China's Carbon Emission Trading Mechanism: Realistic Challenges and Practical Pathways

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Abstract. Carbon emissions trading serves as a pivotal mechanism for carbon reduction and significantly contributes to the realization of China's dual-carbon objectives. China will implement a nationwide carbon trading market from 2021, but it is still in the early stage of development, and there are still a lot of imperfections. Through an analysis of the current status of the development of China's carbon emissions trading mechanism, this study identifies several challenges within the domestic carbon emissions trading market mechanism, including the "overly singular allocation of quotas, lack of market activity, and difficulties in supervision and verification." In order to overcome these obstacles, this paper proposes a series of recommendations, including gradually increasing the proportion of paid auction quotas, accelerating the expansion of carbon market participants, and applying digital technologies for carbon emissions monitoring and data collection. This paper then put forward suggestions such as gradually expanding the proportion of allowances to be used in the auction, accelerating the expansion of carbon market participants, and applying digital technology to the monitoring of carbon emissions and data collection, with a view to providing certain theoretical support for the future optimisation and research of China's carbon emissions trading market.

Keywords: Carbon emission right, carbon pricing, trading mechanism, practical paths.

1. Introduction

As the gravity of global climate change continues to escalate, both governments and international entities are diligently seeking out efficient means to mitigate greenhouse gas emissions. In its role as one of the leading carbon emitters globally, the Chinese administration has proactively implemented a range of initiatives aimed at fostering the sustainable growth of a low-carbon economy. Among these measures, the carbon emission trading mechanism stands out as a key tool for achieving market-oriented emission reduction goals. The Chinese carbon emissions trading market has achieved good operational results since its official launch and development in July 2021. Currently, the national carbon emissions trading market covers an annual carbon dioxide emissions of about 5.1 billion tons, with 2257 key emission units included, making it the carbon market with the largest greenhouse gas emissions worldwide [1]. However, as a new phenomenon in the initial stage, the Chinese carbon emissions trading market still faces some problems and challenges in its specific application process, and its optimization path needs to be further explored.

Amidst the operational landscape of China's carbon emissions trading platform, since its launch and enforcement, numerous domestic scholars have conducted thorough research, outlining the difficulties and issues within the trading system, and subsequently suggesting viable resolutions. Some scholars believe that there are problems with China's carbon pricing, such as an inactive, insensitive, and unsmooth carbon pricing mechanism [2], incomplete function of carbon emission trading price discovery [3]. Some scholars believe that the total quota system for carbon emission trading needs further improvement and propose corresponding solutions. They believe that the total quota should be tightened to encourage enterprises to improve their emission reduction capabilities through measures such as improving technological innovation [4]. However, in previous studies, scholars have mostly raised some scattered issues and measures that have not been systematically classified and organized.

This article aims to systematically classify and review the problems and challenges mentioned in existing research through a review of existing literature and analysis of the latest data. This article mainly divides the problems in China's carbon emission trading market into three major aspects: quota allocation mechanism, trading product types and participating entities, and regulatory verification mechanism. Detailed analysis is conducted on these three main aspects, and specific problems in each aspect are elaborated. Finally, this article will propose a series of corresponding solutions based on the above research.

Although there is currently a lot of research on carbon emission trading in China, most of the existing research focuses on a small point and there are few studies that systematically analyze it from multiple levels. On this basis, this study will analyze the problems in China's carbon emission trading market from multiple aspects through a review of existing literature and propose corresponding solutions in various aspects. This is of great significance for further promoting the construction and improvement of China's carbon emission trading mechanism, as well as achieving the carbon reduction goals of "carbon peak" and "carbon neutrality".

2. Status Quo of China’s Carbon Emission Rights Trading Market

President Xi mentioned that China will strive to achieve carbon peaking and carbon neutrality by 2030 and 2060 at the 75th United Nations General Assembly. In order to realize this solemn commitment, China's carbon emission rights trading market was launched in July 2021, marking its formal entry into the era of "carbon economy". Before that, the carbon market of China had mainly gone through two stages: One was the CDM project stage under the background of the Kyoto Protocol from 2002 to 2012. The number of projects approved by the CDM Executive Board in China kept climbing, reaching nearly 222 in 2008 [5]. Another one was followed by the pilot phase of regional carbon emission trading from 2013 to 2021. Eight provinces and cities, represented by Beijing and Shenzhen, had successively carried out regional carbon emission trading activities in accordance with local conditions, and achieved remarkable results in total amount control and intensity reduction of carbon emissions.

By February 2024, China's carbon market, having been operational for approximately two and a half years, has achieved remarkable progress in four key aspects. Firstly, a relatively comprehensive institutional framework has been established, encompassing relevant management methodologies and quota allocation rules. Secondly, a series of supporting infrastructure for the trading market has been launched, including the establishment of the "National Carbon Market Information Network" website and the setting up of a carbon emissions registration authority, ensuring the smooth operation of the carbon emissions trading system. Thirdly, the capacity for carbon emissions accounting and management has been significantly enhanced. Companies participating in the carbon market have established an internal control mechanism for carbon emission management and incorporated the management of carbon assets into their business activities. The ability of participated companies to track carbon emission has been improved. Fourth, the carbon emission trading market shows a steady and improving trend. In 2023, the trading volume of the national carbon market had reached 212 million tons, accounting for 50% of the cumulative trading volume since its establishment [6]. In addition, the carbon price in China's carbon market exceeded 100 yuan/ton for the first time in April 2024, which was a record high.

3. Challenges Facing China’s Carbon Emission Rights Trading Market

Although the overall performance of Chinese carbon market is better than that of developed countries in the beginning stage of carbon market development, as it is still in its infancy, there is room for improvement in many areas. Through researching and analyzing previous literature and related reports, this paper conclude that China's carbon trading market mainly has the problems of

oversimple quota allocation method, unreasonable allocation mechanism, few types of carbon financial products, few market participants, and imperfect supervision and verification mechanism.

3.1. Quota Allocation Mechanism

China's quota allocation method is relatively simple, only free allocation method was adopted, and very small-scale carbon emission auction method was used in few cities [5]. Most of the free allocation methods are based on the "historical emission law", which grants quotas according to the past emissions amount and emission intensity of the emission-controlled companies. As a result, the companies with larger historical carbon emissions will get more emission allowances. Whereas companies that had previously reduced their emissions by means such as production innovation or machine replacement will get fewer credits. This will reduce the motivation of companies to carry out technological innovation and equipment upgrading, which is likely to cause market inequality and weaken business confidence. In addition, current and future emission control enterprises are mainly concentrated in sectors that are important to the Chinese economy, such as electricity, manufacturing, logistics and so on. If these industries are restricted by carbon emission quotas, it might inevitably have negative impact on the national economy and people's livelihood [2].

3.2. Types of Trading Products and Participated Entities

After years of exploration and development, China has a variety of carbon financial products, including carbon fund, carbon asset mortgage financing. However, compared with developed countries, the types of financial products derived from carbon emission rights in China still need to be further enriched [7], such as carbon bonds, carbon asset-backed securities products are relatively few. In addition, the national carbon market covers a relatively single industry. At present, only the electricity generation industry is included, and other carbon-intensive industries such as transportation and metal smelting are not included, which makes the liquidity of carbon emission rights low, and the market is not active enough to help to achieve the country’s objective of reducing emission amount.

3.3. Supervision and Verification Mechanism

There are three major problems in China's carbon emission trading supervision and verification mechanism. The first one is the technical difficulty and high cost of accurate monitoring of carbon emissions. Compared with the monitoring of conventional pollutants, carbon emission monitoring technology requires higher accuracy of the monitoring data. The best method to collect emission data - "direct measurement method", requires a lot of funds, personnel and expensive equipment [8]. Second, the MRV system lacks uniformity, and some systems are in conflict. Taking M (Monitoring) as an example, Article 25 of the "General Rules for Accounting and Reporting of Greenhouse Gas Emissions of Industrial Enterprises" and the "Measures for the Administration of Carbon Emission Trading (Trial implementation)" outline different rules on relevant accounting standards and methods, which impede the actual implementation. Third, the verification method of sampling survey may prompt companies to prepare false carbon emission reports.

4. Improvement Advice of China's Carbon Emission Rights Trading Market

After the ‘two sessions’ this year, the People's Bank of China, the Ministry of Ecology and Environment and seven other departments jointly issued the Guiding Opinions on Further Strengthening Financial Support for Green and Low-carbon Development, which made it clear that the construction of the China’s carbon market will be further promoted and improved. To address the above challenges, this paper propose to gradually increase the proportion of quota auction, promote the research and development of carbon financial products, accelerate the expansion of participants, increase the use of digital technology, and introduce a fairer and more effective verification mechanism.

4.1. Quota Allocation Mechanism

Lu Wei and Cui Liqin conclude that China should choose the distribution methods that combined free allocation and public auction [8]. Yang Xinjiltu et al. and Lv Jingjing also suggested that China should try to gradually expand the proportion of paid quota auctions [3,5]. This paper believe that it is reasonable and practical to increase the use of paid auctions, but the method of free allocation should also be maintained. As the free allocation can accelerate emissions trading and mitigating the negative economic impacts of mandatory emissions reductions. At the same time, policy makers would need to strengthen cooperation with scientific research institutions to introduce a free allocation method that takes into account the principles of equity and efficiency, and takes into account regional differences. In addition, local governments are required to set emission reduction targets that match local industrial development and technological capabilities. For some key enterprises or industries, the number of quotas can be increased or the compliance period extended as appropriate to ensure steady economic and social development.

4.2. Types of Traded Products and Participated Entities

Regarding the limited types of carbon financial products, financial institutions should be encouraged to actively participate in the market, continuously increasing the types of carbon financial products under the legal framework, and carry out research and development of futures options products for spot carbon emission rights [4]. In addition, it is necessary to promote the expansion of participants in the carbon market, and preparing the basic work of non-electric carbon-intensive industries to join the market, including the statistics of their emissions data and corresponding verification methods [6].

4.3. Supervision and Verification Mechanism

Zheng Pengcheng and Zhang Yanyu, and Tang Jiangwei et al. suggest applying digital technologies such as big data and artificial intelligence on carbon emission monitoring and data collection to improve the quality and efficiency of regulation [9]. Second, improving legislation at the highest level, this can help to regulate the operation and implementation of all aspects of the MRV system. Relevant departments can strengthen exchanges and cooperation with industry experts and scientific research departments to introduce fair, reasonable and more effective verification methods, so as to achieve full coverage of the supervision of market players. Finally, it is necessary to strengthen the punishment of emissions data fraud, which would help to strangle companies' intentions to fake.

5. Conclusion

Establishing a reliable carbon trading system is fundamental to the efficacy and efficiency of China's carbon trading market, an indispensable strategy for the advancement of a sustainable low-carbon economy and the improvement of the residents' life quality, and an important guarantee for realising the goals of "carbon peaking" and "carbon neutrality". It is also an important guarantee for achieving the goals of "carbon peak" and "carbon neutrality". By analysing the current development status of the domestic carbon emissions trading mechanism, it is pointed out that there are challenges in the domestic carbon emissions trading market mechanism, such as "quota allocation is too single, the trading market is inactive, and it is difficult to supervise and verify", and then it is proposed that the three aspects of the "quota allocation mechanism, the type of trading products and the main parties involved in the transaction" should be taken into account in the development of the domestic carbon emissions trading market mechanism, and the regulatory verification mechanism should be implemented, The study then proposes optimisation paths in terms of "quota allocation mechanism, types of trading products and participants, and supervision and verification mechanism", such as gradually expanding the proportion of paid quota auctions, strengthening cooperation with scientific research institutes, designing a fairer and more reasonable basis for free quota allocation, setting

emission reduction targets in accordance with local conditions, accelerating the expansion of the participating parties in the carbon market, and applying digital technology to the monitoring and data collection of carbon emissions. The study presented in this paper holds significant theoretical and practical value in advancing the enhancement of China's carbon emissions trading system, aiding in the attainment of the 'dual-carbon' objectives, and supporting the high-quality economic and social progress of China. Based on the limitations of relevant information and data, as well as the lack of theoretical understanding, the understanding of China's carbon emissions trading market and mechanism in this paper needs to be further deepened, which also puts forward higher requirements for future in-depth research.

Authors Contribution

All the authors contributed equally and their names were listed in alphabetical order.

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