

China's Carbon Emission Policies and High-quality Economic Development: Stylized Facts and Prospect

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Abstract: Since 2006, China has become the worldwide largest emitter of carbon dioxide, and its annual emissions have been continuing to rise. China has always prioritized energy conservation and the reduction of pollution emissions as the long-term goal in its carbon emission reduction strategies, gradually shifting the focus from "Energy-saving Emission Reduction" to "Low-Carbon Development" and then into the current "Double Carbon" period. This paper mainly focuses on the progress of Chinese carbon policies and how it get to high-quality economic development, it aims to provide better policies to improve environmental problems for government and policymakers. Because China's carbon emissions regulations have a variety of effects on the market and country's military economy, which could encourage the R&D and innovative motivation of green technology, more trades in carbon trading market and growth in renewable-energy related industry from market aspect, while the development high-quality economic and promotion in the digital economy in economy perspective, the government should keep combining market mechanism with traditional carbon tax and seek for high-quality economic development.

Keywords: Carbon emission, sustainable development, carbon policy, China

1. Introduction

China is a country with a rapidly growing economy, resulting in a significant increase in carbon emissions. Since 2006 till 2021, from Figure 1, it can be seen that China still took as the largest carbon dioxide emitter in worldwide and annual emissions worldwide is keep increasing [1], and from Figure 2, the annual global of carbon dioxide emission shows a significantly rising trend, so the Chinese government recognized this issue in the early 2000s and has since implemented several climate mitigation policies to mitigate the environmental impacts of carbon emissions.

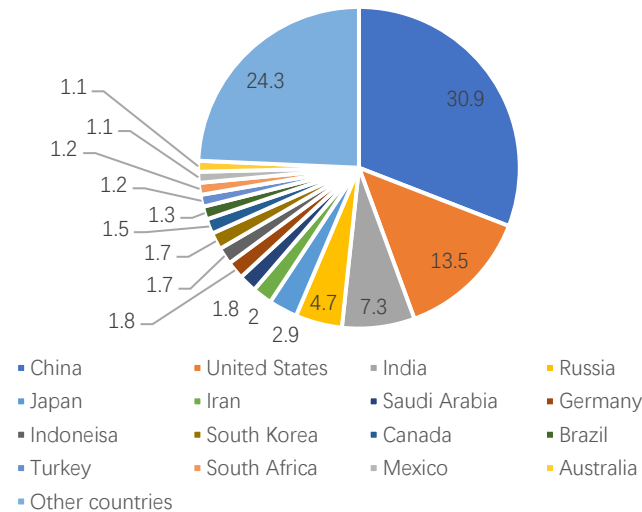


Figure 1: Distribution of carbon dioxide emissions worldwide in 2021, by select country.

Data source: Statista

<https://www.statista.com/statistics/271748/the-largest-emitters-of-co2-in-the-world/?locale=en>

Photo credit: Original

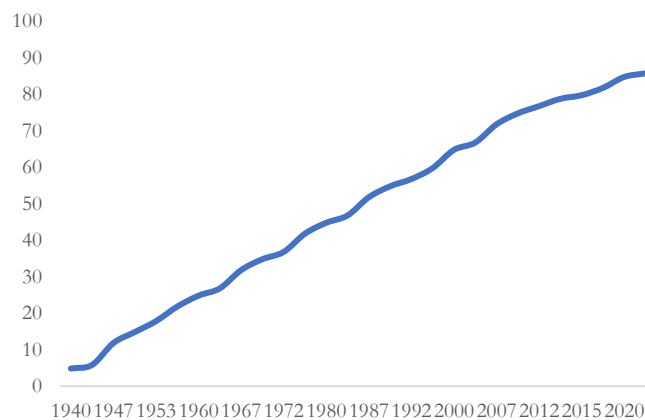


Figure 2: Annual carbon dioxide emissions worldwide in 2021, by select country worldwide from 1940 to 2020.

Data source: Statista

<https://www.statista.com/statistics/276629/global-co2-emissions/?locale=en>

Photo credit: Original

It is crucial to evaluate the effects on carbon emissions as China's carbon emission trading market switches from the regional pilot stage to the nationwide stage in 2021, producing one of the largest carbon markets in the world. This study aims to examine China's development history in carbon emission policies and its current status, including the impacts of these policies on the economy and market and the high-quality economic development.

The following parts of this paper organized as follow: Part 2 focuses on the history mainly in three stages, from energy saving and environmental protection (1980-1994), to carbon policies upon market mechanisms (1995-2007), then transmitted to Emissions Trading System (ETS) till now. Also including current situation with plans of reducing the CO₂ intensity; Part 3 analyzes the impacts to

market and the whole economy, mainly about the motivation of green technology innovation, information and communication technology (ICT) development and carbon trading market, with short-term and long-term analysis of China's economy in current digital development.

2. History and Current Status

2.1. History of China's Carbon Emission Policies

China has always prioritized energy conservation and the reduction of pollution emissions as the long-term goal in its carbon emission reduction strategies, transiting from "Energy-saving Emission reduction" to "Low-carbon " development and then into the current "Double carbon (carbon peaking and carbon neutrality goals)" period, China has gradually changed the focus. To review of the process of development in the carbon emission policies in China, the course would be divided into three time periods in terms of initial policy formation stage, structure transmission stage and deepening development stage [2].

Firstly, from 1980 to 1994, from two dimension of energy saving and environmental protection, policymakers indicated that energy-saving work could be effectively promoted by transforming energy-saving technologies, and highlighted the vital importance of energy conservation, enhancing energy management. It also stated that economic growth must adhere to sustainable development principles and cannot waive the environment's resources as the cost.

During the period between 1995 and 2007, China's policy tools for energy balance and emissions reduction have maintained the use of administrative measures while gradually transitioning to market-based mechanisms. Since the implementation of the "Regulation on the Administration of Pollutant Discharge Fees" in 2003, the Chinese government has continuously strengthened supervision and management of pollution tax collection, further clarifying the scope and standards of the fees, promoting pollution control and the management of polluting entities. The taxation feaa collected by government has reduced the financial burden on the government in terms of energy resources saving, emissions reduction, and environmental governance expenditures, while also subjecting the polluting behavior of enterprises to market mechanisms. However, the incentivizing and restrictive effects of pricing mechanisms have not been fully reflected [3].

From 2007, upon the initial implementation of CO₂ emissions intensity objectives in the Twelfth Five-Year Plan, policymakers recognized the potential efficacy of an Emissions Trading System (ETS) as an economical course of action to combat climate change [4], in place of traditional command-and-control strategies. About 4 years later, the China National Development and Reform Commission made the decision to establish several regional markets for carbon trade, and these markets were situated in Shenzhen, Guangdong, Beijing, Shanghai, seven cities in total.

2.2. Current Status

According to the report of the commission, by the year 2017, close to 3000 companies had taken part in trading of carbon emissions and the reduction of carbon emissions. In the six regional markets, a total of 197 million tonnes of carbon emissions, generating 4516 million RMB which had been successfully traded [5].

China will establish reform agenda plans for peaking carbon dioxide emissions in important industry field and sectors, involving a number of supporting measures, and in order to meet its carbon peak and neutrality targets, it will impose a "1+N" policy for carbon peak and neutrality goals [2].

In anticipation of the 21st Conference of Parties (COP) in Paris in 2015, the leaders of China communicated their plans to decrease the CO₂ intensity of the country's economy by 60%-65% compared to 2005 levels by 2030. They also stated their goal to reach the highest point of CO₂

emissions no later than 2030. President Xi Jinping later declared in the autumn of 2020, in front of the UN General Assembly, China would attempt to attain carbon dioxide neutrality by 2060.

3. Impact on Market and Economic Development

China's carbon emissions policies have diverse impacts on the country's economy and market. Above all, implementing policies to lower carbon emission level results in the closure of inefficient, high-polluting industries, which may result in job losses and may negatively impact the country's GDP. However, on the other hand, investing in clean and renewable energy infrastructure and technologies stimulates job growth, contributes to sustainable economic development, and boosts innovation and trade.

3.1. Impacts on Market

Firstly, it would encourage the R&D and innovative motivation of green technology. The objective behind green technology innovation is to decrease pollution, enhance the effectiveness of technological progress, and strive for the collective progression of ecological environmental preservation and social economic development. This objective encompasses two significant aspects - technological advancement and environmentally-friendly development. It is imperative to augment the input-output efficiency and economic gains alongside implementing the notion of green development. Innovation in green technologies is an influential way to guarantee high-quality economic growth that is rooted in the notion of mutual cohabitation between humans and nature. Since the government policies would intervene and correct environmental pollution due to unregulated production activities, more investment imposed motive firms to reduce pollution and carbon emissions and have green technology innovation.

For instance, ICT (information and communication technology), although this sector do not contribute comparatively large to carbon emissions, the substantial energy consumption of its cutting-edge network equipment cannot be disregarded when thinking about future carbon emission reduction. Significant amounts of energy are used and carbon dioxide is emitted during data transmission and internet applications. While not having the highest energy use or emissions, the manufacturing business uses more energy overall due to the complexity of its products, their extensive usage, and their prolonged usage [6]. Huawei in ICT industry could be taken as the example for innovation, their efforts have been made to improve energy efficiency, such as increasing the Mate30 mobile phone chip's energy efficiency by more than 20% compared to the previous generation and optimizing TOP applications for different scenarios to decrease product power consumption. The "Green Software Alliance" has been established to promote low-power design practices and improve product renewal times. For instance, compared to the Mate20 series, the Mate30 series mobile phone has an increased application renewal time of more than 10%.

Secondly, more trades would be applied in carbon trading market has emerged as a significant energy policy tool for reducing carbon emissions. This practice entails trading carbon dioxide emission allowances as a form of commodity, in line with each country's regulations for controlling greenhouse gas emissions.[7], the Ministry of Ecology and Environment considers factors such as economic growth, industrial restructuring, energy structure optimization, and coordinated control of atmospheric pollutant emissions to formulate the total carbon emission quota determination and allocation plan. The ecological environment department of the province will assign the specific yearly carbon emission limit to major emitting entities within its area of control, following the carbon emission quota determination and distribution plan created by the Ministry of Ecology and Environment.[8], thereby creating a carbon emissions trading market or CT market, and this

approach, initially introduced in the Kyoto protocol, is more adaptable and efficient than the carbon tax policy of governments in curtailing carbon emissions through market mechanisms [4].

Thirdly, there would be a rising investment in renewable-energy related industry and product, such as electric vehicles industry and photovoltaic power industry, since most of the investors believe that the zero carbon-emission products would have promotion potential. The deployment of carbon neutrality strategies combined with the opportunities presented by the era of parity pricing have led to a new trend in the photovoltaic power industry [9]. As the main renewable energy source for achieving carbon neutrality goals, photovoltaic power needs to establish a more stable and transparent market demand as well as an efficient and sustainable supply capacity. On the demand side, market mechanisms and industrial policies will continue to play a guiding role in driving the demand for photovoltaic power. On the supply side, anchoring of phased-scale, promotion of power system technologies, and clean production throughout the entire industry chain provide important guarantees for the large-scale, high-proportion, and high-quality supply of photovoltaic power.

3.2. Impacts on Economic Development

From the short-run, the tax added to firms would cause a contraction in total revenue, with higher production cost and less competitiveness in world market for export, which means the current account position would worsen in long run, and carbon taxation will cause China's economy to contract by 0.1% every 4 yuan/ton [10], leading to a worse economic performance in China. For the long-term perspective, the carbon emission policies could contribute to whole climate which means it could bring future benefits in sustainable development [11]. The concept of high-quality economic development was introduced during the 19th National Congress of the Communist Party of China in 2017, signifying a shift from rapid growth to a more innovative, efficient, eco-friendly, and value-added mode of growth [12]. This growth model is driven by innovation and supported by environmental regulations that are crucial for addressing economic development and pollution issues, and for promoting high-quality economic development.

This could accelerate the growth of the digital economy and strengthen China's digital infrastructure's collaboration with regional environmental governance. Limiting carbon emissions can stimulate a trend toward telecommuting and remote work. Employee travel to work may be significantly reduced as a result, greatly cutting carbon emissions. Digital tools that enable remote collaboration, such video conferencing and cloud-based collaboration tools, may see new opportunities as the tendency toward remote work rises.

4. Conclusion

This study had a review on the development in carbon emission policies in China, the course would be divided into three time periods in terms of initial policy formation stage, structure transmission stage and deepening development stage, then analyzing the current and future policies. The impact on market and economic development are also involving encourage the R&D and innovative motivation of green technology, more trades in carbon trading market and growth in renewable-energy related industry from market aspect, while the development high-quality economic and promotion in the digital economy in economy perspective.

In conclusion, China's carbon policies have had a significant impact on its market and economic development. Through the implementation of measures such as the carbon trading scheme and investment in renewable energy, China has made great strides in decreasing its carbon emissions while also promoting economic growth. However, there is still room for improvement in ensuring that high-quality economic development remains a priority alongside carbon reduction efforts. As the

with continued focus and investment in sustainable development, China has the potential to lead the way in creating a more environmentally friendly and prosperous future.

The study acknowledges that there are limitations in the current state, since it only considers the carbon emission without taking other pollutants account or models which means it cannot get the valid results with high-quality development.

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