

# Research on the Coordinated Development of New Urbanization and Green Economy in China

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## Abstract

With the rapid development of China's economy, the extensive economic growth cannot meet the demands of a new age, the pattern of economic development has become China's green building harmonious coexistence between man and nature of the new concept of economic development, new urbanization the coordinated development between the construction and development of green economy problem has become a hot spot problem on a nationwide scale. Taking 31 provinces in China as the research object, this paper selects relevant index data of 31 provinces and municipalities in China from 2009 to 2018 to construct a comprehensive evaluation index system of New-type urbanization and green economy. The entropy method, coupling coordination degree model and convergence model are used for analysis, and the conclusions are drawn as follows: Over time, China's new urbanization and green is showed a trend of significant increase in the level of economic development, but the southeast provinces was significantly superior to other regions, overall in the stage of primary coordination and coupling coordination degree, and there is a big regional differences, but differences in absolute value showed a trend of gradually narrowing, build in east China area as the center, continuously to decreasing coupling coordination degree of spatial pattern of other areas. On this basis, corresponding countermeasures and suggestions are put forward for the coupling and coordinated development of New-type urbanization and green economy in China.

## Keywords

**New Urbanization; Green Economy; Coupling Coordination Degree Model;  $\sigma$  Convergence Model.**

## 1. Introduction

New urbanization is the only way to achieve socialist modernization with Chinese characteristics. It is also an important driving force for economic development. The urbanization development strategy was first proposed in 2007. Then, in 2010, the No. 1 document of the central government put urbanization on the same strategic position as the construction of new countryside. Second, in the 18th and the central economic work conference, should clearly put forward the new path of urbanization with Chinese characteristics, improve the quality of urbanization, the development strategy to emphasize environmental protection first, and strictly control the related enterprise pollutant emissions and environmental development strength, completed the overall deployment of China's new urbanization construction and development. In 2018, the Green Development and New Urbanization Sub-Forum of the 9th China Economic Outlook Forum will further explore the deep integration of green development and new urbanization. Difference "in the planning and vision in 2035, the central government further put forward the strategies of China's urbanization should continue to push forward the new urbanization strategy of human-centered, promote" comprehensively

promote green transformation, constructs the harmonious coexistence between man and nature of modern economic and social development ", China's economy is the new normal also give new urbanization and coordinated development of green economy provides a new platform.

The author believes that under the background of the new normal economy, the synergistic development of China's New-type urbanization and green economy is the general trend of China's economic development, and they are mutually permeated and influenced by each other in development, and there is a certain correlation. Therefore, it is of great significance to study the coordinated development of New-type urbanization and green economy in Europe and Europe.

## **2. Analysis on the Mechanism of Coordinated Development between New Urbanization and Green Economy**

### **2.1. Inherent Consistency between New-type Urbanization and the Goal and Connotation of Green Economy**

First of all, the new urbanization and green economy both focus on people's livelihood and put people first. On the basis of traditional urbanization, New-type urbanization is to put people first and pay attention to the livelihood issues related to people's vital interests, which reflects the importance of human development. While emphasizing economic development, green economy should focus on protecting the common interests of all people, improving the welfare level of the whole society and meeting people's needs for a better life. Therefore, the two have a high degree of identity in the people-oriented core content.

Secondly, both New-type urbanization and green economy emphasize the coordination between economic development and the environment. The new urbanization adds environmental considerations to the traditional urbanization, pointing out that we should pay more attention to the quality of economic development rather than the quantity, pay more attention to the carrying capacity of the environment, and pay attention to the coordination between economic development and ecological environment while urbanization. At the same time, green economy also pays attention to the ecological environment and emphasizes the sustainable development of the ecological environment. Economic development should not be done at the cost of destroying the ecology. We should pay attention to the coordinated development of the two. A good ecological environment can create a good basic environment for economic growth.

Finally, both new urbanization and green economy emphasize the importance of scientific and technological progress. New urbanization points out that science and technology innovation should play a leading role in all aspects, apply science and technology innovation in agricultural modernization, social information construction and other aspects, and build a comprehensive, coordinated and sustainable social environment. Secondly, green economy also puts forward that we should pay attention to technological innovation and the transformation and upgrading of industrial structure, attach importance to the development of green economy industry, adjust the industrial structure, improve the efficiency of industrial development, and attach importance to the development of green economy industry.

### **2.2. Analysis on the Supporting Mechanism of New-type Urbanization on Green Economy**

The comprehensive, coordinated and sustainable social environment created by the new urbanization provides strong support for the development of the green economy industry, and then promotes the development of the green economy. Through the continuous improvement of the new urbanization level, from the perspective of economic system, the steady and efficient

economic growth will stimulate the development of green industry, thus promoting the development of green economy and improving the development rate of green economy. From the point of social system, the development of new urbanization can improve and optimize the city function, the development of the society makes high-quality workforce populations, the differences of life in urban and rural areas, narrow, achieve common prosperity for the urban and rural areas, realize the harmonious development of stability, this to the development of green economy provides a good social environment, for the green industry transformation and upgrading process a steady stream of high quality talents, further guarantees the quality of the development of green economy. From the perspective of ecosystem, the New-type urbanization focuses on the strength of the environment, becomes ecological at the same time of urbanization, emphasizes the sustainable development of the ecological environment, points out that economic development should not be at the cost of destroying the environment, coincides with the green theme of green economy, and makes the development of green economy industry more sustainable.

### **2.3. Research on the Driving Mechanism of Green Economy on the Sustainable Development of New Urbanization**

First of all, the green economy is supported by environmental protection concept, guide enterprises to improve the green environmental protection consciousness and resource intensive saving consciousness, to support the new energy industry and environmental protection industries, and realize sustainable development, will lead to an economic, social and ecological aspects of the comprehensive benefits of improved, exerting great thrust role to promote urbanization development. Second, the green economy is a kind of innovation to the traditional economic development model, it embodies the concept of green development, improve the residents in our country's environmental protection consciousness, make the nation formed a kind of "from bottom to top, government guidance, active participation of the residents of a comprehensive new urbanization" atmosphere, the sustainable development of China's new urbanization construction to provide strong pull force. Finally, since China has defined the concept of green development in the 12th Five-Year Plan, all provinces and cities in China have put forward green economic development paths suitable for the development of their own provinces according to their local conditions, and actively respond to the call of the central government. While in the traditional urbanization appeared in the process of the contradiction between economic growth and ecological environment, but the development of green economy planning can fundamentally solve this contradiction, put forward the economic development, coordinated development between resource consumption and environmental protection three paths, green economy development plan can be fundamentally to provide guidance for the development of new urbanization,

### **2.4. Coupling Mechanism of New-type Urbanization and Green Economy**

New urbanization provides certain support for the development of green economy industry through the economic, ecological and social system constructed by it. From the perspective of economic system, stable and efficient economic growth will stimulate the development of green industry, thus promoting the development of green economy and improving the development rate of green economy. From the perspective of social system, the development of New-type urbanization can improve and optimize urban functions, provide a good social environment for the development of green economy, continuously supply high-quality talents for the transformation and upgrading process of green industry, and further guarantee the development quality of green economy. From the perspective of ecosystem, New-type urbanization focuses on the strength of environmental bearing and emphasizes the sustainable development of ecological environment, which coincides with the green theme of green economy and makes the development of green economy industry more sustainable. Secondly,

the development of green economy in turn plays a certain role in pushing, pulling and guiding the new urbanization through the green economy industry, the development concept of green economy and the development planning of green economy. The two complement each other and promote each other, so the coordinated development of the two can be realized.

$$c_2 = a_2 + b_2.$$

### 3. The Empirical Analysis

#### 3.1. Index System Construction and Data Sources

Firstly, using CNKI database, the frequency statistics of 274 literatures related to the measurement of New-type urbanization level from 2005 to 2020 in core journals were carried out. Secondly, based on theoretical analysis, 46 specific indicators are selected from five aspects of population urbanization, economic urbanization, social urbanization, ecological urbanization and coordinated urban and rural development to evaluate the level of new urbanization. The evaluation index system of green economy includes 46 specific indicators from three dimensions of social and economic competitiveness, resource and ecological competitiveness, and green transformation-driven competitiveness.

Data are all from the National Bureau of Statistics web site, China statistical yearbook, China environment statistical yearbook, China environmental research, the provinces in 2005-2014 statistical yearbook, high technology industry in 2005-2014 statistical yearbook, 2005-2014 statistical yearbook of science and technology, population and employment statistics yearbook from 2005 to 2014 and the provinces environment bulletin, the authority of the data and feasible degree has higher security, to some extent, ensures the accuracy of the empirical analysis conclusion below.

**Table 1.** New type of urbanization evaluation index system

First level index	Second level index	Third level index	Attribute	The serial number
Population urbanization	Population urbanization	The proportion of urban population in the total population	Positive	X1
		Proportion of employees in non-agricultural industries	Positive	X2
		Proportion of employees in secondary and tertiary industries	Positive	X3
		Urban population growth rate	Positive	X4
		Urban registered unemployment rate	Negative	X5
Economic urbanization	Economic development index	Urban population density (people/square km)	Positive	X6
		Per Capita GDP (yuan/person)	Positive	X7
		Proportion of added value of the secondary industry in GDP	Positive	X8
		Proportion of added value of the tertiary industry in GDP	Positive	X9
		Per capita fixed asset investment is positive	Positive	X10

		Per Capita Foreign Trade Import and Export Amount (1000 USD/Person)	Positive	X11
	Economic development potential	Per Capita Local Financial Revenue (RMB/Person)	Positive	X12
		Number of domestic patent applications granted (item)	Positive	X13
		Number of R&D personnel per 10,000 people	Positive	X14
		Average Enrollment of Institutions of Higher Learning per 100,000 Population	Positive	X15
		Ratio of R&D expenditure in GDP	Positive	X16
		The proportion of education expenditure in government expenditure	Positive	X17
Social urbanization	Infrastructure construction	The proportion of spending on science and technology in government spending	Positive	X18
		Urban Water Penetration Rate (%)	Positive	X19
		Urban gas penetration rate (%)	Positive	X20
		Internet penetration rate (%)	Positive	X21
		Per Capita Residential Area	Positive	X22
		Urban road area per capita	Positive	X23
		Per capita ownership of public library collections (volumes/persons)	Positive	X24
		Number of beds in medical institutions per 10,000 people in the city (sheet)	Positive	X25
		Public transport vehicles per 10,000 people (marker)	Positive	X26
		Number of health technicians per 10,000 people	Positive	X27
Ecological urbanization	Urban greening	Number of Higher Teachers per 10,000 (persons)	Positive	X28
		Public Toilet Seats per 10,000 People	Positive	X29
		Per capita park green area (square meters/person)	Positive	X30
	Pollution indicators	Forestland area per capita (m <sup>2</sup> / person)	Positive	X31
		Green Coverage Rate of Built Area (%)	Negative	X32
		The proportion of days with air quality above level 2 in the whole year	Negative	X33

	Environmental governance	Sulfur dioxide emissions per capita (tons/person)	Negative	X34
		Per Capita Smoke (Powder) Dust Emissions (tons/person)	Positive	X35
		Wastewater discharge per capita (tons/person)	Positive	X36
		Urban sewage daily treatment capacity (ten thousand cubic meters)	Positive	X37
Balanced urban and rural development	Urban and rural integration	Harmless disposal rate of domestic garbage (%)	Positive	X38
		Proportion of investment in industrial solid waste treatment projects	Positive	X39
		Urban-rural population ratio	Positive	X40
		Per capita fixed asset investment in urban and rural areas	Positive	X41
		Per capita disposable income ratio of urban and rural residents	Positive	X42
		Per capita consumption expenditure ratio of urban and rural residents	Positive	X43
		Ratio of urban and rural residents' expenditure on culture, education and recreation	Positive	X44
		Proportion of rural non-agricultural industry employees	Positive	X45
		Per capita financing of the new rural cooperative medical system (yuan)	Positive	X46

Chart source: combed through the literature and constructed by the authors themselves.

### 3.2. Model Selection and Construction

#### 1. Standardization of evaluation index data

Before analyzing the data, the extremum method is used to conduct dimensionless processing on all the data to eliminate the difference of magnitude and direction among various specific indicators. The specific formula is as follows:

Positive indicators:

$$U_{ij}' = \frac{u_{ij} - \min(u_j)}{\max(u_j) - \min(u_j)} \tag{1}$$

Negative indicators:

$$U_{ij}' = \frac{\max(u_j) - u_{ij}}{\max(u_j) - \min(u_j)} \tag{2}$$



**Table 2.** Evaluation index system of green economy

First level index	Second level index	Third level index	Attribute	The serial number
Socio-economic competitiveness	Economic aggregate and level	GDP per capita	Positive	X1
		Total foreign trade volume	Positive	X2
		Per capita disposable income of urban residents	Positive	X3
	Economic efficiency and structure	The proportion of fixed asset investment in GDP	Positive	X4
		The GDP growth rate	Positive	X5
		Proportion of employees in the tertiary industry	Positive	X6
	The public service	Urban gas penetration rate	Positive	X7
		Urban water penetration rate	Positive	X8
		Natural population growth rate	Positive	X9
		Urban registered unemployment rate	Negative	X10
		The number of public transport vehicles per 10,000 people	Positive	X11
		Number of health technicians per 10,000 people	Positive	X12
		Number of beds in medical institutions per 10,000 people	Positive	X13
	The social security	Average number of institutions of higher learning per 100,000 population	Positive	X14
		The proportion of people covered by social old-age insurance for urban and rural residents	Positive	X15
Resource and ecological competitiveness	Resource status quo	Per capita availability of water resources	Positive	X16
		Per capita park green area	Positive	X17
		Arable land per capita	Positive	X18
		Forest area per capita	Positive	X19
		The proportion of the area of nature reserves to the area under jurisdiction	Positive	X20
		Forest coverage	Positive	X21
		Green coverage rate in built-up areas	Positive	X22
	Resource utilization efficiency	Energy consumption per unit of GDP is negative in resource use efficiency	Negative	X23
		Energy consumption per unit of GDP	Negative	X24
		Power consumption per unit of GDP	Negative	X25
		Fertilizer application per hectare of cultivated land	Negative	X26
			Wastewater discharge per capita	Negative

	Pollution emissions	Per capita emissions of COD in wastewater	Negative	X28
		Ammonia nitrogen emissions per capita in wastewater	Negative	X29
		Sulfur dioxide emissions per capita	Negative	X30
		Per capita emissions of exhaust gas and dust	Negative	X31
	Pollution and environmental control	Proportion of investment in industrial solid waste treatment projects	Positive	X32
		Pollution-free disposal rate of urban household garbage	Positive	X33
		Urban sewage daily treatment capacity (ten thousand cubic meters)	Positive	X34
		Noise control project completed investment (ten thousand yuan)	Positive	X35
		The proportion of days with air quality better than Grade II in the whole yea	Positive	X36
	Green transformation drives competitiveness	Industry guide	Proportion of added value of primary industry in GDP	Positive
Proportion of added value of the secondary industry in GDP			Positive	X38
Proportion of added value of the tertiary industry in GDP			Positive	X39
Technical guidance		Number of domestic patent applications granted (item)	Positive	X40
		Technology market turnover	Positive	X41
Policy guidance		The proportion of investment in environmental protection in government expenditures	Positive	X42
		Investment in industrial pollution control accounted for the proportion of government expenditures	Positive	X43
		Ratio of R&D expenditure in GDP	Positive	X44
		The proportion of education spending in government spending	Positive	X45
		The proportion of spending on science, education, culture and health in government expenditures	Positive	X46

Chart source: combed through the literature and constructed by the authors themselves.

In the formula,  $u_{ij}$  is the original data of  $j$  index in region  $i$ ;  $U_{ij}$  is the standardized data of  $j$  index in region  $i$ ;  $\min(u_j)$  and  $\max(u_j)$  represent the minimum and maximum value of  $j$  index respectively.



Since some indexes may have negative values or small values after the standardization of the results, we hereby conduct the next operation after the unified translation of the standardized data, and the specific formula is as follows:

$$U_{ij}'' = H + U_{ij}' \tag{3}$$

In this case, H is the shift of the index, which is 1.

2. Determine the weight of evaluation indexes

Entropy value method will be used to weight each specific index, and the information provided by each index will be used to weight it. The specific steps are as follows:

First, calculate the specific proportion ( $P_{ij}$ ) of each indicator  $U_{ij}''$ :

$$P_{ij} = \frac{U_{ij}''}{\sum_{i=1}^n U_{ij}''} (j = 1, 2, \dots, m) \tag{4}$$

Secondly, the entropy value ( $E_j$ ) is calculated:

$$E_j = -k \sum_{i=1}^n P_{ij} \ln(P_{ij}) \tag{5}$$

In general,  $k = 1 / \ln n$  is ordered, and  $k > 0, 0 \leq E_j \leq 1$ , when  $E_j = 1$ , it indicates that  $U_{ij}''$  has the same value and the data is of no research significance. The smaller  $E_j$  is, the larger the gap between indicators and the greater the influence on the results. Thirdly, according to the basic principle of entropy value method, the magnitude of difference coefficient ( $G_j$ ) is calculated. Similarly, the larger the difference coefficient is, the greater the role it plays in the system.

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$$d_j = 1 - E_j \tag{6}$$

Finally, the weight of index  $W_j$  in index  $U_j''$  was calculated. In this paper, the index whose weight coefficient was lower than 0.001 in the initial evaluation index system was eliminated and the primary evaluation index system was analyzed.

$$W_j = \frac{d_j}{\sum_{j=1}^m d_j} (1 \leq j \leq m) \tag{7}$$

3. Comprehensive evaluation function

(1) Comprehensive development level of new urbanization

$$T(x)_j = \sum_{j=1}^m W_j * U_{ij}'' \tag{8}$$

In the formula,  $T(x)_j$  represents the comprehensive development level of the new urbanization, and there are  $m$  evaluation indicators;  $W_j$  is the weight of the  $i$  indicator in the development level of the new urbanization, and  $U_{ij}$  is the normalized and translated data of the  $i$  indicator.

(2) Comprehensive level of green economy development

$$F(x)_j = \sum_{j=1}^n W_j * U_{ij} \tag{9}$$

In the formula,  $F(y)_j$  represents the comprehensive development level of green economy, there are  $n$  evaluation indicators,  $W_j$  is the weight of the  $i$  indicator in the development level of green economy, and  $U_{ij}$  is the data after dimensionless and translational processing of the  $i$  indicator.

4. Coupling coordination degree model construction

(1) Coupling degree

Coupling degree can be used to judge the coupling effect of the two systems, and its formula is as follows:

$$C_n = \sqrt[n]{\frac{u_1 * u_2 * \dots * u_n}{\prod_{i \neq j} (u_i + u_j)}} \tag{10}$$

In the formula,  $C$  is the coupling degree;  $0 \leq C_n \leq 1$ , the larger the interaction force between the systems is, the stronger the coupling is, and the stronger the interaction and influence between the two systems are; otherwise, the weaker the interaction is.  $u_i$  represents the comprehensive evaluation level function of the subsystem. Let  $n=2$ , where  $T(x)$  represents the comprehensive evaluation level function of new urbanization and  $F(x)$  represents the comprehensive evaluation level function of green economy. Therefore, the coupling degree formula in this paper can be expressed as:

$$C = \sqrt{\frac{T(x) * F(y)}{[T(x) + F(y)] * [F(y) + T(x)]}} \tag{11}$$

(2) Coupling coordination degree

In some cases, when the coupling degree reflects the degree of coordination between systems, it will produce false impression, resulting in high coupling degree at a low level of development. Therefore, in order to truly reflect the coordination degree between new urbanization and green economy, we introduce the coupling coordination degree model. The formula is as follows:

$$D = \sqrt{C * E} \tag{12}$$

$$E = \alpha T(x) + \beta F(y) \tag{13}$$

Type  $D$  for new urbanization and the green economy in the size of the coupling coordination development level, the greater the value of his cousin new urbanization and the green economy coordinated development of the higher quality, the coupling relationship between the coordination,  $T(x)$  and  $F(x)$ , respectively, said the new comprehensive evaluation of urbanization level functions in a green economy comprehensive evaluation level,  $\alpha$  and  $\beta$ , respectively on behalf of the western urbanization and green economy in the coordinated development system of ownership, make  $\alpha = \beta = 0.5$ .

5.  $\sigma$  Convergence analysis

In combination with the actual situation of this paper, the development trend of the degree of difference of  $\sigma$  convergence measure is selected. When  $\sigma_{t+1} < \sigma_t$ , it is considered that  $\sigma$  converges; otherwise, when  $\sigma_{t+1} > \sigma_t$ , it is not converged, that is, the coordination gap between New-type urbanization and green economy is expanding. The specific formula is as follows:

$$\sigma_t = \sqrt{\frac{1}{n-1} \sum_{i=1}^n (D_{it} - \bar{D}_t)^2} \tag{14}$$

In the formula,  $\bar{D}_t = \frac{1}{n} \sum_{i=1}^n D_{it}$ ,  $i = 1, 2, \dots, n$ ;  $t = 1, 2, \dots, T$ ,  $D_{it}$  represents the coupling coordination level of the  $i$  province in the  $t$  year;  $t$  represents the year;  $n$  represents the number of provinces, where  $n=31$ .

3.3. Classification Standard of Development Level

Through reading relevant literature, drawing on other scholars' classification standards of New-type urbanization and green economy development level, and analyzing the results of New-type urbanization development level of 31 provinces in China, the author sorted out the following classification standard table of New-type urbanization and green economy development level:

**Table 3.** Standard for classifying the development level of a new type of urbanization

Comprehensive evaluation of the value of new urbanization	Development level of a new type of urbanization
$0 \leq T(x)_j < 0.35$	Low level of development
$0.35 \leq T(x)_j < 0.5$	Relatively low level of development
$0.5 \leq T(x)_j < 0.8$	Medium level of development
$0.8 \leq T(x)_j < 1$	Relatively high level of development
$1 \leq T(x)_j$	High level of development

For scientific measure of new urbanization of 31 provinces in China and the development of green economy system coupling coordination degree, according to the scope of coupling and coupling coordination degree, and combined with the existing scholar's related research, in the previous scholars build coupling coordination degree evaluation standards on the basis of certain expansion, for both the coordination development level, formulate the following three categories and ten small class 30 basic types of evaluation criteria, as shown in table 5:

**Table 4.** Classification standard of green economy development level

Comprehensive evaluation value of green economy	The level of green economic development
$0 \leq F(x)_j < 0.35$	Low level of development
$0.35 \leq F(x)_j < 0.5$	Relatively low level of development
$0.5 \leq F(x)_j < 0.8$	Medium level of development
$0.8 \leq F(x)_j < 1$	Relatively high level of development
$1 \leq F(x)_j$	High level of development

**Table 5.** Coupling coordination degree evaluation criteria

Categories of coordinated development	Degree of coordinated development	Coordination effect level	Index contrast	The development of type
Dysdevelopmental	[0, 0.1)	Extreme imbalance	$T(x) < F(y)$	New urbanization is weak
			$T(x) = F(y)$	Double short
			$T(x) > F(y)$	The green economy is weak
	[0.1, 0.2)	A serious imbalance between	$T(x) < F(y)$	New urbanization is weak
			$T(x) = F(y)$	Double short
			$T(x) > F(y)$	The green economy is weak
	[0.2, 0.3)	Moderate disorders	$T(x) < F(y)$	New urbanization is weak
			$T(x) = F(y)$	Double short
			$T(x) > F(y)$	The green economy is weak
	[0.3, 0.4)	Mild disorder	$T(x) < F(y)$	New urbanization is weak
			$T(x) = F(y)$	Double short
			$T(x) > F(y)$	The green economy is weak
Transitional Development	[0.4, 0.5)	On the verge of disorder	$T(x) < F(y)$	New urbanization is weak
			$T(x) = F(y)$	Double short
			$T(x) > F(y)$	The green economy is weak
	[0.5, 0.6)	Barely coordination	$T(x) < F(y)$	New urbanization is lagging behind
			$T(x) = F(y)$	Synchronous developmental
			$T(x) > F(y)$	Green economy is lagging behind
[0.6, 0.7)	Primary coordination	$T(x) < F(y)$	New urbanization is lagging behind	
		$T(x) = F(y)$	Synchronous developmental	

Coordinated Development	[0.7,0.8)	Intermediate coordinate	$T(x) > F(y)$	Green economy is lagging behind
			$T(x) < F(y)$	New urbanization is lagging behind
			$T(x) = F(y)$	Synchronous developmental
	[0.8,0.9)	Good coordination	$T(x) > F(y)$	Green economy is lagging behind
			$T(x) < F(y)$	New urbanization is lagging behind
			$T(x) = F(y)$	Synchronous developmental
	[0.9,1.0)	Perfect coordination	$T(x) > F(y)$	Green economy is lagging behind
			$T(x) < F(y)$	New urbanization is lagging behind
			$T(x) = F(y)$	Synchronous developmental

### 3.4. Analysis of Empirical Results

#### 3.4.1. Measurement of Development Level of New-type Urbanization

Due to too many data, the annual analysis results are too cumbersome. Therefore, this paper takes 2009, 2014 and 2018 as examples to analyze the results of the development level of China's new urbanization according to the classification level summarized by the author.

Through the analysis of the development levels of New-type urbanization in China's provinces in 2009, 2014 and 2018, it can be seen that the development levels of New-type urbanization in China from 2008 to 2018 mainly present the following characteristics: First, regional development imbalance has been running through the development process of New-type urbanization. Second, China's New-type urbanization is developing rapidly, and the level of development shows a trend of increasing year by year. 3. Generally speaking, the southeast of China has achieved a better level of New-type urbanization than the northwest.

#### 3.4.2. Measurement of Development Level of Green Economy

Due to too many data, the annual analysis results are too cumbersome. Therefore, this paper takes 2009, 2014 and 2018 as examples to analyze the development level of green economy in China according to the classification level summarized by the author.

Based on the analysis of the development level of green economy in China's provinces in 2009, 2014 and 2018, it can be seen that the development level of green economy in China from 2008 to 2018 mainly presents the following characteristics: First, regional development imbalance has always existed, and this imbalance phenomenon is sometimes strong and sometimes weak. Second, the development level of green economy in China also shows a trend of increasing year by year. Although the development speed is slow, it is still increasing year by year. Third, the southeast of China is better than the northwest in terms of green economic development.

**Table 6.** Development level of New-type urbanization in China's provinces in 2009, 2014 and 2018

Comprehensive evaluation level of new urbanization	In 2009	In 2014	In 2018
$0 \leq T(x)_j < 0.35$	/	/	/
$0.35 \leq T(x)_j < 0.5$	Hebei, Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Hainan, Chongqing, Sichuan, Guizhou, Yunnan, Xizang, Gansu, Qinghai, Ningxia, Xinjiang,	Jilin Province, Heilongjiang Province, Guangxi Zhuang Autonomous Region, Hainan Province, Guizhou Province, Gansu Province	/
$0.5 \leq T(x)_j < 0.8$	Tianjin, Liaoning, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Shaanxi	Tianjin City, Hebei Province, Shanxi Province, Inner Mongolia, Liaoning Province, Zhejiang Province, Anhui Province, Fujian Province, Jiangxi Province, Shandong Province, Henan Province, Hubei Province, Hunan Province, Guangdong Province, Chongqing City, Sichuan Province, Yunnan Province, Tibet Autonomous Region, Shaanxi Province, Qinghai Province, Ningxia Hui Autonomous Region, Xinjiang Uygur Autonomous Region	Tianjin, hebei, shanxi, Inner Mongolia autonomous region, liaoning, jilin, anhui, fujian, jiangxi, shandong, henan, hubei, hunan, guangxi zhuang autonomous region, hainan, chongqing, sichuan, guizhou, yunnan Tibet autonomous region, shaanxi, gansu, qinghai, ningxia hui autonomous region, xinjiang uygur autonomous region and heilongjiang province
$0.8 \leq T(x)_j < 1$	Beijing, Shanghai	Beijing, Shanghai, Jiangsu Province	Beijing, Shanghai, Jiangsu, Zhejiang and Guangdong
$1 \leq T(x)_j$	/	/	/

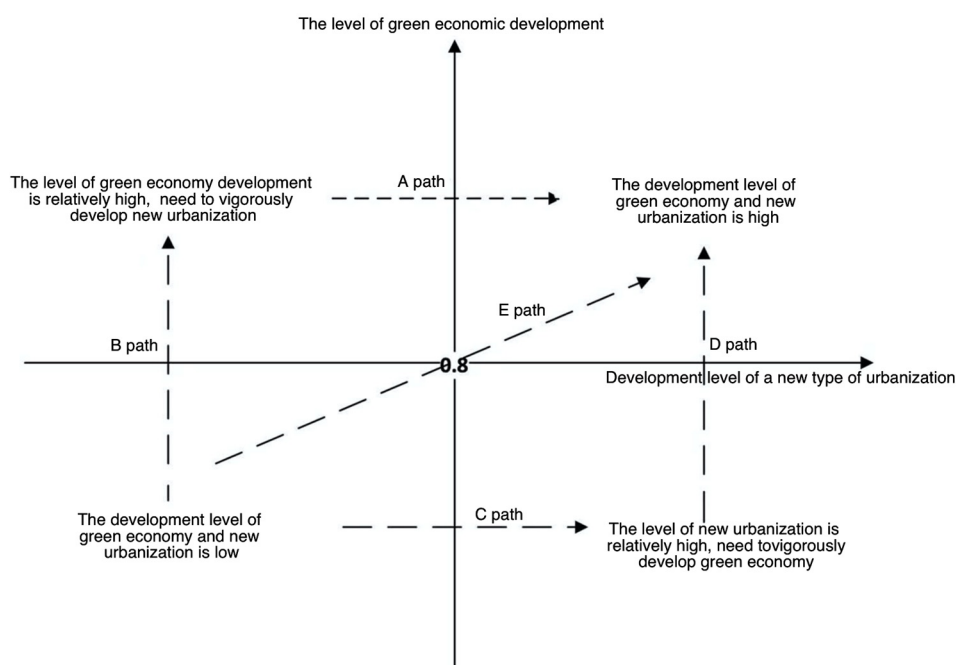
**3.4.3. Empirical Analysis of Coupling Coordination Degree**

This article analysis, draw lessons from scholars Wenlei Liu (2017) of new urbanization and the evaluation method of phase four quadrant green economy development were analyzed, and the horizontal axis of the new urbanization development level, the vertical axis for the green economic development level, with 0.8 as the origin of coordinates, the coordinate axes is divided into four parts, the first quadrant for new urbanization and development of green economy are maintaining high horizontal, the second quadrant show that green economy development level is higher, need to focus on pushing forward the construction of the new type of urbanization in the third quadrant for new urbanization and green economic development level is not ideal, should focus on propulsion, the fourth quadrant for new urbanization development level is better, We need to promote green economy.



**Table 7.** Development level of green economy in China's provinces in 2009, 2014 and 2018

Comprehensive evaluation level of new urbanization	In 2009	In 2014	In 2018
$0 \leq F(x)_j < 0.35$	/	/	/
$0.35 \leq F(x)_j < 0.5$	Hebei, shanxi, Inner Mongolia, jilin, heilongjiang, anhui, jiangxi, henan, hubei, hunan, guangxi, hainan, chongqing, sichuan, guizhou, yunnan, Tibet, gansu, qinghai, ningxia, xinjiang, tianjin, liaoning, jiangsu, zhejiang, shandong, guangdong, shanxi, Beijing, Shanghai, fujian province	Hebei, shanxi, Inner Mongolia, jilin, heilongjiang, anhui, jiangxi, henan, hubei, hunan, guangxi, hainan, chongqing, sichuan, guizhou, yunnan, Tibet, gansu, qinghai, ningxia, xinjiang, tianjin, liaoning, jiangsu, zhejiang, shandong, shaanxi, Shanghai, fujian province	Hebei, Shanxi, Inner Mongolia, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan, Guangxi, Hainan, Chongqing, Sichuan, Guizhou, Yunnan, Xizang, Gansu, Qinghai, Ningxia, Xinjiang, Tianjin, Liaoning, Shandong, Guangdong, Shanxi, Beijing, Shanghai, Fujian
$0.5 \leq F(x)_j < 0.8$	/	Beijing, Guangdong Province	Beijing, Guangdong Province, Jiangsu and Zhejiang
$0.8 \leq F(x)_j < 1$	/	/	/
$1 \leq F(x)_j$	/	/	/



**Fig 1.** Four-quadrant Evaluation Graph of New Urbanization and Green Economy Stage

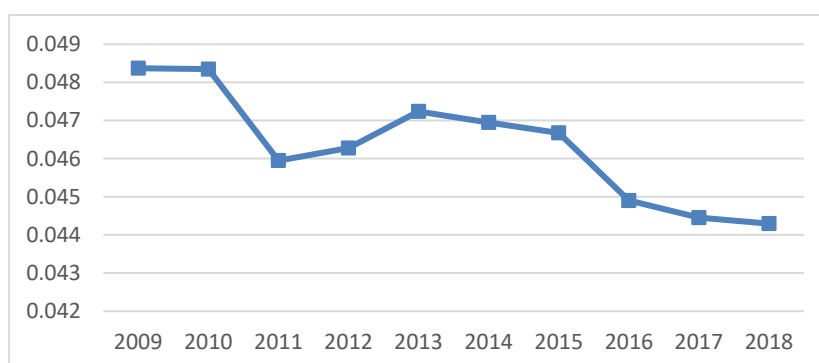
On the whole, the coupling coordinated development index of New-type urbanization and green economy in China's 31 provinces shows a gradual rise, but on the whole, it has the following characteristics: First, there are obvious differences in the coordinated development levels of various provinces, but the gap is gradually narrowing; Second, the coordinated development

level of New-type urbanization and green economy in various provinces shows a gradual upward trend; Third, the development of green economy lags behind the new development of urbanization, one of the reasons is due to a green economy starts late, relevant government economic policies can be appropriately tend to a green economy, promote its development, of course also cannot ignore the development of the new type of urbanization, on the premise of the common development, improve the level of new urbanization and coordinated development of green economy coupling.

The provinces of China in 2009-2018 a new type of urbanization and the green economy overall 0.6 0.7 stage coupling coordination degree, namely primary coordination phase, and in terms of nationwide, large regional differences exist, but in general east China as the center, continuously to the decreasing of the spatial pattern of other parts of the coupling coordination degree, and coupling coordination degree lower region is a centralized covered in China's northwest, northeast, southwest and north parts of parts, parts of central and southern China, the overall performance is represented by the east China area to the east of regional coordinated development degree of coupling is better than that of other areas in China.

#### 3.4.4. Convergence Analysis

According to the convergence model  $\sigma$ , the coupling coordination level of new urbanization and green economy calculated above is used to analyze the regional differences. The specific calculation results are shown in Fig 2:



**Fig 2.** Convergence of coupling coordination degree between New-type urbanization and green economy in 31 provinces in China from 2009 to 2018

Can be seen from above, from 2009 to 2018, the new urbanization of 31 provinces in China and coupling coordination degree of green economy Convergence result can be roughly divided into three sections, 2009-2011, the new type of urbanization and the green economy coupling coordination degree value gradually decline, 2011-2013, value the rise, after 2013, value and a downward trend, continue to 2018, you can see, in general, ignore the middle part of the fluctuations, ten years in 31 provinces in our country urbanization and new green economy presents downtrend coupling coordination degree value, Namely, regional differences are shrinking and convergence has been realized.

## 4. Conclusion and Countermeasures

### 4.1. Conclusion

First, 2009-2018, China's 31 provinces, a new type of level of urbanization and the development of green economy presents a more significant upward trend, in general, the development of green economy lags behind the new urbanization development process, and whether it is a new

type of urbanization development or green economic development, China's southeastern provinces development level are much better than other area.

Second, from 2009 to 2018, the coordinated development level of New-type urbanization and green economy in 31 provinces and municipalities in China shows a gradual upward trend. In terms of the whole country, there is a large regional difference, but the overall spatial pattern is centered in East China, and the coupling coordination degree is decreasing to other regions.

Thirdly, using convergence test, it is found that, on the one hand, the absolute value of regional differences between the coupling and coordinated development levels of New-type urbanization and green economy among 31 provinces in China shows a decreasing trend.

## 4.2. Countermeasures and Suggestions

(1) Emphasize the guidance of planning and formulate development strategies in a scientific way

Provinces should attach importance to the development of green economy industry, science and develop strategy and industry development of green economy to provide support to the greatest extent, give full consideration to the needs of the development of green economy industry, prevent attend, truly in the planning stage does not forget the "people's city building, build good city for people" beginner's mind, promote the development of new and green economy both harmonious symbiosis of urbanization, urban planning into the health of the city, the city of ecological and civilized city, in the planning stage for the high-quality goods, less regret, not failure.

(2) Pay attention to the role of radiation and achieve coordinated regional development

The central and western regions are at a relatively low level of New-type urbanization and green economy. They can learn from the development experience and lessons of the eastern region, avoid the wrong path, develop on the shoulders of giants, introduce advanced production technologies, and achieve New-type urbanization and green economy development more efficiently. At the same time, the eastern region should strengthen environmental protection consciousness, pay attention to technology innovation and development, strengthen the leading role of high levels of provinces and cities in eastern development, give full play to the radiation effect, enhance core competitiveness, leading from provinces and cities to speed up the independent innovation, enhance the level of public services and optimal allocation of resources capacity, actively promote the other cities within the region, narrow the gap between provinces, helped by the strong weak, improve the level of the urbanization and new green economy coordinated development.

(3) Increase investment in science and technology to promote green and innovative development

New urbanization and green economy all emphasized the importance of science and technology innovation, points out that new urbanization should play led the role of science and technology innovation in all aspects, to realize the harmonious development of stable, narrowing the difference of urban and rural residents life, achieve common prosperity for the urban and rural areas, promote green transformation, realize the integration of urban and rural infrastructure and public services equalization, build a comprehensive, balanced and sustainable social environment. Secondly, green economy also puts forward that we should pay attention to technological innovation and the transformation and upgrading of industrial structure, and attach importance to the development of green economy industries.

In addition, the synergistic development of New-type urbanization and green economy faces new challenges, that is, how to promote innovative urban development and smart urban governance by relying on technological advances such as the Internet, big data and artificial intelligence. The innovation of urban governance, the application of high technology and the

extensive promotion of data are also unavoidable themes for the development of new urbanization and green economy.

(4) Attach importance to government guidance and optimize the appraisal mechanism of political achievements

In order to develop the New-type urbanization and green economy, we should attach importance to the guiding role of the government, select appropriate evaluation methods for the performance of leading cadres, and promote the benign coupling between New-type urbanization and green economy. Optimize performance evaluation mechanism, not only must the leading cadres in their respective positions to make a contribution, also should be to work during his tenure the assessment on the influence of the natural ecological environment is also included in the scope, establish a fair, objective, scientific achievement assessment mechanism, economic, ecological and social are all included in the examination system, establish responsibilities clear green achievements appraisal mechanism, strive to promote the development of a higher level of new urbanization and the green economy.

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