

# Construction of China's Carbon Emission Trading System

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## Abstract

With the increasing global climate change, low carbon economy has become the inevitable trend of national economic development. Carbon emission trading, as an important part of low carbon economy, has become one of the main means to deal with climate change worldwide. As the world's largest emitter of carbon dioxide, China has an important role to play in the fight against climate change. Based on the concept and types of carbon emission rights, this paper introduces the principle and function of carbon emission rights trading, and expounds the international experience and development trend of carbon emission rights trading. Then, the status quo of China's carbon emissions, policy evolution and construction planning are analyzed. On this basis, this paper puts forward the objectives and principles of carbon emission trading system design, and respectively discusses the carbon emission quota allocation and management system, carbon emission trading market system, carbon emission monitoring and verification system, carbon emission trading institution construction and operation mechanism, carbon emission price formation mechanism and regulation mechanism. At the same time, it analyzes the defects and challenges of the carbon emission permit market, as well as its positioning in international competition and cooperation. Finally, the corresponding policy suggestions and research prospects are put forward. The aim is to provide reference for the construction of China's carbon emission trading system, promote the development of China's carbon emission reduction work and strengthen international cooperation.

## Keywords

Carbon Emission Right; Carbon Emission Trading; Carbon Emission Trading System.

## 1. The concept and principle of carbon emission trading

### 1.1. The concept and types of carbon emission rights

Carbon emission right refers to the right to use or trade the greenhouse gas emission rights of enterprises or institutions in accordance with certain distribution rules in order to control the total amount of greenhouse gas emission in the atmosphere.

According to different sources and uses of emission rights, carbon emission rights can be divided into the following types:

Carbon emission rights under the fixed quota system: Fixed quota system refers to the specific quota that the government allocates the total emission of a specific industry or enterprise to each enterprise or industry according to the country's overall emission reduction target and distribution principle. These types of carbon permits are usually allocated by government agencies or the National Energy Administration [1]; Carbon emission rights under voluntary emission reduction schemes: Voluntary emission reduction plan refers to the voluntary commitment of enterprises or institutions to achieve emission reduction targets within a certain period of time, and the corresponding carbon emission rights are obtained in the process of achieving the targets. These types of carbon permits are usually issued or administered by international or industry organizations; Carbon emission rights under the Clean Development Mechanism: The Clean Development Mechanism (CDM) is a mechanism between developed and developing countries to reduce greenhouse gas emissions of developing countries through cooperation projects and technology transfer, while obtaining corresponding carbon emission

rights in the process of realizing the global emission reduction targets. These types of carbon permits are issued by the United Nations administration that implements the Clean Development Mechanism; Carbon emission rights purchased from the government or enterprises: Companies or institutions can meet their emission reduction targets by purchasing carbon emission rights from the government or other companies. These types of carbon permits are usually traded on national or regional carbon markets.

In short, different types of carbon emission rights correspond to different emission reduction objectives and policy measures, and carbon emission rights market is one of the important means to achieve carbon emission reduction.

## **1.2. The principle and function of carbon emission rights trading**

Emission trading refers to the market mechanism through which enterprises or institutions can reduce greenhouse gas emissions by buying or selling carbon emission permits without exceeding their emission quotas. The principle of carbon emission trading mainly includes the allocation of carbon quotas, the formation of the market and the process of carbon trading. Specifically, carbon allowances can be allocated through governments or international organizations, and the process of forming a market is completed through carbon emission rights trading between enterprises or institutions [2]. The role of carbon emission trading includes the following aspects:

Encourage enterprises to reduce emissions: Carbon emission trading provides enterprises with the economic power to reduce carbon emissions, so that they can take the initiative to reduce carbon emissions under the incentive of market mechanism, thus promoting the emergence and promotion of emission reduction behavior; We will improve the efficiency of emission reduction: Carbon emission trading focuses the cost of emission reduction on the enterprises or institutions with the highest emissions, thus making the overall cost of emission reduction more reasonable and improving the efficiency of emission reduction; Promoting technological innovation: Carbon emission trading can encourage enterprises or institutions to adopt more environmentally friendly production processes and technologies, promote technological innovation and progress, and thus achieve sustainable reduction of greenhouse gas emissions; To provide the basis for international cooperation: Carbon emission trading provides the basis and framework for international cooperation, promotes the coordination and cooperation of international carbon emission reduction actions, and provides strong support for the global response to climate change;

In conclusion, carbon emission trading is a market-based means to achieve carbon emission reduction. It can improve emission reduction efficiency, promote technological innovation and international cooperation, and is one of the important tools to deal with climate change.

## **1.3. International experience and development trend of carbon emission trading**

Carbon emission trading is one of the important measures to deal with climate change in the world. It has been widely used in some countries and regions. The following is the international experience and development trend of carbon emission trading:

EU Emissions Trading System (EU ETS) : The EU Emissions Trading System, the world's largest carbon market, was launched in 2005. It covers more than 2,600 companies and institutions in 27 EU countries, covering various sectors such as energy, industry and transport. The system provides a market mechanism for companies to reduce emissions through the allocation and trading of carbon emission allowances, and contributes to the achievement of EU emission reduction targets; Canada's ETS: Canada launched its emissions trading system in 2019, aiming to meet its 2030 emissions reduction targets and gradually expanding the system nationwide. Canada's emissions trading system covers several provinces and territories, involving energy, manufacturing, transportation and other industries. The system uses a combination of auctions and quota giveaways to provide companies with financial incentives to cut emissions; China's ETS Pilot :China launched a pilot carbon emissions trading program in 2011 and it is now operating in seven provinces and cities, including Beijing, Shanghai, Guangdong and Shenzhen. China's carbon emission trading pilot program promotes carbon emission reduction through market mechanisms and industry standards to achieve national emission reduction targets. A national emissions trading system is expected to start by the end of 2021; Global Emissions Trading

Alliance (ICAP) : The Global Emissions Trading Alliance is a non-profit organization made up of policy makers and implementors of emissions trading systems. ICAP is committed to promoting the development and cooperation of carbon emission trading, promoting the standardization and stability of carbon emission trading markets by facilitating the exchange of experience and technical cooperation between countries[3].

In short, carbon emission trading has been widely applied and developed around the world, and will continue to be an important tool for global response to climate change in the future. With the continuous improvement and expansion of the carbon emission trading system, its role in promoting emission reduction, technological innovation, international cooperation and other aspects will continue to strengthen.

## **2. Current situation and policy background of China's carbon emissions**

### **2.1. Analysis of China's carbon emission status**

China is one of the world's biggest emitters of greenhouse gases, led by carbon dioxide. According to the National Bureau of Statistics, China emitted 193 million tons of carbon dioxide in 2019, accounting for about 28 percent of the global total. The growth trend of carbon emissions has been maintained at a high level in the past decades, which makes China face great challenges in dealing with climate change. From the perspective of industry, China's carbon emissions are mainly concentrated in energy, industry, transportation and other sectors. The energy sector is the largest source of emissions, followed by industry and transport. With the rapid development of economy, the demand for energy and industry increases, leading to the constant rise of carbon emissions. At the same time, urbanization is increasing carbon emissions from the transportation sector. In addition, there are regional differences in the distribution of China's carbon emissions. The eastern part of China is the country's economic center and energy consumption center, and the region with the highest carbon emissions. The Midwest, by contrast, has relatively low carbon emissions, but that doesn't mean they can ignore the problem. As the country's total carbon emissions continue to climb, all regions should also work together to promote carbon emission reduction. In general, China is a country with large carbon emissions and high growth trend. Coping with climate change has become a serious challenge that the Chinese government and the whole society must face. Therefore, strengthening carbon emission reduction measures, building carbon markets and promoting carbon trading have become one of the important ways to deal with climate change in China.

### **2.2. Evolution of China's carbon emission policies**

China's carbon emission policy has experienced a long evolution process, and its main feature is gradually changing from policy promotion to institutional construction. From the 1980s to the early 1990s, China's environmental protection work was achieved mainly through the promulgation of a series of laws and regulations. During this period, the government focused on pollution control and environmental protection, and relatively little attention was paid to the issue of carbon emissions. It was not until 1994 that China enacted its first law on greenhouse gas emissions, the Law of the People's Republic of China on the Prevention and Control of Air Pollution. The law stipulates that greenhouse gas emissions should be controlled and reduced, but does not address specifics such as carbon trading. In 2005, the Chinese government issued China's National Climate Change Plan (2004-2010), the country's first climate change planning document. The plan sets targets for controlling greenhouse gas emissions and sets out a series of policy measures, such as promoting clean energy and strengthening energy conservation and emission reduction. Since then, China has introduced a series of environmental protection policies, such as the Energy Conservation Law and the Clean Development Mechanism Guidelines, marking the beginning of China's attention to carbon emissions. In 2013, the Chinese government set the goal of establishing a carbon trading market to become one of the largest in the world. In 2015, the Chinese government issued the Opinions of The State Council on Strengthening the Response to Climate Change, which set out clear requirements for the establishment of a carbon emission trading market [4]. In the same year, the Chinese government set up seven pilot carbon trading markets in Beijing, Shanghai, Shenzhen and other places, and began experimenting with carbon trading. In 2017, The State Council of China issued the Guidelines on Promoting the Construction of a Carbon Market, proposing to gradually establish a nationwide carbon emission trading market and gradually

promote the construction of carbon pricing, carbon trading, carbon tax and other systems. In 2018, China launched the construction of a national carbon emission trading market, marking a step forward in the institutional construction of China's carbon emission reduction policies. With the gradual maturity of China's carbon market, China's carbon emission reduction policies and carbon trading mechanisms will continue to improve and develop.

### **3. Construction of China's carbon emission trading system**

#### **3.1. Objectives and principles of system design**

The design of carbon emission trading system needs to clarify its objectives and principles to ensure its effectiveness and sustainability. Here are some possible goals and principles:

##### **3.1.1. Objectives**

**Achieving carbon Reduction targets:** The ultimate goal of the carbon cap-and-trade scheme is to reduce emissions of greenhouse gases such as carbon dioxide. Therefore, the system should be designed to achieve national or regional carbon reduction targets.

**Increase economic efficiency:** Carbon emission trading systems can provide market incentives for companies to reduce emissions and improve efficiency by reducing costs. **Promote technological innovation:** Through carbon emission trading, enterprises can make better use of advanced technologies and reduce carbon emissions, which will encourage technological innovation. **Integration with the international carbon market:** The system design should consider integration with the international carbon market so that China's carbon emission trading can be recognized and effectively traded in the international market.

##### **3.1.2. Principles**

**Fairness and equity:** The system should ensure equal opportunities and a level playing field for all participants in the carbon emission trading market. **Transparency and traceability:** In order to promote market transparency and traceability, carbon emission trading should publicly release market information and trading data. **Feasibility and sustainability:** The system should be designed to ensure that the carbon trading market is viable and sustainable, so that it can operate stably in the future and provide enterprises with long-term emission reduction opportunities. **Governance by law:** The system should follow the provisions of laws and regulations to ensure a legal, fair, open and transparent trading mechanism. When formulating the carbon emission trading system, it is necessary to take into account different market players, different industries and different regions to ensure its flexibility and adaptability. At the same time, it is also necessary to pay attention to the degree of public and media attention to the system, and carry out necessary publicity and interpretation of the system.

#### **3.2. Carbon emission right quota allocation and management system**

The carbon emission quota allocation and management system is the core of the carbon trading market. Its main role is to determine the carbon emission quota of the units participating in the carbon trading, and supervise the implementation process of the trading to ensure the fair, just and efficient operation of the market. The following are some elements that may be included in the allocation and administration of carbon emission allowances:

**Quota allocation method:** In order to ensure the fairness and justice of the market, it is necessary to develop a fair and scientific method of carbon emission quota allocation, which should take into account such factors as enterprise size, industry category, energy consumption intensity, geographical location, etc. For the first time; **Quota allocation,** the government may specify quotas directly or allocate them to several different sectors or industries; **Quota Authority:** Carbon trading requires a dedicated body to manage allocation, trading and regulation of quotas. The agency should be managed by the government or a government-mandated agency; **Cap-and-trade mechanism:** In order to improve the efficiency and fairness of carbon emission trading, it is necessary to establish a reasonable trading mechanism [5]. When developing the carbon emission trading mechanism, it is necessary to consider how to determine the trading price, trading method (such as auction or bidding), trading objects and other factors; **Trading restrictions on carbon emission rights:** In order to ensure the normal operation of the market, trading restrictions and rules need to be formulated. For example, the government may stipulate that traders

must purchase a certain amount of quota in the market and complete the trading of quota within a certain period;

Disclosure of trading data: Transparency is key to the success of carbon markets. Therefore, trading data should be published in a timely manner so that the public, regulators and market participants can monitor the functioning of the market.

The above are the elements that may be included in the allocation and management system of carbon emission permits. The specific design may need to be adjusted appropriately according to the actual situation.

### **3.3. Design of carbon emission trading market system**

Carbon emission trading market is a platform for carbon emission trading. It needs to be efficient, transparent, fair and just. The following aspects should be considered in the system design: Market access system: Market access system refers to the qualification examination and supervision of participants in the trading market. Different access standards should be formulated according to the type and size of participants to ensure fair competition and risk control in the market. At the same time, a corresponding regulatory body and punishment mechanism should be established to ensure market stability and justice. Trading rules and mechanisms: Trading rules and mechanisms refer to the specific rules and methods of trading between parties in a trading market. Appropriate trading rules and mechanisms should be formulated according to market characteristics and participants' needs, including trading time, trading methods, trading varieties, trading systems, etc., to ensure transparent, fair and efficient trading. Supervision and penalty mechanism: Supervision and penalty mechanism refers to the supervision and penalty system for the behaviors of all participants in the market. A corresponding regulatory body and punishment mechanism should be established, including the examination of the qualifications of market participants, real-time supervision of transactions, and penalties for violations, to ensure market stability and justice. Market information disclosure and publicity system: Market information disclosure and publicity system refers to the regulations on the information disclosure and publicity of all parties in the market. The corresponding information disclosure and publicity system should be established, including the transparency and openness of market information and the publicity of market participants' information, so as to ensure the transparency and justice of market information. Market risk management system: Market risk management system refers to the management and control of the transaction risks of all parties in the market. A corresponding market risk management system should be established, including risk assessment, risk diversification, risk early warning, risk compensation, etc., to ensure market stability and security. Market development planning and evaluation system: The market development planning and evaluation system refers to the system for planning and evaluating the development and operation of the carbon emission trading market. The corresponding market development planning and evaluation system should be established, including market demand forecast, market development planning, market operation effect evaluation, etc., to ensure the long-term stability and sustainable development of the market.

### **3.4. Establishment and operation mechanism of carbon emission trading institutions**

Establishment and operation mechanism of carbon emission trading institutions

Carbon emission trading institution is an important part of carbon market construction, responsible for carbon emission trading, clearing and settlement. This part will introduce the construction and operation mechanism of carbon emission trading institutions, including market operation mode, participants and supervision mechanism.

#### **3.4.1. Market operation mode**

There are two main operating modes of carbon emission trading market, namely exchange and over-the-counter market. Exchange is the main form of carbon emission trading, which has the characteristics of openness, transparency and standardization. Exchanges can set strict entry thresholds, trading restrictions and risk management for trading participants to ensure the healthy development of the market. The OTC market refers to the market for trading carbon emission rights outside the exchange. Its trading objects and methods are relatively flexible, but it also has the problem of large trading risks.



### 3.4.2. Participants

Participants in the carbon emission trading market mainly include the government, enterprises and investors. The government is the primary regulator and planner of the carbon market, responsible for supervising market transactions and guiding market development. Enterprises are the main trading participants in the carbon market, and the matching relationship between their emissions and carbon emission quota determines the supply-demand relationship in the market. Investors are the capital providers and trading participants of the carbon market, whose investment behavior will directly affect the market price and supply and demand relationship.

### 3.4.3. Supervision mechanism

The regulatory mechanism of carbon emission trading market mainly includes government supervision and self-regulation. Government regulation means that the government supervises and manages the operation of the carbon market through legislation, law enforcement and supervision to ensure market justice, fairness and norms [6]. Self-regulation refers to the self-restraint and management of carbon market participants, which ensures the normal operation and stable development of the market through the establishment of self-regulation rules, market access thresholds and trading restrictions.

At the same time, in order to ensure an open, transparent and standardized market, carbon emission trading institutions also need to establish a sound information disclosure and risk management mechanism. The information disclosure mechanism includes the disclosure and release of market price, trading volume, trading direction and other information to ensure market transparency and justice. The risk management mechanism includes risk assessment, risk early warning and risk control to ensure the stability and security of the market.

## 3.5. Carbon emission right price formation mechanism and regulation mechanism

Carbon emission right price formation mechanism refers to the process and mechanism of carbon emission right price formation under the market supply and demand relationship and other factors. The price of carbon emission rights directly affects the operation and development of carbon market. In order to ensure the smooth operation of carbon market, it is necessary to design and implement certain regulation mechanism. Carbon emission price formation mechanism mainly includes market supply and demand relationship, government policy guidance and international market influence and other factors. In terms of market supply and demand, the supply side includes domestic enterprises and imported carbon emission rights, while the demand side includes domestic enterprises and investors. Government policy guidance includes setting the total amount and distribution scheme of carbon emission rights and setting the maximum limit and minimum protection price of carbon emission rights. International market influence includes international carbon market price, international carbon emission trading volume and international supply and demand relationship of carbon emission rights. In order to ensure the smooth operation of carbon market, it is necessary to design and implement certain regulation mechanism [7]. The main purpose of the regulation mechanism is to stabilize the carbon market price, prevent excessive market fluctuations and reduce market risks. Regulation mechanism mainly includes market early warning mechanism, market intervention mechanism and market supervision mechanism. The market early warning mechanism mainly detects abnormal price fluctuations in the carbon market in time and releases early warning information to market participants through means of market monitoring and information disclosure. Market intervention mechanisms, including national reserves, emergency allocation and other measures, can stabilize market prices by increasing or reducing the supply of carbon emission permits. Market supervision mechanism includes regulating market trading behavior, formulating market entry and exit rules, and cracking down on fraud. To sum up, carbon emission right price formation mechanism and regulation mechanism are important components of carbon market construction and play an important role in ensuring the stable and healthy development of carbon market.

## 4. Risks and Challenges of China's carbon emission trading system

### 4.1. Risk of price fluctuation of carbon emission rights

Carbon emission right price fluctuation risk refers to the risk of carbon emission right price fluctuation caused by market supply and demand changes, macroeconomic fluctuation, policy adjustment and other factors, which will affect the income, cost and market expectation of carbon market participants. The following analyzes the price fluctuation risk of carbon emission rights from three aspects: market supply and demand, macro economy and policy adjustment.

#### 4.1.1. Market supply and demand factors

The fluctuation of carbon emission right price is affected by market supply and demand factors. When the supply of carbon emission permits is sufficient but the demand is insufficient, the price of carbon emission permits in the market will decrease. On the contrary, when the supply of carbon emission permits is insufficient but the demand is sufficient, the price of carbon emission permits in the market will rise. The reasons for the imbalance of supply and demand in the carbon emission rights market may include technological progress, industrial structure adjustment, policy adjustment and other factors.

#### 4.1.2. Macroeconomic factors

Macroeconomic fluctuations also have an important impact on the price fluctuations of carbon emission rights. The level and trend of macroeconomic development will directly affect industrial production and enterprise operation, thus affecting the carbon emission of enterprises. When economic growth slows down, the demand for carbon emission permits decreases and so does the price. On the contrary, when economic growth accelerates, the demand for carbon emission permits will increase, and so will the price.

#### 4.1.3. Policy adjustment factors

Policy adjustment is one of the important factors of carbon emission price fluctuation. The change of the policy affects the demand and supply of the carbon market, which leads to the fluctuation of the price of carbon emission rights. Policy adjustment includes national policy, local policy and international policy, such as national adjustment of carbon emission reduction policy, change of local government carbon emission allocation policy, international carbon emission trading policy, etc., will have an impact on carbon emission price [8].

In response to the risk of carbon emission permit price fluctuations, participants in the carbon market can adopt a variety of risk management strategies, such as hedging through the futures market of the exchange, adopting diversified investment strategies, controlling position risks, and timely following up policy changes. In addition, government departments can also formulate policies and measures, provide risk management tools, help enterprises reduce the risk of carbon emission rights price fluctuation, and promote the carbon market

### 4.2. Defects and challenges of carbon emission permit market

The construction and development of the carbon emission permit market faces some challenges and defects, which need to be fully paid attention to and solved to ensure the effective operation and development of the carbon market. Here are some of the main ones:

#### 4.2.1. Insufficient market supply

The successful operation of the carbon market requires sufficient supply of carbon emission permits. However, the current supply may not be enough to meet the market demand, which may lead to high prices, thus affecting the sustainability and development of the market. Therefore, more carbon markets need to be established to expand the scale and scope of carbon trading.

#### 4.2.2. Regulatory deficiencies

The carbon emission permit market needs strict supervision and management to ensure market fairness and transparency. However, due to the complexity and novelty of the carbon emission permit market, the existing regulatory system may not be sufficient to effectively address the market challenges. Therefore, it is necessary to strengthen the construction of regulatory system and improve regulatory efficiency.

#### 4.2.3. Risk of price fluctuation

Fluctuations of carbon emission rights market prices may cause risks and losses to market participants. Therefore, it is necessary to establish an effective risk management mechanism to mitigate the risks and losses of market participants.

#### 4.2.4. Fraud and manipulation

The carbon emission permit market is also at risk of fraud and manipulation, which may lead to unfairness and imbalance in the market. Therefore, market monitoring and anti-fraud mechanisms need to be strengthened to prevent market manipulation.

#### 4.2.5. International cooperation and coordination

The carbon emission market needs to establish links and cooperation with the global carbon market, which requires international cooperation and coordination. However, due to differences in carbon market standards and regimes in different countries, this can lead to disjointed and uncoordinated markets. Therefore, it is necessary to strengthen international cooperation and coordination to establish a unified global carbon market standard and system.

### 4.3. International competition and cooperation in the carbon emission trading market

Carbon emission trading market is a global market in which competition and cooperation between countries are of great significance. Internationally, some countries have established mature carbon markets, such as the European Union, the United States, Canada, Japan and so on. These countries have accumulated rich experience and technology in the development of carbon market, which has certain reference significance for the construction of China's carbon market. At the same time, in the context of the global response to climate change, there is also room for and necessity for carbon market cooperation among countries. For example, international cooperation on carbon emission trading can reduce the cost of carbon emissions and contribute to the achievement of global carbon reduction targets through joint actions and market interconnection [9]. In addition, the development of carbon markets also requires global standards and rules on which countries can cooperate and exchange. In conclusion, China needs to actively learn from international experience in the process of building a carbon emission trading market, and also need to carry out international cooperation to jointly promote the process of global response to climate change.

## 5. Conclusion

In the future, the construction and development of China's carbon emission trading market will still face many challenges and opportunities. In order to better promote the construction of China's carbon market, it is necessary to continue to explore and improve the carbon emission trading system and market mechanism, strengthen the allocation and management of carbon emission quota, improve monitoring and verification capabilities, improve the market supervision mechanism, and strengthen technological innovation and personnel training. In addition, it is also necessary to strengthen cooperation and exchanges with the international carbon market, understand the experience and development trend of the international market, actively participate in the construction of the global carbon market system and the formulation of rules, and enhance China's voice and competitiveness in the global carbon market. In short, the construction of China's carbon market faces both challenges and great opportunities. Only by deepening reform, strengthening innovation and promoting the healthy development of the market can we make greater contributions to China's sustainable economic development and environmental protection.

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