

Opportunities, Challenges and Countermeasures of Low-carbon Economy Development from the Perspective of Sustainable Development

Zixuan Wang, Enhao Wei, Liming Qiu and Xiaoyun Peng

Anhui University of Finance and Economics, Bengbu, 233030, China

Abstract: Countries all over the world have reached a consensus on developing a low-carbon economy with low emissions, low pollution and low energy consumption. As the largest developing country in the world, China's economic development is deeply dependent on fossil energy, and its social and economic development is in the stage of industrialization and urbanization. Only by developing a low-carbon economy can we cope with climate warming and realize green and sustainable economic development. On the basis of discussing the concept, background and development trend of low-carbon economy, this paper puts forward the inevitability of developing low-carbon economy in China. In view of the opportunities and challenges faced by China in developing low-carbon economy, this paper puts forward the corresponding measures for developing low-carbon economy in China.

Keywords: Low-carbon economy; Opportunity; Challenge; Counter-measure.

1. Introduction

With the rapid development of the world economy, global warming has become a common problem facing mankind. In order to avoid the crisis and disaster caused by climate change, all countries in the world attach importance to developing low-carbon economy and curbing excessive emissions of greenhouse gases. Low-carbon economy refers to an economic model with low emissions, low pollution and low energy consumption. The purpose of developing low-carbon economy is to achieve the maximum economic benefits on the basis of consuming the least energy[1]. This concept is compatible with China's construction of a resource-saving and environment-friendly society and the transformation of economic development mode. It is the inherent requirement of China's sustainable development and an important starting point for promoting China's high-quality economic development and ecological civilization construction.

2. Concept, Background and Development Trend of Low-carbon Economy

2.1. The concept of low-carbon economy

In 2003, the White Paper on Energy released by the United Kingdom put forward "low-carbon economy" for the first time. There is no clear definition of low-carbon economy in the book, and the explanation of low-carbon economy in domestic academic circles is quite controversial[2]. Its generally acceptable meaning is: promoting industrial transformation through policy guidance and institutional innovation, improving the technology of new energy development and utilization, and reducing the consumption rate of carbon-based energy such as coal and oil, so as to realize an economic model with low emissions, low energy consumption and low pollution and take economic development.

2.2. Background of developing low-carbon economy

By the end of 2019, global CO₂ emissions reached 36.8 billion tons, exceeding 36.57 billion tons in 2018. The trend of global warming has further intensified, the ecological environment has further deteriorated, the frequency and intensity of extreme weather have increased, and the problems caused by global warming have seriously affected people's lives and social development; Over-exploitation and utilization of resources make resources further exhausted. If resources are exhausted, the whole world social order will be chaotic. Developed countries have gone through the development stage with high-carbon energy as the main driving force. In this context, developing a low-carbon economy is an inevitable choice[3].

2.3. Development trend of global low-carbon economy

A global consensus has been reached on developing a low-carbon economy. More and more countries believe that developing a low-carbon economy can guarantee energy security, alleviate global warming, improve the ecological environment and promote the coordinated development of society. Low-carbon economy is the core of future economic development, and the leaders of low-carbon economy will occupy a dominant position in future economic development, so the competition of global low-carbon economic development is becoming increasingly fierce.

Renewable low-carbon energy sources, such as bioenergy and ethanol fuel, are widely used. Solar heating, wind power generation, hydropower generation and nuclear power have all reached a certain scale[4]. Germany has a leading position in solar energy, and China has a great advantage in the development of wind energy, while some countries have 90% of their electricity from hydropower generation, such as Norway and Brazil. The industrial transformation has been accelerated, and the carbon emissions of industry, construction and transportation have been effectively reduced;

As the carrier of low-carbon economy, the infrastructure and consumption system of "low-carbon city" reflect the development degree of a city's low-carbon economy.

3. Opportunities for China to Develop a Low-carbon Economy

3.1. Opportunities brought by the adjustment of global economy and trade pattern

The world economic and trade pattern has undergone far-reaching changes under the promotion and development of low-carbon economy, especially the rapid development of new energy industry and some emerging industries related to new energy industry, which has a far-reaching impact on the overall pattern of the world. China can seize this opportunity, innovate in system and system, and adjust and upgrade the industrial structure to some extent, so as to narrow the gap with developed countries in technology and even catch up. According to the relevant data released by China's Ministry of Commerce in 2020, the total import and export volume of China's goods trade reached 31.54 trillion yuan in 2019, an increase of 34% over last year. Among them, 17.23 trillion yuan was the export volume, an increase of 5.0% compared with last year; 14.31 trillion yuan was imported, up 1.6% year-on-year; And a trade surplus of 2.92 trillion yuan, an increase of 254% over last year. The scale of import and export, export and import all reached record highs. In 2019, China's export commodity price index increased by 2.8%, while the import commodity price index increased by 1.4%, and the competitive advantage of foreign trade was further improved. However, from the perspective of global industrial value chain, China is still at the low end of the value chain, and the manufacturing industry still accounts for a large proportion, which leads to serious environmental pollution[5]. The phenomenon of "pollution at home and export abroad" exists in many domestic enterprises, and China has borne high emissions for developed countries to a large extent. Therefore, only by developing a low-carbon economy can we fundamentally reduce carbon emissions, realize the optimization and upgrading of industrial structure and the transformation of economy to low-carbon development, and improve the country's international trade.

3.2. Huge market demand

Countries around the world have formulated different policies for climate change, and emerging markets have gradually formed under this circumstance, further accelerating the innovation of market mechanisms, such as carbon quota trading market and clean development mechanism. Under this background, China's development of low-carbon economy has a very large market space and faces huge market opportunities. Clean development mechanism (CDM) means that industrialized countries can obtain "certified emission reductions" by doing greenhouse gas emission reduction projects in developing countries, which can be used as part of their promised emission reductions. It can be seen that CDM is beneficial to both industrialized countries and developing countries. Industrialized countries can achieve emission reduction targets at low cost, while developing countries can get technical and financial support from industrialized countries to develop low-carbon economy[6]. More importantly, technology transfer based on emission reduction projects under CDM is effective. New technologies tend to attract large-scale investment, while

renewable energy development technology, clean coal technology and so on are very effective technologies that contribute to energy conservation and emission reduction, and their investment quota increases rapidly, which also expands the market demand for low-carbon products. China is a big manufacturing country with obvious advantages in industrial clusters and can introduce advanced technologies, and China's technological innovation ability is constantly improving, and the gap with developed countries in low-carbon technologies is getting smaller and smaller, and it will occupy a very large market in the market of low-carbon products.

4. Challenges in Developing Low-carbon Economy in China

Challenges often coexist with opportunities. At present, China's main task is still to develop the economy, which means that energy consumption is very large. Therefore, how to effectively reduce greenhouse gas emissions and vigorously develop a low-carbon economy is facing enormous challenges.

4.1. Challenges brought by the development stage of industrialization and urbanization

At present, China's economic development is in the middle and late stage of urbanization and industrialization, and the industry is mainly energy-intensive. Moreover, China wants to quadruple its GDP in 2020 and build a well-off society in 2050. Therefore, how to achieve low carbon and economic development has great challenges. Although industrial production has promoted social and economic development and improved people's living standards, the sewage produced by industrial production has entered rivers and oceans, causing a large number of deaths of aquatic organisms and destroying the ecological environment. The impact of this destructive power is lasting and far-reaching, and the purification technology for sewage in China is far behind the discharge speed of sewage. It is difficult to change China's economic development model in a short time. How to quickly improve low-carbon technology to solve the contradiction between economic development and environmental damage will be a major challenge facing China at present[7].

4.2. Challenges brought by population and resources

One of China's basic national conditions is a large population base. According to the statistical data of 2019, the population of mainland China totals 1.405 billion. The pressure on the environment caused by the huge population size is conceivable, and the amount of resources it consumes is also very large. China's resources are characterized by abundant coal resources, but few oil and gas resources. 94% of China's energy reserves are coal, while oil accounts for 54% of the energy reserves, while natural gas only accounts for 0.6%[8]. At present, China still takes coal as the main energy source, and the steady development of renewable clean energy is difficult to completely replace the traditional fossil energy, which means that China's energy consumption structure will not change fundamentally for a long time, and coal is still the main energy source, and high carbon emissions are inevitable at present. Therefore, how to meet the energy consumption required by the huge population without changing the environment for development and embark on the

road of low-carbon sustainable development is another major challenge for China to develop a low-carbon economy.

4.3. Challenges brought by the status in the international division of labor

China is a big manufacturing country and a "world factory". In the international manufacturing market, China is in a low-end position, and most of the products produced and exported are resource-intensive high-carbon products, which leads to China's commitment to pollution emissions beyond what China should have undertaken, further causing environmental deterioration. In the context of increasing global concern about climate change and low-carbon emissions, many developed countries use their right to speak in the world to obtain more benefits through political, economic, legal and other means, such as improving market access conditions for low-carbon goods; Restrain the market demand of high-carbon products; In order to improve the market competitiveness of low-carbon products, various systems are introduced to stimulate consumers to buy low-carbon products; Even in order to restrict developing countries from exporting high-carbon products to other countries and let developing countries buy their own low-carbon products from developed countries at high prices, they use their own technological advantages to set up technical barriers such as tariffs and environmental protection. Therefore, China faces great challenges in developing its own low-carbon products and technologies.

4.4. Challenges brought by domestic enterprises

Some small business owners lack environmental awareness and understanding of relevant laws, and blindly think that their enterprises are small in scale, so the pollution caused to the environment is also very small. Large enterprises are the main body of environmental pollution. However, there are many small and medium-sized enterprises in China, which are also the main force of environmental pollution. Some enterprises know that the state attaches importance to the environment, but they still choose to illegally discharge pollutants when faced with benefits. Therefore, it is also a very urgent task for our government to improve supervision and enhance the awareness of environmental protection of enterprises.

5. Countermeasures for Developing Low-carbon Economy

5.1. Vigorously develop renewable new energy and promote energy structure optimization.

China's economic development depends on traditional fossil energy to a great extent, and clean energy such as hydropower, wind energy and solar energy in the development stage can't completely replace traditional fossil energy. However, renewable clean energy has gradually accelerated the replacement speed of traditional fossil energy[9]. Therefore, only by making a reasonable and thorough development plan for new energy sources, clarifying the development direction and scientifically guiding the industrial layout can we change the current situation of China's dependence on traditional fossil energy, form a strong guarantee for China's energy security, and

finally realize the low carbonization of China's economic development. The 16-character policy for the development of new energy summarized in the last century: "adjust measures to local conditions, complement each other with multiple functions, comprehensively utilize and pay attention to benefits" has a very good reference significance for the development of new energy. China has begun to reduce enterprises with high energy consumption, high pollution and overcapacity, and adjusted the economic structure. After the adjustment, the energy demand has also changed. In view of the problem of scattered coal burning in rural households, biomass energy can be used to replace it, including liquid and solid particles made of biogas and biomass energy. In this way, the use of coal can be reduced to achieve the purpose of emission reduction, and the life of rural residents will not be affected.

5.2. Increase the research and development and utilization of low-carbon high-tech and foster and support high-end industries.

Low-carbon technology can reduce energy consumption by improving energy efficiency, effectively improve the conversion rate of clean energy, thus saving costs to a great extent, gradually replacing fossil energy, promoting the further development of new energy, and then achieving the purpose of emission reduction from all aspects. The representative low-carbon technologies are carbon capture and storage technologies, which capture and collect CO₂ discharged or being discharged into the atmosphere for storage. Therefore, it is very important to develop low-carbon technologies. Compared with developed countries, China's low-carbon technology is still insufficient. Therefore, in order to compete for a place in the development of low-carbon economy, China must improve its R&D and innovation ability of low-carbon technology and increase its investment in R&D of low-carbon technology. A number of existing technologies with excellent technology, low energy consumption and low carbon emissions will be rapidly popularized and applied, and government departments will give incentives, tax reduction and exemption, discount loans and other policy support. Encourage the combination of state-owned capital and social capital, take the high-end environmental protection industrial chain as the leading factor, jointly build a high-end environmental protection equipment industrial park, make the environmental protection industry bigger and stronger in an all-round way, and provide more new technologies, products and services for carbon emission reduction[10].

5.3. Improve the legal system and strengthen system guidance.

The rapid and stable development of economy needs the guarantee of perfect legal system and sound market mechanism, so does the low-carbon economy, which needs the guarantee of law and market mechanism. In recent years, China has formulated a series of relevant laws and regulations for the development of low-carbon economy, but the role of these laws and regulations in practice is not obvious. As far as laws and regulations are concerned, they are clear and organized, but economic development itself is complex, and economic activities are difficult to be explained by some organized logic. Therefore, it is difficult for laws and regulations aimed at low-carbon economy to play a full role

in the implementation process. At the same time, laws and regulations need to be synchronized with the development of low-carbon economy, that is, with the development of low-carbon economy, laws and regulations should be supplemented and improved accordingly, but in many cases, the speed of improvement of laws and regulations lags behind economic development. Therefore, in the process of low-carbon economy development, the state should always grasp the progress of economic development, and analyze whether the current laws and regulations are compatible with economic development. If not, it is necessary to supplement and improve the existing laws and regulations, so as to solve the legal problems in the development of low-carbon economy quickly and effectively. The state needs to strengthen supervision over enterprises that illegally discharge pollutants, and punish enterprises that have been found to have illegally discharged pollutants according to relevant laws and regulations. The institutional guidance for energy conservation and emission reduction should be further strengthened. The reform and innovation of system plays a very important role in the road of sustainable development in China. The old system can not only adapt to the development of social economy, but also hinder it. Only based on China's basic national conditions can we make a correct overall plan for the development of China's low-carbon economy, set clear development goals, set performance appraisal targets for leading cadres to develop low-carbon economy, use indicators related to low-carbon economy, change the past assessment of government officials based on GDP, and establish a digital, refined, market-oriented and intelligent comprehensive carbon measurement management system to fully serve the assessment and evaluation of peak carbon dioxide emissions's carbon neutrality targets.

5.4. Strengthen the cultivation of carbon finance and make the carbon market stronger and bigger.

Carbon financial market is a standard market for trading greenhouse gases according to relevant agreements and regulations, including various related investment and financing activities. At present, China's carbon finance business has launched carbon funds, carbon bonds, carbon quota mortgage loans, carbon quota repurchase financing and other businesses, but the business level and innovation level are obviously insufficient, which is far from the increasingly mature international carbon finance market and has broad development potential and room for improvement in the future. Loading the carbon market with financial functions is the key to effectively revitalize carbon resources and strengthen and expand the carbon market. Therefore, financial thinking and concepts should be used to promote the development of the carbon market. Incorporate the construction and development of carbon market into the overall framework of China's green financial system, and promote the simultaneous planning and overall design of the development of carbon trading market and the construction of green financial system. The carbon price signal formed by the carbon market can give full play to the function of fund allocation and guide more funds to flow to green and low-carbon fields. It is necessary to encourage financial institutions to participate in carbon market transactions, enrich the varieties of carbon market transactions such as carbon derivatives, encourage carbon financial innovations such as quota mortgage financing and carbon bonds, and

guide financial resources to promote the development of carbon market and the construction of carbon pricing centers with international influence. The development of carbon trading and carbon financial market can greatly promote the implementation of carbon emission reduction plan, and play an important role in improving the allocation efficiency of ecological environment resources, promoting the transformation of development mode and realizing coordinated and sustainable economic and social development. In short, the carbon financial market, as all economic activities related to carbon trading, takes carbon emission rights and their derivatives as trading targets, and through the market trading mechanism, it is increasingly promoting the transformation and upgrading of the industrial structure of energy conservation and emission reduction.

5.5. Establish a national carbon market data information platform to create a fair and just market environment.

Because carbon trading involves many regions, a wide range of fields and complicated procedures, it is an inevitable requirement for the healthy development of carbon trading market to ensure justice and fairness in the whole trading process. The government should organize experts or third-party institutions to investigate the actual situation according to their functions and powers, and make public the greenhouse gas emission reports of national enterprises by establishing an accounting, reporting and verification system, and then accurately record, track and manage the holding and trading of emission quotas by establishing a special information-based carbon trading registration system. Timely disclosure of the main body of carbon trading, carbon trading price, trading rules, quota allocation, regular evaluation and corresponding reports, etc., to provide accurate and true information to the market. Enterprises should also establish a carbon emission reporting system, standardize the contents, scope and methods of disclosure, ensure the accuracy, completeness and verifiability of the data provided, make the emission information open to the public and society, make the competition environment between enterprises fair and open, make full use of the market rules of carbon trading, speed up the process of energy conservation and emission reduction, and create better benefits for enterprises.

6. Conclusion

Developing low-carbon economy is a new opportunity for China's high-quality economic development and high-level protection of ecological environment. We should innovate and take the initiative to further promote the overall integration and synergy of climate change response and ecological environment protection, strengthen the coordinated control of greenhouse gas and air pollutant emissions in the fields of law enforcement supervision, monitoring and evaluation, emission reduction targets, management systems and tasks, accelerate the construction of a new low-carbon industrial system, and strive to create a new situation in ecological civilization construction and ecological environment protection.

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