

Coupling and Coordination Analysis of Tourism Industry, Economic Development and Ecological Environment: A Case Study of Anhui Province

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Abstract: The coupling coordination degree model is used to analyze the coupling coordination of tourism industry, economic development and ecological environment in Anhui Province from 2010 to 2019. The results show that the comprehensive evaluation index of each subsystem increased to different degrees, with the overall rise, and the tourism industry system increased the most; the coupling between the three systems remained at a high level from 2010 to 2019, showing high correlation, and the coupling coordination degree increased year by year, and the coordination level gradually increased from near to a good coordination level.

Keywords: Tourism Industry, Economic Development, Ecological Environment, Coupling Coordination

1. Introduction

Tourism is one of the important pillar industries in China, which has played a huge role in promoting the development of related industries and providing employment services. Tourism industry, economic development and ecological environment interact closely with each other, among which the ecosystem is the basis and guarantee of tourism industry and economic development. The development of tourism industry will drive economic development, and economic development will provide more financial support for the development of tourism industry and the protection of ecological environment. Therefore, while accelerating the development of tourism and economy, paying attention to the protection of the ecological environment and ensuring the mutual promotion and coordinated development of the three systems are the key issues that need to be paid attention to in regional development.

Foreign research on the relationship between tourism, economy and ecology started earlier. D Licitignola^[1] and I Petrosillo^[2] used social-ecological models and dynamic models respectively for related analysis. Domestic studies on the coupling and coordination of tourism industry, economic development and ecological environment are mainly between two systems, and most of them are empirical studies. Wei Zhou^[3], Lian Fu^[4] and Mingyue Xue^[5] respectively empirically explore the degree of coupling and coordination between tourism industry and economic development, tourism industry and ecological environment, economic development and ecological environment. In recent years, Li Ye^[6], Xingkun Tan^[7], Hulan Zhao^[8] and other scholars have begun to study the coupling and coordination between the three systems, and the related research has gradually matured.

This study adopts the coupling coordination model, the Anhui tourism industry, economic development, the ecological environment of three system coupling coordination of an exploratory analysis, further enrich the coupling coordination between the three systems, and provide the reference for the relevant departments for tourism development planning, has certain practical significance.

2. Study design

2.1 Overview of the study area

Anhui province is a big tourism province, rich tourism resources, in recent years, Anhui province tourism industry development continues to improve, between 2010-2019, tourism revenue and tourism revenue as the proportion of GDP are increasing year by year, tourism income from 109.48 billion yuan in 2010 to 829.15 billion yuan in 2019, increased from 8.26% to 22.5%, the tourism industry has become an important support of Anhui province economy.

2.2 Construction of an index system

Follow the principle of index system construction, draw lessons from the existing research^[8], in the tourism industry system, economic development system, ecological environment system selected 10 indicators, a total of 30 indicators, from seven dimensions to establish tourism industry in Anhui province-economic development, ecological environment of comprehensive evaluation index system, specific as shown in (Table 1).

2.3 Data source and processing

The research data are from Anhui Statistical Yearbook and China Statistical Yearbook in 2011-2020. The missing data was supplemented by linear interpolation method, and the weight of each indicator was objectively determined by the entropy method. The calculation results are shown in (Table 1).

Table 1 Tourism industry- -economic development- -ecological environment evaluation index system and its weight

Target layer	The standard layer	Index layer	Weight	Nature
Tourism industry system	Tourism market size	Inbound tourists / person	0.0266	positive
		Domestic tourists / ten thousand person	0.0332	positive
	Tourism economic benefits	Foreign exchange income of international tourism / US \$10 thousand	0.0277	positive
		Total domestic tourism revenue /100 million yuan	0.0348	positive
		Total number of travel agencies / pcs.	0.0261	positive
		Number of star hotels / pcs.	0.0310	positive
	Tourism industry level	The share of tourism revenue in GDP / pct.	0.0234	positive
		The proportion of the tourism industry in the tertiary industry / pct.	0.0164	positive
		Turnover of catering enterprises above the quota/ 100 million yuan	0.0259	positive
		Turnover of accommodation enterprises above the quota/ 100 million yuan	0.0220	positive
GDP / 100 million yuan		0.0308	positive	
Per capital GDP/yuan		0.0297	positive	
Economic development system	Total economic scale	Output value of the tertiary industry / 100 million yuan	0.0406	positive
		Total import and export trade / US \$10 thousand	0.0242	positive
	Characteristics of economic structure	Total retail sales of social consumer goods/ 100 million yuan	0.0421	positive
		Actual utilized foreign investment / US \$10 thousand	0.0267	positive
		Industrial added value / 100 million yuan	0.0169	positive
		Per capital disposable income of urban residents / yuan	0.0290	positive
Ecological environment system	Current situation of environmental pollution	General public budget revenue growth index / pct.	0.0563	positive
		Total labor productivity / ten thousand yuan·person-1	0.0311	positive
		Total discharge of industrial wastewater / ten thousand ton	0.0814	negative
		Total industrial waste gas emissions/ 100 million m ³	0.0502	negative
	Achievements in environmental governance	Total sulfur dioxide emissions /ton	0.0662	negative
		Industrial smoke (powder) dust emission /ton	0.0310	negative
		Industrial solid waste production /ten thousand ton	0.0157	negative
		Household garbage clearance volume/ ten thousand ton	0.0664	positive
		Domestic waste disposal rate is / pct.	0.0139	positive
		The Green coverage rate of the built-up area is /pct.	0.0217	positive
Ecological environment system	Achievements in environmental governance	Per capital park green area / m ²	0.0249	positive
		Water resources per capital / m ³ ·person ⁻¹	0.0338	positive

3. Results analysis

3.1 Analysis of the comprehensive development level of tourism industry, economic development and ecological environment

The comprehensive evaluation index of the three subsystems of tourism industry, economic development and ecological environment in Anhui Province is shown in (Figure 1). On the whole, the three systems show different degrees of fluctuation growth, among which the tourism industry system fluctuates the most, from the lowest value of 0.1009 to the highest value of 0.8327. The fluctuation changes of the tourism industry and economic development systems are more synchronized. It is worth noting that after the level of ecosystem development was significantly improved in 2016, the level of tourism industry and economic development increased significantly between 2017 and 2019, which also reflects that the ecological environment is an important basis and guarantee for the tourism industry and economic development.

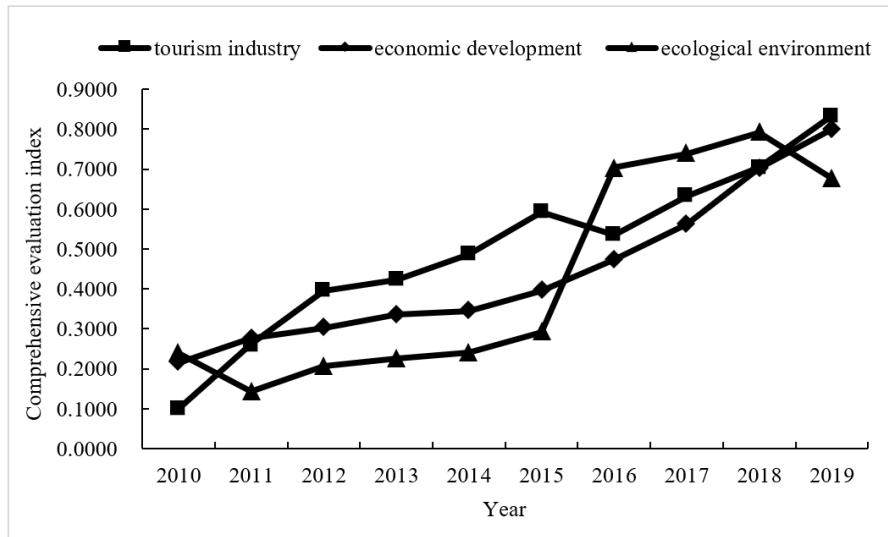


Figure 1. Comprehensive development level of tourism industry- -Economic development and ecological environment in Anhui Province from 2010 to 2019

3.2 Time sequence analysis of coupling and coordination degree

Using the comprehensive evaluation index of the three subsystems of tourism industry, economic development and ecosystem, the coupling degree C and the coupling coordination degree D of the tourism industry-economic development-ecological environment in Anhui Province in 2010-2019 were calculated, and then the coupling coordination level was calculated. The results are shown in (Table 2).

Between 2010 and 2019, the tourism industry in Anhui province, economic development, the coupling of ecological environment of more than 0.9, has been at a high level, coupling coordination shows the trend of increasing year by year, coordination level from almost disorder to barely imbalance, primary coordination, intermediate coordination, 2017 to good coordination level, in the next two years, coupling coordination is still increasing, increased to 0.8706 in 2019, reached a higher level.

Table 2: Coordination level of tourism industry-economic development-ecological environment coupling in Anhui Province from 2010 to 2019

Year	U1	U2	U3	C	T	D	Coupling coordination level
2010	0.1009	0.2156	0.2382	0.9358	0.1902	0.4219	Borderline disorder
2011	0.2612	0.2760	0.1434	0.9602	0.2185	0.4580	Borderline disorder
2012	0.3949	0.3030	0.2068	0.9663	0.2921	0.5313	Forced coordination
2013	0.4221	0.3354	0.2257	0.9682	0.3176	0.5545	Forced coordination
2014	0.4858	0.3451	0.2411	0.9604	0.3457	0.5762	Forced coordination
2015	0.5925	0.3959	0.2924	0.9588	0.4135	0.6296	Primary coordination

2016	0.5359	0.4731	0.7045	0.9860	0.5845	0.7591	Intermediate coordination
2017	0.6323	0.5622	0.7387	0.9937	0.6538	0.8061	Good coordination
2018	0.7040	0.7034	0.7916	0.9984	0.7389	0.8589	Good coordination
2019	0.8327	0.7999	0.6779	0.9961	0.7610	0.8706	Good coordination

4. The conclusions and recommendations

Based on the statistical data from 2010 to 2019, this study uses the coupling coordination degree model to analyze the coupling coordination of tourism industry, economic development and ecological environment in Anhui Province. The conclusions are as follows:

(1)The comprehensive evaluation index of each subsystem shows different degrees of growth and shows an upward trend on the whole, among which the tourism industry system has the largest increase. Due to the impact of the social environment, the tourism industry system experienced a short-term decline in 2016, while the impact of the ecological environment system by the natural environment declined significantly in 2019. Ecological environment is the basis of tourism industry and economic development and security, to realize the three system of sustainable, high quality development, the first attention to the ecological environment protection, only increase investment in ecological environment protection, strengthen the monitoring of environmental quality, tourism industry and economic development level is likely to continue healthy ascension.

(2) The coupling degree between the tourism industry, economic development and ecological environment in Anhui Province has been at a high level from 2010 to 2019, showing a high correlation. The coupling coordination degree also shows a trend of increasing year by year, and the coordination level has gradually increased from near imbalance and maintained at a good coordination level. The continuous development of tourism and economy in Anhui province benefits from the government guidance and policy support. In the future, we should promote the diversified development of the tourism industry, promote the development and growth of a variety of new business forms of “tourism +”, and give full play to the driving role of the tourism industry.

5. Deficiency and outlook

The study analyzes the coupling and coordination of tourism industry, economic development and ecological environment in Anhui Province from 2010 to 2019, and gives reference for the future reasonable development plan, which has certain practical significance. But the research in constructing evaluation index system, only refers to the existing related research for index selection, which has a certain subjectivity. Due to the limited data, only the empirical analysis of Anhui province is carried out. Whether there are differences in the coupling and coordination between the three systems of tourism industry, economic development and ecological environment in different provinces, what are the differences, and what are the reasons for the differences, need to be improved in the future research work.

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