RESEARCH ON THE SUSTAINABLE DEVELOPMENT OF TOURISM IN HEBEI PROVINCE FROM THE PERSPECTIVE OF RURAL REVITALIZATION

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ABSTRACT

Evaluating and studying the sustainable development level of regional tourism under the strategy of rural revitalization is pivotal to achieving sustainable and high-quality regional economic development. This paper measures the sustainable development of tourism in Hebei Province from 2010 to 2020 by constructing a set of evaluation indicators. These consist of five secondary indicators—resource endowment, ecological support, social environment, infrastructure, and urban construction—and 18 tertiary indicators, using the entropy-TOPSIS method. The results show that the greening coverage index has the greatest influence on the sustainable development level of tourism in Hebei Province and is the most representative. From 2010 to 2014, the sustainable development level of tourism fluctuated and decreased, while from 2015 to 2020, it increased year by year. Additionally, a SWOT analysis is combined with corresponding countermeasures and suggestions. The aim is to improve the sustainable development of tourism in Hebei Province, support rural revitalization to seek common prosperity, and create a new growth pole for the comprehensive competitiveness of the regional economy.

Keywords: entropy-TOPSIS method, Hebei Province, rural revitalization, sustainable tourism development

INTRODUCTION

With the advent of mass tourism, tourism has become a comprehensive industry and a significant project to build a new pattern of national development. It is an essential engine for promoting national economic and social development, offering less resource consumption, more employment opportunities, and higher comprehensive benefits. Tourism is also a significant social phenomenon in the new and post-epidemic eras. It is highly expected in the rural revitalization strategy and urgently needs attention and rapid promotion. The subject of China's tourism market is developing rapidly and growing at a fast pace. However, while the development of tourism has added substantial economic benefits to society, it has also generated negative benefits to the ecological environment that cannot be ignored. Excessive energy consumption, waste of resources and environmental pollution are becoming increasingly severe, and the sustainable development of tourism is facing huge challenges. In addition, due to the expansion of tourism and the growth of travel demand, a large number of tourism resources are being exploited blindly, leading to excessive waste.

Destinations also suffer from oversaturation of tourism flows, and the quality of life of local residents and infrastructure development are also negatively affected to a certain extent. The sustainability of the tourism sector and its impact on global sustainable development is currently a major concern for the international community, and sustainable tourism development has become a trend and necessity. Therefore, it is crucial to evaluate the level of sustainable development of the tourism industry and to understand the changing trends of sustainable development in tourism destinations, which is vital for the overall improvement of the comprehensive benefits of the tourism industry and the sustainable and efficient development of regional tourism. The raging side of the COVID-19 epidemic reflects the destruction of the harmony and unity between man and nature and the threat to sustainable development. As a sensitive area, the tourism industry has shown relative fragility in its stability. The supply chain and industrial chain have been seriously hindered, causing damage to the ecological environment, economic construction, and infrastructure. This has greatly impacted the sustainability of tourism development.

The '14th Five-Year Plan' period is the first five years after China built a moderately prosperous society in an all-round way and started a new journey of building a modern socialist country. During this period, Hebei Province faced several significant initiatives, including the coordinated development of Beijing-Tianjin-Hebei, the planning and construction of Xiongan New Area, preparations for the 2022 Beijing Olympic Winter Games, the construction of the Great Wall and the Grand Canal National Cultural Park, and the development of tourism in the Taihang Mountains. It has brought a once-in-a-lifetime historical opportunity to the development of culture and tourism in Hebei. Evaluating and studying the sustainable development level of rural tourism in Hebei Province is crucial to improving tourism development and building a new development pattern in the province and China. Since 2021, the province carried out orderly and effective COVID-19 epidemic prevention and control in the post-epidemic era. As a result, the tourism industry has recovered steadily compared to the period during the epidemic, and cultural tourism governance capacity has improved. The new situation is mainly reflected in the following aspects: First, the construction of the public cultural service system has reached a new level. The completion of the reform tasks in the field of public culture deployed by the central government ranks among the best in the country. The construction level of the public cultural service system in 55 counties (cities, districts) in the province has reached the national or provincial demonstration standards. Many cultural performances have been carried out, benefiting hundreds of millions of people. A new pattern of joint construction and sharing of high-quality cultural resources in urban and rural areas has basically been formed. Second, the protection, inheritance and utilization of cultural heritage are fruitful. Major cultural relics protection projects such as the Xiongan New Area and the Winter Olympic Games have been successfully advanced.

The archaeological research on the site of Prince Edward City in Chongli has been selected as the "Top Ten New Discoveries" in national archaeology, and 102 counties (cities, districts) have been selected as the national list of revolutionary cultural relics protection and utilization areas. The number of key cultural relics protection units in the country has increased to 291, ranking third in the country. The number of intangible cultural heritage projects included in the UNESCO Representative List of Intangible Cultural Heritage of Humanity has reached 6, and the number of national intangible cultural heritage projects has increased to 163, ranking fifth in the country.

Third, the cultural industry is growing rapidly. The upgrading of traditional cultural formats has accelerated, the development momentum of industrial integration has been rapid, the added value of culture and related industries has increased by an average of 10.42% per year, the added value of cultural industries in the province has exceeded 90 billion yuan, the number of cultural enterprises above designated size has reached 1,283, and the number of cultural industry clusters above the order of 10 billion has reached 4 (musical instruments, stone carvings, mahogany furniture, strollers). At the same time, the market players continued to grow, building two national-level cultural industry demonstration parks and experimental parks, 12 demonstration bases, 188 provincial-level demonstration parks (bases), cultivating more than 3,000 cultural and creative technology-based small and medium-sized enterprises, and more than 20 cultural enterprises are listed on the New Third Board.

Fourth, the tourism industry has achieved leapfrog improvement. The establishment of global tourism demonstration provinces has achieved remarkable results. There are seven national global tourism demonstration zones and 14 provincial-level global tourism demonstration zones. The supply of high-quality tourism products has been comprehensively upgraded. The number of 5A-level tourist attractions has increased to 11, and the number of 4A-level tourist attractions has increased to 11. 140, 10 new national and provincial-level tourist resorts have been added, forming a batch of new tourism products such as red tourism, industrial tourism, and characteristic towns. Five provincial tourism conferences and 51 municipal tourism conferences have been successfully held, covering 109 counties (cities and districts) in the province, driving 531 new and upgraded key projects with a total investment of more than 410 billion yuan, becoming the province's transformation and upgrading engine, a breakthrough point for ecological civilization construction, an effective way to tackle poverty reduction, and an important platform for opening up. In addition, the tourism public service system has been continuously improved. More than 3,900 kilometers of tourist highways have been built or rebuilt in the province, more than 4,400 kilometers of scenic roads and greenways have been built, more than 1,000 tourist traffic signs have been improved, and 110 regional tourist service centers and 210 tourist and leisure post stations have been constructed and upgraded. During the new three-year action plan for the tourism toilet revolution, a total of 4,781 tourist toilets have been built in the province. Compared with the task target of 2,192 in the Hebei Province issued by the Ministry of Culture and Tourism, the completion rate is 218%, ranked first in the country. In addition, the pilot construction of smart scenic spots has been advanced in an orderly manner, and the "one mobile phone tour Hebei" (Leyouji) platform has been launched.

Fifth, cultural and tourism poverty alleviation has achieved outstanding achievements. Fifteen large-scale stage works with the theme of poverty reduction have been created. Cultural performances 10,000 in poverty-stricken areas have been organized, benefiting more than 10 million people. Rural tourism has developed rapidly. A total of 1,650 villages in the province have carried out rural tourism, and 35 villages have been selected as key villages for rural tourism in the country. The number of people received has increased from 70 million at the end of the "12th Five-Year Plan" to 205 million, accounting for 27% of the total tourism reception. Comprehensive income has increased from 15 billion yuan to 44.24 billion

yuan, with an average annual growth of more than 40%, driving 793 poverty-stricken villages and more than 300,000 people in the province to increase their income and become rich.

As we look forward to 2022, the impact of the COVID-19 epidemic cannot be ignored. The uncertainty of the tourism economy's recovery due to the epidemic remains, and transforming and upgrading the tourism industry to be more stable, resilient, and sustainable is essential. Hebei Province is currently in a critical period of economic and social transformation. It faces major tasks such as implementing national strategies, building a modern industrial system, and enhancing its cultural strength. These tasks demand higher quality, efficiency in culture and tourism, and comprehensive driving forces.

Given the new international context, the domestic stage, and internal changes within the province, Hebei's culture and tourism development faces a complex situation where opportunities and challenges coexist. It must accurately identify changes, respond scientifically, and actively seek improvements. Additionally, Hebei should integrate into the construction of a Beijing-Tianjin-Hebei world-class urban agglomeration, with the capital as the core. This includes accelerating the construction of a modern and internationalized provincial capital and a regional central city. Building a spatial layout of "one body, two wings, and six belts" for Hebei Province should be prioritized. This involves consolidating the four types of work carriers: "one brand, three platforms, ten projects, and top 100 projects." The goal is to form a cultural and tourism development layout with global linkage, urban-rural integration, cultural and tourism integration, and balanced coordination. Based on this context, it is crucial to improve the modernization level of tourism governance, promote sustainable tourism development, and accelerate the transition from a major tourism province to a strong one. This paper aims to enhance the sustainable development of tourism in Hebei Province, build a new pattern of high-quality rural tourism development, support rural revitalization, seek common prosperity, and create a new growth pole for the regional economy's comprehensive competitiveness.

LITERATURE REVIEW

The basic requirements of sustainable development revolve around the central question of managing and coordinating the development of natural resources, human resources, and infrastructure in tourism destinations. The goal is to achieve economic growth while maintaining the sustainability of environmental resources and ensuring 'intergenerational equity' and 'interregional equity' in the distribution of costs and benefits. Butler (2007) and Zhao (1996) proposed that resources should be used to meet present needs without compromising the use and development for future generations. Based on this, Xu et al. (1996) suggested that sustainable tourism should also meet the needs of tourists, requiring tourism activities to form a balanced whole with resources, culture, and the environment. Tourism development must maintain this balance and not disrupt the fragile equilibrium (Xu et al., 2004).

Liu et al. (2017) and Ng et al. (2017) found that evaluation research on sustainable tourism development is currently conducted using indicator evaluation systems, empirical measurement of indicator systems, grading criteria, and quantitative models. Commonly used methods include comprehensive evaluation methods, tourism environmental carrying capacity method, grey correlation method, factor analysis method, entropy weight method, TOPSIS method, hierarchical analysis method, SWOT-AHP combination method, acceptable limit of change (LAC) method, and tourism ecological footprint model (Liu et al., 2017; Ng et al., 2017). These methods analyze interactions within the tourism destination system and are key to effectively assessing the sustainable development of tourism. Constructing a sustainable tourism evaluation index system is a complex systemic project. It is not merely listing or superimposing statistical indicators from various fields but should consider multiple aspects such as economic development, resources, environment, and rural development, linking tourism development

with nature and society. Based on this, this paper has reviewed the methodological approaches to constructing indicators in the industry and summarizes them in three areas: ecological, social, and infrastructure.

Eco-environmental indicators: Niu (2002) proposed that eco-environmental evaluation indicators should include tourism eco-environmental indicators, which reflect the state of tourism ecosystems, and environmental quality rating indicators, which reflect the level of environmental quality in tourism. These indicators aim to integrate tourism with the resolution of environmental problems in tourism destinations (Niu, 2002). Murava and Korobeinykova (2016) suggested that the first step in achieving sustainability in tourism development is to identify and solve problems such as climate change mitigation, protection of the natural environment, and pollution reduction. They emphasized using renewable energy sources and greening plants (Murava & Korobeinykova, 2016). UNEP (2004) found that environmentally sound waste treatment, including sewage and domestic waste, is essential. Luekveerawattana (2018) and Mongan et al. (2015) suggested that ensuring local tourism operations are socially responsible and sustainable is crucial (Luekveerawattana, 2018; Mongan et al., 2015).

Socio-environmental indicators: Quality of life and socio-environmental factors are also among the most important objectives of sustainable development. Hassan (2000) and Jeon et al. (2016) proposed that tourism operations can focus on improving the hospitality of services provided to tourists and ensuring and improving the quality of life of people living in tourism destinations. They suggested providing local residents with suitable jobs in the tourism industry, increasing the income of the destination, and ensuring the disposable income per capita of local residents. This would increase the spending power and purchasing power of residents, thus promoting the flow of consumption for tourism purposes (Hassan, 2000; Jeon et al., 2016). Additionally, Andereck et al. (2005, 2007, 2011) found that population density is included within the social environment factors. They emphasized the importance of improving the efficiency of resource allocation according to the development of the local tourism industry. It is essential to ensure an appropriate population density—neither too large nor too small—to avoid affecting the city's capacity and increasing urban pressure and other potential problems (Andereck et al., 2005; Andereck et al., 2007; Andereck et al., 2011).

Infrastructure indicators: Sustainable tourism development is a complex process that is directly or indirectly linked to many areas of the value-added chain. For the local population, this includes accessible transport facilities, guaranteed health care, excellent education, accommodation with good hospitality, and satisfying food and drink. These areas are not just for tourists; the local population is also a large potential consumer group. Paulauskienė (2013) proposed that these excellent and sustainable conditions increase the local population's willingness to stay in the area. This not only better meets their needs but also attracts them to stay, contribute to their homeland, and serve the community (Paulauskienė, 2013).

In summary, constructing a sustainable development evaluation index system for tourism is a multi-level, complex process with multiple goals. Moliqiu (2017) and Zhang et al. (2018) suggested the necessity of specifying these goals and representing them through specific and quantitative indicators (Moliqiu, 2017; Zhang et al., 2018). The "Opinions of the Central Committee of the Communist Party of China and the State Council on Doing a Good Job in the Key Work of Comprehensively Promoting Rural Revitalization in 2022" emphasizes the role that culture and tourism should play in rural revitalization. The report of the "20th National Congress of the Communist Party of China" pointed out the importance of promoting the deep integration and development of culture and tourism. This integration is seen as a crucial path to rural revitalization and provides direction for the study of rural transformation and development. Currently, academic circles mainly explore the impact of culture or tourism on rural

revitalization from specific aspects, bringing culture and tourism into a research framework to discuss the outcomes of rural revitalization systematically. However, there are few studies on the selection of evaluation index systems and measurement methods for rural revitalization levels. There is a gap in selecting specific evaluation indicators and the coupling adaptation of measurement targets. The selection level of specific evaluation indicators is relatively narrow and needs to be further expanded to align with measurement targets. Additionally, most research data used to evaluate the development level of tourism are time series data used in vertical macro evaluation. Therefore, there is still room for further research.

Based on this, the possible marginal contribution of this paper is mainly reflected in the following two aspects: Firstly, the gap between the selection of specific evaluation indicators and the coupling adaptation of measurement targets in the existing literature should be narrowed as much as possible, and the selection level of specific evaluation indicators should be further expanded. By considering the current development status, existing problems, and actual needs of tourism in Hebei Province, a comprehensive evaluation system is constructed based on three levels: target layer, criterion layer, and indicator layer. On the basis of existing research, resource endowment indicators and urban construction indicators are added. This expands the five secondary indicators—ecological support, social environment, infrastructure, resource endowment, and urban construction—as the criterion layer of the sustainable development index system of tourism in Hebei Province. Nineteen specific indicators were selected at the indicator layer, including greening coverage rate, harmless treatment rate of domestic waste, sewage treatment rate, number of public toilets (more than three types), total number of travel agencies, total number of high-level hotels, number of medical insurance participants, education funds, number of tourist attractions, area of built-up areas, population density, GDP of the tertiary industry accounted for by accommodation and catering, operating income of tourist attractions, per capita disposable income, completed investment in fixed assets in the tertiary industry (year-on-year), number of employees in the cultural and entertainment industry, land for public service industry, road area, and gas penetration rate.

Secondly, based on the selection of time series data in most literature, a total of 209 sample sizes of 19 tertiary indicators in Hebei Province from 2010 to 2020 were selected to fill the research gap for vertical macro-evaluation of tourism development levels as much as possible. Interpreting the sustainable development level of regional tourism in Hebei Province from the perspective of the rural revitalization strategy has an important leading role and demonstration effect on Hebei Province as an important growth pole for the coordinated development of Beijing-Tianjin-Hebei.

RESEARCH METHODOLOGY

Evaluation Index Selection

The countryside is a regional complex with multiple functions such as production, life, ecology and culture. My country's rural revitalization strategy has evolved from "new rural construction → beautiful countryside → rural revitalization". In order to examine the development status of the five dimensions of "prosperous industry, livable ecology, civilized countryside, effective governance and prosperous life" during the base period of the implementation of the rural revitalization strategy, this paper Based on the path of the rural revitalization and development strategy, at the same time, it studies the sustainable development level of rural tourism in Hebei Province. From the perspective of coupling and adaptation, five criteria layers and 19 specific indicators are selected to evaluate and study the current rural revitalization status quo. The specific index description and calculation method are as follows.

(1) Ecological support. The ecological environment and living conditions are not only the "face" of the countryside from the outside, highlighting the cleanliness of the ecological environment but also the "inner child" to measure the quality of rural production and life, highlighting the comfort of livable quality of life. Ecological livability is the basic premise for maintaining the rural labor force and revitalizing the countryside. Therefore, four secondary indicators of "green coverage rate of built-up areas, harmless treatment rate of domestic waste, sewage treatment rate and number of public toilets (more than three types) " are selected.

(2) Resource endowment. Revitalizing the countryside takes resource endowment and industrial development as the economic basis to attract better people, land, money and other resource factors to flow into the countryside and activate the internal vitality of the countryside. Rural industry is rooted in the countryside. To fully ensure food security, it is necessary to break through the bottleneck of the development of traditional industries. While making good use of the advantages of resources, it is necessary to target the changes in the consumption demand of urban and rural residents to promote the integrated development of three rural industries. Accordingly, four secondary indicators of "the number of tourist attractions, the area of built-up areas, population density, and the proportion of accommodation and catering in the GDP of the tertiary industry" are selected.

(3) Infrastructure. The rural style civilization has continued the Chinese farming civilization for thousands of years, emphasizing the protection and inheritance of the excellent traditional culture of the countryside and integrating the modern civilization brought about by industrialization and informatization. Perfect infrastructure building is conducive to improving the quality of rural civilization, the rural business environment, and the competitiveness of the rural soft environment. Accordingly, three secondary indicators of "total number of travel agencies, total number of star-rated hotels, and total education funds" were selected; in addition, due to the close relationship between rural medical problems and rural economic development, a new indicator of "number of urban basic medical insurance participants" was added.

(4) Urban construction. The so-called "poverty makes you think about change" and "warehouse is what you know etiquette". The development of civilization depends on the material foundation and social environment. Only with perfect construction, worry-free food and clothing, and strong health can farmers have enough leisure to inherit and develop the excellent traditional culture of the countryside and help realize the effective governance of the countryside. Accordingly, three secondary indicators of "land for public service industry, road area and gas penetration rate" are selected.

(5) Social environment. In order to reflect the absolute affluence of rural residents in the early stage of rural revitalization, the "per capita disposable income of residents" indicator is selected, and at the same time, the "operating income of tourist attractions" is increased to describe the development of rural tourism; in addition, the newly added "fixed asset investment in the tertiary industry year-on-year and the number of employees in the cultural and entertainment industry" together characterize the social environment of rural tourism.

Evaluation Indicator System Construction

This paper uses a panel of 19 tertiary indicators from 2010 to 2020 as a sample for empirical measurement to examine the development of sustainable tourism development in Hebei Province over the past eleven years. The data were obtained from the Hebei Provincial Bureau of Statistics, the National Bureau of Statistics, the National Tourism Administration and the Ministry of Housing and Urban-Rural Development. Individual missing values were supplemented by interpolation, and in the

data processing process, the original data figures less than or equal to 0 were subjected to non-negative panning, with the unit of panning being 0.01.

Table 1

Evaluation Index System for Sustainable Development of Tourism in Hebei Province

Target level	Guideline level	Indicator layer	Indicator attributes		Unit
			Positive indicator "+"	Negative indicator "-"	
Sustainable development of the tourism industry	Ecological support	Greenery coverage in built-up areas	+		Percentage (%)
		Harmless disposal rate of domestic waste	+		Percentage (%)
		Sewage treatment rate	+		Percentage (%)
		Number of public toilets: Category 3 or above	+		individual
	Infrastructure	Total number of travel agents	+		individual
		Total number of star-rated hotels	+		individual
		Number of participants in basic urban health insurance	+		People
		Total education expenses	+		million
	Resource endowment	Number of tourist attractions	+		individual
		Area of built-up area	+		Square kilometres (km^2)
		Population density		-	People/km2 (people/km2^2)
		Accommodation and catering as a percentage of tertiary GDP	+		Percentage (%)
	Social environment	Operating income from tourist attractions	+		million
		Disposable income per capita	+		Yuan
		Tertiary industry fixed asset investment completed year-on-year	+		Percentage (%)
		Number of people employed in the cultural and entertainment industry	+		10,000 people
	Urban construction	Public service land	+		Square kilometres (km^2)
		Road area	+		million square metres (million m^2)
		Gas penetration rate	+		Percentage (%)

Figure 1

Tree of indicators for the evaluation of sustainable development of tourism in Hebei Province.
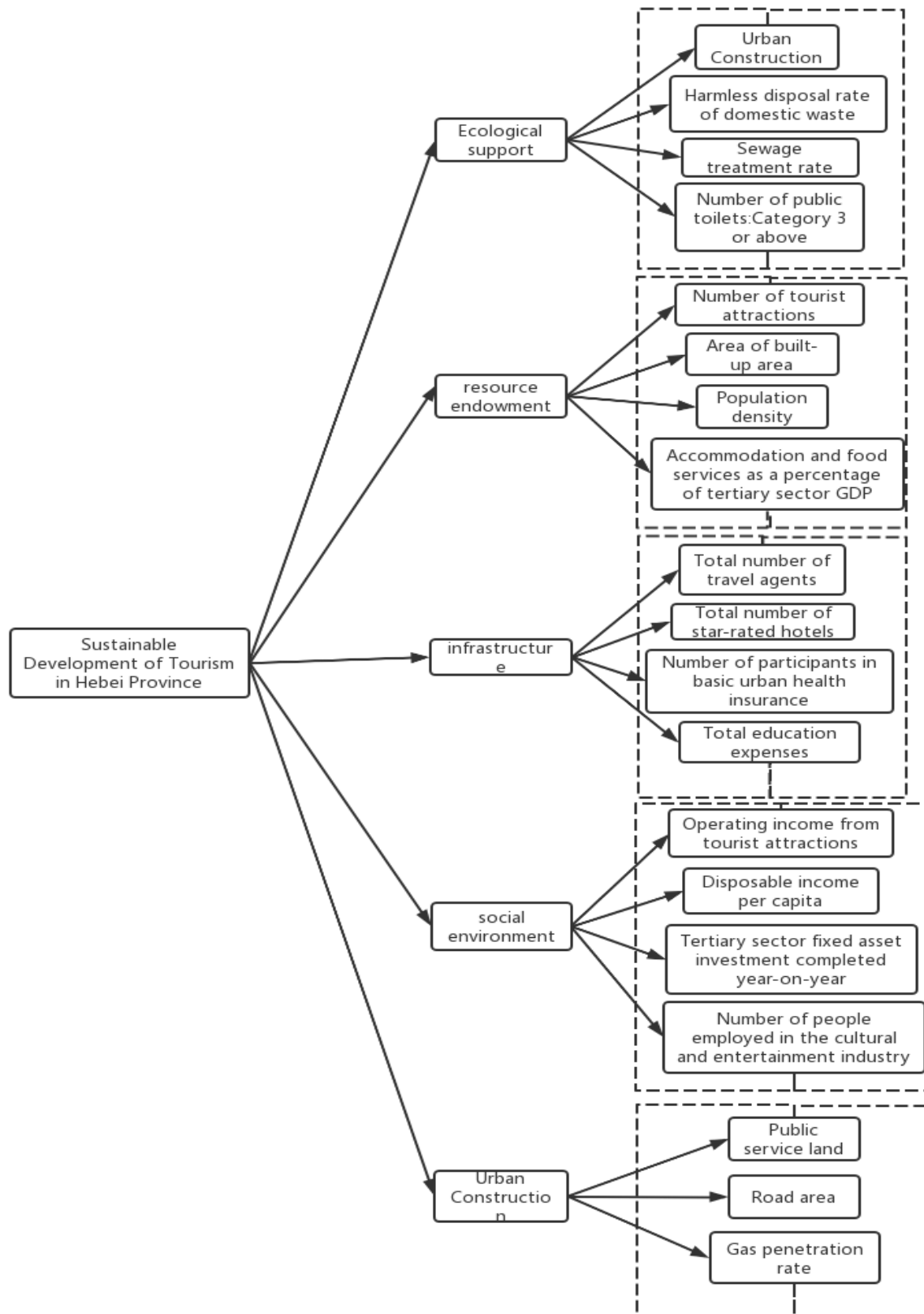
Entropy-TOPSIS Method

A comprehensive evaluation of the sustainable development of tourism is a complex system that involves selecting multiple indicators, processing the data using certain modeling methods, obtaining observations with reference to specific criteria, and then judging and analyzing these observations to assign realistic meanings. To evaluate and analyze the sustainable development of tourism in Hebei Province more accurately and objectively, this paper adopts the entropy-TOPSIS method based on the research methods

of Cao and Xu (Cao et al., 2017; Xu et al., 2013). This method is a comprehensive evaluation technique that combines the entropy method and the TOPSIS method. Compared to hierarchical analysis (AHP) and principal component analysis methods, it has the advantage of avoiding subjective bias in the entropy method, while the TOPSIS method can evaluate the strengths and weaknesses of each sample individually. The application of this method in tourism sustainability evaluation research is highly objective and practical, expanding the range of evaluation methods available in this research area. Therefore, this paper uses this comprehensive evaluation method to calculate the weights of the 18 tertiary indicators in the Sustainable Tourism Development Evaluation Index System for Hebei Province. The specific steps are as follows.

Step 1: Because the 18 indicators in the evaluation index system contain both positive and negative indicators, the raw data are standardized before being measured. This standardization process eliminates differences between orders of magnitude and magnitudes.

$$Y_{ij} = \frac{X_{ij} - \min(X_{ij})}{\max(X_{ij}) - \min(X_{ij})} \tag{1}$$

where,
X_{ij} are positive indicators.

$$Y_{ij} = \frac{\max(X_{ij}) - X_{ij}}{\max(X_{ij}) - \min(X_{ij})} \tag{2}$$

where,
Y_{ij} is a negative indicator. i denotes the year, and j denotes the indicator measured by X_{ij} with Y_{ij} denotes the data for each initial indicator and the data after the forwarding process.

Step 2: Measure the weights of the 18 tertiary indicators using the entropy weighting method.

$$E_j = -\ln(n)^{-1} \sum_{j=1}^{n} \frac{Y_{ij}}{\sum_{j=1}^{n} Y_{ij}} \ln \frac{Y_{ij}}{\sum_{j=1}^{n} Y_{ij}} \tag{3}$$

where,
E_j denotes the information entropy of each indicator, and according to E_j calculate the weight of each indicator W_j.

$$W_j = \frac{(1 - E_j)}{\sum_{j=1}^{n}(1 - E_j)} \tag{4}$$

The lower the information entropy, the greater the amount of information contained in the indicator, and thus, the greater the role and influence it plays in the overall evaluation, and the greater the weight; conversely, the less the role and influence it plays, and the less the weight.

Step 3: On the basis of the indicator weights derived in Step 2, the TOPSIS method is used to obtain the ranking results and relative fit of the evaluation objects.

First, construct a data analysis matrix Y.

$$Y = \begin{pmatrix} y_{11} & y_{12} \cdots & y_{1p} \\ \vdots & \ddots & \vdots \\ y_{n1} & y_{n2} \cdots & y_{np} \end{pmatrix} \tag{5}$$

Next, find the optimal and inferior values of each indicator and build the optimal value vector A_j^+ and the worst value vector A_j^- : the

$$A_j^+ = (\max y_{ik}) \tag{6}$$

$$A_j^- = (\min y_{ik}) \tag{7}$$

Again, the distance between the best and worst values was calculated for each evaluation indicator.

$$D_i^+ = \sqrt{\left(\sum_{j=1}^m A_j^+ - y_{ij}\right)^2} \tag{8}$$

$$D_i^- = \sqrt{\left(\sum_{j=1}^m A_j^- - y_{ij}\right)^2} \tag{9}$$

Finally, the relative discounting of each evaluation indicator to the optimal value is calculated C_i : The

$$C_i = \frac{D_i^-}{D_i^+ + D_i^-} \tag{10}$$

where the relative fit C_i is between 0 and 1, indicating the closeness of the evaluation object to the optimal solution. A larger value indicates that the object is closer to the optimal value and the higher the level of sustainable development; on the contrary, it indicates a lower level of sustainable development.

ANALYSIS OF EMPIRICAL RESULTS

Based on the comprehensive evaluation index system for the sustainable development of tourism in Hebei Province constructed in Table 1, this paper uses the "entropy-TOPSIS" method to measure 18 tertiary indicators for the period 2010-2020, and the results are analyzed in detail below.

Analysis of Indicator Weights

Table 2

*Results of the Weighting of Indicators for Sustainable Development of Tourism in Hebei Province*

Tertiary indicators	Information entropy value E_j	Information utility value	Weighting W_j
Greening coverage of built-up areas (%)	0.8895	0.1105	6.77%
Harmless disposal rate of domestic waste (%)	0.9165	0.0835	5.11%
Sewage treatment rate (%)	0.9216	0.0784	4.80%
Number of public toilets: Category 3 or above (pcs)	0.9035	0.0965	5.91%
Total number of travel agents (pcs)	0.9035	0.0965	5.91%

Tertiary indicators	Information entropy valueE_j	Information utility value	WeightingW_j
Total number of star-rated hotels (units)	0.9030	0.0970	5.94%
Number of medical insurance participants (persons)	0.9035	0.0965	5.91%
Total education expenses ($ million)	0.9035	0.0965	5.91%
Number of tourist attractions (pcs)	0.9100	0.0900	5.51%
Area of built-up area (sq km)	0.9035	0.0965	5.91%
Population density (persons/km2)	0.9035	0.0965	5.91%
Accommodation and food services as a percentage of tertiary sector GDP (%)	0.9330	0.0670	4.10%
Operating income from tourist attractions (RMB million)	0.9584	0.0416	2.55%
Disposable income per capita (yuan)	0.8996	0.1004	6.15%
Tertiary sector fixed asset investment completed year-on-year (%)	0.8975	0.1025	6.28%
Number of people employed in the cultural and entertainment industry (10,000)	0.9625	0.0375	2.30%
Public service land (sq km)	0.8898	0.1102	6.75%
Road area (sqm)	0.9035	0.0965	5.91%
Gas penetration rate (%)	0.9609	0.0391	2.39%

The weights of tertiary fixed asset investment, the number of employees in recreation and culture industry, public service land, road area and gas penetration rate are 0.0677, 0.0511, 0.048, 0.0591, 0.0591, 0.0594, 0.0591, 0.0591, 0.0551, 0.0591, 0.041, 0. 0255, 0.0615, 0.0628, 0.023, 0.0675, 0.0591, 0.0239, with relatively even weights between the items, all around 0.053. If the weight of the indicator is greater, the greater the degree of influence of the indicator on the comprehensive measure of sustainable development of tourism in Hebei Province, the more representative the indicator is in the measure. As can be seen from Figure 2, among the 18 tertiary indicators, the top three indicators are land for public service industry, greening coverage rate and the year-on-year amount of fixed assets completed in the tertiary industry, with the weights of 0.0677, 0.0675, 0, 0628 respectively, indicating that the three indicators of land for public service industry, greening coverage rate and year-on-year amount of fixed assets completed in the tertiary industry have a greater influence on the sustainable development of tourism in Hebei Province.

Figure 2

Weighting of indicators for sustainable development of tourism in Hebei Province
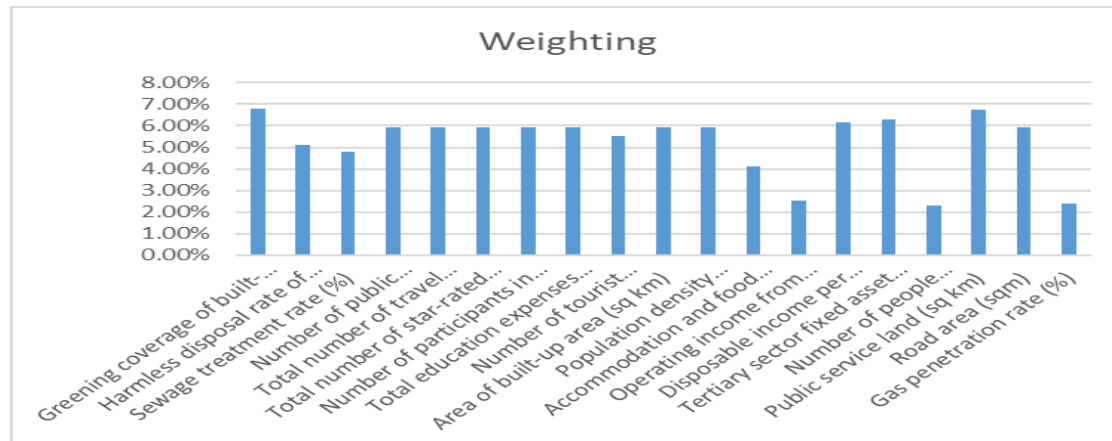
In the measure, the three indicators of land for public services, greenery coverage and the year-on-year amount of fixed assets completed in the tertiary industry are more representative. The green coverage rate has the greatest weight, ranking first among the 18 indicators, with a value of 0.0677, indicating that tourists are paying more and more attention to the ecological environment of tourist destinations, placing more emphasis on the comfort and satisfaction of their journeys, and no longer visiting sites in the same way as before, placing more importance on personal feelings and quality of life and tourism. The second indicator is public service land, with a weighting of 0.0675, indicating that this indicator plays a pivotal role in the sustainable development of tourism in Hebei Province.

The second indicator is land for public services, with a weighting of 0.0675, indicating that this indicator plays a major role in the sustainable development of tourism in Hebei Province, second only to the greening coverage rate, indicating that active and moderate development of tourism resources, tapping tourism potential, expanding the scale of tourism development, and responding to the policy of comprehensive tourism, can enhance the sustainability of tourism in Hebei Province and improve the sustainable comprehensive benefits brought by tourism. Investment support for the tourism industry also plays a pivotal role in the sustainable development of the tourism industry. The Hebei provincial government can relax its tourism development policies, lower the threshold for the operation of the tourism sector, give financial concessions to the tourism operation sector, expand financial support to the operation sector, ensure the capital flow strength of the enterprises and help the tourism operation enterprises to extend their operation cycle. In addition to the top three indicators mentioned above, the four tertiary indicators within the second criterion tier - the infrastructure dimension - can be found: the number of travel agencies, the number of star-rated hotels, the number of people with medical insurance and the amount of money spent on education are all in the top six of the overall weighting of the indicators, with weights of 0.0591, 0.0594. 0.0591, 0.0591, 0.0591, indicating that the infrastructure of tourist destinations plays an important role in the sustainable development of tourism. This is why Hebei should continue to strengthen the infrastructure of its tourist destinations, improve the capacity of travel agencies, increase the number and quality of star-rated hotels, extend the value-added chain of tourism, improve medical and educational conditions, enhance tourist satisfaction and experience, and cultivate a potential 'repeat' market.

Analysis of TOPSIS Results

The above empirical analysis calculated and ranked the relative closeness to the sustainable development level of the tourism industry in Hebei Province from 2010 to 2020. The relative closeness from 2010 to 2020 was 0.141, 0.113, 0.089, 0.113, 0.101, 0.110, 0.122, 0.142, 0.164, 0.171, 0.194 in ascending order of time. The higher the value, the closer the object is to the optimal value and the higher the level of sustainable development; on the contrary, the lower the level of sustainable development.

Figure 3 shows that in 2012, Hebei's tourism sustainability level was the lowest, with a relative proximity of 0.346, ranking tenth, while in 2020, it was the highest, with a relative proximity of 0.645, ranking first. From 2010 to 2014, the sustainability level of Hebei's tourism industry fluctuated and decreased, with the relative closeness dropping from 0.435 to 0.410 and the sustainability level fluctuating from sixth to tenth, with the relative closeness ranked in ascending order by year at 0.435, 0.404, 0. 346 and 0. 346 respectively. 0.404, 0.346, 0.431 and 0.410, respectively; while the years 2015-2020 saw a year-on-year increase, and in 2020, when the New Coronary Pneumonia epidemic was rampant, the level of sustainable development did not decrease, although the tourism industry received a major blow and impact, ranking first in the eleven years. In the context of the overall development of Hebei province, it is assumed that the different levels of sustainability in 2014 may be due to the normative level - ecological support - air conditions.

In Hebei province, for example, the cities of Shijiazhuang, Baoding and Xingtai, the air quality was frequently ranked at the bottom of the national rankings from 2010 to 2014, with the average concentration of PM2.5 in the air frequently exploding, the number of days with better than secondary air quality deteriorating, and Xiaojing and Zhou (2022) suggested that environmental pollution severe, which not only seriously affected industrial development, but also strongly hindered the development of the service industry(Xiaojing & Zhou, 2022), including tourism, and the ecological environment was severely damaged. After 2014, the emergence of the "APEC Blue", the call for policies such as "green water and green mountains are the silver mountain of gold", and the improvement of the government's modern governance capacity have brought Hebei Province "back to blue skies". "The province's air quality has improved significantly, ecological management has been effective, and the level of sustainable development of the tourism industry has improved and enhanced year on year.

Table 3

Analysis of TOPSIS Ranking Results

Item	Positive ideal solution distance $D+$	Negative ideal solution distance $D-$	Relative proximity C	Sort results
2010	0.183	0.141	0.435	6
2011	0.166	0.113	0.404	10
2012	0.167	0.089	0.346	11
2013	0.149	0.113	0.431	8
2014	0.145	0.101	0.410	9
2015	0.142	0.110	0.435	7
2016	0.140	0.122	0.466	5
2017	0.125	0.142	0.532	4
2018	0.120	0.164	0.577	3
2029	0.120	0.171	0.587	2
2020	0.107	0.194	0.645	1

Figure 3

Trend of TOPSIS ranking results
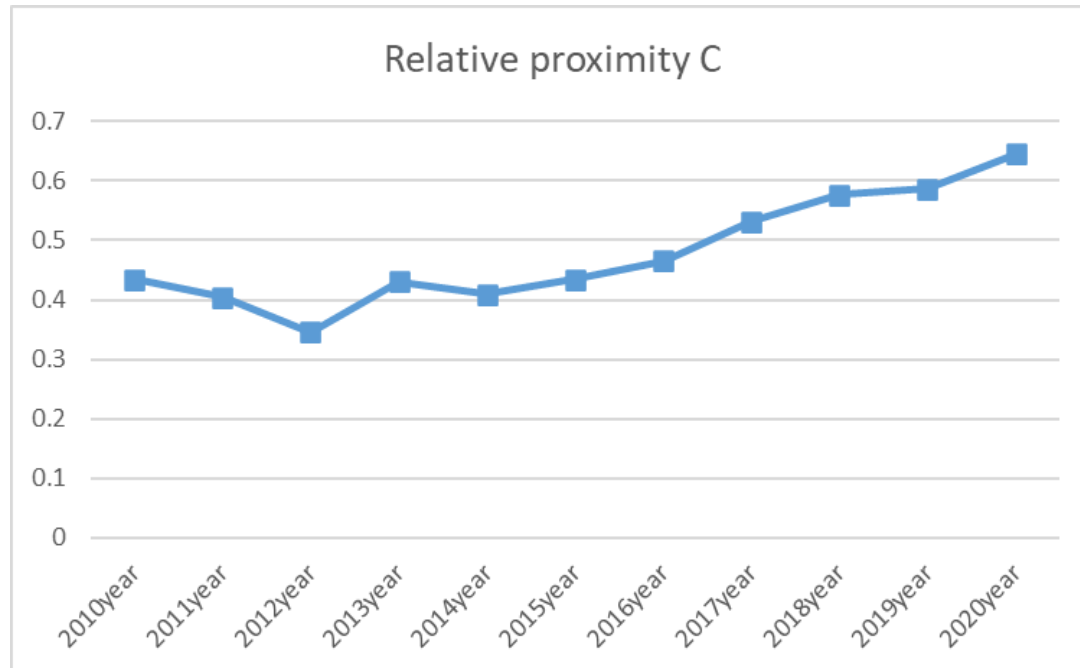
SWOT Analysis

Figure 4

SWOT analysis of sustainable tourism development in Hebei Province

Strengths (S) Resource endowment advantages Convenient location	Weaknesses (W) Shortage of professionals
Opportunities (O) Government Policy Support	Threats (T) Too much competition from the surrounding area

Strength Analysis (S)

Tourism resources are a prerequisite for the development of tourism. As of August 2021, there were 464 A-class tourist attractions in the province, of which 140 were 4A-class attractions and 11 were 5A-class attractions; and 15 projects were selected for the fifth national list of non-heritage; five provincial tourism conferences and 51 municipal tourism conferences were successfully held, covering 109 counties (cities and districts) in the province, leading to the construction and upgrading of 531 key projects 531, with a total investment of more than 410 billion yuan, and an average annual growth rate of 26% in total tourism revenue by the end of 2019. The province built and altered more than 3,900 kilometres of new

tourism roads, more than 4,400 kilometres of scenic roads and greenways, improved more than 1,000 tourism traffic signs, built and upgraded 110 regional visitor service centres and 210 tourism leisure stations; during the new three-year action plan for the tourism toilet revolution, the province built a total of 4,781 tourism toilets, comparing to the target of 2,192 tasks set by the Ministry of Culture and Tourism. In addition, in terms of digital tourism, Li and Tian (2019) found that the pilot construction of intelligent scenic spots was carried out in an orderly manner (Li &Tian, 2019), and the "One Mobile Phone Touring Hebei" - "Le Touring Ji" platform The platform of "One Mobile Phone Touring Hebei" - "Le Touring Ji" was put into operation.

Weakness Analysis (W)

Hebei Province has many human and natural landscapes, and cultural connotation is the biggest selling point of tourist attractions, especially red tourism attractions, so the professionalism of practitioners is needed to obtain the satisfaction of tourists and improve satisfaction so that the role is very important. However, in Hebei Province, there is a lack of professionalism and cultural connotation of some tourism staff and a lack of professional training, so the content of the explanation in red tourism scenic spots does not reflect the cultural charm of the tourist attractions, which makes the tourist attractions less attractive and reduces the experience of tourists. The overall quality of the staff and their professional training needs to be further strengthened so that they can add to the sustainable development of tourism in Hebei Province rather than greatly reduce it.

Opportunity Analysis (O)

The government has promulgated the 14th Five-Year Plan for the Development of Tourism in Hebei Province, the 14th Five-Year Plan for Culture and Tourism in Hebei Province, and the 14th Five-Year Plan for Science and Technology Innovation in Culture and Tourism in Hebei Province. The "Tourism Development Conference" and the "13th China Arts Festival" have also greatly boosted tourism enthusiasm in the province and enriched the cultural connotation of tourism resources. Three major events—the Beijing-Tianjin-Hebei Synergistic Development, the planning and construction of the Xiongan New Area, and the preparation for the Beijing Winter Olympics—have provided a once-in-a-lifetime historical opportunity for the quality development of tourism in Hebei. The Beijing-Tianjin-Hebei synergistic development plan has expanded the tourist market and enhanced the visibility of tourism resources by effectively decongestion of Beijing's non-capital functions and constructing an integrated platform, which can effectively create a good scale agglomeration effect. The construction of the Xiongan New Area and the preparation for the Winter Olympics have optimized the upgrading of tourism industry institutions and routes, bringing tourists closer to the destinations. Additionally, Hu et al. (2022) found that multiple opportunities, such as the National Cultural Park, the China (Hebei) Pilot Free Trade Zone, and the construction of the Beijing Daxing International Airport Airside Economic Zone, provide strong support for the sustainable and high-quality development of Hebei's tourism industry (Hu et al., 2022).

Threat Analysis (T)

Li et al. (2018) proposed that the tourism industry is characterized by vulnerability and sensitivity, with a weak ability to resist irresistible factors and a strong dependence on domestic and international situations and security factors. Although the tourism industry in Hebei Province has generally been stable in the current post-epidemic era, the impact of the epidemic on tourism development is undeniable. Most attractions, hotels, and travel agencies struggled to make ends meet within a few months of the epidemic,

and supply chains and industry chains were shattered. Additionally, international wars, terrorist activities, and trade frictions, such as the "US-China trade frictions" and the "Russia-Ukraine war," can be fatal to the tourism industry. These issues reduce the market for tourists, lower the willingness to travel, and decrease tourism benefits. This will affect not only the local tourism industry but also the other countries involved and even the sustainable development of global tourism.

CONCLUSION AND POLICY

Conclusion

In the previous paper, the entropy-TOPSIS method was used to analyze and rank the level of sustainable development of tourism in Hebei Province from 2010 to 2020, and the weights of the evaluation indicators were calculated.

First, the three indicators of public service land, greening coverage, and the year-on-year amount of fixed assets completed in the tertiary industry have a greater influence on the sustainable development of tourism in Hebei Province. Among these, the indicator with the greatest influence and strongest representation is the greening coverage.

Second, using 2014 as the dividing line, Hebei Province's tourism sustainability level shows different development trends. From 2010 to 2014, its sustainable development level fluctuates lower. From 2015 to 2020, it increases year by year, with the tourism industry ranking first in terms of sustainable development in 2020.

Third, Hebei's tourism industry has advantages and disadvantages, opportunities, and threats to sustainable development. Strengths include a strong history and culture and a convenient location. Weaknesses include a shortage of professionals and insufficient publicity. Opportunities come from government policy support and market prospects, while threats include force majeure and diverse tourist demands.

Counter Measures

In summary, tourism development in Hebei province has obvious advantages and many shortcomings, and it faces great opportunities and challenges. In this regard, Hebei Province should take stock of the situation, adapt scientifically, avoid harm, seize opportunities and meet challenges in order to achieve sustainable development in the tourism industry. Based on this, this paper proposes the following three measures to promote sustainable tourism development in Hebei Province.

Skills Training for Professionals

Promote the construction of a high-end tourism talent team by strengthening tourism culture education and professional skills training. Improve the quality of tourism services and enterprise management in all aspects, and train a number of professional and international tourism talents with a long-term development vision. This will qualitatively improve the overall level of tourism in Hebei Province, fundamentally enhance the operation level, and realize a development concept that keeps pace with the times. Utilize the role of surrounding universities and implement a talent introduction policy, focusing on the cultivation of local tourism professionals to accelerate the construction of a professional talent team. Provide consumers with the richest, most direct, and satisfactory material and spiritual enjoyment in the shortest possible time. Improve the quality of services and professional skills, win the market with first-

class management and services, and establish a high-quality brand image of tourism in Hebei Province.

Increased Marketing and Promotional Efforts

Actively establish and carry out regular cooperation with new media platforms such as Weibo, Xiaohongshu, ShakeYin, and Racer. Strengthen cross-border joint promotion and precise marketing by utilizing the fast dissemination, wide range, and strong influence of new media. Plan various forms of promotional content and conduct new media promotion through multiple channels. Promote and shape the tourism brand of Hebei Province by strengthening marketing awareness and investing actively and effectively in publicity. Increase the visibility of Hebei Province's tourism industry and strengthen its brand image. Improve the cultural and tourism branding system, launch more famous product brands similar to "Beijing's blessed land, enjoy Hebei," and form a branded industrial chain. Increase the added value of tourism and strive to make Hebei Province's tourism industry an internationally renowned brand. Further open up to the outside world by integrating tourism resources in Hebei Province according to the new competitive market situation and market demand. Focus on branding tourism resources by relying on the province's unique tourism resources, highlighting the thematic characteristics of tourism resources, and using modern and electronic means of professional brand management.

Deficiencies and Prospects

In addition to the above conclusions, this paper has certain limitations: First, since this paper is still an exploratory study on the evaluation of the sustainable development level of rural tourism and the

construction of an impact model, Liu (2021) and Streimikiene et al. (2021) found that it needs to be further tested regarding the theoretical connotation of the sustainable development of rural tourism and the extraction of influencing factors (Liu, 2021; Streimikiene et al., 2021). This direction also needs to be continuously deepened and improved in follow-up research.

Second, the research case selected in this paper is Hebei Province, which has certain limitations in sample representation. It is necessary to supplement case samples from different provinces and cities in the future. Kang et al. (2022) found that tourism development types and cultural connotation characteristics need to be considered to improve the scientific validity of the research (Kang et al., 2022).

Third, Zhu (2018) proposed that it is difficult to obtain data from cities, counties, and villages due to the sustainable development of rural tourism. This paper does not involve the dynamic evolution process and spatiotemporal differentiation analysis of the impact path of the sustainable development level of rural tourism in Hebei Province, so it is also necessary to continue to follow up in future research and supplement this aspect (Zhu, 2018).

Fourth, Dongrui and Huang (2021), Dong et al. (2020), and Du et al. (2022) found that with the continuous advancement of major strategies such as new urbanization, integrated development of urban and rural areas, common prosperity goals, rural revitalization strategies, and dual-carbon strategies, it is crucial to measure the level of integrated development of rural cultural tourism and rural revitalization from a micro perspective. This includes promoting in-depth integrated development and green consumption in rural cultural tourism, revealing the interactive mechanism of industrial integration and rural revitalization, and exploring the mode and path of common prosperity in urban and rural areas. These will become important directions for future research (Dongrui & Huang, 2021; Dong et al., 2020; Du et al., 2022).

REFERENCES

Andereck, K. L., & Nyaupane, G. P. (2011). Exploring the nature of tourism and quality of life perceptions among residents. *Journal of Travel Research*, 50, 248-260.

Andereck, K. L., Valentine, K. M., Knopf, R. C., & Vogt, C. A. (2005). Residents' perceptions of community tourism impacts. *Annals of Tourism Research*, 32, 1056-1076.

Andereck, K. L., Valentine, K. M., Vogt, C. A., & Knopf, R. C. (2007). A cross-cultural analysis of tourism and quality of life perceptions. *Journal of Sustainable Tourism*, 15, 483-502.

Bulte, R. W. (1991). *Tourism, environment, and sustainable development*. Environmental Conservation, 18, 3, 201-209.

Cao Pei Pei. (2017). Research on the evaluation of the coordination between urban tourism and urban development based on entropy power - TOPSIS method - taking 13 cities in Jiangsu Province as an example[J]. *Modern Urban Research*, 07, 124-129.

Xiaojing, & Zhou, W. (2022). Comprehensive evaluation, system construction and promotion mechanism of ecological security in the middle and upper reaches of the Yellow River in northwest China. *Ningxia Social Science*, 04, 115-125.

Dongrui, & Guangwei H. (2021). Quantitative analysis of factors influencing the development of folk culture tourism and countermeasures based on multi-source data and multi-decision model: the case of Yuanjia village in Xianyang City, Shaanxi Province. *Forestry Economics,* 43, 12, 77-92.

Dong, W.J., Wang C.S., & Zhang, Z.Z. (2020). Spatio-temporal coupling study of rural revitalization and rural tourism in Shandong Province[J]. *Geoscience*, 40, 04, 628-636.

Du Yan, Li Shitai, & Yang Yang. (2022). Study on the coupled and coordinated development of high-quality rural tourism development and rural revitalization in Shandong Province[J]. *Journal of Natural Sciences, Hunan Normal University,* 45, 03, 22-32.

Hassan, S. S. (2000). Determinants of market competitiveness in an environmentally sustainable tourism industry. *Journal of Travel Research*, 38, 3, 239-245.

Hu, Wei-Xia, & Liang, Xiao-Tao. (2022). Performance evaluation and optimal development of tourism-led rural revitalization: A case study of Yunqiu Mountain Village in Shanxi Province[J]. *Arid Zone Resources and Environment*, 36, 08, 183-191.

Jeon, M. M., Kang, M. M., & Desmarais, E. (2016). Residents' perceived quality of life in a cultural-heritage tourism destination. *Applied Research in Quality of Life*, 11, 105-123.

Kang Zhenhai, Shi Guangfeng, Chen Sheng, & Zhang Wei. (2022). In Jiaqi, Xing Huibin and Li Zhiyong, (Eds.), *Hebei Blue Book: Hebei Tourism Development Report*.

Li G. Bing, & Tian Y. Ping. (2019). Validity analysis of the competitiveness of tourism resources and tourism development level in the Pearl River Delta. *Economic Geography,* 39, 03, 218-239.

Li Wei, Han Peijie, & Zhao Xueyan. (2018). Research on sustainable development of tourism in ecologically fragile areas based on energy value analysis--Gannan Tibetan Autonomous Prefecture as an example. *Journal of Ecology*, 38,16, 5894-5903.

Liu, J., Nijkamp, P., Huang X. X., Lin D. R. (2017). Urban livability and tourism development in China: analysis of sustainable development by means of spatial panel data. *Habitat International,* 68, 99-107.

Liu, Bingjie, Zhao, Yangyun, & Li, Qian. (2021). Spatial and temporal evolution of tourism development in China and analysis of its influencing factors. *Statistics and Decision Making*, 37(23),106-110

Luekveerawattana, R. (2018). Key factors affecting of tourists' decisions to stay at environmentally friendly hotels. *Polish Journal of Management Studies*, 17, 2, 148- 157.

Mo Liqiu. Construction of an evaluation index system for sustainable development of rural tourism resources in Hainan Province. *China Agricultural Resources and Zoning*, 2017, 38, 06, 170-177.

Morgan, N., Pritchard, A., & Sedgley, D. (2015). *Social tourism and well-being in later life.* Annals of Tourism Research, 52, 1-15.

Murava, I., & Korobeinykova, Y. (2016). The analysis of the waste problem in tourist destinations on the example of Carpathian region in Ukraine. J*ournal of Ecological Engineering*, 17, 2, 43 -51.

Ng, S. I., Chia K. W., Ho J A., Ramachandran S. (2017). Seeking tourism sustainability: a case study of Tioman Island, Malaysia. *Tourism Management,* 58, 101-107.

Niu Yafei. (2002). Research on the index system of sustainable development of tourism. *China Population, Resources and Environment*, 2002, 06, 44-47.

Paulauskienė L. (2013). The tourism management principles and functions on local level. *Management Theory and Studies for Rural Business and Infrastructure Development,* 1, 99-110.

Streimikiene, D., Svagzdiene, B., Jasinskas, E., & Simanavicius, A. (2021). *Sustainable tourism development and competitiveness: The systematic literature sustainable development*, 29, 259- 271.

UNEP. (2004). *Sustainable tourism development in UNESCO*. Vienna, Austria, UNEP.

Xu Chunhong. (2013). Research on the evaluation of the competitiveness of city tourism industry based on TOPSIS method of information entropy weight--Take 11 cities in Zhejiang Province as an example. *Business Times*, 31, 128-130.

Xu T, Zhang Qiuju, & Zhao Lianrong. (2004). Overview of research on sustainable tourism development in China. *Arid Zone Resources and Environment*, 18, 6, 123-127.

Zhang Naiming, Zhang Li, Zhao Hong, Han Yunchang, & Duan Yonghui. (2018). Construction and application of agricultural green development evaluation index system. *Ecological Economy,*34, 11, 21-46.

Zhao Shidong, & Wang Limao. (1996). The concept and meaning of sustainable development. *Journal of Natural Resources,* 11, 3, 288-292.

Zhu Xueqiang. (2018). China's tourism economic development model in the perspective of sustainable development. *Social Scientist*, 10, 70-78.