Research on the Present Situation and Countermeasures of Carbon Emission in Beijing, Tianjin and Hebei

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Abstract. Resource and environmental issues are one of the bottlenecks restricting China's economic and social development. Adhering to carbon emission reduction and green development is a top priority for the development of Beijing-Tianjin-Hebei. This paper analyzes the data of Beijing-Tianjin-Hebei carbon emissions and its main influencing factors in the past 20 years. On this basis, it sorts out the existing energy-saving and emission-reduction policies and plans of Beijing-Tianjin-Hebei, and clarifies its shortcomings. Furthermore, it proposes countermeasures from five aspects: changing concepts, enacting regulations, green transformation, green finance, and population regulation.

1. Introduction

From the "steam age" to the "electrical age" to the "information age", the industrial era has brought enormous economic wealth and material civilization to human society, but it has also aggravated the deterioration of the global ecological environment. Global warming caused by the massive discharge of greenhouse gases such as carbon dioxide is becoming more and more serious. After entering the 21st century, with the increasing emphasis on the environment, human society has entered the fourth industrial revolution - the green industrial revolution. China proposed the carbon emission peak target at the Paris Climate Change Conference, achieving carbon dioxide emission peaks around 2030 and striving to reach its peak as soon as possible. As the capital, Beijing also put forward the goal of striving for the peak of carbon dioxide emissions in 2020 in the “13th Five-Year Plan”. Tianjin mentioned in the "Thirteenth Five-Year Plan for Controlling Greenhouse Gas Emissions in Tianjin" that the city's carbon emissions peaked around 2025, and the cities of Hebei Province also proposed an overall improvement in the quality of the ecological environment by 2020.

2. Analysis of carbon emissions and influencing factors in Beijing, Tianjin and Hebei

It can be concluded from the existing research literature that the carbon emissions of a region will be affected by factors such as GDP and total energy consumption, which will show different growth trends. The following is an analysis of the carbon emission status of Beijing-Tianjin-Hebei from three aspects: GDP, energy consumption and carbon emissions.

From the experience of countries and cities where carbon emissions have peaked, GDP and carbon emissions, GDP and energy consumption all show an "inverted U-shaped" relationship. With the
development of the city, GDP grows rapidly, accompanied by a large amount of energy consumption and carbon emissions. However, as the economy grows, the level of technology continues to increase, and energy consumption is gradually shifted from coal to clean energy. The growth rate of total energy consumption will gradually slow down, and then it will remain in a stable state and then begin to decline. Similarly, economic growth and energy conversion will result in a growth-smooth-declining trend in carbon emissions.

As can be seen from Figure 1, since 1995, Beijing's GDP has been increasing year by year. In particular, since the beginning of the 21st century, it has maintained a trend of rapid growth. The rapid growth of GDP is inseparable from the massive consumption of energy. Before 1998, the GDP growth rate was small, and the total energy consumption and carbon emissions showed a short-term downward trend, but then showed an upward trend. From the success of Beijing's Olympic bid in 2001 to 2007, the growth rate of carbon emissions has been maintained at a relatively stable value. From 2007 to 2008, Beijing implemented a series of emission reduction policies for the successful hosting of the Olympic Games, so that carbon emissions have declined in this year. After 2008, the financial crisis broke out and the ecological environment worsened. The country began to pay attention to the governance of the ecological environment. In the following years, the GDP growth rate slowed down, and the growth rate of total energy consumption was basically consistent with the growth rate of carbon emissions. In 2013, after the country put forward the development concept of “green development” until it was implemented, the government formulated a series of related policies and laws to limit carbon emissions in economic development, then carbon emissions began to decline slowly. In particular, in 2014, the Beijing government shut down several large power plants to control the smog. In the following two years, more than 700 polluting enterprises were shut down. China’s development model of “energy consumption for economic growth” has also begun to change.

Figure 1. Beijing's GDP, energy consumption and carbon emissions.

Compared with Beijing in the political center, Tianjin's development model needs further optimization and transformation. As an industrial center in the north, Tianjin has been driving economic growth at the expense of a large amount of energy consumption and carbon emissions. Because of its proximity to Beijing, Tianjin has also made a certain degree of effort for the successful
hosting of the Olympic Games. It can be seen from Figure 2 that the arrival of environmental storms has caused Tianjin's total carbon emissions and energy consumption to reach a relatively high level around 2012, similar to the first peak. Since 2012, the total carbon emissions and energy consumption have been in a platform period, and there has been a very slow decline. Before 2012, Tianjin's GDP, total energy consumption and carbon emissions almost maintained a consistent development trend, but since 2012, the state has introduced “Ten rules of the atmosphere”. In 2013, Tianjin proposed to reduce the total coal output by 10 million tons by the end of 2017. Since then, economic growth, carbon emissions and total energy consumption have gradually “de-linking”.

![Figure 3. Hebei's GDP, energy consumption and carbon emissions.](image)

As a major province of energy consumption, Hebei has maintained a relatively high level of energy consumption and carbon emissions for many years. As can be seen from Figure 3, in the development model of Hebei Province, the total energy consumption and GDP growth are closely related. And between 2004 and 2011, with the growth of economic level, the growth rate of carbon emissions has risen sharply. Since 2012, Hebei Province has issued a number of “Twelfth Five-Year Plan” on energy conservation and emission reduction, ecological environmental protection, and environmental impact assessment, the growth of carbon emissions has gradually stabilized. Since the 18th National Congress, the implementation of the new economic development model has made Hebei's energy consumption not increase, while GDP has also been in a state of “near-step”. Hebei Province explores new development kinetic energy, releases new development points, and changes the original development model without delay. As a province with large energy consumption, Hebei's economic growth and energy consumption and carbon emissions “go forward and retreat together”. Before 2010, the growth trend of the three indicators was almost the same, and even the growth rate of GDP was lower than the growth rate of total energy consumption and the growth rate of carbon emissions. In recent years, due to the strong control of the central and provincial governments, the growth rate of total energy consumption and carbon emissions in Hebei Province has gradually declined, but most of the period has maintained a positive growth rate.

3. Beijing-Tianjin-Hebei’s existing energy-saving emission reduction policies and planning analysis

Beijing, Tianjin and Hebei have adopted a series of policy measures in the five aspects of ecological environment, atmospheric management, construction engineering, total pollutant control, and environmental protection.

However, in many initiatives, for example, the average annual concentration of PM2.5 in Beijing in 2017 was 35% lower than that in 2013, only 58 micrograms per cubic meter. In 2017, the air quality in Tianjin was 23 days and the pollution was 23 days less than that in 2013. In 2016, in Hebei Province, the completion of coal-fired transformation of 318,700 households and the reduction of domestic carbon emissions by 21.4% compared with 2013 also exposed some of the shortcomings of some policies. First, when planning for Beijing-Tianjin-Hebei, most of the planning is based on the local status, and does not consider the development plan of Beijing-Tianjin-Hebei as a whole. Second, after the government made the plan, the notification and implementation of the first implementation was too
simple, the task was not divided in detail, resulting in incomplete implementation. In the later supervision, there was still incomplete governance, and there was no legal constraint on the basis of planning. Third, Beijing’s economic level has been at a relatively high level. Although shutting down enterprises has an impact on the economy, it is not obvious. However, for the long-term development of Beijing-Tianjin-Hebei, the closure of polluting enterprises is not applicable to Hebei, nor is it a long-term solution. Fourth, enterprises and governments do not cooperate well with banks, promote the development and transformation of industries with green finance, and promote the development of new energy technologies with green finance. Fifth, many high-quality enterprises choose to set up a head office in Beijing, and they have given generous treatment to absorb talents. As a result, the population of Beijing has been much higher than the plan, while the talents in Tianjin and Hebei are very scarce. And the overall urbanization rate of Beijing-Tianjin-Hebei has been continuously improved, but too much attention has been paid to the growth rate and the quality of urbanization has been neglected.

4. Beijing-Tianjin-Hebei proposal to reduce carbon emissions

Based on the above analysis of Beijing-Tianjin-Hebei carbon emissions and its influencing factors and energy-saving emission reduction policies and plans, and the five points pointed out, the following five recommendations on green development and carbon emission reduction are proposed.

Change the concept and aim at sustainable development. We must stand in the perspective of Beijing-Tianjin-Hebei coordination and symbiotic development, and explore new development models. We must adjust the economic structure and spatial structure of Beijing, Tianjin and Hebei with the overall low carbon orientation of Beijing, Tianjin and Hebei. Increase investment in Binhai New Area, Xiong'an New Area, Bohai New Area and other economic new areas, and cooperate with some enterprises to build characteristic industrial parks to guide other enterprises to enter industrial parks, away from urban areas, and establish Beijing-Tianjin-Hebei Industrial Park and Beijing-Tianjin Industrial parks such as industrial parks play an advanced role in Beijing, driving the overall development of Tianjin and Hebei Province, including the flow and development of talents, economy and technology, improving the innovation capability and competitiveness of undertaking industries, and building three industrial chains with low carbon. Strengthen the cooperation and docking of the three industries, and implement the coordinated development pattern of “Beijing R&D – Tianjin Conversion – Hebei Production” to promote regional low carbon.

Under the new situation, all provinces and cities in Beijing, Tianjin and Hebei should seek strategic synergy, based on the energy status of “Beijing-Tianjin less, Hebei numerous”, coordinate the total energy consumption in the region and control the overall energy consumption, and refine the laws and regulations to each. The source of pollution provides a legal basis for the government's subsequent inspection and governance work. Secondly, all localities should introduce corresponding laws and regulations according to the status of each place, and amend the provisions in each year to ensure their forward-looking and timeliness. The plan and the law will be disclosed and the target responsibility system will be implemented. In the following work, all regions will strictly follow the laws and regulations to implement the planning plan, supervise each other during the implementation process, and adopt corresponding sanctions for areas that do not meet the standards or violate the law, and gradually avoid and avoid unnecessary losses caused by short-term large-scale investment that is eager for success.

With the improvement of the technical level and the quality of life of the people, in the future, from the perspective of Beijing-Tianjin-Hebei coordination, the three regions need to carry out planned industrial transformation and technological exploration. As a city with a high carbon emission rate, Beijing is developing low-carbon technologies and exploring clean and renewable energy. The carbon emission rate in Tianjin and Hebei Province is low, and the primary task is to improve the transformation and upgrading of the industry. Hebei Province uses its own advantages to fully develop the primary industry, integrates with the international market, and with the establishment of Beijing-Tianjin technology and the establishment of the Xiong'an New District, accelerates the transformation
and upgrading of the secondary industry, broadens the coverage of the tertiary industry, and the proportion of Tianjin's tertiary industry steadily rises. At the same time, using the advantages of the manufacturing industry, it forms a knowledge and technology connection with Beijing, extends the industrial chain of the manufacturing industry, and enhances the added value of the manufacturing industry. With the changes in industrial structure, energy consumption will gradually transform from coal to oil and gas, and efforts will be made to develop new energy, develop new technologies, and support economic development with sustainable and renewable energy sources to achieve emission reduction.

Promote the development of the real economy with green finance. High-energy, high-pollution, low-efficiency industries in Hebei Province and Tianjin City are transforming into low-energy, low-pollution, high-efficiency industries. Large-scale industrial adjustments require a lot of manpower and financial resources, along with large-scale environmental governance projects, all of which require the support of green finance. Beijing-Tianjin-Hebei's current one-time energy is still dominated by pollution energy such as coal. Beijing will focus on the research and development of clean energy. After that, the procurement and maintenance of clean energy equipment will require green finance.

To cultivate high-quality talents as the driving force for long-term development, and lay the foundation for continuous innovation and development. The population factor is also an important factor in energy saving and emission reduction in Beijing-Tianjin-Hebei. The impact of population quantity on carbon emissions will not be reduced due to the increase of urbanization rate. The key to regulating population is to solve the causes of population movement, improve Beijing's threshold for population and enterprises, and properly allocate Beijing's talents and benefits to Tianjin and Hebei Province, and guide the population and industry to the surrounding cities through welfare, reducing Beijing. The population size, the non-capital function, the corresponding demand for living services in Beijing will be reduced, and the carbon emissions will be reduced. At the same time, Tianjin and Hebei Province have introduced more high-quality talents while controlling the population size, laying a solid foundation for long-term sustainable development. While increasing the rate of urbanization and accelerating economic development, it also pays attention to the quality of urbanization. Urban residents implement the concept of energy conservation and emission reduction, and adopt measures similar to the free ride of winter buses in Hebei Province to attract residents to spontaneous green travel and green living.

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