

# Research on Cross-Regional Carbon Trading Cooperation between Sichuan and Chongqing

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**Abstract:** As one of the major coal-fired power generation regions, Sichuan and Chongqing rank among the top in the western region in terms of carbon emissions and have great emission reduction potential. Therefore, controlling the total carbon emissions of the two places is an important measure to achieve the goals of carbon peaking and carbon neutrality, and also an effective means to realize the green development of the Chengdu-Chongqing Twin City Economic Circle. However, drawbacks such as insufficient vitality of the carbon markets in Sichuan and Chongqing and enterprises participating only for compliance purposes have become increasingly prominent. To fulfill the dual carbon tasks, stimulate the vitality of the carbon markets in Sichuan and Chongqing, further reduce the energy intensity of the two regions and boost export trade, a cross-regional carbon trading market can be constructed in Sichuan and Chongqing relying on the Chengdu-Chongqing Twin City Economic Circle, the fourth pole of China's economic growth. By formulating cross-regional carbon trading management policies, building a cross-regional carbon trading platform, cultivating professional talents, introducing green carbon reduction technologies and other measures, the circulation of carbon resources between Sichuan and Chongqing can be promoted to realize coordinated emission reduction, joint construction and shared benefits of the two places.

**Keywords:** Cross-regional carbon trading; Carbon resources; Carbon peaking; Carbon neutrality.

## 1. Current Situation of the Carbon Trading Markets in Sichuan and Chongqing

### 1.1. Policy Status Quo of the Carbon Markets in Sichuan and Chongqing

Following the release of the Outline of the Construction Plan for the Chengdu-Chongqing Twin City Economic Circle in 2020, Sichuan and Chongqing jointly adopted the Framework Agreement on Cooperation in Addressing Climate Change and the Cooperation Agreement on Establishing a Regional Environmental Access Consultation Mechanism in 2021. These three important documents demonstrate the determination of Sichuan and Chongqing in ecological and environmental protection. Among them, the goals of "pollution reduction and carbon abatement" and "establishing a regional carbon emission rights trading market in Sichuan and Chongqing" are particularly important. Under the premise of national policy permission, the two places will jointly explore and promote the construction of a carbon emission rights trading market relying on their existing carbon emission rights trading systems.

In February 2022, the governments of Sichuan and Chongqing formulated the Joint Action Plan for Carbon Peaking and Carbon Neutrality in the Chengdu-Chongqing Twin City Economic Circle. In accordance with the Plan, Sichuan and Chongqing will jointly promote the R&D and application of key green and low-carbon technologies, co-construct a green and low-carbon market factor platform, and further advance the market-oriented reform of resource factors such as pollutant discharge rights and carbon emission rights. On the premise of comprehensively considering the categories of carbon trading products and the current market development in Sichuan and Chongqing, the two places will focus on cross-border trading issues, adhere to a unified standard for both regions, improve the cross-regional green

and low-carbon rights trading mechanism and the resource emission reduction trading mechanism, aiming to achieve such goals as the slowdown of the growth rate of carbon dioxide emissions in Sichuan and Chongqing by 2025, the further increase of the proportion of non-fossil energy, and substantial progress in the coordinated promotion of carbon peaking and carbon neutrality work.

On April 12, 2023, the Sichuan-Chongqing Joint Service Platform for Carbon Neutrality was officially launched. In accordance with the principle of step-by-step progress, Sichuan and Chongqing have carried out phased cooperation in such areas as "carrying out cross-institutional cooperation on Certified Emission Reduction (CER), promoting voluntary emission reductions for carbon neutrality, and advancing the capacity building of the carbon market in the western region", taking the first solid step in the cooperation of the environmental rights trading market between the two places.

### 1.2. Current Development of the Carbon Markets in Sichuan and Chongqing

General situation of the Chongqing carbon trading market in 2023:

In terms of trading volume, the total trading volume of carbon emission allowances in the national carbon market reached 1,231,834 tons in May. Shanghai, Guangdong and Shenzhen ranked the top in trading volume, followed by Hubei, Tianjin and Fujian, while Beijing and Chongqing were at the bottom. However, Beijing had trading volume in the early, middle and late ten days of May, whereas Chongqing only had trading volume on the 29th. In October, the total trading volume of carbon emission allowances in the national carbon market was 9,305 tons. As the second compliance period approached, the trading volume of carbon markets in Shanghai and other regions rose gradually. Taking the Beijing carbon market as an example, its transaction volume was about 400,000 tons in October, while there was no trading volume in the Chongqing carbon trading market during the

same month.

In terms of trading price, the average national carbon price was 56 CNY per ton in May. The carbon price in Beijing remained above 100 CNY per ton, followed by Guangdong with a price of around 80 CNY per ton and Shenzhen with around 65 CNY per ton. The carbon price in Shanghai ranged from 58 to 62 CNY per ton, and that in Tianjin and Fujian was basically between 32 and 33 CNY per ton. In contrast, the carbon price in Chongqing, which only had one day of trading in May, dropped as low as 29.5 CNY per ton. On October 31, with the arrival of the second compliance period, the average daily closing price of the national carbon market reached 80.37 CNY per ton, and the monthly highest price hit a record high of 82.79 CNY per ton in the national carbon market, yet there was no trading activity in the Chongqing carbon trading market in October.

The above data fully indicate that the Chongqing carbon trading market is currently plagued by problems such as a small scale, insufficient vitality and enterprises participating merely for compliance purposes.

General situation of the Sichuan carbon trading market in 2023:

In terms of trading volume, by November 2023, the Sichuan carbon market was dominated by Certified Emission Reduction (CER) trading, with a relatively single variety of carbon trading products. The total trading volume of CER was 16,037 tons in July, and it rose to 46,093 tons in August as the compliance period drew near. Starting from September, the trading volume of CER concluded through over-the-counter trading soared from 0 to 21,231 tons in addition to block trading and fixed-price selection, with the overall trading volume increasing by 82,015 tons. In October, the trading volume of CER via the three trading methods surged sharply, with the total trading volume rising by 112,133 tons. By the end of November, the overall trading volume of CER in Sichuan dropped by 234,794 tons.

In terms of trading price, the average price of CER was 82 CNY per ton in June, 165 CNY per ton in July, 64 CNY per ton in August, 57 CNY per ton in September, 78 CNY per ton in October and only 2 CNY per ton in November. Moreover, the Sichuan United Environment Exchange organized an electronic bidding for CER Qianwasi 01 on September 1, which was only successful after three failed auctions.

The above data show that the Sichuan carbon market is confronted with problems such as a single variety of carbon trading products, unstable prices, strong compliance-oriented motivation of enterprises, and insufficient supply and demand.

## **2. Necessity of Constructing a Cross-Regional Carbon Trading Market in Sichuan and Chongqing**

### **2.1. Fulfilling the Dual Carbon Tasks**

The Paris Agreement in 2015 set carbon emission reduction targets for all participating countries to achieve a global climate transition. Although China is a developing country, as the world's second largest economy, it put forward the goals of carbon peaking and carbon neutrality in 2020 and established a national unified carbon emission rights trading market in 2021, aiming to optimize the rational allocation of carbon resources through market means and promote the achievement of emission reduction targets.

First of all, China's energy structure is dominated by coal, with a shortage of natural gas and oil. In particular, Sichuan

and Chongqing, as major coal-fired power generation regions, have a high proportion of coal in their energy consumption structure and thus large carbon emissions. Secondly, located in the western region, Sichuan and Chongqing have a relatively low level of economic development and lack financial and technical support, making it difficult to balance the upgrading of the energy system and the achievement of emission reduction targets. Finally, the energy in the eastern region is mainly transmitted from the western region, and the obstacles to the realization of emission reduction targets in the west will ultimately affect the achievement of the dual carbon targets in the east and exacerbate the unbalanced development of the national carbon market. Therefore, taking advantage of the similar energy consumption structures and small regional differences between Sichuan and Chongqing, establishing a cross-regional carbon trading market can promote the cross-regional flow of carbon resources between the two places, adhere to a unified standard for both regions, avoid carbon leakage caused by enterprises' speculative behaviors, and thus facilitate the country to achieve the goals of carbon peaking and carbon neutrality.

### **2.2. Stimulating the Vitality of the Carbon Markets in Sichuan and Chongqing**

Taking the national carbon market as an example, after its establishment in Shanghai in 2021, the trading volume on the first day reached 4.1 million tons, but then declined continuously, and the trading volume was concentrated near the compliance period.

For the pilot carbon markets, the 8 pilot regions are relatively closed, resulting in the fragmentation of the carbon market. The pilot markets are small in scale and have even poorer liquidity, and like the national carbon market, their trading volume is concentrated on the eve of the compliance period.

As can be seen from the brief introduction to the carbon markets in Sichuan and Chongqing above, the problems of the carbon trading markets in the two places are more severe than those of the national carbon market and other pilot carbon markets. Problems such as a single product category, low trading volume, low trading price, unstable carbon market and obvious compliance-oriented motivation of enterprises all reflect the insufficient vitality of the carbon markets in Sichuan and Chongqing.

Therefore, the establishment of a cross-regional carbon trading market in Sichuan and Chongqing can break the closedness of the carbon markets in the two places. The inclusion of carbon trading entities from both places will increase the heterogeneity of entities in the carbon market, enhance the diversity and flexibility of the market, promote the circulation of carbon emission allowances, and stimulate the vitality of the carbon markets in the two regions.

### **2.3. Reducing the Energy Intensity of Sichuan and Chongqing**

Taking Chongqing as an example, its industrial structure is still dominated by heavy industry and other manufacturing industries, with coal accounting for as high as 90% of the total primary energy production.

From 1999 to 2012, the total carbon emissions of Chongqing's manufacturing industry increased continuously, with the expansion of industrial scale being the main factor. For the six major manufacturing sectors, the reduction of energy intensity had a significant effect on carbon emission

reduction.

From 2011 to 2021, carbon emissions continued to rise, but with the nationwide implementation of pollution reduction and carbon abatement, Chongqing achieved relatively ideal emission reduction effects, in which the reduction of energy intensity contributed the most to carbon emission reduction.

Sichuan and Chongqing, both located in the western region, are highly similar in terms of energy intensity and industrial structure. Taking 2015 as an example, the comprehensive energy efficiency of the two places was 1.026 and 1.217 respectively, and the rationalization index of industrial structure was 0.181 and 0.179 respectively. Therefore, Sichuan's achievement of ideal emission reduction targets is also inseparable from the reduction of energy intensity and the optimization of industrial structure.

In retrospect, the reduction of energy intensity and the optimization of industrial structure have made great contributions to the carbon emission reduction targets of Sichuan and Chongqing. On the contrary, the carbon emission reduction targets will also exert a reverse driving force on enterprises, urging them to improve production technologies to reduce energy utilization intensity and increase the use of clean energy to cut carbon emissions. The two form a positive cycle and complement each other. However, the insufficient vitality of the carbon markets in Sichuan and Chongqing makes it impossible for the market to play an incentive role. Therefore, constructing a cross-regional carbon trading market in Sichuan and Chongqing to stimulate the vitality of the carbon market will impose carbon emission reduction pressure on enterprises while providing market incentives, promoting the joint construction and shared benefits of the two places, optimizing the industrial structure and reducing energy utilization intensity.

#### **2.4. Promoting Export Trade in Sichuan and Chongqing**

In February this year, the European Union officially adopted the Carbon Border Adjustment Mechanism (CBAM) agreement, which has greatly increased the tariff costs for Chinese enterprises exporting to the EU. The EU carbon price is about 100 euros per ton, while China's carbon price is 60 CNY per ton, and Chongqing's carbon price is even as low as 30 CNY per ton.

As the EU's largest export partner, China is required to pay the price difference with the EU carbon trading price for exports to the EU due to the adoption of the CBAM agreement. The 13-fold gap has added unaffordable costs to Chinese enterprises' exports to the EU, and the export costs of enterprises in Sichuan and Chongqing are even higher. Taking the iron and steel industry as an example, China's carbon emissions from iron and steel production are still at a high level. The implementation of the CBAM agreement has increased the cost of per ton of steel in China by about 650 CNY, imposing greater external pressure on the iron and steel industry to reduce carbon emissions. The EU is a major export market for China, and the China-Europe Railway Express in Sichuan and Chongqing is a key project of the "Belt and Road Initiative". Therefore, the gradual increase of the domestic carbon price is an effective means to promote export trade. From the perspective of Sichuan and Chongqing, constructing a cross-regional carbon trading market to boost the vitality of the carbon market, give play to the market incentive role, promote the transformation of enterprises' carbon emission reduction motivation from passive compliance to active

profit-seeking, and gradually raise the carbon price while ensuring the stability of the carbon market is an effective way to reduce export costs.

To sum up, whether it is to achieve the national goals of carbon peaking and carbon neutrality or to promote the own development of Sichuan and Chongqing, it is imperative to construct a cross-regional carbon trading market in the two places.

### **3. Challenges Faced by the Cross-Regional Carbon Trading Market in Sichuan and Chongqing**

Although Sichuan and Chongqing have formulated the Joint Action Plan for Carbon Peaking and Carbon Neutrality in the Chengdu-Chongqing Twin City Economic Circle and the Sichuan-Chongqing Joint Service Platform for Carbon Neutrality was officially launched on April 12 this year, a search on the two platforms of the Sichuan United Environment Exchange and the Chongqing Carbon Emission Rights Center shows that at the policy level, no joint management documents on cross-regional carbon trading in Sichuan and Chongqing have been issued except for the Measures for the Administration of Carbon Emission Rights Trading (for Trial Implementation) and the Measures for the Administration of Carbon Emission Rights in Chongqing. At the platform level, carbon trading in Sichuan and Chongqing is still carried out separately at present. Therefore, although the Sichuan-Chongqing Joint Service Platform for Carbon Neutrality has been launched, the cross-regional green and low-carbon rights trading mechanism between Sichuan and Chongqing has not been truly implemented. The main challenges in constructing the cross-regional carbon trading market in Sichuan and Chongqing are as follows.

#### **3.1. Lack of Cross-Regional Carbon Trading Management Policies**

The legal attribute of carbon emission rights has not yet been determined in academic circles. Abroad, the theory of property right and the theory of regulatory right are the mainstream, while in China, the theory of real right and the theory of new property right are dominant, and some scholars also define carbon emission rights as assets with financial properties.

It is held in this paper that it is more reasonable to define carbon emission rights as regulatory rights. First of all, China's current carbon trading market is mainly divided into the primary market and the secondary market. The primary market is for the government to allocate carbon emission rights to enterprises, and the secondary market is the main platform for enterprises to trade surplus carbon emission rights. Moreover, the state imposes strict restrictions and management on the subjects, product scope and trading scope of carbon emission rights trading. Therefore, carbon emission rights trading is not merely an administrative act of the government nor a market act of enterprises alone, but a combination of public and private rights, hence it is more reasonable to define it as a regulatory right. Secondly, carbon emissions are inevitable in daily life and industrial development, so carbon emission seems to be a natural right, but it is only an unregulated right. There is no carbon emission right in China before it is established by law. Only after the right to emit a certain amount of carbon dioxide is legislated as a carbon emission right does it have the nature of property

or finance, and the government has the ultimate power of distribution and management over it. Therefore, carbon emission rights belong to regulatory rights.

The public right nature of carbon emission rights determines that the carbon trading market in China cannot emerge spontaneously from the market, so it should be developed under the model of "government-led and market-promoted". The development of the seven national pilot regions and the national carbon trading market relies on the guidance of policies such as the Interim Measures for the Administration of Carbon Emission Rights Trading in 2014 and the Measures for the Administration of Carbon Emission Rights Trading (for Trial Implementation) in 2021. Therefore, the premise for constructing a cross-regional carbon trading market in Sichuan and Chongqing is the formulation of cross-regional carbon trading management policies. However, no relevant policies have been issued since the official launch of the Sichuan-Chongqing Joint Service Platform for Carbon Neutrality this year, which has become the primary problem hindering the further development of the cross-regional carbon trading market.

### **3.2. Absence of a Cross-Regional Carbon Trading Platform**

Taking the pilot regions as an example, the seven pilot carbon trading markets are relatively closed from each other, with each market trading on its own platform and no circulation of carbon resources between them. In addition, since China's current carbon trading subjects are mainly power enterprises, the carbon trading subjects within each region are highly similar, making it impossible to form a vibrant demand and supply of carbon resources. As a result, the carbon market lacks vitality and the emission reduction effect is not obvious. After the establishment of the national carbon trading market, through a unified national carbon trading platform, it coordinates the cross-regional trading of national key emission units, effectively breaks regional barriers, promotes the development of the carbon market and achieves remarkable emission reduction effects. However, due to the regional differences between the east and the west, the north and the south, and the implementation of a unified industry standard for the allocation of carbon emission allowances, the establishment of the national carbon trading market cannot make up for the differences between western regions such as Sichuan and Chongqing and the eastern regions, resulting in limited stimulation to carbon trading. Therefore, for Sichuan and Chongqing to achieve a win-win situation in emission reduction targets and construct a cross-regional carbon trading market, the establishment of a unified cross-regional trading platform is indispensable.

However, Sichuan and Chongqing have not yet established a unified cross-regional carbon trading platform. As a result, carbon resources cannot flow across regions, carbon trading subjects cannot conduct cross-regional transactions, making it impossible to form linkage development, share development information and achieve a win-win situation in development goals, which is an important problem in constructing the cross-regional carbon trading market in Sichuan and Chongqing.

### **3.3. Shortage of Talents in Green and Low-Carbon Advantage Industries**

There is a huge gap in economic development between the eastern and western regions. Most of the electricity in the

western region, especially in Sichuan and Chongqing, is transmitted to the eastern region. The western region ranks first in the country in terms of energy output, but its energy consumption is less than half of that in the eastern region. It has great potential for economic development, but is lacking in green carbon reduction technologies and under great pressure of carbon emission reduction. However, the industrial structure of the eastern region is relatively stable, and the emission reduction cost is rising continuously. The demand for energy input from the western region will keep increasing, so the task of energy conservation and emission reduction in the western region will become more arduous, and the demand for the rational allocation of carbon resources is growing. Nevertheless, the western region is in an acute shortage of carbon trading talents. The first training course for carbon emission administrator teachers in Chongqing was successfully completed in September 2022, and Sichuan only launched the registration for the fifth "carbon trading" training course on November 23, 2023. At present, no training programs for carbon trading talents have been formulated in universities and vocational and technical colleges in Sichuan and Chongqing. Therefore, the acute shortage of carbon trading talents is also a major problem in constructing the cross-regional carbon trading market in Sichuan and Chongqing.

### **3.4. Deficiency in Green and Sustainable Emission Reduction Technologies**

Green and sustainable emission reduction technologies are different from ordinary emission reduction technologies. Sustainability means that the operation cost is controllable, and even carbon capture technologies can be used to convert carbon dioxide into industrial products with negative carbon emissions to achieve profit goals. Green means that technologies for reducing carbon emissions must be of negative carbon emission nature, which is closely related to sustainability. At present, many technologies can reduce carbon emissions, but they are not green technologies because of their high operation costs and unsustainability.

"Rich in coal, poor in oil and short of gas" is the characteristic of China's energy resources, and the western region is rich in coal resources, with coal-fired power generation accounting for 60% to 70% of energy supply. It is understood that there are more than 100 coal-fired power plants in Sichuan and Chongqing, and each power plant produces more than 2 million tons of carbon dioxide on average. Theoretically, Sichuan and Chongqing have great emission reduction potential, but due to the relatively low level of economic development compared with the eastern region and the lack of funds, the two places are short of green and sustainable emission reduction technologies, resulting in a small amount of surplus carbon emission allowances for enterprises, which has become a technical bottleneck in constructing the cross-regional carbon trading market in Sichuan and Chongqing.

## **4. Suggestions for Constructing the Cross-Regional Carbon Trading Market in Sichuan and Chongqing**

### **4.1. Formulating Cross-Regional Carbon Trading Management Policies**

As discussed above, carbon emission rights are more of a

regulatory right, so the development model of the carbon trading market should be appropriately "government-led and market-promoted". However, the construction of a cross-regional carbon trading market in Sichuan and Chongqing cannot be carried out due to the lack of unified cross-regional carbon trading management policies. Therefore, formulating a unified carbon trading policy according to the regional characteristics of Sichuan and Chongqing is the primary task. Taking Chongqing's carbon trading policy as an example, this paper analyzes the deficiencies of the current policies and puts forward suggestions for Sichuan and Chongqing to formulate cross-regional carbon trading management policies.

#### **4.1.1. Expanding the Participants in the Carbon Market**

Turnover rate represents the circulation activity of products, and the current turnover rate of China's carbon trading is only 2%, and the activity of the carbon trading markets in Sichuan and Chongqing is poor, so the turnover rate may be even lower. Without the trading of carbon emission rights, it is difficult to optimize the allocation of carbon resources through the market to achieve the overall emission reduction goal.

One of the main reasons for the low turnover rate is that the carbon market is currently only open to the power generation industry, and China's power generation is mainly coal-fired. The technologies adopted by enterprises in coal-fired power plants in Sichuan and Chongqing are highly similar, so the gap in emission reduction costs among enterprises is small, making it impossible to form obvious differentiation and generate trading demand, hence the low turnover rate.

When constructing the cross-regional carbon trading market, Sichuan and Chongqing can gradually expand the industrial coverage. Starting from the power generation industry, industries with carbon emissions accounting for 25% of the national total such as cement, iron and steel and alumina can be included in the carbon market. When the carbon trading market operates steadily, the coverage of carbon trading subjects can be gradually expanded, striving to cover eight high energy-consuming industries including power generation, petrochemicals, chemical engineering, building materials, iron and steel, non-ferrous metals, papermaking and domestic civil aviation. This will form industrial differences, improve the diversity and flexibility of the carbon market, expand trading demand and stimulate the development of the carbon trading market.

#### **4.1.2. Improving the Initial Carbon Emission Allowance Allocation Mechanism**

Taking the Detailed Rules for the Administration of Carbon Emission Allowances in Chongqing as an example. First of all, in terms of carbon emission quotas, Article 8 stipulates that the Chongqing Municipal Bureau of Ecology and Environment may flexibly adopt the equal quantity method, industry benchmark method, historical intensity reduction method and other methods for carbon emission allowance allocation. Article 10 stipulates that Chongqing adopts advance allocation and adjustment of allowances for the initial allocation of carbon emission rights. Enterprises obtain the annual carbon emission allowances through three steps: declaration, allocation and adjustment. Although this reflects the autonomy of enterprises, there is a high possibility of false declaration by enterprises, which cannot achieve the goal of effective emission reduction. Secondly, in terms of the initial allowance allocation method, Chongqing mainly adopts free allocation. Although the government reserved allowances can be issued paidly through auction, competitive bidding and other methods, the government reserved allowances shall not

exceed 5% of the total annual allowances, so the actual allocation method is still dominated by free allocation. The free allocation method cannot create a sense of crisis for enterprises, cannot effectively stimulate enterprises to carry out independent emission reduction, and cannot play a role in providing price signals for carbon trading.

Therefore, when formulating cross-regional carbon trading management policies, Sichuan and Chongqing can appropriately adopt a combination of free and paid allocation. Taking the EU as an example, the EU Emissions Trading System (EU ETS) has mainly gone through three stages. In the first and second stages, free allowance allocation based on historical emission levels was the main method, with an extremely low proportion of auctioned allowances. In the third stage, the proportion of auctioned allowances was increased. Except for the power and energy industries which obtain allowances entirely through auctions, more than 50% of the allowances for other industries are obtained through auctions. The high proportion of auctioned allowances has stimulated EU enterprises to increase emission reduction efforts to achieve efficient emission reduction targets, and the auction mechanism also provides price signals for carbon prices and stimulates the rise of carbon prices. Sichuan and Chongqing can also introduce the EU's method, gradually raise the proportion of auctioned allowances, and even adopt a combination of free and auction allocation for key emission units such as power and petroleum enterprises, so as to promote enterprises to take the initiative in emission reduction, stimulate the rise of carbon prices and give play to the role of the carbon market in the optimal allocation of carbon resources.

#### **4.1.3. Increasing the Proportion of Certified Emission Reduction (CER) for Compliance and Carbon Emission Allowance Trading**

Taking Chongqing as an example, it is stipulated that the upper limit of key emission units using products such as CER for compliance is 10% of their carbon emission allowances to be paid, and 60% of which shall be generated in Chongqing. Although this has been raised from 5% to 10% compared with the national regulation, the proportion is still small. It is also stipulated that key emission units shall ensure that the retained carbon emission allowances are not less than 50% of the annual carbon emission allowances obtained free of charge before the compliance period expires. Therefore, if enterprises do not purchase CER and other products from the outside for compliance, the maximum proportion of free carbon emission allowances that enterprises can trade in the carbon market before the compliance period expires is 50%. At present, the national and Chongqing's restrictions on the compliance ratio of CER and other products and the trading limit of carbon emission allowances have restricted the development of CER and other products and the vitality of the carbon market.

Therefore, when formulating cross-regional carbon trading policies and regulations, Sichuan and Chongqing can take the opportunity of the restart of CER this year to expand the write-off ratio of CER and other products, cancel the regional restrictions on the source of CER to realize the interconnection of CER in Sichuan and Chongqing, and appropriately relax the trading restrictions on the carbon emission allowances obtained by enterprises free of charge, so as to stimulate enterprises to increase emission reduction efforts and achieve emission reduction targets.

#### **4.1.4. Consummating the Trading Supervision Mechanism**

At present, Chinas supervision of the carbon market is still led by competent departments of ecology and environment, supplemented by a small amount of public supervision. In contrast, the EUs supervision system is much more perfect than Chinas. The supervision departments include the EU and its member states, with administrative supervision by the Directorate-General for Climate Action as the main method and strengthened trading supervision from the information perspective. The supervised matters include information disclosure and market abuse. Therefore, Sichuan and Chongqing can add supervision institutions, refine supervised matters and increase public supervision channels on the basis of the Measures for the Administration of Carbon Emission Rights Trading (for Trial Implementation).

#### **4.1.5. Establishing a Robust Punishment Mechanism**

Taking the Measures for the Administration of Carbon Emission Rights Trading in Chongqing (for Trial Implementation) as an example, Article 30 stipulates that if a trading subject violates the relevant provisions, the registration and settlement institution and the trading institution may take restrictive trading measures against it; Article 32 stipulates that the compliance status of key emission units shall be incorporated into the environmental credit evaluation system. First of all, the use of the word "may" in Article 30 is inappropriate. The consequence of a trading subject violating the relevant provisions on the registration and settlement of carbon emission rights is not that it shall be punished, but only that it may be punished, which reflects the laxity of the punishment mechanism. Secondly, the punishment subjects are the registration and settlement institution and the trading institution, which have low authority and cannot impose truly deterrent punishments on illegal trading subjects. Thirdly, "light punishments" such as restrictive trading and incorporation into the environmental credit evaluation system will not have an actual punitive effect on enterprises.

Therefore, when formulating cross-regional carbon trading management policies, Sichuan and Chongqing can adopt a fine system and establish a robust punishment mechanism to maintain the stable operation of the carbon market. For example, in terms of the punishment mechanism, the EU set a fine of 40 euros per ton for excess emissions for the first time in the first stage, and raised the fine to 100 euros per ton in the second stage. The United States also stipulates strict liability for breach of contract in its punishment mechanism, requiring non-compliant enterprises to pay a fine three times the price of allowances. In addition, Chinas Environmental Protection Law also stipulates a strict daily penalty system. A strict punishment mechanism will force enterprises to achieve better emission reduction effects. Therefore, Sichuan and Chongqing can also learn from this model, take the ecology and environment bureau as the subject of punishment, and increase the intensity of punishment to regulate the behavior of trading subjects.

#### **4.2. Building a Cross-Regional Carbon Trading Platform**

The lack of a joint carbon trading platform is an important problem for Sichuan and Chongqing to establish a cross-regional carbon trading market. Policies without a corresponding platform still cannot realize the cross-regional circulation of carbon resources. Therefore, the government

should take the lead in building a cross-regional carbon trading platform for Sichuan and Chongqing to promote the circulation of carbon resources between the two places.

Sichuan and Chongqing can learn from the model of the cross-regional carbon trading market in the Beijing-Tianjin-Hebei region. The existing carbon trading platforms in Sichuan and Chongqing remain unchanged, and on this basis, a joint trading platform is established with interconnection between the regional trading platforms and the joint trading platform. Enterprises in the two places can conduct carbon trading on the joint trading platform or carry out cross-regional transactions on the platforms of other places, which not only maintains the stability of the original trading platforms, but also promotes the circulation of carbon resources between the two places and reduces the carbon trading costs of enterprises.

#### **4.3. Cultivating Professional Talents through Internal and External Efforts**

The late establishment of the carbon market, its low vitality and the unclear legal status of carbon emission rights have all led to a shortage of carbon trading talents in China. The relatively low level of economic development and lack of funds in Sichuan and Chongqing have resulted in an acute shortage of carbon trading talents. To construct the cross-regional carbon trading market in Sichuan and Chongqing, professional talents can be cultivated through internal and external efforts.

Externally, professional talents can be attracted through talent introduction. As the fourth pole of Chinas economic growth, the Chengdu-Chongqing Twin City Economic Circle has great potential for economic development. To realize the green development of the Twin City Economic Circle, we can rely on the support of national policies and the balanced work-life style in Sichuan and Chongqing to introduce professional carbon trading talents.

Internally, standardized training of carbon trading talents can be carried out by making use of existing universities, technical schools and professional training in Sichuan and Chongqing. Sichuan and Chongqing can encourage universities to set up relevant technical colleges in the field of green and low-carbon development, accelerate the cultivation of professional talents in carbon market and carbon finance, support the improvement of carbon emission management level through professional training, competitions and experience exchanges, and build training bases for carbon emission management talents to reserve talents for the carbon trading market.

#### **4.4. Introducing Green Carbon Reduction Technologies**

As the fourth pole of Chinas economic development and one of the major coal-fired power generation regions, the Chengdu-Chongqing Twin City Economic Circle has huge carbon emissions but is lacking in carbon reduction technologies. Compared with the eastern region, it has great emission reduction potential. The state hopes that Sichuan and Chongqing can master effective carbon emission control technologies to achieve emission reduction goals and at the same time form products with negative carbon emissions to obtain profits.

At present, Sichuan has introduced a new membrane technology and carried out tests, and a project has also been promoted in Wanzhou, Chongqing. Therefore, Sichuan and

Chongqing should seize the opportunity to promote the localization of international technologies, and further introduce more advanced green carbon reduction technologies by virtue of policies. We should not only aim to reduce carbon emissions, but also focus on how to use carbon reduction technologies to create benefits for ourselves and promote the green development of the Chengdu-Chongqing Twin City Economic Circle.

## 5. Conclusion

As one of the major coal-fired power generation regions, Sichuan and Chongqing have an annual carbon emission of about 200 million tons from coal-fired power plants. However, the insufficient vitality of the carbon markets in Sichuan and Chongqing makes it impossible to give play to the role of the carbon market in the optimal allocation of carbon resources. Therefore, constructing a cross-regional carbon trading market in Sichuan and Chongqing is an important means to reduce carbon emissions, achieve the goals of carbon peaking and carbon neutrality, stimulate the vitality of the carbon markets in Sichuan and Chongqing, reduce the energy intensity of the two regions, promote the transformation of the energy structure, and boost the economic development and export trade of Sichuan and Chongqing. At present, however, the actual implementation of the cross-regional carbon trading market in Sichuan and Chongqing is hindered by the lack of cross-regional carbon trading policies, a unified trading platform, professional talents and advanced technologies. Therefore, cross-regional carbon trading management policies can be formulated by expanding the participants in the carbon market and improving the initial

allowance allocation method, adhering to a unified standard for both regions. Guided by policies, the establishment of the cross-regional carbon trading market in Sichuan and Chongqing can be promoted by building a cross-regional carbon trading platform, cultivating professional talents and introducing advanced technologies, so as to enhance the vitality of the carbon market, optimize the rational allocation of carbon resources and promote the green development of the Chengdu-Chongqing Twin City Economic Circle.

## References

- [1] Liao Zhenliang, Shen Yifan, Yao Qiang, et al. A Flexible Mechanism for Project-based Cross-regional Cooperative Carbon Trading. *Energy Environmental Protection*. 2023, Vol.37(NO.02),P.98-105.
- [2] Wen Mengyao, et al. Current Situation and Development Trend of China's Carbon Trading Market. *China Money Market*, 2023, Vol.(04), P.71-75.
- [3] Zheng Yunchang, Xu Zhirong, et al. Four Major Impacts of the EU Carbon Border Adjustment Mechanism. *China Power Enterprise Management*. 2023, Vol.(07), P.92-93.
- [4] Wang Hui, et al. On the Legal Nature of Carbon Emission Rights. *Seeking Truth Journal*. 2016, Vol.43(06), P.74-86.
- [5] Ma Jiajun, et al. Research on the Valuation of Carbon Emission Rights under the Background of "Dual Carbon" Goals. *Commercial Exhibition Economy*. 2023, Vol.(19), P.133-136.
- [6] Zhang Xiaoyan, Yin Zihan, Li Zhiyong, et al. Development Experience and Enlightenment of the EU Carbon Emission Trading Market. *Tsinghua Financial Review*. 2023, Vol.(02), P.28-31.