

A Review of the Role of Understory Technologies for Carbon Neutrality

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ABSTRACT

Carbon emissions are considered the main cause of global warming. The mainstream scientific community has reached a consensus on this, which stimulates international political responses and promotes research on carbon emissions and their reduction in the economics community. At the 75th session of the UN General Assembly, President Xi Jinping solemnly promised that China will strive to peak its carbon emissions by 2030 and achieve carbon neutrality by 2060. Carbon emission reduction has received more attention. At the same time, the under-forest economy is regarded as a new growth point for carbon emission reduction. This paper focuses on reviewing the history of carbon emissions, the development of carbon emission reduction in China, and the economic analysis of China's carbon emission reduction policies. China's carbon emission reduction policy has been implemented for more than ten years, especially the carbon trading pilot policy, which has been implemented for seven years. Are state efforts effective? What is the current state of the carbon emission reduction market? What is the role of understory economy in reducing carbon emissions? The article also answers the above points.

Keywords-- Reducing Carbon Emissions, Carbon Tax, Carbon Trading, Trading Rights Pilot, Undergrowth Economy

I. INTRODUCTION

It has become a public consensus that the climate problems caused by carbon emissions may lead to an existential crisis. The carbon emissions referred to a scientific cognitive problem at first, and later it becomes a social problem. This is because the carbon emissions is widely believed to be the reason of the warming effect, which may lead to an existential crisis. At the 75th United Nations general assembly, President Xi Jinping has made a commitment that China will strive to achieve peak carbon by 2030 and achieve carbon neutrality by 2060. It has aroused further attention and carried out in-depth research of domestic government and scholars on the issue of carbon emissions (Yang Yang et al., 2010; Ma Jun, 2021).

Our government has made active efforts in carbon emissions reduction. In 1992, China's government signed the "United Nations Framework Convention on Climate Change". In 2007, the State Council issued "The Comprehensive Plan for Energy Conservation and emissions Reduction" according to the severe situation of energy conservation and emissions

reduction, which further cleared its targets and general requirements, and put forward related policies during the period of "11th five-year plan".

In 2013, the National Development and Reform Commission approved the pilot program of carbon emissions trading rights in Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong and Shenzhen. The pilot phases was set as 2013-2015, and the national carbon emissions trading system was planned to launch in 2017. In 2018, China integrated the carbon dioxide emissions reduction and the low-carbon economy development into its state planning. During the 12th Five-Year Plan period, the carbon dioxide emissions per unit of GDP reduced by 40%-45% in 2020 compared with 2005, and will be reduced 60%-65% in 2030 compared with 2005 (Liu Junmin, 2011).

According to the severe situation of carbon emissions, many scholars at academics also attach great importance to it (Peng Mengxia, 2013). Some scholars make an analysis of driving factors of carbon emissions. After the classification of carbon dynamics, the scholars compare different factors on the function and the contribution to the growth of carbon emissions, identify functions and contribution to the growth of carbon emissions, recognize the main factors and the secondary factors, pro-motive factors and inhibited factors affecting carbon emissions growth, in order to analyze how to reduce carbon emissions. After a series of research work on carbon emissions reduction, domestic scholars focus on which of the emissions reduction tools, carbon tax and emissions trading, is more suitable for China.

II. THE DEVELOPMENT HISTORY OF CARBON EMISSIONS REDUCTION POLICIES

How to formulate environmental regulation policies according to the specific national conditions is the main issue that the academics has researched. Domestic scholars focus on which of the two emissions reduction tools, carbon tax and emissions trading, is more suitable for China (Zhu Yalu et al., 2020).

2.1 Carbon Tax

Carbon tax is a special economic means established by the theory of pollution charges. After the implementation of some legal regulations, it has played a certain role in energy conservation and environment preservation in China. However, we also recognize that the effect is limited.

As a developing country, carbon tax that was introduced in China is an integral part of energy tax or environmental tax, which can increase the management capacity of environmental protection and achieve the basic state policy of environmental protection. Therefore, the introduction of carbon tax is an ideal economic means to solve the current energy and environmental problems in China. However, the current tax system has not formed a relatively independent energy or environmental protection tax system with the goal of saving energy and protecting the environment. The design of carbon tax rate is very complicated and it can only be determined after comprehensive and detailed calculation on the basis of the cost of long-term carbon dioxide emissions reduction measures. However, the current tax system is inadequate, which is detrimental to the optimization of China's energy consumption structure and the improvement of environmental quality. In China, it is difficult to reduce carbon dioxide emissions by levying carbon tax under the inadequate market economic system.

2.2 Carbon Emissions Trading Rights

Carbon trading is a market mechanism to curb global carbon dioxide emissions. Carbon trading market means the trading carbon emissions rights, which refers to the limited use of carbon resources. The idea of emissions rights comes from the analysis of environmental issues by economists. Compared with carbon tax system, it can respond to the impact of emissions reduction cost caused by factor price changes more quickly by adjusting production decision and factor demand. At present, the gradual trading mechanism of carbon emissions rights has gradually become an important means for China to deal with energy conservation and emissions reduction.

III. CARBON TRADING PILOT MECHANISM AND ITS OPERATION

3.1 Operating Mechanism

In 2013, The National Development and Reform Committee has approved trials for carbon emissions rights in Beijing, Tianjin, Shanghai, Chongqing, Hubei, Guangdong and Shenzhen. According to different structures, administrative costs and market activity of industries, these seven pilots select different indexes to incorporate into the industry. These indexes may control carbon emissions, accounting for 35% - 60% in the local society. Beijing and Shenzhen include a large number of industries, covering industry and service industry. Tianjin and Shanghai pilots cover industry and a small amount of non-industry (such as aviation, ports, etc.); The other three trials only incorporated industry (Yangqu et al., 2017).

Different pilots have different standards, quota allocation methods, quota determination methods. The standards to incorporate into industries vary according to the specific conditions of pilots. Also, the standards are

mostly determined by comprehensive energy consumption or carbon dioxide emissions. In terms of quota allocation, most of the pilots adopt free allocation, while Tianjin, Shanghai and Guangdong adopt paid allocation. According to determined methods of quota, Beijing uses historical discharge method, datum line method, historical intensity method; Tianjin uses historical intensity method, datum line method; Hubei uses benchmark method, historical intensity method, datum line method;

Shenzhen uses benchmark method; Guangdong uses datum line method, historical intensity reduction method and historical discharge method; Chongqing, on the other hand, uses an independent discharge method based on historical emissions.

3.2 Running Conditions

By November 15, 2019, a total of 356 million tons of spot carbon markets in seven pilots were traded with a total turnover of 7.689 billion yuan. Among them, Guangdong and Hubei have the highest accumulative volume and turnover, which are located in the first echelon; Shenzhen, Shanghai, Beijing trading volume and turnover are located in the second echelon; Tianjin and Chongqing accumulated trading volume and turnover is relatively low, located in the third echelon. Hubei took the first place in carbon trading volume and carbon trading volume, accounting for 34.4%, followed by Guangdong with 30%, Shenzhen with 14.2%, Shanghai with 8.1%, Beijing with 7.2%, Chongqing with 4.6% and Tianjin with 1.6% (Han Jinyu et al., 2020).

After recorded in the National Voluntary emissions Reduction Transaction Register, it shall be registered in the National Register and traded in the recorded trading institutions. By November 15, 2019, the total transaction volume of CCER in China was 202 million tons, with large differences among different regions. Among them, the cumulative transaction volume of CCER in Shanghai continued to lead, with the current total transaction volume of 88.23 million tons, accounting for 48%. The cumulative transaction volume of Guangdong CCER exceeded 40 million tons, ranking the second, accounting for 22%; Beijing and Shenzhen are between 10 million tons and 30 million tons, accounting for 13% and 10% respectively. The trading volume in Hubei and Tianjin is relatively low, with volume between 2 million tons and 10 million tons, accounting for 5% and 3% respectively. Chongqing has the lowest volume. In 2019, more than 2,900 enterprises and units were included in the seven pilot carbon markets, with a total of 6.2 billion tons of carbon emissions quotas allocated. Compared with 2018, the total trading volume of seven pilot carbon markets increased in 2019, reaching about 770 million yuan (Cui Youguang et al., 2020).

IV. ECONOMIC ANALYSIS OF CARBON TRADING POLICIES

Carbon trading means that the carbon emissions right, an intangible asset, which was traded freely in the market as a commodity. Based on the "Coase Theorem" in economics, carbon trading defines property rights and transaction costs. The externality brought by the main carbon emitters should be assumed by themselves, and the market should be used to solve environmental problems. Carbon trading follows the general market law, and forms carbon price under supply and demand laws. As an important signal of market, carbon price, on the one hand, provides guidance for market participants to make production and investment decisions; on the other hand, it also provides a basis for the government to make macro-control and policies. There are many ways for the government to regulate the carbon price, such as price fluctuation, opening price and auction reserve price.

The original intention of the carbon emissions trading system is to limit the total amount of carbon emissions, encourage enterprises to reduce carbon emissions, and develop new energy technologies. Therefore, it is very important to make a comprehensive assessment of the carbon emissions reduction efficiency of carbon trading, which will help the government improve the carbon trading system and encourage more enterprises to participate in carbon trading.

Due to short-term price fluctuations and institutional changes in China's carbon emissions trading pilots, decentralized carbon trading markets will generate market arbitrage, reduce the efficiency of resource allocation and cause carbon leakage. Therefore, it is imperative to establish a national unified carbon trading market. At the industrial development level, carbon trading will reduce the output of various industrial sectors, especially the energy sector. But generally, the negative impact of carbon trading on the industry is relatively small (Wang Xinting et al., 2020).

Currently, the carbon emissions reduction capacity of China's carbon market is improving steadily, but it slightly lags in its construction progress.

V. THE ROLE OF UNDERSTORY MANAGEMENT IN CARBON SEQUESTRATION

The understory economy contributes to carbon neutrality. Forest resources can play an important role in sequestering carbon, and the under-forest economy is an important way to achieve the goal of "double carbon". Vigorously cultivate new forestry management entities; strengthen the construction of scientific and technological innovation capabilities, increase the added

value of forest products; increase policy support, improve the relevant laws and regulations system, establish and improve the social service system, and provide reference for promoting the healthy and sustainable development of my country's under-forest economy.

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