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Article

Study on the High-Quality Development Level and Spatio-Temporal Differentiation Characteristics of the Jianghuai Ecological Economic Zone

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Abstract: This paper takes the Jianghuai Ecological Economic Zone as the research object and delves into the high-quality development level and spatio-temporal differentiation characteristics of the region. By establishing indicators across multiple dimensions such as regional economy, ecology, and society, and employing the entropy method for comprehensive evaluation, it reveals the challenges and opportunities faced by the region in the process of high-quality development. The research results indicate that the Jianghuai Ecological Economic Zone exhibits significant spatio-temporal differentiation characteristics in the process of high-quality development, and this differentiation is influenced by various factors. This study provides theoretical support and practical guidance for the high-quality development of the Jianghuai Ecological Economic Zone.

Keywords: Jianghuai ecological economic zone, High-quality development, Spatio-temporal differentiation, Characteristic study

1. Introduction

The report to the 20th National Congress of the Communist Party of China emphasizes that high-quality development is the primary task in comprehensively building a modern socialist country, and achieving high-quality development is one of the essential requirements of Chinese-style modernization. [1] As a crucial component of Jiangsu Province's "1+3" key functional area strategy, the Jianghuai Ecological Economic Zone holds a significant position and plays a vital role in the national strategy.

The Jianghuai Ecological Economic Zone, designated in alignment with the national Grand Canal Cultural Belt and the Jianghuai Ecological Corridor, adopts ecological protection and green development approaches, which are of great significance to the sustainable development of the economic zone. Serving as the "ecological green heart" of Jiangsu Province, the Jianghuai Ecological Economic Zone showcases the ecological value of an ecological economic zone and exemplifies the promotion of ecological civilization construction. It is an important agricultural production base in the province, and promoting high-quality development in this ecological economic zone helps enhance Jiangsu's green ecological value and fosters sustainable development of the ecological economy. However, the Jianghuai Ecological Economic Zone faces numerous challenges and opportunities in its pursuit of high-quality development. Accurately assessing the level of high-quality development in this region and delving into its spatio-temporal differentiation characteristics are of great value for formulating scientific development strategies and policies.

Scholars both domestically and internationally have achieved certain results in research on high-quality development, but research on the high-quality development of the Jianghuai Ecological Economic Zone remains insufficient. Based on this, this study aims to fill this research gap by deeply analyzing the status of high-quality development in the Jianghuai Ecological Economic Zone, revealing its spatio-temporal differentiation characteristics, and providing theoretical support and practical guidance for promoting sustained and healthy development in this region.

2. Literature Review

The rich connotation and strategic significance of high-quality economic development have been widely concerned by scholars from various fields. Li (2018) proposed that high-quality development is the unity of five aspects, including intensive growth at the macro level, improvement in supply quality at the micro level, local characteristics, and regional coordination, based on the five development concepts. [2]. Jiang, Zhai and Wang (2019) believed that the current high-quality economic development in China aims to well meet the people's growing needs for a better life [3]. Xu and Liu (2021) argued that the foundation of high-quality economic development lies in sustained economic growth, enabling economic products to maximize utility while meeting basic

residents' needs [4] Li and Gao (2024) suggested that strengthening opening up and innovation could address the issue of incoordination in regional economic development in Liaoning Province [5]. Li (2024) mentioned promoting high-quality economic development in the Bohai Rim region by facilitating regional coordinated development and deepening institutional and mechanism reforms [6].

Regarding the research on measurement methods for the Jianghuai Ecological Economic Zone, Sun (2020) believed that the entropy method can provide a basis for multi-indicator comprehensive evaluation.[7]. Song (2019) considered principal component analysis (PCA) as an objective weighting method suitable for measuring the comprehensive score of economic development quality across the country and various regions [8]. Lin (2024) noted that the TOPSIS method is a ranking method that approximates the ideal solution, requiring only that each utility function be monotonically increasing or decreasing, and is a commonly used and effective method in multi-objective decision analysis [9]. Shang (2024) pointed out that the Jianghuai Ecological Economic Zone faces issues such as an insecure leading position in ecological advantages, prominent phenomena of "weak links, broken chains, and short chains," and unnoticeable effectiveness in realizing the value of ecological products [10]. Existing research mainly focuses on interpreting the connotation and measuring the level of high-quality development, with numerous fruitful studies that have expanded the ideas for researching high-quality development and spatio-temporal differentiation characteristics in the Jianghuai Ecological Economic Zone.

3. Development Status of Jianghuai Ecological Economic Zone

The Jianghuai Ecological Economic Zone is located in the central part of Jiangsu Province, at the lower reaches of the Yangtze River and Huai River basins. It includes five prefecture-level cities (Huai'an, Suqian, Yancheng, Yangzhou, and Taizhou), two county-level cities (Xinghua and Gaoyou), and nine counties (Lianshui, Xuyi, Jinhu, Siyang, Sihong, Shuyang, Jianhu, Funing, and Baoying). The zone boasts rich natural resources and a superior geographical location. Situated at the intersection of the Yangtze River and Huai River basins with the Beijing-Hangzhou Grand Canal, the Jianghuai Ecological Economic Zone enjoys a unique advantage of inland waterways, providing convenient transportation conditions within the economic zone. Its proximity to major cities such as Shanghai, Nanjing, and Suzhou allows it to benefit from their radiation effects and industrial transfer. With a relatively high level of agricultural development, the Jianghuai Ecological Economic Zone is endowed with abundant natural and agricultural ecological resources. The zone includes large lake wetland ecosystems such as Hongze Lake, possessing high ecological value and development potential.

Currently, the Jianghuai Ecological Economic Zone maintains a good momentum and quality of economic growth. With industrial undertaking and transformation and upgrading, the region's economy has also achieved high-quality development. The Jianghuai Ecological Economic Zone embodies ecological value, with an industrial structure dominated by ecological agriculture, ecological industry, and ecological tourism, continuously optimizing the regional industrial structure. However, in the process of economic development, a series of ecological and environmental issues have arisen. The Jianghuai Ecological Economic Zone faces severe air pollution, water resource pollution, and a decline in forest coverage, which have caused damage to the region's ecosystem and constrained the sustainable development of ecological value and the economy. In the ecological and economic construction of the Jianghuai Ecological Economic Zone, the government plays a leading role, formulating ecological protection regulations, strictly enforcing the law, and severely punishing ecological pollution behaviors. The introduction of policies such as environmental protection taxation and green financial support for ecological sustainability incentivizes enterprises to participate in ecological protection work within the region. Greater emphasis will be placed on the overall, systematic, and collaborative aspects of ecological and environmental protection efforts, strengthening collaborative governance within the region to jointly address ecological and environmental issues and promote ecological sustainability in the region. The construction of the ecological economic system focuses on the research and development of green technologies and the cultivation of talents, injecting new momentum into the regional ecological industries, promoting regional ecological industrial clusters, and building a new type of ecological economic demonstration zone.

In recent years, the Jianghuai Ecological Economic Zone has shown strong development momentum. With the goal of coordinating economic development and ecological protection, the zone has received government attention and support for its ecological economic value. With the transformation and upgrading of the industrial structure within the region, residents' income levels have also improved, although there is still a gap compared to first-tier cities such as southern Jiangsu, Nanjing, and Shanghai. The region is further improving its business environment, reducing enterprise operating costs, enhancing product market competitiveness, improving the infrastructure required by enterprises, simplifying government administrative approvals, and improving government administrative efficiency. It actively cooperates and exchanges with domestic and foreign ecological economic zones, expands economic space, explores international markets, establishes interconnected cooperation models, and jointly strengthens economic development. At the same time, it strengthens economic coordination within the region, promotes

industrial division among regions, achieves resource sharing and complementary advantages, improves cooperation mechanisms, and narrows economic gaps between regions.

The quality of life of residents in the Jianghuai Ecological Economic Zone is reflected in many aspects. In terms of education, the number of books in public libraries has increased year by year, educational resources are abundant, and the quality of education has improved. However, issues such as uneven distribution of educational resources and differences in educational resource quality still exist within the region. In terms of healthcare, with the government's emphasis on and increased funding for the medical and healthcare sector within the region, the medical resources of the Jianghuai Ecological Economic Zone have improved, and residents' basic medical security has been enhanced. The number of medical and healthcare institutions in the region has increased year by year.

4. Construction of Regional Evaluation Index System for High-Quality Development

4.1. Evaluation Index System for High-Quality Development of the Jianghuai Ecological Economic Zone

4.1.1 Principles for Constructing the Evaluation Index System

This paper aims to address the major social contradictions in the region and conduct a comprehensive analysis and evaluation of enhancing economic development in relatively backward areas while narrowing economic development gaps among various regions. The indicators used in this paper are standardized to meet the above evaluation requirements, ensuring the scientificity and feasibility of the indicators. An evaluation index system for high-quality development of the Jianghuai Ecological Economic Zone is constructed based on the principles of comprehensiveness, scientificity, rationality, and accessibility.

4.1.2 Design for Constructing the Evaluation Index System

This paper constructs the index system for high-quality development of the Jianghuai Ecological Economic Zone based on the "Five Development Concepts" of high-quality development, measuring and comparing the level of high-quality development among regions within the ecological economic zone. The specific evaluation system is set out in Table 1.

Table 1. Evaluation Index System for the High-Quality Economic Development Level of the Jianghuai Ecological Economic Belt.

Primary Indicator	Secondary Indicator	Tertiary Indicator	Attribute
High-Quality Scientific and Technological Innovation	Innovation Drive	Number of Patent Applications Accepted (pieces)	Positive
		Number of Students in Ordinary Middle Schools (10,000 people)	Positive
High-Quality Coordinated Development	Regional Coordination	Per Capita Living Consumption Expenditure of Residents in Various Regions (yuan)	Positive
	Urban-Rural Coordination	Ratio of Disposable Income between Urban and Rural Residents (%)	Negative
		Percentage of Housing Construction Area between Urban and Rural Residents (%)	Negative
High-Quality Green Development	Green Ecology	Green Space Coverage Area in Built-Up Areas (hectares)	Positive
		Forest Coverage Rate (%)	Positive
High-Quality Openness and Inclusivity	Foreign Economy	Total Export Value (billion yuan)	Positive
		Total Import Value (billion yuan)	Positive
	Domestic Trade	Total Retail Sales of Consumer Goods (billion yuan)	Positive
		Regional GDP (billion yuan)	Positive
High-Quality People's Livelihood and Shared Development	Infrastructure	Regional Road Mileage (kilometers)	Positive
		Annual Electricity Consumption (billion kWh)	Negative
		Number of Books in Public Libraries (thousand volumes)	Positive
		Number of Medical and Health Institutions (units)	Positive
	Economic Benefits for the People	Per Capita Disposable Income of Residents (yuan)	Positive
		Proportion of General Public Budget Revenue to GDP (%)	Positive

Notes: Positive indicators are better when larger, while negative indicators are better when smaller.

The disposable income ratio of urban and rural residents refers to the ratio of the per capita disposable income of urban permanent residents to that of rural permanent residents. The housing construction area ratio of urban and rural residents refers to the ratio of the per capita housing construction area of urban permanent residents to that of rural permanent residents [11].. Generally, the larger the proportion of general public budget revenue to GDP, the more sufficient the financial resources of the region.

Considering the availability of data, the data examination period is defined as 2017-2021, with all data sourced from the "Jiangsu Statistical Yearbook".

4.2. Evaluation Method for High-Quality Development in the Jianghuai Ecological Economic Zone

4.2.1 Selection of Evaluation Method

The entropy method is an objective evaluation method that can avoid biases caused by human factors and better reflect the originality of the data. This paper uses the entropy method to calculate the weights of each indicator. The specific measurement method and steps are as follows.

Firstly,Establish an indicator matrix: Let represent the ith object and the jth indicator.

$$A = \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1j} \\ a_{21} & a_{22} & & \\ \vdots & & \ddots & \\ a_{i1} & & & a_{ij} \end{pmatrix}_{i \times j}$$

Where i=1,2,3,...,m, j=1,2,3,...,n (in this paper, m=5 years, n=16 cities and counties, A has 17 groups);

Secondly,Dimensionless processing:

Calculation formula for positive indicators:$x_{ij} = \frac{a_{ij} - min\{a_{ij}\}}{max\{a_{ij}\} - min\{a_{ij}\}}$

Calculation formula for negative indicators:$x_{ij} = \frac{max\{a_{ij}\} - a_{ij}}{max\{a_{ij}\} - min\{a_{ij}\}}$

Where is the standardized value and is the original value;

Thirdly, To ensure that every data point is meaningful and to avoid affecting the standardization calculation results and reducing subsequent calculation errors, 0.001 is added to all data.

Fourthly, Calculate the proportion of the ith object under the jth indicator:

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}}$$

Fifthly, Calculate the entropy value of the jth indicator:

$$e_j = -\frac{1}{\ln m} \sum_{i=1}^{m} (P_{ij} \ln P_{ij})$$

Among them,$e_j \in [0,1]$.

Sixthly, Calculate the difference coefficient:

$$g_j = 1 - e_j$$

Seventhly, Calculate the weight of the jth indicator:

$$W_j = \frac{g_j}{\sum_{j=1}^{m} g_j}$$

Finally,Calculate the comprehensive score through linear weighting:

$$Z_j = \sum_{j=1}^{n} W_j X_i$$

4.2.2 Analysis of Calculation Results

Table 2. Scores for High-Quality Development Levels in the Jianghuai Ecological Economic Zone from 2017 to 2021.

Zone	In 2017	In 2018	In 2019	In 2020	In 2021	amplification
Huai'an City	0.0179	0.0190	0.0211	0.0317	0.0330	0.0151
Lianshui County	0.0018	0.0023	0.0030	0.0036	0.0039	0.0021
Xuyi County	0.0018	0.0020	0.0025	0.0030	0.0033	0.0015
Jinhu County	0.0016	0.0018	0.0022	0.0030	0.0033	0.0016
Yancheng City	0.0265	0.0287	0.0304	0.0572	0.0713	0.0448
Funing County	0.0024	0.0028	0.0036	0.0046	0.0054	0.0030
Jianhu County	0.0021	0.0022	0.0027	0.0035	0.0040	0.0019
Yangzhou City	0.0221	0.0247	0.0250	0.0454	0.0521	0.0300
Baoying County	0.0028	0.0031	0.0033	0.0047	0.0050	0.0022

Gaoyou city	0.0027	0.0033	0.0038	0.0045	0.0049	0.0022
Taizhou City	0.0216	0.0235	0.0231	0.0547	0.0592	0.0376
Xinghua city	0.0032	0.0034	0.0037	0.0051	0.0058	0.0026
Suqian city	0.0135	0.0148	0.0205	0.0294	0.0330	0.0195
Shuyang County	0.0037	0.0041	0.0048	0.0069	0.0074	0.0037
Siyang County	0.0017	0.0025	0.0046	0.0058	0.0066	0.0049
Sihong County	0.0020	0.0022	0.0046	0.0055	0.0062	0.0042
City (level) mean	0.0203	0.0221	0.0240	0.0437	0.0497	0.0294
County (level) mean	0.0022	0.0025	0.0032	0.0042	0.0047	0.0025
City (level) standard deviation	0.0001	0.0001	0.0001	0.0007	0.0011	0.0006
County(level) standard deviation	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Among all counties, Shuyang County has consistently maintained the highest level of high-quality development over the past five years, with an annual growth rate of 18.92%. The counties with the highest increases in high-quality development levels are Siyang County and Sihong County, with annual growth rates of 40.40% and 32.69%, respectively. Jinhu County and Xuyi County, on the other hand, have consistently ranked at the bottom in terms of high-quality development levels and their growth rates, with annual growth rates of 19.84% and 16.36%, respectively. The disparity in high-quality development levels among regions in the Jianghuai Ecological Economic Zone is relatively small, but the overall development level is still at a relatively low stage.

A comparison of data from various regions reveals that, as of 2021, while the number of patent applications accepted in most regions has been decreasing, the counties in Suqian City not only saw an increase in numbers but also a significant increase that far exceeded that of other prefecture-level cities. In addition, the increase in the number of students enrolled in ordinary secondary schools in Suqian City also far exceeds that of other prefecture-level cities, leading to the speculation that Suqian City has placed particular emphasis on education in recent years.

5. High-Quality Development Level and Spatio-temporal Differentiation Characteristics of the Jianghuai Ecological Economic Zone Development

5.1. Spatio-temporal Characteristics of High-Quality Development in the Jianghuai Ecological Economic Zone

5.1.1 Overall Timing Characteristics

From the overall temporal perspective of the Jianghuai Ecological Economic Zone, the average level of high-quality development has shown an upward trend year by year. Specifically, the municipal average increased from 0.0203 in 2017 to 0.0497 in 2021, with an increase of 0.0294. The county average rose from 0.0022 in 2017 to 0.0047 in 2021, with an increase of 0.0025. The municipal average increased by 0.294, with an annual growth rate of 25.09%, while the county average increased by 0.0025, with an annual growth rate of 20.90%. However, the overall development level is still at a relatively low stage.

A comparative analysis of the high-quality development level increases among the five prefecture-level cities within the Jianghuai Ecological Economic Zone reveals that Huaian, Yancheng, Yangzhou, Taizhou, and Suqian have all shown a year-on-year upward trend. From the high-quality development level scores from 2017 to 2020, it can be seen that Yancheng has the highest increase, while Huaian has the smallest growth rate. Horizontally, in 2017, the ranking of high-quality development levels among the five cities was Yancheng, Yangzhou, Taizhou, Huaian, and Suqian. By 2021, the ranking had changed to Yancheng, Taizhou, Yangzhou, Huaian, and Suqian tied for fourth. In fact, as early as 2020, Taizhou's high-quality development level score had surpassed that of Yangzhou, with a significant growth rate. At the same time, it can be seen that Yancheng's high-quality development level score is significantly higher than that of the other four cities, indicating that there are noticeable differences in the economic high-quality development levels among the five cities within the Jianghuai Ecological Economic Zone. It is necessary to further leverage the "diffusion effect" of high-level cities to drive the high-quality development of surrounding cities [12].

At the county level, the high-quality development levels of the 11 counties within the Jianghuai Ecological Economic Zone have all shown an upward trend from 2017 to 2021. The increase in the number of students in ordinary middle schools in Suqian City is also significantly higher than that of other prefecture-level cities, and the increases in Shuyang, Siyang, and Sihong counties are also significantly higher than those of other counties and county-level cities. This suggests that Suqian City has placed particular emphasis on education in recent years. The number of patent applications accepted and the number of students in ordinary middle schools are both indicators of high-quality technological innovation in a region. Compared with other data, it can be inferred that technological innovation plays an important role in the high-quality development of Suqian City. At the same time, Suqian City also has the highest values for the two indicators of green ecology, making it the best-performing prefecture-level city in terms of

greening within the Jianghuai Ecological Economic Zone. From the data on per capita disposable income and the three indicators of coordinated development, it can be seen that Taizhou City's per capita living consumption level has basically been the highest among the prefecture-level cities in the Jianghuai Ecological Economic Zone, indicating a relatively high quality of life for its residents. However, comparing the values of the two indicators in green development, it can be seen that the approximate ranking of economic development levels is the opposite of the approximate ranking of green development levels, suggesting a conflict between economic development and green development [13]. In future development, all regions need to pay attention to protecting the environment while vigorously developing the economy, and must not lower the bottom line of green development [14].

5.1.2 Dimdimensional Temporal Characteristics

A further comparative analysis of the first-level indicators of the high-quality development level of prefecture-level cities in the Jianghuai Ecological Economic Zone is conducted. From 2017 to 2021, there were significant differences in the economic high-quality development levels among the prefecture-level cities in the Jianghuai Ecological Economic Zone, mainly due to noticeable differences in the first-level indicators among the prefecture-level cities within the zone. A visual comparative analysis of the first-level indicators of the economic high-quality development level of prefecture-level cities in the Jianghuai Ecological Economic Zone in 2021 reveals that Yancheng, Taizhou, and Yangzhou have higher levels of innovative development and technological innovation. From the perspective of the coefficient of variation of each subsystem, the differences among the subsystems of coordinated development, green development, and shared development are relatively small. The gaps mainly stem from the indices of open development and innovative development, especially as innovative development plays a decisive role in the high-quality development level of the Jianghuai Ecological Economic Zone [15]. The gaps among prefecture-level cities are not only influenced by geographical location but also by development foundations and regional policies.

Therefore, to promote the improvement of the economic high-quality development level of the Jianghuai Ecological Economic Zone, it is necessary not only to further promote coordinated, green, and shared development but also to further enhance the level of openness [16], making it a new strategic fulcrum for open development in the central and eastern regions and promoting the realization of a new development pattern with domestic circulation as the mainstay and domestic and international circulations reinforcing each other [17]. At the same time, innovative development should continue to be regarded as the primary driving force for promoting the high-quality economic development of the Huaihe Ecological Economic Belt. While increasing the input of innovative elements, the transformation of innovative outcomes should be further accelerated [8].

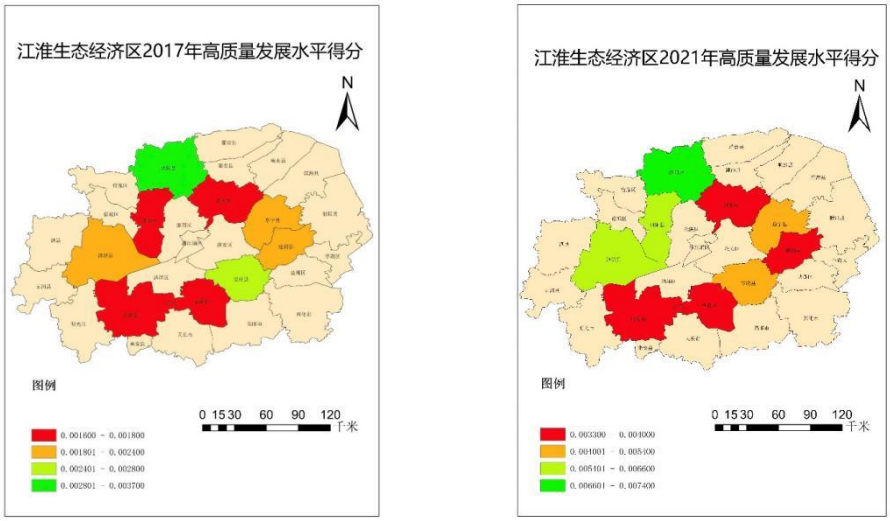

Fig. 3. Score of high-quality development level of Jianghuai Ecological Economic Zone from 2017 to 2021.

5.2. Characteristics of the Spatial Pattern Distribution

To facilitate the comparison of the distribution and evolution characteristics of high-quality development levels in the Jianghuai Eco-Economic Zone across geographical space, the comprehensive scores for high-quality development in the Jianghuai Eco-Economic Zone from 2017 to 2021 were graded and visualized with the support of ArcGIS 10.8 software.

The results indicated that Yancheng City's level of high-quality economic development was significantly higher than that of the other prefecture-level cities in the five cities of the Jianghuai Eco-Economic Zone during the study period and consistently led

the way. Conversely, Huaian City and Suqian City consistently lagged behind other prefecture-level cities, remaining in the low-level region. In 2017, there were notable differences in the level of high-quality economic development within the Jianghuai Eco-Economic Zone, decreasing in a stepped pattern from the eastern coastal area to the northwest. Compared to 2017, in 2021, Huaian City's high-quality development clearly lacked momentum and was overtaken by Suqian City in the northwest. Taizhou City rose to second place. However, overall, a spatially heterogeneous pattern of "strong in the southeast and weak in the northwest" persisted. Nevertheless, an overall upward trend was observed, with the hierarchical structure of high-quality development becoming more flattened. This suggests that the gap in high-quality development levels among the prefecture-level cities in the Jianghuai Eco-Economic Zone is narrowing, leading to a more coordinated and balanced overall situation, potentially indicating spatial correlation [18].

6. Analysis on the Formation Mechanism of the Spatial Differentiation Characteristics of the High-quality Development Level in Jianghuai Ecological Economic Zone

The high-quality development of the Jianghuai Eco-Economic Zone exhibits significant spatial correlation. By conducting spatial autocorrelation analysis to calculate the spatial distance and correlation coefficient between various regions, we can analyze the spatial association and economic agglomeration degree of ecological and economic development levels among regions within the zone. Utilizing geographic information technology enables comprehensive analysis and processing of geographical data within the region, allowing for the creation of ecological economic spatial distribution maps. This visualizes regional spatial data and provides an intuitive understanding of the spatial distribution characteristics of high-quality ecological and economic development. Employing spatial econometric models to analyze the spatial differences in high-quality development indicators within the eco-economic zone reveals the causal relationships and mechanisms of high-quality development among regions. Through factor decomposition, high-quality development indicators can be decomposed into different influencing factors, analyzing the extent and mechanism of each factor's impact on high-quality development.

Traditional econometric models may ignore the interactive effects between different regions, leading to biases in research results. In light of this, this paper adopts a comprehensive indicator evaluation system that includes multiple indicators to comprehensively assess the high-quality ecological and economic development of various regions within the zone, covering economic, social, and ecological aspects, among others. This provides a more accurate reflection of the high-quality ecological and economic development levels of various regions. Applying multivariate statistical analysis to deeply analyze high-quality development indicators allows us to understand the main factors and degree of differences affecting the development of the eco-economic zone, as well as the structural characteristics and mechanisms of high-quality development. Utilizing spatial econometric models to explore spatial factors is an important tool for understanding the formation mechanism of the spatial differentiation characteristics of high-quality development levels in the Jianghuai Eco-Economic Zone, providing a comprehensive analysis of the relational and influential mechanisms in geographical space. By comprehensively applying these methods, this paper analyzes the formation mechanism of high-quality development and spatio-temporal analysis characteristics in the Jianghuai Eco-Economic Zone.

7. Conclusion and Suggestion

This paper first refers to the research findings and theoretical methods of relevant experts and scholars at home and abroad. Starting from the connotation of high-quality development, it constructs five evaluation indicator systems: high-quality scientific and technological innovation, high-quality coordinated development, high-quality green development, high-quality openness and inclusivity, and high-quality people's livelihood and shared development. It conducts an in-depth analysis of the spatio-temporal analysis characteristics and formation mechanism of high-quality development levels in the Jianghuai Eco-Economic Zone and draws the following conclusions:

1. The level of high-quality development has significantly improved. From 2017 to 2021, the overall mean value of the Jianghuai Eco-Economic Zone has shown an increasing trend year by year. The high-quality development level of the region has been significantly improved, and the gap between regions has gradually narrowed. Data from economic, ecological, and social dimensions all indicate that the region's comprehensive strength has been continuously enhanced, laying a solid foundation for sustainable development in the future.

2. Spatio-temporal differentiation characteristics are evident. The research results show that there are significant differences in the high-quality development level of the Jianghuai Eco-Economic Zone in both space and time. Overall, the municipal mean value is higher than the county mean value. The municipal mean value has increased by 0.294, with an annual growth rate of 25.09%, while the county mean value has increased by 0.0025, with an annual growth rate of 20.90%. However, the overall development level is still at a relatively low stage. Some areas, such as Yancheng, have achieved rapid development due to factors such as geographical location, resource conditions, and policy support, and have to some extent driven the development of surrounding

areas. Other areas, however, have developed relatively slowly due to various constraints. This differentiation reminds us to fully consider the actual situation of different regions when formulating development strategies.

3. Ecological and economic coordinated development. The Jianghuai Eco-Economic Zone is the "ecological green heart" of Jiangsu Province, demonstrating the coordinated role of its ecological value and high-quality economic development. Studies have shown that the region has achieved remarkable results in ecological protection, providing strong support for high-quality economic development. However, there are still conflicts in certain aspects. In the future development process, all regions should continue to strengthen economic development while achieving harmonious coexistence between ecology and the economy.

Based on the above conclusions, we propose the following suggestions:

1. Strengthen regional coordinated development. In response to the issue of spatio-temporal differentiation, the government should increase support for relatively backward areas through policy inclination, financial support, and technological guidance to promote balanced development among regions.

2. Increase investment in innovation and enhance regional development competitiveness. Technological innovation is a key driver of high-quality development. In response to the problem of insufficient innovation capacity, investment in science and technology and education should be increased, high-quality talents should be cultivated and introduced, and continuous innovation momentum should be injected into the region's high-quality development. At the same time, investment in scientific and technological research and development should be increased, and enterprises should be encouraged to strengthen technological innovation and improve product added value.

3. Strengthen international cooperation and exchanges to achieve resource sharing. By cooperating and exchanging with internationally advanced regions, advanced concepts and technologies can be introduced to accelerate the high-quality development process of the Jianghuai Eco-Economic Zone. Through regional cooperation, common problems encountered in the development process can be solved together, enhancing the overall competitiveness of the region.

4. Establish and improve monitoring and evaluation mechanisms: Regularly monitor and evaluate the high-quality development status of the region to ensure the effective implementation of various policies and measures, and make timely adjustments based on actual situations to ensure the smooth progress of the development process.

The high-quality development of the Jianghuai Eco-Economic Zone is a long-term and complex process that requires the joint efforts of the government, enterprises, and society. Through scientific planning, effective implementation, and continuous innovation, it is believed that the region can achieve a higher level of development and make greater contributions to the development of China and even the world.

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