

The Development of China's Carbon Emissions Regulation System¹

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Abstract

In the face of climate and environmental problems caused by carbon emissions, China is taking positive actions, such as promoting the achievement of the emission peak of traditional energy sources, accelerating the optimization of industrial and energy structures, promoting and improving the construction of the national carbon trading market, increasing investment and scientific research work to develop new energy sources, and several other actions. The administrative approach plays an important role in the development of China's low-carbon economy. The carbon trading system also greatly promotes energy conservation and emission reduction, contributes to attracting investment in low-carbon technology and transforming the energy structure, and is becoming an important policy guarantee for China's carbon emission reduction. However, at the same time, China's carbon trading market faces many practical challenges. For China, the task of reducing carbon emissions through carbon trading alone is unrealistic. China's current actions on carbon taxation are not broad enough to regulate emission reductions. With the implementation of carbon trading, there is a need to establish a carbon tax as a policy option to further strengthen the regulation of emission reduction. The introduction of a carbon tax should consider the relationship between economic and social development and carbon reduction and coordinate the relationship between the carbon tax and carbon trading system on various aspects, including the field and object of taxation, tax rates, use of tax revenue, and the relationship between the authorities regulating the two policies, to leverage their complementary roles.

Keywords: China, low-carbon policy, carbon trading system, carbon tax

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Introduction

As the climate challenge becomes more prominent, the actions of the world's countries and international organizations to adapt and respond to climate change are gradually expanding. In particular, the European Union (EU) plans to introduce a border carbon adjustment mechanism in 2023. By setting a price on the implied carbon emissions of imported products, the EU carbon trading system will influence other countries, including China, which has significant carbon emissions implied in export trade but is heavily dependent on the export markets of developed countries. Moreover, since 2007, China has become the world's largest energy consumer and emitter of carbon. Its behaviour and measures are important for globally reducing

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carbon emissions. Therefore, it is important to analyze the development of China's carbon regulation system.

Recently, researchers have focused on the problems of carbon trading. The work of H. X. Zhang, J. H. Pan, L. Xiong, H. T. Shen, and others, considers problems of the allocation of carbon credits, efficiency of carbon emission reduction, and the price of carbon units in the carbon trading market, among other issues. The work of J. Cui, Y. A. Pu, M. Sh. Duan, Y. He, G. Fang, L. B. Cui, and others, is devoted to the problems of implementation of carbon tax and its impact on economic growth in China. L. B. Wu, H. Q. Qian, M. J. Shi, and others write about the necessary implementation of a combined carbon tax and carbon trading policy for China. Studies by many researchers, such as C. F. Lee, H. Tamura, L. Wang, M. A. Joshua, and T. A. Weber, assert the effectiveness of the combined policy in contributing to carbon reduction and its stimulating effect on technological innovation in the EU.

Despite the large body of work devoted to the problems of carbon regulatory instruments, there is no research that comprehensively examines the development of carbon regulatory systems in China, which determines the significance of the chosen goal of this study, the main purpose of which is to analyze the measures of carbon regulation in China. First, the development of this system in China is reviewed and the political and institutional aspects of the low-carbon economy in China is examined. Then, the features and problems of the application of market instruments of carbon regulation are analyzed. Finally, the possibility of introducing a policy of combining carbon tax and carbon trading is considered, and a recommendation for this approach is made.

Stages of Development of the Carbon Regulation System in China

China's efforts to address climate change can be divided into four phases. Prior to 2005, China issued few policy documents on carbon emissions regulation, and restrictions for industrial enterprises were informed more by air pollution prevention and control policies. From 2006 to 2010, the Eleventh Five-Year Plan period was passed, during which energy conservation and emissions reduction was stressed. At this stage, low-carbon policies were being implemented en masse, with a notable variety of policies. The government took the lead, and the use of voluntary and hybrid tools in China during this period lagged. From 2011–20, a strategic planning period was carried out. During this period, China formulated relevant policies and programmes, resulting in further improvement of the low-carbon policy system, the launching of pilot projects on carbon trading and low-carbon cities, and continuous promotion of energy conservation and emission reduction efforts. From 2020 to the present, the policy level and implementation of strategic decisions continue to improve. In 2020, China first mentioned achieving a carbon peak by 2030 and carbon neutrality by 2060, setting the overall tone for low-carbon development after 2020.

As the world's largest consumer of fossil energy and a source of greenhouse gas emissions, China is under tremendous pressure to reduce emissions. How to use economic instruments to realize China's carbon reduction goals of reducing emissions while lowering the cost of reducing emissions has become an important issue in China's climate governance. The main ways of China's transition to a low-carbon economy to achieve peak and neutral carbon goals are low-carbon transformation of the economic structure, implementation of green finance, reliance on social capital, and acceleration of the creation of a carbon market.

Actions on China's Carbon Taxation

During the period of the Eleventh Five-Year Plan, China's taxes related to the regulation of carbon, such as resource taxes, consumption taxes, and export tax rebates, were continuously adjusted.

Beginning in 2006, the export tax rebate rates for certain goods (including steel, ceramics, glass, cement, and other high-energy-intensive products) have been amended, and a catalogue of prohibited goods for processing trade has been added.² Since 2007, the export tax exemption for high-energy-intensive goods (including cement, certain types of wooden boards, disposable wood products, and other goods) has been eliminated, and even export tax measures have been taken. In 2007, the car and boat use tax and the car and boat licence tax were combined to introduce a car and boat property tax. On this basis, the Motor Vehicle and Boat Tax Act has been in effect since 2012, which largely reflects the concept of a low-carbon economy.³ Since 2009, China has changed the road maintenance fee to a fuel consumption tax. In 2011, a 5% additional tax on oil and gas resources was introduced, which changed the previous situation where resource prices did not reflect market demand. However, the implementation of a carbon tax remains uncertain.

In 2013, the Environmental Protection Tax Law was submitted for consultation and officially enacted in 2018. The law defines the field of taxable pollutants. Only certain types of carbon emission sources are included in its category. The law is not inherently a concrete policy for taxing carbon emissions. The issue of a carbon tax is again becoming the subject of heated debate, but there is still no clear approval.

A review of China's current resource tax and consumption tax shows that while these taxes are not levied to control carbon emissions, they all overlap with carbon taxes. For example, from the perspective of the field of taxation, resource taxes are levied on minerals such as coal, crude oil, and natural gas during production, while consumption taxes are levied on gasoline, diesel, and other refined products during consumption [Cui, 2010]. From a taxation framework perspective, resource taxes and consumption taxes are levied on the amount of energy products produced and consumed, respectively, and neither takes into account the carbon content of fossil fuels. As a result, they are not sufficiently universal to regulate carbon reduction. It is possible to implement a carbon tax policy for carbon taxation in general, combining current resource, consumption, and other carbon-related taxes to establish a tiered tax system for fossil fuels and thereby achieve comprehensive carbon reduction regulation.

China's Carbon Trading System

China began experimenting with carbon trading mechanisms relatively early. In 2011, China approved seven provinces and cities—Hubei, Guangdong, Beijing, Shanghai, Shenzhen, Chongqing, and Tianjin—to begin building a carbon trading pilot project. In 2013, Shenzhen officially launched China's first carbon trading market. Fujian and Sichuan joined the pilot project in 2016. Currently, China's carbon trading pilot projects cover industries such as electric power, thermal power, cement, transportation, iron and steel, impacting more than 3,000 responsible

² In 2009, Europe, the U.S. and Mexico challenged China's export tax policy on certain commodities at the World Trade Organization (WTO), arguing that an additional export tax increase was inconsistent with relevant WTO provisions.

³ Tax rates for passenger cars were differentiated according to exhaust power, and vehicles and ships that save energy and use new types of energy were reduced or exempted from taxation.

enterprises with a combined carbon trading volume of nearly 500 million tons and a turnover of approximately 11.4 billion yuan.

Based on the experience gained from the pilot project, the National Development and Reform Commission issued the National Carbon Trading Market Construction Plan in 2017 and the Interim Carbon Trading Management Rules (Draft for Public Comment) in 2019, which initially defined the scope of the national carbon trading market with industry coverage, responsibility allocation, and operating mechanisms. In July 2021, the national carbon trading market was officially launched, and the first series includes more than 2,225 large electric power enterprises covering 4.5 billion tons of carbon emissions per year, which makes it the world's largest greenhouse gas emissions trading market.

Notably, the construction of China's carbon trading system is also inspired by international experience, especially the EU experience. In terms of trade structure, the EU Emissions Trading System (ETS) has always accounted for more than half of the global carbon market turnover, making it the largest carbon market, and its advanced trading system and institutional structure have become a model for market-based trade in the global model of total control.

Although China promulgated the Interim Measures on Carbon Emissions Trading Management in 2014, the measures were only a transitional legislative document to establish the carbon trading market. Their legal effect has been limited. The measures cannot respond to the development of the carbon trading market. During the development of the EU ETS, legislation also became the main issue. Its legal system gradually improved along with changes in the trading mechanism. China should learn from the EU experience with the creation of high-level legislation that provides both substantive legal provisions defining the commodity nature of carbon emission rights, the subjects of trade, the total amount of carbon credits, distribution systems, supervision, and reporting and verification, as well as procedural legal provisions providing for the implementation of the above-mentioned activities. In addition, strict penalties and accountability for any violations of the law and for all actors involved in trading activities should be established.

An important feature of the development of the EU ETS is the phased pattern of its development. A dynamic and gradual process such as this corresponds to the development of the newly established carbon market, which, to some extent, ensures the effectiveness of carbon reduction and controllability of the implementation process. China has previously tried to gradually move from a regional pilot trading market to a single national market, and the carbon trading market is also implemented in a gradual and purposeful manner under the guidance of the National Carbon Trading Market Construction Plan (power generation sector), which not only defines the general requirements, market elements, participating actors, system construction, quota management in the power generation sector, and support systems but also emphasizes that China will continuously take forward the construction of the carbon market in three phases, with the distribution of priorities in each phase being similar to the distribution of priorities in the EU ETS, including a basic construction period, a modelling period and a further improvement period. In the infrastructure period, the first task is to complete the construction of a unified national data reporting system, registration system, and trading system within one year, focusing on data mapping and establishing a system for a unified national carbon trading market. The modelling period will be used to emulate quota trading in the electricity production sector, to verify the effectiveness of its different market elements and the interaction between them through the practice of each trading session, to test the operation of market risk prevention and control mechanisms and early warning, and for preliminary attempts in the market management system and support systems. The final refinement period is a period of sublimation for the entire electric power industry due to the experience gained in the first two phases of spot trading quotas and system construction and operation. The market capacity of

China's unified carbon trading market will continue to expand, and the mechanisms and institutions under the electricity carbon trading system will be improved as they are being refined.

What the lessons learned from the first two phases of the EU ETS show is that the consequences of inadequate regulation will inevitably lead to market anomalies, represented by sharp fluctuations in carbon prices. Since China is in the early stages of establishing a unified carbon trading system, it is necessary to rely on administrative guidance and intervention to a large extent while establishing a multitiered and extensive regulatory system to ensure the smooth operation of the carbon trading system. First, the National Development and Reform Commission should be designed as the central regulatory body responsible for coordinating carbon verification, establishing total emissions and allocating allowances, as well as verifying the status of trading organizations and the reliability and science of reported data; and second, it will promote regulatory diversification and actively introduce third-party verification agencies, trade agencies and individuals with extensive experience in finance, low-carbon technology, and the carbon trading market as a supplement to encourage market-based regulatory tools in the carbon trading market through a wide range of regulatory agencies.

In addition, it is necessary to create a special agency to manage the registration of carbon emissions and a strict penalty mechanism. The former is used to avoid market risks associated with differences in regulatory standards due to asymmetric market information or other artificial factors, such as local protectionism, which can lead to sharp fluctuations in carbon prices. The latter is used to promote the market in a formal and effective way by applying strict penalties, such as large fines, deduction of allocated quotas for the next year, and restriction of trading conditions for noncompliant companies or trading organizations that commit illegal actions in the carbon trading market.

The carbon trading system creates a carbon price signal for the whole society, which will greatly promote energy conservation and emission reduction, and contribute to attracting investment in low-carbon technology and transforming the energy structure, and is becoming an important political guarantee for the reduction of carbon emissions in China. However, the current state of development does not yet allow full assessment of the role of carbon trading in achieving carbon peak and carbon neutrality goals. In addition, China's carbon trading market still faces many practical problems [Pan, 2016; Xiong, Qi, Shen, 2016].

Compared with the ideal carbon price of nearly \$100 for the same period under the global goal of limiting temperature rise by 2°C, the price of carbon trading in China's pilot provinces and cities is very low, stabilizing at approximately 30 yuan per ton in recent years, and the trading price continues to decline. Since the market opened in July 2021, the trading price of the carbon emission allowance market is still only 40–60 yuan per ton [Fan, Mo, 2015]. Clearly, too low a price for carbon trading is not conducive to regional investment in low-carbon technology and transformation of energy structures and may lead to a deviation from the desired emissions pathway in the long term, which will ultimately affect the timely achievement of China's macrocarbon reduction goals.

Due to numerous constraints at both theoretical and practical levels, the industry coverage of the carbon trading market has gradually adjusted from the originally envisaged eight industries—petrochemical, chemical, building materials, iron and steel, nonferrous metals, paper, electric power, and aviation—to a single electric power industry. The sectoral coverage of the carbon trading mechanism is far from the original intention, and the process of establishing a unified carbon trading market in China has been proceeding rather slowly. Moreover, even if the remaining key energy-consuming sectors are included in the trading system at a later stage, the carbon emissions they cover would account for only more than 50% of China's total carbon emissions. As a result of the lower cost of carbon emissions for businesses not included in the

national trading market, it is likely that greater carbon emissions will be transferred to these non-key emitters, leaving the country's total carbon emissions unchanged or even increased.

As part of the carbon trading system, Chinese enterprises mainly reduce carbon emissions through short-term actions, such as reducing production, rather than implementing emission reduction technologies to achieve the emission reduction target [Shen, Huang, Liu, 2017].

Current pilot carbon trading deals lack transparency in terms of information, which may create a problem on fair allocation [Zhang, 2015].

All of this shows that a single carbon trading system cannot effectively reduce carbon emissions in the long term, and its problems and shortcomings need to be compensated for by the implementation of a carbon tax system.

The Approach of Introducing a Combined Policy of Carbon Tax and Carbon Trading

Carbon trading controls the amount of carbon reduction, and a carbon tax controls the price of carbon reduction. A common view assumes that a carbon tax and carbon trading are alternatives to each other. Carbon trading is growing rapidly because of its ability to control total carbon emissions, which in turn narrows the possibilities for a carbon tax, and many countries that have adopted a carbon trading system will be reluctant to switch to a carbon tax. In practical terms, however, both a carbon tax and carbon trading would affect a country's real economic interests, with uncertainty about the long-term benefits of reducing carbon emissions. As a result, the government's attitude toward either of the two emission reduction measures will be relatively modest, and it will not meet the need for environmental protection and energy security.

An increasing number of scientists see synergies between a carbon tax and carbon trading. Carbon trading can quickly limit total carbon emissions and achieve an immediate effect on reducing emissions. However, based on the practical experience of many countries, carbon trading is mostly applicable to large enterprises but difficult to implement for small businesses and households and cannot cover all areas of carbon reduction. Additionally, as seen from the example in the EU, the limitation of carbon trading is that the effectiveness of the implementation of carbon trading policy depends largely on the total amount of emissions set by the government, and the volatility of the price of carbon due to political factors will greatly limit the attention and investment of businesses in reducing carbon emissions, making it difficult to achieve the goal of reducing carbon emissions. A carbon tax with a clear tax rate can give a stable price signal to the market, thereby creating constant pressure to reduce emissions. However, imposing a carbon tax would increase the cost of carbon and meet greater social resistance. A more moderate carbon trading policy, such as free allowances at the outset, is more easily accepted by businesses and could help promote carbon reduction policies.

In this regard, a more rational choice would be to combine the benefits of a carbon tax and carbon trading to combine the long-term benefits of reducing emissions with achieving short-term goals. Research by many researchers also argues that an effective combination of carbon policy, being a very flexible option, can lead to greater carbon reductions through lower abatement costs and less economic loss [Cui et al., 2014; Gao et al., 2019; He, Wang, Wang, 2012; Lee et al., 2007; Liu, Sun, Zhang, 2019; Tamura, Kimura, 2008]. Research also suggests that carbon trading is more appropriate for China at this stage and, as China's efforts to reduce emissions increase in the future, the introduction of a carbon tax into China's emissions reduction system should be considered [Shi et al., 2013; Wu et al., 2014].

Moreover, the practical experience of the EU, the UK and other countries around the world shows that policies of a combined carbon tax and carbon trading have a positive impact

on regional energy efficiency and emissions reduction. Not only do they achieve the desired carbon reduction goals at the lowest cost, but they also result in less gross domestic product (GDP) loss, which is more efficient.

In fact, the two points of view are not contradictory. Carbon tax and cap-and-trade measures can be taken simultaneously to maximize their benefits and, as conditions mature, an eventual choice can be made in favour of one or the other.

Based on the above reasoning and taking into account the present problems of the carbon trading market and the situation of carbon tax policy in China, it is already necessary to introduce a carbon tax in China by implementing a combined policy to make up for the existing shortcomings in the carbon regulatory system.

It is certainly worth mentioning that when developed countries start to impose carbon tariffs, the introduction of a carbon tax in China will avoid international trade disputes, overcome trade barriers, and boost export products, and it can also provide tax subsidies to relevant export enterprises and improve their international competitiveness.

To introduce a combined policy, China should establish a full coordination mechanism for carbon tax and carbon trade in a number of ways, including the area and object of taxation, tax rates, use of tax revenue, and communication between the regulators, to leverage the complementary roles of the two policies.

In setting the areas of control of carbon tax and emissions trading, the phenomenon of double taxation should be avoided so that they control different sources of emissions. Large emission sources that are controlled by emissions trading should be excluded from the field of taxation.

Regarding the determination of the carbon tax rate, in theory, the carbon tax rate should be equal to the external value of carbon, but the external value is varied in different methods and the price of carbon in the market reflects the external value for a certain period of time, so the carbon tax rate can be based on the price of traded carbon in the market.

For the objects of the carbon tax, individual residents should be excluded for the time being. Although residents are included in the scope of the carbon tax in developed countries, the actual situation in China is that the income level of residents is relatively low and the regressive nature of the carbon tax will affect low-income groups, leading to greater social resistance to the introduction of the carbon tax. Moreover, China's carbon share of household consumption is only approximately 6%, and the annual increase is relatively small (see Table 1). In the industrial sectors, since the introduction of a carbon tax affects the competitiveness of industry, a combined policy can use tax rebates to maintain tax neutrality.

Table 1. CO₂ Emissions From Household Consumption in China, 2005–2016

Year	Total CO ₂ Emissions (million tons)	Household CO ₂ Emissions (million tons)	Share of CO ₂ Emissions From Household Consumption
2005	5,824.63	341.33	5.86%
2006	6,437.47	375.94	5.84%
2007	6,993.18	427.28	6.11%
2008	7,199.61	441.34	6.13%
2009	7,719.07	481.71	6.24%
2010	8,474.92	513.82	6.06%
2011	9,282.55	556.95	6.00%

Year	Total CO ₂ Emissions (million tons)	Household CO ₂ Emissions (million tons)	Share of CO ₂ Emissions From Household Consumption
2012	9,541.87	590.56	6.19%
2013	9,984.57	597.08	5.98%
2014	10,006.67	603.43	6.03%
2015	9,861.10	589.57	6.07%
2016	9,874.66	601.30	6.09%
2017	10,096.01	619.90	6.14%
2018	10,502.93	648.03	6.17%
2019	10,707.22	669.20	6.25%
2020	10,065.54	637.15	6.33%

Source: China Energy Statistical Yearbook [n.d.]; National Bureau of Statistics [n.d.]; The Global Economy.com [n.d.].

In addition, there should be transparency in the use of tax revenues. A special agency, which is independent of the government, can be created to manage tax revenues, oversee the flow of revenues, and disclose information about the use of revenues to increase public and business confidence in the use of revenues and facilitate the smooth implementation of policies. Tax revenues must be used wisely. Western countries, such as Denmark, include tax revenues in the general budget and return all tax revenues from industry to industry [Tang, 2011]. Other countries use them to reward businesses that use energy more efficiently or to reduce taxes on personal income. Taking into account the experience of western countries and China's national context, tax revenues should be used in three ways: to return to businesses in the form of incentives or subsidies, to stimulate renewable energy development, and to provide financial support for the carbon trading system.

The combined policy should be adapted to China's economic conditions. At present, China has not implemented a carbon tax system and, if a combined policy of carbon tax and carbon trading is to be implemented, it must take into account the economic factors in the country. First, the Central Working Conference on Economy in 2018 pointed out that China's economy is under downward pressure and needs to reduce taxes and fees more extensively, so the principle of tax neutrality is especially important in the implementation of a carbon tax [Wu, Su, Xu, 2015]. Second, in March 2016, the Chinese government announced that it would not impose a separate carbon tax, instead organizing it as a tax item under the environmental tax or resource tax. However, considering the current low-carbon economic situation and the urgency of China's carbon reduction, direct carbon taxation would better strengthen the regulation and control of carbon reduction [Pu, Yang, 2016]. In addition, the evolution of carbon tax policy in Scandinavian countries shows that it is difficult to balance the goals of fiscal taxation and carbon reduction in carbon tax policy design and it is easy to get influenced by one type of demand and become biased [Duan, Zhang, 2015]. Therefore, in the process of carbon tax policy formulation in China, it is necessary to harmonize the understanding of the role of carbon tax among various government departments so that carbon tax policy can be more targeted and effective.

Conclusion

The administrative approach to energy conservation and carbon reduction plays an important role in the development of a low-carbon economy In China. China is also gradually shifting to market-based carbon emission reduction tools—carbon trading systems, the construction of which takes into account the establishment of the legislative system, incremental development planning, and regulatory enhancement.

Despite the fact that the carbon trading market has a positive impact on reducing emissions, it faces practical problems. Due to both theoretical and practical constraints, it is unrealistic for China to reduce carbon emissions through carbon trading alone. China's existing carbon tax actions are not sufficiently universal to regulate emission reductions. In addition, China will have to face the impact of carbon tariffs and emission reduction pressure to achieve the carbon reduction target. More decisive policies and measures to reduce carbon emissions should be adopted. A combined policy of carbon trading market and carbon tax proves to be an effective approach.

A carbon tax should consider the relationship between economic and social development and carbon reduction, design the carbon tax implementation scheme according to the needs of national interests, and coordinate the relationship between the carbon tax and carbon trading.

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