

Research on the Evaluation of Ecological Health Tourism Resources Based on DHGF Algorithm — A Case Study of Changshou County of Bama

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Abstract. [Objective] Taking the famous ecological health preservation base Guangxi Bama as the research object to construct a systematic index system for the evaluation of ecological health tourism resources, and compare and analyze the relevant ecological health tourism resource indicators. Finally, determine the abundance of ecological health tourism resources in Bama Village. [Results] The research shows that in terms of the index weight of ecological health tourism resources in Changshou Township, Guangxi, the weight of health tourism resources is the highest. In terms of comprehensive evaluation, the comprehensive evaluation score of ecological health tourism resources in Changshou township is 7.375. The comprehensive evaluation level of ecological health tourism resources in Changshou Township is Class II (good). On the basis of in-depth analysis of the evaluation results, it is proposed to strengthen the government's support, fully tap the rural ecological health tourism resources, cultivate "rural tourism + ecological health" skilled compound talents, and strengthen the integration of rural health care and related industries, so as to achieve a one-two Suggestions on the integration and development of the three industries.

Keywords: Guangxi Bama longevity; ecological health preservation; tourism resources; DHGF algorithm.

With the aging of the population structure and the growing prevalence of subhealth, as well as the revolutionary influence of the global overall health concept, people's demand for health and wellness has become another mainstream market trend and development hotspot of the times after the demand for food and clothing. The emergence of wellness tourism, which integrates the cross-pollination of wellness resources and tourism activities to achieve integration, has begun to receive global attention in the form of a new industry [1], which meets people's all-round demand for physical and mental health. According to the "2014-2018 China Wellness Tourism Product Development Model and Regional Investment Opportunities Analysis Report", more than half of the residents in China's big cities, especially the "urban white-collar workers", are in a state of sub-health, and the number is still on the rise.

The ecological health resources in Bama, Guangxi are rich, and the reasonable utilization and development of ecological health tourism resources can help accelerate the transformation of local tourism industry and promote the creation of ecological protection type beautiful countryside model. Therefore, the DHGF algorithm is used to construct the evaluation index system of Bama ecological wellness tourism resources and to make a comprehensive evaluation of the richness of Guangxi Bama ecological wellness tourism resources [2-3]. This is not only important for the protection and utilization of Bama ecological health tourism resources in Guangxi, but also provides reference value for the development of ecological health tourism in China.

1. Overview of the study area

Changshou County, Bama, Guangxi is located in Hechi City, Guangxi Zhuang Autonomous Region, in the northwest of Guangxi. The study area covers an area of 1976.42 square kilometers. The population is mainly composed of Yao, Zhuang and Han nationalities, with a resident population of 300000. The study area is rich in ecological health tourism resources. In recent years, it has been

known as the "hometown of longevity" by the outside world. It focuses on excavating its "longevity" brand ecotourism products and developing "longevity" ecotourism. The development of leisure ecotourism model has created rich economic benefits for the tourism industry in Bama, Guangxi..

2. Research Methodology

DHGF algorithm is based on the DH model, that is, the factors in the index system adopt the improved Delphi method and the fuzzy comprehensive evaluation method. In this study, the calculation steps of DHGF algorithm can be roughly divided into: the first step, based on the DH algorithm model to determine the weight of various evaluation index hierarchy of ecological health tourism resources in Guangxi Bama longevity country. In the second step, the GF algorithm of the DHGF algorithm is used to make a comprehensive comparative evaluation of the research objects in the study area.

2.1 DH algorithm to determine the evaluation index weights

Based on the principles of Delphi method, fuzzy comprehensive evaluation method and target object hierarchy analysis method, fuzzy measurement is carried out on a scale of 1-9, 15 experts are invited to make a comprehensive comparison and assign values, and the average value of each index is calculated for systematic comparison and then its dimension is evaluated comprehensively. Then, the ratio between adjacent double indicators is calculated, and the comparison is rounded to determine the value of the indicator matrix, and the double judgment matrix is constructed with the value of the indicator matrix, and then the weights of the matrix are assigned to each level. The weight coefficient of each factor indicator is W_i , and the set of its comprehensive combination weights W , is found as

$$W = \{W_1, W_2, \dots, W_i, \dots, W_n\} \quad (1)$$

The formula W_i denotes the weight value of the evaluation index D_i , $W_i \in (0, 1)$. $i = 1, 2, \dots, n$. The evaluation layer index of ecological and health tourism resources factors in the study about Guangxi Bama longevity county is 20, so the number of quantity factors n in the formula here is taken as 20.

2.2 GF algorithm for comprehensive evaluation

Firstly, it is assumed that there are K experts in the field participate in the fuzzy assignment scoring of the index model, $E = \{E_1, E_2, \dots, E_l, \dots, E_k\}$, and expert l to the evaluation index d_{li} , which finally means that K experts in the field make fuzzy assignment scoring to the evaluation index of ecological and health tourism factors in Guangxi Bama longevity county, and the scoring value adopts the standard of 10-point system, and the corresponding evaluation sample size matrix (D) is obtained as follows

$$D = \begin{Bmatrix} d_{11} & d_{12} & \dots & d_{1i} & \dots & d_{1n} \\ d_{21} & d_{22} & \dots & d_{2i} & \dots & d_{2n} \\ \vdots & \vdots & & \vdots & & \vdots \\ d_{l1} & d_{l2} & \dots & d_{li} & \dots & d_{ln} \\ \vdots & \vdots & & \vdots & & \vdots \\ d_{k1} & d_{k2} & \dots & d_{ki} & \dots & d_{kn} \end{Bmatrix} \quad (2)$$

In the formula $l = 1, 2, \dots, k$. In this study, five experts were selected to score the fuzzy assignment of ecological and health tourism resources evaluation index of Guangxi Bama longevity county, so x was taken as 5.

Secondly, according to the relative threshold method of the data model, the peak values (maximum, minimum and median values) are found in the matrix of selected evaluation sample sizes in Guangxi Bama longevity township as the limits of relative assignment (upper, lower and median values), and then the set of model evaluation levels V_j is determined V .

$$V = \{V_1, V_2, \dots, V_j, \dots, V_M\} \quad (3)$$

$j = 1, 2, \dots, m$. After comprehensive comparison, the ecological and health tourism resources evaluation index system is divided according to 4 grades of excellent, good, medium and poor, so m is taken as 4.

Again, the corresponding whitening weight functions are obtained according to the evaluation levels of the model, and then the gray statistics n_{ij} , the total gray statistics n_i , the evaluation weights (r_{ij}) of each gray category and the gray evaluation weight matrix (R) are calculated for each evaluation index.

$$n_{ij} = \sum_{l=1}^K f_l(d_{li}) \quad (4)$$

$$n_i = \sum_{j=1}^m n_{ij} \quad (5)$$

$$r_{ij} = \frac{n_{ij}}{n_i} \quad (6)$$

$$R = \begin{Bmatrix} r_{11} & r_{12} & \dots & r_{1i} & \dots & r_{1n} \\ r_{21} & r_{22} & \dots & r_{2i} & \dots & r_{2n} \\ \vdots & \vdots & & \vdots & & \vdots \\ r_{i1} & r_{i2} & \dots & r_{ij} & \dots & r_{im} \\ \vdots & \vdots & & \vdots & & \vdots \\ r_{n1} & r_{n2} & \dots & r_{nj} & \dots & r_{nn} \end{Bmatrix} \quad (7)$$

The formula $f_l(d_{li})$ is the whitening weight function of d_{li} at j gray category. r_{ij} is the gray evaluation weight arithmetic value of the i th evaluation factor at the time of evaluation criteria in j .

Finally, according to the combined weights W of the evaluation factors of the selected samples and the gray evaluation weight matrix R , the fuzzy evaluation matrix B of ecological health tourism resources of Guangxi Bama Longevity Township can be obtained. based on the results of the fuzzy evaluation matrix and the determined evaluation levels, the final result Z of the evaluation of health tourism resources of the nature reserve can be calculated.

$$B = WR \quad (8)$$

$$Z = BV^T \quad (9)$$

V^T in the formula indicates the transposition of the boundary value of V in the evaluation index system.

3. Results and Analysis

The famous ecological health base Guangxi Bama is used as the research object to construct the system index system of ecological health tourism resources evaluation, compare and analyze the relevant ecological health tourism resources indexes, and use DHGF algorithm to carry out the system factor weight analysis to make a comprehensive evaluation of the abundance of ecological health tourism resources in Bama village.

3.1 Resource own richness has the greatest influence on health tourism, and accessibility has the least influence on health tourism

Using YAAHP V7.5 version software analysis. It shows that the judgment matrix models at all levels of ecotourism resources in the study area have passed the consistency test. In the comprehensive evaluation index system, the inherent conservation conditions of ecological health tourism resources in the study area account for the highest weight, and the second weight is the environmental conditions of ecological health tourism resources in Bama, Guangxi.

Table 1. Guangxi Bama longevity country ecological health tourism resources level one comprehensive evaluation system indicators

First-level comprehensive evaluation system indicators	Symbol	Weight
Ecological health tourism resources innate conditions	B ₁	0.642
Ecological health tourism resources environmental conditions	B ₂	0.304
Ecological health resources development conditions	B ₃	0.113

Table 2. Guangxi Bama longevity country ecological health tourism resources secondary evaluation index

First-level comprehensive evaluation system indicators	Secondary Comprehensive Evaluation System Indicators	Symbol	Weight
Ecological health tourism resources innate conditions	Natural Health Resources	C ₁	0.383
	Human Wellness Resources	C ₂	0.065
	Bama Resource Attributes	C ₃	0.113
Ecological health tourism resources environmental conditions	Environmental Quality	C ₄	0.213
	Environmental Capacity	C ₅	0.074
	Environmental Protection	C ₆	0.030
Ecological health resources development conditions	Accessibility	C ₇	0.012
	Conservation Infrastructure	C ₈	0.089

3.2 Comprehensive evaluation grade of ecological health tourism resources of Guangxi Bama longevity country is II (good)

Table 3. Three-level factor evaluation index of ecological health tourism resources in Changshou Township, Bama, Guangxi

Second-level comprehensive evaluation system indicators	Three-level resource factor evaluation layer	Symbol	Weight	sort
Natural Health Resources	rural natural produce	D ₁	0.062	3
	Bama wild Chinese herbal medicine	D ₂	0.236	1
	Bama wild health food	D ₃	0.162	2
Human Wellness Resources	Yao and Zhuang national culture health preservation	D ₄	0.032	7
	Minority medical health care	D ₅	0.029	8
	Bama tea culture and health care	D ₆	0.022	9
Bama Resource Attributes	plant and animal species diversity	D ₇	0.020	11
	animal and plant species rarity	D ₈	0.019	12
Environmental Quality	soil environmental quality	D ₉	0.039	5
	water quality	D ₁₀	0.033	6
	Air negative ion content	D ₁₁	0.051	4
	sound environment quality	D ₁₂	0.021	10
Environmental Capacity	ecological capacity	D ₁₃	0.017	13
Environmental Protection	Resource and environmental protection	D ₁₄	0.013	14
Accessibility	transportation	D ₁₅	0.006	20
Conservation Infrastructure	Accommodation environment	D ₁₆	0.011	16
	communication environment	D ₁₇	0.007	19
	primary care	D ₁₈	0.012	15
	Professional technicians service	D ₁₉	0.009	18
	standard quality			
	Tourist health facilities	D ₂₀	0.010	17

According to the fuzzy evaluation conducted by relevant industry experts, according to the relevant data model, the final evaluation results of DHGF model algorithm show that,

$$Z = BV^T = (0.382 \ 0.376 \ 0.227 \ 0.014)(9 \ 7 \ 5 \ 3)^T = 7.375$$

According to the evaluation level system of I-V ecological health tourism resources, the comprehensive evaluation level of ecological health tourism resources of Guangxi Bama longevity country is II (good), which is suitable for developing moderate intensity tourism activities.

4. Conclusions and Recommendations

4.1 Conclusion

The evaluation model of ecological and health tourism resources in Guangxi Bama longevity country containing 20 relevant evaluation influence factors constructed by DHGF model algorithm extends a certain scope for the study of ecological and health tourism resources in China. The rational utilization of its own rich innate natural conditions [4-5], ecological health resources and Yao herbal resources is a prerequisite for the development of longevity tourism in Guangxi Bama. In addition, the ecological permaculture tourism resources of Guangxi Bama longevity township belong to level 2 good, which not only reflects that the permaculture resources of Guangxi Bama longevity township are adapted to carry out tourism activities related to the purpose of great health and wellness, but also further verifies that the DHGF model algorithm is an effective method applicable to the comprehensive evaluation of regional ecological permaculture tourism resources.

Table 4. Evaluation of gray classes and whitening weight functions

Gray category	Grade	Gray number	Whitening weight function
The I gray category	Excellent	$\in [9, +\infty)$	$f_i(d_{li}) = \begin{cases} \frac{d_{li}}{9} & [0, 9] \\ 1 & [9, +\infty) \\ 0 & [-\infty, +\infty) \end{cases}$
The II gray category	Good	$\in [0, 7, 14]$	$f_i(d_{li}) = \begin{cases} \frac{d_{li}}{7} & [0, 7] \\ 2 - \frac{d_{li}}{7} & [7, 14] \\ 0 & (0, 14) \end{cases}$
The III gray category	Moderate	$\in [0, 5, 10]$	$f_i(d_{li}) = \begin{cases} \frac{d_{li}}{5} & [0, 5] \\ 2 - \frac{d_{li}}{5} & [5, 10] \\ 0 & [0, 10) \end{cases}$
The IV gray category	Poor	$\in [0, 3, 6]$	$f_i(d_{li}) = \begin{cases} 1 & [0, 3] \\ 2 - \frac{d_{li}}{3} & [3, 6] \\ 0 & (0, 6) \end{cases}$

4.2 Recommendations

4.2.1 Establish a standardized government management system

To bring rural health tourism into the tourism system for unified planning and construction, we must give full play to the central role of the government and make the operation and management of rural health tourism have rules to follow [6]. Under the standardized leadership of the competent government departments, strive to combine rural tourism with the health care industry.

4.2.2 Change the traditional concept of wellness, fully exploit the rural ecological wellness tourism resources

On the basis of pure ecological tourism and health preservation, it fully excavates the deep-seated ecological tourism and health preservation products.

4.2.3 Strengthen the training of "rural tourism + ecological health" skilled composite talents

Talent is the primary productive force. To vigorously develop the rural health tourism industry, we must strengthen the publicity and introduction of talents through various channels [7]. We should take the government as the leading and market-oriented, absorb and introduce rural health tourism talents through various measures, strengthen the construction of talent team, and contribute to the rural health tourism industry.

4.2.4 Strengthen the combination of rural wellness and related industries to achieve the integration of one, two and three industries

No. 1 central document pointed out that the integration of the 123 industries in rural areas should be an important support for farmers' sustained and rapid increase [8]. It is imperative to develop the integrated development of agriculture and the secondary and tertiary industries. Under the background of industrialization integration, rural health tourism itself is the combination of tourism industry and health industry, and there is no obvious sense of marginality.

References

- [1] Peng Zonglan. Development of tourism products in ethnic villages from the perspective of healthy tourism [D]. Sichuan Agricultural University, 2019. DOI: 10.27345/d.cnki.gsnyu. 2019. 001122.
- [2] Guo Jing. Research on the development of traditional Chinese medicine health care tourism in Kaili City based on consumer preference [D]. Guizhou Normal University, 2021.
- [3] Ouyang Xinyi. Research on the planning of mountain forest tourism resort based on the concept of healthy tourism [D]. Central South University of Forestry and Technology, 2017.
- [4] Ming Qingzhong, Li Ting. Research on Health Geography and Health Tourism Development Based on Big Health Industry [J]. Academic Exploration, 2019(01): 96-106.
- [5] He Yuxu. The current situation and countermeasures of traditional Chinese medicine health tourism in Yunnan Province [J]. Tourism Research, 2017, 9(02): 16-21.
- [6] Liu Qingyu, Mi Ning. Countermeasures for the development of health and wellness tourism from the perspective of global tourism [J]. Tourism Journal, 2016, 31(11): 4-6.
- [7] Tsai Fa (TF) Yen. Finding the Possible Solutions to the Cooperation within Livestream and Health and Wellness Tourism [J]. Asian Journal of Education and Social Studies, 2021.
- [8] ResearchAndMarkets.com Release Report: Key Trends in Health and Wellness Tourism (2021) [J]. Manufacturing Close - Up, 2021.