Study on the Green Credit's Impact on Environmental Pollution Control under the Double Carbon Target

Haoyu Ding[1, *, †], Yuxiao Yue[2, †] and Yun Zhang[3, †]

[1]Department of Economics, University College London, London, United Kingdom

[2]Department of Environment, Hohai University, Nanjing, China

[3]School of Guangdong country garden school, Foshan, China

*Corresponding author: haoyu.ding.20@ucl.ac.uk

[†]These authors contributed equally.

Abstract. Since the Chinese government announced the "double carbon" goal in 2020, carbon pollution has become the most concerned topic of the people and the government. In terms of economy, China has continuously introduced economic policies to achieve carbon reduction targets, among which green credit is one of the most important tools for energy conservation and emission reduction. This paper analyzes carbon emissions of each province after "opinions from Chinese government on Green Credit" in 2007. It finds that carbon emissions of all provinces in China have increased year by year in the past ten years, but the growth rate has decreased year by year. Moreover, this paper develops statistical analysis by Excel, using the green credit level and carbon emissions of each province in 2017. The result shows that the green credit have different impacts in reducing carbon emissions in different province: green credit plays a positive role in reducing emissions in Guangxi, Hainan and some other provinces. However, for Shandong, Jiangsu and some other provinces, green credit is not the only regulatory factor in these regions, regional geographical environment, per capita GDP, industrial reform and other factors may affect the degree of environmental pollution. As a result, this paper also provides suggestions for further promoting green credit's development.

Keywords: Green credit policy; Air pollution; Environmental effect; Double carbon goal.

1. Introduction

From the mid 19 century with the beginning of industrialization, one of the most severe issues facing the world today is global warming, which is thought to be primarily caused by human activity as evidenced by the greenhouse gases, particularly carbon emissions [1]. The Intergovernmental Panel on climate change (IPCC) warned that once the temperature rises above the critical point of 1.5°C, the frequency and intensity of climate disasters will increase significantly. The rapid economic development is one of the main drives for the overwhelming energy consumption and unprecedented rise in CO2 [2], especially in Asia (Figure 1), many countries like China, Japan, and India started to carry out large-scale economic construction since World War II, and the demand for energy and industrial products continued to increase, leading to a rapid increase in carbon emissions and becoming the world's largest carbon emission area.

Since 1970, China's carbon emissions began to rise synchronously with economic growth and maintained an emission rise rate of about 5% in the next 30 years. After joining the WTO in 2001, carbon emissions and GDP increased dramatically, with the growth rate rising to over 10% in some years. It wasn't until 2011 that China's environmental protection regulations started to tighten, however, and the growth rate of carbon emissions started to fall. China's carbon emissions surged 13 times between 1990 and 2003, from 770 million tonnes to 10.18 billion tonnes. Compared with China, the growth rate of the United States remained below 5% from 1971 to 2007, and the growth rate in some years was negative, and finally reached the peak in 2007. Since then, carbon emissions have begun to decline in fluctuations, and have been basically decoupled from GDP growth.

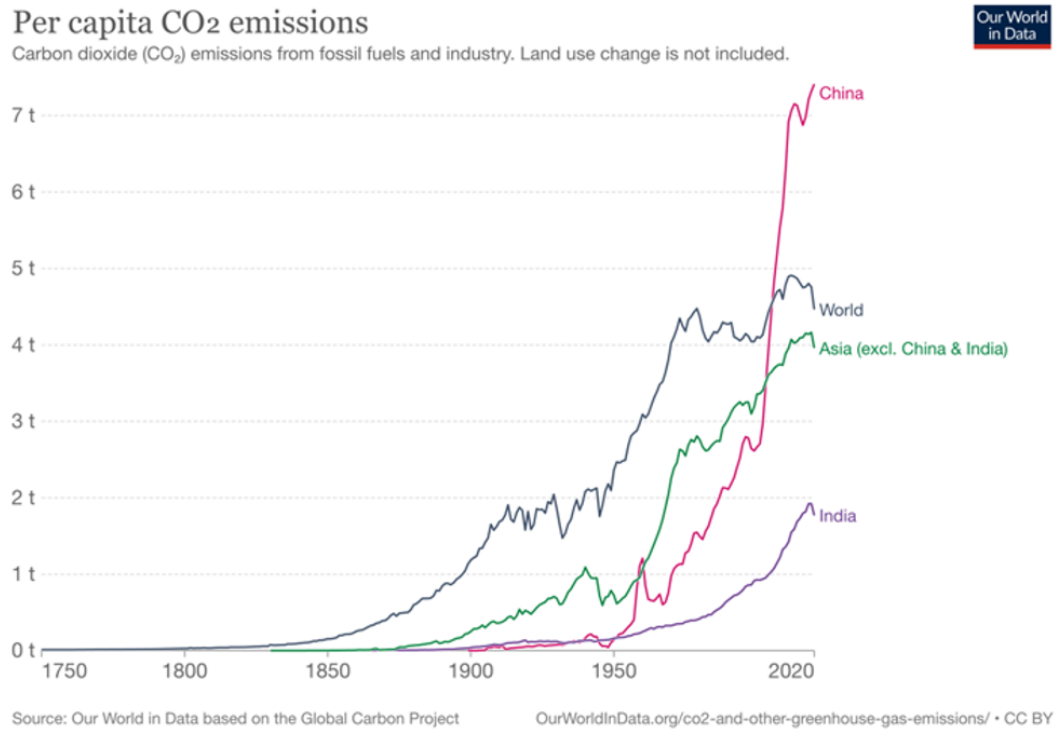
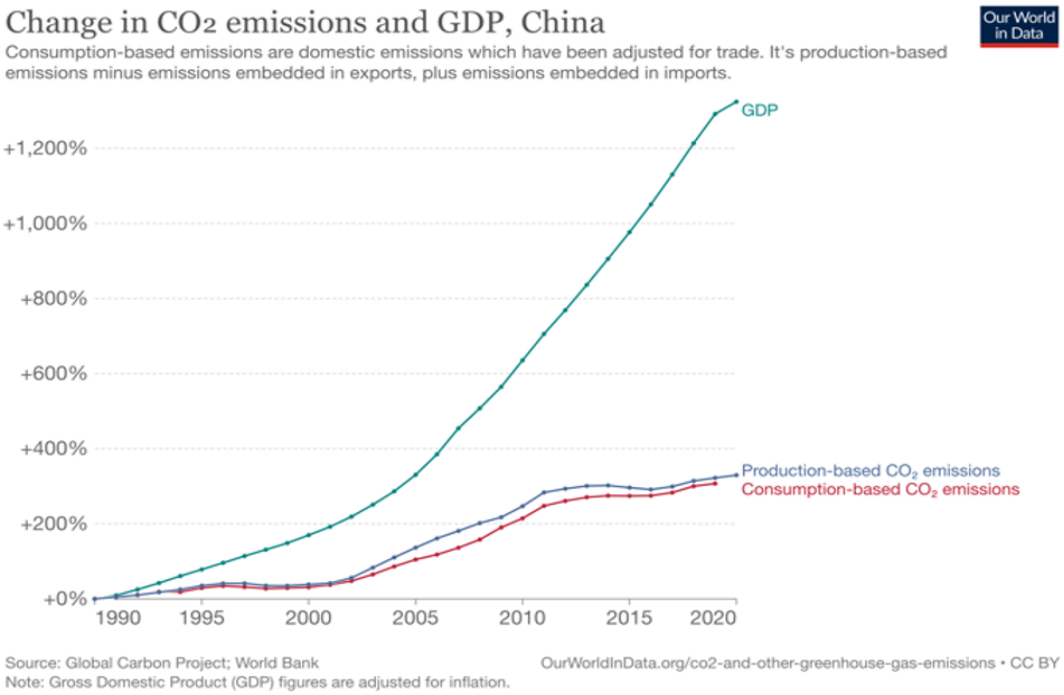
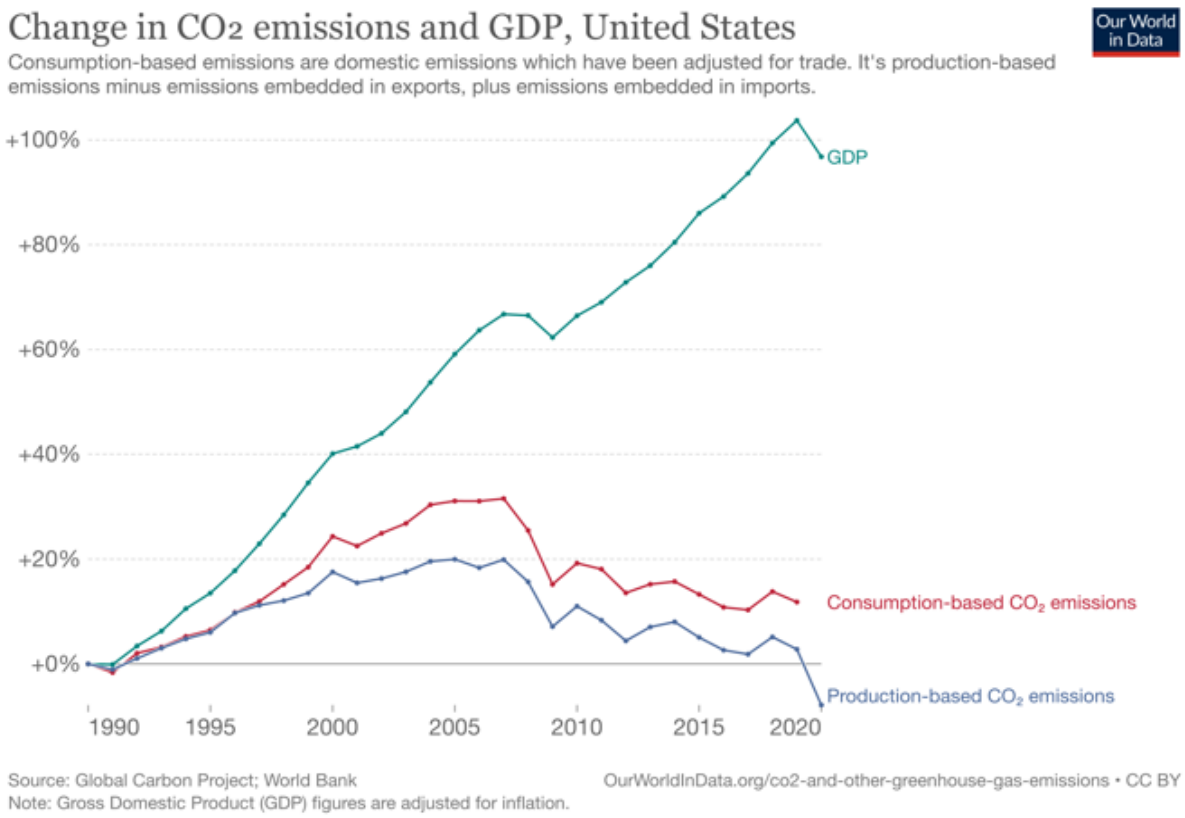


Fig 1. Carbon emissions per capita in China, India and the World average.

China has become the world's largest carbon emitter since 2006[3], to tackle this climate crisis, in 2020, Chinese government has announced that it will reach the carbon peak before 2030 and carbon neutrality before 2060, which also called the "double carbon" goal. It was a long-term low carbon emission development strategy in accordance with the Paris Agreement. It is manifested in that the level of carbon dioxide emissions continues to rise from fast to slow, fluctuates at the inflection point of zero annual growth rate, and continues to decline until the anthropogenic emission sources and absorption sinks offset each other. This strategy advocates a green, environmental-friendly, and low carbon lifestyle, it is instrumental in guiding green technology innovation and other appropriate policies, including green finance.



(a)



(b)

Fig 2. (a, b) Change in CO2 emissions and GDP in China and United States.

In this study, we use the data of pollution level and green credit to in each province between 2011 and 2021 to examine the implication of green financial policies to the improvement of environmental pollution. Firstly, from the theoretical analysis, we describe the mechanism of green credit's effects on managing environmental problems, it provides the empirical evidence of how green financial works and determine the future green financial development for China. Then, by using spatial measurement and Excel representation, we found the influences of implementing green credit in different regions are distinct, this analysis reveals the relationship between the balance of green credit and air pollution, our findings extend the existed understanding of how green financial tools affects the governance of ecological environment. Finally, we discuss the shortage of current green credit, thus more connection with other institutions like commercial banks and firms should be taken in the future to explore more benefits from green credits.

2. Background

2.1 Green Finance & Green Credit

Green finance refers to activities aimed at supporting environmental improvement, coping with climate change, and saving and efficient use of resources. It minimizes the threat posed by environmental change to human life to the greatest extent and aims to achieve the coordinated development of the economy, environment, and society. At present, green finance is mainly developed in the fields of green credit, green bonds, and green funds. The biggest difference between green finance and traditional finance is that it attaches more importance to the environmental interests of human survival, that is, many related products are promulgated based on the goal of protecting the environment, reducing energy consumption, and saving resources.

Green credit is one of the green financial instruments. From a macro perspective, green credit means that banks intervene in the loan process of polluting enterprises, weigh the impact of

enterprises' behaviors on the environment with the goal of environmental protection, and then decide whether to grant loans or even recover the funds that have been issued that do not meet the payment requirements. Its purpose is to eliminate the potential possibility of environmental pollution and maximize the effect of environmental protection. From the micro perspective, green credit refers to the fact that financial institutions constantly adjust the lending mechanism under the premise of national environmental protection policies to provide low-interest rate credit for green and environmental protection enterprises and promote their development. Charging high interest and limiting loan amounts for environmental pollution enterprises, in order to promote their continuous modification and improvement of enterprise production mode, and promote environmental pollution enterprises to get closer to green enterprises.

2.2 Current development and challenges of Green Credit

The Green credit is relatively the earliest, fastest growing, and mature green finance instruments among green finance in China [4]. Since 2007, Environmental Protection Administration, the People's Bank of China, and the China Banking Regulatory Commission have issued a document entitled "suggestions on Implementing Environmental Protection Policies and Regulations to Prevent CREDIT Risks"(<<suggestions>>), which calls for strengthening the coordination between credit management and environmental protection. By the end of 2020, the green credit balance in China was nearly 12 trillion yuan, the largest in the world. Currently, the green credit has a larger size among other types of green finance. Compared to the green bond which is relatively low, accounting for only 0.8% of the total bond stock as of March 2021, the share of green loans in total loans is about 7.0%. Furthermore, under the "double carbon" target, green finance is still the future development direction of our country, and more green products will serve the smooth implementation and promotion of environmental protection policies [5].

Since 1995, the Chinese government implement a series of policies to stabilize and improve the green finance system, especially green credit. "suggestions" issued in 2007 first proposed the concept of green credit, which laid a solid foundation for future development.[6] In the following years, the green credit developed rapidly: the government continuously promoted the documents of the development of the green credits, and the financial institution increasingly developed the green credit services. Thus, green credit become the major source of funding for green investment, which largely promotes the green economics, sustainable development, and structural transformation [7]. However, there are still some problems in the modern green finance systems [8]. First, the standards of green finance are not uniform. The definitions and standards of green finance are different from internationally accepted definitions and standards, which block international communication and cooperation and increase the difficulty and cost of operation of financial institutions. Moreover, green certification and rating systems are still not comprehensive in China. Second, the government does not provide enough incentives for enterprises to carry out environmentally friendly stuff. Third, the green credit system lacks legal institutions. Many "two high" enterprises can escape from the penalty because of a lack of legal supervision. As a result, there are still some issues that need to be resolved in order to advance the growth of green credit, even though China's system has reached a certain level of development.

3. Theoretical Analysis: Mechanism of Green Credit' influence on environm ental pollution control

Green credit is one of the most effective financing tools for reducing pollution by optimally allocating resources and directing capital to low-carbon industries. For the direct impact, it can mainly divide into incentive effect vs. inhibitory effect [9]. For incentive effect, green credit provides credit as funding for green industries like the new-energy industry, environmental protection industry, and energy-saving projects. In this way, green credit can solve the struggle of funding for those green industries and eco-friendly projects because of the high risk and operational cost and period, and then

support and promote the development of those green enterprises and projects. Therefore, carbon emissions will directly decline because of these developed green industries. For the inhibitory effect, green credit restrains the development of “two high” industries which refer to “high pollution and energy consumption” and reduces the funding for those polluted projects by controlling credit allocation. Thus, carbon emissions will decrease due to suppressing “two high” enterprises.

For indirect impact, green credit can promote the improvement of technology. Technology is the primary driving factor for thoroughly reducing pollution and green development [10]. Companies in green industries can invest more in research & development of technology or strategy to reduce carbon emissions and improve productivity with the capital provided by green credit [11]. For example, the new-energy industry can use credit to develop a better way to store and transform renewable energy. If the problem of storage and transformation of renewable energy can be solved, the penetration of renewable energy will further expand, which means that renewable energy will be available on a larger scale, reducing carbon emissions. As a result, green credit can encourage increases in investment in innovation, which promote the development of green industries and further reduce carbon emissions on large scale. Furthermore, green credit can optimize the industrial structure by allocating credit resources and differentiating green industry and “two high” industry. Green credit forces "two high” enterprises to transform and upgrade or withdraw from the market and support energy-saving and environmental protection as well as new energy and other green industries [12]. Financial capital is essential for industrial development. Because green credit restrains the funding for the “two high” industry and gradually eliminates the credit for some projects in the “two high” industry, the capital resources flow to green industries, which stimulates the development of the green industry. On one hand, rapid progress in the green industry will crowd out some companies in the “two high” industry. On the other hand, without enough funding and capital, enterprises in the “two high” industry are compelled to withdraw from the “two high” industry and seek transformation to be more environmentally friendly. Therefore, there will be fewer “two high” enterprises and more green companies because of allocating of capital resources by green credit. Then, green credit plays an important role on improving the environment and pollution control. Next, green credit can publicize green signal which refers to encourage more enterprises to take social responsibility and raise environmental awareness [13]. In China, most green credit policies are proposed by the government, and the market will respond to the policies. If the inhibitory effects and incentive effects are effective, the green credit will encourage more enterprises to take responsibility. If green credit inhibits or encourages companies in the same industry, which will release warnings or stimulus signals, other companies in the same industry respond to these signals. For example, if green credit inhibits one company in the “two high” industry, other companies will transform or upgrade to prevent being inhibited by the policy. Therefore, it will encourage more enterprises to be aware of environmental problems, and reduce carbon emissions. Moreover, the investors will also notice the green credit policy. To secure new opportunities, the investor will invest in the green credit of the commercial bank, and social capital will flow into the funding for green credit. Increasing funding will expand the scale of green credit in commercial banks, so more green companies can gain benefits from it, and the environmental problems will be alleviated. In conclusion, green credit can reduce carbon emissions by allocating capital resources to directly promote the progress of the green industry and suppress the development of the “two high” industry and indirectly optimize the industrial structure and encourage green signals and technological innovation.

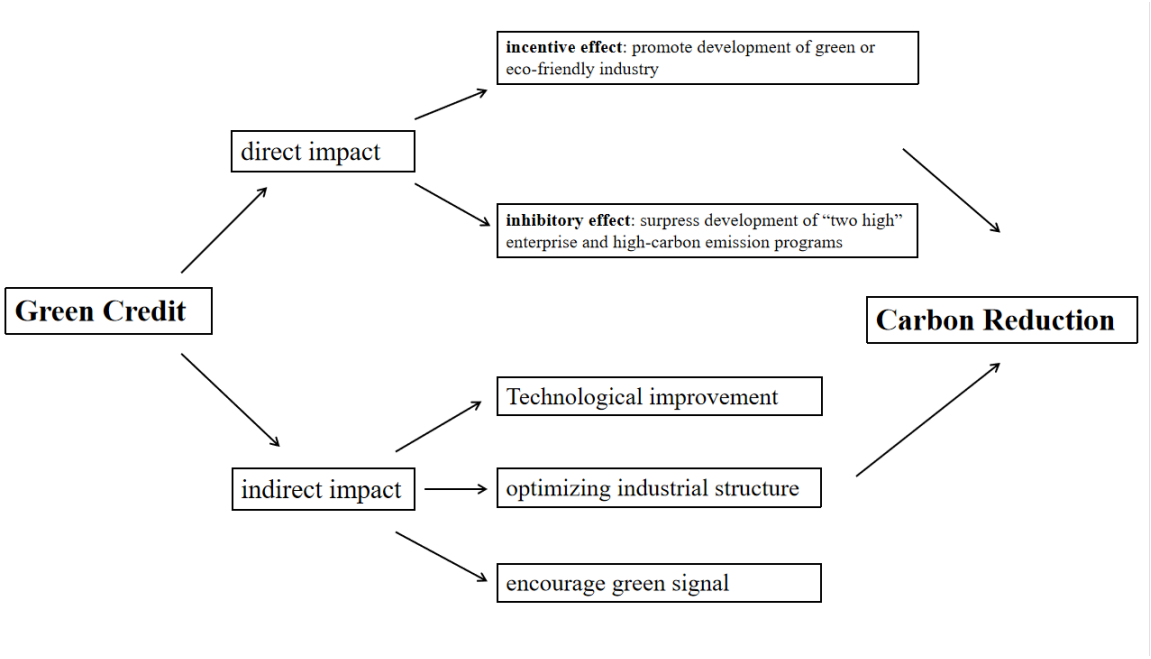


Figure 3. The mechanism of impact of green credit on carbon reduction.

4. Empirical Analysis

4.1 Analysis of Green Credit

When China overtakes other countries as the world's top supplier of air pollution and the largest emitter of carbon dioxide. Increasingly, people are becoming aware of how important it is for the economy and environment to grow together. Since the G20 Summit in 2016, the nation has given the growth of green credit more consideration as a macroeconomic policy to protect the environment. On July 30, 2007, the China Banking Regulatory Commission (CBRC), the People's Bank of China (PBC), and the Ministry of Environmental Protection (MEP) jointly published Suggestions on Implementing Environmental Policies and Regulations and Guard Against Credit Risks. It aims to motivate financial institutions to produce green financing and strengthen their approach to social and environmental risk management. According to earlier research, banks can highlight environmental hazards, businesses' green transformation, and sustainable economic development through the use of green finance.[14].

From diagram below, the amount of green credit balance kept rising steadily between December 2011 and December 2021. In 10 years, the green credit increased from 1.47 to 15.1 trillion Yuan with over 10 times growth. The percentage of green credit in total credit has also increased throughout this time, rising from 8.8% in 2013 to 10.4% at the end of 2019. The CBRC reports that the green credit of 21 major Chinese banks has already saved more than 400 million tonnes of standard coal and reduced the equivalent of more than 700 million tonnes of carbon dioxide annually.

On the other side, from the table below, it shows the main distribution structure of China's current green credit investment in June 2013 and June 2017. Although the investment fields are relatively wide and rich, the distribution is not balanced, transportation, renewable energy and strategic emerging industries took the most account of the total credits. The remaining balance of green credit flows to energy and water conservation, waste disposal, nature protection and other fields in energy conservation, environmental protection and service projects. Moreover, the proportion in the investment of pollution prevention project and green transportation project were both witnessed an upward trend, from 36% in 2013 to 41.2% in 2017, while for the renewable energy and strategic emerging industries, there is a little decrease during this period. Therefore, it can be seen that China has begun giving more support from the field of clean energy projects to transportation and pollution projects.

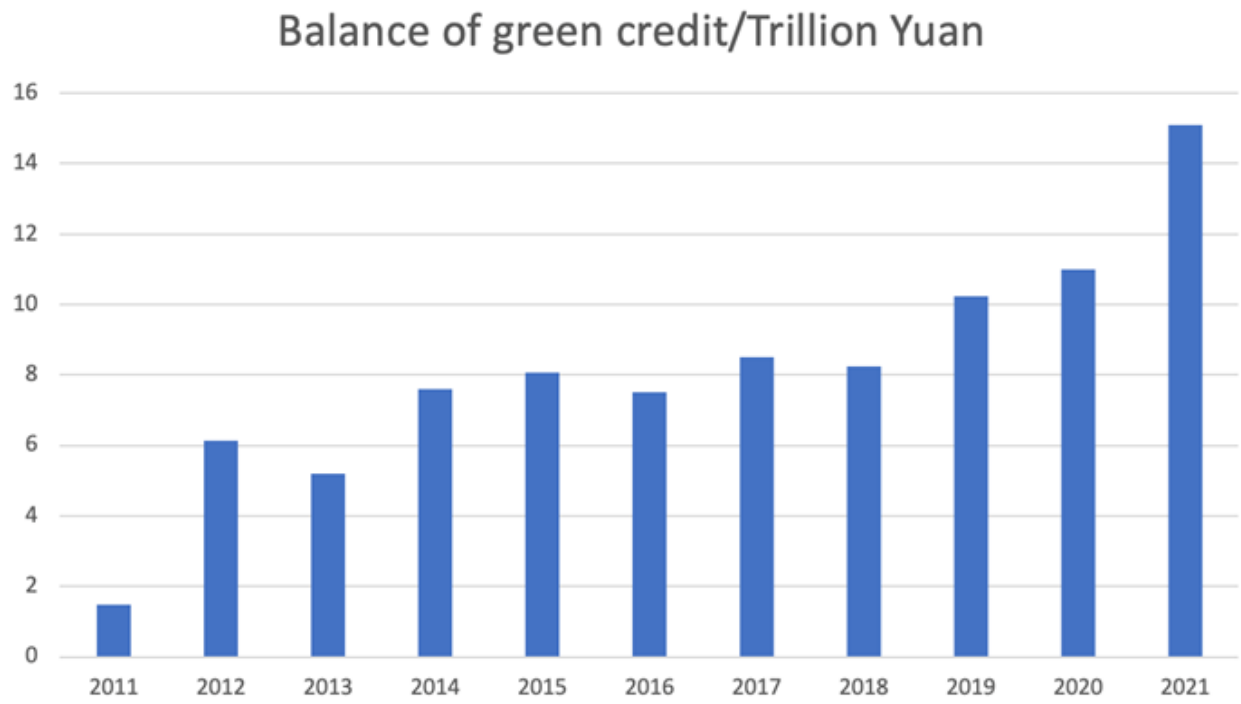


Figure 4. Balance of green credit in green credit market of China (Trillion Yuan).

Table 1. Distribution of green credit investment of 21 banks in China from June 2013 to June 2017.

The distribution of green credit investment of 21 banking institutions in China from June 2013 to June 2017				
	2017		2013	
	Proportion	Balance/Trillion Yuan	Proportion	Balance/Trillion Yuan
Green Agriculture Development Project	0.65%	536.03	0.45%	216.79
Green Forestry Development Project	0.54%	446.98	0.34%	167.24
Industrial energy-saving and water-saving project	6.15%	5056.64	5.98%	2899.61
Natural protection and ecological restoration project	4.11%	3378.99	1.89%	918.51
Resource recycling project	1.95%	1603.18	1.55%	750.94
Garbage treatment and pollution prevention project	4.53%	3722.9	3.49%	1695.8
Renewable and clean energy projects	19.59%	16103.17	20.55%	9970.85
Rural and urban water projects	2.34%	1921.35	1.52%	738.36
Building energy conservation and green building	1.64%	1347.79	0.88%	426.51
Green transportation project	36.67%	30151.67	32.50%	15770.39
Energy conservation and environmental protection services	0.82%	672.18	0.84%	408.84
Strategic emerging industries	20.56%	16907.05	29.33%	14233.1
Other	0.45%	371.75	0.68%	329.9
Total	100.00%	82219.68	100.00%	48526.84

4.2 Analysis of Pollution

China's main sources of air pollution are emissions from energy-intensive industrial production, such as soot, sulfide, nitrogen oxides, carbon compounds, etc. Domestic stoves and heating boilers discharge pollutants during coal combustion; Transportation combustion of petroleum and coal pollution. In this paper, the carbon emissions of each province in China were selected as the detection variable to explore the air quality conditions in different regions.

4.2.1 Spatial analysis of environmental pollution areas

This paper uses the Geoda tool to plot the carbon emissions of each province in China in 2008 and 2019, as shown in Figures 5. and 6. The natural segment point method is used to divide them into five levels, that is, the color depth in the figure represents the level of carbon emissions. The darker the color is, the more serious the phenomenon of carbon emissions in the area, and the more serious the air pollution is, and vice versa.

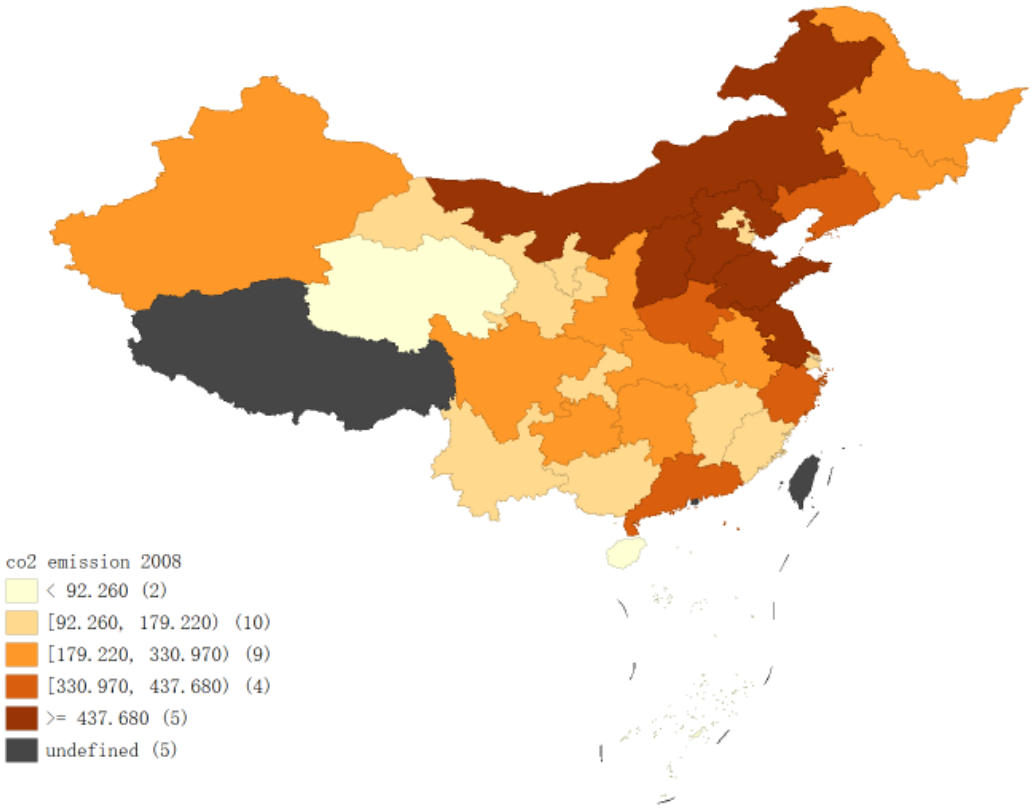


Figure 5. CO2 emissions of each province in 2008.

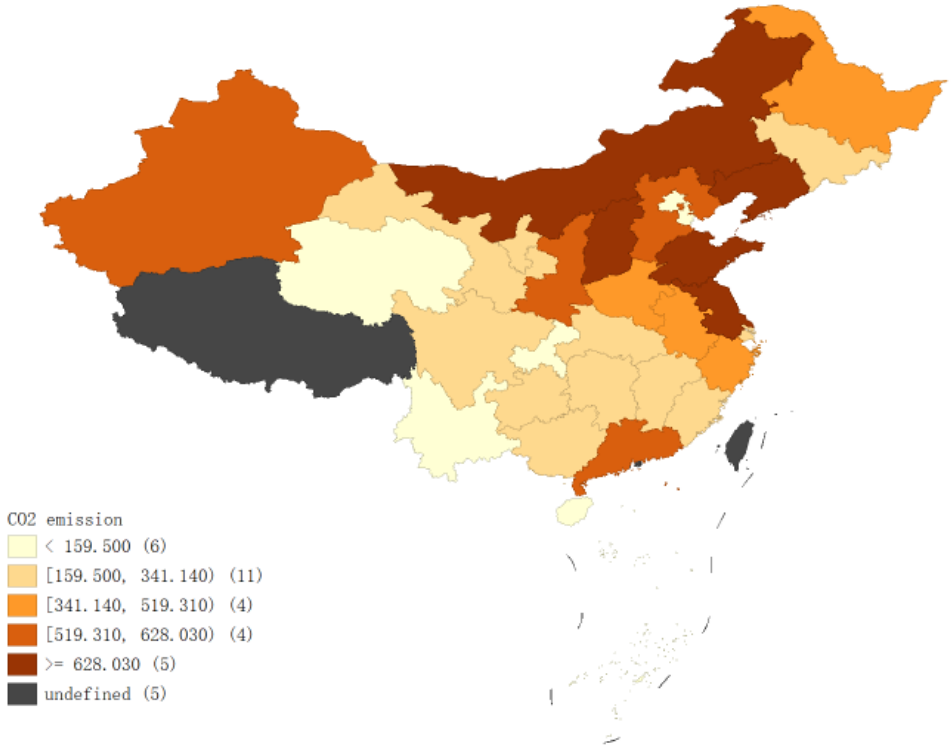


Figure 6. CO2 emissions of each province in 2019.

As can be analyzed from the two figures, serious air pollution areas in China are mainly concentrated in the central and northeastern regions, including Inner Mongolia, Shandong, Shanxi, Hebei, Liaoning, and Jiangsu provinces. The areas with low pollution are mainly concentrated in southwest China, including Sichuan, Tibet, Hunan, and Yunnan provinces. From the overall change

in carbon emissions from 2008 to 2019, the environmental pollution phenomenon in Northeast China was slightly alleviated, and the carbon emissions in Jilin Province and Hebei Province were reduced by one grade respectively. The carbon emissions in central and southwest China decreased significantly, indicating that the air quality in these regions had improved significantly. In addition, Xinjiang and Shaanxi provinces have become heavily polluted areas with rising carbon emissions over the past 10 years.

Geoda was used to analyze the data about spatial autocorrelation of carbon emissions of Chinese provinces in 2008.The results are shown in Figures 7. and 8.

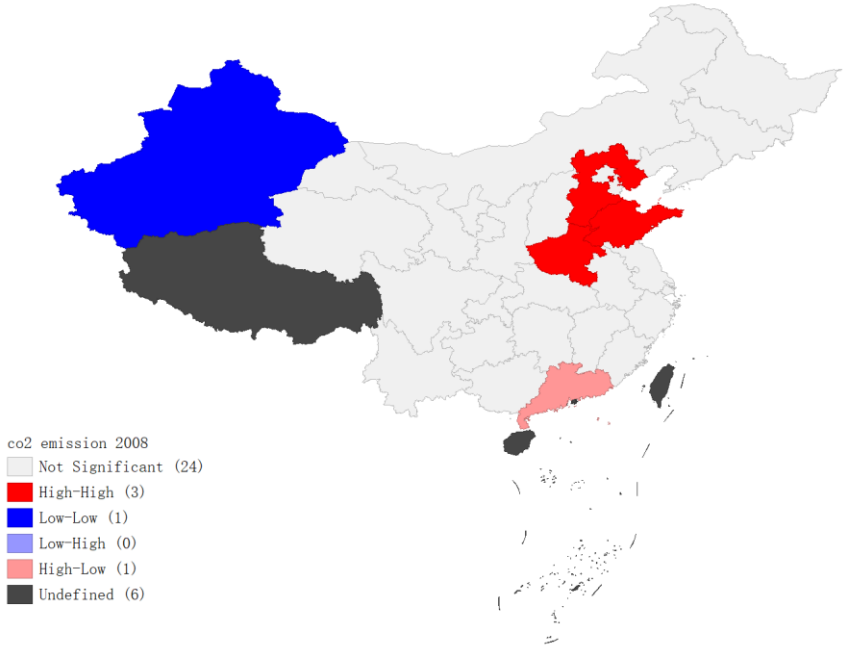


Figure 7. The spatial autocorrelation of carbon emissions of Chinese provinces in 2008.

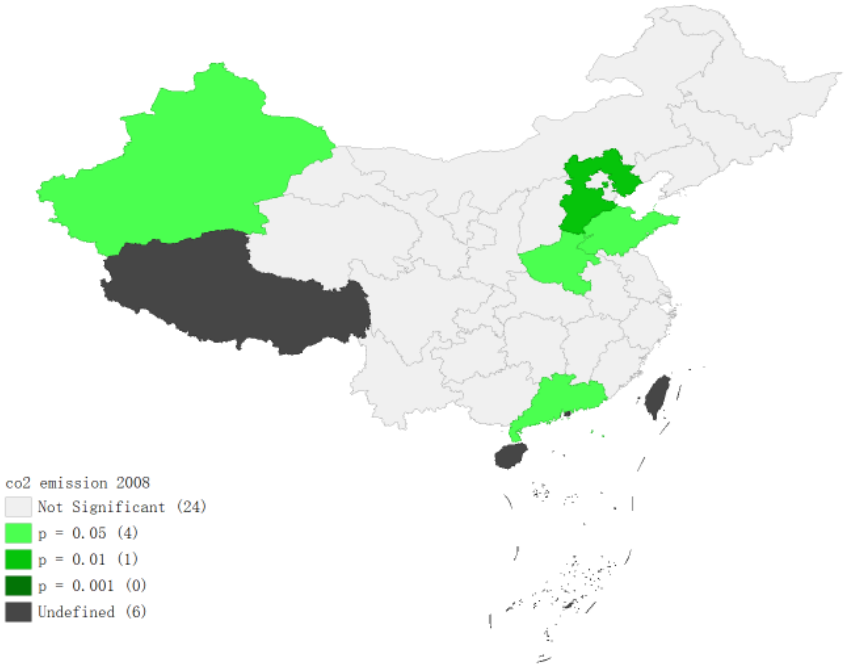


Figure 8. The spatial autocorrelation of carbon emissions of Chinese provinces in 2008.

It can be seen from the figures that the spatial autocorrelation of Henan, Shandong, Hebei, Guangdong, and Xinjiang is significant, and the spatial autocorrelation of Henan, Shandong, and Hubei is positive, that is, the regions of these three provinces and the areas which around them have high carbon emission aggregation. However, there is a negative correlation between Xinjiang and Guangdong, that is, they are in an environment with higher carbon emissions in their own province and lower carbon emissions in neighboring provinces. Therefore, in addition to the influence of green bonds, spatial factors should also be taken into account in influencing the carbon emissions of each province.

4.2.2 Analysis of environmental pollution time

In this paper, EXCEL was used to draw the carbon emission line charts of each province in China in 2008, 2013 and 2019.This is shown in Figure 9.

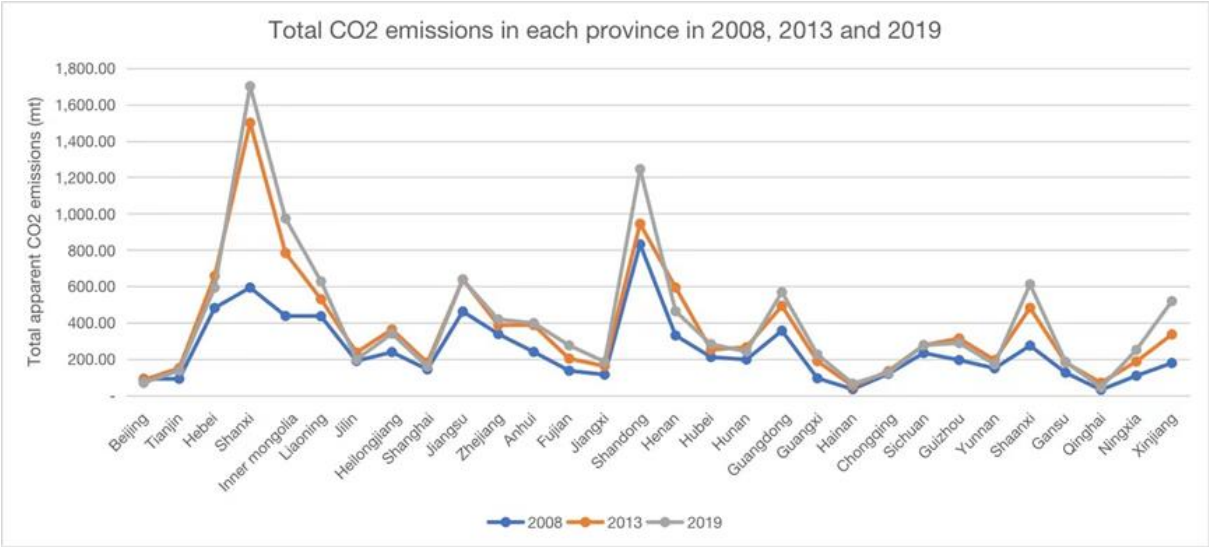


Figure 9. The carbon emission of each province in China in 2008, 2013 and 2019.

It can be seen from the figure that the carbon emissions of Shanxi, Jiangsu, Shandong, Guangdong, and Shaanxi provinces were always higher during the three years. However, Beijing, Tianjin, Jiangxi, Hainan, and Qinghai provinces maintained low pollution levels. Looking from the time dimension, Shanxi, Inner Mongolia, Liaoning, Jiangsu, Shandong, Guangdong, Shanxi, and Xinjiang showed a growth in carbon emissions significantly over time, Beijing, Jilin, Shanghai, Hainan, Chongqing, Qinghai province change not obvious, and the contrast between 2013 and 2008 and 2019 to 2013, the growth of can be found that most provinces show the phenomenon of slowing down the growth of carbon emissions. It can be concluded that, overall, China's carbon emissions are increasing gradually, and the degree of air pollution is increasing, but the increase is decreasing, which indicates the effectiveness of relevant measures taken by China to improve the current environmental pollution situation.

4.3 Correlation test analysis

The line chart of China's environmental pollution degree and green credit level in 2017 was drawn, and the correlation coefficient between them was tested by Excel. A general conclusion can be drawn from the figure: provinces with a higher level of green credit have a lower degree of environmental pollution, which further indicates that green credit can improve carbon emissions.

As can be seen from Figure 10, the green credit level of Guangxi, Hainan, Sichuan, Gansu, Qinghai, and other provinces is relatively high and their corresponding carbon emissions are generally low, demonstrating that green credit regulate carbon emissions and improving environmental pollution to a certain extent in these regions. However, in Shanxi, Jiangsu, Shandong, Guangdong and other regions, the level of green credit is high, but the level of pollution is also high, indicating that the

effect of green credit is weak in these regions. By use of excel analysis the correlation of environmental pollution degree and the green credit, calculated the overall correlation coefficient is -0.16866, the negative correlation, and the correlation is weak, therefore, green credit to a certain extent, regional, regulatory industrial carbon emissions, but beyond that, the provinces environmental pollution not only is regulated by the green credit, also affected by regional factors, industrial reform factors and other factors.

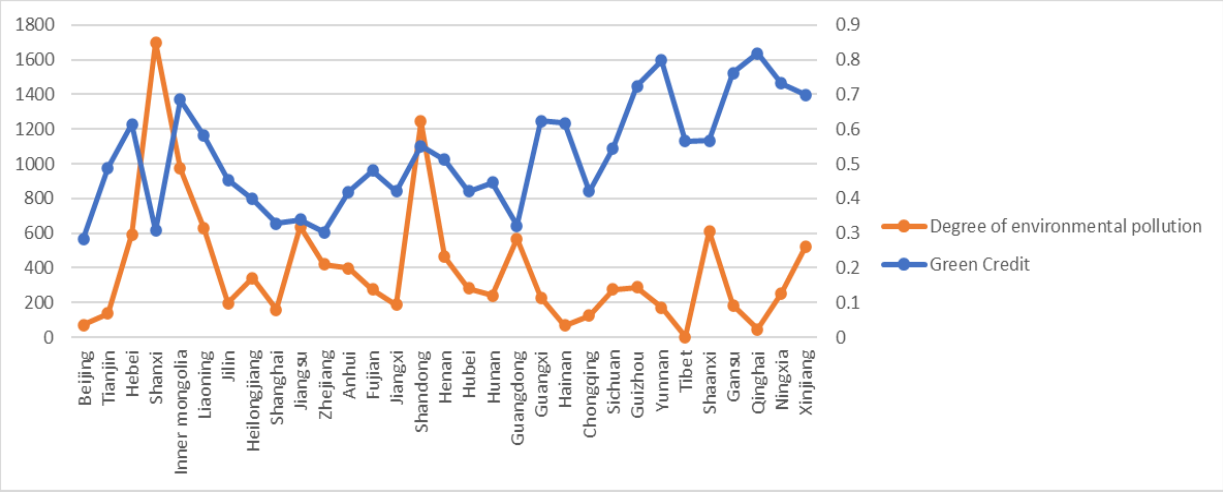


Figure 10. Green credit level and corresponding pollution level in different provinces.

5. Suggestions

5.1 Improving the green credit system

China's green credit industry is still not perfect in some aspects. First, the legal and policy frameworks for green credit market need to be strengthened. Regarding the law, China lacks a strong supervision system and organization. Many companies are taking advantage of the lack of rules to escape from the environmental protection law. Because the responsibility of environmental pollution is unclear and the punishment system is not enough effective, many companies can escape from the punishment. Moreover, many companies can also intentionally falsely report to obtain green credits. To solve this problem, the government could establish a special supervision system, and banks and related departments could enhance information transparency and information sharing to avoid penalties that are not effectively enforced. On the institutional side, China also lacks an effective incentive mechanism. The green credit system enacted by the government does not provide a strong incentive for commercial banks to develop green credit products. To expand the scale of the market of green credit, the government could adopt some incentive mechanisms such as preferential taxation on revenues generated by green credit or direct government subsidies and expenditures on these commercial banks. Furthermore, the government can also give preferential interest rates or loan subsidies for green credit to green enterprises. Thus, such incentive measures can further develop the green credit system to promote its growth. This incentive policy can also further raise awareness of environmental protection and corporate responsibility. Second, there are some problems with the standard of green credit: first, each bank does not have a clear definition of the classification of green credit products, second, there is a lack of a unified certification and rating standard, and third, the definition of green credit in China is different from general accepted international definition. The first step is to classify green credit products and establish a unified certification and rating standard. Some western countries like America are more developed and mature in this aspect of green finance, and enterprises can learn from and refer to the Western standards and systems. Secondly, in order to be in line with international standards and for future international cooperation and exchange, more banks

in China should join the Equator Principles and integrate international concepts such as Corporation Social Responsibility (CSR), Sustainable Finance, etc.

5.2 Regional green credit policy

From the conclusion, we can also see that the effect of green credit of reducing carbon emissions varies from region to region. Factors such as geography, talents, resources, industrial structure, and causes of pollution vary from region to region. When implementing green credit policies, local governments should adjust to local conditions and take targeted measures. Local banks should also grant credit according to local conditions. While learning from foreign systems, local governments should also learn from and adopt cooperation with other regions that have a significant reduction of carbon emissions. The government should strengthen inter-regional communication and cooperation as well as targeted measures for different regions, so that the environmental problems will be significantly improved and will be further improved.

5.3 Commercial banks should expand services and targets

The current domestic green credit business is narrow, lacks diversity in products, and only has a small target, mainly for enterprises and large projects. Banks can expand their green credit business and expand their target groups. Banks should enhance innovation and provide more green credit products and services, and should try to include individual groups in their services. The combination of personal consumption and green credit can better encourage publicize of environmental protection and further reduce environmental pollution.

5.4 Cultivating and introducing professional experts

Cultivating and introducing professional talents can effectively solve the above series of problems. Excellent talents can provide suggestions and help for system improvement and local targeted measures, and bringing in professional talents can further promote local as well as international cooperation on green credit. Excellent talents are also the key to business expansion and innovation of banks. Therefore, the training of talents is essential for the development of green credit.

6. Conclusion

Based on the theoretical analysis of green loan, data analysis of green loan, current situation analysis of China's environmental pollution and correlation analysis of green loan and environmental pollution degree, this paper provides ideas for improving China's environmental quality and promoting the "double carbon" goal, and draws the following conclusions:

Through the data analysis of green loan, since 2011, the balance of green loan has been steadily rising, and its proportion in the total credit is also growing. China's current green credit investment is characterized by a wide range and uneven scope, but the data show that the proportion of China's investment has gradually shifted from industry to renewable energy and pollution prevention and control projects.

Through the analysis of environmental pollution in China, it can be concluded that the carbon emissions of all provinces in China have increased steadily over the past decade, but the growth rate has decreased year by year.

Environmental pollution, represented by carbon emission, is a major threat to the northeast and middle regions of China, and there is regional correlation. With the increase of the proportion of green credit investment in each province in the past decade, the green credit level in Guangxi, Hainan and other provinces is high, and the corresponding carbon emissions are low, revealing that the programs of green credit were extreme imperative in these regions. However, for Shandong, Jiangsu and other provinces, green credit is directly proportional to carbon emissions, indicating that green credit is not the only regulatory factor in these regions, regional geographical environment, per capita GDP, industrial reform, and other factors will affect the degree of environmental pollution.

In view of the current relationship between green credit and environmental pollution in China, it is suggested to improve the green credit system first. First, improve the political and legal system of green credit. For example, the government can establish a special supervision system; For green enterprises to adopt some incentive mechanisms. Second, unify green credit standards. Finally establish our green credit certification and rating standards. For regional green credit policies, it is suggested that local governments should adapt to local conditions and strengthen communication and cooperation among provinces. Meanwhile, commercial banks should expand their service scope and provide more channels for different types of enterprises. We will innovate and launch green credit products and services to further integrate individual consumption with green credit.

References

[1] Zhang, Yue-Jun, et al. "The Impact of Economic Growth, Industrial Structure and Urbanization on Carbon Emission Intensity in China." *Natural Hazards*, vol. 73, no. 2, 20 Feb. 2014, pp. 579–595, 10.1007/s11069-014-1091-x.

[2] Dong, Feng, et al. "Drivers of Carbon Emission Intensity Change in China." Resources, Conservation and Recycling, vol. 129, 1 Feb. 2018, pp. 187–201,

[3] Wang, Yao, et al. "Carbon Peak and Carbon Neutrality in China: Goals, Implementation Path, and Prospects." China Geology, vol. 4, no. 0, 2021, pp. 1–27, 10.31035/cg2021083.

[4] Liu Xianfeng, et al. "Research on Green Finance Theory and Practice." Financial Regulation Research, 9th April, 2021, 10.13490/j.cnki.frr.20210409.001

[5] Qiu Xiaohua, et al. "Green Finance in Support of Carbon Neutral Targets:International and Domestic Practices and Recommendations", Insurance Theory and Practice, 2021

[6] Zhou Liang, et al. "The current situation and suggestions for the development of green finance in China", Journal of Tianjin University of Commerce, vol. 41, no.1, Jan..2021, 10.15963/j.cnki.cn12-1401/f.2021.01.007

[7] Wang Jiacheng, "Study on the Impact of Green Credit on Environmental Pollution Control", may.2019

[8] Hao Rui, "Research on the Current Situation and Problems of Green Credit in China 's Banking Industry" may.2017

[9] Hu Tianyang, et al."Green Finance and High Quality Corporate Development: Incentive and Disincentive Effects", Financial Science, no.4, April. 2022, pp.133-148

[10] You Zhiting, et al. "Study on the Impact of Green Financial Development on Regional Carbon Emissions --Take green credit, green industry investment and green bonds as examples" Theory and Practice of Finance, vol.511, no.2, Feb.2022, pp.69-77

[11] Shi Daimin, et al. "Green Finance and Economic Quality Development: Mechanisms, Characteristics and Empirical Studies" Statistical Research, vol.39, no. 1, Jan.2022, 10. 19343 /j.cnki 11-1302 /c 2022. 01. 003

[12] Lingyun He, et al. "Green credit, renewable energy investment and green economy development: Empirical analysis based on 150 listed companies of China" Journal of Cleaner Production, Oct ober.2018, 10.1016/j.jclepro.2018.10.119

[13] Bai Lyu, et al. "How Does Green Credit Promote Carbon Reduction? A Mediated Model" Frontiers in Environmental Science, April.2022, 10.3389/fenvs.2022.878060

[14] Zhang, Bing, et al. "Tracking the Implementation of Green Credit Policy in China: Top-down Perspective and Bottom-up Reform." Journal of Environmental Management, vol. 92, no. 4, Apr. 2011, pp. 1321–1327, 10.1016/j.jenvman.2010.12.019.