

Study on green economic development path under the carbon neutrality target

Zhiyan Zhao¹, Dongxiao Yu²

¹ School of Economics and Management, Beijing University of Chemical Technology, Beijing, 100029, China

² School of Business and Management, Hong Kong University of Science and Technology, Hong Kong, 999077, China

Abstract. Green economic development is an inevitable trend of social progress. The target of “carbon neutrality” can’t be achieved simply by conserving energy and reducing emissions, but needs to realize a higher-level development under the “low carbon” threshold. As the key and essence of national development, how to give a full play to the economic function and achieve green economic development is not only a realistic requirement of social high-quality development but also an indispensable important component of green economic development. This paper studied the concept of “carbon neutrality” and green economy, the necessity of green economic development, the merit of realizing green economic development under the background of “carbon neutrality”, and the development path of green economy under the carbon neutrality target, in order to provide some reference for China’s green economic development.

Keywords: Carbon neutrality; green economy; development path.

1. Introduction

In the new period of national social and economic development, only by achieving peak carbon dioxide emissions and carbon neutrality could new development idea be really implemented, to accelerate the high-quality economic development in China. This is a profound revolution in every aspects including economy, energy, transportation, production, life style and so on. In recent years, China has made a good progress in energy reservation and emission reduction, but from a global reach, China’s carbon emission is still the world highest (Fig.1). Achieving the target of “carbon neutrality” requires to make a holistic change in knowledge, technology and governance and bring economy to development towards green and low carbon.

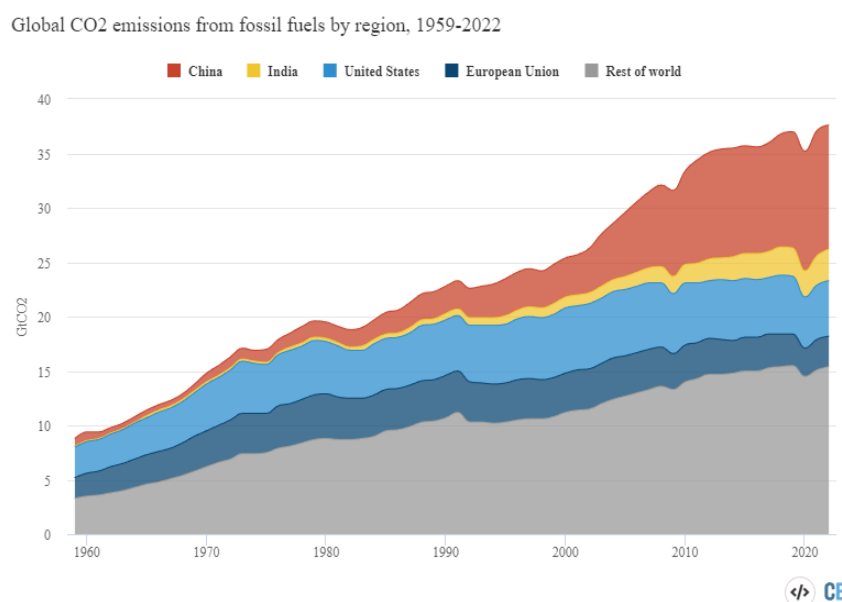


Fig. 1 Global CO₂ emissions from fossil fuels by region from 1959 to 2022

2. Implication of Green Economy

David Pierce indicated in his work Blue Book of Green Economy that we should find out and create a new economic model that can adapt to natural economy and the natural condition human can receive according to current ecological situation. Developing green economy is also a kind of economic development. We all know that economic development closely relates to environment and resources, however, due to China's economic development for so many years, ecological environment has been damaged seriously. Therefore, the idea of developing green economy generates. Its main idea of economic development is to coordinate the conflict between economic development and ecological environment, making both of them to develop in a harmonious way.

Green economy is a kind of market-oriented new economic form based on traditional industrial economy that takes ecological environmental protection and improvement as basic principle, targets at the harmony between economy and environment, and can solve ecological environment problem. The acute contradiction between economic development and environmental protection is a state that industrial economy produces and realizes in order to meet human's demand for environmental protection and health. Green economy must insist on the basic principle of "developing demand, reducing cost, enhancing impetus, coordinated action and macroeconomic regulation", and achieve sustainable development on this basis.

3. Current Situation of Green Economic Development

3.1 International development of green economy

In 2011, the United Nations Environment Programme defined "green economy" as the economy that can accelerate human well-being and social justice and meanwhile significantly reduce environmental risk and ecological scarcity. Constructing green economic system is the main approach to achieve peak carbon dioxide emissions target and carbon neutrality. Till 2020, the global total greenhouse gas emission of energy industry was 5,740,000 tons, covering 49.5% of overall greenhouse gas emissions. Therein, transportation occupies 2,550,000 tons, agriculture 1,520,000 tons, manufacturing and construction industries 460,000 tons, other industrial processes 320,000 tons, and other sectors 670,000 tons. Industry and transportation account for the majority of greenhouse gas emissions.

At present, there are 54 countries reaching to the peak carbon dioxide emission in the globe, covering 40% of global overall carbon emissions, and most of them are developed countries. In 2020, among the top 15 carbon dioxide emission countries, the USA, Russia, Japan, Brazil, Indonesia, German, Canada, Korea, the UK and France have already reached the peak carbon dioxide emission. Among them, German reached the peak carbon dioxide emission in 1973 and has committed to achieve carbon neutrality in 2045, and most countries in the world have committed to achieve carbon neutrality in 2050 (As shown in table1). The developing countries have formulated their own green development strategies and enacted special measures for regional green development to drive and support green economic development so as to achieve carbon neutrality target.

Table 1. Summary of carbon neutrality target attainment time for each country

Country/Region	Target time for carbon neutrality	Country/Region	Target time for carbon neutrality
Finland	2035	Japan	2050
Austria	2040	Korea	2050
Iceland	2040	Fiji	2050
Sweden	2045	Denmark	2050

USA	2050	Hungary	2050
Canada	2050	Ireland	2050
UN	2050	New Zealand	2050
UK	2050	Portugal	2050
France	2050	South Africa	2050
German	2045	Switzerland	2050
Chile	2050	Spain	2050
Costa Rica	2050	China	2060

3.2 China's development in green economy

China has become the world's largest energy consumer with carbon dioxide emission ranking first in the world. Our green economic development faces the challenges of traditional resources with high material consumption, power consumption and pollution; inadequate development of circular economy and low use ratio of industrial waste; and insufficient capability of green technological innovation and and low input in research and development. Our energy consumption per unit GDP is 1.5 times of the world average level, so energy conservation and efficiency improvement is the top priority of our energy strategy and the primary source of green and low carbon energy. In 2020, China's total energy consumption was 4.98 billion tons of standard coal, 2.2% more than 2019; coal production and consumption were 3.9 billion tons and 3.96 billion tons, accounting for 50.4% and 54.3% of the world's total, and coal consumption increased by 0.6%; total oil consumption reached 0.702 billion ton, making China the world's second largest oil consumer, and the consumption of crude oil, natural gas and electricity increased by 3.3%, 7.2% and 3.1%, respectively [1].

China will work hard for peak carbon dioxide emission in 2030 and carbon neutrality in 2060. On October 24th 2021, the CPC Central Committee and the State Council issued the Opinions on the Complete, Accurate and Comprehensive Implementation of New Development Idea for Accomplishing Peak Carbon Dioxide Emission and Carbon Neutrality Work, to deeply adjust industrial structure, expedite the construction of a clean, low-carbon, safe and efficient energy system, and strengthen the research, promotion and implementation of specialized plan on putting green low-carbon technologies into practice. [2]

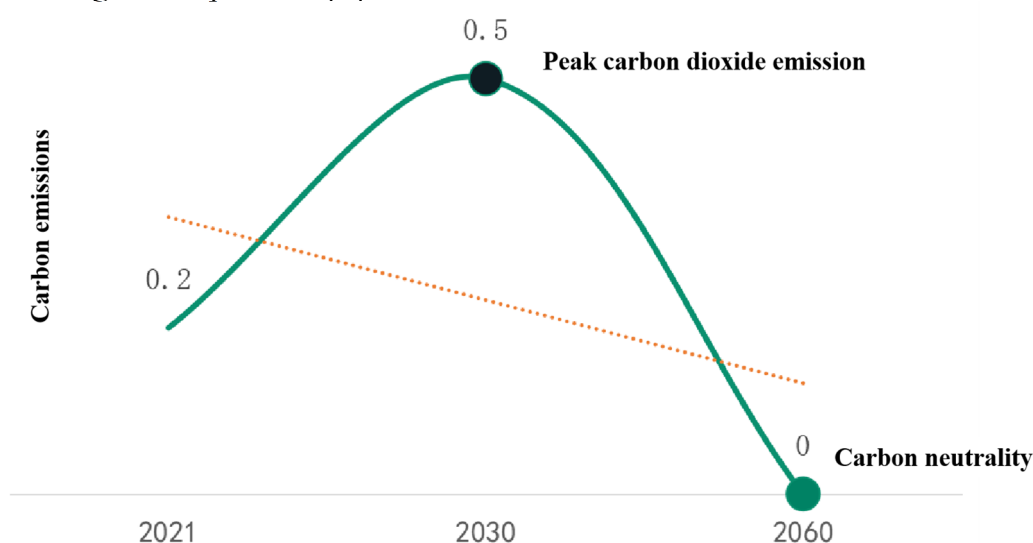


Fig. 2 China's plan on carbon dioxide emission

4. Current Problems in Green Economic Development

First, traditional industries face various problems in development, making company competitiveness to constantly decrease. For example, China has consumed a great deal of resources and produced pollution and other environmental problems in the development of industry, which costs too highly in economic development.

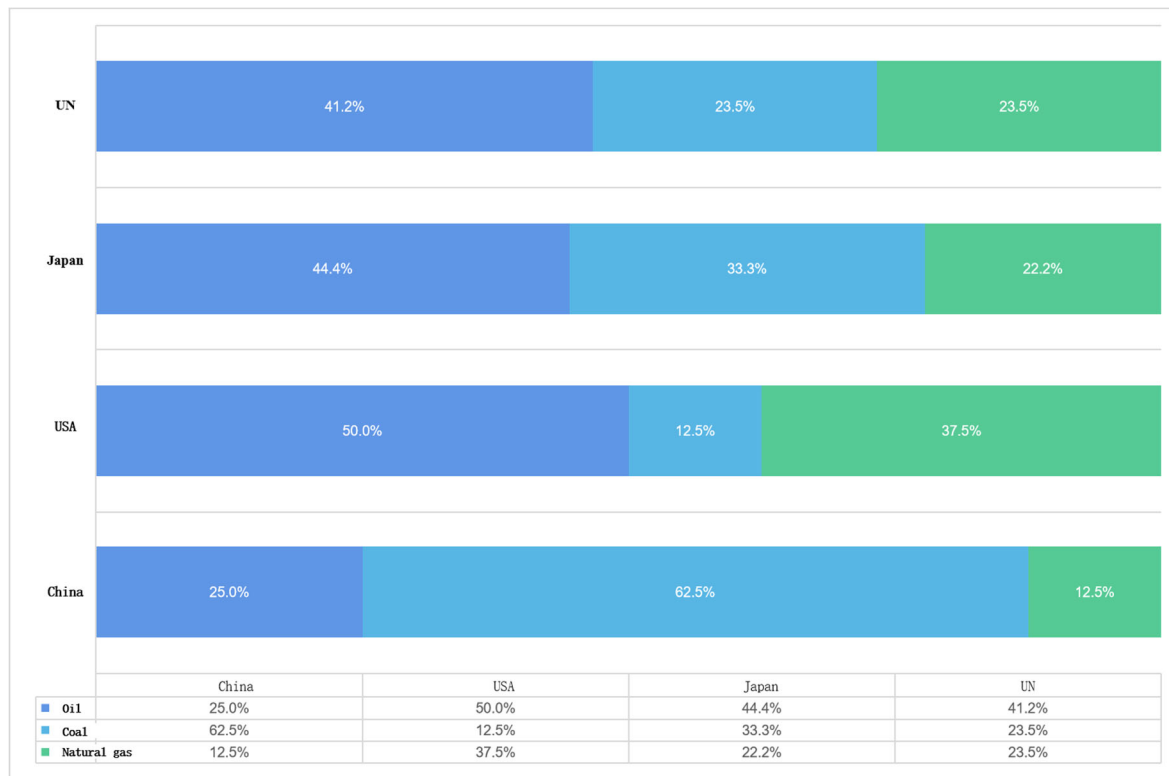


Fig. 3 Comparison of major economies in their energy structures of traditional industries

Second, the development and utilization of green energy in China is still at an initial stage, without being widely applied. It is discovered from the comparison of major economies in their energy structures of traditional industries that coal accounts for 65.5% of China's present energy consumption structure and green energy is lowly popularized. [3]

Third, economic development requires for innovation, but for the time being, China's independent innovation ability is still weak and needs to be further enhanced. Currently, in the progress of China's economic development, some energy-conservative green technologies are imported from abroad and the introduction cost is higher.

5. Path and Methods of Green Economic Development

5.1 Establish green low-carbon industrial systems

In China's industrial system, the proportion of tertiary industry continues to increase, and industrial chain gradually shift to middle and high end. Achieving the target of "carbon neutrality" requires to adjust and improve industrial structure, carry out a green low-carbon efficient industrial production and development, realize a higher production efficiency and energy use ratio, and thus promote the comprehensive green transformation of economy and society and the low-carbon development of traditional industries. The simulated data of China Academy of Engineering Physics indicates that the steel, cement, smelting and coal chemical industries will reach the peak value in 2021, 2023, 2024 and 2025, followed by petrochemical industry in 2029. As these time nodes approach, we have to vigorously promote the development of low-carbon industry, pay close attention

to low-carbon manufacturing, integrated circuit, network communication, new energy vehicles and other low-carbon efficient industries, and reduce the reliance to mineral resources. At present, the 14th Five-Year Plan has listed new energy vehicles, bio-medicine, integrated circuit and other industries as the key industries. Carrying forward the application of digital technologies can realize the green development of digital economy. Using the IoT technology and intelligent control technology can effectively bring down CO₂ generated during production, solve the waste of resource problem, and make production, circulation and consumption greener. In 2020, the G20's Exponential Climate Action Roadmap showed the solution of digital problems in energy, transportation, manufacturing and service industries can help cutting down about 15% of global CO₂ emissions. [4]

5.2 Build a clean and efficient energy system

China is the world's largest energy consumer and carbon emitter. According to the data of National Bureau of Statistics, in 2020, the national consumption of standard coal was 4.98 billion tons, with a year-on-year increase of 2.2%. [5] The enacting of peak carbon dioxide emission and carbon neutrality indexes is of great guiding significance to China's energy industrial development. Energy industry plays a decisive role in the process of "double carbon" development and assumes the heavy responsibility of shifting China's energy consumption to a low-carbon type, so, it is urgent to build a clean, low-carbon, safe and efficient energy system. In China's primary energy consumption, coal accounts for more than a half of the proportion, while clean energy consumption is smaller. To achieve the "double carbon" target, it is essential to substantially lower the proportion of mineral energy, increase the proportion of non-mineral energy, strongly propel traditional oil company to shift to a low-carbon type, strive to develop hydrogen, wind, solar, geothermal and other green energies, and continue to improve energy supply level (As shown in figure4 & figure5).

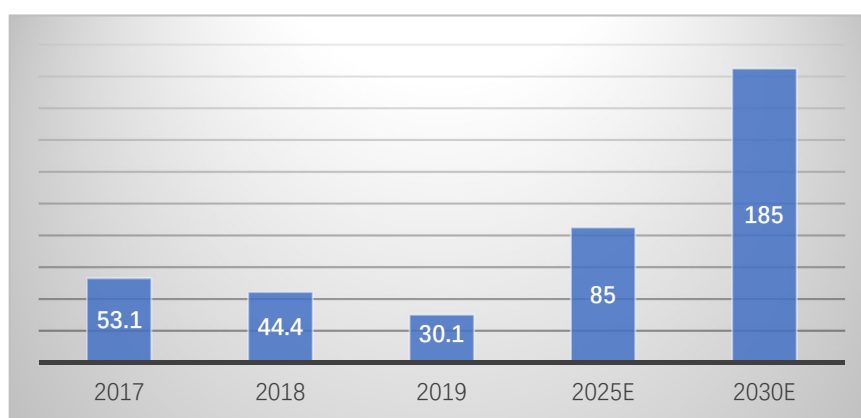


Fig. 4 Prediction of new photovoltaic installations in China

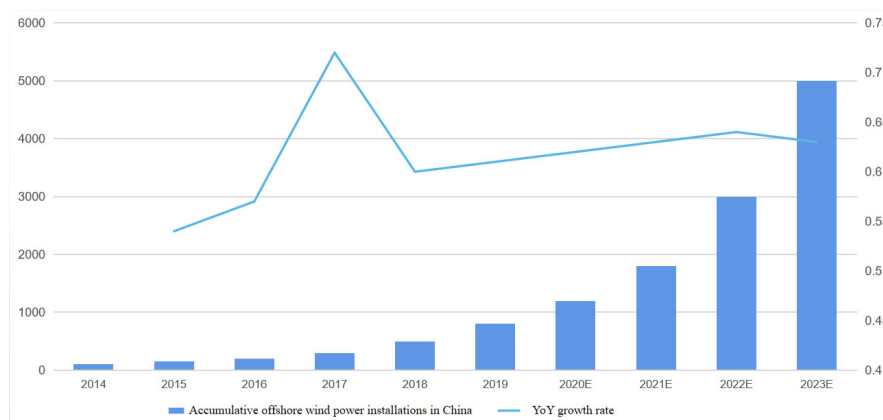


Fig. 5 Prediction of offshore wind power installations (10,000 kilowatts)

5.3 Continue to improve carbon trading market

Building a national carbon emissions permit trading market can better give play to market function and guide resources to flow to low-carbon green developing enterprises, thereby forming a marketing demand and supply regulatory mechanism. In such trading, the high emission companies will increase purchase cost and the environmental protection companies will benefit from this, which can tremendously mobilize the activity of enterprise to develop in a green and low-carbon way and finally avail the achievement of “double carbon” target. Since 2011, China started to carry out pilot carbon emission trading in multiple regions. On July 16th 2022, the national carbon emission permit trading market was launched officially, and the first batch of more than 2000 electric power companies had been included in the trading system. This clears that petroleum, chemical industry, construction, steel, non-ferrous metals, paper-making, electricity power and other high energy demand industries will be included in the system gradually in the future. Therefore, we are actively improving carbon trading market and lay a solid foundation for green economic development.

5.4 Continue to improve green financial system

The green Bond Endorsed Projects Catalogue (2020 Edition) modified by the People’s Bank of China cancels the support to traditional mineral energy projects of production and consumption, increases the support to environmental-friendly projects, considers to enact relevant policies to provide tax reduction for issuers and investors, reduce risk weight, establish rapid credit enhancement approval and formulate related supporting systems, and reinforce the work for overseas investment and financing of green companies; developing green government bond and green company bond requires to intensify the collaboration of the People’s Bank of China, the Ministry of Finance, China Banking and Insurance Regulatory Commission, National Development and Reform Commission, China Securities Regulatory Commission, exchange houses and other departments, and improve green bond regulatory system and evaluation system. The development of market should be driven from multiple levels including standard definition, capital use, information disclosure, guarantee mechanism, benefit evaluation, environmental influence evaluation, investment standard of working capital and so on. Now, the People’s Bank of China has listed the green bond body with credit rating above AA in the qualified collateral category of financial tools. The author believes that we have to use monetary policy more flexibly in future to facilitate the application of financial institutions in green financial field and the fund support to low-cost and low-carbon projects. At the same time, We should also intensify the cooperation with international financial institutions, monetary authorities, various offshore markets and financial institutions, improve the institutional arrangement for securities market entry and fund management, reinforce the investment supervision on low-carbon environment industries, and promote the development of China’s low-carbon environment industries.

5.5 Enhance intelligent construction

Internet technologies and modes should be used to assist greener and intelligent transformation and upgrading of manufacturing industry, improve manufacturing efficiency, and reduce energy and material consumption, which is an effective approach to accelerate the integrated development of digital economy and manufacturing industry. Intelligent production and manufacturing is an inevitable development way in future, and it is a general trend of realizing high flexibility, intelligence, low carbon emission, low energy consumption and customized production through the informatization and integrated construction of upstream and downstream of industrial chain so as to ensure production and manufacturing. For adaptive intelligent manufacturing, enterprises should raise informatization level, drive the replacement of people with machine and production line and the change of governing idea, activate new elements and foster new growth incentive. Big data intelligence should not only empower the economy but also add color to the life, and increase the application in people’s life service, smart city, governmental management, industrial fusion and so on.

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