China's Voluntary Carbon Market: Opportunities and Challenges from The CCER Relaunch

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Abstract. Given the severity of global climate change and the urgency of carbon emission control tasks, the restart of the China Certified Emission Reduction (CCER) mechanism has garnered significant attention. This paper analyzes the impact and challenges associated with the CCER's relaunch on domestic stakeholders. The study focuses on the innovations and operations of the CCER market mechanism, comparing it with the international Clean Development Mechanism (CDM) to highlight similarities and differences. Utilizing literature review and case analysis methods, this research explores how CCER drives investment in clean energy, stimulates technological innovation, and increases demand for carbon management services. The findings indicate that CCER not only offers enterprises flexible and diverse carbon reduction pathways but also incentivizes increased investment in clean energy technologies through market mechanisms, supporting the transition of industrial structures towards a green and low-carbon economy. Thus, the paper concludes that the restart of CCER represents a significant milestone in China's efforts to combat climate change and promote green, low-carbon development.

Keywords: CCER; Green finance; voluntary carbon market in China.

1. Introduction

The primary cause of global warming is the significant increase in greenhouse gas emissions, making energy conservation and emission reduction urgent and crucial goals. In 2023, the voluntary carbon market faced numerous problems, obstacles, and an uncertain future, continuing the downward trend of 2022 with no signs of improvement. Despite the systematic intensification of global climate change impacts and increasingly severe conditions, the development of global carbon markets seems to be diverging from global economic trends, showing increasing tendencies of decoupling and independence. Faced with this problem, China proposed China Certified Emission Reduction to solve it [1]. Certified Emission Reduction (CCER) projects have great potential, and carbon sink afforestation and forest management projects only account for 1.5% of CCER registered projects. China's economic development cannot stand large-scale industrial emission reduction, so increasing the CCER forestry carbon sink project is an ideal nature-based solution [2]. The impact of CCER on carbon pricing is also a key area of current research. CCER is an effective supplement to quota supply, and its volume can have structural effects on carbon prices [3].

The new market mechanism under the Paris Agreement aims to establish a global unified carbon market to solve related problems [4]. In this context, the voluntary carbon market is important to China. Analyzing its impact on various stakeholders under the new circumstances will help maximize its effectiveness in the country. This research will first examine the mechanisms of carbon pricing, including influencing factors and volatility. With the restart of CCER in 2023, the paper will identify market supply and demand and analyze their impacts. It will explore the development of China's voluntary carbon market, incorporating Clean Development Mechanism (CDM) case studies for comparison, and ultimately provide targeted recommendations and decisions based on the identified opportunities and challenges.

2. Concept and Mechanism of CCER

According to the "Interim Measures for the Management of Carbon Emission Rights Trading" issued by China's Ministry of Ecology and Environment, CCER refers to the quantification and verification of greenhouse gas reduction effects from projects such as renewable energy, forestry carbon sinks, and methane utilization within China, with these reductions registered in the national voluntary greenhouse gas reduction trading registry system. While the Kyoto Protocol proposed using the CDM as a compensation mechanism for emission trading systems, the CDM market has gradually shrunk in recent years, and its limitations have rendered it unsuitable for operation in China. Therefore, China successfully launched its first Certified Emission Reduction (CCER) projects, which were traded exclusively within the Chinese carbon market. However, development has been slow, and since 2017, the CCER mechanism has been suspended [5]. After nearly seven years, CCER was relaunched on January 22 in Beijing. On the first day of the market's reopening, the total transaction volume reached 375,315 tons, with a total transaction value of 23,835,280 yuan. The formation mechanism of CCER involves quota allocation, trading methods, and price formation. Quota allocation refers to the distribution of emission reduction allowances by the government or relevant institutions to eligible projects or enterprises. CCER trading typically occurs through carbon markets, employing methods such as listing agreements, bulk agreements, unilateral bidding, and other regulated trading methods. The price of CCER is determined by market supply and demand dynamics. Several factors influence price formation:

Policy Factors: Government emission reduction policies, measures, and regulatory support directly impact CCER supply and demand, thereby affecting prices.

Market Supply and Demand: The demand for emission reductions by enterprises and projects, as well as the available CCER quotas, dictate market supply and demand relationships and influence price fluctuations.

International Market Trends: The price trends in international carbon markets also affect the prices in the Chinese carbon market, particularly as international carbon market connections become stronger.

3. Impact Analysis of CCER Market Restart

3.1. Influencing Factors of CCER

3.1.1 Supply and demand of carbon quota

From the current situation, the total amount of carbon market quota directly affects the trend of carbon prices. When the total amount of quota is set low, the quota will be scarcer, and the carbon price will rise accordingly. And vice versa [6]. At the end of 2021, the first compliance period of the Chinese carbon market concluded successfully. This period involved the allocation and trading of carbon allowances for the power sector covering the years 2019-2020. The allocation was relatively generous, with the national carbon market's total cap setting noticeably higher heating and electricity benchmarks compared to local carbon pilot projects and the actual situation of most power plants [7]. As more industries are integrated into the national carbon emission trading system, the overall cap and expected baseline values for each sector are expected to align more closely with actual values. Consequently, fluctuations in carbon prices will increasingly depend on the emission reduction efficiency of enterprises [6].

3.1.2 Supply and demand of CCER

As an effective supplement to the national carbon market, the "Notice on the Carbon Emission Allowance Compliance for the First Compliance Period of the National Carbon Emission Trading Market" specifies the procedures for using CCERs to offset allowances. Currently, CCER spot credits in circulation can be used for compliance. However, since the issuance of CCER projects was halted in 2017, there were fewer than 60 million tons of CCERs remaining in the market by the end of 2021.

This tight supply has led to a continuous increase in CCER prices, bringing them closer to carbon allowance prices [8]. The Chinese CCER market was restarted in 2023, significantly affecting CCER prices. Initially, the market's reopening will greatly increase the supply of CCERs, which is expected to have a short-term negative impact on CCER prices. This increase in supply may also exert some pressure on carbon allowance prices [9].

3.2. Influence of CCER

3.2.1 Investment and construction of clean energy

On one hand, energy companies can directly apply for CCERs from their clean energy projects to participate in market trading. On the other hand, driven by cost avoidance, more high-energy-consuming enterprises will actively adopt clean energy solutions [10]. As subsidies for clean energy in China gradually decline, CCER trading has become an important channel for realizing returns on clean energy investments. According to estimates by CICC, CCER trading contributes 7% to 10% of the revenue for offshore wind projects. The restart of CCER is expected to attract more enterprises to invest in clean energy projects [6].

3.2.2 Promote the development of green and low-carbon transformation technologies in traditional industries

For traditional industries to achieve a green and low-carbon transformation, adopting advanced technologies to optimize production processes is crucial. These technologies include energy-saving techniques, clean production methods, and renewable energy utilization. By implementing these technologies, companies can effectively reduce energy consumption and carbon emissions, thus earning more CCERs in the carbon market. Companies must enhance their carbon reduction performance to lower economic costs, such as through technological innovation and process optimization, which significantly reduce greenhouse gas emissions without compromising production efficiency. This approach not only helps businesses comply with environmental regulations and policies but also boosts their competitiveness and sustainability. Additionally, CCERs encourage the development and application of environmental technologies, as companies invest in these technologies to meet reduction targets and market demands. Governments and industry associations often support this transition through subsidies, rewards, and policy incentives. This promotion effect is not only conducive to reducing carbon emissions but also contributes to the maturity of technology and the popularization of the market [8].

3.2.3 Generate more demand for carbon management services

CCER projects involve complex technical, legal, and market mechanisms from initiation to the final issuance of emission reductions. To participate effectively in the carbon market and manage their carbon assets, companies typically rely on specialized carbon management services. These services include energy audits, carbon emission assessments, and carbon asset trading management, helping companies evaluate project feasibility, optimize reduction measures, and engage in carbon market trading. Energy audits assess a company’s energy use efficiency by analyzing consumption and emissions to identify potential reduction opportunities. Carbon emission assessments measure and evaluate emissions produced during production, providing data to support reduction strategies and market participation. Before engaging in CCER projects, companies must conduct feasibility assessments covering technical, economic, and market aspects to ensure the project meets its reduction goals and achieves market benefits or cost savings. Carbon management service providers offer expert evaluations and consulting to clarify project risks and opportunities, and to develop effective implementation plans. Once CCER emission reductions are certified, managing and trading carbon assets involves monitoring market conditions, registering carbon assets, and selecting trading platforms. Carbon management service providers help enterprises maximize the value of carbon assets and optimize the management and operation of carbon assets through their expertise and resources [9].

4. Comparative Analysis with CDM International Cases

Based on the development history, CCER is later than the international CDM. For China, there is no restriction on foreign investment conditions in terms of the qualification of the owner, and foreign investors are not allowed to hold a majority stake in CDM projects in China; secondly, it is the development process of the project, and the CDM needs the issuing body to set up a board for the CDM-EB, in addition, the CDM bilateral project involves the identification of emission reduction countries, and at the same time or around the time of project validation, it needs to obtain the approval letter from the competent authorities (DNA) of each country. In addition, CDM bilateral projects involve the identification of emission reduction countries, at the same time or before and after the validation of the project need to obtain a Letter of Approval from the competent authorities of each country. CCERs must only be issued by the Department of Response to Climate Change of the Ministry of Ecology and Environment (formerly the National Development and Reform Commission) [11].

Furthermore, for the classification of projects, CDM projects are divided into two categories: one is the traditional single CDM project activities (PA for short), and the other is the scalable Programme of Activities (POA for short) under a framework and the latter framework, the process of component project activities (CPA) is more simplified and cost-reduced, which is more conducive to the formation of scale effects of micro and small projects, as shown in table 1. Under the latter framework, component project activities (CPAs) are simplified and cost-reduced, which is more conducive to forming scale effects of small and micro-projects. Although the existing CCER mechanism has almost entirely adopted the PoA methodology in the CDM, the processes for large-scale micro and small-scale projects are the same.

Table 1. CDM and CCER approved and registered projects as of September 2017, national numbers.

CDM (Clean Development Mechanism) Projects			CCER (Chinese Certified Emission Reduction) Projects		
Scope	Approved	Registered	Scope	Approved	Registered
Afforestation and reforestation	5	4	Biogas-Methane	389	116
Chemical pollutants reduction (HFC-23)	11	11	Biomass	92	46
Energy saving and efficiency improvement	630	254	Other	174	73
Fuels substitute	49	26	Forest-Carbon Sink	91	12
Landfill burning power generation	56	35	Hydro	162	94
Methane recovery & utilization	475	236	Solar	797	152
N2O decomposition	43	43	Waste-Landfill	159	34
Others	69	21	Wind	960	334
Renewable energy	3736	3177	Total Renewable energy	2824	8,61

Source: CCEREI 2017.

The most important is the difference in development cost; CDM projects than CCER projects have two more aspects of price; on the one hand, the cost of registering the project in the EB, the projected annual emission reduction of more than 15,000 tonnes of projects charged 0.1 ~ 0.2 U.S. dollars per tonne, the maximum of 350,000 U.S. dollars capped; on the other hand, the management fee to the government of the country to which the project belongs to, accounting for about 30 to 60 percent of the amount of the project transfers, and the project is the most important source of funding for the CDM Fund. This is also the most important source of funding for the CDM fund of the Ministry of Finance of China. In addition, due to the international communication and information opacity involved in CDM projects, many parts of the project development process cannot be completed by the project owner alone, and the relative cost of each part is higher. Analyzing the data in the table

below, as of September 2017, the number of projects approved and registered by CDM and CCER is close to each other, and in several ranges, the number of CCER projects is more than that of CDM.

5. CCER Opportunities and Challenges

5.1. CCER Relaunch Brings New Opportunities for Green Finance

5.1.1 Expanding channels for financial product innovation

Banks can use CCERs as collateral or security to provide loan products linked to carbon emission rights. Enterprises can enhance their debt-servicing capacity by obtaining CCER revenues and favorable financing terms. This encourages enterprises to adopt emission reduction measures and promotes the participation and innovation of financial institutions in green project financing. Insurance companies can develop CCER-related insurance products, such as carbon market risk insurance or carbon asset loss insurance. Such insurance products can protect investors and enterprises, reduce the risk of investing in and operating carbon market projects, and enhance investor confidence in the green financial market. Securities companies can provide securities trading services linked to CCERs, such as carbon quota trading platforms and futures trading. These services provide investors with diversified investment channels, promote the liquidity and transparency of the carbon market, and help form a healthy carbon market ecosystem [1].

5.1.2 Increase funding requirements for eco-projects

The relaunch of CCERs will stimulate companies to increase their investments in ecological projects such as clean energy, carbon reduction technologies, and forest land conservation, leading to new investment opportunities. Enterprises will increase their investments in clean energy and carbon reduction technologies to obtain more CCER revenues or reduce carbon reduction expenditures. This not only promotes the development of the clean energy market but also promotes technological innovation and application, providing new opportunities for enterprises to improve their competitiveness in the carbon market [7]. Implementing CCER projects will also increase the demand for funds for ecological protection projects, such as forest land conservation. Enterprises can obtain carbon emission reductions by investing in environmental protection projects, realizing the common growth of environmental and economic benefits.

5.1.3 Recovering corporate eco-assets

Banks can use CCER certificates as a pledge to provide enterprises with a low-cost, market-based emission reduction method. The operating performance of enterprises rich in ecological resources, such as forest land, will be significantly improved. The credit risk will be reduced considerably, which can effectively help enterprises revitalize their carbon quota assets, broaden the channels of realizing their assets from resources, and stimulate the enthusiasm of enterprises to participate in carbon trading and the motivation of practicing the "dual-carbon" goal. The "dual-carbon" goal will be realized. Some domestic banks have launched CCER-related financial services or ecological asset pledge financing products. However, in general, they are still in the initial stage, and the increasing recognition of the market and the further expansion of related fields will provide broad development opportunities for related financial services [4].

5.2. Current Challenges

5.2.1 Increasing Carbon Market Volatility

China's carbon emissions market needs to be more maturely developed. Carbon allowances' price and trading volume are extremely low, with obvious differences. In 2020, the average CEP of the eight pilot projects in China was about 6 USD/tonne, much lower than the EU carbon market (16 USD/tonne), and the CEP fluctuates greatly. China's current carbon trading products are single, mainly quota trading, and the proportion of free quota is too large, more than 95 [12]. In this case, CCER restart may lead to increased volatility in the carbon market. With many new emission

reduction projects entering the market, the supply of carbon credits may become unstable, affecting carbon prices' stability. This poses a certain risk to enterprises' emission reduction plans and investment decisions.

5.2.2 Inadequate relevant institutional standards

The quality and auditing standards of CCER projects may need help. To ensure the authenticity and reliability of emission reductions, it is necessary to establish a rigorous project vetting and regulatory mechanism. However, this also increases the cost and time for project development and review, making it possible that some potential projects may need to be successfully implemented. Policy uncertainty is a major challenge for CCER relaunch. Although the government supports the development of the carbon market, the specific implementation rules and support policies are still to be clarified. According to the study, the government should set a cap on the carbon offset rate of the CCER program and formulate corresponding laws and regulations. The government should set reasonable fines and subsidies to regulate carbon emission control enterprises [5]. Changes in policies may affect market expectations and the long-term planning of enterprises.

5.2.3 Competition in the global carbon market

With the continuous development of the global carbon market, China's CCER projects are also facing the pressure of international competition. Improving the international recognition and competitiveness of the projects and ensuring their position in the global carbon market is an urgent problem to be solved.

6. Conclusion

The relaunch of China's voluntary carbon market (CCER) has had far-reaching impacts on China's economy and environment, as well as challenges and opportunities. Firstly, by allowing companies to voluntarily reduce their carbon emissions and convert them into Emission Reduction Certificates (ERCs), CCERs provide economic incentives to drive increased investment in clean energy and technological innovation, helping to reduce carbon footprints and promote the application of green technologies and sustainable development of the overall economy. Secondly, CCERs have a significant catalytic effect. Enterprises participating in the projects obtain certified emission reductions and receive economic returns in the carbon market, enhancing competitiveness, optimizing energy structure, and reducing reliance on traditional high-carbon energy sources. In addition, the re-launch of CCERs has also boosted the demand for carbon management services, such as energy audits and carbon emission assessments, driving the development of the carbon management services industry. However, the CCER relaunch also faces challenges. The first is the increased volatility of the carbon market, which may affect companies' long-term investment plans and risk management strategies; the second is the imperfect auditing standards, which need to be strengthened and regulated to ensure the authenticity and validity of emission reduction certificates. Meanwhile, competition in the global carbon market is fierce, and China needs to enhance the competitiveness of CCERs in the international carbon market through policy support and market rule improvement. To maximize the opportunities CCERs bring, policy support and regulatory mechanisms need to be strengthened. The government can formulate clear carbon market policies and incentives to attract more enterprises to participate in the carbon market while enhancing the supervision of the market to ensure fair, transparent, and effective operation and prevent market manipulation and information asymmetry risks. In conclusion, the relaunch of CCERs has brought new opportunities and challenges to developing green finance and the carbon market in China. By effectively responding to the challenges and taking advantage of the opportunities, China can play an important role in global carbon emission reduction and realize a win-win situation regarding economic growth and environmentally sustainable development.

Authors Contribution

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

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