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Research on Hierarchical Analysis Method and Optimization Path of Comprehensive Benefits of Tourism Culture

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Abstract Under the impact of artificial intelligence technology, it is both a challenge and an opportunity for the tourism culture industry. Referring to the relevant information, the comprehensive benefit evaluation index system of tourism culture is preliminarily determined. In order to ensure the practical application value of its system, the evaluation indexes are preprocessed using the Durfee method, and the task of constructing the comprehensive benefit evaluation index system of tourism culture is finally completed. Aiming at the limitations of the hierarchical analysis method, a combination algorithm of the entropy weight method and the hierarchical analysis method is proposed, and the weights of the indicators are calculated using this combination algorithm, and the calculated weights are imported into the fuzzy comprehensive evaluation model to realize the evaluation and analysis of the comprehensive benefits of tourism culture. The calculated value of the comprehensive benefit evaluation of tourism and culture in the region from 2016 to 2023 is 82.4, indicating that the value tends to [80, 90) interval, and its benefit level is good. A corresponding optimization path is formulated to accelerate the green and sustainable development of tourism and culture industry.

Index Terms deffy method, hierarchical analysis algorithm, entropy weight method, tourism culture

I. Introduction

At present, the deep integration of culture and tourism has become an important way to promote local economic development and enhance the influence of regional brands [1], [2]. With the improvement of people's living standards and the diversification of leisure, tourists are no longer satisfied with traditional sightseeing tours, but are more inclined to experience the cultural connotation and unique charm of the destination in depth [3], [4]. Through the deep integration of culture and tourism, the local tourism industry can not only provide tourists with a more colorful and regional characteristics of the tourism experience, but also enhance the quality of service at the same time, enhance the value connotation of tourism products [5]-[7].

With the rapid development of tourism and culture industry, the need for tourism benefit evaluation has been spawned [8]. However, unlike other industries, tourism and culture industry is a variety of industries to form an industry group, and the performance of its benefits is both economic and ecological and other aspects [9], [10]. At present, the local management of tourism and culture industry is limited to the coordinated management by the first-level government, the loose binding management by the specialized tourism functional institutions, and the independent self-management of the tourist attractions [11]-[13]. For the performance assessment of local specialized functional institutions will be limited to the assessment indicators of the higher level and the efficiency assessment of the work carried out at this level, for the comprehensive cross-sectoral functions of the industry's overall effectiveness of the assessment and evaluation of the lack of scenic spots, tourism enterprises pay more attention to the internal business benefits [14]-[17]. Therefore, it is necessary to establish a comprehensive benefit evaluation model of tourism and culture that considers the interests of all parties to realize comprehensive information, global grasp and scientific and effective evaluation.

Based on the principles of evaluation index design and References, 27 secondary indicators and 3 primary indicators were selected, thus constituting the evaluation index system. The Delphi method is used to amend the evaluation index system so that the system is more in line with the current tourism and culture industry. Before constructing the fuzzy comprehensive evaluation model, the entropy weight method and hierarchical analysis method are used to calculate the weights of evaluation indicators. Then based on the index weight data, set the factor set, evaluation set, affiliation degree, and finally get the comprehensive evaluation model oriented to the benefits of tourism and culture. The model of this paper is used to evaluate the comprehensive benefits of tourism

and culture in a region, and according to the actual situation reflected in the evaluation results, the corresponding optimization path is proposed in order to improve the benefits of tourism and culture in the region.

II. Evaluation indicators for the comprehensive benefits of tourism and culture

II. A. Principles for the design of evaluation indicators for the comprehensive benefits of tourism and culture

II. A. 1) Scientific

The quantitative analysis method should be combined with the qualitative analysis method to determine a scientific indicator system, which can accurately reflect the basic characteristics of the tourism industry and the requirements of sustainable development, reflecting the intrinsic benefits of the tourism industry itself and the way of realizing it as well as the driving effect of the tourism industry and the external benefits, which is of guiding significance to the sustainable development of the tourism industry.

II. A. 2) Completeness

As an organic whole, the indicators and system should be able to reflect the essential characteristics of the comprehensive benefits of the tourism industry and its basic structure, comprehensively cover the contents of the benefits, and require the indicators of the indicator system to be both interconnected and relatively independent.

II. A. 3) Credibility

The study of tourism benefit evaluation is an important reference basis for decision-making by administrative departments, developers, operators and related organizations, and it should adhere to the principle of seeking truth from facts and being objective and fair, and the evaluation results should not be far-fetched, otherwise the development of the industry will bring about huge economic losses and negative effects, and the results of the benefit evaluation should be discussed in the form of hearings and other forms of discussion, if necessary.

II. A. 4) Hierarchy

The indicator system should be stratified according to the functions of the indicators according to the needs of research and application, with different levels reflecting different hierarchical contents, clear affiliation and correspondence between the levels, and juxtaposition of sub-indicators within the levels.

II. B. Construction of evaluation index system based on Delphi method

II. B. 1) Criteria for the selection of experts

Famous scholars or technical backbones in multiple fields involving the cultural tourism industry in China were selected to participate in this study's Delphi method expert consultation, including cultural tourism industry workers in tourism management, hotel management, geoscience, graphic design, marketing and other activities. The specific requirements are as follows:

(1) Professional knowledge background related to cultural tourism industry such as economics, geography, and marketing.

(2) Working for 8 years or more from the field related to cultural tourism industry and have become the technical backbone of the field.

(3) Possessing the title of associate senior or above (or experts with doctoral degree and intermediate title) and understanding the latest research progress in cultural tourism industry.

II. B. 2) Implementation process of expert advice

Round 1: The questionnaire will be sent by SMS or e-mail, and the experts will be provided with relevant background materials, the preliminary assessment indicator system and knowledge of the Delphi method, so that they can fill in the questionnaire in a relatively short period of time, based on their professional knowledge and experience. Each expert rated the importance of the three-level indicators according to the “five-point Likert scale”, and put forward his or her own opinions or suggestions, stating the basis and reasons. After the questionnaire was collected, Excel 2019 and SPSS 22.0 software were used to enter, summarize and analyze the data. According to the results of indicator screening and expert opinions, the second round of the expert consultation questionnaire was revised and developed after discussion by the subject group

Second round: the second round of the expert consultation questionnaire, the revision of the three-level indicators and the second round of the evaluation indicator system are fed back to the experts together in the form of emails. The experts will refer to the results of the previous round of survey and make adjustments to their own judgments. If the evaluation results differ greatly from the feedback information, they should state the reasons in the column of “Revision Opinions”. The investigator collects the questionnaires and analyzes them statistically again, modifies, deletes or adds evaluation indicators according to the results, and formulates the third round of expert consultation

questionnaires. If the degree of concentration and harmonization of expert opinions is high, the correspondence can be concluded.

II. B. 3) Indicator screening principles

The indicator importance assignment satisfies the arithmetic mean (x) ≥ 4.2, the full score ratio (K) > 0.20, and the coefficient of variation (CV) < 0.25, and the indicator is considered to be selected if the degree of concentration of expert opinions is high and the consistency of expert opinions is good. Indicators that do not meet the conditions are modified or excluded based on expert recommendations. In addition, some entries that are more controversial among experts and are suggested to be deleted/suggested to be added are deleted/added after discussion by the subject group.

II. B. 4) Statistical analysis of expert advice data

(1) Positive coefficient of experts

The size of the expert positive coefficient, i.e., the rate of questionnaire recovery and the rate of suggestions, indicates the degree of interest of the experts in this study, and is calculated by the formula:

$$\text{Questionnaire recovery rate} = \frac{\text{Questionnaire Recovery Rate}}{\text{Questionnaire sent out rate}} \times 100\% \tag{1}$$

$$\text{Suggestion rate} = \frac{\text{Number of Suggestions}}{\text{Number of questionnaires sent}} \times 100\% \tag{2}$$

(2) Assignment of the importance of indicators

The importance of each indicator to the quality of foodborne disease surveillance in medical institutions was evaluated using a five-point Likert scale, which was set at five levels of “very important, important, generally important, unimportant, and very unimportant”, and assigned a score of 5, 4, 3, 2, and 1, respectively.

(3) Concentration of expert opinions

(a) Calculate the arithmetic mean:

$$\bar{x}_j = \frac{1}{m}\sum_{i=1}^{m} x_{ij} \tag{3}$$

Where: $\bar{x}_j$ denotes the evaluation result of the j th indicator, x_{ij} denotes the rating value of the i th expert for the j th indicator, and m denotes the number of experts. The larger the value of $\bar{x}_j$, the higher the degree of importance of the corresponding j indicator.

(b) Calculate the full score frequency:

$$K_j = \frac{m_j}{M_j} \tag{4}$$

In the formula: m_j denotes the number of experts participating in the j th evaluation indicator. M_j denotes the number of experts who give perfect scores. K_j takes a value between 0 and 1, which can be used as a supplementary indicator of $\bar{x}_j$. The larger the value of K_j, the larger the proportion of experts giving full marks to the j indicator, and the more important the indicator.

(4) Degree of coordination of expert opinions

Indicators of the degree of coordination of expert opinion include the coefficient of variation $\left(CV_j\right)$, the coefficient of coordination of expert opinion (W) and χ^2 test. Among them, CV_j can only indicate the degree of coordination of m_j experts on a single indicator, if we want to know the degree of coordination of m experts on all j indicators need to calculate the coefficient of coordination of expert opinion and carry out the significance test - χ^2 test.

(a) Calculate the coefficient of variation:

$$CV_j = \frac{\sigma_j}{\bar{x}_j} \tag{5}$$

where: σ_j denotes the standard deviation of the j th indicator. CV_j denotes the degree of fluctuation in the relative importance of the j -indicator by the experts, and the smaller the value of CV_j, the higher the degree of harmonization among the experts.

(b) Calculate the Kendall's harmony coefficient:

$$W = \frac{12}{m^2\left(n^3-n\right)-m\sum_{i=1}^{m}T_i}\sum_{j=1}^{n}d_j^2 \tag{6}$$

$$T_i = \sum_{i=1}^{L}(t_i^3 - t_i) \tag{7}$$

where: n denotes the number of indicators. m denotes the number of experts, and $\sum_{j=1}^{n}d_j^2$ is the off-mean squared deviation of the rank sum of all indicators. T_i is the correction factor, and L denotes the number of evaluation groups of i experts in the evaluation. T_i denotes the number of identical grades in the L group.

The value of W is between 0 and 1. The larger W is, the better the degree of coordination of the experts. If the experts are in complete agreement on the evaluation of the relative importance of all indicators, $W=1$, and in the case of extreme opposite opinions, $W=0$.

(c) Significance test of the degree of coordination - χ^2 test:

$$\chi_R^2 = \frac{1}{m(n+1)-\frac{1}{n-1}\sum_{i=1}^{n}K_i}\sum_{j=1}^{n}d_j^2\ (\nu=n-1) \tag{8}$$

According to the degree of freedom ν and the significance level $\alpha=0.05$, the value of χ_α^2 is checked from the table of χ^2 values. If $\chi_R^2>\chi_\alpha^2$, it can be considered that the probability of non-accidental coordination of expert opinions is small, and this difference is statistically significant, which indicates that the expert opinions are well coordinated and the results are desirable. If $\chi_R^2<\chi_\alpha^2$, it is assumed that the expert opinion will be less than confidently coordinated in terms of non-accidental coordination, the credibility of the assessment conclusion is poor, and the evaluation results are not desirable.

(5) Degree of authority of experts

The degree of authority of the expert is expressed by the expert authority coefficient (C_r), which is generally determined by two factors: one is the basis of the expert's judgment on the issue, expressed by C_α. One is the expert's familiarity with the indicator, denoted by C_s. The calculation formula is:

$$C_r = \frac{(C_\alpha + C_s)}{2} \tag{9}$$

This study quantifies the basis of experts' judgment and familiarity with each indicator, and when the C_r result is greater than 0.7, it indicates that the results obtained from this expert consultation are authoritative.

III. Evaluation model of comprehensive benefits of tourism and culture

III. A. Subjective weight calculation based on hierarchical analysis algorithm

III. A. 1) Hierarchical modeling

The first step of using the hierarchical analysis method is to construct a hierarchical structure model, this paper refers to the method combined with the research needs of this paper will be divided into three levels of evaluation indexes, respectively, the target layer, the guideline layer and the program layer. The target layer is the research goal, only one element. The criterion layer is the intermediate link to realize the goal, which can be composed of multiple elements. The program layer is the bottom layer of the hierarchical model, which is the layer with the most elements of the hierarchical model, and it is a variety of programs or measures that can be used for reference to achieve the research objectives.

III. A. 2) Constructing judgment matrices

After constructing the hierarchical model, it is necessary to make the factor importance scoring table, and then invite the authoritative experts in the relevant research field to score, this paper scoring using the 1-9 scale method, the scale and the meaning of the scale is shown in the following table 1, and finally the statistical scoring results of the

experts to construct the judgment matrix, so as to calculate the indicator weights in the next step, to determine the degree of importance of the indicators.

Table 1: Scales and meanings

Scale	Implication
1	The two elements are compared and of equal importance
3	The former factor is slightly more important than the latter
5	Compared with the two elements, the former factor is significantly more important than the latter factor
7	Comparing the two elements, the former factor is more important than the latter factor
9	Compared with the two elements, the former factor is extremely important than the latter factor
2,4,6,8	The median value of the adjacent judgment scale
1,1/2,…,1/9	The importance of comparing the order before and after the exchange of two elements

III. A. 3) Hierarchical Single Ordering and Consistency Tests

According to the judgment matrix, the maximum characteristic root and eigenvectors are determined, and the weights of each index are solved as follows:

In this paper, the sum product method is used to find the weight of each indicator, firstly, the matrix A is normalized by column:

$$\bar{A}_{ij} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}} \quad i, j = 1, 2, \cdots, n \tag{10}$$

Then find the average of each row of the matrix that has been normalized by column:

$$\omega_i = \frac{1}{n} \sum_{j=1}^{n} \bar{A}_{ij} \quad i, j = 1, 2, \cdots, n \tag{11}$$

Where ω_i represents the weight of the i th row of the judgment matrix.

Next, the large eigenvalue corresponding to the weight vector is computed with the formula:

$$\lambda_{\max} \approx \frac{1}{n} \sum_{i=1}^{n} \frac{(A\omega)_i}{\omega_i} \quad i = 1, 2, \cdots, n \tag{12}$$

The matrix consistency indicator is calculated as:

$$CI = \frac{\lambda_{\max} - n}{n - 1} \tag{13}$$

The stochastic consistency ratio was calculated according to the following formula:

$$CR = \frac{CI}{RI} \tag{14}$$

where RI is the average stochastic consistency index, RI take the value of the following table 2. when CR is less than 0.1, it is considered that the calculated weight value of each indicator to meet the consistency requirements.

Table 2: RI Value

Rank N	1	2	3	4	5	6	7	8	9
RI	0	0	0.52	0.89	1.12	1.26	1.36	1.41	1.46

III. A. 4) Hierarchical General Ordering and Consistency Tests

After calculating the relative weights of the indicators at each level, the comprehensive weights of each indicator are calculated according to the formula $W_{ij} = W_i \times W_j$ and the hierarchical total ranking consistency test is performed [18]. The formula is as follows:

$$CR = \frac{\sum_{j=1}^{m} CI_j \omega_j}{\sum_{j=1}^{m} RI_j \omega_j} \tag{15}$$

When CR is lower than 0.1, the results of the calculation of the integrated weights of the indicators meet the consistency requirements, and the total ranking results meet the requirements and are acceptable.

III. B. Objective weight calculation based on entropy weight method

The original data matrix X is obtained by downloading the statistics from the relevant official website:

$$X = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{bmatrix} \tag{16}$$

The raw data matrix X obtained above is normalized using the following equations (17) and (18):

Normalization of positive indicators:

$$y_{ij} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \tag{17}$$

Negative indicators are standardized:

$$y_{ij} = \frac{\max x_{ij} - x_{ij}}{\max x_{ij} - \min x_{ij}} \tag{18}$$

The entropy value e_j for the j th metric is given in Eqs. (19) and (20):

$$e_j = -\frac{1}{\ln m} \sum_{i=1}^{m} \left(P_{ij} \ln P_{ij} \right) \tag{19}$$

$$P_{ij} = \frac{y_{ij}}{\sum_{i=1}^{m} y_{ij}} \tag{20}$$

$$w_j = \frac{1 - e_j}{\sum_{j=1}^{n} (1 - e_j)} \tag{21}$$

III. C. Calculation of combined weights

In the weight calculation of each index, both the AHP method and the entropy weight method show unique advantages. However, these two methods also have certain limitations in practical application. In view of this, this paper uses the comprehensive assignment method to calculate the indicator weights. The comprehensive weight is denoted by w_j, where w_j^1 denotes the weight calculated by the AHP method, w_j^2 denotes the weight calculated using the entropy weight method, and δ is the weight coefficient.

$$w_j = \delta w_j^1 + (1 - \delta) w_j^2 \tag{22}$$

The result of δ is to satisfy the condition that the following equation (23) is minimized, so the calculation of δ is carried out according to the objective function shown in (23):

$$\min w = \sum_{i=1}^{n} \left[\left(w_j - w_j^1 \right)^2 + \left(w_j - w_j^2 \right)^2 \right] \tag{23}$$

The first order derivative of the objective function is made equal to zero, and the calculation finds $\delta = 0.5$.

The final synthesized weight equation (24) is obtained:

$$w_j = 0.5w_j^1 + 0.5w_j^2 \tag{24}$$

III. D. Construction of a comprehensive evaluation model

The fuzzy comprehensive evaluation method has the advantage of quantifying the indicators that are not easy to be quantified, and this evaluation method has been widely used in many fields by virtue of its advantages [19]. The steps are as follows:

The first step of conducting fuzzy comprehensive evaluation is to determine the factor set and evaluation set, the determination of the factor set and evaluation set depends on the content of the evaluation, $U = \{u_1, u_2, u_3, \cdots, u_m\}$ and $V = \{v_1, v_2, v_3, \cdots, v_m\}$ denote the factor set and evaluation set, respectively.

The affiliation matrix R is derived by fuzzy judging of single factors and normalizing the affiliation vectors corresponding to all factors. That is:

$$R = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \cdots & \cdots & \cdots & \cdots \\ r_{m1} & r_{m2} & \cdots & r_{mn} \end{bmatrix} \tag{25}$$

In order to reflect the degree of importance of each factor, a corresponding weight is assigned to each factor, i.e., to determine the weight vector required for the evaluation object when conducting fuzzy comprehensive evaluation, $A = (a_1, a_2, a_3, \cdots a_m)$. The weight vector A is calculated by matrix multiplication with the affiliation matrix R to finally obtain the composite rating quantity Z.

IV. Analysis of the construction of the evaluation index system

IV. A. Formation of the Consultative Group of Experts

The identification of the CGE takes into account the representativeness of the experts. According to the requirements of the Delphi method, it is more appropriate to select 10-30 experts. Considering the content of this study, 20 experts with rich experience in tourism and culture industry are selected to form the expert advisory group.

IV. B. Analysis of the degree of motivation and authority of experts

IV. B. 1) Analysis of the degree of expert activism

The expert positivity coefficient can be expressed by the effective recovery rate of the questionnaire, and the results of the statistical analysis of the degree of expert positivity are shown in Table 3. The study issued a total of 20 questionnaires through WeChat sending, of which one of the 20 recovered questionnaires was not filled out completely and was regarded as an invalid questionnaire. According to the above formula, the expert positive coefficient is 95%, which is greater than 70%, indicating that the experts are more active in participating in the scoring of the indicator system.

Table 3: Expert positive degree statistical analysis results

Sending mode	Quantity issued	Recovery quantity	effective quantity	Expert positive coefficient
Wechat	20	20	19	95.00%

IV. B. 2) Analysis of the degree of expert authority

The expert authority coefficient is determined by two factors: the experts' familiarity with the indicators and the judgmental basis of the experts' scores; the quantitative values of the experts' familiarity and judgmental basis are shown in Table 4, and the statistical results of the expert authority coefficient are shown in Table 5. The statistical results show that the authority coefficient of 19 experts is between 0.70 and 0.93, and the mean value of the expert authority coefficient is 0.807, which is greater than 0.7 and acceptable, indicating that the expert consultation panel formed in the study meets the requirements of the Delphi method.

Table 4: Quantitative value of expert familiarity and judgment basis

Familiarity coefficient		Judgment coefficient			
Sort	Quantized value	Sort	Quantized value		
			Big	Mid	Small
Very familiar	1	Theoretical analysis	0.2	0.1	0.2
Know well	0.8	Practical experience	0.6	0.6	0.3
General familiarity	0.5	Peer understanding	0.1	0.1	0.3
Not familiar with	0.2	Personal intuition	0.1	0.2	0.2
Be unfamiliar with	0	Total	1	1	1

Table 5: Expert authority coefficient statistical results

Expert	Familiarity coefficient	Judgment coefficient	Expert authority coefficient
1	0.865	0.859	0.862
2	0.832	0.734	0.783
3	0.706	0.827	0.767
4	0.741	0.856	0.799
5	0.792	0.71	0.751
6	0.746	0.812	0.779
7	0.725	0.805	0.765
8	0.862	0.751	0.807
9	0.88	0.794	0.837
10	0.814	0.883	0.849
11	0.789	0.845	0.817
12	0.889	0.773	0.831
13	0.882	0.773	0.828
14	0.825	0.852	0.839
15	0.89	0.761	0.826
16	0.815	0.798	0.807
17	0.841	0.885	0.863
18	0.716	0.775	0.746
19	0.789	0.795	0.792

IV. C. Screening and Analysis of Tourism Cultural Benefit Evaluation Indicators

IV. C. 1) Initial selection of indicators

Through the investigation and research on all aspects of a city's tourism industry, combined with the content of the comprehensive benefit evaluation of tourism and cultural industries, in accordance with the principles of scientific, complete, credible and hierarchical selection of indicators, the preliminary formulation of 27 secondary indicators and 3 first-level indicators, the preliminary selection of indicators for evaluation of the benefits of tourism and culture is shown in Table 6.

IV. C. 2) Results of the first round of indicator screening

(1) First-level indicators

Based on the Delfel method, the preliminary formulation of the three first-level tourism and cultural benefit evaluation indicators were screened and analyzed, and the results of the data analysis of the expert ratings of the first-level indicators are shown in Table 7. The statistical results show that the median of the three first-level indicators is between 4.0 and 5.0, the plural is greater than or equal to 4, the mean is between 4.37 and 4.58, and the total mean is 4.467, which indicates that the experts agree with the indicator settings. The standard deviation is between 0.478 and 0.609, all less than 1, and the coefficient of variation is between 0.104 and 0.137, and the mean value of the coefficient of variation is 0.109, all less than 0.25, indicating that the results of the experts' ratings are more concentrated. The $|Mo-M|$ of each indicator is less than 1, indicating that the consistency of expert opinions is better. Taken together, all level 1 indicators are retained.

Table 6: Primary evaluation index of tourism cultural benefits

Primary index	Symbol	Secondary index	Symbol
Social benefits	A1	Tourist satisfaction	A11
		Satisfaction degree of villagers	A12
		The integration of tourism industry and local culture	A13
		Utilization intensity of tourism resources	A14
		Infrastructure construction	A15
		Population growth	A16
		Employment position	A17
		Income level	A18
		The degree of infrastructure improvement	A19
Economic benefit	A2	Village tourism revenue	A21
		Set the proportion of travel business	A22
		Tourist capacity	A23
		Proportion of tourism income in village GDP	A24
		Tourist arrivals	A25
		GDP growth	A26
		Ticket revenue of scenic spot	A27
		Income from catering and accommodation	A28
		Commodities and other wholesale and retail income	A29
Ecological benefits	A3	The size and richness of village landscape	A31
		Tourism waste disposal capacity	A32
		Village air quality index	A33
		Vegetation coverage	A34
		Rural index	A35
		Urban greening rate	A36
		Air cleanliness	A37
		Environmental governance up to standard rate	A38
		Compliance rate of waste treatment	A39

Table 7: Results of expert score data analysis of first-level indicators

Primary index	Median	Mode	Mean value	Full score frequency/%	$\lvert Mo-M \rvert$	Standard deviation	Coefficient of variation
A1	5.0	5.0	4.58	65.85	0.42	0.478	0.104
A2	5.0	5.0	4.45	54.51	0.55	0.609	0.137
A3	5.0	5.0	4.37	43.38	0.63	0.509	0.116
Total mean	4.467			Mean coefficient of variation	0.109		

(2) Secondary indicators

Based on the same method as above, the initially formulated secondary indicators of comprehensive benefits of tourism and culture were screened, and the statistical results of the expert ratings of the secondary indicators are shown in Table 8. The statistical results show that the median and the plural of the 27 secondary indicators are both 5.0, with the average value between 4.5 and 5, and the total average value is 4.722, which is greater than or equal to 4.5. The frequency of full scores ranges from 50.0% to 88.3%, which is greater than or equal to the basic standard of 50%. The above data show that the experts' ratings of the secondary indicators are more concentrated, and there is a higher degree of agreement on the indicators. From the discrete trend, the standard deviation of 21 secondary indicators is between 0.1 and 1.3, and 5 indicators (A18, A19, A29, A38, A39) are greater than 1, corresponding to a coefficient of variation greater than 0.25, which results in the exclusion of 5 indicators and the retention of the remaining 22 indicators.

Table 8: Secondary index expert score statistical results

Secondary index	Median	Mode	Mean value	Full score frequency/%	|Mo-M|	Standard deviation	Coefficient of variation
A11	5.0	5.0	4.701	65.86	0.299	0.193	0.041
A12	5.0	5.0	4.65	63.72	0.35	0.135	0.029
A13	5.0	5.0	4.624	64.53	0.376	0.102	0.022
A14	5.0	5.0	4.89	60.97	0.11	0.192	0.039
A15	5.0	5.0	4.854	78.96	0.146	0.188	0.039
A16	5.0	5.0	4.791	70.55	0.209	0.156	0.033
A17	5.0	5.0	4.763	50.34	0.237	0.155	0.033
A18	5.0	5.0	4.799	63.68	0.201	1.272	0.265
A19	5.0	5.0	4.637	50.27	0.363	1.315	0.284
A21	5.0	5.0	4.868	71.39	0.132	0.18	0.037
A22	5.0	5.0	4.894	64.61	0.106	0.12	0.025
A23	5.0	5.0	4.877	55.93	0.123	0.188	0.039
A24	5.0	5.0	4.642	55.11	0.358	0.102	0.022
A25	5.0	5.0	4.618	51.61	0.382	0.146	0.032
A26	5.0	5.0	4.722	61.89	0.278	0.157	0.033
A27	5.0	5.0	4.696	53.54	0.304	0.141	0.030
A28	5.0	5.0	4.834	72.48	0.166	0.104	0.022
A29	5.0	5.0	4.508	62.04	0.492	1.165	0.258
A31	5.0	5.0	4.571	77.08	0.429	0.136	0.030
A32	5.0	5.0	4.783	52.19	0.217	0.19	0.040
A33	5.0	5.0	4.626	59.7	0.374	0.161	0.035
A34	5.0	5.0	4.756	70.12	0.244	0.157	0.033
A35	5.0	5.0	4.887	76.83	0.113	0.165	0.034
A36	5.0	5.0	4.692	70.53	0.308	0.133	0.028
A37	5.0	5.0	4.57	78.94	0.43	0.193	0.042
A38	5.0	5.0	4.582	56.4	0.418	1.145	0.250
A39	5.0	5.0	4.655	53.2	0.345	1.159	0.249
Total mean			4.722	Mean coefficient of variation			0.074

IV. C. 3) Results of the second round of indicator screening

(1) First-level indicators

With the help of the above methodology, the second round of first-level indicator screening was completed, and the data analysis of the expert scores of the first-level indicators is shown in Table 9. The plural and median of all level 1 indicators are 5.0, and the average value is between 4.69 and 4.55. The frequency of perfect scores ranged from 56.3% to 75.0%, all of which were greater than 50%. In terms of the degree of dispersion, the standard deviation is between 0.437 and 0.521, all less than 1, and the coefficient of variation is within the range of 0.098 to 0.114, with the mean value of the coefficient of variation being 0.103, all less than 0.25. The above data show that the second round of expert consultation is more focused, and the experts have a high degree of recognition and coordination of the indicators of all levels and show a better degree of consistency.

Table 9: First level index expert score data analysis

Primary index	Median	Mode	Mean value	Full score frequency/%	|Mo-M|	Standard deviation	Coefficient of variation
A1	5.0	5.0	4.69	71.52	0.31	0.461	0.098
A2	5.0	5.0	4.55	65.11	0.45	0.521	0.114
A3	5.0	5.0	4.46	68.92	0.54	0.437	0.098
Total mean	4.567			Mean coefficient of variation	0.103		

(2) Secondary indicators

The results of the second round of secondary indicators screening are shown in Table 10. Based on the data performance in the table, it can be seen that the median and the plural of the 22 secondary indicators are 5, and the average value is between 4.3 and 4.8, while the overall average bit 4.589, which indicates that the experts' ratings of the secondary indicators are more concentrated and the degree of agreement on the indicators is higher.

In terms of discrete trends, seven secondary indicators (A16, A17, A26, A27, A28, A36, A37) were greater than 1, and the corresponding coefficient of variation was greater than 0.25, so they were excluded from the treatment, and all the remaining 15 secondary indicators were retained.

Table 10: The second round of secondary index screening results

Secondary index	Median	Mode	Mean value	Full score frequency/%	|MO-M|	Standard deviation	Coefficient of variation
A11	5	5	4.791	86.611	0.209	0.112	0.023
A12	5	5	4.774	93.664	0.226	0.185	0.039
A13	5	5	4.669	65.874	0.331	0.164	0.035
A14	5	5	4.317	74.975	0.683	0.123	0.028
A15	5	5	4.589	71.456	0.411	0.171	0.037
A16	5	5	4.414	72.593	0.586	1.131	0.256
A17	5	5	4.547	84.098	0.453	1.114	0.245
A21	5	5	4.656	94.517	0.344	0.18	0.039
A22	5	5	4.671	68.394	0.329	0.184	0.039
A23	5	5	4.747	83.788	0.253	0.193	0.041
A24	5	5	4.555	76.242	0.445	0.181	0.040
A25	5	5	4.758	82.453	0.242	0.131	0.028
A26	5	5	4.361	81.326	0.639	1.169	0.268
A27	5	5	4.487	87.059	0.513	1.144	0.255
A28	5	5	4.707	77.008	0.293	1.108	0.235
A31	5	5	4.592	94.558	0.408	0.187	0.041
A32	5	5	4.709	81.506	0.291	0.166	0.035
A33	5	5	4.614	72.528	0.386	0.152	0.033
A34	5	5	4.552	67.587	0.448	0.188	0.041
A35	5	5	4.462	83.795	0.538	0.176	0.039
A36	5	5	4.402	60.223	0.598	1.162	0.264
A37	5	5	4.59	61.553	0.41	1.136	0.247
Total mean			4.589	Mean coefficient of variation			0.105

IV. D. Determine the evaluation index system of tourism culture efficiency

The evaluation index system of tourism cultural efficiency is shown in Table 11. After the screening and analysis of the evaluation indexes based on the Deferral method, the evaluation index system of tourism cultural efficiency is finally determined, which consists of 3 first-level indexes and 15 second-level indexes.

Table 11: Evaluation index system of tourism cultural efficiency

Primary index	Symbol	Secondary index	Symbol
Social benefits	A1	Tourist satisfaction	A11
		Satisfaction degree of villagers	A12
		The integration of tourism industry and local culture	A13
		Utilization intensity of tourism resources	A14
		Infrastructure construction	A15
Economic benefit	A2	Village tourism revenue	A21
		Set the proportion of travel business	A22
		Tourist capacity	A23
		Proportion of tourism income in village GDP	A24
		Tourist arrivals	A25
Ecological benefits	A3	The size and richness of village landscape	A31
		Tourism waste disposal capacity	A32
		Village air quality index	A33
		Vegetation coverage	A34
		Rural index	A35

V. Evaluation and analysis of the comprehensive benefits of tourism and culture

V. A. Analysis of subjective weight calculation

V. A. 1) Hierarchical Single Ordering and Consistency Tests

Hierarchical analysis is the current quantitative research method of weight assignment unanimously recognized, and its principle is that experts based on experience and understanding of the same level of indicators in reflecting the importance of the previous level of indicators to make a two-by-two comparison, the formation of a judgment matrix, through the calculation of the weight of each indicator.

(1) First-level indicators

Using the hierarchical analysis algorithm to explore the results of the first-level indicator weights and consistency test, the weights and consistency test results are shown in Figure 1, where W indicates the weight value of each indicator. Through the data performance in the figure, it can be seen that the social benefits (A1: 0.6678), economic benefits (A2: 0.2224), ecological benefits (A3: 0.1098), and the CR is less than 0.1, which indicates that the calculated weight values satisfy the consistency test requirements.

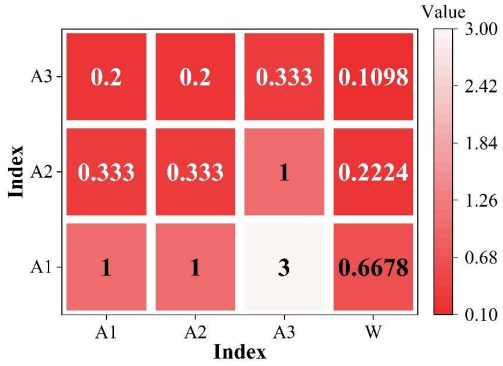

Figure 1: Weight and consistency test results

(2) Secondary indicators under social benefit

By constructing the judgment matrix of each indicator, the weights of secondary indicators subordinate to social benefits and the consistency test value are calculated, and the judgment matrix of secondary indicators subordinate to social benefits is shown in Figure 2. According to the size of the data in the figure, it can be seen that the tourists' satisfaction (A11: 0.2526), villagers' satisfaction (A12: 0.1743), the integration of tourism industry and local culture (A13: 0.1505), the intensity of utilization of tourism resources (A14: 0.2199), and the infrastructure construction (A15: 0.2027), and the weights of each satisfy the requirement of CR<0.1.

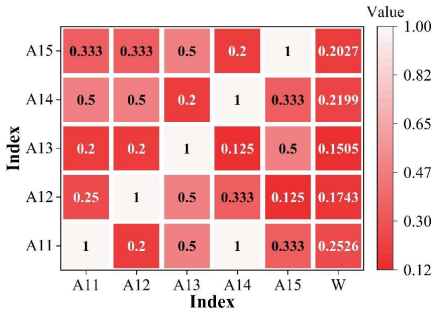

Figure 2: Social benefit is subordinate to two index judgment matrix

(3) Subordinate secondary indicators of economic benefits

Using the same method, the weight data of economic efficiency subordinate secondary indicators are calculated, and the judgment matrix of economic efficiency subordinate secondary indicators is shown in Figure 3. The weights of the subordinate secondary indicators of economic efficiency are calculated to be 0.2042, 0.1969, 0.1883, 0.2163, 0.1943 respectively, and pass the requirement of consistency test, CR<0.1.

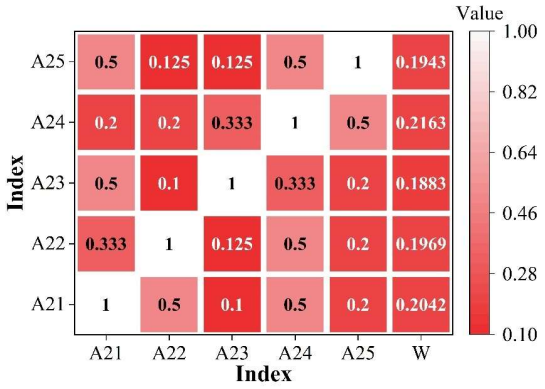

Figure 3: Economic benefit is subordinate to two index judgment matrix

(4) Secondary indicators under eco-efficiency

With the support of hierarchical analysis algorithm, the results of the subordinate secondary indicators of eco-efficiency are shown in Figure 4. It can be seen from the judgment matrix data that the weights of village landscape scale and richness A31, tourism garbage disposal capacity A32, village air quality index A33, vegetation coverage A34, village index A35 are 0.2195, 0.1957, 0.2150, 0.1871, 0.1827, and the weights pass the consistency test, CR<0.1.

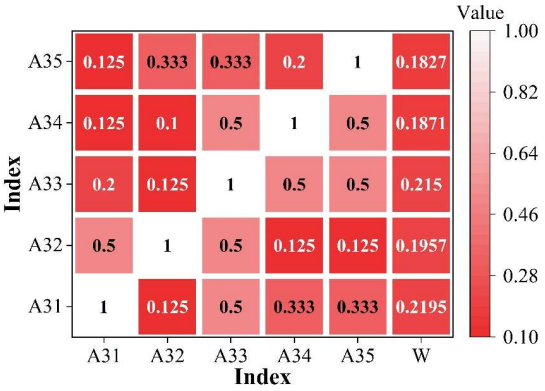

Figure 4: Ecological benefits are subordinate to the results of secondary indicators

V. A. 2) Hierarchical General Ordering and Consistency Tests

Hierarchical general ranking is the weighting of indicators at each level of ranking with respect to the overall objective. Consistency testing is an important step to ensure that there are no contradictions or inconsistencies in the decision maker's judgment. Its purpose is to check for logical or quantitative errors in the decision maker's assignment of weights between levels or criteria. The consistency test can be accomplished by calculating the consistency ratio (CR) of the judgment matrix. If the consistency ratio is less than or equal to 0.1, the judgment matrix is considered consistent and the decision result is acceptable. If the consistency ratio is greater than 0.1, the decision criteria and hierarchy need to be revisited and the weights reassigned until the consistency ratio is less than or equal to 0.1. On the basis of the hierarchical single sorting, the hierarchical total sorting is performed to calculate the subjective absolute weights of the comprehensive benefits of tourism and culture, and the results of the hierarchical total sorting and consistency test are shown in Table 12. For example, the subjective absolute weight of A11 is equal to the relative weight of the first-level indicator multiplied by the relative weight of the second-level indicator, A11=0.2526*0.6678=0.1687, and the rest of the fourteen second-level indicators are the same, because the first-level indicator is the highest level, thus, it is concluded that the subjective relative weight of the first-level indicator is equal to the subjective absolute weight, and the consistency test of the weights is 0.095<0.1, which shows that The calculated weight values satisfy the consistency test, which ensures the reliability and validity of the research results of this paper.

Table 12: Hierarchical total ordering and consistency test results

Primary index	Weight	Secondary index	Relative weight	Absolute weight	CR
A1	0.6678	A11	0.2526	0.1687	0.095
		A12	0.1743	0.1164	
		A13	0.1505	0.1005	
		A14	0.2199	0.1468	
		A15	0.2027	0.1354	
A2	0.2224	A21	0.2042	0.0454	
		A22	0.1969	0.0438	
		A23	0.1883	0.0419	
		A24	0.2163	0.0481	
		A25	0.1943	0.0432	
A3	0.1098	A31	0.2195	0.0241	
		A32	0.1957	0.0215	
		A33	0.2150	0.0236	
		A34	0.1871	0.0205	
		A35	0.1827	0.0201	

V. B. Analysis of objective weight calculation

V. B. 1) Data acquisition

A county, which combines “ethnicity, poverty, and rich endowment of tourism resources”, is taken as the object of study, and the period of 2011-2018 is taken as the scope of the study interval. Therefore, the data required for the study were obtained from the 2016-2023 Statistical Yearbook of a certain region, the Statistical Bulletin of National Economic and Social Development of a certain region, the Statistical Bulletin of National Economic and Social Development of a certain county, the Report on the Work of the Government of a certain county, as well as the portals of a certain county Tourism Bureau and the People's Government of a certain county. As some data are missing, some indicators are calculated based on the average growth rate of the indicator.

V. B. 2) Data standardization

Because of the differences in the indicators in terms of outline, order of magnitude, etc., data standardization is required to eliminate the influence of the units of each indicator on the evaluation results. According to the above formula to standardize the raw data of each indicator, get the standardized data, data standardization results are shown in Table 13. Through the data in the table, it can be clearly seen that the raw indicators for the period from 2016 to 2023 have been pre-processed so that all of them are distributed in the range of 0 to 1, which is a good way to avoid the differences in the indicator scale, order of magnitude, and other aspects.

Table 13: Data standardization processing results

Index	2016	2017	2018	2019	2020	2021	2022	2023
A11	0	0.3413	0.8206	0.479	0.4182	0.1202	0.0437	1
A12	0	0.9618	0.444	0.6636	0.0348	0.7449	0.1373	1
A13	0	0.0189	0.3118	0.2232	0.8168	0.4172	0.6926	1
A14	0	0.7832	0.8208	0.5156	0.2636	0.7463	0.0732	1
A15	0	0.1241	0.6233	0.1706	0.97	0.0826	0.9224	1
A21	0	0.2517	0.8867	0.2357	0.5283	0.8394	0.6726	1
A22	0	0.9643	0.0022	0.8354	0.5412	0.2781	0.775	1
A23	0	0.3598	0.9051	0.104	0.6309	0.237	0.9919	1
A24	0	0.1353	0.4274	0.9887	0.1066	0.8166	0.7271	1
A25	0	0.2024	0.6878	0.7396	0.6387	0.3613	0.2015	1
A31	0	0.9508	0.2687	0.8514	0.422	0.2553	0.0473	1
A32	0	0.2905	0.1573	0.4305	0.0089	0.6757	0.666	1
A33	0	0.7806	0.4995	0.0173	0.1152	0.3841	0.9091	1
A34	0	0.7636	0.4848	0.3418	0.5776	0.8297	0.9846	1
A35	0	0.3557	0.0819	0.9528	0.1115	0.9471	0.1579	1

V. B. 3) Analysis of objective weighting results

(1) Find the P_{ij} of the j th indicator, and substitute the standardized data into the formula to find the value of P_{ij} specifically as shown in Table 14.

Table 14: P_{ij} Value

Index	2016	2017	2018	2019	2020	2021	2022	2023
A11	0	0.105895	0.254608	0.148619	0.129755	0.037294	0.013559	0.31027
A12	0	0.24127	0.111379	0.166466	0.00873	0.18686	0.034442	0.250853
A13	0	0.00543	0.089585	0.064129	0.234679	0.119868	0.198994	0.287315
A14	0	0.186356	0.195303	0.122683	0.062722	0.177576	0.017417	0.237942
A15	0	0.031878	0.160108	0.043822	0.249165	0.021218	0.236938	0.256871
A21	0	0.057018	0.200865	0.053393	0.119677	0.19015	0.152365	0.226531
A22	0	0.219349	0.0005	0.190028	0.123106	0.063259	0.176289	0.227469
A23	0	0.085085	0.214037	0.024594	0.149195	0.056046	0.234564	0.236479
A24	0	0.032201	0.101721	0.23531	0.025371	0.19435	0.173049	0.237999
A25	0	0.052828	0.179521	0.193042	0.166706	0.094302	0.052593	0.261008
A31	0	0.076538	0.041444	0.113424	0.002345	0.178027	0.175471	0.26347
A32	0	0.089969	0.048716	0.133327	0.002756	0.209266	0.206262	0.309703
A33	0	0.210643	0.134789	0.004668	0.031086	0.103648	0.245318	0.269847
A34	0	0.153269	0.097308	0.068606	0.115935	0.166536	0.197628	0.200719
A35	0	0.098617	0.022706	0.26416	0.030913	0.26258	0.043777	0.277246

(2) Find the entropy value e_{ij}, and find the entropy value of each indicator according to the formula. For example, A11, the calculation process is as follows:

$$e_1 = -1/\ln 8\sum_{i=1}^{8}\left(P_{ij}\ln P_{ij}\right) =$$
$$= -1/\ln 8\left(0.105895\ln 0.105895+\cdots+0.31027\ln 0.31027\right)$$
$$= 0.8072$$

The remaining fourteen indicators are the same, and the detailed calculation process will not be given.

(3) Find out the coefficient of variation $1-e_j$, according to the formula to find out the difference between the indicators, for example, A11: $1-e_j = 1-0.8072 = 0.1928$, and similarly to find out the A12 ~ A35, see Table 15 for details.

Table 15: Evaluation index entropy results

Secondary index	e_j	$1-e_j$
A11	0.8072	0.1928
A12	0.8193	0.1807
A13	0.8150	0.1850
A14	0.8571	0.1429
A15	0.7976	0.2024
A21	0.8824	0.1176
A22	0.8307	0.1693
A23	0.8450	0.1550
A24	0.8369	0.1631
A25	0.8695	0.1305
A31	0.7472	0.2528
A32	0.8006	0.1994
A33	0.8004	0.1996
A34	0.9085	0.0915
A35	0.7777	0.2223

(4) According to the above formula, the objective weights of the evaluation indicators of the comprehensive benefits of tourism and culture are derived, and the results of the objective weights of the indicators are shown in

Table 16. Again taking A1 as an example, $A1 = 0.1928/(0.1928+\cdots+0.2223) = 0.0740$, and the same for the rest of the indicators.

Table 16: Objective weight results of each index

Primary index	Weight	Secondary index	Weight
A1	0.3471	A11	0.0740
		A12	0.0694
		A13	0.0711
		A14	0.0549
		A15	0.0777
A2	0.2823	A21	0.0451
		A22	0.0650
		A23	0.0595
		A24	0.0626
		A25	0.0501
A3	0.3706	A31	0.0970
		A32	0.0766
		A33	0.0766
		A34	0.0351
		A35	0.0853

V. C. Comprehensive weighting analysis

According to the combination assignment formula mentioned before, the combination weight of each evaluation index of comprehensive effect of tourism and culture is derived, and the specific data results are shown in Table 17. Taking A11 as a specific example, the detailed calculation and analysis will be carried out, $w_j = 0.5w_j^1 + 0.5w_j^2 = 0.16870*0.5 + 0.0740*0.5 = 0.12135$, and the other indexes are the same as the other indexes.

Table 17: Comprehensive weight analysis

Index	Subjective weight	Objective weight	Comprehensive weight	Index	Subjective weight	Objective weight	Comprehensive weight
A1	0.6678	0.3471	0.50745	A11	0.1687	0.0740	0.12135
				A12	0.1164	0.0694	0.0929
				A13	0.1005	0.0711	0.0858
				A14	0.1468	0.0549	0.10085
				A15	0.1354	0.0777	0.10655
A2	0.2224	0.2823	0.25235	A21	0.0454	0.0451	0.04525
				A22	0.0438	0.0650	0.0544
				A23	0.0419	0.0595	0.0507
				A24	0.0481	0.0626	0.05535
				A25	0.0432	0.0501	0.04665
A3	0.1098	0.3706	0.2402	A31	0.0241	0.0970	0.06055
				A32	0.0215	0.0766	0.04905
				A33	0.0236	0.0766	0.0501
				A34	0.0205	0.0351	0.0278
				A35	0.0201	0.0853	0.0527

V. D. Integrated evaluation analysis

V. D. 1) Affinity settings

Referring to the research results of related scholars and combining with the actual development of the current tourism and culture industry, 10 experts are invited to score each indicator, determine the degree of affiliation of the indicator (the frequency of different levels of affiliation experts choose), and obtain the fuzzy evaluation matrix of the first-level indicators after standardization as shown in Fig. 5~Fig. 7, in which U1~U6 expresses the factor set. According to the formula, set the evaluation set V = [100 90 80 70 60 50] to get the evaluation results of each level one indicator and integrated energy service business model. Specifically as follows:

Fuzzy comprehensive evaluation of social benefits:

$$A_1 = W_1 R_1 V$$

$$= [0.17284, 0.12806, 0.1294, 0, 0.02074, 0.06361] \begin{bmatrix} 100 \\ 90 \\ 80 \\ 70 \\ 60 \\ 50 \end{bmatrix} = 42.94$$

Fuzzy integrated evaluation of economic efficiency:

$$A_2 = W_2 R_2 V$$

$$= [0.0648, 0.06130, 0.05344, 0.0102, 0.0204, 0.4294] \begin{bmatrix} 100 \\ 90 \\ 80 \\ 70 \\ 60 \\ 50 \end{bmatrix} = 20.28$$

Fuzzy integrated evaluation of eco-efficiency:

$$A_3 = W_3 R_3 V$$

$$= [0.1124, 0.0307, 0.0398, 0.0574, 0, 0] \begin{bmatrix} 100 \\ 90 \\ 80 \\ 70 \\ 60 \\ 50 \end{bmatrix} = 21.20$$

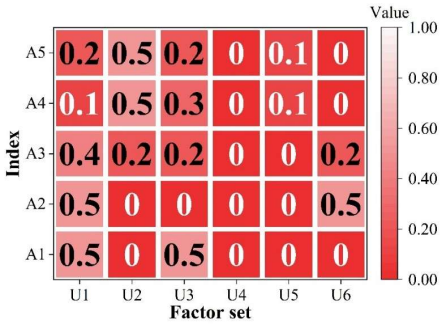

Figure 5: Social benefit fuzzy judgment matrix

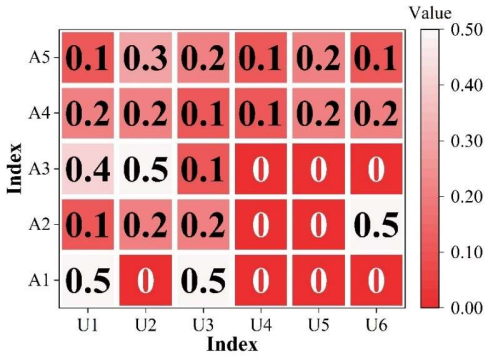

Figure 6: Economic benefit fuzzy judgment matrix

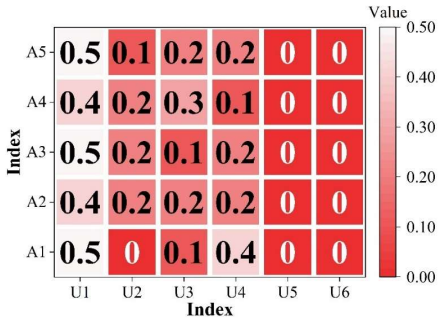

Figure 7: Ecology benefit fuzzy judgment matrix

V. D. 2) Comprehensive evaluation results

According to the affiliations determined on the fuzzy comprehensive evaluation rubric set V = (100, 90, 80, 70, 60, 50), the [90, 100) interval is evaluated as very good, the [80, 90) interval is evaluated as good, the [70, 80) interval is evaluated as good, the [60, 70) interval is evaluated as fair, the [50, 60) interval is evaluated as poor, and the [0, 50) interval is evaluated as very poor. From the above calculations, the result of the fuzzy comprehensive evaluation of the comprehensive benefit of tourism and culture in a certain region is 40.92+20.28+21.20=82.4, which concludes that the level of the comprehensive benefit of tourism and culture in a certain region is good, indicating that the planning and implementation of tourism and culture projects in a certain region is good, with large investment value and space, and suitable for the continuation of long-term development.

VI. Optimization path of comprehensive benefits of tourism and culture

Through the analysis above, it can be seen that the comprehensive benefit level of tourism culture in the region, in order to further improve the construction and development of tourism culture in the region, this chapter will put forward a series of targeted optimization path. Specific optimization paths are shown below:

VI. A. Create a favorable environment for tourism development

VI. A. 1) Upgrading regional economic development

Cultivating cultural and tourism professional functional urbanization with the county town as the carrier. County towns are an important part of China's urbanization construction, as well as the basic unit for the construction of regional tourism, and are of great significance in promoting urban-rural integration and linking urban and rural resources. In accordance with the Opinions on Promoting Urbanization Construction with County Towns as Important Carriers, the construction of county urbanization actively fosters the professional function of culture and tourism, and develops study and experience, vacation and leisure, recreation and health care, and characteristic folklore through scientific assessment of the quality of county cultural and tourism resources, and identifying the characteristics of cultural and tourism resources. Emphasis has been placed on the protection of historical and cultural towns, historical and cultural districts, ancient buildings and houses, red revolutionary relics and industrial heritage, and the promotion of cross-border integration and industrialization of intangible cultural heritage. In addition, counties located in the vicinity of large cities are actively accelerating the positioning of their “satellite” systems, and are opening up the “micro-vacation” market by strengthening ties with neighboring central cities.

VI. A. 2) Increase in the regional level of educational development

The influence of regional education development on the high-quality development of tourism is mainly reflected in two aspects, one is the gathering of high-quality teachers and students, especially the horizontal guidance and academic research from the scientific research team of higher education institutions, which will provide intellectual support for the high-quality development of regional tourism. On the other hand, the higher degree of regional education development means that institutions of higher learning will form a cluster layout, thus forming a large base of college students. With their active mobility and advanced consumption habits, college students will drive the development of tourism in the provinces where the schools are located. In addition, college student groups visiting each other and parents accompanying students to school increase the number of tourists in the school area, which will undoubtedly stimulate the development of the regional tourism economy. Therefore, there is a need to improve the degree of regional educational development and to contribute to the high-quality development of tourism in two ways.

VI. A. 3) Strengthening regional ecological environment protection and management

Strengthening the protection of forest and wetland resources. Accurately predict the environmental carrying capacity of scenic spots with forests and wetlands as the main resources, reasonably control the flow of visitors to scenic spots, and realize the protection, restoration and development of resources and ecology. Focusing on the greening of the urban environment, cultivation of grasses and trees, strict management of exhaust gas pollution, domestic sewage discharge, noise pollution and other problems. Dredge and manage the drainage channels of the major rivers and their tributaries in the area, and emphasize the ecological landscape building on both sides of the rivers. At the same time, environmental protection supervision is strengthened, and the responsibility is realized to a specific person. Rural environmental improvement should adhere to the local conditions and do the best it can, without over-occupying farmland resources or over-hardening the rural surface, improving the vegetation coverage of bare and wasteland rural areas, preventing soil erosion, and creating a neat, hygienic, environmentally friendly, and beautiful rural landscape.

VI. B. Promoting cross-regional synergies

There are great differences in tourism resources, and cultural integration and collision will add vitality to the high-quality development of tourism. The two places need to strengthen cooperation in resource development, investment promotion, and mutual promotion of tourists. Give full play to the role of industry associations and cultural and tourism enterprises to establish a long-term cooperative relationship. In addition, give full play to the role of universities and institutes to strengthen cooperation between the two provinces in the field of talent training. The level of opening up to the outside world can be enhanced through synergistic cooperation, accelerating the adjustment of industrial structure, continuously improving the quality of tourism and cultural products and the influence of the brand, and expanding the scale of trade exports and commodity transactions.

VII. Conclusion

Combined with relevant principles and reference materials, this paper initially formulates the comprehensive benefit evaluation index system of tourism culture, and in order to make the system fit the actual situation, it adopts the Delphi method to screen its evaluation indexes, and finally determines the evaluation index system. Considering that the hierarchical analysis algorithm has subjective views and certain limitations, based on such problems, it is proposed to use the hierarchical analysis method and entropy weight method to calculate the weights of its indicators, and then substitute its weights into the fuzzy comprehensive evaluation model to complete the assessment and analysis of the comprehensive benefits of tourism culture in a region. The calculation results in 82.4 for the comprehensive benefit assessment of tourism culture in a region during the period from 2016 to 2023, which concludes that the level of benefit is good, and finally puts forward the corresponding optimization path for promoting the high-quality development of tourism culture in the region.

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