the world, should continue mitigating its GHG emissions actively while formulating and implementing more and more stringent emissions reduction policies so as to bridge the gap with developed countries. China's carbon market may expand its market scale and stabilize the market by linking to the international carbon market, which will further enhance China's position in the international carbon market.⁸¹ China is taking an active part in global environmental governance relying on the Belt and Road (B&R) Initiative in which China supports more climate investment and financial projects to help countries along the route to enhance their local capacity to cope with climate change, and is also paving the way for a green financial market under B&R. Moreover, China should cooperate with countries having taken a lead role in environmental governance, such as EU and Japan, to enhance its capacity building.⁸² It is necessary to promote the development and layout of low-carbon technology sooner, as well as the transformation of scientific achievements in environmental governance.

In the second place, it is undeniably true that some industries or entities, *per se*, have difficulties in fulfilling the duty of GHG emissions mitigation, thus making it necessary to provide carbon credits to those in need. A typical example is the aviation industry. As mentioned above, CORSIA is based on the

80 Shuai Gao, et al., International Carbon Markets under the Paris Agreement: Basic Form and Development Prospects, *Advances in Climate Change Research*, Vol. 10, No. 1, 2019, p. 27.

81 Hua Y. and Dong F., China's Carbon Market Development and Carbon Market Connection: A Literature Review, *Energies*, No. 9, 2019, pp. 15-16.

82 Johanna Coenen, et al., Environmental Governance of China's Belt and Road Initiative, *Environmental Policy and Governance*, Vol. 31, No. 1, 2021, p. 10.

resolution A39-3 of International Civil Aviation Organization (ICAO),⁸³ which is a UN deal designed to help the aviation industry reach its “aspirational goal” to make all growth in international flights after 2020 “carbon neutral”.⁸⁴ For the time being, airlines basically have to buy carbon credits to offset their carbon emissions. It is technically impossible for airlines to switch to new energy sources. China has clearly supported the ICAO resolution to adopt a market-based measure to address aviation GHG emissions. However, the Chinese government has not yet formally notified ICAO of its voluntary participation in the pilot operation of the CORSIA mechanism started in 2021.⁸⁵ But China’s aviation industry will still be subject to international obligations of energy efficiency and emissions reduction once CORSIA enters its full mandatory implementation phase starting in 2027. It is essential for China to contend to lower the burden of emissions reduction for enterprises in future negotiations, during which a possible position is that CORSIA should dovetail with the UNFCCC and the Paris Agreement allowing the emission units or emissions reduction credits generated therefrom to be directly used to offset obligations of the aviation industry.

Furthermore, it is important for China to pay attention to the development of the EU Carbon Border Adjustment Mechanism.⁸⁶ In the complex game of different countries and interest groups, China should adhere to the long-term goals and principles established by the Paris Agreement, firmly develop international cooperation and fair competition, and safeguard the rights and interests of developing countries, while responding to GHG reduction with a positive stance, including promoting the development of low-carbon industry technologies, expanding the scope of carbon pricing, etc.⁸⁷

83 ICAO, *Resolution A39-3: Consolidated Statement of Continuing ICAO Policies and Practices Related to Environmental Protection Global Market-based Measure (MBM) Scheme*, https://www.icao.int/environmental-protection/Documents/Resolution_A39_3.pdf (Last Visited on July 22, 2022).

84 Jocelyn Timperley, *Corsia: The UN’s Plan to “Offset” Growth in Aviation Emissions*, <https://www.carbon-brief.org/corsia-un-plan-to-offset-growth-in-aviation-emissions-after-2020/> (Last Visited on July 22, 2022).

85 Liu Yong and Zhu Yu, *New Development in Global Governance of Climate Change — Carbon Offsetting and Reduction Scheme for International Aviation*, *Journal of Beijing Institute of Technology (Social Science Edition)*, No. 3, 2019, p. 48.

86 UNTCAD, *A European Union Carbon Border Adjustment Mechanism: Implications for Developing Countries*, 2021, pp. 6-7.

87 Zhonglu Liu and Haibo Sun, *Assessing the Impact of Emissions Trading Scheme on Low-carbon Technological Innovation: Evidence from China*, *Environmental Impact Assessment Review*, Vol. 89, 2021, p. 8.

V. CONCLUSION

The COP26⁸⁸ in Glasgow promoted the course of an international carbon market.⁸⁹ However, an international carbon market is, of course, built upon the carbon markets across different countries or regions. In this regard, China's carbon market contributes to the creation of the international carbon market.

Objectively speaking, as the world's largest emitter, China has actively taken measures to mitigate its GHG emissions in the face of constant pressure from the international community. Obviously, ETS is one of the most important among all the measures. Despite the coverage of only the power sector at present, China's carbon market is still the biggest one across the world which has issued the most allowances. And China's carbon market is also the single largest carbon market in the world. But in terms of transaction amount, the EU ETS tops the list. On July 16, 2022, China's national ETS celebrated its first anniversary. Although China's carbon market is very young, the development of the emissions trading has already gone through a decade. During the first compliance period, China's carbon market included a total of 2,162 key emission enterprises in the power sector, covering annual GHG emissions of about 4.5 billion tons of CO₂, making it the largest carbon market in the world.⁹⁰ By the end of 2021, the compliance completion rate of the national carbon market reached 99.5%, effectively bringing into play the role of enterprise emissions reduction and carbon pricing. As of July 14, 2022, the cumulative volume of carbon emissions allowances traded in the national carbon market was 193.99 million tons, with a cumulative turnover of 8.492 billion RMB.⁹¹

However, China's ETS is still in its early stage with immature rules, making

88 COP is the abbreviation of the Conference of Parties to the United Nations Framework Convention on Climate Change.

89 Kelley Kizzier, COP26 Ends with a Strong Result on Carbon Markets and an International Call to Action for the Most Urgent Climate Priorities, <https://www.edf.org/media/cop26-ends-strong-result-carbon-markets-and-international-call-action-most-urgent-climate> (Last Visited on July 22, 2022).

90 Yang Yang, China's Carbon Emission Trading Market to Celebrate 1 Year Anniversary, <https://govt.china-daily.com.cn/s/202207/20/WS62d8bde9498ea2749279ef63/chinas-carbon-emission-trading-market-to-celebrate-1-year-anniversary.html> (Last Visited on August 12, 2022).

91 Yuan Ye and Jiang Shuyi, Construction of China's Carbon Market Helps It to Be the Contributor of Global Climate Governance, https://www.thepaper.cn/newsDetail_forward_19060618 (Last Visited on August 15, 2022).

it still in need of improvements, especially in raising the authority of the relevant rules, accelerating the stable growth of the market and paying attention to global cooperation in climate governance. In the complex situation of the COVID-19 pandemic combined with the Russia-Ukraine crisis, China has slowed down the pace of its economic growth responsively, however, there's enough resilience in China's economy to face the challenges ahead in achieving its ambitious carbon neutrality goal.