Research Article

The Path Evaluation of Integrated Development of Leisure Sports and Rural Ecological Environment in Guangxi Based on Fuzzy Comprehensive Evaluation Model

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Sports tourism is a new form of tourism based on sports resources, which attracts people to participate and feel the interest of sports activities and nature, and is an important part of sports industry. Through the field survey method and logical analysis method, we make a comparative analysis of the five existing rural sports tourism integration development models in Guangxi, analyze the problems of the existing rural sports tourism integration development models in Guangxi from macro-, meso-, and microdimensions, propose corresponding development countermeasures, provide reference for promoting the national strategy of building important tourism bases in Guangxi and theoretical system construction, use the method of fuzzy mathematics to construct a fuzzy comprehensive evaluation model, and apply this model to objectively evaluate the sports tourism resources in Guangxi Province. Finally, in response to the evaluation results, it is proposed to deeply develop characteristic advantageous sports tourism resources, focus on breakthroughs, develop fitness and leisure participation sports tourism industry, and reasonably lay out and cultivate some attractive sports tourism products.

1. Introduction

The tourism + folk sports culture development model is a special cultural development model based on folk customs, folk culture, and folk way of life to meet people's multiple travel needs [1–3]. This development model has greatly increased the popularity of the tourist area, broadened the market of sports tourism sources, and driven the sustainable development of the local economy [4].

Tourism + sports town development model's basic features are as follows: the market as the goal to create a set of traditional culture, ecological tourism, health and leisure sports, parent-child leisure play, and pension to enjoy the old in one of the cultural and health tourism areas [5, 6]. At present, many sports and leisure characteristic towns have been built in Guangxi (Nanning City Beautiful South Sports and Leisure Base, Liuzhou City Luzhai County Zhongdu Shiluijiang Sports and Leisure Characteristic Town, Hechi City Desheng Lalang Ecological Sports and Leisure Characteristic Town, etc.). This model takes sports as the core of development and cross-border integration with culture, education, health, and other industries, forming an intelligent and comprehensive public sports service platform, which is essential for enhancing tourists' experience and coordinating regional economic development [7, 8]. It has a nonnegligible role in enhancing tourists' experience and coordinating regional economic development [9, 10]. This development mode can effectively promote the mutual integration of Guangxi sports industry and red tourism area on the one hand and drive the good development of old revolutionary areas and economy and society in Guangxi on the other hand. In addition, it can effectively strengthen the education of traditional culture in old revolutionary areas, enhance the patriotism sentiment, and promote the national spirit of people all over the country [11, 12].

The construction of rural sports tourism circle development mode refers to the core of sports tourism resources to form a collaboration area with certain geographical scope.
in order to obtain the best economic, social, and environmental benefits, and its basic features are taking sports industry as the core, referring to the actual situation of the development of major domestic sports tourism circles, integrating various types of tourism resources in Guangxi area, and creating a new brand about sports tourism products [13, 14]. This development mode promotes and strengthens the tourism economic cooperation between regions to a certain extent, promotes the construction of cross-regional tourism bases, improves the development environment of regional tourism economy, and promotes the overall characteristic and sustainable development of regional economy [15].

The rural sports tourism theme-based integration development model is a new model of integrated development of rural sports tourism [16]. Its main feature is to create theme lines, theme festivals, theme events, theme parks, featured villages, featured hotels, featured shopping, and other sports tourism products with different functions to meet the tourism needs of tourists, optimize the regional industrial structure, and promote the sustainable and healthy development of regional sports tourism and economy [17, 18]. On the one hand, this model can effectively avoid or reduce repetitive sports tourism market competition to guarantee the innovation and diversification of products; on the other hand, it can effectively allocate the specific resources of sports tourism so that they can be utilized in different time periods, geographical spaces, and functional uses. However, it will encounter obvious limitations in the implementation process, such as the theme tourism developed under this model can be easily imitated or copied [19, 20].

In this paper, we make a comparative analysis of the five existing rural sports tourism integration development models in Guangxi, analyze the problems of the existing rural sports tourism integration development models in Guangxi from macro-, meso-, and microdimensions, propose corresponding development countermeasures, provide reference for promoting the national strategy of building important tourism bases in Guangxi and theoretical system construction, use the method of fuzzy mathematics to construct a fuzzy comprehensive evaluation model, and apply this model to objectively evaluate the sports tourism resources in Guangxi Province. Finally, in response to the evaluation results, it is proposed to deeply develop characteristic advantageous sports tourism resources, focus on breakthroughs, develop fitness and leisure participation sports tourism industry, and reasonably lay out and cultivate some attractive sports tourism products.

2. Integration Path

Industrial integration needs to go through a very complicated process, generally needs to go through the implicit to explicit process, industry through cross-penetration and complementarity, as far as possible to reduce costs, in order to achieve a win-win situation in the competition. Guangxi sports tourism and rural tourism integration is the result of multilevel, multipath, and all-round integration of industries (see Figure 1). Through the policy support of Guangxi municipal government, the pull of market demand, the internal promotion of enterprises, and the drive of scientific and technological development, the two sides achieve the integration in resources, market, products, and technology and form the new business mode of integration, thus producing corresponding economic and social benefits. The whole process has the characteristics of low consumption and high enjoyment; it is both the process of tourism and sports and leisure. Visitors not only directly participate in various sports but also make full use of various rural resources to carry out sports activities, thus realizing the integration of sports tourism resources and rural tourism resources and ultimately achieving the purpose of increasing income and promoting the construction of beautiful countryside.

3. Integration Model

This study adopts the cross-combination method of tourism activity attributes and resource attributes to determine the type of fusion formation. According to the activity attributes of Guangxi sports tourism, it is divided into three main types: recreation and health type, ornamental experience type, and competition participation type; according to the resource attributes of Guangxi tourism, it can be divided into natural resources type, human resources type, and artificial resources type. The 9 theoretical types of composite classification method are natural recreation and health type rural tourism, natural ornamental experience type rural tourism, natural competition participation type rural tourism, humanistic recreation type rural tourism, humanistic experience type rural tourism, humanistic participation type rural tourism, artificial recreation type rural tourism, artificial ornamental experience type rural tourism, and artificial participation type rural tourism (see Figure 2). In the process of promoting school aesthetic education, some schools have some problems, such as insufficient construction of campus aesthetic education environment and lack of aesthetic thinking in various disciplines. In view of these problems, combined with the concept of flipped classroom and the characteristics of artificial intelligence task-driven teaching, taking PHP, HTML + CSS + JS, and other development technologies as the main development technologies, and relying on the flipped classroom teaching mode of network learning space, this paper constructs an artificial intelligence core course website as a teaching platform for graduate teaching and undergraduate extended learning. The platform seeks the optimal solution of multiple combination optimization based on genetic algorithm and effectively improves the teaching quality of artificial intelligence course and students’ learning efficiency.

Comparing and analyzing the 118 rural tourism areas in Guangxi city with the 9 major types formed by composite, it is determined that the fusion of sports tourism and rural tourism in Guangxi can form 4 major types, such as ornamental and playful rural tourism, recreation and health rural tourism, sports and leisure rural tourism, and folklore experience rural tourism. The characteristic resources of the
4 fusion tourism types and the main representative tourist places are shown in Table 1. Through the multilevel fuzzy comprehensive evaluation of sports tourism resources, we can judge the value of sports tourism resources and provide a scientific basis for the development and protection of sports tourism resources. The evaluation model of sports tourism resources constructed in the evaluation process can adjust the index system appropriately according to the specific situation, which is also applicable to the evaluation of sports tourism resources in other regions. In this study, only representative sports tourism scenic spots as shown in Table 1 are selected for resource evaluation, which does not involve all scenic spots. In the future, more in-depth statistical analysis and evaluation of resources can be carried out from a more comprehensive perspective and the research conclusions will be more practical and targeted.

### 4. Diversified Demand

It is found that the influencing factor of tourism motivation of tourists over 56 years old in Guangxi is mainly health factor, and the selected tourism type is mainly recreation and health type; the influencing factor of tourism motivation of tourists between 35 and 56 years old is mainly experience factor, and the selected tourism type is mainly viewing and playing type and folklore experience type; the influencing factor of tourism motivation of tourists under 35 years old is mainly breakthrough factor, and the selected tourism type is mainly sports leisure type (see Table 2).

As mentioned in Table 2, the tourism needs and motives of tourists of different ages are different; middle-aged and elderly people prefer the types of projects with relatively small sports intensity and volume, such as hiking, traditional ethnic sports, fishing, ornamental and amusement, while young people prefer the types of projects with larger sports intensity and volume and stronger excitement, such as rafting, mountaineering, rock climbing, mountain biking, and orienteering. At present, Guangxi’s sports tourism and rural tourism resources are not fully utilized and tourism-related industrial resources such as business, learning, and leisure are not fully integrated, not to mention the formation of a complete set of industrial system, which has caused the contradiction between a single tourism product and diversified and diverse tourism needs. For example, in Xitou Village of Conghua District, although there are a series of tourism projects under the government planning, such as riding, camping, and viewing, the business model is relatively single and the consumption characteristics are mainly “one-day trip,” “overnight mode” has not been formed. Therefore, we should make use of the radiation advantage of urban areas in Guangxi city, continuously enrich and develop tourism resources in rural areas, meet the diversified tourism demand of tourists, create diversified and upgraded sports and rural tourism products to promote the horizontal development of rural leisure in Guangxi city, and break the dual economic structure of urban and rural areas in Guangxi [21–23].

### 5. Evaluation of Sports Tourism Resources in Guangxi Province

#### 5.1. Construction of Sports Tourism Resources Evaluation System

According to the principles of concise scientificity, systematic wholeness, operability, and comparability, the evaluation indexes are selected by the theoretical analysis method and expert consultation method. The theoretical analysis method is to analyze, compare and synthesize the issues related to sports tourism, and select the important and targeted indicators; the expert consultation method is to further consult the relevant experts and adjust the indicators on the basis of the preliminary proposed evaluation indicators. By combining these two methods, the evaluation index system will be finally obtained and the indexes will be divided into target layer A, criterion layer B, and indicator
layer C according to their attributes and hierarchical relationships (see Figure 3).

5.2. Determination of Evaluation Index Weights. The weight of evaluation indexes is determined by using the hierarchical analysis method (AHP), and relevant experts are invited to make a two-by-two comparison of the importance of each factor in each level of evaluation by issuing questionnaires, and the results of the comparison are used to establish the distribution weights of the AHP judgment matrix. Taking the evaluation of comprehensive level B as an example, judgment matrix A is constructed.

\[
A = \begin{bmatrix}
1 & 7 & 3 \\
5 & 1 & 4 \\
3 & 7 & 1 \\
\end{bmatrix}
\]  \( \text{(1)} \)

Take the calculation of the weights of layer B relative to layer A as an example, and use the sum-product method to solve it as follows:

1. Normalize each column of the judgment matrix A, i.e., with \( \bar{a}_{ij} = a_{ij} / \sum a_{ij} \) where \( a_{ij} = 1/1 + 5/7 + 1/3 = 0.4883 \), and calculate the other terms in turn to obtain the following matrix:

\[
\bar{A} = \begin{bmatrix}
0.4884 & 0.4712 & 0.5217 \\
0.3848 & 0.3365 & 0.3043 \\
0.1628 & 0.1923 & 0.1740 \\
\end{bmatrix}
\]

2. Adding the elements in \( \bar{A} \) by rows gives the vector \( \bar{w} \) whose components \( \bar{w} = (1.4813 \ 0.9896 \ 0.5291) \).

3. Normalizing \( \bar{w} \), we obtain the weight \( w = (0.4938 \ 0.3298 \ 0.1764) \) of the relevant elements in layer B with respect to layer A.

4. Input the judgment matrix A into MATLAB software, and calculate the maximum characteristic root \( \lambda_{\text{max}} = 3.0046 \) of the judgment matrix A [12].

\[
CI = \frac{\lambda_{\text{max}} - n}{n - 1} = \frac{3.0046 - 3}{2} = 0.0023. \quad (2)
\]

Since the number of dimensions is \( n = 3 \), checking the table shows that \( RI = 0.58 \); then, we have

\[
CR = \frac{CI}{RI} = \frac{0.0023}{0.58} = 0.0039 < 0.1. \quad (3)
\]

Therefore, the above weights of the relevant elements in layer B were confirmed relative to layer A by consistency tests. Using the same approach, the weights of the indicators in layer C were determined to be equivalent to the weights in layer B (see Table 3).

6. Evaluation Effects

6.1. Factor Set and Evaluation Set of the Evaluation Object. Factor set is a general collection of factors affecting the evaluation object; the first top evaluation set \( A = \{ B_1, B_2, B_3 \} = \text{[resource elements value, scenic environment conditions, development conditions]} \), index evaluation set \( B_1 = \{ C_{11}, C_{12}, C_{13}, C_{14} \} = \text{[sports culture value, spectacle value, recreation value, sports education value]} \), \( B_2 = \{ C_{21}, C_{22}, C_{23}, C_{24} \} = \text{[scenic attractions portfolio, environmental quality and capacity, touring period, safety]} \), and \( B_3 = \{ C_{31}, C_{32}, C_{33}, C_{34} \} = \text{[regional economic conditions, tourism service system, infrastructure conditions, visitor market conditions]} \).

The evaluation factor indexes are quantified in a hierarchical manner (see Table 4).
Figure 3: The sports tourism resource evaluation hierarchy diagram of Henan Province.

Table 3: Weights for each evaluation.

<table>
<thead>
<tr>
<th>Target layer $A$</th>
<th>Criterion layer $B$</th>
<th>Index weight $C$</th>
<th>Total weight of indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluation of sports tourism resources in Henan Province $A$</td>
<td>Resource element value $B_1$</td>
<td>0.485</td>
<td>0.317 4 0.157 3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.202 8 0.101 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.344 2 0.171 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.141 9 0.069 5</td>
</tr>
<tr>
<td></td>
<td>Environmental condition $B_2$</td>
<td>0.332</td>
<td>0.271 7 0.089 6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.207 6 0.068 2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.302 5 0.099 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.232 3 0.074 7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.387 6 0.069 2</td>
</tr>
<tr>
<td></td>
<td>Development condition $B_3$</td>
<td>0.177 4</td>
<td>0.135 7 0.024 8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.232 6 0.042 5</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.188</td>
<td>0.255 2 0.044 1</td>
</tr>
</tbody>
</table>
According to the evaluation index, de-

Table 4: Quantitative evaluation index fuzzy evaluation form of sports tourism resources.

<table>
<thead>
<tr>
<th>Evaluation factor</th>
<th>Weight</th>
<th>Evaluation grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sports cultural value</td>
<td>0.155 2</td>
<td>Very high</td>
</tr>
<tr>
<td>Viewing value</td>
<td>0.089 7</td>
<td>Higher</td>
</tr>
<tr>
<td>Recreation value</td>
<td>0.171 6</td>
<td>Higher</td>
</tr>
<tr>
<td>Physical education value</td>
<td>0.069 5</td>
<td>Higher</td>
</tr>
<tr>
<td>Scenic spot combination</td>
<td>0.089 6</td>
<td>Excellent</td>
</tr>
<tr>
<td>Environmental quality and capacity</td>
<td>0.069 2</td>
<td>Excellent</td>
</tr>
<tr>
<td>Suitable travel period</td>
<td>0.098 4</td>
<td>Very long</td>
</tr>
<tr>
<td>Safety</td>
<td>0.075 6</td>
<td>Very high</td>
</tr>
<tr>
<td>Regional economic conditions</td>
<td>0.069 2</td>
<td>Excellent</td>
</tr>
<tr>
<td>Tourism service system</td>
<td>0.024 8</td>
<td>Excellent</td>
</tr>
<tr>
<td>Infrastructure conditions</td>
<td>0.042 4</td>
<td>Excellent</td>
</tr>
<tr>
<td>Source market conditions</td>
<td>0.043 2</td>
<td>Excellent</td>
</tr>
</tbody>
</table>

6.2. Comprehensive Evaluation of Sports Tourism Resources in Guangxi Province. According to the evaluation index, design the relevant questionnaire and finally get the set of comments of qualitative index. Each member of the rubric evaluates each evaluation factor of each scenic spot according to the identified evaluation level criteria, and the arithmetic mean is used to calculate the affiliation value of each attraction index. For example, 30% of the people thought that the sports and cultural value of Songshan Shaolin Temple was high, and the affiliation degree of “very high” was 0.30; 32% thought that the sports and cultural value of Songshan Shaolin Temple was high, and the affiliation degree of "high” was 0.32; and 26% thought that the sports and cultural value of Songshan Shaolin Temple was high, and the affiliation degree of “average” was 0.10; and 2% of people think that the sports and cultural value of Songshan Shaolin Temple is high. Thus, the fuzzy evaluation matrix of $C_{11}$ is $[0.30, 0.32, 0.26, 0.10, 0.02]$.

For simplicity, in the fuzzy evaluation table, each single-factor evaluation level is recorded as “very good, good, better, average, and poor.” The fuzzy comprehensive evaluation of sports tourism resources of Songshan Shaolin Temple is still taken as an example (see Table 5). After calculation, the first-level fuzzy comprehensive evaluation result $B_1$ has 3 single-factor fuzzy comprehensive evaluation: $B_{11}, B_{12}, B_{13};$ then, the second-level comprehensive evaluation and the above 3 single-factor first-level comprehensive evaluation result together form the second-level fuzzy comprehensive evaluation judgment matrix $R_2$. Then, the second-level fuzzy comprehensive evaluation result is

$$A = A_w \times R_2 = \begin{bmatrix}
0.4938, & 0.3298, & 0.1764 \times \\
0.2427, & 0.3804, & 0.2472, & 0.1159, & 0.0138 \\
0.2509, & 0.3635, & 0.3358, & 0.0816, & 0.0072 \\
0.2354, & 0.4181, & 0.2656, & 0.0622, & 0.0187
\end{bmatrix}

(4)$$

where $A$ is the comprehensive evaluation result of the sports tourism resources of Songshan Shaolin Temple. According to the principle of maximum affiliation, the sports tourism resources of Songshan Shaolin Temple are of “good” level.
Using the same method, the fuzzy evaluation results of several other sports tourism scenic spots were obtained (see Tables 5 and 6).

6.3. Analysis of Evaluation Results and Suggestions for Countermeasures. Guangxi Province is rich in types of sports tourism resources, which can well satisfy tourists with different needs. There are both traditional national sports tourism resources and new sports tourism resources, which provide a rich resource base for the development of sports tourism.

Establish the overall development strategy in the province, based on the comprehensive evaluation of the quantity, quality, and scale of sports tourism resources in the province, determine the areas more suitable for the development of sports tourism, form the core area of sports tourism, and achieve the coordinated development of resources, benefits, and brands. Taking the “national fitness project” as the strategy and taking the development mode of domestic major sports tourism circle as the reference, construct a sports tourism area in Central Plains, which is highly integrated with tourism development and scenic spot construction in Guangxi Province, and tourists demand for sports and leisure vacation, making Guangxi sports tourism become a unique charming tourist destination in China.

7. Conclusion

Through multilevel fuzzy comprehensive evaluation of sports tourism resources, the high and low merits of sports tourism resources value can be discerned, providing a scientific basis for the development and protection of sports tourism resources. The sports tourism resources evaluation model constructed in the evaluation process can be appropriately adjusted according to the specific situation, and it is also applicable to the evaluation of sports tourism resources in other regions. In this study, only seven representative sports tourism scenic spots in Guangxi Province were selected for resource evaluation, and not all the spots were involved. In the future, more in-depth statistical analysis and evaluation of resources can be carried out from a more comprehensive perspective and the research conclusions will have more practical guidance and relevance.

Data Availability

The dataset used in this study is available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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