

Evaluation of the Present Situation of the Landscape Image in Xiamen Shuzhuang Garden Based on the Analytic Hierarchy Process Method

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Received: 24 June 2023; Accepted: 24 July 2023; Published: 18 August 2023

Abstract:

This study takes Shuzhuang Garden in Xiamen as the research object, combined with the realistic needs of heritage tourism development, and uses Delphi method and the Analytic Hierarchy Process method to evaluate the current situation of its landscape image, aiming to excavate the cultural connotation of garden heritage and promote the display and development of the current situation of heritage. The results indicate that: 1) Humanistic factors have the highest weight proportion in the landscape image of Shuzhuang Garden. 2) The current situation of the landscape image is presented as the coastal overseas Chinese garden in southern Fujian with rich cultural connotation, the literati stylization and the “hiding the sea and replenishing the mountains” are the most important landscape images.

Keywords:

Shuzhuang Garden, Landscape Image, Analytic Hierarchy Process, Heritage Protection

1. Introduction

Chinese classical gardens contain strong image beauty, and the image theory is the theoretical result of the study of Chinese classical aesthetics, which has an important guiding position in Chinese garden landscape design. This is because the image theory in China is a profound theory based on the broad background of national culture and national philosophy that reflects the underlying logic of Chinese people's aesthetics. In China, “image” is called “Yi Xiang”. In the feudal society period, the research on “image” can be traced back to the “Obtaining its external image by looking at them” and “Creating an external image to fully express the connotation and theme” in Zhouyi, and the image is understood as the connection between subjectivity and objectivity, metaphysical up and metaphysical down. Later, Liu Xie combined “Yi” and “Xiang” in book “The Literary Mind and the Carving of Dragons”, which “Yi” is understood as the subject's emotion affected by objective things, and “Xiang” refers

to the object's image affected by subjective feelings [1]. The modern period is the intersection period of China's image theory and Western aesthetic theory research [2]. Mr. Zhu Guangqian put forward in "Talking about Beauty" that the image is created by human beings [3]. Mr. Zong Baihua, an aesthetic master, believes that images can express the real world [4]. Scholar Hou Youbin in "Chinese Architectural Aesthetics", defines imagery as the unity of Yi and Xiang. "Yi" refers to the subjective feeling, while "Xiang" has two kinds of directions, one refers to the objective image, which is the image shown by objective things, and the other refers to the presentation, that is, the image formed in the human brain after the perception of things [5].

From the aesthetic point of view, the research purposes of Chinese and Western image theory are different. The Chinese theory of image guides realistic creation through empirical induction, while western academic circles respond to questions about philosophy and psychology through pure discernment. In his Critique of Judgment, Kant believes that images exist both in the subjective world and in the objective world outside the imagination [6]. Susanne K. Langer, a famous American semiotician, proposed that image appeared as an artistic symbol because of the creation of artists [7], and she proposed that the appreciation of art depends on whether the aesthetic image is produced to determine [8]. In the context of Western epistemology and psychology, Aristotle pointed out that cognitive activities such as thinking and perception are closely related to image [9]. French psychologist Paul Sartre believes that image is the product of subjective consciousness, which comes from objective things, but is different from them, emphasizing the role of spirit and thinking activities in the formation of image [10]. In addition, in landscape design, the western image theory is based on many disciplines, becoming an empirical method in the field of landscape design by relying on the extensive scientific basis, and provides a scientific and quantitative theoretical paradigm for landscape design.

The theoretical study of Chinese gardens cannot be separated from the exploration of landscape image theory and Chinese aesthetic system. In this study, we conducted research objects with Shuzhuang garden, Chinese garden heritage, evaluates the present situation of the landscape image through scientific and quantitative research methods. It aims to excavate the cultural connotation of garden heritage and provide theoretical guidance for its current situation protection.

2. Materials and Methods

2.1. Overview of the study area

Shuzhuang garden is located on the south seashore of Gulangyu Island, Xiamen city, Fujian Province (7 Post Road, Gangzai), and covers an area of about 26,000 square meters now. The south side of Shuzhuang garden faces the sea, the north side backs on the Sunlight rock, the geographical location is superior, the scenery is pleasant. Shuzhuang garden is one of the first batch of national 5A-level tourist areas, and national level scenic spots in China. In 2017, it was included in the World Cultural Heritage List as one of the constituent elements of the heritage.

Shuzhuang Garden was built in the thirtieth year of Guangxu of the Qing Dynasty (1904) and completed in the second year of the Republic of China (1913). Its owner was Mr. Lin Erjia, a patriotic overseas Chinese. In the 21st year of The reign of Emperor Guangxu of the Qing Dynasty (1895), during the Sino-Japanese Naval Battle of Jiawu, the Japanese imperialists occupied Taiwan. Lin Erjia and his family were

unwilling to obey the rule of the Japanese Empire, and relocated from Taiwan to Xiamen to settle down. At that time, the Lin family was Taiwan's richest man.

Shuzhuang garden was built in the transition period from ancient times to modern times, which is located in the coastal area of southern Fujian, and obviously influenced by western foreign culture. Its artistic characteristics have a strong epochal and regional character, is a combination of Chinese and Western garden. Shuzhuang garden is divided into two parts, namely the "Hidden sea garden" and "fill mountain garden" respectively, each of which contains five scenic points, with a total of ten spots. In the Hidden sea garden, there are Hall of Meishou (1), Pavilion of Renqiu (2), pavilion of Zhenshuai (3), bridge of forty-four (4), pavilion of zhaoliang (5); And in the fill mountain garden, there are attic of listen to the tide (6), thatched cottage of Yiaiwulu (7), attic of stubborn stone mountain (8), twelve holes days rockery (9), pavilion of Xiaolan (10). (Figure 1)

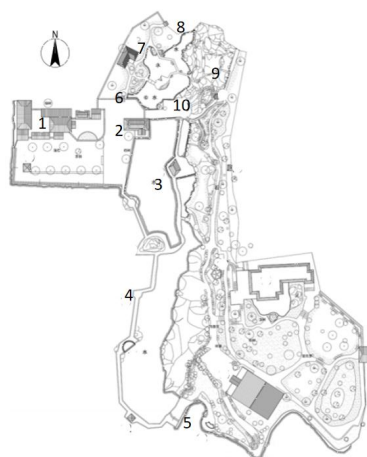


Figure 1. Layout of Shuzhuang Garden.

After more than 100 years of history, and due to the erosion of local waves and the impact of typhoons, many of the attractions in Shuzhuang Garden are now gone, or have been restored at a later stage and are different from what they looked like in the historical period. However, in the protection and status quo evaluation of garden heritage, besides considering whether the objective entities have been properly kept, the more critical thing is whether the garden, as an artistic product, the cultural connotations and aesthetic images it wants to convey are effectively preserved. On the one hand, by consulting historical documents, it can be seen that Shuzhuang garden is the place where the owner and his friends used to compose poems here, and organised literary activities regularly, and set up the literary society "Shuzhuang poetry society". The landscape image of the literati garden is the key consideration. On the other hand, "hiding the sea and replenishing the mountains" and the broad vision are their unique artistic characteristics. The above two points are important evaluation directions for the current status of landscape image.

2.2. Data source

The research data are obtained according to the form of expert scoring and on-site interviews, aiming to analyze and evaluate the present situation of the landscape image of Shuzhuang Garden from a professional perspective, as well as the aesthetic communication degree of Shuzhuang Garden and the connoisseur's acceptance of the aesthetic image. The determination of the evaluation indexes shall meet the following conditions and steps: (1) The selection of indexes should fully consider the standards

of “comprehensiveness, functionality, ambiguity, hierarchy and easy operability”, so that the selection of indexes conforms to the research purpose; (2) In the beginning of research, frequency analysis method, theoretical research method and brainstorming method are comprehensively used to determine the evaluation indexes of landscape image in Shuzhuang Garden; (3) According to the actual research situation and the research experience of relevant scholars, the indicators are adjusted and screened through the Delphi method, so that the selected indicators have certain correlation and comparability; (4) The representative influence factors and index template consulting design, landscape architecture, architecture and other fields of experts and scholars, and staff members who are related to the work of landscape and heritage protection and display are also consulted. The staff total twenty people, and after collecting expert’s opinions to statistics and induction, through repeated confirmations to, determine the reasonable evaluation index.

2.3. Study methods

This study selected Analytic Hierarchy Process as the main method, namely AHP analysis. This method is a method to solve qualitative problems through quantitative analysis by dividing the factors associated with the final result into target layer, criterion layer, index layer and other dimensions [11].

2.3.1. Construct the status quo evaluation model of landscape image

The objective of this study is to evaluate the present situation of the landscape image in Shuzhuang Garden in order to determine the target layer. For the selection of each index of the standard layer, on the basis of fully considering the current situation of Shuzhuang Garden and the historical background, the influencing factors in the process of aesthetic communication and the aesthetic ability and acceptance of the aesthetic recipients should be analyzed in combination with the relevant historical documents. According to the communication and acceptance of the aesthetic image of Shuzhuang Garden, the criterion layer is constructed from the four dimensions of natural environment, humanistic factors, garden elements and service experience, and 18 evaluation index layers of landscape image are constructed under it, so as to construct the evaluation model of landscape image of Shuzhuang Garden A. (Table 1)

Table 1. Evaluation model of landscape Image in Shuzhuang Garden.

Target layer	standard layer	Index layer	Index layer definition
Evaluation model of landscape image in Shuzhuang Garden A	natural environmentB1	Psychological perception of natural sceneryC1	The beauty of the surrounding and internal natural scenery
		Air purityC2	Whether there is any dust or polluted gas, and the air quality
		line of sight accessibilityC3	Whether there is a line of sight occlusion
		Noise pollutionC4	Whether there is a car honking or industrial production noise, etc
	Humanistic factorsB2	The historical background of building the gardensC5	The extent of historical factors on landscape imagery acceptance
		Heritage sites C6	The degree of preservation of garden monuments
		Garden owner experienceC7	The influence of owner's personal experience on aesthetic communication
		Poetry recordsC8	The influence of poetry text on

	Garden elementsB3		the transmission of landscape image
		characteristic buildingC9	The particularity of the architecture and the communication degree of the image
		Garden rockeryC10	The landscape image transmitted by the garden rockery
		plant speciesC11	The harmony degree and collocation and coordination degree of plant color
		Water in the gardenC12	The area and layout of the water in the park
		spatial distributionC13	The proportional relation of the overall space
	Service experienceB4	traffic accessibility degreeC14	Mode of transportation and time used to arrive there
		level of consumptionC15	High and low tour cost (tickets)
		safe environmentC16	Local public security and the security degree of the play environment
		tourism guideC17	The popularity of signage and accessibility facilities
		information sharing degreeC18	Text introduction, explanation, the quality of QR code information

2.3.2. Determine the weight of indicators

The index weight is determined in order to quantify the factors affecting the final results, so as to obtain the comparative relationship between the weights of the trait factors of the research object. First, the judgment matrix was used to construct the comparison framework between each index. Meanwhile, the Delphi method was used to consult experts, and the Thomas Saaty 1-9 scale method was used for comparison (Table 2). Then the m-dimensional vector is normalized by the operation of formula 1 and 2 to obtain the sorting weight vector W of each index, that is, the weight of each index in its previous level.

Table 2. Score criteria of Shuzhuang Garden judgment matrix. (source: Thomas Saaty 1-9 scale method).

scale	meaning
1	equally important
3	It's a little important
5	Obviously important
7	It's very important
9	Extreme importance
2,4,6,8	The intermediate value of the above two adjacent judgments
count backwards	The judgment of i and j is a_{ij} , then the judgment of j and i is $a_{ji}=1/a_{ij}$

$$M_i = \sqrt[m]{\prod_{j=1}^m a_{ij}} \quad (\text{Formula 1})$$

$$W_i = \frac{M_i}{\sum_{i=1}^m M_i} \quad (\text{Formula 2})$$

Where m is the order in each judgment matrix; a_{ij} is the scale value after the pairwise comparison of each element in the matrix.

2.3.3. Consistency test

In order to ensure the scientific and reasonable conclusion, the consistency test of the judgment matrix and the research data is required. By $CR=CI/RI$ to determine whether consistency is acceptable. The Thomas Saaty average random consistency index R.I. Value Table (Table 3) is used for checking, The CI run formula is as follows (formula. 3).

Table 3. Table of the average random consistency index of Shuzhuang Garden R. I.

m	1	2	3	4	5	6	7	8	9	10
R.I.	0.00	0.00	0.52	0.89	1.12	1.26	1.36	1.41	1.46	1.49

A is the cumulative value of the judgment matrix; W is the weight of each indicator.

$$CI = \frac{\frac{1}{m} \sum_{i=1}^m \frac{(AW)_i}{W_i} - m}{m-1} \quad (\text{Formula 3})$$

3. Results and Analysis

3.1. Status quo evaluation model and consistency test results

After counting the scoring results of experts, the weight value of each evaluation index of the landscape image of Shuzhuang Garden was calculated based on the mathematical model of AHP based on model A (Table 4). In addition, after calculation, the CR values are less than 0.1, which passed the consistency test, and showed that the above assignment score of each index factor and the treatment of the judgment matrix were in the reasonable interval, which was in line with the normal logic (Table 5).

Table 4. List of evaluation factors of Shuzhuang Garden.

Target layer	standard layer	weight	Index layer	weight
Evaluation model of landscape image in Shuzhuang Garden A	natural environment B1	0.11	Psychological perception of natural scenery C1	0.28
			Air purity C2	0.14
			line of sight accessibility C3	0.51
			Noise pollution C4	0.07
	Humanistic factors B2	0.58	The historical background of building the gardens C5	0.06
			Heritage sites C6	0.16
			Garden owner experience C7	0.26
			Poetry records C8	0.52
	Garden elements B3	0.25	characteristic building C9	0.45
			Garden rockery C10	0.16
			plant species C11	0.07
			Water in the garden C12	0.28
			spatial distribution C13	0.04
	Service experience B4	0.06	Traffic accessibility degree C14	0.04
			level of consumption C15	0.07

			safe environment C16	0.30
			tourism guide C17	0.14
			information sharing degree C18	0.45

Table 5. Consistency test results of landscape image status evaluation in Shuzhuang Garden.

	The biggest characteristic root	CI	RI	CR	Results of the consistency test
Standard Layer	4.057	0.019	0.882	0.022	pass through
Natural Environment B1	4.01	0.003	0.882	0.004	pass through
Humanistic Factors B2	4.091	0.03	0.882	0.034	pass through
Garden Elements B3	5.162	0.041	1.11	0.037	pass through
Service Experience B4	5.185	0.046	1.11	0.042	pass through

3.2. Analysis of the standard layer weight results

It can be seen from Table 4 that the index weights of the current situation of landscape image evaluation criteria in Shuzhuang Garden are, from highest to lowest , B2 humanistic factor> B3 garden elements> B1 natural environment> B4 service experience respectively. Among them, the criterion layer factor with the highest influence weight is the humanistic factor, accounting for 58%.Because the landscape image belongs to the subjective and objective combination of landscape cognitive categories, and the humanistic factor plays the intuitive “explanation” role to the aesthetic transmission of the landscape image on the basis of the objective composition of the landscape, it has the highest influence and the largest weight in the acceptance process of the landscape image of Shuzhuang Garden. This also reflects the literati landscape image presented by Shuzhuang Garden as a literati garden to some extent. As the realistic basis for conveying the objective existence of landscape image, the garden elements, weighing 25%, also have a relatively large degree of influence. The landscape elements, both as the play experience of the tourists and as experts and scholars to explore the indicators, have a direct impact on the overall landscape image presentation of the garden.

In addition, the natural environment B1 is higher than the service experience B4, because the service experience has no direct impact on the aesthetic transmission of the garden itself. The “service experience” here refers to the modern Explanation cards or barrier-free service facilities.etc. At the beginning of the garden construction, Shuzhuang garden as the private garden, occasionally open to the public to appreciate chrysanthemum view flowers, will not provide guidance or service facilities for visitors, but does not affect the transmission of its landscape image. Therefore, the current service experience only plays an auxiliary role in the presentation process of the landscape image. Although the proportion is relatively small, it still affects the presentation of the artistic effect of the garden to a certain extent. On the contrary, the natural factors play a role in conveying the landscape image from beginning to end. For example, the good or bad of the natural environment will directly affect the transmission of its aesthetic image. If the local natural conditions of continuous rain and cloudy air, then the vast image of the sea will be greatly reduced.

3.3. Analysis of index layer weight results

The results of the index layer weight can more specifically reflect the influence degree of the influence factor on the upper layer criterion and the final landscape trait

evaluation, which is of reference significance for the study of the current situation of the landscape image of Shuzhuang Garden in Xiamen. This part will be analyzed according to the index weight ranking of the standard layer.

First, in the Humanistic factors, the weight of each index from is successively ranked high to low is C8 poetry record> C7 garden owner experience> C6 heritage sites> C5 The historical background of building the gardens. Among them, poetry records account for the highest 52%, which is an important influencing factor in humanistic factors. Combined with the construction history of Shuzhuang Garden and the theoretical research of landscape image, “poetry record”, as an explicit, intuitive and objective expression, has a direct and effective influence on the aesthetic communication of artistic creators (garden builders). For example, the couplet of the pavilion of Duyue in shuzhuang garden says “the long bridge is three thousand feet, the bright moon and the sky are twelve columns”. This is the most intuitive explanation of the owner of the garden to express the landscape image of “long bridge across the strait” and “overlooking in the natural beautiful seaside”. The identity of the overseas Chinese and the owner of the richest man in Taiwan, as well as the historical experience of his family crossing from Taiwan, are also places that tourists talk about, which play an important role in the transmission of their images.

Second, in the evaluation of garden elements, its weight from high to low is C9 characteristic building> C12 water in the garden> C10 garden rockery> C11 plant species> C13 spatial distribution. There are a lot of buildings of Chinese and western combination type in shuzhuang garden, be like attic of stubborn stone mountain, pavilion of Xichun, pavilion of Zhaoliang, bridge of forty-four, of this kind of collage juxtaposed construct characteristic and the decorative art of pluralistic and unity belongs to explicit aesthetic expression likewise, the influence weight to landscape image is highest. Mountains, waters and landscape plants, as an objective element of the landscape, also play a significant role in shaping the overall image of the garden. Among them, the garden water body accounts for a relatively high proportion, which is related to its unique coastal location, and also becomes the unique garden example because of the “Hidden sea garden” in China. Although the spatial layout does not belong to the constituent elements of the garden, which only a presentation of the gardening techniques and design concepts, it also has an impact on the transmission of the landscape image. For example, the spatial layout of “hiding the sea and replenishing the mountains” expresses the patriotism of the garden owner.

Third, in the analysis of natural environment level, the weight of each index factor from high to low is C3 line of sight accessibility> C1 psychological perception of natural scenery> C2 air purity> C4 noise pollution. Among them, the line of sight accessibility accounts for as much as 51%, which is closely related to the design technique of borrowing into the scene. Shuzhuang garden makes the advantage of the situation to realize “hiding the sea and replenishing the mountains” landscape image, the most important reason is “borrow the scenery”, borrow the scenery of the sea, borrow the vast sea of the landscape feeling, this also has a higher requirement to the line of sight. C2 and C4 indicators, although also affecting the transmission of landscape imagery, are not obvious for tourists, not as obvious as other indicators, so the weight is lower.

Fourth, in the service experience, the influence degree of each index from high to low is C18 information sharing degree> C16 safe environment> C17 tourism guide> C15 level of consumption> C14 traffic accessibility degree. Among them, C18 and

C17 are both intuitive information transmission, which plays a promoting role for tourists to better understand the landscape image and the design concept of the garden. And the safety environment as a basic factor also plays an important role, the weight of 30%. The C14 traffic accessibility degree weight accounted for the smallest proportion, only 4%. This is concerned with the characteristic traffic environment on Isle of Blown Waves, the island does not allow to drive a motor vehicle, and the island area is small, can walk to the whole island, because of its traffic can reach degree to convey the degree of influence of landscape image of shuzhuang garden is the lowest.

4. Conclusion and Discussion

In this study, AHP analysis method and Delphi method were used to evaluate the current situation of the landscape image of Shuzhuang Garden in Xiamen, which clarifies the weight relationship of the index factors to a certain extent, and provides reference and emphasis for the grasp of the cultural connotation of garden heritage. The current situation of landscape image in Xiamen Shuzhuang Garden is summarized as: the coastal overseas Chinese garden in southern Fujian with rich cultural connotations. The landscape image is mainly in the literati historical background of humanisation and the garden design of “hiding the sea and replenishing the mountains” two aspects. These two points should be the key points in the process of further heritage excavation and display. It is also the focus of the development and application of tourism resources. In addition, in the face of the continuous improvement of tourists’ aesthetic needs, the matching services should also keep pace with the Times and provide tourists with a better environment to accept aesthetic images.

Conflicts of Interest

The authors declares that there is no conflict of interest regarding the publication of this article.

Funding

This work was supported by the Supported by the Natural Science Foundation of Fujian Province, grant number 2022J01936.

Acknowledgments

The authors would like to acknowledge the Gulangyu Management Committee of Xiamen city, Fujian Province for its strong support for this study.

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