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The Mechanism, Advantages and Disadvantages of China's Carbon Emission Trading Market and Its Future Prospects

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Abstract: As the issue of global warming takes center stage, the growing demand for low-carbon development at home and abroad. On the one hand, China should actively respond and integrate into the world's new economic landscape. On the other hand, China's carbon emissions rights market should be set up to develop the Chinese economy and improve the climate issue. After many years of pilot testing in various places, China's emissions trading market is still in the initial stage and faces many problems. This essay aims to conduct an in-depth analysis of domestic emission reduction policies, the fundamental structure of the carbon trading market, as well as its associated benefits and drawbacks. The objective is to identify the specific challenges faced by China's carbon trading market and draw insights from international experience. The findings will serve as a theoretical foundation and practical reference for the establishment and enhancement of China's carbon trading market, as well as the design of its market mechanisms.

Keywords: Carbon trading market, Mechanism, CCER

1. Introduction

The Industrial Revolution's transformation of industry has caused significant socio-environmental externalities in humanity's pursuit of material wealth. Environmental degradation, energy shortages, and structural social aberrations, especially global warming, have put pressure on the global macroeconomic landscape. In response to these demands, developed economies have mostly adopted low-carbon economic paradigms that reduce emissions, energy use, and pollution. This transformational shift depends on energy-related scientific research and technological advances. This includes developing cutting-edge alternative energy sources, resetting energy infrastructures, and decarbonizing economic frameworks. To achieve this ecological and economic adjustment and accelerate technological progress, property rights must be protected and regulatory benchmarks set. Technical innovation is encouraged by the carbon emission trading scheme's environmental capacity proprietary rights. Such a system allows market-driven modulation of carbon emission expenditures, enhances carbon emission entitlement fiduciary nuances, and creates a cohesive trading architecture.

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It boosts entrepreneurial dynamism, strengthening the symbiotic relationship between proprietary rights and technological advances, enabling the cyclical sustainability of a low-carbon economy.

The People's Republic of China, the world's largest greenhouse gas emitter, is closely monitored to reduce its emissions. China's unrestrained industrial rise over the previous trisdecade remains visible despite an unprecedented eco-environmental crisis exacerbated by rapid urbanization. China must improve its macroeconomic development and create a dynamic carbon emission trading environment to overcome this carbon-intensive legacy and sustain industrial-economic growth. China's emerging carbon market and its infrastructural apparatus have garnered government attention, leading to pan-national pilot initiatives, but circumscribed market dimensions, languid trading dynamism, and nascent systemic frameworks remain. This discourse seeks to meticulously explain the pros and cons of the carbon emission trading milieu, dissect China's trading nexus' procedural intricacies, operational mechanisms, and current state, diagnose the indigenous carbon trading matrix's inherent challenges, extrapolate insights from industrialized nations' developmental trajectories, and provide a pragmatic blueprint for the holistic carbon trading milieu.

2. Analysis of emission reduction policy instruments, carbon pricing instruments, and carbon trading.

2.1. Emission reduction policy tools

Governments at home and abroad are actively using policy tools such as standards, taxes, subsidies, advocacy, and education to steer individuals and companies toward green lifestyles and low-carbon production models. By summarizing the low-carbon consumption policies of various countries, emission reduction policy tools can be divided into three categories: command and control measures, persuasion and encouragement measures, and economic stimulus measures. Command and control measures include the use of regulations and mandatory standards, mainly in the form of mandatory carbon labeling, regulation of industrial tailpipe emissions, and the decomposition of energy-saving target liability indicators. The methods of persuasion and encouragement mainly include moral education and training, as well as various forms of low-carbon advocacy and education, persuasion and encouragement of resource reduction, etc. Economic stimulus measures start by influencing cost-effectiveness and guiding participants to make behavioral choices to achieve environmental protection goals. [1] They fall into two main types:

1. Utilize markets: fees and taxes, such as carbon taxes, and subsidies, such as wind power subsidies.

2. The creation of markets, such as clarifying the nature of carbon emission rights, privatizing such rights through legal provisions, and setting up trading markets, among others.

Compared with the previous two emissions reduction policy tools, the economic stimulus measures have the advantage that they provide an economic stimulus, rather than a mandatory stimulus to the major players, and that the cost of policy implementation is low. At the same time, it comes with drawbacks: corresponding demands on market maturity and government management capacity.

2.2. Two Methods of Carbon Pricing

Figure 1 explains the basic mechanisms of the two carbon pricing methods. Carbon pricing refers to how much greenhouse gas emitters should pay for the right to emit a certain amount of greenhouse gases and is mainly based on market mechanisms to mitigate climate change. Economic theory considers environmental problems caused by greenhouse gas emissions, such as carbon dioxide, to be negative externalities in the market. Both carbon taxes and carbon trading could provide a clear

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carbon price, designed to internalize the negative externalities of carbon emissions and to reflect the principle that whoever pollutes pays.[2]

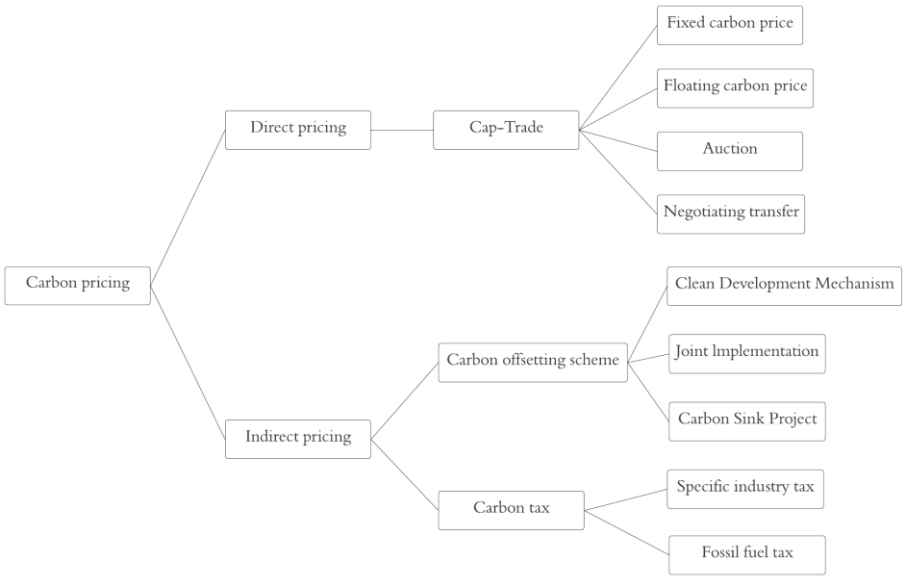

Figure 1: Flow chart of carbon pricing mechanism.

In the short run, the implementation effect of a carbon tax is due to carbon trading, as it can increase the cost of emissions for businesses through tax collection and encourage high-carbon businesses to consciously achieve their maximum level of emissions reduction. In the medium and long run, the implementation efficiency of carbon trading markets is higher than that of carbon taxes. Carbon trading markets are market regulation approaches based on total volume control that uses cost-benefit analysis to achieve a combination of minimum cost and optimal benefit for businesses in terms of carbon emissions.

3. History of the development of the carbon trading market in China

Overall, the construction of a national carbon market system is mainly divided into three phases, with participation in the international carbon trading system first, followed by domestic regional pilot projects, and then the generalization of the national carbon market system. Tabel1 explains the basic situation and product characteristics of the three phases of the market

On September 11, 2012, the Guangdong Carbon Emissions Exchange was launched for the first time, with 827 companies participating in emissions control in nine high-energy consuming industries, including the power industry, cement, steel, ceramics, petrochemicals, textiles, non-ferrous metals, plastics, and papermaking.

On 18 June 2013, the Shenzhen Carbon Emissions Rights Exchange was launched, with 635 industrial enterprises and 200 large public buildings in Shenzhen included in the pilot carbon emissions rights trading scheme.

On 26 November 2013, Shanghai's pilot carbon emissions trading scheme was officially launched. During the pilot phase, 191 enterprises such as steel, chemicals, and hotels were allowed to participate in the deal.

On 28 November 2013, the Beijing Carbon Emissions Trading Market was officially opened, with more than 400 high-performing companies forced to be included in the city's carbon trading market; on 26 December 2013, the Tianjin Emissions Trading Exchange launched carbon emissions trading,

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adding 114 enterprises and units from five industries including steel, chemicals, power and heat, petrochemicals, and oil and gas extraction to the initial pilot range.

On April 2, 2014, the Hubei Carbon Emission Rights Exchange was launched, with a total of 138 enterprises included in the carbon quota management, covering 12 industries including electricity, heating, and steel; on June 19, 2014, the Chongqing Carbon Emission Rights Exchange was launched to identify 254 industrial enterprises with annual carbon emissions exceeding 20,000 metric tons of CO2 for pilot trading, with a total quota of approximately 13,000 metric tons.

A total of 277 pilot enterprises covering nine industries, including power, petrochemicals, chemicals, building materials, steel, non-ferrous metals, paper, aviation, and ceramics, started trading carbon emissions in Fujian on Dec 22, 2016. The pilot market covers nearly 3,000 key emission units in more than 20 industries, including electricity, steel, and cement. As of June this year, the cumulative quota trading volume of the pilot carbon market in provinces and cities reached 480 million tons of carbon dioxide equivalent or about 11.4 billion yuan.[3]

The national carbon market mainly focuses on quota (CEA) trading, and CCER trading has not yet been opened. At the same time, due to the direct burning of coal in the power generation industry, the carbon dioxide emissions are relatively high, and the industry's management system is relatively sound, with a good database, making the power generation industry the first industry to be included in the national carbon market. Including 2,162 key emitters covering 4.6 billion tones of CO2 emissions, it is the world's largest carbon market. On the first day of trading, the total volume of carbon allowances traded in the national carbon emissions trading market was 4.04 million tons, with the total value of transactions exceeding 210 million yuan. In the future, the scope of the national carbon market will be gradually expanded to eventually cover industries such as power generation, petrochemicals, chemicals, building materials, steel, non-ferrous metals, papermaking, and domestic civil aviation.

4. A basic framework for a unified national carbon market

4.1. Determine the coverage

Geographical scope: The geographic scope of China's carbon emissions trading market is nationwide, that is, it covers the entire carbon emission unit of China. This includes provinces, autonomous regions, and municipalities, as well as specific special economic zones and pilot cities.

Industry scope: The industrial scope of China's carbon emissions trading market is broad, covering several important sectors of the economy, including energy, power, steel, petrochemicals, chemicals, cement, building materials, textiles, transportation, and other high-emission industries.

4.2. Set the total amount

Setting aggregate targets: The Chinese government sets aggregate targets for carbon emissions through the country's carbon reduction targets and emission reduction missions. The targets are typically based on a combination of national development needs, environmental carrying capacity, and international climate change commitments.

Determine the total allocation plan: Based on the target for the total amount of emissions, the Chinese government has formulated a quota allocation plan for carbon emissions. The scheme will take into account the actual situation of various industries, regions, and enterprises to ensure fair, reasonable, and efficient distribution.

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4.3. Trading mechanism

4.3.1. Quota allocation

Quota allocation can be divided into free allocation and paid allocation, or the two can be used at the same time according to a certain proportion. China's carbon market is dominated by free-for-all allowances, with a small portion of allowances paid for, mostly auctioned.

Initial quota calculation methods mainly include the historical emission method, historical carbon intensity reduction method, and industry baseline method. [4]

Table 1: An explanation of the types and methods of quota allocation and their advantages and disadvantages.

	Type	Meaning	Advantage& Disadvantage
Allocating method	Allocation for free	The government directly provides free distribution to emission control enterprises	Advantages: Enterprises have a strong willingness to accept and policies are easy to implement; The negative impact on the economy is relatively small. Disadvantage: There may be rent-seeking issues.
	Paid distribution	The carbon emission quota for the next year is determined based on the carbon emission data of an enterprise included in the quota management in the past few years	Advantages: Increase government revenue and reduce distortion effect through subsidy policies; Solve rent-seeking issues; More-efficient allocation. Disadvantage: Not easily accepted by enterprises
Allocated amount	Historical emissions	Based on the carbon emission data of a certain enterprise under quota management for a certain number of years in the past, determine the carbon emission quota for the next year	Advantages: The calculation method is simple and has low data requirements. Disadvantages: Unfair, indirectly rewarding enterprises with high historical emissions; Not considering recent economic development and emission reduction trends; No historical emission data for the new company has been considered.
	Historical carbon intensity reduction method	Calculate the allocation quota based on the product output, historical intensity value, emission reduction coefficient, etc. of the emitting enterprise. Conduct vertical comparisons among enterprises themselves.	Advantages: The calculation method is relatively simple and has relatively low data requirements, suitable for industries with multiple product types. Disadvantages: There is also unfairness, which indirectly rewards enterprises with relatively high historical emissions;

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Table 1: (continued).

			No historical emission data for the new company has been considered.
	Benchmarking	Based on the carbon emission efficiency benchmark of the enterprise, determine its future annual carbon emission quota. That is, horizontally comparing the proportion with enterprises in the industry, such as taking a weighted average of enterprises with lower emissions as the benchmark value for the entire industry and calculating on this basis.	Advantages: relatively fair; Set a clear benchmark for industry emission reduction, taking into account the emissions of new and old companies. Disadvantages: Complex calculation methods, high data requirements, and high administrative costs; Only used in industries with a single product category

4.3.2. CCER mechanism:

CCER is a "nationally certified voluntary emission reduction", which is an offsetting mechanism. It can be divided into two keywords: "certification" and "voluntary". "Certification" refers to a CCER project that needs to undergo a series of strict quantitative inspections and layer-by-layer filing before entering the market. "Voluntary" refers to the transaction target that is different from the carbon emission quotas imposed by the state, and is an environmental protection and emission reduction project that actively initiates emission reduction activities. Combining the two, a CCER is a type of greenhouse gas reduction initiative created by an environmental protection project or business that has been approved and filed by an officially designated agency.

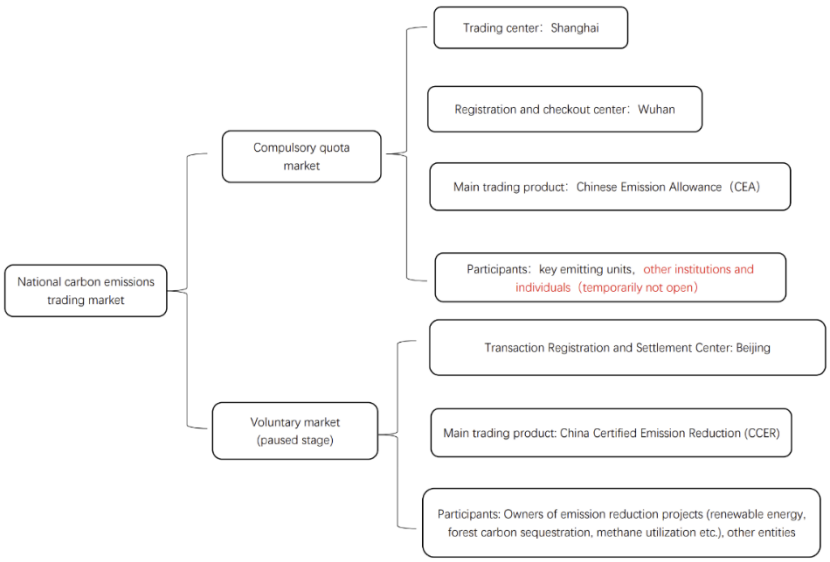

Figure 2: The current quota system in China.

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On March 14, 2017, the National Development and Reform Commission suspended the approval of greenhouse gas voluntary emission reduction trading methods, projects, and related certification bodies and certification standards. Therefore, the compensation mechanism of China's carbon trading market has not yet been perfected and is still in its initial stage.

4.4. Flexibility mechanism:

The compliance period, which is the period between the issuance of the initial carbon allowances and the final surrender of the allowances to the government, is currently one year nationwide and in pilot areas.

A quota advance is a quota that allows a participant to advance a quota from a future performance period to the current period, and a quota advance is a quota that allows a participant to store a quota from the current performance period for future use. Common finance includes carbon mortgages, carbon pledges, carbon repurchases, carbon swaps, carbon custody, and more. Carbon financial derivatives: Futures contracts, forward contracts, options, swaps, etc.

4.5. MRV

MRV refers to the process of quantifying carbon emissions and data quality assurance, including monitoring, reporting, and validation:

1. Monitoring: Companies involved in carbon trading are required to monitor their carbon emissions. This includes the collection and recording of data related to carbon emissions, such as energy consumption, production process emissions, fuel use, etc. Monitoring requires enterprises to set up corresponding monitoring systems and adopt appropriate monitoring methods and equipment for data collection.

2. Report: Companies involved in carbon trading are required to submit carbon emission data reports to the relevant regulatory authorities for the requirements of the regulations. The report usually includes the company's carbon emissions, the use of carbon allowances, and other relevant information. Requiring companies to follow a prescribed schedule and format ensures data consistency and comparability.

3. Verification: Verification of carbon emission data is an important part of ensuring the accuracy and reliability of the data. The verification is carried out by a third-party verification body that independently verifies and reviews the company's reported carbon emissions data. The verification body will review the company's monitoring methods, data collection process, and the authenticity of the data to ensure data compliance and credibility.

Implementation of MRV will help ensure transparency, fairness, and effectiveness in the carbon emissions trading market. It can prevent false reporting and fraud, enhance the trust of market participants, and push companies to be more proactive in meeting their emissions reduction obligations.

4.6. Performance mechanism

Registered trading platform, trading methods include listed agreement trading, bulk agreement trading, and one-way bidding.

4.7. Punishment mechanism

Fines: Companies that violate carbon trading rules, fail to file reports on time, or fail to pay for carbon emissions as required could face fines.

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Reduce or eliminate carbon allowances: For serious violations, regulators could reduce or eliminate carbon allowances held by companies and limit their participation in the carbon trading market.

Suspension of trading eligibility: For serious violations, regulators could suspend their trading eligibility in the carbon trading market and bar them from trading carbon emission rights.

Other Legal Consequences: In addition to the above penalties, companies that violate carbon trading rules may also face other legal consequences, such as administrative penalties or legal proceedings.

4.8. Compliance

Submission quota + CER quota = annual quota

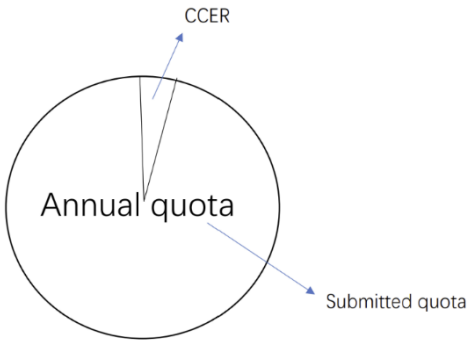

Figure 3: Submission quota ratio to CCER.

5. Basic information of the National Carbon Pilot Program

5.1. Overall market situation

1. The national carbon trading market, which includes eight pilot exchanges, offers too low a price for emissions permits compared with international carbon markets.

2. In terms of the broader context of carbon price fluctuations, the domestic carbon pilot project had a declining trajectory in average carbon prices from 2013 to 2017 in its initial phase, which was subsequently followed by a recovery leading up to 2020.

3. In terms of the volatility of carbon prices among different pilot exchanges, Hubei and Tianjin have exhibited very consistent carbon price levels, but Beijing, Shenzhen, and Guangdong have experienced notable oscillations in carbon prices.

4. In terms of trading volume, Guangdong, Shenzhen, and Hubei are at the forefront of carbon pilots.

5. In terms of carbon trading volume, the total volume of 2020 carbon pilots will decrease, but the total turnover will increase.

During the initial day of trading, the national carbon market saw a trading volume of around 4,103,900 tons for the carbon emission quota (CEA) listing agreement. This resulted in a turnover of around 210 million yuan, with the closing price settling at 51.23 yuan/ton.

For now, the national carbon trading market is generally running smoothly. The National Carbon Market carbon emission Quota (CEA) listed agreement on September 6, 2021, the trading volume was 10 tons, the turnover was 400 yuan, the opening price was 44.00 yuan/ton, the highest price was 44.00 yuan/ton, the lowest price was 44.00 yuan/ton, the closing price was 44.00 yuan /, the closing price was 1.50% lower than the previous day, there was no bulk agreement trading on the day. As of October 21, 2022, the national carbon market has accumulated 196 million tons of carbon emission

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allowances and 8.58 billion yuan in cumulative turnover. China's Ministry of Ecology and Environment released the "China's Climate Change Policies and Actions 2022 Annual Report", preliminary estimates showed that after the formation of China's national carbon trading market, the quality of economic development was steady and improving. In 2021, China's carbon dioxide emissions per unit of GDP dropped significantly, by 3.8% compared with 2020, and by 50.8% compared with 2005. Clean energy generation installations are gradually replacing traditional power generation methods, such as wind and solar power, totaling 635 million, reducing coal consumption and emissions per unit of GDP. [5]

Figure 4: National carbon price chart in the past two years.

5.2. The development of a national carbon market

The Ministry of Ecology and Environment has issued administrative measures and regulations pertaining to carbon emission rights. These measures clarify that the trading products in the national carbon trading market are carbon emission quotas, and the Ministry of Ecology and Environment may add other trading products promptly by relevant national regulations. The carbon emission quota trading system operates using the "price per ton of carbon dioxide equivalent" as the unit for pricing, with a minimum change measurement of 1 ton of carbon dioxide equivalent for the stated volume. Additionally, the minimum change measurement for the declared price is 0.01 yuan.[6]

The national carbon market not only serves high-quality development at home but also fights for China's voice in the global process of addressing climate change and building an ecological civilization. In addition to addressing climate change and promoting energy conservation and emission reduction, it is imperative to enhance the functionality of the local carbon market. This is particularly crucial within the framework of the dual-carbon target pattern. It is necessary to make the best use of the carbon market as a policy tool, force local energy transformation and the development of green and low-carbon industries, and further tap the carbon market's role in promoting low-carbon technology and green finance.

Currently, there are many problems in realizing the coordinated development of local and national carbon markets, and further research is needed to achieve effective synergies between the two markets in the future.

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At present, the national carbon market has made great progress in system design, system construction, and operation, but the inclusion schedule of other industries, how to digest the pilot quota, and other issues have not been further clarified, which will affect the construction process of the national unified carbon market and the deepening of local pilot carbon markets.

There are also institutional barriers to linking local and national carbon markets. Due to the large differences in the allocation methods, trading systems, trading processes, and carbon prices of the previous eight local carbon markets, in the long run, how to unify the rules of the local carbon market with the rules of the national carbon market and how to carry forward the quotas held by enterprises are also a major problem for the coordinated development of the local carbon market and the national carbon market.[7]

Table 2: Annual transaction data of national carbon market (July.16, 2021-December.31, 2021) [8].

Trading variety	Highest price (yuan/ton)	Lowest price (yuan/ton)	Closing price(yuan/ton)			Turnover (ton)	Volume of business (yuan)	Means of transaction
			Jul.16th, 2021	Dec.31st, 2021	Chg			
CEA	62.29	38.5	51.23	54.22	5.84%	30,774,596	1,451,471,161.73	Listing agreement trading
						148,014,754	6,209,758,861.26	Block trading
						178,789,350	7,661,230,022.99	Subtotal
Cumulative: As of December 31,2021						30,774,596	1,451,471,161.73	Listing agreement trading
						148,014,754	6,209,758,861.26	Block trading
						178,789,350	7,661,230,022.99	Total

Table 3: Annual transaction data of national carbon market (January.4, 2022-December.30, 2022) [9].

Trading variety	Highest price (yuan/ton)	Lowest price (yuan/ton)	Closing price(yuan/ton)			Turnover(ton)	Volume of business (yuan)	Means of transaction
			Dec.31st,2021	Dec.30th,2022	Chg			
CEA	61.6	50.54	54.22	55	1.44%	6,218,972	357,855,798.67	Listing agreement trading
						44,670,521	2,456,148,895.61	Block trading
						50,889,493	2,814,004,694.28	Subtotal
Cumulative: As of December 30,2022						36,993,568	1,809,326,960.40	Listing agreement trading
						192,685,275	8,665,907,756.87	Block trading
						229,678,843	10,475,234,717.27	Total

5.3. Status of local pilot carbon emission rights exchanges

At present, China's eight trading platforms have accumulated rich experience in trading management during the pilot process and have formed a relatively complete system mechanism and trading system. According to the pilot, Hubei, Shenzhen, Shanghai, and Beijing have prominent features:

Hubei Carbon Emissions Trading Center ranked first in the country in major market indicators such as total trading volume, total value, cumulative average daily trading volume, number of investors, and the amount of investment brought in from outside the province. In addition, Hubei took the lead in launching spot forward trading of carbon emission allowances, setting a precedent for the

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development and innovation of carbon financial markets. However, Hubei's relatively weak financial market foundation is its most obvious disadvantage.

Shenzhen Emissions Exchange saw the highest trading activity, mainly due to its high market openness. Shenzhen, which pioneered the introduction of institutional and individual investors, is currently the only market to introduce foreign investors. In addition, Shenzhen is more active in carbon finance innovation, issuing the country's first carbon bond, the first carbon fund, the first cross-border carbon production repurchase transaction, the first green structural deposit, etc., in the quota custody system, pledge financing, innovative trading varieties of research and development are also at the forefront. However, Shenzhen has a small market size and many trading entities, and fewer companies are included under the coverage standards of the national carbon market, which is the main drawback of the Shenzhen Emissions Exchange.

Shanghai Environment and Energy Exchange has the third-largest online trading volume in China and is the only pilot carbon market in the country that has met 100 percent of its commitments for three consecutive years. In addition, the Shanghai Environment Exchange is exploring carbon emission-forward products (planned to launch in the third quarter of this year). Shanghai's main advantages lie in its status as a financial center and its relatively mature and complete overall market environment, which will have a positive impact on the smooth operation of the national carbon market.

Although the overall volume of trading at the Beijing Environment Exchange is small, its chain of carbon trading industries is the most complete. Not only are financial institutions, carbon asset managers, and large central enterprises headquartered in Beijing, but the design team for the national carbon market is also based in Beijing, and they are important stakeholders in the development of future sustainable carbon financial products. Currently, the Beijing Environment Exchange undertakes several national research tasks, such as the development of a national carbon market management system and a carbon finance system, which also means that it will play an important role in the future national carbon market.

6. Problems in China's carbon trading market

6.1. The market access rules for carbon pilots are problematic

It is mainly manifested in the low standards of entry into enterprises and single types. China's carbon pilot scheme is largely limited to high-emission industries, with no opportunities for agriculture, forestry, and other sectors that can join the market. Moreover, this makes the pilot areas for non-industrial companies reflect poorer expectations. On that premise, carbon trading markets must lower barriers to entry to improve liquidity. But for such companies, the problem is the high marginal cost of reducing emissions, not just the amount, which makes carbon markets less useful. The long-term situation is bound to make the market lack long-term momentum, as the purpose of reducing emissions while reducing production costs cannot be achieved, which is more disadvantageous to other enterprises with strong emission reduction intentions or more necessary emission reductions. Such market resource allocation is unfair and not conducive to the long-term development of China's carbon trading market. It would also prevent China's carbon market from participating in globalization.

6.2. Lack of support for carbon finance

There are a large number of domestic and foreign financial institutions and the financial capital is full, but in our country, carbon trading in the financial sector is still in its infancy and only provides financing and loans in some areas. At the same time, domestic laws on carbon trading are not perfect; there is a lack of relevant financial accounting, assessment standards and other processing

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mechanisms; carbon trading has a shortage of talent; few derivatives are linked to carbon trading, making the market less dynamic.

6.3. Single players in the carbon market

In our country, the major players in carbon trading are the quota-distributing companies, and if only power sector companies participate in the carbon market, the market activity is limited.

6.4. The level of market activity is relatively low

Today, worldwide, the climate issues related to carbon emission trading, energy conservation and emission reduction are easy to cause corporate reputation crisis and social stability problems, coupled with irregular data sources, information barriers and rent-seeking space between enterprises and the market, making it difficult for carbon trading platforms to operate. Although the Chinese government and the Chinese financial industry are actively interested in participating in the field of carbon emission trading, at the same time, because the risk assessment of social stability is not complete, the progress of the relevant allocation policy is slow, which affects the activity of China's carbon trading market.

6.5. Standard systems such as quota allocation methods still need to be unified

Currently, the total amount of each pilot quota is relatively loose because the criteria are not clear. Many emission control companies have excess carbon permits, resulting in low carbon trading prices and weakening the financial properties of carbon permits, reducing market liquidity. In addition, the total amount of allowances in China's carbon trading pilot areas, after deducting the free allocation portion, is generally distributed by local governments, mainly through auction or pricing. However, since the allocation method and criteria are generally determined by the government of the pilot region, regional bias in the allocation of the total quota will inevitably arise, resulting in differences in the cost of the paid allocation of the quota in the various regions.[10]

6.6. Lack of effective offsetting mechanism

6.6.1. Lack of incentives to reduce emissions

Offset schemes typically encourage businesses and individuals to implement emission reduction measures and take sustainability actions in order to receive carbon offset credits. Without an offsetting mechanism, market participants may lack the incentive to proactively reduce carbon emissions, thus reducing the response to climate change.

6.6.2. Increased emission reduction costs

Offset mechanisms can provide a cost-effective way for companies to meet their emissions reduction targets. In the absence of an offsetting mechanism, companies may need to take more expensive emissions cuts to achieve the same reduction, increasing the cost of reducing emissions.

6.6.3. Unfair competition

Offset mechanisms can give companies the flexibility to choose between emission reductions and offsets. Without an offsetting mechanism, competition among companies may not be fair enough, and those industries or companies that struggle to achieve emissions reductions may face greater challenges.

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7. Conclusion

7.1. National carbon pricing

Carbon prices will likely remain stable. Carbon prices are influenced by economic and industrial trends over the long term. Market trading will set carbon prices temporarily. Short-term carbon price fluctuations are common, but excessively high or low prices are harmful to long-term market stability. Insufficiently priced carbon will demotivate firms from emission reduction efforts, but excessively priced carbon will cost high-carbon businesses a lot.

7.2. Clarify emission reduction targets and gradually tighten the total quota

Market incentives are needed to meet carbon reduction targets, and clear total amount Settings are needed to develop and improve incentive mechanisms. Some countries have set quantitative targets in their total carbon control plans, and China needs to make more transparent and stable long-term planning to help market players set expectations and act. Total quota determines market supply. A loose quota will lower the carbon price, but a tight one will hurt economic growth. Thus, the carbon quota will be a gradual tightening and dynamic adjustment process, and its total amount should be determined by moderate tightening to ensure a reasonable market supply and demand relationship and stabilize the carbon trading price.

7.3. Increase the proportion of paid distribution and release effective price signals

China's carbon market's quota allocation is mostly free, which makes price discovery difficult. The EU carbon market has used auction as the main quota allocation method since the third stage, while the US RGGI carbon market has always used auction to send effective price signals to the secondary market.

In the early stages of the national carbon market, relevant enterprises are not fully prepared to receive emission allowances as compensation, so free allocation is a reasonable way. After the national carbon market starts, paid distribution should be considered as soon as possible, gradually increasing auctions and providing clear secondary market price guidance.

7.4. Expand offset items and improve CCER pricing

Current CCER projects focus on new and renewable energy, with wind power projects being the most active and biomass power generation projects growing rapidly. CCER projects are still limited to a few types, and more types are needed to fully realize emission reduction potential while clarifying market access conditions, improving the offset process, and strengthening risk prevention.

The national carbon market construction plan calls for CCER as a basic trading product after market stability. The pilot showed that the CCER market is incomplete, the main trading method is negotiated price, and there is no market-based price discovery mechanism. The trading price and carbon quota price differ greatly, so the trading mechanism and pricing standard must be improved.

7.5. Increase market opening and participant diversity

Market-based carbon trading and large-scale carbon market development promote price discovery, energy conservation, and emission reduction. To expand the market scale and improve liquidity, institutional investors must be introduced and developed in addition to emission control enterprises' compliance needs.

Depending on operation, the national carbon market can gradually introduce institutional investors and open the market. Institutional investors have different entry thresholds, property status,

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investment experience, professional knowledge, and risk tolerance at different stages of development. As the national carbon market develops, an institutional investor management system should be gradually established to match market demand, stabilizing trading activity and promoting market health.

7.6. Create a flexible mechanism to balance market supply and demand

Many of the EU's carbon market reforms address allowance supply-demand imbalances. The EU carbon market stability reserve mechanism was announced in 2018 to give the market a consistent expectation of allowances and price trends, resulting in stable upward carbon prices. China's carbon market can set up a flexible mechanism like the EU's quota and reserve system, balance supply and demand, and maintain a stable and reasonable carbon price.

For the market regulation mechanism to work effectively in the national carbon market, detailed planning should be done in advance and the market should not be excessively interfered with to maintain its stability. To stabilize the market, the government can reserve a certain proportion of quota during allocation, set the conditions for using the reserved quota, and improve information disclosure to make carbon market information more transparent.

7.7. Study carbon market finances and accelerate trading product innovation.

Investigating carbon markets' financial properties may make it easier to invest financial assets in energy-saving and emission-reducing businesses or projects. Company and project emissions reduction efforts can be traded more easily in financial markets to promote green, low-carbon development. This is not about financing carbon markets for the sake of financing, but rather how to better serve China's carbon reduction targets.

As a trading product, the derivatives market can enhance the financial attributes of the carbon market and discover market prices, complementing the spot market and optimizing trading price determination. Therefore, China should first explore the development direction of carbon trading financialization and develop risk control measures to boost market investor confidence and vitality. Encourage commercial banks, securities banks, and other financial institutions to participate in the trading market to increase capital volume, service capacity, liquidity, and market price discovery.

Carbon trading requires spot, contract, and innovative trading. This can boost carbon finance financial institutions' profit margins, application models, and social benefits. Financial institutions should expand their services beyond bulk carbon allowance and carbon emission trading and participate more in global carbon trading. Institutional services and trading can be linked several ways:

1. Credit service is mostly assurance and security for carbon credit assets. Its goal is to use low-carbon credit system financial leverage to solve environmental and economic problems. This includes increasing bank loans to low-carbon industries, preferential support for Clean Development Mechanism (CDM) projects and environmentally sustainable initiatives, and increasing enterprise carbon asset value.
2. Financial Services: Develop carbon trading derivatives related to carbon emissions and release their financial attributes, such as carbon futures and options. This reduces the negative impact of price fluctuations on a single product, releases market liquidity, and increases investor investment potential.
3. Intermediary services: Financial institutions can use their information advantages and talent base in the investment field to expand their investment and research resources, assemble a carbon trading team to provide revenue and risk analysis services for the project, help seller enterprises contact overseas potential customers in CDM projects, or act as a carbon trading market financial consultant to provide project owners with price information.

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