



## Study on the Comprehensive Assessment and its Application of Environmental Pollution Governance Effect of Low-carbon Tourism Emissions from Energy Consumption in Jiangsu Province

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**Abstract:** Jiangsu Province is the first largest province in China for low-carbon tourism, set to explore the comprehensive assessment method of the effect of low-carbon tourism environmental pollution governance in Jiangsu Province and to promote the effective way of continuous improvement of low-carbon tourism in Jiangsu. This paper takes the effect of low-carbon tourism environmental pollution governance in Jiangsu Province as an overall comprehensive assessment object and utilizes the spatial ecological niche model as well as the basic statistical data of Jiangsu Province to carry out a comprehensive assessment study on the effect of low-carbon tourism environmental pollution governance in Jiangsu Province from 2013 to 2021. It is found that the comprehensive assessment coefficient of low-carbon tourism in Jiangsu Province rises from 0.8770 in 2013, with the environmental pollution governance effect of low-carbon tourism ranked at level II, to 0.9401 in 2021, with the corresponding environmental pollution governance effect of low-carbon tourism ranked at level I, which fully reflects the good trend of continuous growth of the environmental pollution governance effect of low-carbon tourism in Jiangsu Province. According to the specific assessment results, this paper further puts forward policy recommendations to promote the continuous improvement of the environmental pollution governance effect of low-carbon tourism in Jiangsu Province.

**Keywords:** assessment of the effectiveness of environmental pollution governance, spatial ecological niche suitability model, assessment index system, low-carbon tourism, Jiangsu Province

## 1. Introduction and Literature Review

Jiangsu Province is a large tourism province in China. In 2023, Jiangsu Province received 940 million domestic and foreign tourists, with a total tourism revenue of 1202.27 billion yuan; the total consumption of culture and tourism amounted to 536.6 billion yuan, which accounted for 9.74% of the country, the first in the country. The low-carbon tourism industry in Jiangsu Province has realized energy savings and emission reduction compared with the industrial energy consumption industry, which is of great practical significance for realizing the "double carbon" goal of China's economic development. According to the comparison and analysis of China's industrial development situation, although the development of tourism will also produce a certain amount of environmental pollution due to energy consumption, compared with the industrial production of energy consumption, the consumption of energy by cultural tourism industry will not pollute the environment on a large scale and large area, and if there is no industrial energy pollution, the pollution produced by the energy consumption of the cultural tourism industry can be fully utilized by the ecological environment's natural restoration function can be achieved, in this sense, the tourism industry is often referred to as a "low-carbon" industry. In this sense, tourism is often called a "smoke-free" industry (Zhang et al. 2023).

Along with the rapid development of the low-carbon tourism industry in Jiangsu Province, the low-carbon tourism industry in Jiangsu Province is gradually moving towards high-quality development (Li & Li 2024). As of February 2024, Jiangsu Province has 26 5A-level scenic spots, 235 4A-level scenic spots, 266 3A-level scenic spots, and more than 600 tourist attractions above 2A level. According to the data of China UnionPay Business, the total consumption of culture and tourism in Jiangsu Province in 2023 amounted to 536.636 billion yuan, a year-on-year increase of 40.08%, accounting for 9.74% of the total consumption of the country's culture



and tourism, and continuing to rank first in the country. The tourism industry is a low-carbon industry, not a carbon-free industry, the rapid development of the tourism industry in Jiangsu Province, to a large extent, caused the environmental pollution of tourist attractions in Jiangsu Province to effectively improve the environmental governance of low-carbon tourist attractions in Jiangsu Province, the Jiangsu provincial government in the development of the tourism industry at the same time, gradually strengthened the management of ecological pollution in the tourist attractions, greatly improving the environment of the scenic area, and promoting the enhancement of environmental governance effect of the scenic area (Wang et al. 2024). With the rapid development of China's social economy and the rising trend of residents' disposable income, the development of the low-carbon tourism industry in China's provinces has gradually become the direction of China's future industrial development, and the full use of the low-carbon industry to promote economic development not only reflects the demand for the low-carbon development but also reflects the gradual enhancement of residents' leisure life (Huang et al. 2023). Jiangsu Province is a major tourism province in China, and making full use of low-carbon tourism to promote Jiangsu's economic development is an effective strategic approach. Currently, China is facing the strategic pressure of realizing the "double-carbon" goal, and prioritizing the development of low-carbon and carbon-free industries is a strategic choice for the future sustainable development of Jiangsu Province. Therefore, in this case, it is of great importance and urgency to explore the comprehensive assessment method and its application of the effect of low-carbon tourism environmental pollution governance in Jiangsu Province and to make full use of the results of the assessment of the effect of low-carbon tourism environmental pollution governance in Jiangsu Province, which can be used to judge the degree of influence of the development of the tourism industry on the economic development of Jiangsu Province.

The research on the assessment of environmental pollution governance effect Overseas and domestically began in the early 21st century, New Zealand scholars Becken and Patterson (2006) studied the statistical methods of carbon emissions from energy consumption and explored effective ways to save energy and reduce emissions; American scholars Fawkes (2007) studied the carbon emissions generated by space tourism and the pollution of the space environment; Scott et al. (2016) scholars from the University of Waterloo, Canada, studied the impact of the Paris Climate Change Agreement on the international tourism industry, focusing on the risk assessment of climate policies in developed countries, and exploring the importance of low-carbon tourism as well as the promotion of the development of a low-carbon economy; Reis and Tavoni (2023) studied the impact of Glasgow's commitments on the Paris Climate Agreement from Glasgow to Paris; Mian et al. (2024) analyzed the relationship between the global environment, society, and governance, and developed a three-stage approach based on the analysis results. The results indicate that the importance of environmental components is about 5-14% higher than that of social and governance components, the relative importance of design, service life, and material procurement projects is about 14-20%, and the importance of water and air pollution risks is about 34-38% higher than that of solid waste. The results of this study provide a basis for developing ESG standards.

Li et al. (2012), taking studied the carbon footprint assessment and influencing factors of the transportation system of tourist attractions as an example of Hengshan Tourism in China and explored the path of energy saving and emission reduction in China's tourism industry; Xiao et al. (2015) studied the regional variability of carbon dioxide emissions from the tourism industry as well as the assessment of emission reduction effects as an example of the Golden Triangle of Zhoushan Putuo Tourism in Zhejiang Province; Zhu (2018) studied the development of a greenhouse gas management assessment system for textile enterprises, and made full use of the developed assessment system to control the greenhouse gas effect of textile enterprises in an effective way. On September 22, 2020, President Xi Jinping released the "dual-carbon". On September 22, 2020, President Xi Jinping announced to the world at the 75th session of the United Nations General Assembly the "dual-carbon" goal, promising to achieve "carbon peaking" by 2030 and "carbon neutrality" by 2060. So far, assessing the effect of carbon emission and environmental pollution governance in China's provincial areas has gradually shifted to comprehensive, high-quality development. Liu and Sunhee (2021) studied the assessment index system of China's low-carbon tourism area, taking the Daxinganling area in China as an example, and assessed the environmental quality status of Daxinganling Low-Carbon Tourism Area; Ye and Li (2022) studied the assessment index system of low-carbon tourism development in the countryside based on the sustainable calculation. Low-carbon tourism development assessment index system construction and its application, exploring the development performance assessment issues of rural tourism in China; Cao et al. (2023) studied the sustainable tourism-driven promotion strategy and dynamic assessment model of traveler satisfaction after the Xin Guan epidemic, comprehensively assessing the tourism performance issues of the development status of low-carbon tourism; Liu et al. (2024) utilized a big data analysis method to empirically examined the carbon emission efficiency of China's transportation system and its influencing factors, and identified the main driving factors affecting China's transportation carbon emissions; Zhou et al. (2024) assessed the effectiveness of air

pollution governance in 9181 enterprises in seven major cities in China's Beijing Tianjin Hebei region based on basic data from 2017. They concluded that this region's air pollution governance effect meets the national second level standard, with air pollution losses ranging from 8.4-199 billion yuan.

From the results of the above literature analysis, it is obvious that along with the sustainable development of China's low-carbon tourism industry, the tourism market in Jiangsu Province has gradually shifted to a combination of low-carbon tourism, green transformation, eco-efficiency, and high-quality development, and the assessment of the effect of the quality of environmental pollution in Jiangsu Province's low-carbon tourism has developed in the direction of multi-indicator as well as complex model construction and application (Qin et al. 2024). To realize the expected research objectives, according to the literature review, drawing on the latest research results, energy consumption is fully considered in the research process (Wu et al. 2024). Taking low-carbon tourism in Jiangsu Province as an example, we fully utilize the basic data of low-carbon tourism in Jiangsu Province, integrating low-carbon constraints, "dual carbon goals", and high-quality development into the comprehensive assessment process of the environmental pollution quality effect of low-carbon tourism in Jiangsu Province. Based on comprehensive analysis, we explore the comprehensive assessment method of the environmental pollution governance effect of low-carbon tourism in Jiangsu Province and policy recommendations for continuously improving the development environment and enhancing the comprehensive effect of low-carbon tourism environmental pollution governance.

## **2. Materials and Methods**

### **2.1. Data sources and research ideas**

This paper takes low-carbon tourism in Jiangsu Province as the research object, based on the actual situation of low-carbon tourism in Jiangsu Province, draws on the latest comprehensive assessment indexes and methods for the effect of environmental pollution governance in tourism areas in the academic world, and selects a total of 26 comprehensive assessment indexes in five categories for assessing the effect of environmental pollution governance in Jiangsu Province's low-carbon tourism based on a comprehensive analysis, utilizing statistical data provided by the National Bureau of Statistics of China as well as by the governments of Jiangsu Province at two levels. The environmental pollution governance effect of low-carbon tourism in Jiangsu Province is assessed as a whole, and using the statistical data provided by the government, the assessment object is divided into nine annual comprehensive assessment cycles from 2013-2021, and the comprehensive assessment results of each cycle are used to reflect the development trend of the environmental pollution governance effect of low-carbon tourism in Jiangsu Province (Si & Tang 2024). The basic data used in this study come from the national and provincial Statistical Yearbook, Bulletin of Ecological Environment Condition, Energy Statistical Yearbook, Urban Statistical Yearbook, and the Statistical Bulletin of Culture and Tourism Development, etc. Since some statistics for 2022 are not yet available, the data cycle of this paper ends in 2021 for the validity of the research results. Comprehensive assessment of the effect of low-carbon tourism environmental pollution governance in Jiangsu Province is a very complex research topic, to improve the effectiveness of assessment of the effectiveness of the assessment, indicators need to be constructed to assess the affiliation function and the comprehensive assessment model, and sometimes need to estimate or amend the parameters of the affiliation function and the assessment model. According to the research objectives and assessment requirements, the basic idea of this paper is shown in Figure 1.

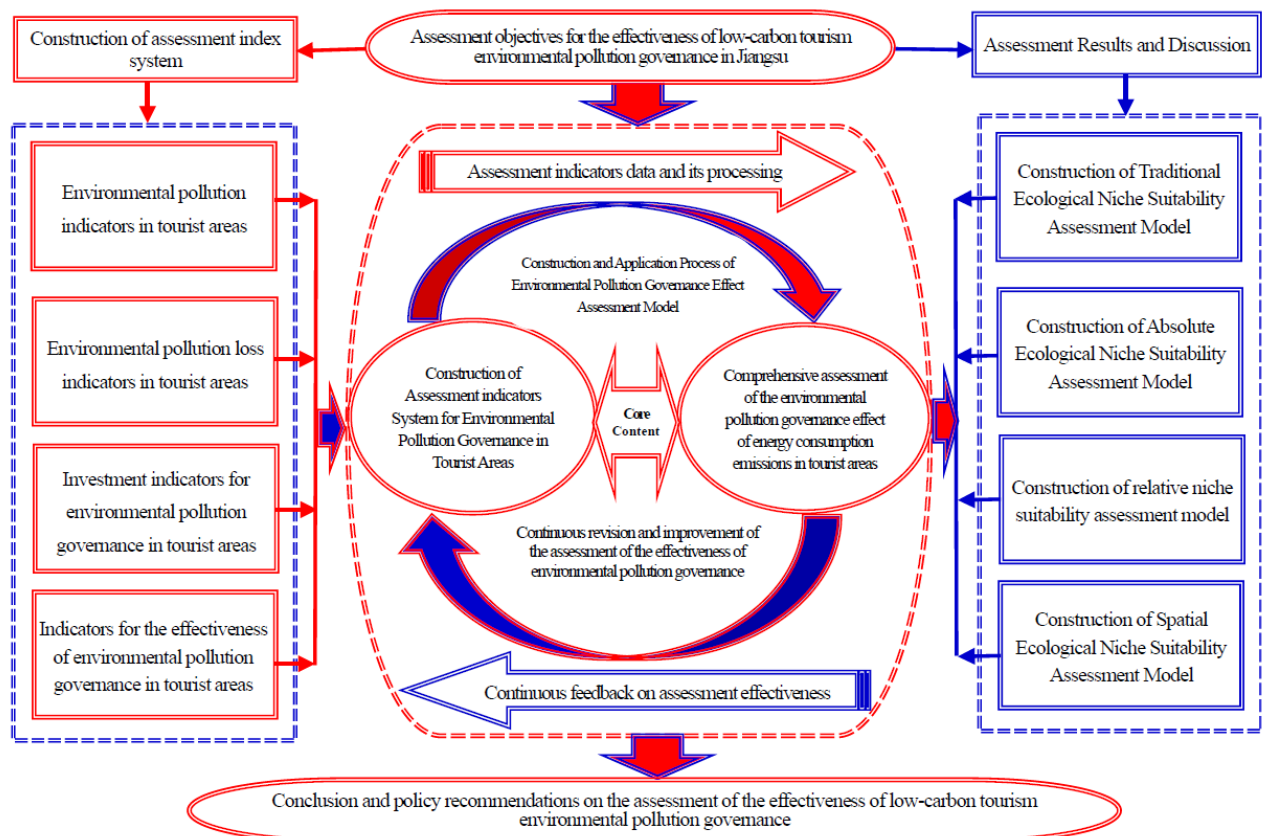


Fig. 1. Overall framework diagram of the research idea in this paper

## 2.2. Assessment index system for the effect of environmental pollution governance in low-carbon tourism

To effectively assess the environmental pollution governance effect of low-carbon tourism pollutant emissions from energy consumption in Jiangsu Province, the authors, based on a comprehensive analysis, took low-carbon tourism in Jiangsu Province as the research object and chose a total of 26 assessment indexes in four categories, such as environmental pollution pressure, intensity of environmental pollution losses, environmental pollution governance inputs, and environmental pollution governance performance, etc., and constructed a comprehensive assessment of the environmental pollution governance effect of carbon emissions from energy consumption in low-carbon tourism in Jiangsu Province. Indicator system. This comprehensive assessment index system can comprehensively reflect the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption in Jiangsu Province and also reflect the future development trend of the high-quality development of the low-carbon tourism ecological environment in Jiangsu Province. In fact, there is no essential difference between the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption and the high-quality development of low-carbon tourism ecological environment, the former emphasizes the process of artificial restoration of the environmental pollution governance effect after the pollution of low-carbon tourism energy consumption and carbon emission, while the latter emphasizes the process of self-automatic ecological restoration of low-carbon tourism carbon emission from In fact, there is no essential difference between the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption and the high-quality development of low-carbon tourism ecological environment, the former emphasizes the process of artificial restoration of the environmental pollution governance effect after the pollution of low-carbon tourism carbon emission from In fact, there is no essential difference between the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption and the high-quality development of low-carbon tourism ecological environment, the former emphasizes the process of artificial restoration of the environmental pollution governance effect after the pollution of low-carbon tourism energy consumption and carbon emission, polluted areas relying on ecological restoration to make them realize self-automatic ecological restoration (Li et al. 2014). The assessment of environmental pollution governance effect of low-carbon tourism carbon emission from In fact, there is no essential difference between the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption and the high-quality development of low-carbon

tourism ecological environment; the former emphasizes the process of artificial restoration of the environmental pollution governance effect after the pollution of the low-carbon tourism carbon emission from energy consumption, in Jiangsu Province emphasizes the process of enhancing the effect of man-made management after environmental pollution, and the specific assessment index system is shown in Table 1.

**Table 1.** Comprehensive assessment indicators system of environmental pollution governance effect for low-carbon tourism emissions

Target level	Standardized layer	Measure level (e.g., insurance against fraud)	Unit (of measure)	Nature of the indicator
Comprehensive assessment indicators system for environmental pollution governance effect of low-carbon tourism emissions from energy consumption	Environmental Pollution Pressure Indicators ( $X_1$ )	CO <sub>2</sub> Emission concentration ( $X_{11}$ )	ppm	contrarian indicator
		SO <sub>2</sub> Emission concentration ( $X_{12}$ )	ug/m <sup>3</sup>	contrarian indicator
		NO <sub>x</sub> emission concentration ( $X_{13}$ )	ug/m <sup>3</sup>	contrarian indicator
		CO emission concentration ( $X_{14}$ )	mg/m <sup>3</sup>	Positive indicators
		PM emission concentrations ( $X_{15}$ )	ug/m <sup>3</sup>	contrarian indicator
		OP emission concentration ( $X_{16}$ )	ug/m <sup>3</sup>	contrarian indicator
		Composite pollution index for tourist areas ( $X_{17}$ )	exponents	contrarian indicator
	Environmental Pollution Loss Intensity Indicator ( $X_2$ )	CO <sub>2</sub> Emission loss intensity ( $X_{21}$ )	Yuan/person	contrarian indicator
		SO <sub>2</sub> Emission loss intensity ( $X_{22}$ )	Yuan/person	contrarian indicator
		NO <sub>x</sub> emission loss intensity ( $X_{23}$ )	Yuan/person	contrarian indicator
		CO emission loss intensity ( $X_{24}$ )	Yuan/person	Positive indicators
		PM emission loss intensity ( $X_{25}$ )	Yuan/person	contrarian indicator
		OP emission loss intensity ( $X_{26}$ )	Yuan/person	contrarian indicator
	Environmental pollution governance input indicators ( $X_3$ )	Percentage of investment in EPG ( $X_{31}$ )	%	Positive indicators
		Share of investment in fixed assets in tourism ( $X_{32}$ )	%	Positive indicators
		Scenic service staff input intensity ( $X_{33}$ )	%	Positive indicators
		Environmental pollution loss rate ( $X_{34}$ )	%	contrarian indicator
		Tourism Resource Abundance Index ( $X_{35}$ )	%	Positive indicators
		Tourist attraction reputation ( $X_{36}$ )	%	Positive indicators
		Energy intensity ( $X_{37}$ )	SC/Million	contrarian indicator
	Environmental pollution governance Performance Indicators ( $X_4$ )	Tourism income per capita ( $X_{41}$ )	10000 Yuan	Positive indicators
		Loss ratio of pollutant emissions from tourism ( $X_{42}$ )	%	contrarian indicator
		Air quality index for tourist areas ( $X_{43}$ )	exponents	contrarian indicator
		Landscape index of tourist areas ( $X_{44}$ )	exponents	Positive indicators
		Average greening rate in tourist areas ( $X_{45}$ )	%	Positive indicators
		Low-carbon tourism identity in tourist areas ( $X_{46}$ )	%	Positive indicators

EPG: environmental pollution governance

The concentration of the six pollutants included in the environmental pollution pressure index in Table 1 determines the pollution status of the tourist area to a large extent, and here is the average value of the air quality statistics of the main scenic spots in Jiangsu Province selected following China's "Ambient Air Quality Standard GB3095-2012". The comprehensive pollution index of the tourist area adopts the weighted average of the air pollution index of the scenic area, the soil pollution index of the scenic area and the surface water pollution index of the scenic area announced by the government, and the weights are selected as natural numbers: 3,2,1; the environmental pollution loss intensity of the six types of pollutants of the environmental pollution loss intensity adopts the ratio of the amount of the accounted pollution loss to the total number of domestic tourists in the corresponding area, reflecting the pollutant emission caused by an average of one tourist. The amount of economic loss; the four tourism input volume share indicators in the environmental pollution governance input indicators are all ratios to the total tourism revenue of the corresponding region, and the environmental pollution loss share is the ratio of the calculated economic loss of all pollutants to the total tourism revenue of the corresponding region, and the tourism resource abundance index is the weighted average of the number of scenic spots of three stars or above in the calendar year of each region, calculated with the year 2013 as the base period, to the number of scenic spots of star ratings of the same caliber in the base period. An expert survey determines the reputation of tourist attractions, and its value range is [0,1]. A value

close to 1 indicates an increase in reputation. The per capita tourism income in environmental pollution governance performance is determined by the ratio of the annual total tourism revenue in the region to the resident population at the end of the period in the region. The ratio of tourism pollutant emission loss rate adopts the ratio between the calculated regional pollutant emission loss amount and the total tourism income of the region; the air quality index of the tourism area adopts the modified value of the air quality index of the scenic area published by the local government departments; the landscape index of the scenic area adopts the average of the landscape index of the scenic area of more than three stars published by the local government; the average greening rate of the tourism area adopts the weighted average of the greening rate of the scenic area of more than three stars published by the local government, and the weights for the star scenic area are taken as 3,4,5; the degree of recognition of the tourism area as a low-carbon tourist According to the results of the questionnaire survey to determine the same rating, the value domain is [0,100].

### 2.3. Assessment model construction of the environmental pollution governance effect in low-carbon tourism

To realize an effective assessment of the environmental pollution governance effect of low-carbon tourism emissions from energy consumption in Jiangsu Province, based on comprehensive analysis, combined with the nature and characteristics of the assessment object, this paper chooses the ecological niche suitability model, refers to the spatial and temporal position of different individuals or populations in their own populations or communities in the original environment and their functional relationships. It is the ecological minimum threshold necessary for the survival of each organism in an ecosystem. The concept of ecological niche was first proposed by the British animal ecologist Charles Elton in 1927. If we use  $x_i$  to denote an ecological factor, and  $X$  denotes the set of ecological factors, we have:  $X = \{x_1, x_2, \dots, x_n\}$ . If there are  $m$  regions, then within this territory consisting of  $m$  regions, a geographical area of  $m \times n$  dimensional matrix of ecological factors exists. Suppose there are ecological factors in an ecological region, if there are  $m$  regions, then the ecological factors within different regions form a  $m \times n$ -dimensional matrix of ecological factors, and if EFM denotes this matrix. If this matrix is denoted by, then there are:

$$EFM = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x & x & \cdots & x \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{pmatrix} \quad (1)$$

In the above equation,  $x_{ij}$  denotes the first  $i$  region and the  $j$  quantitative value of the ecological factor. The time factor was introduced and denoted by  $t$  to calculate the ecological niche suitability. The ecological factors in the matrix are normalized at the time, and the result after the processing is denoted by  $x'_{ij}$ . In the matrix of ecological factors after normalization, the ecological factors in the matrix are denoted by  $minx'_{ij}$  denotes the minimum value of the ecological factor in the first  $i$ . The minimum value of the ecological factor in the region is denoted by  $maxx'_{ij}$ , which denotes the minimum value of the ecological factor in the region  $i$ . The maximum value of the ecological factor in the region is denoted by  $\delta_{it}$  denotes the maximum value of the ecological factor in the region, and  $x'_i(t)$  with the ratio of  $|maxx'_i(t) - minx'_i(t)|$  ratio of the ecological factor in the region, denote the minimum value of the ecological factor in the region by  $\delta_{min}$  denotes the minimum value of the ecological factor in the region, and  $n$  is the number of ecological factors.  $\delta_{max}$  denotes the maximum value of it,  $n$  is the number of ecological niche factors, and  $S_t$  is the ecological niche suitability. Then there is:

$$S_t = \frac{1}{n} \sum_{i=1}^n \frac{\delta_{min} + \gamma \delta_{max}}{\delta_{it} + \gamma \delta_{max}} = \frac{1}{n} \sum_{i=1}^n \frac{\min \{ |x'_i(t) - x'_i(\alpha)| \} + \max \gamma \{ |x'_i(t) - x'_i(\alpha)| \}}{|x'_i(t) - x'_i(\alpha)| + \max \gamma \{ |x'_i(t) - x'_i(\alpha)| \}} \quad (2)$$

in the formula:  $x'_i(\alpha)$  is the  $i$  the most suitable value of the normalized ecological behavior factor in the region, because the normalization transforms the reverse indicator into a positive indicator, so it is generally chosen  $maxx'_i(t)$  as the most suitable value, other optimal values can also be determined according to the criteria.  $\gamma$  is the model parameter ( $0 \leq \gamma \leq 1$ ). The model (2) is often called the traditional ecological niche suitability model. Based on the traditional ecological niche suitability model, this paper constructs the absolute ecological niche suitability model, the relative ecological niche suitability model, and the spatial suitability model, which are used to assess the effect of environmental pollution governance of the low-carbon tourism emissions from energy consumption in Jiangsu Province. Suppose the assessment indicators of the low-carbon tourism emissions from energy consumption environmental pollution governance effect in Jiangsu Province are regarded as ecological factors. In that case, the time series of each ecological region assessment indicator can be expressed as:  $X = \{x_{i1}, x_{i2}, \dots, x_{it}\}$ , where  $i$  is the ecological area ( $i = 1, 2, \dots, m$ );  $t$  is the year sequence of the

assessment indicators ( $t = 1, 2, \dots, n$ ). The assessment indicators, comparable and easy to calculate, are required to effectively assess the environmental pollution governance effect of the low-carbon tourism emissions from energy consumption in Jiangsu Province. Drawing on the practice of Han Xiuyan and Cao Tianyi (2021), it is necessary to normalize the basic data. The specific normalization formula is as follows:

$$\begin{cases} X'_{it} = x_{it} \cdot (\max x_{it})^{-1} \\ X'_{it} = 1 - x_{it} \cdot (\max x_{it})^{-1} \end{cases} \quad (3)$$

In the formula  $X'_{it}$  is the  $i$ -th indicator, the original or standard value in the  $t$ -th year,  $\max$  is the maximum value among them; the optimal value of the  $\alpha$  is the optimal value of the factor, when the optimal value of the assessment indicator is  $X'_{i\alpha}$ , and  $X'_{i\alpha}$  is the dimensionless optimal value of the  $i$  dimensionless optimal value of the assessment index. Therefore, when the assessment index is the optimal value, the result of the dimensionless processing of the index can be calculated using the following formula:

$$\begin{cases} X'_{i\alpha} = x_{i\alpha} \cdot (\max x_{i\alpha})^{-1} \\ X'_{i\alpha} = 1 - x_{i\alpha} \cdot (\max x_{i\alpha})^{-1} \end{cases} \quad (4)$$

After the dimensionless processing, the assessment indicators have a comparable nature, but more importantly, the reverse assessment indicators are transformed into positive indicators, making the nature of the assessment indicators have homogeneity. On this basis, the spatial ecological niche suitability model can be constructed by using the results of the dimensionless assessment indicators. The spatial ecological habitat suitability model is the weighted average of the absolute ecological habitat suitability model and the relative suitability model, so the absolute ecological habitat model is constructed first. To construct the absolute ecological habitat suitability assessment model, it is necessary to "zero-image" the assessment indicators. According to the principle of null transformation, the absolute null transformation result is calculated, and the specific formula is as follows:

$$\begin{cases} X'_{it}(0) = X'_{it} - X'_{it} \\ X'_{i\alpha}(0) = X'_{i\alpha} - X'_{i\alpha} \end{cases} \quad (5)$$

Absolute null conversion value is the use of the assessment of the matrix of indicators in the rows minus the first row of the assessment of the value of the indicators after the difference because the first row since the reduction of the remaining difference are zero, because the absolute difference forms these zero values, so it is called "null conversion" or "zero conversion". If you use  $AS_{i\alpha}$  absolute ecological niche assessment value, when the assessment indicator is a discrete variable, then there are:

$$AS_{i\alpha} = \frac{I + |S_{\alpha}| + |S_t|}{I + |S_{\alpha}| + |S_t| + |S_{\alpha} - S_t|} \quad (6)$$

When the assessment index is a continuous function, you can use the integral to solve for the area enclosed by the continuous function or take the absolute value if the integral sought is negative. The specific solution formula is as follows:

$$\begin{cases} S_t = \int_1^n (X'_{it}(0) - X'_{it}(0)) dt \\ S_{\alpha} = \int_1^n (X'_{i\alpha}(0) - X'_{i\alpha}(0)) dt \\ S_t - AS_{\alpha} = \int_1^n (X'_{it}(0) - X'_{i\alpha}(0)) dt \end{cases} \quad (7)$$

Equation 7 is the absolute ecological niche suitability model constructed in this paper. The relative ecological niche suitability model can be constructed using the same method. Firstly, the relative null conversion is carried out, and the specific conversion formula is as follows:

$$\begin{cases} X''_{it}(0) = \frac{(x''_{mt})}{(x''_{1t})} - 1 \\ X''_{i\alpha}(0) = \frac{(x''_{m\alpha})}{(x''_{1\alpha})} - 1 \end{cases} \quad (8)$$

The relative null transformed value is the difference between each row of the matrix of assessment indicators compared to the value of the assessment indicator in the first row minus one. Since the values of the indicators in the first row are converted to zero by relative null conversion, they are called "relative null conversion" or "relative null conversion". If we use  $RS_{i\alpha}$  to represent the relative ecological niche assessment value, when the assessment indicator is a discrete variable, then there are:

$$RS_{i\alpha} = \frac{I + |S'_\alpha| + |S'_i|}{I + |S'_\alpha| + |S'_i| + |S'_\alpha - S'_i|} \quad (9)$$

$$\begin{cases} |S'_i| = \left| \sum_{k=2}^{m-l} X''_{ki}(0) + \frac{I}{2} X''_{mi}(0) \right| \\ |S'_\alpha| = \left| \sum_{k=2}^{m-l} X''_{k\alpha}(0) + \frac{I}{2} X''_{m\alpha}(0) \right| \\ |S'_i - S'_\alpha| = \left| \sum_{k=2}^{n-l} (X''_{k\alpha}(0) - X''_{ki}(0)) + \frac{I}{2} (X''_{m\alpha}(0) - X''_{mi}(0)) \right| \end{cases}$$

As with the absolute ecological niche model, when the assessment metrics are continuous functions, the integral can be used to solve for the area enclosed by the continuous function. If the integral sought is negative, it is still necessary to take the absolute value. The exact formula for solving is as follows:

$$\begin{cases} S'_i = \int_l^n (X''_{ii}(0) - X''_{il}(0)) dt \\ S'_\alpha = \int_l^n (X''_{i\alpha}(0) - X''_{il}(0)) dt \\ S'_i - RS'_\alpha = \int_l^n (X''_{ii}(0) - X''_{i\alpha}(0)) dt \end{cases} \quad (10)$$

Equation (10) is the relative ecological niche suitability model constructed in this paper. Suppose we use  $SS_{i\alpha}$  to denote the spatial ecological niche suitability model and  $\xi$  denote the adjustment coefficient of the absolute ecological niche suitability model and relative suitability model, in that case the spatial ecological niche assessment model can be expressed as follows:

$$SS_{i\alpha} = \xi AS_{i\alpha} + (I - \xi) RS_{i\alpha} \quad (11)$$

## 2.4. Develop assessment standards for the environmental pollution governance effect

According to the national "air quality standard GB3095-2012", "soil environmental quality standard GB15618-2018", "surface water quality standard GB3838-2020" and the relevant provisions of Jiangsu tourism environmental protection, this paper, based on a comprehensive analysis as well as drawing on the latest domestic and international research results, formulates the low-carbon tourism pollutant emissions from energy consumption in Jiangsu Province, the effect of environmental pollution governance Assessment standards for the assessment of low-carbon tourism environmental pollution status of the comprehensive assessment of the results of the judgment, the specific assessment criteria as shown in Table 2.

Since the environmental quality of low-carbon tourism scenic spots in Jiangsu Province is significantly better than that of cities with carbon emission pollution from energy consumption due to rapid economic development, this paper determines five levels of environmental quality indicators based on the national and Jiangsu Province's environmental quality grading standards and the latest research results at home and abroad when formulating the indicators for assessing the effectiveness of environmental pollution governance of low-carbon tourism emissions from energy consumption in Jiangsu Province. The five-level assessment standards are determined regarding the Chinese government-designated Air Quality Standard GB3095-2012, Soil Environmental Quality Standard GB15618-2018, Surface Water Quality Standard GB3838-2020, Chinese Hygienic Standard for Design of Industrial Enterprises GB15618-2018 and other standards for soil environmental quality soil pollution risk control standards for agricultural land (for trial implementation). Based on a comprehensive analysis of the above assessment standards, combined with the environmental pollution governance effect of low-carbon tourism emissions from energy consumption in Jiangsu Province, the assessment standards of the target layer are determined in Table 3.



**Table 2.** Assessment standards of environmental pollution governance for low-carbon tourism emissions from energy consumption

Serial number	Indicator name	Leve I	Level II	Level III	Level IV	Level V	Level VI
1	X <sub>11</sub>	0-300	300-350	350-400	400-450	450-500	>500
2	X <sub>12</sub>	0-20	20-30	30-40	40-50	50-60	>60
3	X <sub>13</sub>	0-30	30-40	40-50	50-60	60-70	>70
4	X <sub>14</sub>	0-3	3-5	5-8	8-10	10-15	>15
5	X <sub>15</sub>	0-40	40-55	55-70	70-85	85-100	>100
6	X <sub>16</sub>	0-45	45-60	60-75	75-90	90-110	>110
7	X <sub>17</sub>	0-50	50-100	100-150	150-200	200-300	>300
8	X <sub>21</sub>	0-5	5-7	7-10	10-20	20-30	>30
9	X <sub>22</sub>	0-3	3-5	5-7	7-10	10-15	>15
10	X <sub>23</sub>	0-2	2-3	3-5	5-7	7-10	>10
11	X <sub>24</sub>	0-3	3-5	5-7	7-10	10-15	>15
12	X <sub>25</sub>	0-3	3-5	5-7	7-10	10-15	>15
13	X <sub>26</sub>	0-2	2-3	3-5	5-7	7-10	>10
14	X <sub>31</sub>	>1.6	1.5-1.6	1.4-1.5	1.2-1.4	1-1.2	0-1
15	X <sub>32</sub>	>70	65-70	60-65	55-60	50-55	0-50
16	X <sub>33</sub>	>0.1	0.08-0.1	0.06-0.08	0.004-0.06	0.002-0.004	<0.002
17	X <sub>34</sub>	0-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9	>0.9
18	X <sub>35</sub>	95-100	90-95	80-90	70-80	60-70	0-60
19	X <sub>36</sub>	95-100	90-95	80-90	70-80	60-70	0-60
20	X <sub>37</sub>	0-1	1-1.05	1.05-1.1	1.1-1.15	1.15-1.2	>1.2
21	X <sub>41</sub>	>16	15-16	13-15	11-13	9-11	0-9
22	X <sub>42</sub>	0-0.5	0.5-0.75	0.75-1	1-1.25	1.25-1.5	>1.5
23	X <sub>43</sub>	0-50	50-100	100-150	150-200	200-300	>300
24	X <sub>44</sub>	95-100	90-95	80-90	70-80	60-70	0-60
25	X <sub>45</sub>	>75	70-75	60-70	50-60	40-50	<40
26	X <sub>46</sub>	95-100	90-95	80-90	70-80	60-70	0-60

**Table 3.** Assessment standards of environmental pollution governance effect for energy consumption emissions for the target layer

Assessment factor	0.90-1.00	0.8-0.90	0.7-0.8	0.6-07	0-0.6
Level of assessment	Leve I	Level II	Level III	Level IV	Level VI
Assessment results	talented	favorable	moderate	eligible (voter etc.)	substandard

Since the assessment criteria were determined with reference to the relevant criteria developed by the Chinese government above in Table 3, the research results of Han et al. (2021) and Han and Cao (2022) were also considered.

### 3. Results and Discussion

#### 3.1. Main findings

To assess the effect of low-carbon tourism emissions from energy consumption environmental pollution governance in Jiangsu Province, based on the calculation of the above indicators and the collection of government statistical data, according to the requirements of the assessment, the basic data information of the 26 assessment indicators for the period of 2013-2021 is organized and included in Table 4.

To effectively assess the management effect of environmental pollution of low-carbon tourism emissions from emissions in Jiangsu Province, it is necessary to carry out technical processing of the above basic data, and since the basic data collected in this paper has a good smoothness, it does not need to carry out buffer processing. The results of the standardized treatment of the basic data are detailed in Table 5.

**Table 4.** Basic data for comprehensive assessment' of low-carbon tourism environmental pollution governance effect in Jiangsu Province

Indicators	2013	2014	2015	2016	2017	2018	2019	2020	2021
X <sub>11</sub>	403.23	380.41	363.53	325.27	288.48	298.05	315.26	285.41	303.27
X <sub>12</sub>	30.26	28.51	29.17	27.91	28.46	30.41	31.85	29.48	30.58
X <sub>13</sub>	45.28	40.28	38.87	36.24	37.27	3.67	41.23	35.28	39.35
X <sub>14</sub>	3.32	3.27	2.87	3.24	3.27	37.67	4.23	2.28	3.35
X <sub>15</sub>	78.43	83.26	85.05	92.73	103.37	112.52	123.46	89.72	115.65
X <sub>16</sub>	115.46	105.47	102.35	89.38	86.26	76.36	78.26	65.26	70.21
X <sub>17</sub>	128.52	119.53	112.47	102.42	85.35	72.38	61.27	48.27	50.51
X <sub>21</sub>	5.26	5.53	5.74	5.88	6.01	6.21	6.47	5.65	6.32
X <sub>22</sub>	2.32	2.51	2.72	2.89	3.03	3.32	3.84	2.95	3.53
X <sub>23</sub>	1.04	1.42	1.73	1.84	1.93	2.16	2.45	1.87	2.32
X <sub>24</sub>	2.67	2.46	2.36	2.41	2.64	2.81	3.12	2.38	2.91
X <sub>25</sub>	3.08	2.85	2.74	2.82	2.88	3.05	3.16	2.91	3.11
X <sub>26</sub>	2.14	2.08	1.89	1.68	1.81	2.17	2.42	2.04	2.36
X <sub>31</sub>	1.39	1.42	1.45	1.49	1.53	1.59	1.62	1.41	1.57
X <sub>32</sub>	62.27	64.45	66.73	68.91	70.26	71.37	73.48	70.45	74.51
X <sub>33</sub>	0.0896	0.0907	0.0924	0.0982	0.1014	0.1021	0.1052	0.1062	0.1079
X <sub>34</sub>	0.71	0.74	0.68	0.52	0.37	0.28	0.26	0.33	0.27
X <sub>35</sub>	92.38	93.57	94.53	95.61	96.37	96.63	96.86	93.56	95.77
X <sub>36</sub>	95.32	94.51	93.27	92.45	93.89	94.35	95.52	92.68	96.18
X <sub>37</sub>	0.95	0.93	0.91	0.94	0.97	1.01	1.03	0.96	1.02
X <sub>41</sub>	15.52	15.74	15.85	15.93	16.08	16.17	16.31	15.85	16.21
X <sub>42</sub>	0.61	0.57	0.55	0.53	0.49	0.47	0.45	0.52	0.51
X <sub>43</sub>	120.21	116.26	108.27	101.27	79.28	68.28	50.26	53.38	58.38
X <sub>44</sub>	92.56	93.15	93.91	94.36	95.26	95.92	96.38	93.47	95.85
X <sub>45</sub>	73.23	73.89	74.03	74.32	74.72	75.16	75.48	75.36	75.24
X <sub>46</sub>	91.27	92.34	93.27	94.52	94.92	95.24	95.574	93.41	94.86

**Table 5.** Standardization results of comprehensive assessment data

Indicators	2013	2014	2015	2016	2017	2018	2019	2020	2021
X <sub>11</sub>	0.8387	0.8478	0.8546	0.8699	0.8846	0.8808	0.8739	0.8858	0.8787
X <sub>12</sub>	0.8991	0.9050	0.9028	0.9070	0.9051	0.8986	0.8938	0.9017	0.8981
X <sub>13</sub>	0.8706	0.8849	0.8889	0.8965	0.8935	0.9895	0.8822	0.8992	0.8876
X <sub>14</sub>	0.9262	0.9273	0.9362	0.9280	0.9273	0.1629	0.9060	0.9493	0.9256
X <sub>15</sub>	0.8431	0.8335	0.8299	0.8145	0.7933	0.7750	0.7531	0.8206	0.7687
X <sub>16</sub>	0.7901	0.8082	0.8139	0.8375	0.8432	0.8612	0.8577	0.8813	0.8723
X <sub>17</sub>	0.8715	0.8805	0.8875	0.8976	0.9147	0.9276	0.9387	0.9517	0.9495
X <sub>21</sub>	0.9839	0.9826	0.9796	0.9759	0.9722	0.9716	0.9698	0.9745	0.9705
X <sub>22</sub>	0.9825	0.9816	0.9809	0.9804	0.9800	0.9793	0.9784	0.9812	0.9789
X <sub>23</sub>	0.9825	0.9816	0.9809	0.9804	0.9800	0.9793	0.9784	0.9812	0.9789
X <sub>24</sub>	0.9985	0.9983	0.9982	0.9981	0.9980	0.9978	0.9974	0.9980	0.9976
X <sub>25</sub>	0.9896	0.9858	0.9827	0.9816	0.9807	0.9784	0.9755	0.9813	0.9768
X <sub>26</sub>	0.9795	0.9810	0.9817	0.9812	0.9808	0.9797	0.9789	0.9806	0.9793
X <sub>31</sub>	0.8688	0.8875	0.9063	0.9250	0.9438	0.9688	0.9750	0.8813	0.9563
X <sub>32</sub>	0.8535	0.8737	0.9192	0.9545	0.9242	0.8990	0.9141	0.8485	0.8889
X <sub>33</sub>	0.8087	0.8370	0.8666	0.8949	0.9125	0.9269	0.9543	0.9149	0.9677
X <sub>34</sub>	0.8145	0.8245	0.8400	0.8927	0.9218	0.9282	0.9564	0.9655	0.9809
X <sub>35</sub>	0.9593	0.9627	0.9673	0.9693	0.9660	0.9547	0.9580	0.9633	0.9593
X <sub>36</sub>	0.9238	0.9357	0.9453	0.9561	0.9637	0.9663	0.9686	0.9356	0.9577
X <sub>37</sub>	0.9532	0.9451	0.9327	0.9245	0.9389	0.9435	0.9552	0.9268	0.9618
X <sub>38</sub>	0.9208	0.9225	0.9242	0.9217	0.9192	0.9158	0.9142	0.9200	0.9150
X <sub>41</sub>	0.8818	0.8943	0.9006	0.9051	0.9136	0.9188	0.9267	0.9006	0.9210
X <sub>42</sub>	0.9593	0.9620	0.9633	0.9647	0.9673	0.9687	0.9700	0.9653	0.9660
X <sub>43</sub>	0.8664	0.8708	0.8797	0.8875	0.9119	0.9241	0.9442	0.9407	0.9351
X <sub>44</sub>	0.9256	0.9315	0.9391	0.9436	0.9526	0.9592	0.9638	0.9347	0.9585
X <sub>45</sub>	0.8876	0.8956	0.8973	0.9008	0.9057	0.9110	0.9149	0.9135	0.9120
X <sub>46</sub>	0.9127	0.9234	0.9327	0.9452	0.9492	0.9524	0.9557	0.9341	0.9486

According to the normalization results of the basic data in Table 5, it is possible to use the research design and the integrated assessment model to carry out the assessment and determine the specific assessment results of the assessment object. According to the research design, the assessment method in this paper can realize a two-level assessment of the effectiveness of environmental pollution governance of low-carbon tourism's emissions from energy consumption, i.e., target-level assessment and criterion-level assessment. This chapter only studies the comprehensive assessment at the target level. Limited to space, the absolute zero conversion calculation of the data and the relevant table of the relative zero conversion calculation are attached as tables. According to the ecological niche assessment model, the integrated assessment was conducted using the data after the technical processing of the 26 assessment indicators. On this basis, the three ecological suitability assessment models (6), (9), and (11) are used to comprehensively assess the effect of low-carbon tourism carbon emissions from energy consumption in Jiangsu Province and the specific calculation process of the three ecological suitability assessment models and the corresponding calculation results are listed in Table 6.

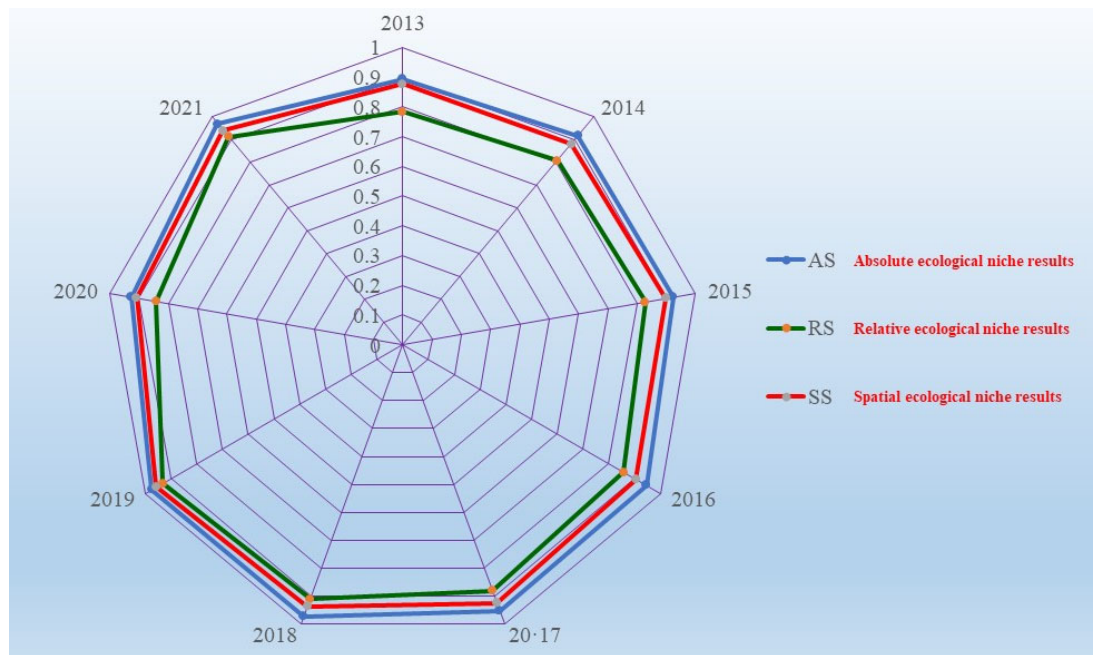
**Table 6.** Comprehensive assessment results of the pollution governance effect of low-carbon tourism environment in Jiangsu Province

Methodologies	Norm	2013	2014	2015	2016	2017	2018	2019	2020	2021
$AS_{ta}$	$ S_t $	2.2283	2.2805	2.3437	2.4442	2.4613	2.5111	2.5675	2.2181	2.5275
	$ S'_\alpha - S'_t $	0.2903	0.2919	0.3219	0.2997	0.2772	0.2598	0.2549	0.3077	0.2829
	$1+ S'_\alpha + S'_t $	4.3712	4.6347	5.3218	5.5449	5.6114	5.8198	6.0681	4.8765	6.1020
	$I+ S'_\alpha + S'_t + S'_\alpha-S'_t $	4.8878	5.0503	5.7689	5.8645	5.8863	5.9862	6.232	5.2594	6.292
	Assessment factor	0.8943	0.9177	0.9225	0.9455	0.9533	0.9722	0.9737	0.9272	0.9698
	Level of assessment	II	I	I	I	I	I	I	I	I
$RS_{ta}$	$ S_t $	2.3377	2.3631	2.4151	2.486	2.5162	2.5932	2.6113	2.3530	2.6530
	$ S'_\alpha - S'_t $	0.3076	0.2859	0.2804	0.2615	0.2414	0.2358	0.2291	0.3343	0.2727
	$1+ S'_\alpha + S'_t $	4.7212	4.7462	4.9870	5.2826	5.5223	5.8194	6.1040	5.6325	6.1696
	$I+ S'_\alpha + S'_t + S'_\alpha-S'_t $	6.0196	5.8697	6.0178	6.1669	6.2696	6.3893	6.5487	6.6871	6.7671
	Assessment factor	0.7843	0.8086	0.8287	0.8566	0.8808	0.9108	0.9321	0.8423	0.9117
	Level of assessment	III	II	II	II	II	I	I	II	I
$SS_{ta}$	$AS_{ta}$	0.8731	0.8980	0.9114	0.9212	0.9309	0.9399	0.9465	0.9061	0.9281
	$RS_{ta}$	0.8682	0.8886	0.9087	0.9166	0.9228	0.9308	0.9411	0.9021	0.9213
	$\xi$	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Assessment factor	0.8770	0.8811	0.8983	0.9060	0.9239	0.9369	0.9573	0.9084	0.9401
	assessment level	II	II	I	I	I	I	I	I	I

The above comprehensive assessment of the effect of low-carbon tourism environmental pollution governance in Jiangsu province was obtained. In fact, the comprehensive assessment model of spatial ecological niche suitability is the weighted average of the comprehensive assessment model of absolute ecological niche suitability and the comprehensive assessment model of relative suitability, and the final comprehensive assessment result of spatial ecological niche suitability depends on the size of the relative weights  $\xi$ . According to the spatial ecological location suitability assessment model principle,  $\xi \in [0,1]$ . When  $\xi \rightarrow 0$   $SS_{ta} \rightarrow RS$ ; when  $\xi \rightarrow 1$   $SS_{ta} \rightarrow AS$ . In the comprehensive assessment of the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption, the value of  $\xi$  can be adjusted to realize the adjustment of the comprehensive assessment results of spatial ecological niche suitability.

### 3.2. Discussion of the results of the comprehensive assessment

A comprehensive assessment of the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption in Jiangsu Province is a very complicated work. This paper combines the actual situation of low-carbon tourism in Jiangsu Province, draws on the latest research results at home and abroad, and carries out a comprehensive assessment of the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption in Jiangsu Province by reconstructing the spatial ecological niche suitability model and utilizing the comprehensive assessment method system designed above. To analyze the pattern of the assessment results and its problems, effective improvement strategies are formulated based on the analysis results. The comprehensive effect assessment results of low-carbon tourism environmental pollution governance at the guideline level are drawn in the right-angled coordinate system, and the specific rule of change and its interrelationship are detailed in Figure 2.



**Fig. 2.** The Relationship of the Assessment Results of Low carbon tourism environmental pollution governance in Jiangsu Province

From the assessment results in Figure 2, it can be clearly seen that the spatial niche suitability assessment results have a correction feature between the absolute niche suitability assessment results and the relative niche suitability assessment results, reflecting the advantages of the two assessment models of absolute niche suitability and relative niche suitability.

### 3.3. Discussion on the Differences in Assessment Results of Different Assessment Methods

This paper uses three ecological niche suitability assessment models to assess the environmental pollution governance effect of low-carbon tourism energy consumption emissions in Jiangsu Province. Based on the assessment results of the three ecological niche suitability assessment models, it can be seen that there are certain differences in the assessment results of different ecological niche suitability assessment models. According to the assessment results of absolute ecological suitability, the assessment results of the environmental pollution governance effect of carbon emission of low-carbon tourism from energy consumption in Jiangsu Province, the comprehensive assessment coefficient in 2013 is 0.8943, and the environmental pollution governance effect of energy consumption emission was level II; the assessment coefficient of the environmental pollution governance effect of carbon emission of low-carbon tourism from energy consumption in Jiangsu Province in 2021 is 0.9698, and the environmental pollution governance effect of energy consumption emission was level I. The assessment results of the environmental pollution governance effect of carbon emission of low-carbon tourism from energy consumption in Jiangsu Province in 2013 are as follows: level I. According to the assessment results of relative ecological location suitability, the assessment results of the environmental pollution governance effect of energy consumption emission of low-carbon tourism in Jiangsu Province, the comprehensive assessment coefficient in 2013 was 0.7843, and the environmental pollution governance effect of energy consumption emission was level III; by 2021, the assessment coefficient of the environmental pollution governance effect of energy consumption emission of low-carbon tourism in Jiangsu Province was 0.9117, and the environmental pollution governance effect of energy consumption emission was level I. The assessment results of the environmental pollution governance effect of low-carbon tourism in Jiangsu Province were as follows: The effect of environmental pollution governance on energy consumption emission was level I. According to the assessment results of the suitability of spatial ecological location, the assessment results of the environmental pollution governance effect of energy consumption emission of low-carbon tourism in Jiangsu Province, the comprehensive assessment coefficient in 2013 was 0.8770, and the environmental pollution governance effect of energy consumption emission was level II; by 2021, the assessment coefficient of the environmental pollution governance effect of energy consumption emission of low-carbon tourism in Jiangsu Province was 0.9401, and the environmental pollution governance effect of energy consumption emission was level I. The assessment results of the environmental pollution governance effect of energy consumption emission of low-carbon tourism in Jiangsu Province were as follows: level I. This paper uses a spatial niche suitability assessment model for assessment and takes this assessment result as the final assessment result.

#### 4. Conclusion and Recommendations

To solve the problem of comprehensive assessment of the effect of low-carbon tourism carbon emission environmental pollution governance from energy consumption in Jiangsu Province, this paper constructs a spatial ecological niche suitability comprehensive assessment model. Based on the literature review and theoretical analysis, drawing on the latest research results at home and abroad, and taking into full consideration of the actual situation of the comprehensive assessment of the effect of low-carbon tourism carbon emissions environmental pollution governance from energy consumption in Jiangsu Province and its requirements, the paper constructs a new spatial ecological suitability model based on traditional ecological suitability model. Based on the traditional ecological niche suitability model, a new comprehensive assessment model of spatial suitability is constructed through improvement and innovation. Through the comprehensive assessment of the effect of environmental pollution governance of low-carbon tourism carbon emission from energy consumption in Jiangsu Province, it is determined that the main contribution of this paper lies in the following: the spatial ecological niche model has been revised and improved, the assessment index system of the effect of environmental pollution governance of low-carbon tourism carbon emission from energy consumption in Jiangsu Province has been constructed and the constructed index system and the spatial ecological niche model have been utilized to assess the effect of environmental pollution governance of low-carbon tourism in Jiangsu Province. The study also utilizes the constructed indicator system and the spatial ecological niche comprehensive assessment model to test the effect of low-carbon tourism carbon emission environmental pollution governance from energy consumption in Jiangsu Province. It is found that the comprehensive assessment coefficient of low-carbon tourism in Jiangsu Province was 0.8770 in 2013. The environmental pollution governance effect of low-carbon tourism areas is grade II, and the comprehensive assessment coefficient will rise to 0.9401 in 2021. The corresponding environmental pollution governance effect of low-carbon tourism area is grade I, which fully reflects that the environmental pollution governance effect of Jiangsu Province's low-carbon tourism shows a good trend of continuous growth. Although this paper has effectively addressed the issue of assessing the environmental pollution governance effectiveness of low-carbon tourism energy consumption emissions in Jiangsu Province, there are still certain limitations in its research process. The main limitations include incomplete and scientific collection of basic data, the addition of constraints in constructing the assessment model, and the implementation of constraints in the assessment application process. Therefore, to effectively overcome the limitations of these studies, future research on this topic needs to investigate the breadth and effectiveness of basic data further, conduct an in-depth exploration of assessment models, and assess the effectiveness of applications. The trend of environmental pollution governance in low-carbon tourism in Jiangsu Province has shown a good continuous growth trend. To promote the continuous improvement of the environmental pollution governance effect of low-carbon tourism carbon emission from energy consumption in Jiangsu Province, we put forward the following policy recommendations based on the specific assessment results:

- (1) Promote the assessment effect by changing the direction of positive indicators of the declining category or enhancing the rising height of such indicators. In the degree of affiliation of assessment indicators, we should focus on declining and slow-rising indicators to promote the rapid improvement of these assessment indicators; at the same time, we should also maintain or increase the quantitative value of the rising positive indicators, to promote the rising effect of low carbon tourism carbon emission governance from energy consumption in Jiangsu Province.
- (2) Promote the rise of the assessment results by changing the direction of the rising reverse indicators or promoting the decline of the reverse indicators. To enhance the effect of low-carbon tourism carbon emission environmental pollution governance from governance in Jiangsu Province, it is necessary to control the source of the basic indicators and promote the continuous improvement of the degree of affiliation to fundamentally promote the continuous rise of the comprehensive assessment results.
- (3) Make full use of the organic combination of assessment indexes and assessment models to promote the improvement of the effect of low-carbon tourism emission environmental pollution governance from energy consumption in Jiangsu. Based on making full use of the positive role of assessment indicators and based on guaranteeing the improvement of positive indicators and the reduction of negative indicators, we make full use of the combination of assessment indicators and assessment models to maximize the promotion of low-carbon tourism carbon emissions from energy consumption and the enhancement of the effect of environmental pollution governance.

*This study was supported by the Social Science Fund of Jiangsu Province, with project approval number 2023EYD001. The author thanks the Jiangsu Provincial Planning Office of Philosophy and Social Sciences for supporting the research funding for this project, and thanks the reviewers for their constructive suggestions for revising this paper.*

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