Study on the Impact of Urbanization on China′s Carbon Emissions

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Abstract

China is in the stage of rapid development of urbanization and industrialization, and China's economic development has achieved great success. At the same time, the demand for urban infrastructure has increased, and the energy consumption has also increased. China's emission reduction situation is not optimistic, and the economic development model characterized by high energy consumption has also brought great pressure on resources and environment, thus causing carbon cycle imbalance. How to improve the efficiency of carbon emissions is the key to the development of low-carbon economy, which is of great theoretical significance to the sustainable development of our economy and the improvement of urbanization quality Practical value. Based on the existing environmental theory and urban development theory, this paper analyzes the relevant research to sort out the key factors that affect the carbon emission level of china: population factor, wealth ownership, urbanization level, application of science and technology, and policy support for emission reduction. In order to improve the accuracy and rationality of the analysis, the paper divides the provinces, autonomous regions and municipalities directly under the Central Government into three regions according to the level of urbanization. Based on the STRPAT model, the sub-region carries out panel data regression analysis, and finds that the influence direction and size of various factors on carbon emissions are different, and the urbanization is found. The agglomeration effect of the high area is more obvious, which can obviously reduce the great impact of urban construction and population on carbon emissions, and summarize and analyze the influence path of these factors on carbon emissions, and provide an analysis for the development of low-carbon economy in various regions.

Keywords

Carbon emissions, Urbanization, Grey correlation, STIRPAT model.

1. Introduction

Urbanization is an important feature of China's economic development at the present stage, and the average level of urbanization in China exceeds the threshold of 60%, but it is still below the level of developed countries, and there is a great room for development. The continuous improvement of urbanization level in our country has brought many benefits to people's life: income improvement, living convenience, transportation development, housing improvement and so on. However, the progress of urbanization will inevitably bring a series of social problems, and the problems accumulated in this process are becoming more and more prominent. However, China is in the stage of rapid development of urbanization and industrialization, and the trend of energy demand rigidity and rapid growth in China will not change, and there is no energy structure dominated by coal law changes, carbon emissions will still grow rapidly, even gradually reduce the carbon emission increment, is also a very difficult task. China's low-carbon transformation strategy and emission reduction policy choice can only start from the control of carbon emission increment. In this situation, more and more research in China has begun to pay attention to how to mitigate greenhouse gas emissions in the process of urbanization, and it is very urgent to study how to mitigate greenhouse gas emissions in the process of urbanization.

This paper expounds the measurement range of carbon dioxide and the measurement method of carbon emission. By comparing the carbon emission coefficient of different carbon emission calculation methods, the measurement of carbon emission of each province, city and autonomous region is calculated. At the same time, the country is divided into three regions according to the level of urbanization, so as to facilitate the empirical research and discussion.

2. Data sources

2.1 CO2 measurement range

Carbon emission coefficient refers to the amount of carbon emissions per unit of energy produced in the process of burning or using each energy source. In general, in the process of use, according to the IPCC assumption, it can be considered that the carbon emission coefficient of some kind of energy is invariant. According to the average low calorific value coefficient of the unit to standard coal, the unit energy quality is calculated, and the carbon emission coefficient of IPCC is brought in to obtain the standard carbon dioxide emission coefficient.

Index	Average low calorific value（KJ/KG）	IPCC Carbon Emission Factor（KG/KJ）	Carbon emission factor
coal	20934	97500	0.556654091
coke	28470	94600	0.734526
crude oil	41868	73300	0.836979382
gasoline	43124	70000	0.823276364
kerosene	43124	71900	0.845622436
diesel oil	42705	74100	0.863029227
fuel oil	33453	77400	0.706162418
natural gas	38979	56100	0.5963787

Ps：The average low calorific value of coal converted to standard is derived from the China Energy Statistics Yearbook; the IPCC Carbon Emissions Factor is derived from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; and the Carbon Emissions Factor is calculated by using coal as an example:1TJ/(20934KJ/KG)=4776.918KG, which is substituted into the IPCC official data to obtain the standard emission factor, i.e.9750KG/J918K=1988Kg/KG coal, if it is carbon emissions. to 12/44, i.e.0.5567 KgC/Kg coal charcoal.

2.2 Selection of Model Factors

The IPAT equation for environmental impacts was first proposed in the early 1970s by American ecologists Ellich and Holden, who argued that environmental stress is the result of a combination of population, affluence and technology. The basic forms of the equation are as follows: $I = P \times A \times T$ I denote environmental pressure, and P, A, and T denote population, per capita wealth, and technology, respectively. The drawback of the IPAT equation is that the form is not flexible enough to make it difficult to carry out econometric analysis. to this end, dits and rosa constructed the stochastic form of the IPAT equation, that is, the STIRPAT model. The basic expression is: $I = aP^{b}A^{c}T^{d}e$, the natural logarithm is taken on both sides of the equation to facilitate the regression the analysis determines the relevant parameters and obtains the model. $\ln L = \ln a + b\ln P + c\ln A + d\ln T + e$ a is the constant term of the model. b, c and d indicate that when each variables of p, a, and t have 1% change, respectively, it will cause l to change b%, c% and d%; e is the random perturbation term. Based on this model, two factors of urbanization level are added to investigate the impact of urbanization on regional carbon emissions.

Fig. 1 Model building

	Variable name	variable declaration	Unit

Environmental pressure (I)	Carbon emissions	Carbon emissions	million tons
	green coverage ratio	Green Covering of Built Areas	%
	Per capita green space	Per capita green area	square metres/pers on
Population (P)	Population size	Population	Ten thousand)
Urbanization (urban)	Level of urbanization	Urban Population / Resident Population	%
Technology (T)	Science and Technology Level (Funding)	R & D funding for industrial enterprises above scale	ten thousand dollars
	Science and Technology Level (Number of Projects)	Number of R & D projects in industrial enterprises above scale	nape
	Technical market turnover	Technical market turnover	$100 million Yuan
Wealth (A)	Economics of scale	Total GDP	$100 million Yuan
	Consumption of residents	Consumption level of residents	Yuan
Government Support (gov)	Investment in environmental protection	Government expenditure on environmental protection	$100 million Yuan

2.3 Grey correlation analysis

A comprehensive evaluation index system of the influencing factors of carbon emissions in China was constructed, and the correlation between the factors and carbon emissions was analyzed by the grey correlation method. Because of the different physical meaning of each factor in the system, the dimensionality of the data is not necessarily the same, which is not easy to compare, or it is difficult to get the correct conclusion when comparing. Therefore, in the grey correlation analysis, generally must carry on the dimensionless data processing.

No. Factor Correlation Coefficient (Means) Correlation Coefficient (Standardization)

X2 Population size 0.7406 0.5562

X3 urbanization level 0.7007 0.5758

X4 Science and Technology Level

(Funding) 0.6632 0.5594

X5 Science and Technology Level

(Number of Projects) 0.6711 0.5529

X6 Technology Market turnover 0.6247 0.5470

X7 Economic Scale 0.7219 0.5603

X8 Investment in

Environmental Protection 0.7541 0.5930

X9 Greening Coverage 0.7020 0.4748

X10 Per capita green space 0.7160 0.4833

X11 Residents'Consumption Level 0.7091 0.5432

2.4 Model setting

$$\ln(Carban)_{it} = \beta_0 + \beta_1 \ln(\mathrm{P})_{it} + \beta_2 \ln(\mathrm{A})_{it} + \beta_3 \ln(\mathrm{T})_{it} + \beta_4 \ln(\mathrm{gov})_{it} + \beta_5 \ln(\mathrm{urban})_{it} + \varepsilon \quad (1)$$

Among them,1n (Carbon) it is the carbon emission intensity of the first province and city in the t year;1n (P) it represents the population size of the first province and city in the t year;1n (A) it represents the per capita wealth of the first province and city in the t year;1n (T) it represents the technology level of the first province and city in the t year; ln (gov) represents the government's investment in environmental protection;1n (urban) it represents the level of urbanization in each region.

2.5 Division of urbanization level

Initial period (population urbanization is below 50%): the rural population is dominant, the level of industrial and agricultural productivity is low, the industry provides less employment opportunities, and the agricultural surplus labor force is not released.

Medium-term (urbanization 50% to 70%): The industrial base is relatively strong, the economic strength is obviously enhanced, the rural labor productivity is increased, the surplus labor force turns to industry, and the proportion of urban population exceeds 50% quickly, then it rises to 70%.

Later period (70% to 90% of the population): The transformation of the rural population to the urban population tends to stop, the proportion of the rural population is stable at about 10%, and the urban population can reach about 90% and become saturated.

Fig. 2 Geographical division

Area 1	Area 2	Area 3
Beijing;Tianjin; Shanghai; Guangdong	Inner Mongolia; Liaoning; Jilin; Heilongjiang; Jiangsu; Zhejiang; Fujian; Shandong; Hubei; Hainan; ChongqingCity; Shaanxi; Ningxia	Hebei;Shanxi;Anhui;Jiangxi;Henan;Hunan;Guangxi;Sichuan;Guizhou;Yunnan;Gansu;Qinghai;Xinjiang

3. Testing and Analysis

3.1 Panel smoothness test

the panel data contains the cross section data and time series data of each region at the same time, which expands the sample information and reduces the collinearity, which can effectively improve the validity of the estimation results. therefore, the panel data are used for analysis in this paper. The unit root test refers to the existence of unit root in the sequence, because the existence of unit root is a nonstationary time series, the existence of unit root process in the sequence is not stable, which will make the regression analysis exist pseudo-regressive.

Fig. 3 Pool unit root test: Summary

	variable	Level values		first difference	
		LLC	ADF - Fisher	LLC	ADF - Fisher
nationwide	lnCarbon	-23.8224 (0.0000)	158.430 (0.0000)	-6.61818 (0.0000)	66.1049 (0.2743)
	lnP	-243.988 (0.0000)	98.6048 (0.0012)	-135.156 (0.0000)	242.086 (0.0000)
	lnA	-16.9131 (0.0000)	126.767 (0.0000)	-5.14632 (0.0000)	71.1938 (0.1528)
	lnT	-4.90919	53.9353	-10.3543	103.263

		(0.0000)	(0.6957)	(0.0000)	(0.0004)
	lnGov	-3.53964 (0.0002)	52.3918 (0.7469)	-15.9260 (0.0000)	157.404 (0.0000)
	lnUrban	-3.67920 (0.0001)	75.3786 (0.0871)	-55.3461 (0.0000)	205.566 (0.0000)
Area 1	lnCarbon	-3.06569 (0.0011)	34.9624 (0.0391)	-4.96696 (0.0000)	35.1512 (0.0374)
	lnP	-1.69343 (0.0452)	57.3936 (0.0001)	-27.4417 (0.0000)	75.8607 (0.0000)
	lnA	-2.84974 (0.0022)	16.8535 (0.7714)	-3.37709 (0.0004)	37.9580 (0.0185)
	lnT	-2.99995 (0.0014)	23.7828 (0.3587)	-6.25254 (0.0000)	36.9415 (0.0240)
	lnGov	-1.12251 (0.1308)	13.3162 (0.9240)	-9.43864 (0.0000)	58.6259 (0.0000)
	lnUrban	2.09056 (0.9817)	26.8246 (0.2180)	-52.7626 (0.0000)	78.4791 (0.0000)
Area 2	lnCarbon	-6.67168 (0.0000)	51.4076 (0.0000)	-3.41436 (0.0003)	16.0030 (0.0000)
	lnP	1.49193 (0.9321)	13.7024 (0.6209)	-100.237 (0.0000)	71.9518 (0.0000)
	lnA	-11.9428 (0.0000)	42.2047 (0.0004)	-3.09411 (0.0010)	16.7607 (0.0016)
	lnT	-3.12072 (0.0009)	14.7290 (0.5446)	-5.10888 (0.0000)	23.7146 (0.0279)
	lnGov	-2.95812 (0.0015)	13.2600 (0.6537)	-9.47225 (0.0000)	30.7215 (0.0146)
	lnUrban	-13.0943 (0.0000)	48.2605 (0.0000)	-10.5997 (0.0000)	35.6088 (0.0033)
Area 3	lnCarbon	-2.65916 (0.0039)	6.40123 (0.9995)	-6.88534 (0.0000)	23.5424 (0.0387)
	lnP	-67.1442 (0.0000)	79.4467 (0.0000)	-1074.12 (0.0000)	66.7538 (0.0000)
	lnA	-1.55000 (0.0606)	6.23837 (0.9996)	-12.4700 (0.0000)	48.1029 (0.0011)
	lnT	-3.63604 (0.0001)	12.7438 (0.9401)	-8.38837 (0.0000)	33.1601 (0.0006)
	lnGov	-6.59648 (0.0000)	32.8175 (0.0645)	-14.0990 (0.0000)	52.3767 (0.0003)

	lnUrban	-12.5759 (0.0000)	46.4380 (0.0017)	-18.6991 (0.0000)	52.6485 (0.0003)

Note: Within () is the concomitant probability P value.

3.2 Cointegration test of panel data

The long-term equilibrium relationship between economic variables is called cointegration relationship. From the economic point of view, this long-term equilibrium shows that when multiple economic variables satisfy the cointegration relationship, even if each variable is hit once, it is only possible to deviate from the equilibrium position in the short term and return to the original equilibrium position in the long term. This chapter uses the Kao test for the cointegration test of panel data as shown in Table 2-2 below:

Fig. 4Panel Cointegration Test Results

	nationwide	Area 1	Area 2	Area 3
Kao Test	-7.393361 (0.0000)	-2.437129 (0.0074)	-3.000186 (0.0013)	-3.398600 (0.0003)

from the results of table 2-2 test, it can be found that the kao test statistics all reject the original assumption that there is no cointegration relationship at the level of 1% significance, that is, there is a long-term equilibrium relationship between variables, and the panel data can be regressed.

3.3 Model estimation results and analysis

3.3.1 National measurement analysis

National measurement of regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.139370	0.011529	792.7199	0.0000
LnP	3.265932	0.378887	8.619814	0.0000
LnA	0.386791	0.091105	2.050292	0.0418
LnT	-0.053156	0.023929	-1.967707	0.0345
LnGOV	-0.068282	0.019842	-3.441336	0.0007
LnURBAN	1.727715	0.309341	5.585154	0.0000

P was less than 0.05 or 0.01 compared with significant level α, and the results were statistically significant. The explanatory variables in the model are mostly significant, and the adjusted R square is higher, which indicates that the model fits well.

According to the regression results of the panel data model, the regression coefficient of population (P) is 3.265932, which plays a positive role in promoting carbon emissions. The increase of population means that every one more person consumes more food and has new housing and transportation needs. These need to consume more energy to meet the needs of industry, electricity, transportation and so on, thus generating more carbon emissions. Secondly, population agglomeration will promote urban construction, and a large amount of construction demand will lead to the growth of fuel and cement use, which will lead to the increase of carbon emissions. Population growth is the main cause of past growth in total emissions.

The regression coefficient of wealth (A) is 0.386791, indicating that carbon emissions increase with the increase of individual average consumption level. The reason for this is that rising people's incomes mean more energy-intensive household activities such as heating, cooling and transportation.

And improvements in technology (T) and government support for environmental protection (gov) have a role in carbon emissions. Because the carbon emission reduction work is a long-term and arduous task, in the short term, it can be carried out around the aspects of energy use optimization, production energy saving, development and utilization of clean energy by tapping the potential of emission reduction within the company. However, in order to achieve long-term and lasting effective emission reduction, more carbon dioxide emission reduction and utilization means, that is," post-treatment "technology, so it is necessary to quickly lay out the research and development of carbon emission reduction and utilization technology, prepare sufficient emission reduction technology and plan, and upgrade the enterprise while fulfilling the national requirements core competitiveness, promote the low-carbon transformation of enterprises, and promote the sustainable development of enterprises. At the national level, the State Council issued the 13th Five-Year Plan on Controlling Greenhouse Gas Emissions in 2016, which made it clear that by 2020, carbon dioxide emissions per unit of GDP will be 18 percent lower than in 2015, with some heavy chemical industry leading the way around 2020. chamber gas emission information and control action measures.

Urbanization (urban) has a regression coefficient of -1.727715, and the rising level of urbanization means that the population and the population of factors of production are massed in the city, and the scale of the activities related to urbanization, such as infrastructure construction and housing construction, will expand the process requires a lot of energy and thus emit a lot of carbon dioxide.

3.3.2 Measured analysis of Area 1

Regional measurement regression results

Variable	Coefficient	Std. Erro r	t-Statistic	Prob.
C	8.799673	0.024028	366.2292	0.0000
LnP	2.369288	0.922214	5.203993	0.0001
LnA	0.656556	0.244024	2.69053 4	0.0145
LnT	-0.081675	0.082135	-1.994400	0.0325
LnGOV	-0.106393	0.050657	-2.100258	0.0493
LnURBAN	-1.849727	1.381183	-1.339234	0.0963

According to the regression of the panel data model, the regression coefficient of population (P) is 2.369288, which has less positive effect on carbon emissions compared with the national level, and the increase of population means more energy consumption and more carbon dioxide emissions, but the population agglomeration effect is relatively more obvious.

The regression coefficient for wealth (A) is 0.656556, which is larger than at the national level, meaning that an increase in the size of wealth will still contribute to the growth of carbon emissions, and that this factor is relatively more potent for the region. Because the region is a region with a higher level of economic development, holding larger wealth means higher consumption capacity.

And improvements in technology (T) and government support for environmental protection (gov) have a relatively greater impact on reducing carbon emissions. That is, the output input of technology is a little larger, which means that the conversion of certain technical transformation inputs into emission reduction results is more efficient. The effectiveness of policy support is more pronounced than it deserves. Taking Beijing as an example, from 2013 to 2016, there were as many as 15 policies, regulations and notices on carbon emission reduction issued by the people's Congress, the government and the NDRC, covering the pilot trading of carbon emission rights, trading units, trading management methods, emission offset management methods and total emissions Quantity control and other areas and content; Guangdong Province from 2012 to 2017 also issued more than 10 policies, notices and interim measures, etc., in addition to the implementation of carbon trading pilot work, carbon market transaction management, quota allocation plan, but also include voluntary emission reduction use, inventory, verification report submission and other content.

And the regression coefficient of urbanization (urban) will reach -1.849727 in the high urbanization rate of region one, which means that the urban population has a higher sense of environmental protection, which will consciously reduce the use of automobiles and tend to consume products that can reduce environmental damage, and at the same time, the public will choose green clean energy to reduce the traditional energy consumption, so as to optimize the energy consumption structure and improve the utilization efficiency. On the other hand, the transfer of rural population to cities and towns promotes the rapid agglomeration of industry, technology and talents, which is conducive to the spillover of new knowledge and technological progress, and then promotes clean technology and the emergence and application of new energy, energy use efficiency, grasp the energy-saving technology is higher. It shows that the technological progress caused by the agglomeration of elements and the optimization of consumption structure continuously reduce the energy pressure and promote the urbanization to the direction of more green energy saving. Finally, in the middle and late period of urbanization, the industrial focus changed from the manufacturing industry with high energy intensity to the service industry with low energy intensity, which promoted the advanced industrial structure and appeared the trend of "economic service ". The industrial structure determines energy consumption, the proportion of tertiary industry has now overtaken the secondary industry, and the upgrading of industrial structure can reduce the intensity of energy demand through urbanization.

3.3.3 Measured analysis of Area 2

Regional measurement regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.224524	0.016105	572.7857	0.0000
LnP	2.062504	1.188152	1.904221	0.0608
LnA	0.262180	0.126145	2.078395	0.0412
LnT	-0.092758	0.029969	-0.659280	0.0118
LnGOV	-0.041072	0.029952	-0.703535	0.0840
LnURBAN	2.174039	0.537942	3.855506	0.0002

R-squared	0.991756	Mean dependent var	14.69835
Adjusted R-squared	0.989836	S.D. dependent var	10.70292
S.E. of regression	0.085957	Sum squared resid	0.539363
F-statistic	516.5761	Durbin-Watson stat	1.124089
Prob(F-statistic)	0.000000		

According to the regression results of the panel data model, the regression coefficient of population (P) is 2.362504, which will still play a positive role in promoting carbon emissions, and its impact on carbon emissions remains the primary. The regression coefficient of wealth (A) is 0.262180, indicating that carbon emissions increase as the average consumption level of individuals increases, and that CO2 emissions in relatively low-income areas are lower than those in high-income areas, implying high-income emissions. Improvements in technology (T) and government support for environmental protection (gov) have helped reduce carbon emissions, and emissions from technical inputs Use more clearly. Urban has a regression coefficient of 2.074039, and, like at the national level, an increase in urbanization increases carbon emissions, meaning that the population agglomeration effect is not obvious at the level of urbanization in this range.

3.3.4 Measured analysis of Area 3

Regional measurement regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.179107	0.037790	242.8975	0.0000
LnP	4.799195	1.077184	3.199520	0.0310
LnA	0.181504	0.230838	-2.519102	0.0140
LnT	-0.039725	0.060144	-1.327966	0.0439
LnGOV	-0.170978	0.071326	-2.397125	0.0191
LnURBAN	2.631979	0.730904	2.232822	0.0286

R-squared	0.987304	Mean dependent var	9.050128
Adjusted R-squared	0.984347	S.D. dependent var	0.721551

S.E. of regression 0.090274 Akaike info criterion -1.796732

Sum squared resid 0.594905 Schwarz criterion -1.300078

Log likelihood 99.75130 Hannan-Quinn criter. -1.596363

F-statistic 333.9288 Durbin-Watson stat 1.061194

Prob(F-statistic) 0.000000

The regression coefficient of population (P) is 4.799195, according to the regression results of the panel data model of region 3. This coefficient is larger than that of each region, and the population size has a greater positive effect on carbon emissions because of the low level of urbanization in these regions, and the agglomeration effect of cities is not obvious: because of the advantages of cities in providing funds, markets, transportation, and so on, the smaller effect of urban radiation in this region has exacerbated the problem of carbon emissions. Thus, the regression coefficient of urbanization (urban) is 2.631979, which is also relatively large. Because in the early days of urbanization, The upgrading of the industrial structure is the driving force and cornerstone of the continuous development of urbanization, and the transfer of industry to these regions, so the rapid growth of energy, raw materials industry, manufacturing industry, high-tech manufacturing industry and the rigidity of the demand for construction, transportation, road transportation infrastructure and residents'travel have all changed greatly, which are the two major characteristics of energy consumption in the urbanization stage. That is, the expansion of urban infrastructure related to energy consumption to stimulate carbon oxide.

The regression coefficient of wealth (A) is 0.181504, which indicates that carbon emissions increase the least with the increase of individual average consumption level, indicating that the income level in this region has a lower consumption tendency to energy consumables. Improvements in technology (T) have a limited impact on carbon emissions, while government support for environmental protection (gov) has a relatively large impact on carbon emissions.

4. Impact path analysis

4.1 Population - Urbanization - Carbon Emissions

In most regions, population growth is a major environmental strain and an important factor in increasing carbon emissions, more pronounced in low-urbanized areas. In regions with high levels of urbanization, the pressure on carbon emissions is relatively small.

4.2 Wealth - Urbanization - Carbon Emissions

The increase in people's holdings of wealth is also bound to generate a huge demand for consumables, the largest and most stable demand in economic growth. In 2010, the energy consumption in China's consumption field accounted for 54.2% of the energy consumption, while the energy consumption in the developed countries generally accounted for about 70% of the total energy consumption, and the contribution of the energy consumption in the consumption field in China to the total energy consumption was lower than that in the developed countries. With the acceleration of urbanization, more and more rural residents will enter the city, and the change of their way of life, especially the consumption level, will bring a lot of carbon emissions. As more "villagers" become "citizens" The use of energy for life will rise, creating pressure on carbon emissions. Therefore, with the development of economy and society, the increase of wealth is an inevitable trend, so it is more difficult to reduce environmental pressure from this factor, we need to start with the way of consumption, consciously reduce the use of cars and tend to consume products that can reduce environmental damage, and at the same time, citizens prefer green clean energy to reduce traditional energy consumption.

4.3 Urbanization - Carbon Emissions

Low-density, high-energy types of urban expansion will help increase carbon emissions. Urbanization is often accompanied by a large number of infrastructure construction, compared with the relatively perfect infrastructure system that only needs to be maintained and operated in developed countries, the city of our country is still expanding, and the construction process needs a large number of high energy and high carbon density raw materials products, including steel, cement and so on, and the energy consumption of infrastructure is showing a significant upward trend. In the absence of local government behavior interference, urbanization process is often accompanied by land intensive use, unit land carbon emissions increased, per capita land carbon emissions decreased.

4.4 Technology - Carbon Emissions

The development and application of technology can reduce carbon emissions. Taking Shandong Port Qingdao Port Fully Automation Terminal as an example, the project launched six of the world's first scientific and technological achievements, including independent research and development of Shandong Port, integrated and innovative hydrogen-powered automatic track crane and 5G automation technology. In addition, technology has a strong lock-in effect in the development of urbanization, and when a certain technology is adopted, its impact will be long-term and lasting. For the status quo of the fast-growing towns in China, through Adopting new technology can avoid some disadvantages of the development of traditional cities, improve the efficiency of energy use, improve the energy structure, and reduce carbon emissions from the two aspects of energy consumption of production and life. For more mature cities, it is difficult to slow carbon emissions from the technology sector, because the expansion of economic scale resulting from technological maturity may indirectly drive energy consumption, the energy resilience effect. The dominant position of the game between the rebound effect and the quality effect determines the direction of the technological progress factors.

4.5 Government Support - Carbon Emissions

Most of the strategies and policies to promote environmental protection are carried out by administrative or prescriptive means of control. Administrative measures have played an important role in China's environmental work because of their inherent directness, mandatoryness and efficiency, and easy supervision. However, in the process of market economy and social democracy development, the limitation of high cost and lack of incentive is becoming more and more obvious. Because in the market economy, the enterprise is profit-oriented, it generally does not take the initiative to invest in the environment, therefore, the national will is difficult to translate into local and corporate self-consciousness Move.

5. conclusion

5.1 Eliminate urban and rural dual structures and share the fruits of economic development

In the process of transition from planned economy to market-oriented economy, the economic growth is maintained at a high level. However, the effect of urbanization on economic growth in the process of population migration is hindered by the structural contradiction of dual economy under strict household registration system. Due to the influence of dual economic structure, labor force, technology and other factor resources cannot flow freely between urban and rural areas, which violates the full and rational utilization of resources, and has a negative effect on the transformation of industrial structure and overall competitiveness of our country. In order to eliminate the effect of dual economic structure on the free movement of factors of production, this paper puts forward some suggestions. In addition to agricultural household registration and non-agricultural household registration, it is unified as household registration for residents (some provinces and municipalities have already adopted household registration), reasonably promoting the migration of rural labor force to cities, providing equal employment opportunities for rural residents and urban public services such as social security, education and medical services, effectively promoting the free flow of capital, population and technology and the balanced allocation of social and public resources; secondly, reforming the rural economic structure, increasing the support for agriculture, promoting the upgrading of financial resources to rural areas, promoting the upgrading of industrial structures in rural areas, supporting the development of rural enterprises, and improving the current situation of farmers'employment difficulties the improvement of people's income level. Third, starting from the macro-level, we should coordinate the coordinated development of urbanization, industrialization and agricultural modernization, firmly put the issues of agriculture, rural areas and farmers under the premise of building a harmonious socialist society, and coordinate the coordinated development of urban and rural areas.

5.2 Improving the economic assessment system

The current official assessment mechanism and local taxation system are the two main reasons to aggravate the development trend of high carbonization. First, the assessment mechanism of local officials mainly focuses on the assessment of economic indicators such as GDP, without combining with resource efficiency indicators related to sustainable development. Second, the incomplete reform of the central and local tax system drives local governments to rely too heavily on land finance. In order to meet local development, GDP improvement, basic government operation and social welfare, local government often gains benefits through urban expansion. Such a localized management model inevitably induces dislocation of local government functions and roles, often due to local interests and lost sector interests, showing high economic carbonization of the path dependence.

Low-carbon urbanization is a necessary and feasible way to solve the problem of gradually increasing carbon emissions in urbanization process. High carbon emission will continue in China in the process of industrialization, and it is still a key area that cannot be ignored in the future. construction, transportation, residents ’ lives and policies are also closely related, especially economic incentive policies. The deviation of building area expansion from its use efficiency, the continuous rise of transportation demand and the increase of consumption power brought by the improvement of residents'living standard can be balanced by economic means. However, medium- and long-term low-carbon transformation, must be economic development and Combining the system reform, the low-density expansion of the city and the malpractice of the local government officials assessment mechanism and the local finance and taxation system behind it, the system foundation determines the incentive effect. Only by taking "low-carbon development" as the idea from the policy and measure, can the low-carbon road of urbanization be realized.

5.3 Accelerating the transformation of technology into practical applications

To transform science and technology into real productive forces, we must first attach to the carrier of enterprise, which is the best carrier to realize the transformation of science and technology to real productive forces. The incentive mechanism is the sum of the relationship between the incentive subject and the incentive object through the incentive factor or incentive means in the organizational system, which is the best means in the scientific research work and the transformation of the results. In the evaluation of scientific and technological achievements, the performance of scientific and technological achievements should be regarded as one of the main criteria for the evaluation of scientific research personnel; in the evaluation of technical titles, not only the level of scientific research achievements and the number of published monographs should be assessed as hard indicators, but also the results should be transformed benefit level as the focus of assessment. Scientific and technological personnel with scientific and technological achievements in colleges and universities are actively encouraged to establish scientific and technological enterprises in relevant science and technology parks and demonstration zones in accordance with the incentive policies and the form of cash contributions, and may also hold enterprise equity.

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