

# The Coupling and Coordinated Development of Ecological Civilization Construction and Regional Economy

## -- Take Anhui Province as an Example

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### Abstract

This article selects the relevant data of 16 cities in Anhui Province from 2011 to 2020 as the research sample, calculates the coupling and co scheduling of their ecological civilization construction and regional economy, and uses the local Moran index to draw Lisa clustering maps for the two time nodes of 2015 and 2020 to further explore their spatial characteristics. The research results show that, on the whole, the average coupling coordination degree of Anhui Province fluctuated around 0.51 from 2011 to 2020, with a certain degree of stability; Comparing 16 cities in the province, it is found that there is still a large gap between prefecture-level cities. The average coupling coordination degree of Hefei in the past decade is the first in Anhui Province, while the average coupling coordination degree of Fuyang and Huainan in the past decade is juxtaposed at the tail of Anhui Province. The average coupling coordination degree of Hefei is 1.971 times that of Fuyang and Huainan; From a spatial perspective, in 2015 and 2020, the changes in urban agglomeration areas were not significant, and the overall coordination level was not high. Among them, Chizhou City and its surrounding cities had a relatively high degree of coordination within the province, enabling them to communicate with surrounding cities. The above research provides a certain reference for the country to formulate policies to promote the construction of ecological civilization and coordinated economic development in various regions.

### Keywords

Ecological Civilization; Regional Economy; Coupled Co Scheduling.

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### 1. Introduction

Since the reform and opening up, China's economy has developed rapidly, but most of this rapid economic development has been achieved at the expense of the national environment. Many environmental issues will continue to emerge with economic development, such as environmental pollution, resource scarcity, and reduced ecological diversity. With the continuous development of the economy, the people's requirements for the quality of life are also increasing. At the same time, the main contradiction in Chinese society has changed from "the contradiction between the people's increasing material and cultural needs and backward social production" to "the contradiction between the people's need for a better life and the imbalance and insufficiency of development". China and the entire world are gradually discovering ecological environmental pollution and the serious consequences of these environmental issues. In this situation, people gradually realize the necessity

of ecological civilization construction, and begin to emphasize the green development of the economy, promoting the integration of ecological civilization and economic development.

The 18th National Congress of the Communist Party of China (CPC) incorporated the scientific concept of development and ecological civilization into the Party Constitution, proposing that "building ecological civilization is a long-term plan that is related to people's well-being and the future of the nation." This fully demonstrates that the CPC Central Committee attaches great importance to the construction of ecological civilization and recognizes that the construction of ecological civilization can play an important role in the sustainable development of China's economy. It is concluded that the construction of ecological civilization also plays an important role in regional economic development. Regional economic development does not develop independently, but is interconnected and influenced by various factors, of which the construction of ecological civilization is particularly important. The construction of ecological civilization provides a good environment for regional economic development, which can not only promote rapid economic development in China, but also promote high-quality economic development in China, thereby further achieving sustainable economic development. At the same time, regional economic development can provide material support for the construction of ecological civilization, both of which are "I in you, I in you". Prior to this, many articles have studied the correlation between ecological civilization construction and regional economy, but all of them have certain limitations. There are few quantitative analyses on the internal coupling coordination mechanism and space-time evolution of the two. Therefore, we need to study the coupling and coordinated development of ecological civilization construction and regional development, taking Anhui Province as an example, to find the important connection between the two, promote the coordinated development of ecological civilization construction and economic construction within the province, and provide reference significance for the sustainable development of the national economy.

## 2. Literature Review

China vigorously promotes a new form of economic development that integrates the construction of ecological civilization and regional economy. According to the 2019 Yangtze River Delta Regional Integrated Development Plan Outline [2], the planning scope is officially positioned in all regions of the three provinces and cities of Jiangsu, Zhejiang, Anhui, and Shanghai. The regional resident population exceeds 200 million, and the GDP accounts for nearly 25% of the country. Anhui Province, as a key development target of the country and the Yangtze River Delta region, includes 16 prefecture-level cities, with Hefei as the center, and adheres to the concept of "green environmental protection, ecological sharing" to build an ecological civilization city. Therefore, exploring the coordinated development of ecological civilization construction and regional economy in Anhui Province is of great significance [3].

As early as the 1970s, Western scholars have incorporated environmental factors into economic growth models to deeply explore the relationship between the two. The first category is a neoclassical growth model that analyzes after incorporating environmental factors. The main representatives of research include Stiglitz (1974), Baumol (1986), Chichilnisky (1995), and others. The scholar Stiglitz studied this issue in 1974. He believed that through economic development and technological progress, productivity can be improved, alternative commodities can be promoted, and human dependence on natural resources can be reduced. When technological progress is fast enough, the development of human society will not be constrained by natural resources [4]. Researcher Chichilnisky has summarized the "Green Golden Rule", which believes that scientific and technological progress is the key to influencing the marginal substitution rate, and that the marginal substitution rate of natural capital and consumption equal to the marginal renewal rate of natural capital is a condition for maintaining sustainable growth in the economic path [5]. The main research representatives of the second category of scholars include: Romer (1986, 1990), Lucas (1988), and M. Scott Taylor (2003, 2004). Their main idea is to internalize technological progress, and begin to introduce environment and pollution into the new economic growth model, and then study the

formation of a situation where economic growth and environment develop together under resource and environmental constraints. The common characteristic of the above scholars is to recognize the positive role of technological progress in economic development and ecological civilization construction.

In these areas of research, China started relatively late, while foreign countries started earlier, providing a certain foundation and assistance for future generations of research. In 2002, Li Chongyang, a scholar, based on game theory, deeply explored the relationship between economic growth and environmental quality, and proposed the concept of "developing and discarding". In the subsequent economic development process, it is necessary to inherit the advantages of economic development in the industrial era, but also to discard some aspects. For example, economic development requires improving the quality of economic development, ensuring the quality of life of residents, and reducing environmental pollution caused by economic development, Use innovation to solve the problem of high emissions and high pollution. Adhere to the sustainable development concept of "Heaven and Man Republic", adopt scientific and prudent methods, and combine local realities to explore the correlation between economic development and local ecological environment light [6]. In 2004, scholars He Yinong and Hu Shigeng linked environmental pollution and total production to observe the relationship between the two. They used three factors, namely, the amount of consumption material, the quality of the ecological environment, and the speed of population growth, to determine the utility. They established an economic growth model of environmental endogenous population growth, and conducted equilibrium analysis and dynamic analysis of the model according to the stability theory of differential equations, The growth rate of population, the level of environmental control, the growth level of output and consumption, and the level of environmental pollution in a long-term equilibrium are obtained, and the stability in a long-term equilibrium is discussed.

To sum up, research in the theoretical field has been fruitful in China, but in the empirical field, Chinese scholars have done less research based on China's actual environment and economic development, and there are few references for the research on the coupling and coordinated development of ecological civilization construction and regional economy in Anhui Province. Therefore, this article collects relevant data from 2011-2020 for the 10 years, establishes an indicator system based on existing research, analyzes the correlation between state civilization construction and regional economy using a coupling coordination degree model, and draws a Lisa cluster map using ArcMap and GeoDa software on this basis to further explore its spatial evolution rules and propose more scientific development suggestions.

### **3. Index System Construction and Model Selection**

#### **3.1 Index Selection and Description**

In order to scientifically measure the coupling and coordination of ecological civilization construction and regional economy in Anhui Province, relevant data of all prefecture level cities in Anhui Province from 2011 to 2020, such as Hefei, Wuhu, Ma'anshan, Mount Huangshan and other 16 cities, were selected as research samples. Following the principles of systematicness, scientificity and comprehensiveness, and starting from several dimensions of economic structure, economic quality, coordination and opening-up, environmental pollution and environmental governance, Build a level measurement indicator system that includes 15 three-level indicators, as shown in Table 1.

The main research content of this article is the coupling and coordinated development of ecological civilization construction and regional economy. Therefore, in terms of the first level indicators, civilization selects the regional economy and ecological environment, and then subdivides these two first level indicators into second level indicators and third level indicators. Under the regional economy, three secondary indicators are established, namely, economic structure, economic quality, and coordinated opening. At the same time, two secondary indicators, namely, environmental

pollution and environmental governance, are established under the ecological environment. The selection of secondary and tertiary indicators is described below.

**Table 1.** Index System for the Coupled and Coordinated Development of Ecological Civilization Construction and Regional Economy

Primary indicator	Secondary indicators	Level 3 indicators	Attribute
Regional economies	Economic structure	Proportion of primary industry in GDP (%)	-
		Proportion of secondary industry in GDP (%)	-
		Proportion of tertiary industry in GDP (%)	+
	Economic quality	Per capita GDP (yuan)	+
		Disposable income of urban residents (yuan)	+
		Disposable income of rural residents (yuan)	+
Coordination and openness	Total import and export trade (100 million yuan)	+	
Ecological environment	Environmental pollution	Total industrial wastewater discharge (10000 tons)	-
		Industrial sulfur dioxide emissions (10000 tons)	-
		Generation of general industrial solid waste (10000 tons)	-
	Environmental governance	Treatment capacity of wastewater treatment facilities (10000 tons/day)	+
		Greening coverage rate in built up area (%)	+
		Excellent rate of ambient air quality (%)	+
		Utilization rate of general industrial solid waste (%)	+
		Total afforestation area (ha)	+

(1) Economic structure. The economic structure can be used to determine the main direction of a regional economic development, with three indicators. The three indicators are the proportion of the primary industry to GDP, the proportion of the secondary industry to GDP, and the proportion of the tertiary industry to GDP. Based on these three indicators, it is easy to determine the main industries developed in the region.

(2) Economic quality. Economic quality is the focus of a region's economic development. China proposes to pay attention not only to the speed of economic development, but also to the quality of economic development. Under this level of indicators, there are three indicators: GDP per capita, disposable income of urban residents, and disposable income of rural residents. The improvement of this indicator can improve the living standards of residents in the region, and can also promote and drive the improvement of economic standards in other regions.

(3) Coordination and openness. Coordinated opening up is an important condition for national economic development in the context of contemporary globalized economic development, with a set of indicators. This indicator is the total amount of import and export trade. The increase in total import and export trade data indicates that the opening up of the country is due to the continuous expansion of the market, promoting the construction of a shared and inclusive development model.

(4) Environmental pollution. Environmental pollution is a huge problem brought about by the development of industrial economy, which has affected the development of modern economy to a certain extent. Under this indicator, three indicators have been established. The total amount of industrial wastewater discharge can measure the degree of local water pollution, the amount of

industrial sulfur dioxide discharge can measure the degree of local air pollution, and the production of general industrial solid waste can determine the degree of land pollution.

(5) Environmental governance. There are five indicators, namely, the treatment capacity of wastewater treatment facilities, the greening coverage rate of the built up area, the excellent rate of ambient air quality, the utilization rate of general industrial solid waste, and the total afforestation area. The improvement of these indicators can, on the one hand, provide a good environment for local economic development and promote economic development, on the other hand, improve the well-being and satisfaction of local residents, and improve their living standards.

### 3.2 Model Selection

#### 3.2.1. Coupling Coordination Degree Model

The coupling coordination degree model is used to analyze the coordinated development level of things. This paper selects this model to study the interaction between the ecological civilization construction and regional economic development, and achieve the dynamic correlation between coordinated development. The specific calculation method is as follows:

(1) Data normalization processing.

For positive indicators:  $u_{ij} = \frac{x_{ij} - x_{min}}{x_{max} - x_{min}}$ .

For negative indicators:  $u_{ij} = \frac{x_{max} - x_{ij}}{x_{max} - x_{min}}$ .

(2) Calculate the contribution of subsystems to the overall system order.

$$\begin{aligned} u_i &= \sum_{j=1}^m w_{ij} u_{ij} \\ \sum_{j=1}^m w_{ij} &= 1 \end{aligned} \quad (1)$$

Where,  $w_{ij}$  is the weight of the  $j$ th indicator in the  $i$ -th subsystem.

(3) Calculate the coupling degree of the  $n$ -ary system.

$$C_n = \left\{ \frac{(u_1 \cdot u_2 \cdots u_n)}{\prod (u_1 + u_2)} \right\}^{1/n} \quad (2)$$

(4) Calculate coupling co scheduling.

As this article is a binary system of ecological civilization construction and regional construction, the formula is simplified as follows:

$$\begin{aligned} C &= 2 \left\{ \frac{(u_1 \cdot u_2)}{(u_1 + u_2)^2} \right\}^{1/2} \\ D &= (C \cdot T)^{\frac{1}{2}} \\ T &= au_1 + bu_2 \end{aligned} \quad (3)$$

#### 3.2.2. Moran's I index

The Moran's I index explores the local spatial distribution characteristics of various cities in Anhui Province under the coupling coordination degree, and presents them in a visual manner to obtain a Lisa cluster diagram. The formula is as follows:

$$I_i = \frac{Z_i}{S^2} \sum_{j \neq i}^n w_{ij} Z_j \quad (4)$$

Where,  $Z_i = y_i - \bar{y}$ ,  $Z_j = y_j - \bar{y}$ ,  $S^2 = \frac{1}{n} \sum (y_i - \bar{y})^2$ ,  $w_{ij}$  is the spatial weight value,  $n$  is the total number of all regions in the study area,  $I_i$  represents the local Moran index for the  $i$ th region.

### 3.3 Data Source

Data related to ecological civilization construction and regional economy in 16 cities in Anhui Province from 2011 to 2020 is selected, all of which is sourced from the Anhui Statistical Yearbook.

## 4. Analysis of Research Results

### 4.1 Coupling Coordination Analysis

According to the calculation formula for coupling and co scheduling, this paper calculates the coupling and co scheduling between the ecological civilization construction and regional economic development systems of 16 prefecture-level cities in Anhui Province from 2011 to 2020. The specific results are shown in Table 2.

**Table 2.** Coupled co dispatch 2011-2020

city	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Mean
Hefei	0.64	0.66	0.76	0.63	0.73	0.74	0.70	0.60	0.68	0.75	0.69
Huaibei	0.48	0.48	0.48	0.53	0.41	0.47	0.46	0.39	0.47	0.40	0.46
Bozhou	0.48	0.49	0.48	0.44	0.48	0.42	0.40	0.36	0.35	0.35	0.42
Suzhou	0.38	0.39	0.41	0.41	0.41	0.44	0.44	0.39	0.39	0.34	0.40
Bengbu	0.52	0.58	0.60	0.59	0.57	0.60	0.59	0.49	0.53	0.52	0.56
Fuyang	0.32	0.33	0.34	0.38	0.36	0.37	0.35	0.33	0.34	0.33	0.35
Huainan	0.33	0.33	0.37	0.37	0.35	0.40	0.35	0.30	0.34	0.38	0.35
Chuzhou	0.53	0.56	0.58	0.56	0.51	0.48	0.54	0.45	0.46	0.45	0.51
Lu'an	0.51	0.52	0.50	0.44	0.46	0.40	0.45	0.44	0.36	0.43	0.45
Ma'anshan	0.57	0.55	0.50	0.55	0.62	0.60	0.55	0.61	0.58	0.52	0.56
Wuhu	0.61	0.62	0.65	0.66	0.66	0.63	0.57	0.58	0.61	0.65	0.62
Xuancheng	0.55	0.60	0.61	0.60	0.64	0.61	0.62	0.54	0.54	0.45	0.58
Tongling	0.51	0.49	0.53	0.52	0.50	0.51	0.49	0.48	0.56	0.57	0.52
Chizhou	0.54	0.55	0.55	0.50	0.62	0.59	0.59	0.54	0.56	0.54	0.56
Anqing	0.57	0.58	0.58	0.58	0.62	0.59	0.59	0.51	0.54	0.54	0.57
Huangshan	0.62	0.61	0.61	0.49	0.60	0.62	0.66	0.60	0.64	0.73	0.62
Mean	0.51	0.52	0.53	0.52	0.53	0.53	0.52	0.48	0.50	0.50	0.51

According to Table 2, the average coupling coordination degree of Anhui Province fluctuated around 0.51 from 2011 to 2020, with a certain overall stability. From 2011 to 2017, it was at a stage of barely functioning disorder, and in 2018, 2019, and 2020, it was at a stage of near functioning disorder. The trend of overall coupling and coordinated dispatching in Anhui Province is that the coordination degree increased year by year from 2011-2013, slightly decreased by 1.887% in 2014 compared to 2013, and then rebounded, while the coordination degree decreased year by year from 2017-2020. From 2011 to 2020, the coupling and coordination level of ecological environment construction and regional economic development in various cities in Anhui Province has strong stability, but there is still a large gap between prefecture-level cities. The average coupling coordination degree of Hefei in the past ten years ranks first in Anhui Province, with an average of 0.69 in the primary coordination stage [8], with 2013, 2015, 2016, 2017, and 2020 in the intermediate coordination stage; The average coupling coordination degree of Fuyang and Huainan in recent ten years is juxtaposed in the tail of Anhui Province, with an average of 0.35 being in a mild imbalance stage. The average coupling coordination degree in Hefei is 1.971 times that of Fuyang and Huainan, with significant regional differences.

**Table 3.** Classification of coupling coordination levels in 2015 and 2022

Coordination level	Coordination interval	Degree of coordination	2015	2020
1	[0, 0.1]	Extreme disorders		
2	[0.1, 0.2]	Serious disorders		
3	[0.2, 0.3]	Moderate imbalance		
4	[0.3, 0.4]	Mild disorders	Fuyang, Huainan	Huaibei, Bozhou, Suzhou, Fuyang, Huainan
5	[0.4, 0.5]	Borderline disorder	Huaibei, Bozhou, Suzhou, Lu'an	Chuzhou, Lu'an, Xuancheng
6	[0.5, 0.6]	Grudging coordination	Bengbu, Chuzhou, Tongling	Bengbu, Ma'anshan, Tongling, Chizhou, Anqing
7	[0.6, 0.7]	Primary coordination	Ma'anshan, Wuhu, Xuancheng, Chizhou, Anqing, Huangshan	Wuhu
8	[0.7, 0.8]	Intermediate coordination	Hefei	Huangshan, Hefei
9	[0.8, 0.9]	Good coordination		
10	[0.9, 1.0]	Quality coordination		

In order to further explore the coupling and coordination degree of various cities within Anhui Province, data from 2015 and 2020 were selected to classify the coordination level and calculate the coupling and coordination degree classification of 16 cities, as shown in Table 3. It can be seen from Table 3 that the intermediate coordination area 2 will increase from Hefei in 2015 to Mount Huangshan and Hefei in 2020. The coupling coordination value of Hefei in 2020 will increase by 2.740% compared with that in 2015, mainly because the preparation of the "13th Five Year Plan" ecological environment construction plan of Hefei will be basically completed in 2015. By 2020, the water environment, atmospheric environment, acoustic environment, soil environment and radiation environment of Hefei will be further improved, steadily coordinating the relationship between ecological environment and regional economic development; The primary coordination will be reduced from Ma'anshan City, Wuhu City, Xuancheng City, Chizhou City, Anqing City and Mount Huangshan City in 2015 to Wuhu City in 2020. In 2020, the coupling coordination degree of five cities except Mount Huangshan City will decline compared with the average in 2015, of which Xuancheng City has the largest decline, and the coupling coordination degree will decline by 29.688% compared with 2015, mainly because the protection and restoration of the Yangtze River and Chaohu Lake are still not in place, In the Nanyi Lake basin of Xuancheng City, aquaculture tail water and a large amount of domestic sewage are directly discharged, and there is no substantial progress in the dredging of the lake estuary and wetland protection and restoration projects. The problem of sewage flowing down the river and into the river still exists, and the renovation of combined sewage pipe networks and the inspection and testing of rainwater and sewage pipe networks in Xuancheng City are slowly advancing [9]. The promotion of mine ecological restoration work is insufficient, and the implementation of the requirements of "mining while managing" in mines in cities such as Xuancheng is insufficient. The barely coordinated increase from Bengbu, Chuzhou, and Tongling in 2015 to

Bengbu, Ma'anshan, Tongling, Chizhou, and Anqing. The number of cities on the brink of imbalance decreased from Huaibei City, Bozhou City, Suzhou City, and Lu'an City in 2015 to Chuzhou City, Lu'an City, and Xuancheng City in 2020; (5) Mild imbalance increased from Fuyang City and Huainan City in 2015 to Huaibei City, Bozhou City, Suzhou City, Fuyang City, and Huainan City in 2020 [10].

#### 4.2 Coupling Coordination Degree Lisa Analysis

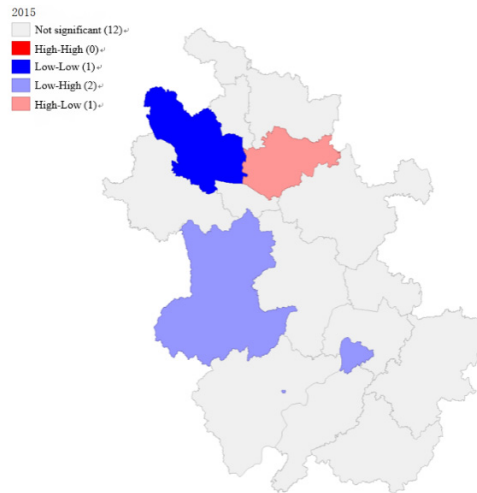


Figure 1. Lisa Cluster Diagram of Coupling Coordination Degree in 2015

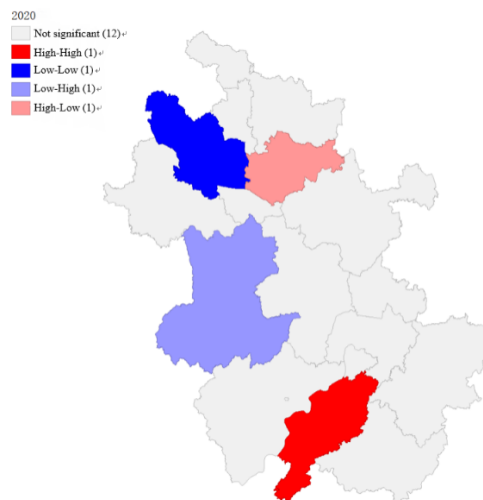


Figure 2. Lisa Cluster Diagram of Coupling Coordination Degree in 2020

Further study the spatial characteristics of the coupling and coordination between ecological civilization construction and regional economic development, calculate the local Moran index for 2015 and 2020 according to the formula, and draw a Lisa cluster map, as shown in Figure 2 and Figure 3. It can be seen from the figures that there was little change in urban agglomeration areas in 2015 and 2020, with both low and low concentration areas (L-L) at the two time nodes being Bozhou City, indicating a relatively low level of ecological civilization construction and regional economic development, but a relatively large space for development and progress, and a relatively rapid pace of development; In 2015, the low and high concentration area (L-H) was divided into Lu'an City, Tongling City, and Yixiu District of Anqing City. In 2020, it was reduced to Lu'an City. The coupling and coordination between ecological civilization construction and regional economic development in these cities grew slowly, and although located around Hefei City, they were not driven by it. The high and low concentration area (H-L) is Bengbu City, which has certain advantages over the surrounding



cities; In 2015, there was no high concentration area (H-H), and there were no prefecture-level cities in the province that had a high degree of coupling and coordination between themselves and neighboring cities. The overall coordination level was not high, and it was increased to Chizhou City in 2020, indicating that Chizhou City and its surrounding cities had a relatively high degree of coordination within the province, and were able to communicate with peripheral cities, presenting a clustering relationship.

## 5. Conclusion and Suggestions

### 5.1 Conclusion

Starting from the dimensions of economic structure, economic quality, coordination and openness, environmental pollution, and environmental governance, this paper constructs a level measurement indicator system that includes 15 three-level indicators. Using the coupling coordination degree model and local Moran index, and on this basis, using ArcMap and GeoDa software to draw a Lisa cluster map, further exploring its spatial characteristics, and analyzing the correlation between ecological civilization construction and regional economy, the following conclusions are drawn:

First, on the whole, the average coupling coordination degree of Anhui Province fluctuated around 0.51 from 2011 to 2020, with a certain degree of stability overall. The overall trend of coupling and co scheduling is shown as the coordination degree increasing year by year from 2011-2013, slightly decreasing by 1.887% compared to 2013 in 2014 and then recovering, and decreasing year by year from 2017-2020.

Secondly, comparing 16 prefecture-level cities, it is found that from 2011 to 2020, although the coupling and coordination level of ecological environment construction and regional economic development in various cities in Anhui Province has strong stability, there is still a large gap between prefecture-level cities. The average coupling coordination degree of Hefei in recent ten years is the first in Anhui Province, with an average of 0.69 in the primary coordination stage. The average coupling coordination degree of Fuyang and Huainan in recent ten years is juxtaposed in the tail of Anhui Province, with an average of 0.35 in the mild imbalance stage. The average coupling coordination degree in Hefei is 1.971 times that of Fuyang and Huainan, with significant regional differences.

Thirdly, from a spatial perspective, there was little change in urban agglomeration areas in 2015 and 2020. Bozhou City's ecological civilization construction and regional economic development level were relatively low, but the corresponding development and progress space was larger and the development speed was faster; The coupling and coordination between ecological civilization construction and regional economic development in Liu'an City, Tongling City, and Yixiu District of Anqing City have been growing slowly, and although they are located around Hefei City, they have not been driven by them; Bengbu City has certain advantages over surrounding cities; In 2015, there was no high concentration area (H-H), and the overall coordination level was not high. In 2020, it was increased to Chizhou City, indicating that the coordination degree of Chizhou City and surrounding cities in the province is relatively high, and it can communicate with surrounding cities, presenting a clustering relationship.

### 5.2 Suggestions

First, adjust China's industrial structure. In order to promote the coordinated development of the ecological environment and economy, attention should be paid to green development. We can start by focusing on the development of green agriculture, focusing on planting, breeding, and recycling, promoting the development of the entire green industrial chain, and extending the green industrial chain. Secondly, it is also possible to expand and strengthen green industries, actively promoting the high-tech and modernization of industries that were originally highly polluting, such as mining and metallurgy, to reduce pollution. For the tourism industry, it is necessary to rely on ecological resources for green tourism, protect key tourism projects such as ancient towns and villages, and beautiful villages, and increase the promotion of the concept of "green water and green mountains are

golden mountains and silver mountains".

Second, take a long-term view to protect the ecology and make good planning for ecological construction. Economic construction requires short-term and long-term planning, and ecological construction also requires short-term to long-term planning. The ecological environment and economic development should be dialectical unity and complement each other. Adhere to the protective development of the ecological environment, so that economic construction has a foundation to be found, and also develop economic construction on this basis, so that the ecological environment has a basis for development. Therefore, we need to make good planning, not limited to short-term construction and development, but from a long-term perspective, using a development perspective to carry out ecological planning, so as to truly form a complete coordinated development of ecology and economy.

Third, increase the promotion of green culture. Firstly, we should advocate a series of green concepts such as the concept of green achievements, green production, and green consumption, and explore new experiences in integrating the concept of ecological civilization into the entire process of economic and social development. Integrating ecological construction not only into family education, but also deeply into the national concept. In addition, it is also necessary to promote a green ecological model and actively cultivate an ecological culture conducive to promoting greening. When green culture gradually takes root in the hearts of the people, the whole society will exert its subjective initiative, and the economy will be able to develop green on this basis.

## References

- [1] Xia Panpan. Research on theory and method of energy efficiency evaluation based on DEA [D]. China University of Science and Technology, 2020.
- [2] Cui Shuqin. The spatial spillover effect of financial agglomeration on regional economic growth [D]. Shanghai University of Finance and Economics, 2020.
- [3] Yue Haijun. Measurement and Analysis of the coupling coordination between ecological protection and high quality economic development in the Huaihe River Basin [D]. Shandong University of Finance and Economics, 2022.
- [4] Stiglitz J. Growth with exhaustible natural resources: efficient and optimal growth paths [J]. *Review of Economic Studies*, 1974, 41:123~137.
- [5] Craciela Chichilnisky. Geoffrey heal andrea beltrati, green golden rule [J]. *Economic Letters*, 1995, 49: 175-179.
- [6] Li Chongyang. On the Game between Economic Growth and Environmental Quality [J]. *Fujian Forum (Economic and Social Edition)*, 2002 (2): 38-40.
- [7] He Yinong, Hu Shigeng. Environmental pollution, endogenous population growth, and economic growth model [J]. *Journal of Huazhong University of Science and Technology (Natural Science Edition)*. 2004 (9): 114-116.
- [8] Huang Huafu. Study on the coupling relationship between urbanization and ecological environment in Jinjiang city [D]. Fujian Normal University, 2017.
- [9] Yu Minjiang, Zou Feng. Stimulating social vitality: the construction of an actor network in collaborative water environment governance in the Yangtze River Delta [J]. *Jiangsu Social Science*, 2022 (01): 43-51+242.
- [10] Wang Shu. Study on ecological security assessment of cultivated land resources in Northern Anhui Province [D]. Anhui Agricultural University, 2018.