

# Evaluation of High Quality Tourism Development in Hunan Province Based on Entropy Topsis Method and Chronological Evolutionary Features

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**Abstract:** Based on the new development concept, this paper constructs an evaluation index system for the high-quality development of tourism in Hunan Province with five primary indicators and 19 secondary indicators of innovative development, coordinated development, green development, open development and shared development, and uses the entropy-weighted TOPSS method to evaluate the level of high-quality development of tourism in Hunan Province from 2015 to 2021, and then analyzes its time-series evolution characteristics. The results show that the level of green development, innovation and open development of tourism in Hunan Province is relatively high, while the level of coordinated development and shared development is relatively low; the overall trend of tourism quality development shows an upward trend, but the development is almost stagnant between 2019 and 2021; the risk resistance of tourism quality development is weak, and the coordinated development and open development are most seriously affected under the new epidemic. In turn, the overall development of tourism is affected and constrained. Based on the above research, this paper proposes countermeasures to promote the high quality development of tourism in Hunan Province.

**Keywords:** quality tourism development; entropy TOPSIS; time-series evolutionary characteristic

## 1. Introduction

High-quality development is the primary task of building a modern socialist country, and the Fifth Plenary Session of the 19th CPC Central Committee put forward the theme of promoting high-quality development for economic and social development in the 14th Five-Year Plan period. In December 2021, the State Council issued the Tourism Development Plan for the 14th Five-Year Plan, in which it clearly proposed to "promote the high-quality development of tourism". Xu Aiping (2021)[1] proposes that high quality tourism development is a new model of tourism development in the context of the new era, and is a comprehensive measure of the development of tourism economy, development efficiency, industrial structure and other aspects of development results. Yan Youbing (2022)[2] also expresses the core concept of high-quality tourism development: high-quality tourism development is development that can well meet the growing needs of people for a better tourism life, development that reflects the new development concept, and development that promotes quality change, efficiency change and dynamic change in tourism economic development.

Research on the high-quality development of tourism has emerged in recent years, and there are now more mature research results in academia. In terms of the scope of research, it is mostly national, provincial and regional in scope, for example, Liu Yujing (2022)[3] measures the level of high quality development of tourism in China; Ke Ying (2022)[4] studies the high quality development of tourism in Hainan Province; Liu Jie (2022)[5] constructs and further empirically studies the evaluation index system of high quality development of tourism in the Yellow River Basin. In addition to evaluating the high-quality development of tourism, many scholars have further explored the spatial and temporal evolution, spatial differences and influencing factors of the high-quality development of tourism. For example, Li Zhiyuan (2022)[6] explores the spatial and temporal patterns of tourism quality development in the Yangtze River Economic Zone. Zhong Yiping (2022)[7] examines the regional differences and convergence characteristics of high-quality tourism development. Wang Zhaofeng (2022)[8] explores the factors that influence the level of tourism quality development in the Changsha-Zhuzhou-Xiangtan Urban Agglomeration.

In the construction of the indicator system for high-quality tourism development, scholars such as

Zhou Chengming (2021)[9] and Li Zhiyuan (2022)[6] chose to construct the five new development concepts of innovation, coordination, green, openness and sharing as dimensions. Many scholars have added new dimensions to the new development concept, for example, Zhong Yiping (2022)[7] adds the sixth dimension of economic vitality, and Yan Youbing (2022)[2] covers a total of seven dimensions of industrial development vitality and effective development on the basis of the new development concept. In addition to the new development concept, many scholars choose to construct indicator systems from other perspectives, such as Wu Qiuying (2022)[10] who constructs an indicator system with five dimensions of tourism attractiveness, comprehensive tourism reception capacity, innovation production capacity, tourism development effectiveness and public happiness; and Liu Yujing (2022)[3] who chooses to construct five dimensions of tourism supply and demand level, innovation drive, ecological civilization, economic efficiency and livelihood quality from Tourism quality development evaluation index system.

In summary, there is already a relatively complete evaluation index system for the quality development of tourism in China, and most scholars have deepened their research on the quality development of tourism in terms of influencing factors, regional differences and spatial and temporal evolution. In this paper, on the basis of the existing research results, we choose to construct an evaluation index system for the high-quality development of tourism in Hunan Province based on the five new development concepts of innovation, coordination, green, openness and sharing, and select the index data of Hunan Province from 2015 to 2021, and use the entropy-weighted TOPSIS method to evaluate the high-quality development of tourism in Hunan Province. The evaluation will further explore its time-series evolution characteristics, in order to enrich the content of tourism quality development research and provide ideas to further promote the high quality development of tourism in Hunan Province.

## **2. Construction of Tourism Quality Development Evaluation Index System**

### ***2.1. Selection of evaluation indicators***

#### ***2.1.1. Innovative developments***

Innovation is the fundamental driving force behind the high quality development of tourism. In the face of the new development environment and stage of development, adhering to the innovation drive is a fundamental way to comprehensively shape the new development advantages of tourism. Innovation in tourism is mainly reflected in the investment in science and technology and the support of human resources in tourism. In this paper, the government's investment in science and technology in the tourism industry is reflected in the proportion of expenditure on culture and tourism and the number of cultural and tourism institutions, while the human resource support for tourism development is reflected in the number of employees in cultural and tourism institutions and the number of academic papers published in tourism, based on the indicator system established by Li Zhiyuan (2021)[6].

#### ***2.1.2. Coordinated development***

The coordinated development of tourism is mainly reflected in the industrial coordination between tourism and other industries, and the coordinated regional development. The main aspects of industrial coordination are the coordinated development of tourism with the primary industry in the form of developing rural tourism, etc., and the coordinated development of tourism with the tertiary industry in the form of tourism-led services such as catering, accommodation and finance. This paper draws on the research of Wu Rulian (2022)[11] and uses the proportion of tourism revenue to the value added of the primary industry and the proportion of tourism revenue to the value added of the tertiary industry to reflect the coordinated development of tourism and the primary and tertiary industries. In terms of regional coordination, the introduction of 'whole area tourism' has led to a gradual shift from the original model of individual tourist attractions to one in which tourism is the dominant industry in the region, thereby driving and promoting the coordinated development of the whole region's economy and society. Therefore, based on the research of Zhang Xincheng (2020)[12], this paper uses the contribution rate of the tertiary industry to the growth of regional GDP and the proportion of added value of tourism and related industries to GDP to reflect the coordinated development of tourism and the region.

#### ***2.1.3. Green development***

Green development is an important feature of high-quality tourism development, an inevitable choice for sustainable tourism development, and a driving force in building core competitiveness for tourism. The green development of tourism is reflected in the ecological and environmental management aspects

of tourism. Therefore, this paper adopts the forest coverage rate, per capita park green area and good air quality rate to measure the overall ecological environment quality of regional tourism. The harmless treatment of domestic waste is an important measure to prevent environmental pollution and improve the tourism environment. Based on the indicator system constructed by Wu Rulian (2022) [11], this paper uses the harmless treatment rate of domestic waste to measure the level of regional environmental management.

#### 2.1.4. Open Development

The open development of tourism is an important indicator reflecting the level of opening up of Hunan Province to the outside world, including tourism's external attractiveness, tourism's external opening resources and external cultural exchanges. This paper uses tourism foreign exchange earnings and the number of inbound tourists to reflect tourism's external attractiveness; the number of A-class scenic spots to reflect tourism's external opening resources; and the number of performances in art performance venues to measure the level of external cultural exchange, drawing on the study by Hu Huanhuan (2021)[13].

#### 2.1.5. Shared Development

The shared development of tourism is reflected in the sharing with the people. In terms of content, the sharing of tourism development mainly includes the sharing of resources and the sharing of benefits. Therefore, this paper chooses the share of tertiary industry in employment and the share of per capita education, culture and entertainment consumption expenditure of residents in total consumption expenditure to measure the resource sharing of tourism development; and draws on the study of Tang Yexi (2021) [14] to reflect the revenue sharing of tourism development in terms of per capita tourism income.

## 2.2. Evaluation Indicator System

Table 1: Quality Tourism Development Evaluation Indicator System

Target system	Tier 1 indicators	Secondary indicators	Unit	Nature of indicator
Tourism Quality Development Evaluation Index System	Innovative developments	Culture and tourism business expenses as a proportion of fiscal expenditure	%	Positive
		Cultural and tourism institutions	individual	Positive
		Practitioners in cultural and tourism institutions	People	Positive
		Number of academic papers published on tourism-related topics	Part	Positive
	Coordinated development	Tourism revenue as a proportion of value added in the primary sector	%	Positive
		Contribution of the tertiary sector to regional GDP growth	%	Positive
		Tourism revenue as a share of tertiary sector value added	%	Positive
		Value added of tourism and related industries as a proportion of GDP	%	Positive
	Green development	Forest cover	%	Positive
		Green space per capita	m <sup>2</sup>	Positive
		Excellent air quality rate	%	Positive
		Harmless disposal rate of domestic waste	%	Positive
	Open Development	Foreign exchange earnings from tourism	\$ billion	Positive
		Number of inbound visitors	million people/times	Positive
		Number of A Grade Tourist Attractions	individual	Positive
		Performing Arts Venues Arts Performances	Field	Positive
	Shared Development	Tertiary sector as a share of employment	%	Positive
		Per capita consumption expenditure on education, culture and entertainment as a proportion of total consumption expenditure	%	Positive
		Tourism income per capita	Yuan	Positive

Based on the new development concept, this paper, on the basis of existing relevant studies, adheres to the principles of scientificity, systematicity, quantifiability and data accessibility, selects 5 primary indicators and 19 secondary indicators, and constructs them into the following indicator system, as shown

in Table 1:

### 3. Evaluation Methodology and Data Sources

#### 3.1. Entropy method

Entropy weighting method is an objective assignment method. In the process of specific use, the entropy method uses information entropy to calculate the entropy weight of each indicator according to the degree of variation of each indicator, and then corrects the weight of each indicator by entropy weight, so as to obtain a more objective indicator weight. The calculation method is as follows:

##### 3.1.1. Data dimensionless processing

$$\text{Positive indicators: } x_{ij}' = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (1)$$

$$\text{Negative indicators: } x_{ij}' = \frac{\max x_{ij} - x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (2)$$

Positive indicators (1) are normalized and negative indicators (2) are inverted.  $x_{ij}'$  are the normalized values and  $x_{ij}$  is the original value of the  $j$ th indicator in year  $i$ .  $i$  denotes the year ( $i=1,2,\dots,m$ ) and  $j$  denotes the indicator ( $j=1,2,\dots,n$ ).

##### 3.1.2. Calculating the information entropy of an indicator

$$e_j = -\frac{1}{\ln n} \sum_{i=1}^n (x_{ij}' * \ln x_{ij}') \quad (3)$$

##### 3.1.3. Calculate the weights of each indicator

$$W_j = (1 - e_j) / \sum_{i=0}^n (1 - e_j) \quad (4)$$

#### 3.2. TOPSIS method

The TOPSIS method is a commonly used comprehensive evaluation method, the results of which accurately reflect the gap between the evaluation solutions. TOPSIS method obtains the object evaluation score by calculating the distance between the evaluation object and the ideal solution. Based on the entropy weighting method to determine the weights, combined with the TOPSIS model, the distance between the object and the positive and negative ideal values can be effectively measured, and then evaluated and ranked as superior or inferior.

##### 3.2.1. Extreme value method for raw data

$$k_{ij} = \frac{x_{ij} - \min_{i,j}(x_{ij})}{\max_{i,j} - \min_{i,j}(x_{ij})} \quad (5)$$

(5) in  $i=1,2,\dots,m$ ;  $j=1,2,\dots,n$ , and get the decision matrix  $K \triangleq (k_{ij})_{m \times n}$

##### 3.2.2. Constructing a weighted decision matrix

$$P_{m \times n} \triangleq (p_{ij})_{m \times n} \begin{bmatrix} w_1 k_{11} & \cdots & w_n k_{1n} \\ \vdots & \ddots & \vdots \\ w_1 k_{m1} & \cdots & w_n k_{mn} \end{bmatrix} \quad (6)$$

(6) in  $W_j$  represents the indicator weights and  $k_{ij}$  represents the normalised data.

##### 3.2.3. Calculate positive and negative ideal solutions

$$P^+ = \{ \max_{ij} p_{ij} | i=1,2,\dots,m \} = \{ p_1^+, p_2^+, \dots, p_m^+ \} \quad (7)$$

$$P^- = \{ \min_{ij} p_{ij} | i=1,2,\dots,n \} = \{ p_1^-, p_2^-, \dots, p_n^- \} \quad (8)$$

##### 3.2.4. Calculating proximity

$$F_i = \frac{\sqrt{\sum_{j=1}^n (p_j^- - p_{ij})^2}}{\sqrt{\sum_{j=1}^n (p_j^+ - p_{ij})^2} + \sqrt{\sum_{j=1}^n (p_j^- - p_{ij})^2}} \quad (9)$$

### 3.3. Data sources

This paper takes the high-quality development of tourism in Hunan Province as the research object and selects the data of each indicator in Hunan Province from 2016-2021, with the indicator data coming from the China Statistical Yearbook (2016-2022), China Statistical Yearbook of Culture and Tourism (2016-2022), Hunan Statistical Yearbook (2016-2022).

## 4. Evaluation results and analysis of high-quality tourism development in Hunan Province

### 4.1. Indicator weights

Based on the data of the indicators of Hunan Province from 2015-2021, the entropy weighting method was applied to calculate the weights of each indicator, as shown in Table 2:

Table 2: Weighting of indicators for quality tourism development in Hunan Province

Target system	Tier 1 indicators	Secondary indicators	Weighting factor w
Tourism Quality Development Evaluation Index System	Innovative developments (20.26%)	Culture and tourism business expenses as a proportion of fiscal expenditure	3.17%
		Cultural and tourism institutions	5.38%
		Practitioners in cultural and tourism institutions	7.13%
		Number of academic papers published on tourism-related topics	4.58%
	Coordinated development (16.02%)	Tourism revenue as a proportion of value added in the primary sector	4.28%
		Contribution of the tertiary sector to regional GDP growth	2.68%
		Tourism revenue as a share of tertiary sector value added	4.02%
		Value added of tourism and related industries as a proportion of GDP	5.04%
	Green development (25.14%)	Forest cover	4.82%
		Green space per capita	7.15%
		Excellent air quality rate	7.30%
		Harmless disposal rate of domestic waste	5.87%
	Open Development (22.12%)	Foreign exchange earnings from tourism	5.91%
		Number of inbound visitors	5.48%
		Number of A Grade Tourist Attractions	4.52%
		Performing Arts Venues Arts Performances	6.21%
	Shared Development (16.47%)	Tertiary sector as a share of employment	8.78%
		Per capita consumption expenditure on education, culture and entertainment as a proportion of total consumption expenditure	3.50%
Tourism income per capita		4.19%	

An analysis of the weighting of the indicators shows that the three dimensions of green, open and innovative development have a high weighting in the first level of indicators, with a weighting of 25.14%, 22.12% and 20.26% respectively, indicating that these three dimensions play an important role in promoting the high quality development of tourism in Hunan Province. Coordinated development and shared development have a relatively low weighting, with 16.02% and 16.47% respectively.

Among the secondary indicators, those with a weight value of 6% or more are: the number of employees in cultural and tourism institutions in the innovation development dimension (7.13%); the area of green space per capita in the green development dimension (7.15%) and the rate of good air quality (7.30%); the number of artistic performances in arts performance venues in the open development dimension (6.21%); the share of the tertiary sector in employment in the shared development dimension (8.78%). The indicator of the share of employment in the tertiary sector has the highest weighting, indicating that the high quality development of tourism in Hunan Province plays an important role in promoting employment, increasing the income of urban and rural residents and promoting common prosperity. The green development dimension accounts for two of the five indicators with a weighting of 6% or more, indicating that the tourism industry in Hunan Province is not only well developed but also more comprehensive, focusing on ecological protection of tourism and urban and rural environmental management in order to promote sustainable and healthy development of tourism.

#### 4.2. Results of the evaluation of the quality development of tourism in Hunan Province

On the basis of the entropy weighting method to obtain the weights of each indicator, the TOPSIS method was used to calculate the comprehensive proximity of the level of high-quality development of tourism in Hunan Province from 2015 to 2021, as well as the relative proximity of each indicator, and ranked based on the comprehensive proximity. As shown in Table 3:

Table 3: Relative proximity to the level of quality tourism development in Hunan Province

Year	Innovation	Coordination	Green	Open	Share	Overall proximity	Combined ranking
2015	0.144	0.199	0.185	0.348	0.155	0.215	7
2016	0.493	0.357	0.248	0.337	0.220	0.334	6
2017	0.460	0.726	0.099	0.513	0.359	0.394	5
2018	0.360	0.886	0.542	0.532	0.374	0.503	4
2019	0.780	0.897	0.592	0.630	0.455	0.632	2
2020	0.603	0.360	0.907	0.282	0.709	0.572	3
2021	0.599	0.471	0.962	0.488	0.793	0.642	1

#### 4.3. Analysis of the time-series evolution of the level of quality tourism development

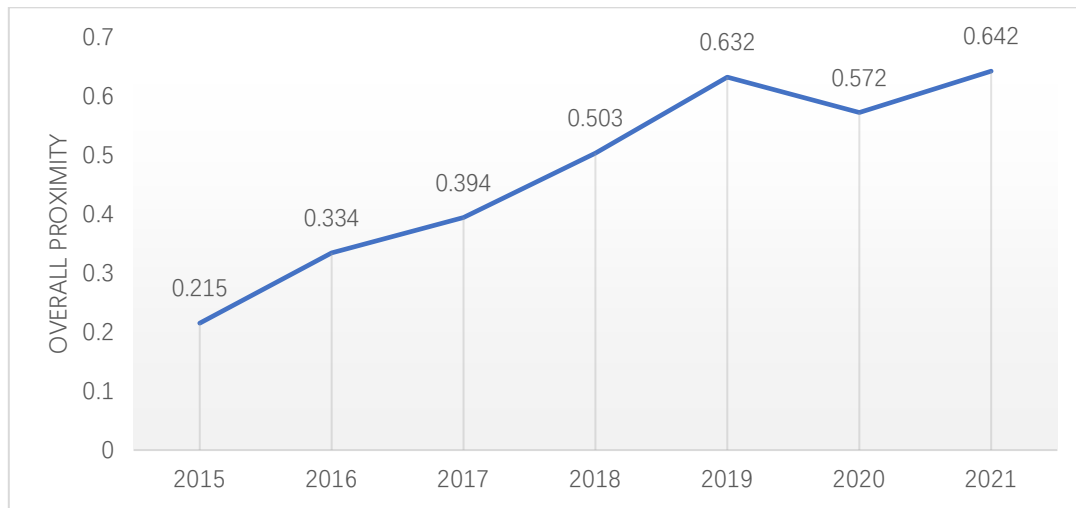


Figure 1: Time-series evolution of high-quality tourism development in Hunan Province

As shown in Figure 1, in terms of the comprehensive proximity, the level of high quality development of tourism in Hunan Province from 2015-2021 generally shows an upward trend, with rapid development of high quality in tourism during 2015-2019, with the comprehensive proximity rising from 0.215 in 2015 to 0.632 in 2019, an increase of 0.417, reflecting Hunan Province's 2015-2019 tourism great achievements in the development. However, tourism development nearly stagnated between 2019 and 2021, and declined significantly in 2020 before rebounding to some extent in 2021.

As shown in Figure 2, from the relative closeness of the five dimensions of innovation, coordination, green, openness and sharing respectively, the level of green development and shared development of tourism in Hunan Province during the period 2015-2021 shows an overall rising trend, although there are certain fluctuations, with the green development level rising most significantly. The levels of innovative development, coordinated development and open development all rose to varying degrees between 2015 and 2019, and reached their highest peak in 2019. In 2020, however, the level of development of the three dimensions declined sharply, with the level of coordinated development declining the most, with the relative proximity falling from 0.897 in 2019 to 0.360 in 2020. 2021 saw a certain rebound in innovation, coordination and open development, but it is still not comparable to the level of development in 2019.

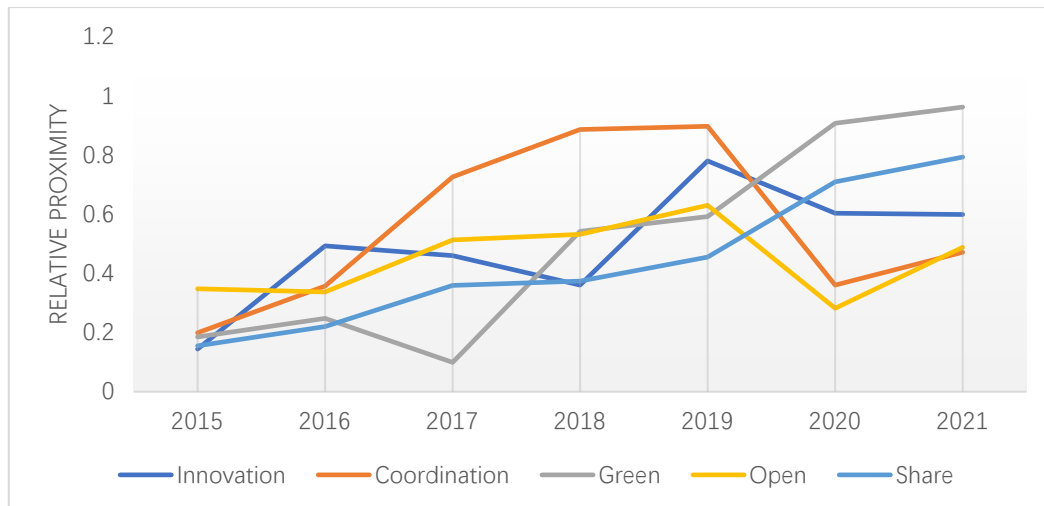


Figure 2: Relative proximity of indicators at each level of quality tourism development in Hunan Province

In summary, Hunan Province has continued to promote the high quality development of tourism over the years, of which tourism green ecology and tourism benefit sharing have been rising year by year. In contrast, tourism innovation, coordination and open development, although developing at a faster rate, have developed erratically, with the level of development of all three declining significantly in 2020, which in turn led to a decline in the overall level of tourism development in Hunan Province. It is deduced that this is due to the global outbreak of the New Crown epidemic, which has hit economies around the world to varying degrees, as well as under the influence of various anti-epidemic and anti-epidemic policies introduced in China, which has caused a serious impact on the innovative, coordinated and open development of tourism in Hunan Province, which in turn has affected and constrained the high quality development of tourism, indicating that the high quality development of tourism in Hunan Province is less risk-resistant.

## 5. Conclusions and Recommendations

### 5.1. Conclusion

This paper constructs an evaluation index system for the high-quality development of tourism based on the new development concept, and selects a total of 19 indicators from five dimensions: innovative development, coordinated development, green development, open development and shared development, and uses the entropy-weighted TOPSIS method to evaluate and analyse the level of high-quality development of tourism in Hunan Province, and arrives at the weight of each indicator and the relative level of high-quality development of tourism in Hunan Province from 2015-2021 Proximity. Through the study we found that:

(1) In the process of high-quality development of tourism in Hunan Province, the level of green development, open development and innovative development is relatively high, while the level of shared development and coordinated development is relatively low.

(2) The level of high quality tourism development in Hunan Province from 2015-2021 shows a general upward trend, with rapid high quality tourism development between 2015-2019 and near stagnation between 2019-2021 due to the impact of the new crown epidemic.

(3) Hunan's tourism industry is weakly resilient to risk in terms of quality development, where the level of innovative, coordinated and open development of tourism is more vulnerable to external factors, which in turn affects and constrains the overall development of tourism.

### 5.2. Recommendations

#### 5.2.1. Strengthen the coordination of the industry chain and enhance the comprehensive effectiveness of tourism

Continuously promote the coordinated development of tourism, on the one hand, promote the deep integration of digital agriculture, culture and tourism industries, and strengthen the collaboration of the agriculture, culture and tourism industry chain in order to enhance the core competitiveness of tourism.

On the one hand, accelerate the development of all-area tourism, co-ordinate the implementation of structural reform on the supply side of tourism, and promote coordination of supply and demand; promote the development of regional specialisation, and promote coordination within and outside scenic spots; promote the quality and efficiency of rural tourism, and promote urban-rural coordination; and enhance the intelligence of tourism services, and promote scale and quality coordination. On the other hand, it promotes the linkage of resources between government, enterprises, universities, relevant cultural and tourism institutions and other subjects, builds an open and efficient tourism innovation synergy network, strongly supports the development of tourism projects, tourism industries and tourism brands, implements innovative tourism talent training strategies, and continuously promotes the improvement of comprehensive tourism effectiveness from all aspects.

### 5.2.2. Relying on digital intelligence to empower and promote smart tourism development

Strengthen digital intelligence empowerment to improve tourism's risk resistance. Firstly, facing up to the vulnerability of the tourism industry, major tourist attractions should make use of the Internet, cloud computing and other emerging technologies to promote the construction of a smart tourism management system and strengthen tourism scene monitoring, crowd monitoring, location monitoring, environmental monitoring and risk prediction. Secondly, we should strengthen investment in tourism innovation and research, improve the construction of supporting facilities for digital smart tourism, increase the level of 5G network coverage in tourism areas, promote the digital transformation of the tourism industry and the upgrading of the "tourism +" industrial structure, and promote the diversification of tourism enterprises and regions to improve the tourism industry's resilience to risk from various aspects.

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