

A Study on the Coupling Coordination Relationship between Tourism and Eco-environment in Mudan Jiang City

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Abstract

Based on the overall tourism industry and ecological environment perspective of Mudanjiang City, a coupling coordination model is used to study the internal relationship between the tourism industry and the ecological environment. Based on the relevant data samples from 2013 to 2017, an indicator system was established to analyze the relationship between the tourism industry and the ecological environment. Through analysis, it is concluded that from 2013 to 2017, the degree of coupling and coordination between the tourism industry and the ecological environment system in Mudanjiang City has gradually transitioned from a moderately coordinated and coordinated to a highly coupled and coordinated type. The two elements have a good level of correlation, promote each other, and develop in harmony. It shows that Mudanjiang City keeps up with national policies, uses resources to develop tourism, and continuously strengthens ecological environmental protection and construction to promote the coordinated and healthy development of the two.

Keywords

Tourism, Ecological environment, Coupling degree.

1. Introduction

Since the 18th National Congress of the Communist Party of China, the country has introduced a series of policies and measures to promote the reform and development of the tourism industry, which has provided new opportunities for accelerating the development of the tourism industry, and gradually made it a strategic industry in China. The prosperity of the tourism industry has promoted economic and social development. While people are getting more economic benefits, the development and use of ecological resources will inevitably bring pressure and challenges to the ecological environment. The report of the 19th National Congress of the Communist Party of China stated that "it is necessary to respect nature, comply with nature, and protect nature", "adhere to the harmonious coexistence of man and nature", and emphasize "accelerated reform of the ecological civilization system to build a beautiful China. It can be seen that the quality of the ecological environment is directly related to the long-term development of human society and the safety of human survival. For the tourism industry, how to maximize the development of the tourism industry within the ecological environment carrying range to drive social and economic benefits, and realize the positive interaction and coordinated development of the tourism industry and the ecological environment has important practical significance.

Mudanjiang City is a prefecture-level city under the jurisdiction of Heilongjiang Province. It is located in the southeast of Heilongjiang Province. It is a provincial sub-central city in Heilongjiang Province, an important regional center city in the northeast and an important open gateway to Heilongjiang. The total area of the city is 38.827 million square kilometers, which belongs to the characteristics of the marine mid-temperate monsoon climate. As of the end of 2017, the total population was 2.478 million. Mudanjiang City, named because the Mudanjiang River, one of the

largest tributaries of the Songhua River in Heilongjiang Province, spans the city, is located in the basin, surrounded by mountains on all sides, and has four distinct seasons. Mudanjiang is rich in natural and tourist resources, and has many places of interest and humanities. Mudanjiang is rich in history and culture, and is extremely congested. Coupled with the characteristics of warm temperate summers and cold winters, the tourism industry in Heilongjiang Province has developed rapidly. The winter snow period in the mountain area is about 120 days. The advantages of large snow volume and good snow quality make Mudanjiang's ice and snow tourism activities a major feature. The cool summer makes Mudanjiang China's summer resort. The rapid development of tourism has brought huge economic benefits to the province. Rich natural resources and historical culture provide the necessary resource support and strong ecological carrying capacity for the development of local tourism. However, while using resources to develop tourism, we must always pay attention to the relationship between the development of tourism industry and the quality of the ecological environment. Implementing the concept of green development is the top priority of development tasks at this stage.

2. Research methods

Based on the weights calculated by the entropy weighting method and the dimensionless index, this paper comprehensively evaluates the tourism industry and ecological environment system of Mudanjiang:

$$f = \sum_i^n \omega_i * x_i \quad (1)$$

$$g = \sum_j^n \omega_j * x_j \quad (2)$$

In formulas (1) and (2), f , g respectively, indicate the comprehensive evaluation level of the tourism industry index and the comprehensive evaluation level of the ecological environment; ω_i , ω_j is the index weight of tourism industry index and ecological environment index, x_i , x_j is the standardization index value of tourism industry and ecological environment system.

This paper draws on the model of capacity coupling coefficient in physics to obtain the coupling degree model of Mudanjiang tourism industry and ecological environment system (Wang Zhaofeng et al., 2018):

$$C = \{(f * g) / [(f + g) / 2]^2\}^{1/2} \quad (3)$$

In formula (3), C is the coupling degree between the tourism industry system and the ecological environment system, and at this time, $0 \leq C \leq 1$. When $C = 0$, it indicates that the coupling degree of the two is the smallest, and there is no dependency between the elements in the two systems and they interfere with each other; When $C = 1$, the tourism industry system and the ecological environment system reach a benign resonance, that is, the system develops in an orderly state. The specific calculation results of the coupling degree are shown in Table 3.

C in Mudanjiang's tourism industry and ecological environment coupling model can only reflect the degree of dispersion and coupling of the indicators in the two systems, but it cannot explain the level of coordinated development of the two systems, that is, it cannot truly measure the development between the two systems. Level of coordination. Therefore, this paper introduces a coordinated development model to analyze the coordination degree D of the tourism industry and ecological environment in Heilongjiang Province (Jia Jucai, 2019):

$$D = (C * T)^{1/2} \quad (4)$$

$$T = \alpha * f + \beta * g \quad (5)$$

In formulas (4) and (5), T is the comprehensive evaluation index of the tourism industry and ecological economy of Mudanjiang City, which is used to reflect the overall development level of the two. α and β represent the respective coefficients of the two systems. Considering that they are in an important position, $\alpha + \beta = 1$, So take $A = B = 0.5$ during calculation. The types of coupling and coordinated development and the classification criteria are detailed in Table 1.

Table 1 Types and classification criteria for coupled and coordinated development

D	Coupling coordination level
$0 < D \leq 0.3$	low
$0.3 < D \leq 0.5$	medium
$0.5 < D \leq 0.8$	high
$0.8 < D \leq 1$	extremely high

3. Data source and Determination of weights

3.1 Data source and index screening

In this paper, the relevant data of Mudanjiang City from 2013 to 2017 is used as the original data for this study. The selected indicators include 14 indicators that can reflect the tourism industry and 11 indicators that can reflect the ecological environment. The data used are mainly from the 《China City Statistical Yearbook》 and the Mudanjiang Bureau of Statistics, but in view of the lack of data in individual years, in order to ensure the authenticity and integrity of the study, this article also draws on the 《Mudanjiang National Economic and Social Development Statistical Bulletin》 data.

The research on the coupling relationship between Mudanjiang tourism industry and the ecological environment needs to be comprehensively and scientifically analyzed. Because both are complex systems, this paper draws on the analysis of the coupling relationship index system constructed by relevant scholars, and combines the unique geographical advantages of Mudanjiang with After the frequency statistics method has completed the screening of primary indicators, it consulted with experts and finally formed a tourism industry and ecological environment system evaluation index system. This article divides the tourism industry system into two primary indicators: tourism benefits and tourism services. Tourism benefits are divided into six secondary indicators: domestic tourist arrivals, tourism income as a percentage of GDP, foreign exchange income, inbound tourists, per capita social consumer goods retail sales, and per capita GDP. Composition; tourism services include eight secondary indicators of highway mileage, number of star-rated accommodation and catering companies, number of employees in the tertiary industry, per capita urban road area, highway density, railway density, mobile phone penetration rate, and number of public toilets per 10,000 people Make up. The ecological environment system includes two primary indicators of ecological resources and environmental pressure. Ecological resources include five secondary indicators of per capita water resources, forest coverage, green coverage of built-up areas, per capita park green space and per capita arable land area; environmental pressure includes There are six secondary indicators of wastewater discharge, COD discharge, ammonia nitrogen discharge, SO₂ discharge, nitrogen oxide discharge, and smoke (powder) dust discharge (Table 2).

3.2 Determination of indicator weight

Due to the difference in measurement between various categories of data, the data will not be comparable. In order to eliminate this effect, this paper needs to perform dimensionless processing on the selected raw data. In order to ensure the objectivity of the research, this paper chooses two kinds of indicators: forward and reverse. This paper uses the range method to standardize the data. The value range of each index after processing is between 0 and 1. According to the nature of the

indicator, formula (6) is calculated for the forward indicator, and formula (7) is used for the reverse indicator.

$$x_{ij} = [X_{ij} - \min(X_{ij})] / [\max(X_{ij}) - \min(X_{ij})] \tag{6}$$

$$x_{ij} = [\max(X_{ij}) - X_{ij}] / [\max(X_{ij}) - \min(X_{ij})] \tag{7}$$

In the formula, X_{ij} is the original data of the system i and j indexes, x_{ij} is the standardized value of the system i and j indexes, and the $\max(X_{ij})$ and $\min(X_{ij})$ scores represent the maximum and minimum values of the system i and j indexes.

In order to more scientifically reflect the indicator weights of the tourism industry and the ecological environment system of Mudanjiang, this paper uses the entropy weighting method to assign values to each indicator. The specific weight calculation results are shown in Table 2.

Table 2 Evaluation index system for the coupled development of the tourism and the ecological environment

System layer	First-level indicators	Secondary indicators	Weights
Tourism Industry	Tourism benefits	Domestic tourism (10,000 people)	0.08
		Tourism income as a percentage of GDP (%)	0.07
		Foreign exchange income (ten thousand US dollars)	0.07
		Number of inbound tourists (10,000 person-times)	0.07
		Total retail sales of social consumer goods per capita (yuan / person)	0.06
		GDP per capita (yuan / person)	0.07
	Travel services	Highway mileage (km)	0.08
		Number of star-rated accommodation catering enterprises	0.1
		Number of employees in the tertiary industry (10,000 people)	0.07
		Urban road area per capita (m ² / person)	0.07
		Highway density (km / 10,000 km ²)	0.08
		Railway density (km / 10,000 km ²)	0.06
		Mobile phone penetration rate (Ministry / 100 persons)	0.07
		Public toilets (seats) per 10,000 people	0.05
Ecosystem	Ecological resources	Water resources per capita (m ³ / person · year)	0.05
		Forest cover rate(%)	0.06
		Green coverage of built-up area (%)	0.06
		Park green area per capita (m ² / person)	0.06
		Per capita arable land area (m ²)	0.06
		Wastewater discharge (10,000 t / year)	0.12
	Environmental pressure	COD emissions (t / year)	0.14
		Ammonia nitrogen emissions (t / year)	0.12
		SO ₂ emissions (t / year)	0.05
		NO _x emissions (t / year)	0.14
		Smoke (powder) dust emission (t / year)	0.14

4. Result analysis

As shown in Table 3, in the five years from 2013 to 2017, Mudanjiang City's coupling coordination degree was at a moderate coupling coordination degree in 2013, and in other years, it developed at a highly coupled coordination level. The good integration of the two shows that Mudanjiang attaches great importance to the promotion of tourism and attaches great importance to environmental protection. On the one hand, Mudanjiang vigorously promotes the structural reform of the tourism supply side, enhances the supply of high-quality tourism services, and has significantly improved the level of tourism services. Innovative tourism development methods and unique independent locations have attracted more and more tourists to come here for summer vacations and experiences. Snow and ice entertainment activities, tourism benefits also show a trend of increasing year after year. On the other hand, the eco-environment index can meet the needs of tourism development. This may be due to the green development concept put forward by the Fifth Plenary Session of the 18th Central Committee, making a series of major arrangements and deployments for ecological civilization and environmental protection, and improving the overall quality of the ecological environment. Include the goal system of building a well-off society in an all-round way. In addition, the Heilongjiang Provincial Government issued the "Thirteenth Five-Year Plan" of Heilongjiang Province's Ecological Environmental Protection in 2016, and various measures provided a strong impetus for environmental protection and construction. This shows that the coordinated development of the two is a long-term construction project.

Table 3 Coupling degree and evaluation results of tourism industry and ecological environment

Year	2013	2014	2015	2016	2017
D	0.485	0.568	0.562	0.551	0.541
Coupling coordination level	low	High	High	High	High

5. Main conclusion and discussions

5.1 Main conclusions

Mudanjiang is a provincial sub-central city in Heilongjiang Province. It is rich in ecological resources and unique in snow and ice tourism resources. In recent years, the local government has attached great importance to the development of tourism economy and the protection of ecological resources. The sustainable development of the two has become the focus of attention of many scholars. Based on this, this paper uses the coupling coordination model to quantitatively measure the coordination degree of the tourism industry and ecological environment in Mudanjiang City from 2013 to 2017. The conclusion is as follows: Overall, the coupling coordination degree of Mudanjiang tourism industry and ecological environment system is moderately coupled from 2013 to 2017. Coordination has gradually transitioned to a highly coupled type of coordination. The two elements have a good level of correlation, promote each other, and develop in harmony. It shows that Mudanjiang City keeps up with national policies, uses resources to develop tourism, and continuously strengthens ecological environmental protection and construction to promote the coordinated and healthy development of the two.

5.2 Discussions

From the perspective of tourism benefits, tourism services, ecological resources, and environmental pressures, this article selects Mudanjiang's tourism industry-eco-environment system evaluation system, and diagnoses the coordinated development relationship between the tourism industry and the ecological environment data from 2013 to 2017. The coordinated development of Mudanjiang's tourism industry and ecological environment construction provides a scientific reference. Although the selection of the two indicators is scientific, the comprehensiveness of the indicators is still insufficient because the tourism industry and the ecological environment system are both complex and huge systems. Based on the existing research results, the evaluation indicators selected in this

paper have considered the data availability more. Therefore, in future research, the selection of indicators will be more innovative, systematic and targeted, integrating multi-disciplinary thinking, and interpreting the relationship between the development of the tourism industry and the ecological environment in a more detailed and accurate way, so as to develop tourism and ecological civilization. Construction provides data support.

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