

Constructing the Landscape Planning and Design of Rural Homestay Under the Concept of Ecological Protection Driven by Digital Art

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Abstract. The rural residential landscape is the latest rural landscape derived from the era of mass tourism. The rural residential landscape makes the types of rural landscape more diverse in our country, creates a new model of new rural construction in our country, and also puts forward higher requirements to landscape designers. However, there is a lack of research on the planning and design of rural residential landscape in China, most of which focus on rural tourism and rural human landscape. For this problem, this paper takes Jiangning area of Nanjing as the main research object, analyses the current development status of rural residential in China, establishes the evaluation index system of rural residential ecological environment by using the analytic hierarchy process and Delphi method. The target level of the evaluation system is the rural residential landscape ecological environment (A), and the criterion level (B) is the natural landscape factor (B1), the human landscape factor (B2), and the residential market factor (B3), respectively. Indicator layer (C) Indicators include scarcity of natural resources (C1), richness of natural resources (C2), swimming period (C3), historical richness (C4), architectural landscape uniqueness (C5), richness of human activities (C6), residential accommodation rate (C7), investment in residential assets (C8), and ratio of residential income (C9). Based on this, an existing residential landscape evaluation model is established. The results show that the natural landscape (B1) of the three areas in the west, middle and east of Jiangning District is 65.3, 47.3 and 88.7, respectively. The B1 index in the East region belongs to grade III, while the others are lower. The results of Human Landscape Evaluation (B2) are 20, 13.7 and 29, respectively. The B2 index of each region belongs to grade I. The result of the index of housing market factor (B3) is 76.3, which belongs to class III. It shows that Jiangning District has a good investment environment for accommodation on the whole, a higher rate of accommodation, a higher amount of investment in accommodation funds, and a higher proportion of income from accommodation. It is suitable for planning and designing rural residential landscape.

Key words: Ecological protection, rural accommodation, landscape planning,

landscape design; Constructing

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1 INTRODUCTION

With the continuous progress of the reform of the open society, China's own economy and consumption level are gradually increasing, "experience economy" is also being driven. Featured rural accommodation happens to be the product of experience economy. It provides people in the city with temporary living space and local local landscape. More importantly, it is a process in which they can relax outside, experience local culture and enjoy distinctive characteristic folk customs. Therefore, the characteristic rural tourism will be the key development area of tourism in the new era.

In recent years, rural tourism has developed rapidly in China. The number of tourists that rural tourism receives each year is increasing. People enjoy a slow life in rural tourism, ease the pressure of life and get closer to nature. The rural residential landscape is an important part of rural tourism, and the rural residential is the key to meet the needs of tourists. Based on this background, rural residential is gradually formed. Traditional rural accommodation transforms individual residences for residents, provides redundant rooms to tourists after decoration, and improves household income while meeting their accommodation needs. After developing to a certain scale, rural accommodation as a village's industrial model is very different from the traditional rural areas. The social structure of the village will also change, and the rural landscape pattern will change, further forming a certain scale of rural accommodation landscape [17],[9].

The innovations of this paper are as follows: (1) By analyzing the environment, climate, culture, economy, tradition and other factors in the whole through the different elements that the ecological technology concept needs to select in the residential buildings, the paper puts forward that the residential buildings in different areas facing different construction standards of characteristic rural residential buildings should adopt the ecological concept according to local conditions, so as to achieve the maximum benefits of sustainable development under different environmental conditions. More comprehensive grasp of the basic principles and methods of ecological building, planning and designing eco-building space for environmental protection and energy conservation, and make a certain contribution to the sustainable development of our country. (2) Evaluate the status of rural residential landscape planning based on the concept of ecological protection. By analyzing the current situation of rural residential buildings in China, it is found that the number of most residential rooms is less than 20, and the theme of residential rooms is mainly about farm music and ancient architectural features. Through research, it is concluded that Jiangning District is suitable for the planning and design of rural residential landscape, which is conducive to promoting the development of residential landscape in this region, digital art can be integrated into the landscape design. This could involve interactive installations, augmented reality experiences, or digital representations of natural elements.

2 RELATED WORK

In the late 1930s, architects began to design residential buildings with different characteristics to adapt to different climatic and geographic environments. Consider both the climatic and geographic conditions and the recycling and reuse of resources [18],[16]. Rural accommodation was the earliest study in the UK, which is known as a home hotel because of its low price and popularity. France defines accommodation as a farmhouse where visitors are invited to play and rest. Now France has

established the French Home and Bed Federation, which is the largest boarding organization in the world, and has formulated a set of complete safety management standards. Japan classifies accommodation as farm accommodation and ocean accommodation, among which ocean accommodation is the professional investment and operation mode of urban white collar. Farmers'accommodation is a farm accommodation centered around sideline operation. Our country has a short time to study the residential and rural residential landscape. Some experts point out that the tourism-oriented rural landscape design is to transform the rural landscape for the development of rural tourism. Others point out that the tourist rural landscape is a kind of rural landscape type with the core of rural tourism behavior [19],[7]. When green buildings and ecological concepts are being emphasized in the construction industry of China, the entire architectural design community has responded one after another. In recent years, there are more and more literature studies on ecological concept architecture in the construction industry. China has a vast territory and a large population base, which is constrained by different geographical conditions and climates. This evolves into a building carrier with unique cultural characteristics. In combination with the special regional environment, a variety of buildings with unique local characteristics are also bred, such as earth buildings in Fujian, suspension towers in Western Hunan, and famous quadrangles in Beijing, which create unique local architectural features. In terms of construction technology, although the construction technology of these buildings is relatively less developed, they have strong regional characteristics. However, these buildings are different from the eco-buildings studied in this paper. The study in this paper refers to the redesign of corresponding local residential buildings under the ecological concept, and create new building forms with sustainable development as the core.

3 STUDY ON THE CURRENT SITUATION OF LANDSCAPE PLANNING AND DESIGN OF RURAL HOSTELS

3.1 Status of Rural Hostels

Compared with standard hotels, most of the rural accommodations are open for individuals, and the number of chained accommodations is very small. The number of accommodation rooms obtained by statistics is shown in Figure 1 below. Among them, the proportion of 5-20 rooms is the highest, the proportion of 5-10 rooms is 45%, the proportion of 10-20 rooms is 24%, the proportion of more than 20 rooms is 12%, and the proportion of 1-5 rooms is 19%. Analyzing the data, we can see that most of the accommodations in China are small-scale and people prefer small-scale accommodations. This type of accommodation has more regional characteristics and outstanding design style of accommodation buildings.

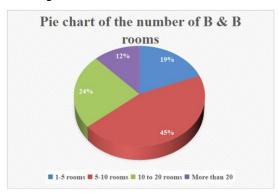


Figure 1: Pie Chart of the Number of B & B Rooms.

Overall, the topic of rural residents'hosting tends to be diversified. When planning and designing the rural residential landscape, it should be combined with the market demand, and take into account the local geographical environment, capital investment and so on [3],[20]. From the figure 2 below, people pay more attention to the type of accommodation which is farm entertainment and recreation. People can feel the idyllic life, harvest fruits, really understand the rural daily life, and give full play to the value of rural accommodation. Then for traditional buildings, this type of accommodation highlights the architectural style of a region. Followed by sports and leisure, these themes mainly focus on hot springs and seashore vacations, and should match the natural environment when building accommodation, such as rivers and seas resources, forest resources and hot springs resources. The ultimate goal is to let people experience farm life, so that tourists can enjoy the daily life of local residents, with the lowest attention paid to food and beverage accommodation. The results show that when planning and designing the rural residential landscape, full consideration should be given to the needs of tourists, based on the concept of ecological protection and regional characteristics [4],[11].

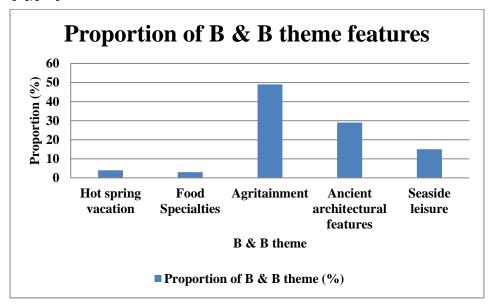


Figure 2: B & B Theme Characteristic Proportion.

3.2 Introduction to the Study Area

Based on the concept of ecological environment, this paper studies the planning and design of rural residential landscape. The Jiangning area in Nanjing is selected as the research object. It is located in the southern and eastern suburbs of Nanjing and has rich tourism resources. In 2017, the beautiful rural demonstration area, Tangshan Hot Spring National Tourist Resort, was successfully constructed, and more than 60 "beautiful rural demonstration areas" were created in Nanjing. Relevant data show that in 2017, only 15.51 billion yuan in tourism revenue and 13.64.96 million visitors were received in Jiangning District of Nanjing. At present, Jiangning rural tourism has created its own brand, which costs the popular areas of rural residential and short-distance tourism in the suburbs of Nanjing. Figure 3 below is a rural tourism area in Jiangning District. This paper takes the east, West and central areas of Jiangning District as the main areas to comprehensively evaluate the eco-environment of landscape planning and design of living room with anger.

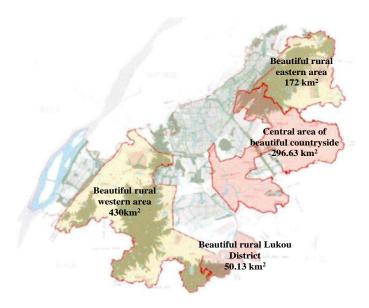


Figure 3: Rural Tourism Area Map of Jiangning District.

4 EVALUATION MODEL OF RURAL RESIDENTIAL LANDSCAPE PLANNING AND DESIGN UNDER THE CONCEPT OF ECOLOGICAL PROTECTION

4.1 Analytic Hierarchy Process

The analytic hierarchy process (AHP) is a hierarchical, quantitative and qualitative multi-criteria decision-making method, which is mainly used to deal with non-quantifiable affairs. After introducing the AHP into China, the relevant decision-making elements are re-divided into criteria, targets and indicators. Based on this combination of quantitative and qualitative evaluation, a practical multi-objective decision-making analysis method is formed [2],[8].

1. First, the hierarchical single-order calculation, which calculates the weight of different elements according to the judgment matrix, uses the product method and the square root method to find the product of each row of elements, and calculates them n-th power to get $W^*_{\ i} = \left(W_1^*, W_2^*, ..., W_n^*\right)^T_{\ .\ where:}$

$$W_{i}^{*} = \sqrt[n]{\prod_{j=1}^{n} cij}$$
 (i=1,2,...,n) (1)

2. After normalizing W^* , the weight vector $W = (W_1, W_2, ..., W_n)^T$ is obtained. The formula for calculating W_i is as follows:

$$W_{i} = \frac{W_{i}}{\sum_{i=1}^{n} W^{*}_{i}}$$

$$(2)$$

3. Sum each column element to get the vector $S = (S_1, S_2, ..., S_n)$, Sj's formula is as follows:

$$Sj = \sum_{i=1}^{n} Cij \tag{3}$$

5. From the following formula λ_{\max} value of:

$$\lambda \max = \frac{1}{n} \sum_{i=1}^{n} \frac{(AW)_i}{W_i}$$
(4)

5.1 Delphi Method

Using Delphi method, ten experts in rural residential landscape design and planning from the concept of ecological protection, combined with the actual situation and personal experience to evaluate the rural residential landscape. The following are the scoring rules: first, select the evaluation index to divide the importance of rural residential landscape planning into five levels, that is, unimportant, general, important, important, and very important. The corresponding numbers for each level are 2, 4, 6, 8, 10. Assuming a total of N influence factors and M experts in a target attribute, the set of expert ratings is $X = \{X_{ij}\}_{[5],[14]}$.

 $\it Ei\,$ expressed the expert's approval of the ith indicator level as follows:

$$\overline{E}i = \frac{1}{n} \sum_{j=1}^{n} Xij \tag{5}$$

The value of \overline{Ei} has a decisive impact on the importance of indicator I and reflects the expectations of experts for this evaluation. δi Standard deviation is used to indicate the degree of dispersion of expert metrics:

$$\delta_i = \sqrt{\frac{1}{n-1} \sum_{j=1}^{n} \left(xij - \overline{Ei} \right)^2}$$
(6)

If $\delta_i > K_0$, the value of K_0 is (0,1). If $K_0 < 2/3$, the evaluation result given by experts is scattered, and the accuracy of the evaluation result is not enough, it should be re-evaluated. The V_i coefficient of variation indicates how well the experts are coordinating with the second indicator, as follows:

$$V_{i} = \frac{\delta_{i}}{Ei} \tag{7}$$

 δ_i value is inversely proportional to V_i , δ_i the smaller the value of, the larger the value of V_i , indicating that the opinions given by experts are basically the same.

5.2 Construction of Evaluation Index System

This paper plans and designs the rural B & B landscape based on the concept of ecological protection, and evaluates the rural B & B landscape by establishing an index system [15],[13]. First, it is divided into multiple types from the level, and then the evaluation indicators are defined according to different classifications. The evaluation index system of rural B & B landscape ecological environment is composed of three layers. The objective of this system is expressed by the objective layer, so as to evaluate and judge the quality of rural B & B landscape ecological environment; The criteria layer includes three factors that affect the evaluation of the rural B & B landscape ecological environment, namely, natural environment factors, cultural landscape factors and B & B market factors; The index layer is the detailed evaluation content, with a total of 9 evaluation indexes [12],[6].

Target Layer (A)	Criterion Layer (B)	Indicator Layer (C)
Rural Hostel Landscape Eco-	Natural landscape	Natural Resource Scarcity (C1)
environment (A)	factors (B_1)	Natural Resource Richness (C2)
		Tourist Period (C3)
	Human landscape	Historical richness (C4)
	factors (B ₂)	Uniqueness of Architectural Landscape (C5)
		Human Activity Richness (C6)
	Hostel Market	Accommodation Rate (C7)
	Factors (B ₃)	Investment in residential assets (C8)
		Hostel income ratio (C9)

Table 1: Evaluation Index System for Landscape Eco-environment of Rural Hostels.

5.3 Establishing Landscape Evaluation Model of Rural B & B

Based on the ecological environment evaluation index system of rural B & B landscape established above, we can get the indicators and weights that have an impact on the planning and design of rural B & B landscape. However, the index system can only reflect the importance of each indicator, and can not give whether the rural landscape B & B planned and designed in this area meets the

requirements of ecological protection. Therefore, it is necessary to divide the landscape ecological environment grades of rural homestays and set standards for different grades [10],[1]. This paper assigns values to all indicators in the rural B & B landscape ecological environment indicator

evaluation system, represented by X_i , where i is the ith indicator in the indicator system, and uses the following formula to calculate the comprehensive coefficient of rural B & B landscape ecological environment evaluation:

$$S = \sum_{i=1}^{n} X_{i} W_{i}$$
 (W_i represents the ith index weight) (8)

5 EXPERIMENTAL RESULT

6.1 Evaluation Index Weight of Rural B & B Landscape

Based on the above calculation formula, the weight of rural B & B landscape ecological environment evaluation index is calculated, as shown in Table 3 below.

Target Layer (A)	Criterion Layer (B)		Indicator Layer (C)		Absolute weight	
	content	weight	content	Weight Wi		
	Natural landscape factors (B ₁)	0.505	Natural Resource Scarcity (C1)	0.612	0.237	
	Tactors (b1)		Natural Resource Richness (C2)	0.239	0.124	
			Tourist Period (C3)	0.149	0.056	
Rural Hostel Landscape Eco-environment (A)	Human landscape factors (B ₂)	0.304	Historical richness (C4)	0.341	0.064	
			Uniqueness of Architectural Landscape (C5)	0.445	0.085	
			Human Activity Richness (C6)	0.213	0.043	
	Hostel Market Factors (B ₃)	0.191	Accommodation Rate (C7)	0.496	0.039	
			Investment in residential assets (C8)	0.272	0.026	

Hostel income ratio	0.232	0.017
(C9)		

Table 2: Evaluation Index Weight of Rural Homestay Landscape Ecological Environment.

Hostel income ratio (C9)	0.232	0.017

According to the above table, the weight of the ecological environment assessment indicators of rural B & B landscape can be obtained. The highest weight in the criteria layer is the natural landscape factor, and the lowest weight is the B & B market factor. This indicates that the B & B investors focus on both the natural landscape and the B & B market during the planning and design of rural B & B landscape. Among the natural landscape factors (B1), the most important factor affecting the rural B & B landscape is the scarcity of natural resources (C1). The absolute weight of this factor is 0.237, which indicates that C1 index has important value for planning and designing the rural B & B landscape. The second is the cultural landscape factor (B2), with a weight of 0.304. The highest weight among the factors in the indicator layer is the architectural landscape uniqueness (C5), with an absolute weight of 0.085. This indicates that more people pay attention to the architectural landscape uniqueness when planning and designing the rural B & B landscape. The architectural landscape also represents a region and has a strong regional style. The weight of the B & B market factor (B3) is 0.191, and the factor with the highest weight in the indicator layer is the B & B occupancy rate (C7). The increase in B & B occupancy rate indicates that people's demand for rural B & B is increasing, and they can obtain more benefits, which is also the ultimate goal of planning and designing rural B & B landscape.

6.2 Evaluation Results Based on Rural B & B Landscape Model

Through the calculation of formula (8) above, the comprehensive coefficient of rural B & B landscape ecological environment evaluation can be obtained. Here, the rural B & B landscape ecological environment is divided into four different grades, which are poor, qualified, good and excellent. The grade standards are listed in Table 3 below to determine the landscape ecological environment grade of rural B & B.

Grade	I	II	III	IV
Rural Hostel Landscape Eco-environment	Poor	Pass	Good	Excellent
Coefficient interval	[0, 60)	[60, 75]	[76, 90)	[90, 100]

Table 3: Classification of Ecological Environment of Rural Residential Landscape.

Grade I is poor, which means that the comprehensive coefficient of ecological environment evaluation of rural B & B landscape is low, and it is not suitable for the design and planning of rural B & B landscape in this area. The natural landscape and cultural landscape of the area under this grade can not meet the ecological environment requirements of the design and planning of rural B & B landscape.

Grade II is qualified, which means that the ecological environment in this area is not suitable for planning and designing rural B & B landscape. The regional natural landscape resources and cultural landscape resources under this level are not ideal, and the B & B market is not conducive to the design and planning of rural B & B landscape.

Class III is good, which means that the region has a high comprehensive coefficient of ecological environment evaluation of rural B & B landscape, which can be used for the planning and design of rural B & B landscape. The natural landscape resources and cultural landscape resources are relatively mature, and the B & B market demand is large, so it is suitable for planning and designing rural B & B landscape.

Grade IV is excellent, which means that the comprehensive coefficient of ecological environment evaluation of rural B & B landscape in this area is very high, which is more suitable for planning and designing rural B & B landscape. All indicators under this grade are relatively mature, which is conducive to the integration of ecological environment and B & B landscape.

Based on the combination of the rural B & B landscape evaluation model and the expert scoring method, this paper calculates the ecological environment indicators of the rural B & B landscape in Jiangning District according to the above, and obtains the ecological environment evaluation results of the eastern, central and western areas of the B & B landscape in Jiangning District, as shown in Table 4 below.

Target Layer (A)	Criterion Layer (B)	Indicator Layer (C)	Evaluation Result Xi		
	Layer (b)		West	Central section	East
Rural Hostel Landscape Eco-environment (A)	Natural Resource	Natural Resource Scarcity (C1)	76	60	92
	Scarcity (C1)	Natural Resource Richness (C2)	60	41	87
		Tourist Period (C3)	60	41	87
	Natural	Historical richness (C4)	60	41	87
	Resource Richness (C2)	Uniqueness of Architectural Landscape (C5)	0	0	0
		Human Activity Richness (C6)	0	0	0
	Tourist Period (C3)	Accommodation Rate (C7)	72	72	72
		Investment in residential assets (C8)	85	85	85

Hostel income ratio	<i>72</i>	<i>72</i>	<i>72</i>
(C9)			

Table 4: Comprehensive Evaluation Results of Rural B & B Landscape Ecological Environment in Three Districts of Jiangning District.

According to the analysis of the comprehensive evaluation results of the landscape ecological environment of rural B & B in Jiangning District shown in the above table, the highest evaluation result is in the eastern region, followed by the western region, and the lowest evaluation result is in the central region. The evaluation results of the human landscape in the three areas of Jiangning District are relatively low. Because the area is dominated by hilly landforms, the human landscape resources are scarce, and only a few areas have historical and cultural characteristics. However, the lack of development leads to the inability to attract tourists. The evaluation result of cultural landscape in the western region is 20, the evaluation result of cultural landscape in the central region (B2) is 13.7, and the evaluation result of B2 in the eastern region is 29. All three regions belong to class I. In terms of natural landscape (B1), the evaluation result of the western region is 65.3, which belongs to class II; The B1 evaluation result of the central region is 47.3, which belongs to class I; the B1 evaluation result of the eastern region is 88.7, which belongs to class III. it can be concluded that the eastern part of Jiangning District is rich in natural landscapes. Starting from the B & B market factor (B3), the evaluation results of the three areas in Jiangning District are the same, all 76.3, belonging to class III, indicating that the region has a good B & B investment environment, a high B & B occupancy rate, a high B & B capital investment, and a high corresponding B & B income ratio, which is conducive to B & B design and planning.

6.3 Analysis of Landscape Characteristics of Rural B & B

The essence of rural B & B is to integrate the regional culture into the rural landscape. The landscape is not an independent individual. Rural B & B is also an important part of the landscape. By integrating the natural ecology, local culture and national customs, the rural B & B landscape can be reasonably planned and designed to improve the vitality and vitality of local tourism.

In this paper, the rural B & B landscape is divided into three different levels: near view, mid view and long view, as shown in Figure 4 below. The perspective in the rural B & B landscape refers to the environment of the area where the B & B is located, that is, the pastoral scenery and the natural environment. The landscape is introduced into the rural B & B by using the borrowing landscape mode, so that people and the natural landscape can interact with each other; The middle view is the rural environment where the B & B is built, with the humanistic environment as the core, including the B & B culture and the overall style and features. People accurately understand the humanistic environment of the rural B & B according to their personal feelings. "Perception" is the main relationship between people and the middle view; The close-up view shows the courtyard space in the rural homestay, mainly involving the fence, gate, green belt, infrastructure, decoration, etc. according to the functional layout, splicing materials and combination colors, it forms a courtyard landscape with distinct rural characteristics. A complete rural B & B landscape is formed through the integration of mid range, long-range and close range.

6 CONCLUSIONS

This paper studies the landscape planning and design of rural B & B based on the concept of ecological protection. First, it analyzes the current situation of rural B & B in China. According to the statistical data, the number of most B & B rooms is less than 20, of which 5-10 rooms account for the largest

proportion. Among the theme features of B & B, farmhouse entertainment and ancient buildings account for 49% and 29% respectively.

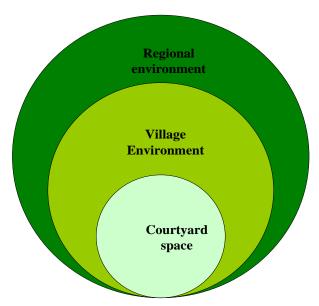


Figure 4: Landscape Levels of Rural Hostels.

In this paper, the evaluation index system of rural B & B landscape ecological environment is established by combining AHP and Delphi method. The indexes of the criterion layer (b) of the system are natural landscape factor (B1), cultural landscape factor (B2) and B & B market factor (B3), and the index layer (c) has a total of 9 indexes. Based on this index, the evaluation model of rural B & B landscape is established. By analyzing the characteristics of rural B & B landscape, it is divided into three different levels of landscape, namely, close view, mid view and long view. The common landscape types in the three landscapes are analyzed to establish a complete rural B & B landscape. According to the analytic hierarchy process and Delphi method, the weight of each index in the evaluation system is calculated. The results show that among the natural landscape factors (B1), the scarcity of natural resources (C1) has the largest impact on the rural B & B landscape, with a weight of 0.237; The highest weight of cultural landscape factor (B2) is architectural landscape uniqueness (C5), with a weight of 0.304; Among the B & B market factors (B3), the highest weight is the B & B occupancy rate (C7), with a weight of 0.039. The high weight indicates that these factors have a great impact on the rural architectural landscape. Based on the rural homestay landscape model, the comprehensive results of the rural homestay landscape ecological environment evaluation are obtained, and four grades are divided according to the obtained results, and each grade is provided with space. By calculating the comprehensive evaluation of the western, central and eastern regions of Jiangning District, it is shown that the highest evaluation result is the eastern region, followed by the western region, and the lowest evaluation result is the central region. The comprehensive evaluation result of the B & B market in the three areas is 76.3, and the grade is III, while the evaluation result of the cultural landscape is low.

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