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China's "carbon emissions" research progress, existing problems and related suggestions

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Abstract

Climate change has become a global problem facing mankind. The fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC) indicated that the global average surface temperature increased by about 0.85 ℃ from 1880 to 2012, and the main factor was the emission of man-made greenhouse gases. In 2018, many countries negotiated on the implementation details of the Paris Agreement to reduce greenhouse gas emissions in the form of a treaty. As a result, China proposed a carbon peak and carbon neutral goal. This article analyzes the progress of carbon emissions and carbon footprint research, and presents some problems in the current carbon neutralization process in China, and puts forward the necessary suggestions, in order to provide the necessary reference for China to achieve "carbon peak and carbon neutrality" as soon as possible .

Keywords

Carbon Emission; Carbon Footprint; Dual Carbon Policy; Existing Problems; Suggestions.

1. Introduction

Carbon dioxide accounts for the largest proportion of greenhouse gases, so people use the term Carbon as a representative of greenhouse gases. Excessive carbon emissions have led to serious ecological and environmental problems on a global scale, and these problems are directly or indirectly affecting the survival of mankind.As the largest developing country in China, with the development of the economy, carbon emissions are also increasing. The special issue of "Nature Climate Change" of the world's top academic journal "Nature" published the report of the Tyndall Climate Change Research Center (UK). Report "The Challenge of Maintaining Global Warming Below 2°C". The report published the annual research results and the latest research data of the research center's "Global Carbon Project", and also simultaneously published all the data in the "Earth System Science Data Discussion" magazine. This report points out that China is the country with the largest carbon emission in the world.

In our country, the increase in carbon emissions year by year for development has caused great trauma to the ecosystem, and the greenhouse effect it brings has increasingly affected people's lives. Research on carbon emissions is imminent, and the pursuit of a low-carbon life is of great significance. In the context of the development of a low-carbon economy, it is of great significance to study how to achieve energy conservation and emission reduction through conversion of land use types, adjustment of land use structure and innovative land use technologies.

2. Research status at home and abroad

In the 1970s, (Stuiver M, 1990) proposed that among the man-made factors affecting the increase in the content of greenhouse gases such as carbon dioxide in the global atmosphere, in addition to the well-known fossil fuel combustion, land use change is also one of the most important man-made factors. The carbon emission effect of land use change has always been

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the focus of research by foreign scholars. (Gaston, 1998) measured the carbon storage on the forest land in Africa and found that between 1980 and 1990, the carbon storage on the forest land in Africa decreased by 6.6 Pg, mainly because of changes in land use and cover, of which 43% came from The vegetation in the forest is destroyed, and the other parts come from humans other activities have led to a decline in the biomass of African forests. (RA Houghton, 2003) measured the carbon emissions caused by land use changes in the United States, and the results showed that before 1945, 21Pg-33Pg was released into the atmosphere due to the impact of land use, and subsequent developments were caused by forest fires. The improvement of fire-fighting capacity and the planting of trees on wasteland have produced positive ecological effects, and the cumulative carbon content has increased by 0.4Pg. These studies show that the study of land use has a very positive significance on the carbon emissions and carbon footprint of a region.

3. Carbon footprint research progress

The concept of carbon footprint originated from the ecological footprint proposed by Wack in 1996 (Pandey et al., 2011). Although there is a lot of research on the connotation of the concept of carbon footprint in academia, there is no consensus yet. There are three mainstream ones. One is that the carbon footprint is the amount of carbon dioxide emitted from the burning of fossil fuels during human production and life; the other is that the carbon footprint is a measure of the acquisition, production, distribution, use, and recycling of raw materials. The conversion of carbon dioxide and other greenhouse gases emitted during the life cycle; third, the point of advocating the concept of carbon footprint is to use direct and indirect carbon dioxide conversion as a standard to measure people

The extent of the impact of such activities on the greenhouse effect. The concept of carbon footprint was first put forward by governments and non-governmental organizations in grey literature, and then gradually standardized through academic intervention and discussion. However, there are still controversies in measuring the types of greenhouse gases, the basic units of measurement, and the boundaries of the system. The calculation method of carbon footprint mainly comes from the principle of life cycle assessment, which can be roughly divided into two categories: process analysis method and input-output method (Padgett et al., 1993). The most typical process analysis method for calculating carbon footprint was proposed by the British Carbon Trust. The first step is to describe in detail the various activities and raw materials involved in the life cycle through a basic flow chart. The second step is to clarify the system boundary for carbon footprint calculation according to the actual situation, and collect all activities, raw materials and carbon emission factors within the boundary. The original and secondary data, the establishment of a full mass balance equation to calculate the carbon footprint of each link in the life cycle, the third step is to review and optimize.

4. China's "carbon peak and carbon neutral" issues

At the 75th United Nations General Assembly, President Xi Jinping promised to achieve the peak of carbon emissions by 2030 and strive to achieve the strategic development goal of carbon neutrality by 2060. In March 2021, Premier Li Keqiang made a government work report at the Fourth Session of the 13th National People's Congress and proposed to further optimize the industrial structure and energy structure, and accelerate the formulation of an overall action plan for peaking carbon emissions in 2030.

Although China has a solid economic foundation, technological foundation, social foundation and policy foundation to achieve the carbon peak in 2030 and the long-term goal of achieving carbon neutrality in 2060, it still faces multiple pressures and the overall development situation is still not optimistic. Specifically, the main challenges facing China's current effective

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promotion of carbon peaking and carbon neutrality come from four dimensions, namely the emission reduction challenge caused by a large carbon emission base, the internal pressure of energy structure optimization, and the sustainability of technological innovation. The technical challenges brought about by nature and the pressure of economic transformation caused by the dependence of the industrial structure and economic structure on fossil energy.

4.1. The base of total carbon emissions is large, and the challenge of reducing emissions is under great pressure

China is still in the transition from industrialization to post-industrial development. At the stage of economic development, the dependence on fossil fuels, mainly coal, is relatively high, and the overall carbon emission base is relatively large. For example, in 2019, the total global carbon emissions were 33 billion tons, and China's total carbon emissions were 10 billion tons, accounting for 30.30% of the world's total emissions, making it the world's largest carbon emitter. In 2019, China's per capita carbon emissions were 8.1 tons, surpassing the EU. Carbon emissions per capita are 25%, exceeding the global average per capita by 65%. At the same time, the European Union and the United States achieved peak energy consumption and carbon emissions in 2006 and 2007, respectively. As China is still in the transition period from industrialization to post-industrial development, China's energy consumption per unit of GDP is approximately higher than the world average. 40%, total energy consumption and total carbon emissions are still on the path of rising at the same time, and the pressure to achieve carbon peak and carbon neutral strategic goals is huge.

4.2. Continuous optimization of the energy structure is under significant pressure

Energy structure optimization refers to an optimization process that gradually reduces the proportion of fossil energy consumption and gradually increases the proportion of clean energy consumption in the total energy consumption. China's current energy structure is still dominated by fossil energy consumption, which accounts for 85.10% of the total energy consumption, of which coal consumption accounts for about 60% of the total energy consumption. From the perspective of the transformation process of the world energy structure, its notable feature is the transition from coal-based to oil and gas-based, and then gradually transition to non-fossil energy.

Mainly, that is, from a high-carbon emission-based energy structure to a low-carbon emission-based energy structure, and then gradually transition to a zero-carbon emission energy structure. From the perspective of China's energy production, the cumulative installed capacity of wind, photovoltaic, and hydropower in China currently ranks first in the world. This determines that the optimization process of China's energy structure is different from the optimization process of major countries in the world, that is, China may not It will transition from an energy structure dominated by coal to an energy structure dominated by oil and gas, but directly transition from an energy structure dominated by coal to an energy structure where coal, oil and gas, and clean energy coexist.

4.3. The sustainability pressure of technological innovation is obvious

The smooth realization of China's carbon peak and carbon neutral goals is inseparable from the optimization and transformation of the energy structure, and the optimization and transformation of the energy structure is inseparable from the continuous support of technological innovation. Judging from the current development, with the widespread application of smart technology, China’s coal development technology is at the forefront of the world’s development level, shale oil and gas extraction technology and equipment capabilities have been greatly improved, and the gas hydrate experimental collection has been successful. These technological innovations have achieved carbon in China. Dafeng and carbon neutral

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strategic goals have laid a solid technical foundation. However, on the whole, there is still a certain gap between China's low-carbon development innovative technology and the world's advanced level, and it is far from the level of developed countries in some core indicators. Take Guangdong, Jiangsu, and Shanghai as examples. Although energy-saving technology is at the leading level in China, energy-saving products with core intellectual property and high value-added are still in short supply, and the core parts of some energy-saving products are still subject to advanced development. nation.

5. Suggest

In terms of industrial structure adjustment, China should manpower from three perspectives: First, continue to promote the strategic transformation of traditional high-energy-consuming industries, and strive to strengthen the transformation and upgrading of traditional high-energy-consuming industries with green and low-carbon related technologies and processes, and continuously improve different industries. The proportion of low- and medium-carbon operating companies has effectively promoted the innovation and development of energy technology. The second is to promote the construction of modern service industries with high quality, effectively integrate the construction of modern service industries with the strategic goals of carbon peaking and carbon neutrality, and strive to develop high-quality producer service industries, and form a comprehensive industrial chain that can effectively meet the needs of the economy. The production service industry with circular demand promotes the modernization and upgrading of the overall tertiary industry. The third is to gradually build a sustainable energy system based on clean energy in the country, and continue to promote the development of high-tech enterprises related to carbon peaking and carbon neutrality.

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