ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

The Impact of Carbon Finance Development Level on Urban Low-Carbon Transformation—Based on the Data of Prefecture-Level Cities in China

Chen Yang[1,a], Ruobing Ning[1,b], Xinyuan Huang[1,c], Xin Liao[2,d,*]

[1]School of Management, University of Shanghai for Science and Technology, Shanghai, China
[2]Associate Professor, School of Management, University of Shanghai for Science and Technology, Shanghai, China
[a]a2639296648y@163.com, [b]ningruobing2021@163.com, [c]694327101@qq.com, [d]liaoxin2010@163.com
[*]Corresponding author

Abstract: *This paper uses the panel data of 29 prefecture-level cities in China from 2013 to 2020 to establish a fixed effect model to study the impact of carbon finance development level on urban low-carbon transformation. The results show that: (1) Overall, the development of carbon finance will significantly promote the low-carbon transformation of Chinese cities; (2) the impact of carbon finance development on urban low-carbon transformation has regional heterogeneity, with the greatest impact on the eastern region, followed by the central region, and the impact on the western region is reversed.*

Keywords: *Carbon Finance, Low Carbon Economy Enterprise, Panel Regression*

1. Introduction

The current world is undergoing major changes unseen in a century. Long-term overexploitation and improper use of natural resources have posed a huge threat to the ecological environment, in the context of global warming and climate imbalance. In 2020, China announced that it will strive to achieve carbon peak by 2030 and achieve carbon neutrality by 2060. However, China is still the largest energy consumer. Urban low-carbon transformation can effectively reduce carbon emissions. Urban low-carbon transformation has become the general trend. How to effectively promote urban low-carbon transformation is an extremely important practical issue facing China.

Carbon finance refers to various financial institutional arrangements and financial transactions aimed at reducing greenhouse gas emissions. Countries around the world urgently need to reduce the impact of ecological deterioration on economic markets. The ' Kyoto Protocol ' stipulates that since 2005, developed countries have the obligation to reduce their carbon emissions, and developing countries have begun to undertake emission reduction obligations since 2012.It is precisely because of the signing of the ' Kyoto Protocol ' that carbon emissions have been introduced into the financial market and thus carbon financial markets have emerged. The report of the 19 th National Congress of the Communist Party of China stressed the need to adhere to the new development concept of " innovation, coordination, green, open and sharing, " accelerate the green transformation of the economy, and then the unified carbon market covering the whole country was officially launched on December 19, 2017. The launch of the unified carbon market marks a new stage of carbon emissions trading in China. Carbon finance empowers urban low-carbon transformation and brings new ways to urban low-carbon transformation, so what is the impact of carbon finance development on urban low-carbon transformation? Is there a regional difference in the impact of carbon finance on urban low-carbon transformation? Exploring these issues is of great significance for improving the level of carbon finance development and accelerating urban low-carbon transformation.

2. Literature Review

2.1. Research on the Concept of Low-carbon Economy

Fu Jiafeng et al. (2010) [1] proposed that low-carbon economy refers to an economic form in which carbon productivity and human development have reached a certain level, with low energy consumption,

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

low pollution, low emission and environmental friendliness. Fang Dachun and Zhang Minxin (2011). [2] The connotation of humanistic low-carbon economy is a new choice of economic development mode, which is the general term of low-carbon industry, low-carbon technology, low-carbon life and low-carbon development economic form.

2.2. Research on the Comprehensive Evaluation Index of Urban Low Carbon Transformation

Fan Zhengqiang and Li Qi (2009) [3] believed that the evaluation index of urban low-carbon transformation should be multi-level and multi-faceted. They evaluated the transformation and development of resource-based cities from four levels: technical level and operation level, and established a comprehensive evaluation index system for coordinated development. Ding Ding et al. (2015) [4] constructed three types of 10 specific indicators including carbon emission related indicators to evaluate urban low-carbon transformation.

2.3. Research on the Concept of Carbon Finance

At present, there is no uniform definition of the concept of carbon finance. The World Bank's description of ' carbon finance ' is almost consistent with carbon trading, while domestic carbon trading is separated from carbon trading-related financial instruments, resulting in the concept of ' carbon finance '. Qiao et al. (2011) [5] proposed that carbon finance is an innovation in the field of low carbon based on climate economics, environmental finance and externality theory. It puts forward higher social responsibility for enterprises and plays a key role in promoting the development of low carbon economy. Jiang Sitong (2023) [6] believed that carbon finance specifically refers to the process of reasonable adjustment and effective management of carbon emissions through the sale of carbon emission rights while maintaining the consistency of total carbon emissions, including various financial activities and financial management systems related to carbon emissions. Similarly, carbon finance usually refers to the financial behavior related to the reduction of greenhouse gas emissions, including the trading of carbon emission rights and their derivatives, the investment and financing of carbon emission reduction projects, and the intermediary services for carbon trading (Li & Liu, 2011) [7].

2.4. Research on the Measurement of Carbon Finance Development Level

There is no authoritative and unified evaluation index system in China. Chen Zhiying, Xu Lin (2020) [8] used the neoclassical theoretical model, fractal dimension discussion and kernel density analysis to construct panel regression for empirical research, and concluded that the carbon emission trading level of the pilot area was consistent with the overall level, and the market depth was the decisive factor of the carbon emission trading level. Liu Yang (2018) [9] innovatively divided 30 provinces into eight economic regions, used factor analysis to measure the development level, and used panel regression to analyze the influencing factors of carbon finance development.

2.5. Research on the Impact of Carbon Finance on Urban Low-carbon Transformation

Based on Marxist reproduction theory, Fan Fangzhi and Zhang Lijun (2003) [10] used Patrick's ' demand following ' and ' supply leading ' theories to derive the internal mechanism of financial structure evolution and industrial structure upgrading. El-Karmi and Abu-Shikhah (2013) [11] believed that the extensive trading of green credit products in the carbon financial market can provide financial guarantee for the development of low-carbon economy, improve energy utilization rate and promote the process of urban low-carbon transformation. Fu Junfang (2017) [12] used Bai-Perron structural mutation test method and VAR model to study the financial support for the development of low-carbon economy in Chongqing, and pointed out that the innovation of low-carbon financial products in Chongqing can play a certain role in promoting the development of low-carbon economy, which is conducive to expanding the breadth and depth of urban low-carbon transformation. Peng Yuwen and Zou Mingxing (2019) [13] selected three perspectives of carbon financial trading mechanism, commercial banking industry and corporate strategic adjustment, and theoretically analyzed the transmission mechanism of carbon finance to promote industrial restructuring. It is believed that the study of carbon financial trading mechanism helps to adjust the city's industrial structure, transform the mode of economic growth, and stimulate low-carbon transformation. Based on green bonds, Minh TC and Naderi N (2022) [14] can achieve effective energy transformation and sustainable development goals by acquiring green technologies.

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

3. Theoretical Analysis and Research Hypothesis

Carbon finance can give full play to the supporting role of financial institutions and commercial banks. At present, China's financial system is mainly based on indirect financing. Bank credit is an important way to raise funds. Under the combined effect of market mechanism and government macro-control, the development of carbon finance can promote the expansion of green credit to form a capital-oriented mechanism. [15] By giving more credit incentives to energy-saving and emission reduction projects, it can provide more funds for low-carbon industries and guide urban low-carbon transformation and industrial restructuring and optimization. On the other hand, we can establish and improve the carbon financial trading market, dredge resource channels, promote the effective allocation of resources, and accelerate the process of urban low-carbon transformation. In addition, the development of carbon finance can promote healthy competition among industries, promote product innovation, and provide technical support for urban low-carbon transformation.[16] Therefore, this paper proposes hypothesis 1:

H_1 : The development of carbon finance contributes to urban low-carbon transformation.

The development of China's carbon financial market is in an unbalanced state. The financial resources in different regions are different, and the level of carbon financial development is also quite different, which leads to different regional economic development. The eastern region has a large demand for carbon financial transactions, and the stock bond market is relatively perfect. The development of carbon finance in the central and western regions mainly depends on credit market financing. [17] The impact of different types of carbon financial instruments on low-carbon economy will have significant regional heterogeneity. Therefore, Hypothesis 2 is proposed:

H_2 : The impact of carbon finance development level on urban low-carbon transformation has regional heterogeneity.

4. Research Design

4.1. Sample Selection and Data Sources

This paper selects 29 cities in China as the research object. In addition to Hong Kong, Macao and Taiwan cities, considering the availability of data and data characteristics, Yinchuan and Xining are excluded from 31 provincial capitals and municipalities. According to the availability and consistency of the data, the sample period is determined from 2013 to 2020. The sample data comes from the National Bureau of Statistics, the statistical yearbooks of cities, the CNRDS China Research Data Service Platform and the Digital Finance Research Center of Peking University.

4.2. Variables Selection

4.2.1. Explained Variable

Table 1: China's urban low-carbon transition scoring system

first grade indexes	Second grade indexes
ecological environment	Urban air quality index
	Equivalent sound level of ambient noise
	harmless treatment ratio for house refuse
	Comprehensive utilization rate of industrial solid waste
	industrial wastewater emissions
economic growth	Proportion of added value of tertiary industry in GDP
	Urban per capita GDP3 GDP growth rate
technological development	The proportion of education expenditure in fiscal expenditure
	The proportion of science and technology expenditure in fiscal expenditure
	Number of city patent applications
energy utilization	carbon emissions per capita
industrial structure	rationalization index of industrial structure
	advanced index of industrial structure

Low carbon transformation level (LC). Five first-level indicators are selected for the comprehensive analysis of urban low-carbon transformation: ecological environment, economic growth, technological development, energy utilization and industrial structure. Under the first-level indicators, the second-level

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

indicators are determined according to the principles of rationality, representativeness and availability, as shown in Table 1. The analytic hierarchy process is used to empower the first-level indicators, and because there is no obvious important relationship between the second-level indicators, the objective weighting method is used to empower them. The weight is determined by calculating the entropy value, and finally the data is substituted into the model to obtain the low-carbon transformation score of each city layer by layer.

4.2.2. Core Explanatory Variables

Carbon finance development level (CF). Carbon finance is a derivative market developed in recent years. The development of carbon finance market will obviously be affected by the progress of financial science and technology, social and economic development and the change of energy environment. Liu Yang (2018) [9] selected five evaluation indicators from the five aspects of economic development, financial environment, energy efficiency, science and technology and financial low carbonization, including the optimization of the tertiary industry structure, the added value of the financial industry, carbon intensity, the proportion of R & D funds, and carbon emission loan intensity. Xu Xiaofei (2020) [18] analyzed from three aspects: economic environment, energy efficiency and market business, and selected 10 indicators such as carbon intensity, the proportion of added value of the tertiary industry in GDP, and the proportion of R & D expenditure in GDP.Using principal component analysis, it is found that economic development, industrial structure and innovation ability have a significant impact on the carbon financial market. Zheng Qunzhe (2022) [19] mainly discussed from the aspects of financial environment, energy efficiency and scientific and technological development. Using the time series multi-index model, the panel data model was established to analyze the influence of different factors on the development level of China's carbon finance, and the score of carbon finance development level of each province was obtained. This paper mainly draws on the research ideas and index system of Liu Yang (2018) [9], Xu Xiaofei (2020) [18] and Zheng Qunzhe (2022) [19]. The final index system is shown in Table 2. Due to the strong correlation between variables, the factor analysis method is used to reduce the dimension and then the entropy weight method is used to objectively weight, and the carbon finance development level scores of 29 cities in China from 2013 to 2020 are obtained.

Table 2: China's carbon finance development level measurement index system

key layer	indicator layer	calculating method
financial factors	The proportion of added value of financial industry	The proportion of added value of financial industry in GDP
	Carbon emission loan intensity	The ratio of the loan balance to carbon emissions
energy factors	carbon emission intensity	The proportion of carbon emissions in GDP
	Energy consumption elasticity	The growth rate of energy consumption is higher than that of GDP in the same period.
technological factors	R & D expenditure ratio	Internal expenditure ratio of technology R & D expenditure to GDP
	patent number	Patent authorization number normalization

4.2.3. Control Variable

Table 3: Selection and Definition of Control Variables

Variable name	code	variable definition
industrial structure	IS	The ratio of tertiary industry to secondary industry output value
financial development level	FD	inclusive financial index
government expenditur	GE	The proportion of general public budget expenditure in GDP
human resources level	HR	The number of college students per 10,000 people in each city over the years
environmental regulation	ER	Three indexes of urban industrial wastewater discharge, industrial sulfur dioxide emission intensity and industrial soot emission intensity were selected and calculated by entropy method.
Per capita wealth	PGDP	Normalization of real per capita GDP

Based on the research of Xu Yingqi et al. (2023) [20], this paper selects industrial structure (IS),

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

financial development level (FD), government fiscal expenditure (GE), human resource level (HR), environmental regulation (ER), per capita wealth ($PGDP$) and other influencing factors as control variables, such as Table 3, to reduce the analysis error of the impact of carbon finance on urban low-carbon transformation.

4.3. Model Specification

This paper uses $Hausman$ test and over-identification test to determine the selection of fixed effects and random effects. According to the test result p value is 0.0017, so this paper uses the fixed effect model for empirical analysis. At the same time, considering the large difference between the clustering robust standard error and the ordinary standard error, the over-identification test is used to verify again, and the p value is 0.0060, that is, the random effect model is rejected. Therefore, this paper uses the fixed effect model for empirical analysis.

$$LC_{it} = \alpha_0 + \beta_0 CF_{it} + \gamma_0 control_{it} + u_i + \eta_t + \varepsilon_{it} \quad (1)$$

Among them, i represents the region, t represents the time, α_0 represents the constant term, LC_{it} represents the level of urban low-carbon transformation in t year, CF_{it} represents the level of carbon finance development in t year, $control_{it}$ represents the control variable, u_i represents the individual fixed effect, η_t represents the time fixed effect, and ε_{it} represents the random error term. This paper focuses on the coefficients of core explanatory variables CF_{it}. If β_0 is significantly positive, it indicates that the development of carbon finance has a promoting effect on urban low-carbon transformation, and Hypothesis 1 is established.

5. Empirical Analysis

5.1. Descriptive Statistic

Table 4 shows the descriptive statistical test results of each variable in the sample. Considering the influence of abnormal extreme value data on the sample, the variables such as urban low-carbon transformation (LC), carbon finance (CF) and per capita wealth ($PGDP$) are treated with 1 % and 99 % bilateral tail reduction. The average value of urban low-carbon transformation (LC) is 0.1683, the standard deviation is 0.0279, the minimum value is 0.0849, and the maximum value is 0.2881, indicating that there are some differences in the level of low-carbon transformation in each city. The level of low-carbon transformation in Nanchang, Guangzhou and other cities is significantly higher than that in Shanghai, Yinchuan and so on. The average value of carbon finance (CF) is 0.4440, the standard deviation is 0.1745, the minimum value is 0.0919, and the maximum value is 0.9746. It shows that the level of carbon finance development in various cities in China has increased in recent years, but the regional differences are obvious. The level of carbon finance development in Beijing, Guangzhou and other regions with strong economic strength is higher, while the level of carbon finance development in some central regions such as Nanchang and Changsha are relatively weak. Changes in other control variables are still within a reasonable range.

Table 4: Descriptive statistical results of main variables

Variables	Means	Sd.	Min	Median	Max	Number
LC	0.1683	0.0279	0.0849	0.1694	0.2881	232
CF	0.4440	0.1745	0.0919	0.4186	0.9746	232
DIF	0.4631	0.2457	0.0099	0.5064	0.9304	232
IS	1.7135	0.8744	0.7130	1.4893	5.3482	232
ER2	0.0750	0.1312	0.0026	0.9701	1.0487	232
GE	0.1516	0.0374	0.0860	0.1434	0.2556	232
HR	0.1599	0.0791	0.0763	0.1455	0.4746	232
PGDP	0.3447	0.2004	0.0221	0.3056	0.8594	232

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

5.2. Regional Heterogeneity Analysis

According to Table 5, the regression estimation results are shown. Column (1) is the regression result of individual fixed effects that will consider the core variables and all control variables. Column (2) is the regression result of individual time two-way fixed effects. Columns (3), (4) and (5) consider the impact of regional carbon financial development scores on urban low-carbon transformation from the perspective of regional heterogeneity. Considering the first two columns, the results show that the impact of carbon financial development level on urban low-carbon transformation is significantly positive, which preliminarily verifies hypothesis 1. This paper speculates that the possible reason is that the combination of carbon finance and ecological environmental protection is conducive to the treatment of energy consumption and environmental pollution from the source. The higher the level of carbon finance development, the more active the carbon emission-related transactions, which promotes urban energy conservation and emission reduction. At the same time, it also reflects the higher the government's attention to reducing carbon emissions and protecting the environment, which is promoting the low-carbon transformation and development of the city.

According to the regression results of each region, it can be seen that the impact of carbon finance development score on urban low-carbon transformation in each region is significant, but there are significant and positive and negative differences, which verifies the hypothesis 2 of this paper. The coefficient of the eastern region is the highest among the three regions. This paper believes that the level of carbon finance development in the eastern region is relatively high, and the guiding role of capital flow is relatively strong. It provides enterprises with a place for carbon emissions trading, so the positive effect on urban low-carbon transformation is also more obvious. In particular, the impact of the western region is significantly negative. It is speculated that the possible reason is that the level of carbon financial development in the western region is relatively low, and the lag of carbon financial development is more serious. The significance of the central region is relatively low, probably because the development of carbon finance in the central region mainly introduces capital into the secondary industry. The low-carbon economy is not the focus of capital flow, which relatively deteriorates the industrial structure and ecological environment, resulting in the development of carbon finance to promote low-carbon economy.

Under the goal of " carbon peak " and " carbon neutrality " in China, for cities with low carbon financial development in the western region, it is very important to vigorously develop carbon finance, actively expand the trading volume of carbon finance, and reduce the lag of carbon finance for the realization of green and low-carbon transformation of cities. Of course, for the eastern cities with a relatively high level of carbon financial development, the impact of carbon finance should also be actively expanded. On the whole, it is necessary to improve the regional coordination of carbon finance development.

Table 5: Regression results of carbon finance and urban low-carbon transformation

Variables	(1)	(2)	(3)	(4)	(5)
	whole sample		eastern region	central region	western region
CF	0.053***	0.078***	0.120***	0.046*	-0.068***
	(3.88)	(2.78)	(5.07)	(2.00)	(-3.65)
DIF	-0.023**	-0.010	-0.036*	-0.042*	0.031**
	(-2.17)	(-0.29)	(-1.78)	(-1.85)	(2.04)
IS	0.015**	0.006	0.009	0.019	0.011*
	(2.33)	(0.81)	(0.66)	(1.61)	(1.76)
ER	-0.036*	-0.038***	-0.036	0.012	0.042
	(-1.89)	(-2.85)	(-1.28)	(0.22)	(1.02)
GE	0.009	0.027	0.008	0.365*	-0.421***
	(0.10)	(0.35)	(0.04)	(1.96)	(-3.26)
HR	-0.005	-0.048	-0.084	0.016	0.098***
	(-0.08)	(-1.08)	(-0.89)	(0.10)	(2.86)
PGDP	-0.001	-0.016	0.002	0.001	-0.161***
	(-0.06)	(-1.03)	(0.10)	(0.02)	(-4.81)
Constant	0.132***	0.144***	0.131***	0.095***	0.244***
	(7.31)	(9.19)	(3.79)	(2.88)	(11.23)
Observations	232	232	88	64	80
Number of province	29	29	11	8	10
Company FE	YES	YES	YES	YES	YES
Year FE		YES			

Note : ***, ** and * indicate that the parameter estimates are significant at the significance level of 1%,5% and10%, respectively. The values in the brackets are statistical values, the same below.

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

The estimation results of the control variables show that the industrial structure (IS) and environmental regulation (ER) have a significant impact on the low-carbon transformation, and the industrial structure optimization and urban low-carbon transformation score higher. However, the factors of government fiscal expenditure (GE), human resource level (HR) and per capita wealth ($PGDP$) have no significant impact on urban low-carbon transformation. This is because only carbon finance actually changes the industrial structure and ecological environment can it truly promote urban low-carbon transformation. The improvement of fiscal expenditure, human resource level and per capita wealth only simply expands the breadth of urban economic development and is not targeted for the development of low-carbon transformation. Therefore, it cannot really promote low-carbon transformation.

5.3. Endogeneity Problem

Because the benchmark regression does not consider the influence of some unobservable practical factors, and the lag term of carbon finance will also have a certain impact on the results, resulting in bias in the estimation results. This paper tests the endogenous problems by establishing a dynamic panel, and constructs a dynamic panel model with the first-order lag term of urban low-carbon transformation level as follows:

$$LC_{it} = \alpha_2 + \rho_1 LC_{i,t-1} + \beta_1 CF_{it} + \theta_2 control_{it} + \varepsilon_{it} \quad (2)$$

Among them $LC_{i,t-1}$ is the first-order lag term of urban low-carbon transformation level.

Table 6: Dynamic Panel Difference GMM Estimation Results

VARIABLES	(1)	(2)	(3)	(4)
	whole sample	eastern region	central region	western region
L.LC	0.065***	0.108	0.373**	-0.166***
	(4.02)	(0.74)	(1.97)	(-2.99)
CF	0.040***	0.080**	-0.021	-0.086***
	(5.31)	(2.53)	(-0.77)	(-8.51)
Constant	0.136***	0.114***	0.114***	0.221***
	(25.42)	(3.98)	(2.77)	(19.61)
Control Variables	YES	YES	YES	YES
Observations	174	66	56	70
Number of province	29	11	8	10
Company FE	YES	YES	YES	YES

According to the estimation results of Table 6, the carbon finance coefficients in columns (1), (2) and (4) are significantly positive, which is consistent with the estimation results of the fixed effect model, and Hypothesis 1 is verified again. However, the effect of carbon finance development level on urban low-carbon transformation in the central region is not obvious. This paper believes that this is related to the weak development of carbon finance in the central region of China, and most regions have not yet been popularized. The full sample results show that carbon finance can accelerate urban low-carbon transformation to a certain extent. In addition, from the perspective of lag term, except for the eastern region, the other sample results show that the first-order lag term of urban low-carbon level has an impact on the development of urban low-carbon transformation. This paper argues that the corresponding results are still robust after controlling endogeneity.

5.4. Robustness Test

Considering that the regression results will be affected by the selection of control variables and lead to unreliable conclusions, this paper puts the control variable urbanization level (UR) into the model. When other variables remain unchanged, the regression coefficient of its carbon finance development level is still significantly positive, which is consistent with the estimation of the fixed effect model, indicating that it has certain robustness. At the same time, due to the rapid development of carbon finance in some cities in China, in order to avoid the impact of extreme values on the regression results, the three cities with the highest level of carbon finance development were eliminated from the sample size of 29 cities, namely Yinchuan, Beijing and Shanghai, and the eliminated samples were returned. The results are still significantly positive. The high level of carbon finance development in Beijing and Shanghai may be due to the active financial transactions. The highest score in Yinchuan is mainly due to the abnormally high score in 2012-2015. This paper believes that the possible reason is that Yinchuan has

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

more carbon emission reduction projects. Due to the length of the article, the detailed estimation results of this part are not listed.

6. Conclusion

Based on the evaluation index of carbon finance development level and urban low-carbon transformation, this paper discusses the impact of carbon finance development level on urban low-carbon transformation in 29 cities in China from 2013 to 2020, and then discusses the regional differences of impact by dividing cities into three regions. The results show that the level of carbon finance development has a significant impact on urban low-carbon transformation under the individual fixed effect model, and the results are robust. At the same time, the level of carbon finance development in different regions is different, and the effect is not the same. The level of carbon finance development in the eastern region is relatively high, and the effect of the eastern region is relatively large. The above conclusions play an important role in promoting the development of carbon finance, building an efficient carbon finance development system, and promoting the low-carbon transformation process of cities in different regions. The following suggestions are made:

First, accelerate the development of carbon finance and accelerate the low-carbon process of resource-based industries. The development level of carbon finance can effectively promote the low-carbon transformation of cities, so it is feasible to achieve the purpose of low-carbon transformation by developing carbon financial market. Under the goal orientation of China's "carbon peak" and "carbon neutrality, " urban managers should pay attention to the green and low-carbon transformation effect of carbon finance while accelerating the development of carbon finance. Specifically, we should develop carbon financial trading tools, promote the cultivation of carbon financial talents, and improve the carbon financial supervision system.

Second, for cities at different stages of development, the impact of carbon finance on urban low-carbon transformation cannot be generalized. The development of China's western region is relatively backward, and the development of technology, capital and innovation is relatively slow. In promoting the development of the western region, it is still necessary to promote the development of basic industries. It can strengthen the intervention of management institutions to vigorously develop carbon financial markets and increase technological innovation to promote low-carbon cities in western China. Specifically, we can increase policy support, vigorously develop carbon financial intermediary services, appropriately increase the collection of environmental taxes, and promote the development of low-carbon economy.

References

[1] Fu Jiafeng, Zhuang Guiyang, Gao Qingxian. (2010) Conceptual Identification and Evaluation Index System for Low Carbon Economy [J]. Chinese population, resources and environmental, 20(08), 38-43.
[2] Fang Dachun, Zhang Minxin. (2011) Theoretical Basis of Low Carbon Economy and Its Economic Value[J]. Chinese population, resources and environmental, 21(07), 91-95.
[3] Fan Zhengqiang, Li Qi. (2009) Research on the evaluation index system of industrial transformation of resource-based cities based on system innovation [J]. Accounting Research, 2009(22), 73-74.
[4] Ding Ding, Cai Meng, Fu Lin, Yang Xiu. (2015) Evaluation on Low-carbon Pilot Cities Based on Indicators [J]. Chinese population, resources and environmental, 25(10), 1-10.
[5] Qiao Haishu, Tan Ye, Liu Xiaoli. (2011) The Latest Development of the Study of Carbon Finance Theory [J]. Financial forum, 16(02), 35-41.
[6] Jiang Sitong. (2023) Research on the construction strategy of China's carbon financial market operation mechanism [J]. Collective Economy of China, 2023(03), 89-92.
[7] Li K, (2011) Liu C. Construction of Carbon Finance System and Promotion of Environmental Finance Innovation in China [J]. Energy Procedia, 2011, 5(1),1065-1072.
[8] Chen Zhiying, Xu Lin, Qian Chongxiu. (2020) Measurement and Dynamic Evolution of China's Carbon Finance Development Level [J]. Technical Economics, 37(08), 62-82.
[9] Liu Yang. (2018) The Measure of Development Level and The Analysis of Influence Factors about Regional Carbon Finance in China [D]. LanZhou University, 2018.
[10] Fan Fangzhi, Zhang Lijun. (2003) Research on China's regional financial structure transformation and industrial structure upgrading[J]. Financial Research, 2003(11), 36-48.
[11] El-Karmi F Z, Abu-Shikhah N M. (2013) The role of financial incentives in promoting renewable energy in Jordan [J]. Renewable Energy, 57(sep.), 620-625.

ISSN 2616-5902 Vol. 5, Issue 7: 17-25, DOI: 10.25236/AJBM.2023.050704

[12] Fu Junfang.(2017) Research on the financial support for the Development of low-carbon economy in Chongqing[D]. Chongqing technology and business university, 2017.
[13] Peng Yuwen, Zhou Mingxing. (2019) The impact of carbon finance development on the upgrading of industrial structure - A comparative analysis based on urban agglomerations[J]. Enterprise Economy, 2019(06), 15-20.
[14] Minh T C, Naderi N. (2022) Unleashing the Role of Green Finance, Clean Energy, and Environmental Responsibility in Emission Reduction[J]. Journal of Environmental Assessment Policy and Management, 2022, 24(03).
[15] Liu Tingting.(2020) Analysis of the impact of green credit on industrial low-carbon transformation[J]. Business Accountancy, 2020(09), 102-104.
[16] Liu Zhida.(2020) The impact of carbon finance on the low-carbonization of resource-based industries - An empirical study based on CDM[J]. Financial theory and Practice, 2020(11), 57-62.
[17] Gao Jinjie.(2021) Research on the Impact of Green Finance on China's Economic Growth and Its Regional Heterogeneity[J]. Jilin University, 2021.
[18] Xu Xiaofei.(2020) Research on the evaluation system of China's carbon financial market development[J]. Economic Research Guide, 2020(02), 154-156.
[19] Zheng Qunzhe.(2022) China's carbon finance development level measurement and influencing factors analysis[J]. 2022(02), 75-79.
[20] Xu Yingqi, Cheng Yu, Wang Jingjing.(2023) The spatial and temporal evolution of carbon emission efficiency and the impact of green technology innovation in resource-based cities in China[J]. Geography Study, 42(03), 878-894.