Study on the impact of climate change in China

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Abstract. Global warming is not only an important problem in the survival and development of human beings, but also an urgent problem to be solved by the contemporary government. China is not only a big country in the world, but also ranks first in the world in total population, economic scale and economic growth rate. With the improvement of the national economic strength, China's greenhouse gas emissions are also increasing year by year, the ecological environment has been seriously damaged, leading to the rising of the environment at the same time is also facing severe environmental challenges and huge pressure to reduce emissions, so, How to deal with the problem of climate warming is particularly important in China.

Keywords: global warming, climate change, environmental challenges.

1. Introduction
Climate is the basic condition for the survival and development of life phenomena on the earth. Earth's temperature comes mainly from Solar radiation the earth radiates into space in the form of long-wave radiation, by absorbing the short-wave radiation of the sun. Keep the balance of heat with outer space. Carbon dioxide in the atmosphere and other trace gases such as methane and oxygen. Such as nitrogen, nitrogen, and the like, can absorb long-wave radiation, thus having a similar greenhouse effect on the ground climate.

From the results of atmospheric science, the global climate refers to the statistical collection of the physical conditions of the entire climate system, including the ocean circle, the atmosphere, the biosphere and the lithosphere. Climate change, which generally includes precipitation, temperature and sea-level change, is a long-term and global environmental issue involving water resources, energy, fisheries, human health and global terrestrial ecosystems. It is closely related to the economic and social development of all countries in the world. Global climate change is not only environmental, scientific, energy, but also political and economic. Warming will lead to the destruction of the Earth's climate system and to the existence of human beings. Threats and social development have also been hampered and, as a result, the issue of climate change has been greatly concerned by Governments and the public.

2. Background
In the 1970s, climate change was a prominent issue in the global environment, which caused extensive attention by international organizations, led by the United Nations. According to the United Nations Intergovernmental Panel on Climate Change, the global average temperature will rise by 2 degrees Celsius to 4 degrees Celsius by 2080, resulting in the possible impact of the drinking water of 11 million
to 2 billion people, and that between 200 and 600 million people will face food shortages. A total of 200 million to 700 million people in the coastal area are likely to suffer from flooding every year. The Secretary-General of the United Nations, Ban Ki-moon, said that, in response to climate change, any delay could have allowed us to cross the critical point of climate change. Over this critical point, the cost of ecology, economy and so on will be greatly increased [1].

In recent years, global warming has become increasingly serious, leading to frequent disasters. For example, tropical storms hit Andhra Pradesh, India, and Gilbert ravaged Jamaica, Haiti, Dominica, Honduras, Mexico and the southeastern coastal areas of the United States in Central America. Property was lost and many residents were homeless. Global warming will lead to destructive storms, melting of polar ice sheets, increased volcanic activity, frequent wildfires and disease spread, and other disasters that endanger human survival and health, and also destroy the ecosystem environment. Cause the extinction of animals and plants. Global warming. The problem has become a major problem that countries all over the world pay attention to and need to be solved urgently [2] [3].

![Fig. 1 Map of global mean temperature change over the past 100 years](image)

**Table 1. Climate Warming Trend in the Recent 100 Years**

| Time Period                  | The whole world | the Northern Hemisphere | The Southern Hemisphere |
|------------------------------|----------------|------------------------|------------------------|
| (1981-1990) - (1881-1900)    | 0.47°C         | 0.47°C                 | 0.48°C                 |
| 1891 / 1990 straight line trend | 0.50°C/100 years | 0.50 °C / 100 years | 0.50 °C / 100 years |

3. Impact elements of global climate change
The climate is determined by the complex interactions between many factors, which together form the global climate system. The effects of climate change are generally classified into two categories: one is natural, and the other is human.

3.1. Natural causes
The main factors controlling global climate change are solar radiation, atmospheric circulation and geographical environment. Solar radiation is the basic driving force of all physical processes or climate changes in the atmosphere over the earth, and atmospheric circulation is an important mechanism for producing regional climatic differences. Solar radiation is the source of heat energy on the ground and
atmosphere, and the balance of surface heat budget is the important reason that affects the formation of climate. Solar radiation is mainly affected by Earth rotation and rotation, latitude, topography and topography, and land-sea distribution. For the Earth as a whole, the balance of land heat is almost zero, but for different regions, there is a difference in the amount of heat received by the ground, and therefore the shape of the climate. Make an impact. At the same time, the heat exchange between the ground and the atmosphere after receiving heat, the heat balance in the process of each component also has an important impact on the formation of the climate.

3.2. Human factor
At present, the scientific understanding of many factors in the global climate change also has great uncertainty, far from reaching the degree of accurate quantification\[4\]. In general, because of that large amount of greenhouse gas that people burn in the daily production and in the life of the combustion, the human deforestation, the reduction of the area of the plowing, the change of the land-use approach, and the change in vegetation. The effects of human on the marine and coastal ecosystems indirectly alter the concentration of greenhouse gases in the atmosphere. The excessive emission of greenhouse gases enhances the greenhouse effect, leading to an increase in global temperature. According to the physics principle, the object with high temperature mainly uses short-wave radiation energy, The energy of the long-wave radiation of the object with low temperature is larger. The atmosphere above the earth allows the short wave of the sun to pass through, and strongly absorbs the energy that the earth’s radiation from the long wave to the universe, and has a warm-keeping effect on the surface of the earth, known as the "natural greenhouse effect". The gas with the greenhouse effect in the atmosphere is called greenhouse gas, mainly including water vapor, carbon dioxide, freon and methane. In which, water vapor is most significant for long-wave radiation absorption, and the content of water vapor in the air is higher than that of other greenhouse gases, so that the warming effect of the greenhouse effect is mainly caused by water vapor, The formation of numerous "heat islands" over the sky has changed the heat of the regional microclimate and affected the global climate system.

4. China’s achievements and challenges at the present stage

4.1. Achievement
Carbon dioxide emissions during energy consumption are the main source of greenhouse gas emissions. The core index is to reduce the carbon emission intensity of GDP while ensuring the sustained development of the economy, which is to increase the economic output benefit of the unit's carbon dioxide emission. Reducing the carbon dioxide intensity of GDP is a relative measure of emission reduction. Only when the decline in the carbon dioxide strength of GDP exceeds the growth of GDP, the emission reduction effect of increasing the carbon production rate can offset the increase in the carbon dioxide emission from the GDP increment, and the total amount of carbon dioxide emission will show a downward trend.

As a result, the rate of decline in the intensity of carbon dioxide in GDP($\gamma_{gc}$), GDP growth rate($\beta_g$), Carbon dioxide emission reduction rate($\beta_c$).The relationship between the three is[5]:

$$\gamma_{gc} = \frac{1}{1 + \beta_g} (\beta_g - \beta_c) \approx \beta_g - \beta_c \quad (1)$$

If carbon dioxide emissions peak or decline, That is $\beta_c \leq 0$, are:

$$\gamma_{gc} = \beta_g \quad (2)$$

The measures to realize the rapid decrease of carbon dioxide intensity of GDP are as follows: first, energy saving, improving energy technology efficiency and economic output benefit, reducing the energy intensity of GDP and slowing down the total energy consumption; Second, vigorously develop new and renewable energy sources, promote energy structure low carbonation, reduce carbon dioxide intensity per unit energy consumption. The combination of the two factors can cause the carbon dioxide
intensity of GDP to decrease rapidly. Therefore, energy conservation and low carbonation of energy structure have become the trend and trend of energy reform in the world. According to the KAYA formula, Carbon dioxide intensity of GDP (\(I_{ge}\)), GDP energy intensity (\(I_{ge}\)) and Carbon dioxide intensity per unit energy consumption (\(I_{ec}\)). The relationship between the three [6]:

\[
I = I_{ge} \times I_{ec}
\]

(3)

When both the annual growth rate of GDP and the annual growth rate of energy consumption are far lower than 1.00. The annual decline rate of carbon dioxide intensity of GDP can be approximately equal to the sum of the annual decline rate of energy intensity of GDP and the annual decline rate of carbon dioxide intensity of energy consumption. That is [5]:

\[
\gamma_{ge} = \gamma_{ge} + \frac{1 + \beta_{c}}{1 + \beta_{g}} \gamma_{ec} \approx \gamma_{ge} + \gamma_{ec}
\]

(4)

The size of the annual decline rate of GDP energy intensity and the energy consumption elasticity (\(\varepsilon\)) and the growth rate of GDP (\(g_{g}\)) are closely related. In the case of the same energy consumption elasticity (\(\varepsilon\)), the faster the GDP growth rate, the greater the decrease rate of GDP energy intensity. Therefore, while paying attention to the decrease of the energy intensity of GDP, we should pay more attention to reducing the energy consumption elasticity, so that the growth rate of energy consumption is much lower than that of GDP, and the growth rate of energy consumption is reduced. That is, If the energy consumption elasticity \(\varepsilon \leq 0\), the formula (4) can be simplified to [5]:

\[
\gamma_{ge} \geq \frac{\beta_{g}}{1 + \beta_{g}} \approx \beta_{g}
\]

(5)

4.1.1. Greatly reduce the carbon dioxide intensity of GDP. At present, China has been in the middle and late stage of industrialization, and has taken the measures of saving energy and reducing carbon to reduce the energy intensity and carbon dioxide intensity of GDP as the policy focus, and has achieved remarkable results. From 2005 to 2017, the carbon dioxide intensity of GDP has decreased by 45%, and the average annual decline rate has reached 4.9% [7]. The target of 40% ~ 45% decrease in 2020 compared with 2005, promised at Copenhagen Climate Conference, has been achieved ahead of schedule. At present, while China is further accelerating the reduction in the intensity of GDP carbon dioxide emissions, it also strives to make carbon dioxide emissions. Reach the peak at an early date, achieve economic growth and carbon dioxide emissions completely decoupled.

4.1.2. Energy Saving and reducing the Energy intensity of GDP. China has made remarkable achievements in saving energy and reducing the energy intensity of GDP. From 2005 to 2017, the annual decline rate of energy intensity per unit GDP reached 4.12%, far exceeding the average level of developed countries and the world. From the eleventh and twelfth five-year plans of China from 2005 to 2015, binding indicators for the reduction of energy intensity per unit of GDP have been formulated and implemented in various provinces (cities). On the one hand, by eliminating backward production capacity and popularizing energy-saving advanced technology, the efficiency of energy technology will be improved quickly, and at the same time, the production process of high-energy-consuming products will be strengthened. Technical transformation and upgrading.

4.1.3. Speed up low carbonization of energy system and reduce carbon dioxide intensity per unit of energy consumption. Our country has set the goal of non-fossil energy accounting for about 20% of primary energy consumption by 2030. This is also an important support to achieve the target of 60% ~ 65% reduction of carbon dioxide intensity of GDP in 2030 compared with 2005 and the peak carbon dioxide emission around 2030. In order to ensure the realization of the goal of national independent contribution, the Chinese government has formulated and published the Energy production and consumption Revolution Strategy 2016 / 2030. On the one hand, it has made great efforts to save energy
and put forward a proposal to control the total energy consumption of 2020. Annual less than 5 billion tce, 2030, less than 6 billion tce, 2050 annual total energy demand tends to stabilize.

4.2. Challenges facing

4.2.1. Urbanization development. In 2016, China is still in the rapid development stage of urbanization by 2030. In 2020, China's urbanization level will reach 60.42%, which is expected to reach the target set by the Central Committee of the Communist Party of China and the State Council in 2014. The urbanization level of 2030 will reach 70.99%, and the development of urbanization will go to the transition stage [9]. At the same time of the development of urbanization, the emission of carbon dioxide is increased, and the pollution of the environment is increased.

4.2.2. Industrial structure. China's export-oriented mode of trade development has greatly promoted its economic growth. However, in the process of trade liberalization and international industrial division, pollution-intensive industries have shifted to China, resulting in pollution emissions concentrated in China. However, a large number of products are sold abroad. In addition, China's economic development mainly depends on coal energy, which is a high proportion of coal energy consumption, resulting in huge carbon dioxide emissions in China.

5. The way to deal with a situation

5.1. Enhancing energy efficiency
We need to adjust the energy consumption structure of our own, change the energy consumption mode based on coal consumption, increase the consumption proportion of clean energy, use high-quality, clean and efficient energy to replace coal resources, such as wind energy, natural gas, nuclear power, solar energy and so on, The emission of carbon dioxide is minimized to a maximum extent under the strategy of adjusting the energy consumption structure.

5.2. Establishing per capita carbon dioxide emissions as a responsible standard
In the process of dividing and defining the realistic responsibility of global warming, the standard of carbon dioxide emission per capita should be taken as the standard, which is the real and universal human rights standard. Only when per capita carbon dioxide emissions are equal can the duty to reduce carbon dioxide be equal. Therefore, the principle of fairness and efficiency should be followed in order to better deal with the fact of global warming.

5.3. Readjusting industrial structure
It is necessary to gradually improve and optimize the energy consumption structure of more polluting industries, limit industries with higher CO₂ emission factors, and encourage and support industries with smaller CO₂ emission coefficients. To support and develop the tertiary industry, because the tertiary industry is an industry with low energy consumption, and the development model of the tertiary industry strongly advocates green and environmental protection, it can reduce the emission of carbon dioxide better. And in the development of the tertiary industry, circular economy can also be carried out to maximize energy consumption and reduce carbon dioxide emissions. Finally, the export-oriented foreign trade strategy is transformed into the import substitution strategy and the domestic demand-driven strategy. Stimulus to China's economy.

6. Conclusion
Global warming is a common problem for the survival and development of all mankind, and it is also a realistic problem that can not be ignored in the idea of governing by governments of all countries. As a large population country in the world, China is facing rapid economic development at the same time to coordinate the ecological environment, carbon dioxide emissions are an unavoidable problem in social
and economic development, but also a major factor leading to global warming of climate change, therefore, How to effectively control or even reduce carbon dioxide emissions, how to deal with and improve the impact of climate change is an objective factor that must be considered in the development of China.

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