

Research Article

Rural Tourism Public Service Performance Evaluation Based on Analytic Hierarchy Process

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In recent years, more and more attention has been paid to the construction of rural tourism, and tourists' demand for rural tourism public services has become stronger and stronger. Through the objective and fair evaluation of rural tourism public service performance, on the one hand, it is helpful to improve the overall satisfaction of tourists to rural tourism. On the other hand, it can also ensure the efficiency of public service financial investment and expenditure. Firstly, on the basis of theoretical summary and hierarchical analysis, this paper constructs the performance evaluation index system of rural tourism public service from five aspects of infrastructure services, public transport services, public information services, security services, and public environmental services. Then taking China as an example, the performance of rural tourism public service is evaluated by analytic hierarchy process. The results show that the construction of hard environment such as public transport services, security services, and infrastructure services is a key factor in the construction of rural tourism public services. Finally, according to the evaluation results obtained in this paper, some suggestions are put forward for the development of rural tourism and the improvement of public service quality in the future.

1. Introduction

Rural tourism has a history of more than 20 years in different regions of China, which has played a positive role in promoting economic development and reform and tourism industry development in rural areas [1]. Especially in the recent ten years, rural tourism in various regions has entered a stage of rapid development, and the operation mode is also developing towards diversification [2]. Tourists in rural areas are also increasing year by year. The number of rural tourism reception in the recent years is shown in Figure 1. However, due to the confusion of the main body of rural tourism construction and the imperfect system of development and construction, the tourism planning and management in most regions are chaotic [3]. Although there are many different problems in the development of rural tourism, on the whole, it plays a positive role in social and economic development and spiritual and cultural construction, which

can promote the solution of the urban-rural dual structure in China to a large extent [4–6].

With the development of rural tourism, the demand of tourists for rural tourism public services has become increasingly strong, and the quality of rural tourism public service also determines the quality of tourism experience [7]. Rural tourism public service is to serve the actual development of rural tourism and realize rural revitalization. In the construction of rural public service infrastructure, it is provided by the government, the market, rural residents, and third-party social organizations and it provides leisure and entertainment products and services for rural residents and tourists. It has distinct nonexclusive, noncompetitive, and public welfare [8]. At present, rural tourism public service in China is generally faced with problems such as lagging infrastructure, non-standard products and services. Under this background, it is particularly important to explore the development level and causes of rural tourism public service in China [9–11].

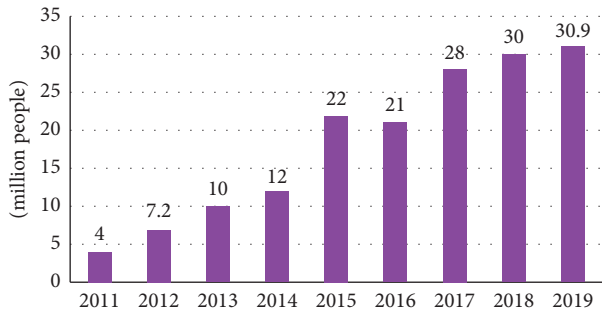


FIGURE 1: Number of leisure agriculture and rural tourism receptions in China from 2011 to 2019.

Survey statistics show that the overall satisfaction of tourists with rural tourism is not high, so the growth rate of rural tourism reception has declined in recent years, as shown in Figure 2 [12]. On the one hand, it is the problem of core attractions of rural tourism products. On the other hand, the lack of local public services such as environmental health, public transport, information services, security policies, and infrastructure is also an important reason for this result [13–15]. Effective performance evaluation of rural tourism public service can comprehensively reflect the effect and benefit of rural tourism construction, which is conducive to improving the quality of rural tourism construction [16]. Therefore, this study takes China as an example to evaluate the performance of rural tourism public service, so as to judge the current status and shortcomings of public service supply and analyze the causes of low performance. It is conducive to providing theoretical basis and practical guidance for optimizing the supply of rural tourism public services.

There are two main contributions of this paper. First, this paper constructs the performance evaluation index system of rural tourism public services from five aspects: infrastructure services, public transport services, public information services, security services, and public environmental services. Second, this paper proposes a comprehensive evaluation method of rural tourism public service performance using analytic hierarchy process. Its advantage is that it can significantly reduce the interference of subjective factors to a certain extent, quantitative analysis of nonquantitative factors, and the determination and calculation of index weight at all levels are more scientific. This method has higher accuracy than the qualitative evaluation method, and the results are closer to the actual situation.

This paper is divided into five parts. The first part describes the research background and significance. The second part summarizes the related works. The third part designs the performance evaluation index system of rural tourism public service. The fourth part gives the performance evaluation of rural tourism public service. Finally, the conclusions and suggestions are given in part 6.

2. Related Work

At present, the research on tourism public service in rural areas is very limited. Scholars mainly focus on the national beautiful rural construction and rural revitalization

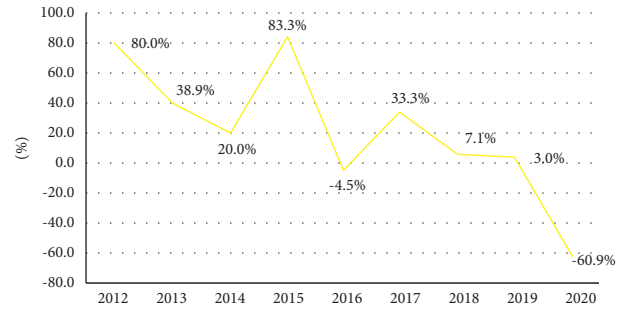


FIGURE 2: Growth rate of rural tourism reception in China, 2012–2020.

strategy to study the public service of rural tourism. However, there are few studies on the performance evaluation of rural tourism public services. Yin et al. [17] takes rural tourism as the research content and constructs a structural equation model with the satisfaction of tourists with public services in rural tourism areas as the intermediary variable, so as to study and analyze the influence mechanism of tourism quality perception (TQP) in rural tourism areas. In order to improve the service efficiency of rural tourism, Zhu and Shang [18] constructed a rural intelligent tourism system based on the Internet, and they improved the traditional rural tourism model combined with the actual situation of rural tourism. Specifically, they analyzed the application of Internet technology in rural tourism and introduced the structure and function of smart tourism system in detail. Davardoust and Karahan [19] constructed the index system from the four aspects of service quality, facilities, management system, and results of rural tourism and determined the important factors affecting the sustainable development of rural tourism by Delphi method. Han et al. [20] aim to explore the impact of service quality of rural tourism scenic spots on tourist satisfaction and loyalty. The results show that service quality has a significant impact on satisfaction. By improving the service quality of rural tourist attractions, it is helpful to improve the overall satisfaction of tourists to rural tourist attractions, which provides suggestions for the future development of rural tourism.

There are many evaluation methods about performance evaluation. For example, Tang [21] established the performance evaluation index system of rural tourism land transfer and then used DEA model to evaluate its performance. And through the actual case, they analyzed the relationship between land transfer and rural tourism, so as to provide direction for the future development of rural tourism industry. Li et al. [22] established the performance evaluation index system of corporate social responsibility and then used the analytic hierarchy process (AHP) and fuzzy comprehensive evaluation method to evaluate its performance. Taking real estate enterprises as an example, the AHP-FCE model proposed in this paper is proved to be widely applicable, providing ideas for the evaluation of corporate social responsibility performance. Li et al. [23] constructed the performance evaluation index system of corporate social responsibility from three aspects of

economic performance, social performance, and environmental performance and then used the improved AHP-BP neural network algorithm for comprehensive evaluation. The results showed that the improved AHP-BP neural network model is better. Liu et al. [24] proposed an improved analytic hierarchy process, which combines D number with BWM to construct a D-BWM weighted model. Moreover, they used the improved weighted model to evaluate the environmental performance of 30 provinces in China and found that the improved model has lower computational complexity.

3. Design of Performance Evaluation Index System of Rural Tourism Public Service

3.1. Principle of Design. On the basis of literature review, this paper is based on the “13th Five-Year National Tourism Public Service Planning” and refers to the “Action Plan for Promoting the Quality and Upgrading of Rural Tourism Development (2018–2020),” “Guidance on Promoting the Sustainable Development of Rural Tourism”, and other documents such as the construction norms and assessment indicators of regional rural tourism demonstration villages. Then on the basis of following: the comprehensive principle, typical principle, and operability principle, after several rounds of expert consultation, the performance evaluation index system of rural tourism public service is constructed.

3.2. Index System Establishment. After sorting out and summarizing the literature on rural tourism public service, this paper fully understands the performance evaluation system of rural tourism public service combined with the opinions and suggestions of experts and professors. Then according to the basic idea of analytic hierarchy process, the relationship between the internal factors of the system is analyzed [25], and the performance evaluation index system of rural tourism public service is established as shown in Figure 3.

4. Performance Evaluation of Rural Tourism Public Service

4.1. Research Method Selection. Analytic hierarchy process (AHP) is an analytical method to solve complex problems. It decomposes decision objectives into multiple levels and then conducts qualitative and quantitative calculation, which is suitable for complex decision-making problems with multiple criteria or disordered structures. By decomposing complex problems into several levels and factors, this method makes a comparative judgment of the importance between two indexes and establishes a judgment matrix. By calculating the maximum eigenvalue and corresponding eigenvector of the judgment matrix, the weight of the importance of different schemes is obtained. Based on the experience of decision makers and the constructed performance evaluation index system of rural tourism public service, this study calculates the standard weight of each evaluation index.

4.2. Evaluation Process

4.2.1. Construct Judgment Matrix. The judgment matrix refers to the relative importance between this level and its related factors compared with a certain factor at the previous level. Through the use of “consistent matrix method,” all indicators are pairwise compared, and the method of mutual scale is used to reduce the difficulty of mutual comparison between different properties of indicators and then improve the accuracy. This method is used to determine the weight of each index on the total benefit, so as to construct the judgment matrix. Therefore, the importance of each element in the matrix is quantitatively displayed by the matrix judgment scale in the analytic hierarchy process [26].

Based on the actual situation of rural tourism public service and expert experience, this paper uses the 1–9 scale method to score each index and constructs the judgment matrix of the performance evaluation index of rural tourism public service. Assuming that the comparison score between indicator X and indicator Y is a , the comparison score between indicator Y and indicator X is $1/a$. Table 1 shows the definition diagram of judgment matrix [13].

4.2.2. Calculate Weight Vector. We use the sum method to calculate the weight vector. Firstly, the column vector is normalized, and then the new matrix is summed. Finally, the weight vector is obtained by normalization.

$$A \cdot W = \lambda \max \cdot W, \quad (1)$$

where $\lambda \max$ is the weight parameters and is the weight vector.

4.2.3. Consistency Test of Judgment Matrix. From the perspective of human cognition, a correct ranking of the importance of judgment matrix has a certain logical rule. For example, if A is more important than B and B is more important than C , A should be more important than C logically. And if A is more important than C in pairwise comparison, the judgment matrix violates the consistency criterion and it is logically unreasonable. Therefore, it is necessary to test the consistency of the judgment matrix, so as to show that the judgment matrix is logically reasonable and to continue to analyze the results.

The steps for consistency checking are as follows [27]:

Firstly, calculate consistency indicators CI .

$$CI = \frac{\lambda \max - n}{n - 1}. \quad (2)$$

Secondly, check table to determine the corresponding average random consistency index, and Table 2 is the value of random consistency index.

Finally, calculate and judge the consistency ratio CR . When $CR < 0.1$, the consistency of judgment matrix is acceptable. When $CR > 0.1$, it is considered that the judgment matrix does not meet the consistency requirement, and the judgment matrix needs to be corrected.

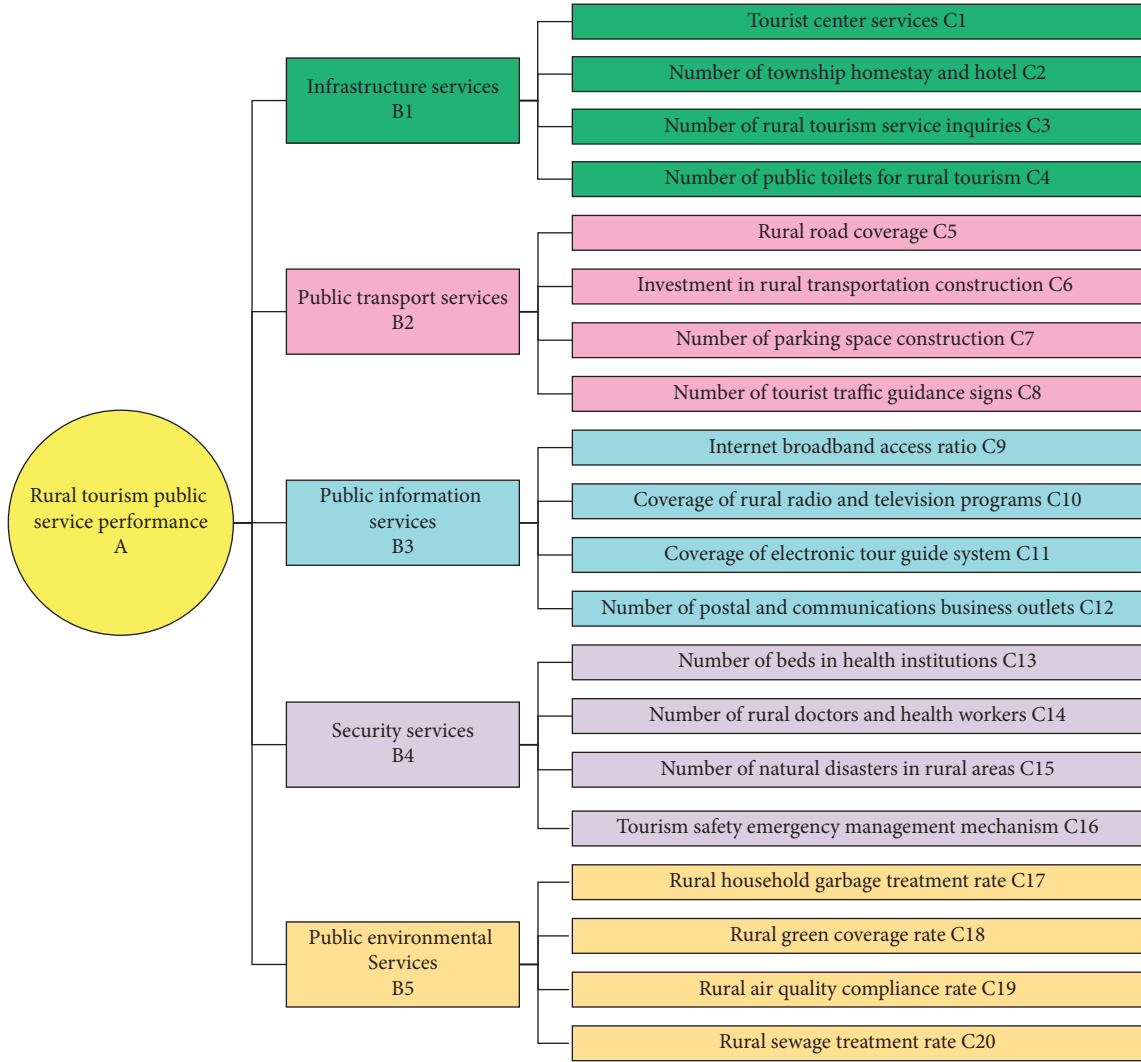


FIGURE 3: Performance evaluation index system of rural tourism public service.

TABLE 1: Definition diagram of judgment matrix.

Level division (comparison of importance between two elements)	Weight
X and Y are equally important	1
X is a little more important than Y	3
X is more important than Y	5
X is very more important than Y	7
X is extremely more important than Y	9
Intermediate value of two adjacent judgements	2, 4, 6, 8

TABLE 2: Random consistency index table.

Order	RI
1	0
2	0
3	0.58
4	0.90
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45

$$CR = \frac{CI}{RI} \tag{3}$$

4.2.4. Calculate Weight. According to formula (4) and expert scoring results, final weights of indicators are obtained.

$$W = W_i W_{ij} \tag{4}$$

In summary, the performance evaluation process of rural tourism public service is shown in Figure 4.

5. Example Analysis

5.1. Determination of Index Weight

5.1.1. Construct Hierarchical Model. According to the hierarchical model and data collection results, as well as the

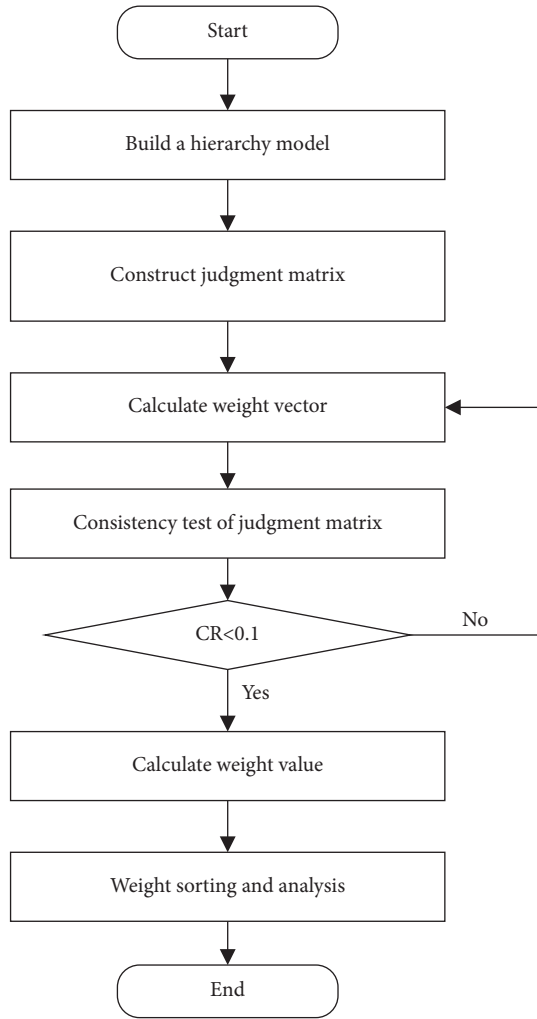


FIGURE 4: Flow chart of rural tourism public service performance evaluation.

specific conditions of the five evaluation indexes of infrastructure services, public transport services, public information services, security services, and public environmental services [28, 29], the primary indicators are set as $U = (U_1, U_2, U_3, U_4, U_5)$. The secondary indicators corresponding to each primary indicator are $U_1 = (U_{11}, U_{12}, U_{13}, U_{14})$, $U_2 = (U_{21}, U_{22}, U_{23}, U_{24})$, $U_3 = (U_{31}, U_{32}, U_{33}, U_{34})$, $U_4 = (U_{41}, U_{42}, U_{43}, U_{44})$, and $U_5 = (U_{51}, U_{52}, U_{53}, U_{54})$.

5.1.2. Construct Judgment Matrix. According to the evaluation of experts on the evaluation index, the weight of the evaluation index is defined and the judgment matrix is constructed. Then according to the results of matrix operation, the feature vector and feature root are obtained, and finally the combination weight is obtained. Accordingly, the index weight at the first level $W = (W_1, W_2, W_3, W_4, W_5)$ can be determined, and $\sum W_i = 1$. The index weights of the second level are respectively $W_1 = (W_{11}, W_{12}, W_{13}, W_{14})$, $W_2 = (W_{21}, W_{22}, W_{23}, W_{24})$, $W_3 = (W_{31}, W_{32}, W_{33}, W_{34})$,

$W_4 = (W_{41}, W_{42}, W_{43}, W_{44})$, and $W_5 = (W_{51}, W_{52}, W_{53}, W_{54})$.

5.1.3. Consistency Test and Weight Calculation. The analytic hierarchy process is used to sort out and transform the relevant data of each index, and the judgment matrix is constructed to meet the requirements. Then the weight of each element is calculated by the characteristic root method, so as to determine the weight of each index. The calculation results are shown in Tables 3–8.

$$\begin{aligned} \lambda_{\max} &= 5.372, \\ CI &= 0.093, \\ CR &= 0.083, \end{aligned} \tag{5}$$

$$\begin{aligned} \lambda_{\max} &= 4.143, \\ CI &= 0.048, \\ CR &= 0.053, \end{aligned} \tag{6}$$

$$\begin{aligned} \lambda_{\max} &= 4.036, \\ CI &= 0.012, \\ CR &= 0.013, \end{aligned} \tag{7}$$

$$\begin{aligned} \lambda_{\max} &= 4.077, \\ CI &= 0.026, \\ CR &= 0.029, \end{aligned} \tag{8}$$

$$\begin{aligned} \lambda_{\max} &= 4.071, \\ CI &= 0.024, \\ CR &= 0.026, \end{aligned} \tag{9}$$

$$\begin{aligned} \lambda_{\max} &= 4.135, \\ CI &= 0.045, \\ CR &= 0.050. \end{aligned} \tag{10}$$

5.2. Results and Discussion. According to the above results, it can be seen that all the judgment matrices given by the experts in this paper have passed the one-time test; that is, the results are valid. The final index weight values are shown in Table 9.

It can be seen from Table 9 that the sum of the weights of public transport service (B2), security service (B4), and infrastructure service (B1) under the criterion level is 0.872, which are the key factors to evaluate the performance of rural tourism public service. The weight of public information service (B3) is the smallest, which has relatively small

TABLE 3: Weight of primary indicators.

U	U_1	U_2	U_3	U_4	U_5	W_i
U_1	1	1/4	4	1/2	2	0.147
U_2	4	1	8	2	7	0.474
U_3	1/4	1/8	1	1/6	1/3	0.035
U_4	2	1/2	6	1	4	0.251
U_5	1/2	1/7	3	1/4	1	0.093
Total						1

TABLE 4: Weight of infrastructure services indicators in second level indicators.

U_1	U_{11}	U_{12}	U_{13}	U_{14}	W_i
U_{11}	1	1/5	1/2	1/9	0.055
U_{12}	7	1	2	1/4	0.252
U_{13}	4	1/2	1	1/5	0.113
U_{14}	9	4	5	1	0.580
Total					1

TABLE 5: Weight of public transport services indicators in second level indicators.

U_1	U_{21}	U_{22}	U_{23}	U_{24}	W_i
U_{21}	1	3	5	8	0.568
U_{22}	1/3	1	2	4	0.245
U_{23}	1/5	1/2	1	2	0.124
U_{24}	1/8	1/4	1/2	1	0.063
Total					1

TABLE 6: Weights of public information services indicators in second level.

U_1	U_{31}	U_{32}	U_{33}	U_{34}	W_i
U_{31}	1	8	5	2	0.503
U_{32}	1/8	1	1/3	1/6	0.051
U_{33}	1/5	3	1	1/2	0.148
U_{34}	1/2	6	2	1	0.299
Total					1

TABLE 7: Weights of security services indicators in second level.

U_1	U_{41}	U_{42}	U_{43}	U_{44}	W_i
U_{41}	1	3	6	1/2	0.331
U_{42}	1/3	1	3	1/4	0.145
U_{43}	1/6	1/3	1	1/8	0.051
U_{44}	2	4	8	1	0.473
Total					1

TABLE 8: Weight of public environmental services indicators in second level indicators.

U_1	U_{51}	U_{52}	U_{53}	U_{54}	W_i
U_{51}	1	7	4	1/2	0.362
U_{52}	1/7	1	1/3	1/8	0.046
U_{53}	1/4	3	1	1/5	0.129
U_{54}	2	8	5	1	0.463
Total					1

TABLE 9: Weights of rural tourism public service performance evaluation indicators.

Criterion layer	Weight	Indicator layer	Weight	Ultimate weight
B1	0.147	C1	0.055	0.008
		C2	0.252	0.037
		C3	0.113	0.017
		C4	0.580	0.085
B2	0.474	C5	0.568	0.269
		C6	0.245	0.116
		C7	0.124	0.059
		C8	0.063	0.030
B3	0.035	C9	0.503	0.018
		C10	0.051	0.002
		C11	0.148	0.005
		C12	0.299	0.011
B4	0.251	C13	0.331	0.083
		C14	0.145	0.036
		C15	0.051	0.013
		C16	0.473	0.119
B5	0.093	C17	0.362	0.034
		C18	0.046	0.004
		C19	0.129	0.012
		C20	0.463	0.043

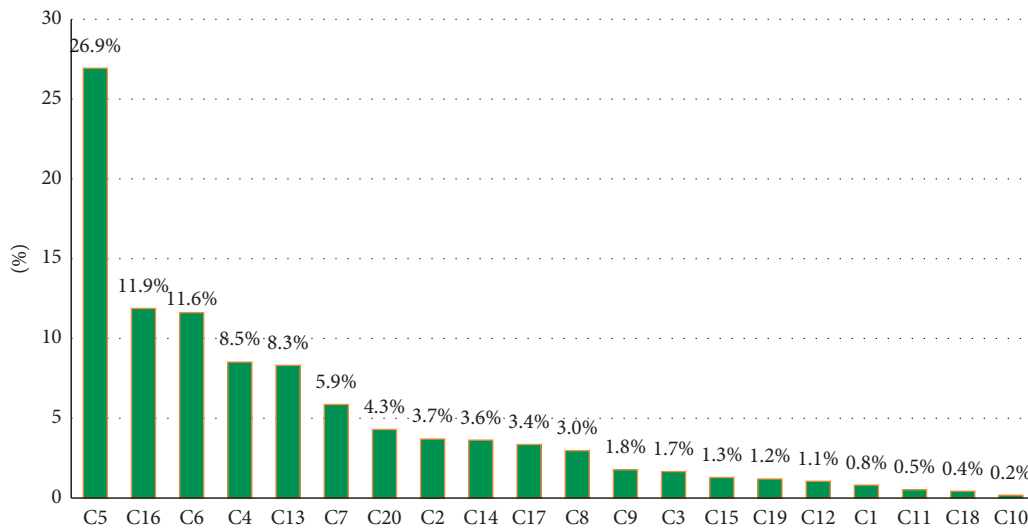


FIGURE 5: Rural tourism public service performance evaluation index layer ranking.

influence on the performance evaluation of rural tourism public service.

The weight of the index layer is sorted according to the order from high to low, and the total ranking weight of the index layer is obtained, as shown in Figure 5. It can be seen from the figure that rural road coverage (C5) is the highest of 0.269, which becomes the primary indicator to measure the public service efficiency of rural tourism. The coverage of rural radio and television programs (C10) is only 0.002, and its influence is relatively weak. Due to the current process of rural tourism public service construction, more attention is paid to the construction of hardware infrastructure, and the construction of soft environment needs to be improved.

6. Conclusions and Suggestions

Based on the connotation of rural tourism public service and referring to relevant research, this study establishes the performance evaluation system of rural tourism public service and takes China as an example to verify the scientificity and rationality of the index system. Then the paper introduces analytic hierarchy process to analyze and evaluate the public service level and development stage of rural tourism in China. The evaluation results show that the construction of hard environment such as public transport services, security services, and infrastructure services is a key factor in the construction of rural tourism public services. And the impact of public information services on rural

tourism public service performance evaluation is relatively small. In addition, rural road coverage, tourism safety emergency management mechanism, and investment in rural transportation construction are relatively high, and coverage of electronic tour guide system, rural green coverage rate, and coverage of rural radio and television programs are relatively low.

Based on the evaluation results of rural tourism public service performance, this paper puts forward corresponding countermeasures and suggestions to improve the input-output efficiency of rural tourism public service in China, so as to achieve large-scale expansion without excessive dependence on investment. However, in order to improve efficiency while maintaining labor input and capital input, it is necessary to optimize industrial policies, enhance enterprise capacity, and improve comprehensive innovation and integrated innovation capability. Among them, the innovation includes institutional innovation, organizational innovation, and service innovation. Specifically, the public service quality of rural tourism can be improved from the following three aspects.

(1) Strengthening the construction of tourism infrastructure service system in rural areas

In view of the practical problems of lagging infrastructure construction in rural areas, relying solely on government investment is bound to be unable to meet the requirements of rural tourism development. Therefore, from the current development situation, the construction work in this regard can be carried out from the following aspects. First, the government guides financial institutions to increase support for rural tourism projects and provide more financial support for tourism project development. Second, before constructing tourism infrastructure projects, enterprises must accurately understand the differentiated needs of tourists and make public services more matching. It can effectively achieve the two-way integration of tourist demand and the efficient delivery of government resources and achieve the precise supply of infrastructure and public services. Third, the government should match rural tourism activities when building different types of tourism infrastructure. This needs to provide professional tourism infrastructure services according to the content, mode, time, place, and other characteristics of rural tourism activities.

(2) Improving the supply level of government rural tourism public service

The important content of government rural tourism public service supply includes the following three aspects. First, we should actively promote the supply-side reform of rural tourism public services and the innovation of tourism system and mechanism. Second, we should actively respond to the era of cross-border integration development and fully implement the concept of "integration can be integrated, integration should be integrated." Third,

we should actively promote the public service of rural tourism to realize the integrated development of urban and rural tourism, cultural tourism, and smart tourism. In addition, it must also aim at maximizing the benefits of resource integration and improve the environment and public service level of tourism destinations as a whole. Overall, it is important to establish the concept of comprehensive benefit development and effectively improve the level of government rural tourism public service supply.

(3) Large-scale introduction of professional rural tourism professionals

The current problems are largely caused by the lack of professionals. Therefore, the government should vigorously promote the cultivation of rural tourism management talents and actively introduce professional talents, so as to better understand and grasp the regularity of rural tourism public service demand and bring new perspectives, new ideas, and new solutions to improve the efficiency of rural tourism public service. At the same time, it is necessary to improve the incentive and reward mechanism. By accelerating the construction of innovative rural tourism talent introduction and incentive mechanism, the government can establish a professional team that can truly serve rural tourism.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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