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Geopark Tourism Planning Evaluation Index System Based on the Interpretation of Cultural and Natural Heritage Values: A Case Study of Dali Mount Cangshan Global Geopark, Yunnan, China

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Abstract
The heritage's scientific value is one of the most fundamental bases for the UNESCO Global Geoparks' application, and it is also the basis for the existence and protection of geoparks. As an important part of heritage protection and utilization, heritage interpretation can enhance the readability and appreciation of heritage and realize the promotion, inheritance and innovation of cultural heritage value. In this study, while fully considering all the influencing factors related to geopark cultural heritage, natural heritage and tourism, the weight of each index is reasonably allocated, and an evaluation index system of geopark tourism planning based on the interpretation of cultural and natural heritage values has been constructed. At the same time, the evaluation criteria and data sources applicable to different impact factors are proposed in detail. Taking Dali Mount Cangshan UNESCO Global Geopark (China) as the research object, the feasibility of the index system is verified effectively. By establishing a scientific and operable procedure and method, this study hopes to establish a foundation for the objective and accurate conclusion of the geological heritage's scientific value and provide a theoretical basis for the application of geological heritage in the UNESCO Global Geopark, World Natural Heritage site and its protection and utilization.

Keywords
Cultural and natural heritage; Interpretation of heritage value; Geopark; Tourism planning; Evaluation index system

1. Introduction

UNESCO Global Geopark (UGG) is a single, unified geographical area where sites and landscapes of international geological significance are managed with a holistic concept of protection, education and sustainable development (UNESCO, 2024a; Ziari et al., 2024). UGG aims to achieve its sustainable development goals through conservation, education, and tourism. It strives to protect important geological features and explore appropriate methods for showcasing knowledge in the field of earth sciences (UNESCO, 2020b). These goals are achieved through geological sites, museums, information centres, tours, tour guides, school classroom education, popular literature, maps, educational materials and exhibitions, and seminars. At the same time, UGG promotes economic activity and sustainable development through geological tourism. By attracting more and more tourists, it can promote tourism labels related to local natural heritage and local socio-economic development (UNESCO, 2024c).

At present, research on the interpretation system of geoparks mainly includes the following categories: the first category is the definition and current status of geopark interpretation. Anze Chen summarized the concept, current development status, problems, and development strategies of geopark interpretation (Chen, 2003). The second type is the study of specific geological and geomorphological interpretation. Tingfeng Yang studied the development of popular science tourism in karst geology with specific landforms (Yang, 2009). Ruikai Chen studied the interpretation of karst resources by analyzing the scientific value of specific geological landforms and proposing development models and strategies (Chen, 2010). The third type is the interpretation system of geoparks. Xiaomei Qian, Yuan Zhao and Meng Xia studied the landscape display planning and design of geoparks, as well as the planning of geopark interpretation systems (Qian et al., 2006). Xuejian Yu comprehensively analyzed factors such as the quantity and types of geological heritage resources, geological knowledge popularization activities, location economic conditions, and tourist education level and proposed the main approaches for developing geopark interpretation systems (Yu, 2013). Based on the conditions and characteristics of different geoparks, Xiaoqian He, Chaonan Li and Jiajia Xu tentatively constructed a tourist perception evaluation index system for geopark interpretation system and investigated tourists' perceptions after tourism to guide the development of geopark interpretation system (He et al., 2008).

From this, it can be seen that the current research status of the interpretation system of geoparks presents the characteristics of some research literature, low quality of research results, and simple research methods. Therefore, it is necessary to explore the evaluation system and evaluation mode of the interpretation system of geoparks further. At present, the development of the geopark interpretation system is unbalanced, and many geopark interpretation activities seriously lag behind tourism activities. Establishing a scientific evaluation index system for interpreting geopark scenic areas is an important basis for the rational development and evaluation of geopark science popularization tourism.

This study will construct an evaluation index system for geopark tourism planning from the perspective of cultural and natural heritage value interpretation based on the characteristics of cultural and natural heritage within the geopark. This will transform the "geopark tourism planning based on cultural and natural heritage value interpretation" from an abstract concept to a practical and operable standard (Zhu et al., 2013). Research on the comprehensive evaluation of tourism planning based on the interpretation of cultural and natural heritage values, including the various elements that make up cultural and natural heritage tourism, such as cultural and natural heritage tourism resources, auxiliary conditions for the interpretation and display of cultural and natural heritage tourism activities, and tourism planning and design, in order to provide a scientific basis for the development and utilization of cultural and natural heritage in geoparks.

2. Theoretical Research and Model Construction

2.1 Material--The Significance Of Geoparks' Tourism and Heritage Value Interpretation

2.1.1 Significance of Geopark Tourism

At present, the development of the tourism industry has brought innovative and exciting tourism products, and geoparks are one of the key areas for development. Local communities can achieve sustainable development and improve their socio-economic status by participating in the ongoing activities of geoparks. The construction and development of geoparks can enhance local communities' awareness of the importance of geological environment protection. The concept of UGG is a new model for the sustainable development of environmental protection areas and an important way for local participation in tourism development (UNESCO, 2024a). Therefore, in order to achieve sustainable development of geographic tourism, local residents must actively participate in the transformation process. The participation of local communities, stakeholders, and businesses in the tourism industry is crucial in the decision-making process and in achieving sustainable development of geoparks. The former usually authorizes local residents to determine their own development goals and negotiates with them to determine their hopes and visions for the tourism industry. The development of UGG can provide employment opportunities, promote local products, improve community welfare, and stimulate economic growth by promoting the improvement of local infrastructure. So far, a total of 213 geoparks from 48 countries have joined the UNESCO Global Geopark Network (UGGN), as assessed by UNESCO. Among these countries, only nine Asian countries' geoparks have been included in UNESCO's UGGN, including China (47 geoparks), Japan (10 geoparks), Indonesia (10 geoparks), South Korea (5 geoparks), Philippines (1 geopark), Iran (3 geoparks), Malaysia (2 geoparks), Thailand (2 geoparks), and Vietnam (3 geoparks) (UNESCO, 2024d).

2.1.2 Significance of Interpreting the Heritage Value of Geoparks

As a natural park with geological scientific significance that integrates natural and cultural landscapes, a geopark contains a large number of landscapes with dual cultural and natural heritage values. A reasonable interpretation of these landscapes can further explore and display the value of cultural and natural heritage in the geopark and explain and display the significance and connotation of the geopark to various audiences. It can effectively protect the tangible and intangible value of the geopark in its natural and cultural background as well as social environment (Ahmad, 2024). By showcasing the formation process, scientific value, cultural heritage, and natural heritage value of geoparks to the public, they can be protected from harmful display facilities, tourism pressure, and inaccurate or inappropriate interpretations and achieve the goal of respecting the authenticity of geoparks (Global Geoparks Network, 2024).

Establishing UGG can promote public understanding and appreciation of heritage values and cultivate public awareness and participation required for heritage protection. By promoting public understanding and participation in current conservation efforts, as well as regular inspections of the long-term maintenance and interpretation of exhibition facilities, the sustainable protection of geoparks is promoted (Acosta, 2024). In the process of interpreting project design and implementation, promoting the participation of stakeholders and relevant groups can enhance the coverage and inclusiveness of geopark interpretation.

2.2 Methods--Construction of Tourism Planning Evaluation Index System Based on Cultural and Natural Heritage Value Interpretation

2.2.1 Election of Evaluation Factors

The evaluation of tourism planning based on the interpretation of cultural and natural heritage values should consider the relative importance of parks at the international, domestic, and regional levels, as well as the characteristics of cultural and natural heritage tourism resources, the value of cultural and natural heritage tourism resources, development conditions, social environment, source markets, stakeholder attitudes, interpretation and display design, tourism planning, scenic area tourism management planning, and other evaluation factors. It is worth noting that these evaluation factors are not equally important. When planning, appropriate evaluation impact factors and evaluation indicators should be selected according to the needs, and different importance should be given to the selected indicators.

The selection of evaluation factors in this study referred to Hu Yu, Linlin Xu and Limin Liu's selection of four factors: regional tourism resources, glacier natural environment, service facility support, and market demand, to construct a suitability evaluation model for glacier tourism resource development (Yu and et al., 2022); Lili Pu, Chengpeng Lu and Xingpeng Chen selected three dimensions: resource value, environmental factors, and reception conditions to construct a rural tourism resource evaluation based on the perspective of tourists (Pu and et al., 2022); Giuliano Bellezza's "Interpretation and Evaluation of Geoparks - Theory and Practice" conducted theoretical research and practice on the interpretation and evaluation of geoparks from the geographical perspective of geoparks and national parks (Bellezza, 2013).

2.2.2 Indicator System Architecture Based on AHP

In the process of formulating the evaluation index system for the cultural and natural heritage tourism planning of geoparks, the selection of indicators comprehensively utilized theoretical methods, frequency methods, and expert consultation methods, mainly based on the following four aspects: firstly, the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, the Environmental Protection Law of the People's Republic of China, the Intangible Cultural Heritage Law of the People's Republic of China, the Ministry of Culture's Measures for the Protection and Management of World Cultural Heritage, the Ministry of Natural Resources Technical Requirements for the Planning of National Geoparks, the National Land and Resources Science Popularization Base Standards, and the Action Plan for the Popularization of Land and Resources Science and Technology (2004-2010) (China Land Society, 1991). The second is the comprehensive evaluation index proposed by experts and scholars in published literature, which mainly includes the evaluation of science popularization tourism development, geological science popularization tourism development, geopark management evaluation, science popularization capability evaluation, etc. (Zhu et al., 2013). Thirdly, based on the characteristics of geopark culture and natural heritage tourism, the evaluation index system must be pertinent. The fourth is to consult with geopark scenic area management personnel, university tourism management professional researchers, tourism planning staff and other relevant experts to ensure the rationality and feasibility of the indicator system.

Based on the reference of the above four aspects, establish a tourism planning evaluation index system based on interpreting cultural and natural heritage values. The evaluation index system is divided into three levels: three first-level indicators, namely geopark cultural and natural heritage tourism resources, auxiliary conditions for the interpretation and display of cultural and natural heritage tourism activities, and tourism planning based on the interpretation of cultural and natural heritage values. There are 9 secondary indicators, among which the characteristics of cultural and natural heritage tourism resources and the value of cultural and natural heritage tourism resources reflect the cultural and natural heritage tourism resources of geoparks in the primary indicators: The development conditions, social environment, source markets, and attitudes of stakeholders reflect the auxiliary conditions for interpreting and showcasing cultural and natural heritage in the primary indicators of tourism activities; Interpretation and display design, tourism planning, and scenic tourism management planning reflect the tourism planning based on cultural and natural heritage value interpretation in the first level indicators. There are a total of 35 tertiary indicators, as shown in Table 1.

Tab. 1. Tourism Planning Evaluation Index System Based on Cultural and Natural Heritage Value Interpretation

First Level Indicator	Second Level Indicator	Third Level Indicator
Geopark Cultural and Natural Heritage Tourism Resources A1	Characteristics of cultural and natural heritage tourism resources B1	Cultural and Natural Heritage Level C1
		Typicality of cultural and natural heritage C2
		Cultural and natural heritage scale C3
	Cultural and natural heritage tourism resource value B2	Ornamental value C4
		Social value C5
		Environmental value C6
		Scientific value C7
A2 for the interpretation and presentation of cultural and natural heritage	Development Condition B3	Geopark Cultural and Natural Heritage Scenic Area Level C8
		Distance from the central city C9
		Relevance to surrounding attractions C10
		Quality of tourism services C11
		Suitable for travel C12
	Social environment B4	Local economic level C13
		Government policy to promote the interpretation and presentation of cultural and natural heritage C14
		High school education penetration rate C15
	Source market B5	Tourist growth rate C16
		Age structure of visitors C17
		Tourist Educational Structure C18
	Stakeholder attitudes B6	The level of interpretation and presentation of the cultural and natural heritage of the local population C19
		Awareness of the local population on the interpretation and presentation of cultural and natural heritage C20
		Local government awareness of the interpretation and presentation of cultural and natural heritage C21
		Awareness of the interpretation and display of cultural and natural heritage by the staff of the scenic spot C22
Tourism planning based on the interpretation of cultural and natural heritage values A3	Interpretation and presentation design B7	Interpret and display the design theme is distinctiveC23
		The harmony of design in terms of interpretation and appreciationC24
		Explain and demonstrate the rationality of system design C25
		Interpretation and presentation of methods and methods planning C26
		Interpretation and display of content, popular science content C27
	Travel Planning B8	Tourism Planning for Cultural and Natural Heritage Sites C28
		Tourist route planning C29
		Tourism Product Planning C30
		Infrastructure and Service Facility Planning C31
	Scenic Tourism Management Planning B9	Interpretation and display of cultural and natural heritageC32
		Interpretation and display of cultural and natural heritage C33
		The number of days of interpretation and display activities per year C34
		Cultural and Natural Heritage Interpretation and Exhibition Base Construction C35

2.2.3 Determination of Evaluation Index Weights

The weight of the indicator reflects its importance in the entire evaluation indicator system, directly affecting the evaluation results. The weight values of the indicators in this study are mainly obtained through the Analytic Hierarchy Process, which combines qualitative and quantitative research. The decision results obtained have a certain degree of objectivity and scientificity (Zhu et al., 2013).

According to the interpretation and evaluation index system of geoparks, an expert evaluation table for the importance of indicators has been developed. A total of 18 experts from geopark scenic spots invited university tourism management teachers, doctoral students, and tourism planning company planners to independently evaluate. After determining the relative importance of the evaluation indicators, Yaanalytic hierarchy process software (version 12.8) was used for pairwise comparisons to obtain fixed values for importance comparisons. A matrix was then created, and the weights of each indicator were calculated.

The weight of each indicator is calculated through programming and consistency testing, and the judgment matrix CR=0.0056<0.1 (Ye, 2022). From this, it can be seen that the indicator weights are reliable. The calculation results show that the proportion of tourism planning based on cultural and natural heritage value interpretation is the highest in the first level indicators (0.43), followed by geopark cultural and natural heritage tourism resources (0.31), and the proportion of auxiliary conditions for cultural and natural heritage interpretation and display tourism activities is the lowest (0.26). The second and third-level indicators have also been given certain weights, as shown in Table 2.

Tab. 2. Tourism Planning Evaluation Index System Based on Cultural and Natural Heritage Value Interpretation

First Level Indicator	Weight	Second Level Indicator	Weight	Third Level Indicator	Weight	Total Order Weight
A1	0.31	B1	0.52	C1	0.39	0.062868
				C2	0.33	0.053196
				C3	0.28	0.045136
		B2	0.48	C4	0.27	0.040176
				C5	0.18	0.026784
				C6	0.19	0.028272
				C7	0.36	0.053568
A2	0.26	B3	0.38	C8	0.34	0.033592
				C9	0.18	0.017784
				C10	0.14	0.013832
				C11	0.18	0.017784
				C12	0.16	0.015808
		B4	0.3	C13	0.32	0.02496
				C14	0.37	0.02886
				C15	0.31	0.02418
		B5	0.32	C16	0.36	0.029952
				C17	0.31	0.025792
				C18	0.33	0.027456
		B6	0.24	C19	0.23	0.014352
				C20	0.26	0.016224
				C21	0.29	0.018096
				C22	0.22	0.013728
A3	0.43	B7	0.42	C23	0.19	0.034314
				C24	0.25	0.04515
				C25	0.16	0.028896
				C26	0.21	0.037926
				C27	0.19	0.034314
		B8	0.33	C28	0.32	0.045408
				C29	0.27	0.038313
				C30	0.21	0.029799
				C31	0.20	0.02838
		B9	0.25	C32	0.25	0.026875
				C33	0.21	0.022575
				C34	0.26	0.02795
				C35	0.28	0.0301

2.2.4 Evaluation and Scoring Standards for Tourism Planning Indicators

Indicator measurement and methods

The measurement of tourism planning indicators is based on the interpretation of cultural and natural heritage values, objective standards, and subjective evaluations. If relevant national standards can be referenced, they can be used for measurement. The indicators that require subjective evaluation are measured through questionnaire surveys, and the various indicator elements of the indicator layer are measured based on the actual situation of the geopark.

The evaluation and scoring criteria for tourism planning indicators refer to Emmet McLoughlin et al.'s (E McLoughlin, 2020) European Tourism Indicator System for assessing the sustainability indicators of tourism planning and Dorothea Julia Bohn's (DJ Bohn, 2019) evaluation of national, regional, and local tourism planning in Finland. The indicator measurement and methods are shown in Table 3.

Tab. 3. Measurement and Methods of Tourism Planning Indicators Based on Cultural and Natural Heritage Value Interpretation

Index	Measurement and Methodology	Index	Measurement and Methodology
C1、C2	Measures for the protection and management of world cultural heritage, rules for compiling codes for natural resource registration units, and technical requirements for the investigation of important geological relics	C14	Information Inquiry
C3	Geopark offers:	C15	upper secondary education coverage; Information Inquiry

C4、C5、C6、C7	Classification and evaluation of quality grades of tourist attractions GB/T17775-2003; Visitor Questionnaire	C16	Geopark offers:
C8	Measures for the protection and management of world cultural heritage, rules for compiling codes for natural resource registration units, and technical requirements for the investigation of important geological relics	C17	Proportion of visitors under the age of 40; Questionnaires
C9	proximity to the nearest central city; Information Inquiry	C18	Proportion of tourists with high school or above; Questionnaires
C10	Geopark offers:	C19、C20	Resident Questionnaire
C11	Service quality standard for tour guides: GB/T 15971-1995;	C21	Information Inquiry
C12	Suitable for visiting days; Geopark offers;	C22	Employee questionnaires
C13	GDP per capita; Information Inquiry	C23-C35	Visitor Questionnaires; Expert questionnaires

Indicator scoring criteria

The study adopted a fuzzy mathematical scoring system to determine the scores of various indicators in tourism planning based on the interpretation of cultural and natural heritage values. The scores were divided into five scoring intervals within the 0-10 points range, as shown in Table 4. The scoring standards for each indicator mainly refer to the "Classification and Evaluation of Quality Grades of Tourist Attractions" (GB/T17775-2003), "Technical Requirements for Planning and Compilation of National Geoparks", "Quality Standards for Tour Guide Services" (GB/T15971-1995), "Measures for the Protection and Management of World Cultural Heritage", "Rules for the Compilation of Natural Resource Registration Unit Codes", "Technical Requirements for the Survey of Important Geological Relics", "National Science Popularization Education Base Standards" and relevant references. For subjective indicators, scoring is based on evaluation data obtained through survey questionnaires.

Tab. 4. Indicator Scoring Standards

Indicator Layer	Evaluation Criteria:				
	10-8	8-6	6-4	4-2	2-0
C1	World-Class	National	Provincial	County	Below the County Level
C2	Very High	High	Ordinary	Low	Very Low
C3	Very High	High	Ordinary	Low	Very Low
C4	Very High	High	Ordinary	Low	Very Low
C5	Very High	High	Ordinary	Low	Very Low
C6	Very High	High	Ordinary	Low	Very Low
C7	Very High	High	Ordinary	Low	Very Low
C8	5A	4A	3A	2A	A
C9	⩽50	50-100	100-200	200-250	⩾250
C10	Very High	High	Ordinary	Low	Very Low
C11	Very High	High	Ordinary	Low	Very Low
C12	⩾300	250-300	150-250	100-150	<100
C13	⩾16000	14000-16000	12000-14000	10000-12000	<10,000
C14	Very High	High	Ordinary	Low	Very Low
C15	⩾30	25-30	20-25	15-20	<15
C16	⩾25	20-25	15-20	10-15	<10
C17	⩾50	40-50	30-40	20-30	<20
C18	⩾30	25-30	20-25	15-20	<15
C19	Very High	High	Ordinary	Low	Very Low
C20	Very High	High	Ordinary	Low	Very Low
C21	Very High	High	Ordinary	Low	Very Low
C22	Very High	High	Ordinary	Low	Very Low
C23	Very Distinct	Distinct	Ordinary	Not Very Obvious	Not Obvious
C24	Very High	High	Ordinary	Low	Very Low
C25	Reasonable	Plausible	Ordinary	Not Very Reasonable	Irrationality
C26	Very High	High	Ordinary	Low	Very Low
C27	Very High	High	Ordinary	Low	Very Low
C28	Very High	High	Ordinary	Low	Very Low
C29	Very High	High	Ordinary	Low	Very Low
C30	Very High	High	Ordinary	Low	Very Low
C31	Very High	High	Ordinary	Low	Very Low
C32	Very High	High	Ordinary	Low	Very Low
C33	There are three types of popular science activities: local popular science activities, teaching practice activities, and special popular science activities.	There are three types of popular science activities: local popular science activities, teaching practice activities, and special popular science	Only two of the three types of popular science activities are practised.	Only one of the three types of popular science activities is practised.	There are no popular science activities.

		activities, but the frequency is average.			
C34	18 days	15-18	10-15	5-10	<5
C35	The cultural and natural heritage museum, the cultural and natural heritage tourism route, and the national popular science education base.	There are cultural and natural heritage museums, cultural and natural heritage tourism routes, and provincial popular science education bases.	There is a cultural and natural heritage museum and a popular science education base.	There are cultural and natural heritage museums and non-popular science education bases.	There are no cultural and natural heritage museums, no cultural and natural heritage tourism routes, and non-popular science education bases.

2.2.5 Tourism Planning Evaluation Model and Evaluation Level

Evaluation Model

Quantitative evaluation indicators are scored according to their membership levels. If the evaluation score falls within a certain score range, its membership degree is 1. If it falls within other score ranges, the membership degree is 0. Meanwhile, corresponding scores will be assigned based on the range of the score interval.

For qualitative indicators, the scores of each indicator level are calculated through questionnaire processing.

Using the multi-objective linear weighting function method, tourism planning can be evaluated based on cultural and natural heritage value interpretation layer by layer through modeling analysis. The range of evaluation results is 0-10, belonging to a certain score interval.

The weight values for tourism planning evaluation based on the interpretation of cultural and natural heritage values are calculated as follows:

$$E = \sum_{i=1}^{n} Q_i P_i \tag{1}$$

In the formula (1), E represents the comprehensive evaluation value of cultural and natural heritage value; Q_i is the weight of the *i*-th evaluation factor; P_i is the evaluation value of the *i*-th evaluation factor, the number of evaluation factors (Chen & Guo, 2019).

The tourism planning evaluation model based on the interpretation of cultural and natural heritage values is as follows:

$$S = \sum_{n=1}^{p} \left[\sum_{j=1}^{m} \left(\sum_{i=1}^{n} C_i W_i \right) B_j \right] A_h \tag{2}$$

In the formula (2), S represents the total score of tourism planning evaluation based on the interpretation of cultural and natural heritage values; C_i is the score of the *i*-th third level indicator; W_i is the weight of the *i*-th third level indicator in this indicator layer; B_j is the weight of the *j*-th secondary indicator in this indicator layer; A_h is the weight of the *h*-th primary indicator in this indicator layer (Zheng & Zhu, 2018); p is the number of primary indicators, and this model takes 3 indicators; m is the number of secondary indicators, and this model takes 9 indicators; n is the number of third level indicators, and this model takes 35 indicators (Zhu & Chen, 2020).

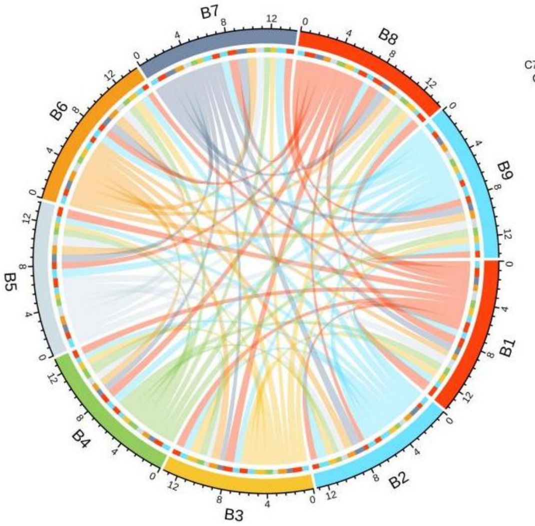

Fig. 1. Relationship between secondary indicators

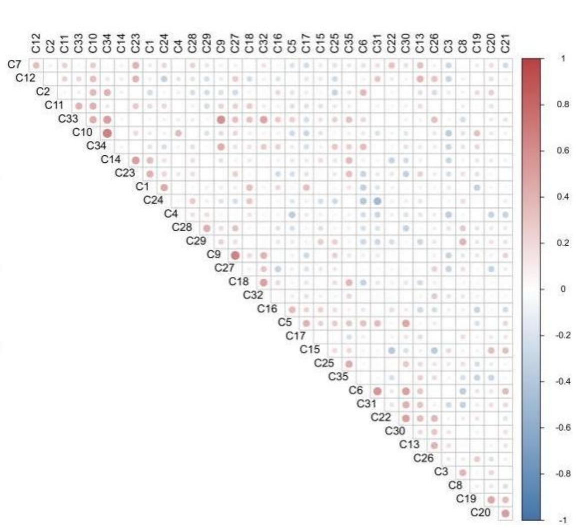

Fig. 2. Correlation heatmap between tertiary indicators (Corrplot)

Evaluation Level

Through the evaluation of tourism planning based on the cultural and natural heritage value interpretation of geological parks, the score range is defined as 0-10 points. However, in reality, the lowest score of 0 and the highest score of 10 points are rarely achieved, so the evaluation values are generally distributed within the range of (0, 10). Drawing on the "Classification and Evaluation of Quality Grades for Tourist Attractions" (GB/T17775-2003), "Technical Requirements for Planning and Compilation of National Geoparks", "Quality Standards for Tour Guide Services" (GB/T15971-1995), "Measures for the Protection and Management of World Cultural Heritage", "Rules for the Compilation of Natural Resource Registration Unit Codes", "Technical Requirements for the Investigation of Important Geological Relics", "National Science Popularization Education Base Standards" and relevant references, combined with the actual situation of tourism planning based on cultural and natural heritage value interpretation in geoparks, the classification of tourism planning based on cultural and natural heritage value interpretation in geoparks is carried out. A score higher than 8 indicates the highest level of tourism planning based on the interpretation of cultural and natural heritage values. Tourism planning for such geological parks should have the characteristics of high cultural and natural heritage resource levels and outstanding resource value. The practice of interpreting the value of cultural and natural heritage is widely carried out, and scenic area management attaches great importance to interpreting the value of cultural and natural heritage. Stakeholders hold a positive attitude and actively participate in tourism activities related to cultural and natural heritage. They have excellent development conditions, favorable socio-economic conditions, and strong customer source market conditions. This type of geological park has a high potential for further implementing tourism planning based on cultural and natural heritage value interpretation. A score between 7-8 indicates a higher level of tourism planning based on the interpretation of cultural and natural heritage values. This type of geological park has a high level of cultural and natural heritage resources and high resource value. The practical activities of interpreting the value of cultural and natural heritage have been carried out, and scenic spots have interpreted the value of cultural and natural heritage. Stakeholders are willing to participate in tourism activities related to cultural and natural heritage and have good development conditions, socio-economic conditions, and customer market conditions. A score between 6-7 indicates that the characteristics and values of cultural and natural heritage are average, the practical activities for interpreting the values of cultural and natural heritage are average, and the support of scenic area management and stakeholders is average, neither actively participating nor opposing, showing an indifferent state. The development conditions, socio-economic conditions, and source market conditions are not yet perfect, which provides limited support for further implementing tourism planning based on cultural and natural heritage value interpretation. A score below 6 indicates that the tourism planning potential based on the interpretation of cultural and natural heritage values is relatively small, the level of cultural and natural heritage resources is not high, the value is not obvious, practical activities for interpreting cultural and natural heritage values have not been carried out or have been slightly carried out, and the support for scenic area management and stakeholder attitudes is low. The support from development conditions, socio-economic conditions, and source market conditions is relatively small.

2.2.6 Reliability and Effectiveness Analysis of Evaluation Models

Sample Estimation and Testing

This study considered three evaluation models for estimating violations: (1) negative error variance, (2) standardized regression coefficient greater than 0.95, and (3) insignificant measured error variance. The research results indicate that the absolute values of the standardized regression coefficients for geological park cultural and natural heritage tourism resources, auxiliary conditions for cultural and natural heritage interpretation and display tourism activities, and tourism planning based on cultural and natural heritage value interpretation are 0.76 to 0.84, 0.67 to 0.83, and 0.75 to 0.87, respectively. None of them exceed 0.95, and the range of error variance is 0.01 to 0.04. There is no negative error variance, and it is significant. Therefore, the model contains no estimation violations and can perform measurement mode fitness testing, as shown in Table 5.

Tab. 5. Estimated Violation Inspection

First Level Indicator	Second Level Indicator	Third Level Indicator	Standardized Regression Coefficient	Error Variance
A1	B1	C1	0.81	0.01
		C2	0.78	0.03
		C3	0.79	0.03
	B2	C4	0.73	0.03
		C5	0.75	0.02
		C6	0.82	0.04
		C7	0.84	0.05
A2	B3	C8	0.81	0.05
		C9	0.74	0.02
		C10	0.70	0.02
		C11	0.71	0.02
		C12	0.72	0.02
	B4	C13	0.73	0.01
		C14	0.68	0.02
		C15	0.77	0.02
	B5	C16	0.71	0.02
		C17	0.74	0.01
		C18	0.75	0.02
	B6	C19	0.83	0.02
		C20	0.75	0.03
		C21	0.70	0.02
		C22	0.67	0.04
A3	B7	C23	0.81	0.02
		C24	0.79	0.04
		C25	0.85	0.03
		C26	0.82	0.03
	B8	C27	0.79	0.03
		C28	0.87	0.04
		C29	0.78	0.03
		C30	0.81	0.04
		C31	0.79	0.04
	B9	C32	0.75	0.03
		C33	0.78	0.01
		C34	0.80	0.02
		C35	0.76	0.02

Normality Hypothesis Test

In this study, the skewness values were all within the range of 2, and the kurtosis values were all within the standard range of 7. According to the standard, the observed variables were all non-multivariate normal distributions, as shown in Table 6.

Tab. 6. Skewness and Kurtosis of Each Variable

Project (Variable)	Skewness	C.R.	Kurtosis	C.R.
C1	-0.19	-1.92	0.88	3.54
C2	-0.25	-2.16	-0.78	-3.29
C3	0.23	1.51	-0.9	-3.82
Multivariable			12.96	17.63
C4	-0.52	-7.09	-1.12	-4.87
C5	-0.47	-5.88	0.28	1.29
C6	0.22	2.08	-0.67	-2.43
C7	-0.38	-3.51	0.84	3.01
Multivariable			6.35	15.84
C8	-0.5	-3.77	-0.79	-3.03
C9	-0.15	-5.08	-0.01	-3.56
C10	-0.22	-4.33	0.7	0.72
C11	0.47	1.26	0.82	1.09
C12	0.08	1.88	0.17	2.63
Multivariable			3.35	14.37
C13	0.08	0.19	-0.61	-3.64
C14	-0.35	-2.52	0.68	0.91

C15	-0.45	-3.23	-0.26	-2.13
Multivariable			1.88	8.16
C16	-0.39	-3.39	0.51	2.75
C17	-0.4	-3.5	0.65	2.12
C18	-0.31	-2.64	-0.1	-4.83
Multivariable			1.49	16.27
C19	-0.93	-3.39	-0.64	-2.3
C20	-0.96	-3.5	0.49	0.38
C21	-0.39	-2.64	-1.29	-2.22
C22	0.93	1.2	-1.37	-2.83
Multivariable			3.92	12.51
C23	-0.57	-3.94	-0.52	-3.46
C24	-0.44	-2.56	-0.47	-4.51
C25	0.23	2.05	0.31	2.58
C26	0.18	0.83	0.14	1.87
C27	-0.46	-3.47	-1.22	-3.52
Multivariable			5.43	24.67
C28	0.19	1.36	0.21	2.05
C29	-0.43	-2.55	1.45	2.72
C30	-0.31	-2.04	-0.81	-4.58
C31	-0.56	-3.52	1.14	1.39
Multivariable			3.56	18.72
C32	-0.89	-4.81	-0.59	-2.92
C33	-0.43	-3.57	-0.88	-2.38
C34	-0.61	-2.76	0.13	4.53
C35	0.35	3.16	0.55	1.64
Multivariable			3.37	17.68

Confirmatory Factor Analysis

(1) Reliability and convergent validity

This study used confirmatory factor analysis to measure the convergent validity and construct validity of the questionnaire. The factor loading in the study is based on the following criteria recommended by factor analysis to determine whether the problem should be included in the factor analysis: factor loading between 0.45 and 0.55 is considered moderate; 0.55 to 0.63 is considered good; 0.63 to 0.71 is considered very good; A value greater than or equal to 0.71 is considered excellent. Therefore, the loads of each factor in this study meet the standards of factor analysis.

Verify the effectiveness of the measurement model through factor analysis to determine whether each measured variable converges to the latent variable that needs to be measured. The average variance extracted between latent variables and their corresponding measures is calculated as the average variance extracted for each observed variable, representing the average explanatory power of each observed variable on the latent variable. In this study, the extracted average variances were all greater than 0.5, which meets the criteria of structural equation modeling for unobservable variables and measurement errors. Therefore, this study has convergent validity.

According to the recommendations of the structural equation model for unobservable variables and measurement errors, the higher the value of the compositional reliability of the latent variable, the higher the internal consistency of the measurement, and the higher the structural validity of the latent variable (Peng, 2010). The results of this study indicate that the reliability values of all structural components are above 0.6, which is consistent with the recommendations of the structural equation model for unobservable variables and measurement errors. Therefore, the internal quality of the model in this study is good.

Table 7 shows the reliability analysis and convergent validity results of the confirmatory factor analysis, indicating that all three indicators of the validation analysis in this study, such as factor loading, extracted mean-variance, and structural reliability, meet the standards.

Tab. 7. Convergence Validity and Structural Reliability Tests

First Level Indicator	Second Level Indicator	Third Level Indicator	Standardized Factor Load	Non-Standardized Factor Load	S.E.	C.R.（t-Value）	p	Smc	C.R.	Average Value
A1	B1	C1	0.83	1				0.76	0.85	0.62
		C2	0.75	0.90	0.07	16.83	***	0.59		
		C3	0.70	0.84	0.06	15.64	***	0.50		
	B2	C4	0.67	1				0.58	0.88	0.56
		C5	0.75	1.12	0.09	16.67	***	0.59		
		C6	0.74	1.10	0.09	16.43	***	0.58		
		C7	0.70	1.04	0.08	15.48	***	0.50		
A2	B3	C8	0.71	1				0.51	0.81	0.68
		C9	0.81	1.14	0.09	18.15	***	0.71		
		C10	0.79	1.11	0.08	17.67	***	0.65		

		C11	0.85	1.20	0.09	19.10	***	0.79		
		C12	0.82	1.15	0.09	18.39	***	0.74		
		C13	0.79	1				0.65	0.87	0.73
	B4	C14	0.85	1.08	0.09	19.21	***	0.79		
		C15	0.82	1.04	0.09	18.49	***	0.74		
		C16	0.71	1				0.51	0.86	0.56
	B5	C17	0.74	1.04	0.09	16.52	***	0.58		
		C18	0.75	1.06	0.09	16.80	***	0.59		
		C19	0.83	1				0.76	0.88	0.57
	B6	C20	0.75	0.90	0.06	16.44	***	0.59		
		C21	0.70	0.84	0.06	15.25	***	0.50		
		C22	0.67	0.81	0.05	14.54	***	0.43		
		C23	0.81	1				0.71	0.80	0.71
		C24	0.79	0.98	0.07	17.48	***	0.65		
	B7	C25	0.85	1.05	0.07	18.91	***	0.79		
		C26	0.82	1.01	0.07	18.19	***	0.74		
		C27	0.79	0.98	0.07	17.48	***	0.65		
		C28	0.87	1				0.84	0.83	0.71
A3	B8	C29	0.78	0.90	0.07	17.26	***	0.64		
		C30	0.81	0.93	0.07	17.98	***	0.71		
		C31	0.79	0.91	0.07	17.02	***	0.65		
		C32	0.75	1				0.59	0.85	0.63
	B9	C33	0.78	1.04	0.07	17.37	***	0.64		
		C34	0.80	1.07	0.08	17.85	***	0.69		
		C35	0.76	1.01	0.07	16.89	***	0.61		

(2) Differentiation validity

Discriminatory validity indicates whether there is a significant relationship between two or more structures, which means whether it has good explanatory power. In this analysis model, bootstrap sampling allocation is used to calculate the 95% confidence interval of the correlation coefficient between structures. If the number 1 does not appear in the 95% confidence interval of the coefficient, it indicates that the structure has good discriminant validity. The results in Table 8 indicate that the 95% confidence interval of the constructed correlation coefficient does not include the number 1, indicating good discriminant validity (Li & Si, 2008).

Tab. 8. 95% Confidence Interval of Bootstrap Correlation Coefficient

			Deviation Correction		Percentile Method	
		Valuation	Lower Bound	Upper Bound	Lower Bound	Upper Bound
A1	A2	0.54	0.45	0.62	0.43	0.60
A1	A3	0.73	0.63	0.84	0.61	0.82
A2	A3	0.63	0.54	0.73	0.55	0.71

(3) Analysis of the overall structural model

The overall model suitability is evaluated through ten secondary indicators, including the X2 test, X2 to a degree of freedom ratio, GFI, AGFI, RMSEA, CFI, and PCFI. As shown in Table 9, the correction ratio of X2 to degrees of freedom is 3.86 (greater than the recommended value of 3), the GFI value is 0.90 (equal to 0.90), the AGFI value is 0.87 (greater than 0.80), the RMSEA value is 0.06 (less than 0.08), the CFI value is 0.95 (greater than 0.90), and the PCFI value is 0.68 (greater than 0.50). Therefore, these results indicate that the model is feasible.

Tab. 9. Evaluation Model Validation Results

First Level Indicator	Second Level Indicator	Path Coefficient	Verification Result
		0.81	Effective
	B1	0.78	Effective
		0.79	Effective
A1		0.73	Effective
	B2	0.75	Effective
		0.82	Effective
		0.84	Effective
		0.81	Effective
		0.74	Effective
	B3	0.70	Effective
		0.71	Effective
		0.72	Effective
		0.73	Effective
A2	B4	0.68	Effective
		0.77	Effective
		0.71	Effective
	B5	0.74	Effective
		0.75	Effective
		0.83	Effective
	B6	0.75	Effective
		0.70	Effective

A3	B7	0.67	Effective
		0.81	Effective
		0.79	Effective
		0.85	Effective
		0.82	Effective
		0.79	Effective
	B8	0.87	Effective
		0.78	Effective
		0.81	Effective
		0.79	Effective
	B9	0.75	Effective
		0.78	Effective
		0.80	Effective
		0.76	Effective

3. Empirical Study Based on Dali Mount Cangshan UNESCO Global Geopark

3.1 Research Area

Fig. 3. Dali Mount Cangshan UNESCO Global Geopark Scope Map

The Dali Mount Cangshan UNESCO Global Geopark (DMCUGG) is located in Dali Prefecture, Yunnan Province, China, with longitude ranging from 99°56'50.37" E to 100°17'19.12" E, latitude ranging from 25°33'57.51" N to 25°59'42.7" N, and altitude ranging from 1700 to 4122 meters (Dali Mount Cangshan UNESCO Global Geopark, 2024). DMCUGG is bounded by the Dali Railway to the east, the Erhe River to the west and to the south, the secondary valley line and ridge line on the western slope of Cangshan to the west, and the ridge line and the administrative boundary between the Dali City and Eryuan County to the north. It is formed by 370 boundary inflexion points and covers an area of 933 square kilometers. DMCUGG has a single, unified geographical area and clear boundaries, managed by the Cangshan Geological Park Management Bureau of Dali Prefecture. It is a natural area that includes Cangshan, Erhai Lake, and the alluvial plain between Cang'er Lake, with a deep integration of natural landscapes and historical culture (Dali Mount Cangshan UNESCO Global Geopark, 2024).


Fig. 4. Ice Bucket on Yuju Peak in Cangshan


Fig. 5. Stone Sea of Longquan Peak in Cangshan

The geological relics within DMCUGG are unique, with the most representative being the Quaternary glacial landforms dating back 15000 years, which are the naming sites of the Dali Ice Age. The metamorphic rock series formed by the complex geological transformation of rocks about 2 billion years ago is the "textbook" of metamorphic rocks and also the birthplace of China's "marble"; The Himalayan orogeny and Cangshan uplift formed the plateau fault depression of Lake Erhai, as well as the rocky islands and lakeside wetlands characterized by erosion of the lake shore landforms (Liu, 2020).

Due to its unique geographical and climatic environment, DMCUGG has nurtured an extremely rich variety of biological species. There are 4094 species of vascular plants and 493 species of vertebrates. Among them are 42 species of nationally protected wild animals, 71 species of plants, 51 species of DMCUGG endemic plants, and 289 species (including varieties) of DMCUGG type specimen plants. It is one of the world's famous sources of animal and plant specimens (Dali Mount Cangshan UNESCO Global Geopark, 2024).

The scope of DMCUGG also includes Dali Old City, a national historical and cultural city of China, where the ancient Nanzhao and Dali Kingdom have a history of more than 500 years, which is an important node on the ancient Southern Silk Road. 25 ethnic groups, including Bai, Han, Yi, and Hui, live here, forming a unique and diverse culture (Liu, 2020). DMCUGG has 8 national intangible cultural heritages, including the Bai Three Spirits, Bai Tie Dyeing Techniques, and Dali March Street. There are also 9 Chinese national key cultural relics protection units, including the Three Pagodas of Chongsheng Temple, Taihe City Site, and Xizhou Bai Ancient Architecture Complex. The DMCUGG area is rich in biological resources, and biodiversity holds an important position in northwest Yunnan, China and even the world. It plays an important role in regulating and improving regional climate, protecting water sources, preserving soil and water, purifying air, promoting human health, and local economic development. At the same time, the DMCUGG protected area has important international significance for maintaining ecological balance and socially sustainable development in the upper and middle reaches of the Lancang-Mekong River Basin.

3.2 Data Sources and Processing

The study evaluates DMCUGG tourism planning based on the evaluation and scoring criteria of tourism planning indicators, evaluation models, and evaluation levels based on the interpretation of cultural and natural heritage values. The specific measurement and scoring criteria for each indicator refer to Tables 3 and 4. If the indicators in the evaluation system can be evaluated according to relevant national standards, universal standards will be used for measurement and scoring. If DMCUGG is required to provide indicators, researchers will obtain them through research on DMCUGG. If subjective evaluations from relevant personnel are required, researchers will obtain ratings through questionnaire surveys of local residents and tourists from September 2020 to July 2021. Finally, by standardizing the data and using the established evaluation model, the scores of three primary indicators in the DMCUGG tourism planning evaluation based on cultural and natural heritage value interpretation were calculated, including geological park cultural and natural heritage tourism resources, auxiliary conditions for cultural and natural heritage interpretation and display tourism activities, and tourism planning based on cultural and natural heritage value interpretation, as shown in Tables 10, 11, and 12.

3.3 Evaluation Index System Main Branches Evaluation Results

3.3.1 DMCUGG's Evaluation Results of Cultural and Natural Heritage Tourism Resources

Tab. 10. Evaluation Scores of Cultural and Natural Heritage Tourism Resources Indicators for DMCUGG

First Level Indicator	Comprehensive Score	Second Level Indicator	Comprehensive Score	Third Level Indicator	Comprehensive Score
A1	8.6046	B1	8.5540	C1	8.7463
				C2	8.6452
				C3	8.2706
		B2	8.6552	C4	8.5637
				C5	8.6641
				C6	8.3648
				C7	9.0283

Through evaluation, the comprehensive score of DMCUGG's cultural and natural heritage tourism resources is 8.6046 points, indicating significant characteristics and value of cultural and natural heritage tourism resources. The comprehensive scores of cultural and natural heritage tourism resource characteristics and tourism resource value as secondary indicators are 8.5540 points and 8.6552 points, respectively. The scores for the seven third-level indicators are relatively high, with each indicator scoring above 8 points, among which the scientific value evaluation reaches 9.0283 points.

3.3.2 Evaluation Results of Auxiliary Conditions for Interpreting and Showcasing Tourism Activities Related to the Cultural and Natural Heritage of DMCUGG

Tab. 11 Evaluation Scores of Auxiliary Condition Indicators for Dmcugg's Cultural and Natural Heritage Interpretation and Display Tourism Activities

First Level Indicator	Comprehensive Score	Second Level Indicator	Comprehensive Score	Third Level Indicator	Comprehensive Score
A2	7.6172	B3	8.4026	C8	8.7463
				C9	8.4852
				C10	8.6471
				C11	7.6127
				C12	8.5215
		B4	7.3968	C13	7.0026
				C14	7.2565
				C15	7.9312
		B5	7.9927	C16	7.7451
				C17	8.3722
				C18	7.8609
		B6	6.6768	C19	6.8325
				C20	6.2436
				C21	6.3168
				C22	7.3142

Through evaluation, the comprehensive score of auxiliary conditions for DMCUGG's cultural and natural heritage interpretation and exhibition tourism activities is 7.6172 points, including a development condition score of 8.4026 points, a social environment score of 7.3968 points, a source market score of 7.9927 points, and the lowest attitude score of stakeholders, which is 6.6768 points. From the evaluation results of the third level indicators, there is a significant difference, with indicators scoring 8 or more being DMCUGG's cultural and natural heritage scenic area level, distance from the central city, association with surrounding attractions, suitable travel period, and tourist age structure. The remaining 9 indicators score between 6-8 points.

3.3.3 Evaluation Results and Analysis of Tourism Planning Based on Cultural and Natural Heritage Value Interpretation

Tab. 12. Evaluation Scores of Post-Tourism Planning Indicators Based on the Interpretation of Cultural and Natural Heritage Values

First Level Indicator	Comprehensive Score	Second Level Indicator	Comprehensive Score	Third Level Indicator	Comprehensive Score
A3	8.3172	B7	8.2971	C23	8.4627
				C24	8.2475
				C25	8.3304
				C26	7.9176
				C27	8.5273
		B8	8.2714	C28	8.4231
				C29	8.3702
				C30	7.8595
				C31	8.4329
		B9	8.2569	C32	8.4562
				C33	8.0327
				C34	7.8593
				C35	8.6795

Through the evaluation of tourism planning indicators based on the interpretation of cultural and natural heritage values, it can be seen that DMCUGG's tourism planning evaluation score based on the interpretation of cultural and natural heritage values is 8.3172 points (Table 12). Interpretation and Display Design, Tourism Planning, and Scenic Area Tourism Management Planning scores are 8.2971, 8.2714, and 8.2569, respectively.

4. Discussion

The evaluation results of DMCUGG's cultural and natural heritage tourism resources indicate that the cultural and natural heritage tourism resources of DMCUGG have obvious attributes that are the basis for carrying out cultural and natural heritage tourism. Due to the short duration of DMCUGG's cultural and natural heritage interpretation and exhibition tourism activities, many aspects still need to be strengthened. Through the evaluation of relevant indicators, we found that most of the attitude indicators of DMCUGG stakeholders scored low. This requires extensive tourism to interpret the value of cultural and natural heritage, strengthen publicity, and improve local residents' awareness and level of cultural and natural heritage interpretation and display. Government departments should also strengthen their awareness of cultural and natural heritage interpretation and display.

The high scores in interpretation and exhibition design, tourism planning, and scenic area tourism management planning are due to the design of popular science tourism routes. Based on the spatial distribution of different geological attractions, three science popularization tourism routes were designed, including 22 geological attractions. Each interpretation and display of the tourism route has a distinct interpretation and display of the tourism theme and achieves the unity of science popularization and sightseeing, ensuring the coordination between science popularization and viewing. Secondly, actively building an interpretation and display tourism signage system. After DMCUGG's planning, it will have one geological park museum, one main monument, three secondary monuments, one science popularization corridor, and more than 150 various signage and explanatory signs, including landscape explanatory signs, scenic spot name signs, warning signs, traffic signs, etc., which will be made of imitation wood or stone. Thirdly, actively construct different interpretation and display schemes, and ordinary tourists adopt popular science popularization methods such as geological park museums, science popularization film and television halls, promotional brochures, scientific tour guides, scenic area interpretation boards, and tour guides. The expert team adopts forms such as scientific expedition guidelines, paper collections, scientific expedition routes, and field investigations; The business team combines tourism promotional materials to produce a promotional brochure for the economic development of Dali City; The art and media teams use DMCUGG's promotional brochures, professionally produced park promotional videos and documentaries. Based on the above principles, DMCUGG's interpretation and display system mainly consists of three thematic parts: indoor interpretation and display, outdoor interpretation and display, and promotion. The indoor interpretation and display system includes natural and cultural heritage museums, science popularization film and television halls, and exhibition halls. The outdoor interpretation and display system includes main and auxiliary steles, traffic guidance signs, landscape explanation signs, management explanation signs, park boundary markers, boundary stakes, science popularization explanation signs, etc. DMCUGG's promotional system includes a series of geological park books, scientific guide maps, promotional pages, and guide manuals. DMCUGG adopts a classification method to comprehensively introduce its natural and cultural heritage, development history, scientific knowledge background, and causes of its main natural and cultural heritage to tourists. Fourthly, activities should be actively carried out to interpret natural and cultural heritage. Actively carry out interpretation and exhibition activities of local culture and natural heritage, teaching internships, and specialized cultural and natural heritage interpretation and exhibition activities, and collaborate with the Chinese Academy of Geological Sciences to launch science popularization summer camps. Fifth, attention should be paid to the interpretation and display of cultural and natural heritage in tourism promotion. Promote cultural and natural heritage knowledge through science popularization weeks, such as promoting cultural and natural heritage knowledge on campus and showcasing cultural and natural heritage knowledge on-site in geological parks. Develop volunteer science popularization promoters who are obligated to provide interpretation and exhibition services for tourists.

5. Conclusions

The evaluation process and method of geopark tourism planning based on interpreting cultural and natural heritage values have broad application prospects. The first is the practical need for many geoparks to declare global geoparks, the second is to popularize the scientific value of geological heritage in geoparks so that tourists can have a deeper understanding of the heritage value, and the third is the need for geological heritage to declare World Natural Heritage. In recent years, there has been a new trend in the application of World Natural Heritage, that is, the United Nations World Heritage Committee in evaluating natural heritage, more attention to the value of geology, geomorphology, ecology, biodiversity and other aspects.

Heritage conservation is essentially an act of communication, and interpretation and display activities are important media for communication between heritage sites and the public. The true purpose of heritage conservation can only be achieved when locals and visitors understand and recognize the significance of heritage through interpretation and display activities. Managers need to consider the particularity of the site and its environment fully. Only in this way can the comprehensive interpretation and display system of the geopark break the previous form of preserving heritage in a single building, a single route and a single point and achieve a high degree of integration in different aspects such as natural and cultural heritage display, historical narrative, public and community participation, archaeological research and science popularization education. So as to realize the multifaceted heritage interpretation and the systematic transmission of site value and significance.

At present, there is no recognized and universal procedure and method for evaluating the interpretation of heritage value in the world. This paper aims to discuss the procedure, evaluation criteria, and methods at each stage of the evaluation of geological heritage value. Through the research of this paper, the key process and method of geopark tourism planning evaluation based on the interpretation of cultural and natural heritage values are constructed. The evaluation matrix of "Attribute category of scientific quality - comparative criteria of scientific value analysis" is established. The evaluation criteria of the outstanding and universal scientific value of geological heritage and the evaluation methods of tourism planning are pointed out.

It should be noted that in this specific method, there is an understanding of the macro standard in the evaluation process and the solution of the micro-operation level, which can only represent a shallow attempt and exploration by the authors. Due to the diverse types of geological heritage, there are great differences between them, and their scientificity, rationality and validity need to be tested and improved in the scientific value evaluation of various types of geological heritage.

In addition, evaluating geopark tourism planning based on the interpretation of cultural and natural heritage value can also provide some strategies and insights worth reference.

First, in the preliminary planning, the overall interpretation framework and general interpretation theme can be established and defined according to the heritage characteristics to coordinate the construction of the specific interpretation project. For heritage sites, especially large or comprehensive heritage sites, the display of heritage is usually a systematic project. As we can see from the interpretation system planning of Cangshan World Geopark, the establishment of a systematic interpretation and display system is to coordinate different display items, strengthen the connection between them, and make them coherent, complementary and concentrated so as to achieve a coherent and multifaceted interpretation and presentation of heritage values.

Secondly, it is important to adopt different display means and methods according to different historical backgrounds and characteristics of heritage, architecture, and space, as well as combine interpretation and display with the needs of tourists and the actual functions of heritage. Interpretation and display is not only a description of the historical information and formation process of the heritage site but also a comprehensive display, which takes into account the characteristics of the heritage itself, the comfort of tourists and the actual function of the heritage in modern society. For example, carry out public participatory archaeological projects. According to different historical backgrounds, a series of tourist experience activities have been planned, such as opening up a walking route and achieving a certain degree of sustainable development in heritage protection and management, archaeological research and cultural tourism development.

Third, we should fully play into the characteristics and advantages of digital technology. The application of digital technology provides a broader space for the interpretation and display of natural and cultural heritage in terms of display methods, content expression and transmission methods. The interpretation and display of heritage is essentially an information exchange activity. Suppose the advantages of digital technology are effectively utilized in terms of comprehensive audio-visual presentation, dynamic effect display, virtual restoration, space reconstruction and interactive participation. In that case, it will help to effectively transmit abstract heritage information, reproduce virtual heritage space, disseminate virtual heritage information, and reproduce virtual heritage environment so as to establish a good tourist experience.

Fourth, the public, experts, scholars, and other relevant organizations and communities should be encouraged to participate in various interpretation and display process forms. Local scholars are widely invited to establish academic sharing platforms and carry out various interpretation and experience activities involving local and public communities. In this interactive process, the heritage site is no longer only preserved as a physical area but has found a way to reconnect people with the heritage, thus promoting the public to participate in the inheritance of historical memory actively and finally returning the interpretation and presentation of the heritage to its original purpose, namely, the "living inheritance" of the heritage.

6. References

Taining UNESCO Global Geopark. (2024). "What is a UNESCO Global Geopark?" UNESCO. 30 Jul. 2024. URL: www.unesco.org/en/iggp/geoparks/about.

Ziari, K., & Etminan, A.M., & Golzar, M. (2024). Qeshm Geopark and an Evaluation of its Capabilities for Various Activities. Geopolitics Quarterly, 20(2), 323-349. DOI:10.22034/IGQ.2024.431873.1825

Taining UNESCO Global Geopark. (2024). "Do they focus exclusively on geology?" UNESCO. 30 Jul. 2024. URL: www.unesco.org/en/iggp/geoparks/about.

Shutterstock. (2024). "Fundamental features." UNESCO. 30 Jul. 2024. URL: www.unesco.org/en/iggp/geoparks/about.

Chen A.Z. (2003). Some problems on the construction of national Geoparks in China. *Resources and Industry*, 2003,(01):57-63. DOI: 10.3969/j.issn.1673-2464.2003.01.019.
Yang T.F. (2009). Research on tourism development of karst geology for popular science. Geological Hazards and Environmental Protection, 20(02), 140-144. DOI:10.3969/j.issn.1006-4362.2009.02.029
Chen R.K. (2010). Geological origin of karst landscape and its tourism development in Xianning City. Journal of Xianning University, 30 (12), 112-114. DOI:10.3969/j.issn.1006-5342.2010.12.043
Qian X.M., & Zhao Y., & Xia M.. (2006). Preliminary study on the planning of Geopark scenic interpretation system. Journal of Hebei Normal University, 2006(02), 236-239+244. DOI:10.3969/j.issn.1000-5854.2006.02.030
Yu X.J. (2013). Research on the development mode of popular science Tourism in China's National Geopark. Southwest University, 2013. DOI:10.3969/j.issn.1672-5379.2012.07.001.
He X.Q., & Li C.N., & Xu Jiajia. (2008). Study on tourist perception characteristics of popular science education in Longhu Mountain Global Geopark. Journal of Arid Land Resources and Environment, 32(08), 202-208. DOI:10.13448/j.cnki.jalre.2018.259.
Zhu G.X., & Wang J.L., & Hong H.P., & et al. (2013). Construction of low-carbon tourism evaluation index system for mountain scenic spots: A case study of Huangshan Scenic Spot. Geographical Research, 32(12), 2357-2365. DOI:10.11821/dlyj201312017.
UNESCO. (2024). "List of UNESCO Global Geoparks and Regional Networks." UNESCO. 26 Jul. 2024. URL: www.unesco.org/en/iggp/geoparks?hub=67817.
Ahmad, N. (2024). "Celebration of heritage." UNESCO. 30 Jul. 2024. URL: www.unesco.org/en/iggp/geoparks?hub=67817.
Global Geoparks Network. (2024). "Global Geoparks Network Mission." Global Geoparks Network. 30 Jul. 2024. URL: https://globalgeoparksnetwork.org/?page_id=202.
Acosta, D. (2024). "10 focus areas to support sustainable societies." UNESCO. 30 Jul. 2024. URL: www.unesco.org/en/iggp/geoparks/about.
Yu H., & Xu L.L., & Liu L.M. (2022). Revisiting the suitability assessment framework for glacier tourism: a case study from Tibet, China. Journal of Resources and Ecology, 13(04), 687-696. DOI:10.5814/j.issn.1674-764x.2022.04.014.
Pu L.L., & Lu C.P., & Chen X.P. (2022). Evaluation of rural tourism Resources from the perspective of tourists: a case study of Lanzhou City. Journal of Resources and Ecology, 13(06), 1087-1097. DOI:10.5814/j.issn.1674-764x.2022.06.013
Bellezza, G. (2013). Interpretation and Evaluation of Geoparks -- Theory and Practice: Geographical views on Geoparks and national parks and a monograph worth reading. Journal of Geographical Sciences, 2013,23(05):958-960. DOI:CNKI:SUN:ZGDE.0.2013-05-016.
China Land Society. (1991). Chapter of China Land Society. China Land Science, 5(01), 45-47+44.
Ye C.H. (2022). Construction of Evaluation index System of University Students' off-campus Engineering Practice Base. Science and Technology Information, 20(14), 192-194. DOI:10.16661/j.cnki.1672-3791.2111-5042-4051.
Chen X., & Guo Y.Y. (2019). Types and evaluation of geological heritage resources in Huaguoshan National Geopark. Mineral Exploration, 10(03), 695-699. DOI:CNKI:SUN:YSJS.0.2019-03-038.
Zheng Q.M., & Zhu A.M. (2018). Research on evaluation index and model of Zhangjiajie Mountain vacation tourism destination competitiveness. Tourism Forum, 11(01), 103-112. DOI:10.15962/j.cnki.tourismforum.201801010.
Zhu J., & Chen P. (2020). The Construction and Demonstration of the Evaluation Index System of the Level of Citizenization of Agricultural Transfer Population:Analysis Based on the Dynamic Monitoring Data of the National Floating Population in 2017. Journal of Xiangtan University:Philosophy And Social Sciences, 2020,44(4):98-103. DOI:10.3969/j.issn.1001-5981.2020.04.017.
Peng S. (2010). Research on Personality and Performance based on the perspective of Five relationships in Oriental Management. Fudan University, 2010. DOI:CNKI:CDMD:1.2010.194658.
Li Y., & Si Y.H. (2008). Exploratory innovation, exploitative innovation and performance: the impact of strategy and environment. Nankai Management Review, (05), 4-12. DOI:10.3969/j.issn.1008-3448.2008.05.002.
Dali Mount Cangshan UNESCO Global Geopark. (2024). "Basic situation of protected areas." Dali Mount Cangshan UNESCO Global Geopark. 30 Jul. 2024. URL: https://dlcsdzgy.cn/newsinfo/1132431.html.
Liu M. (2020). World-class geological heritage landscape of Cangshan Global Geopark in Dali. Journal of Sichuan Geology, 40(02), 332-337. DOI:10.3969/j.issn.1006-0995.2020.02.033.