

Research on the Design of Recreation Facilities in Eco-Recreational Spaces Based on User Needs

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Abstract: Urban residents are troubled by the fast pace and stress, making physical and mental health a focus of concern. Returning to nature and seeking leisure and relaxation has become a widely desired lifestyle. Suburban parks, with their convenient locations and natural ecological environments, are becoming the best choice for citizens to experience high-quality recreational activities in a short period of time. Recreational facilities in suburban parks are an essential part of the park's public service facilities. When designing, it is important to consider the recreational behavior characteristics and needs of users to enhance the quality of the design and meet the needs of users. This paper takes the Shanghai Langxia Suburban Park as the main research object. Through on-site research and questionnaire surveys, it analyzes the needs of visitors and the main existing problems of recreational facilities in suburban parks. Then, based on the recreational needs, it proposes some suggestions for improving the design of recreational facilities, hoping to provide a certain reference for the design of urban public service facilities.

Keywords: User Needs; Eco-Recreation, Recreational Spaces; Rest Facilities; Suburban Parks

1. Introduction

In 1933, the "Athens Charter" proposed that the four major functions of a city are living, working, recreation, and transportation. As society develops, incomes increase, and leisure time grows, the demand for recreational activities and spaces among urban residents is also increasing rapidly. Urban ecological recreational spaces serve multiple functions, including ecology, entertainment, rest, and

social culture. They not only protect biodiversity and mitigate the urban heat island effect but also provide leisure and entertainment venues for urban residents, alleviating their work-related stress. Therefore, they are widely loved by the public. Ecological recreational spaces have become one of the important criteria for measuring the construction of urban ecological civilization and the quality of life of residents. They play an active role in enriching daily life, improving the living environment, enhancing the quality of life, shaping the city's image, and maintaining sustainable development^[1]. With the rise of urban recreational activities, parks with convenient transportation, beautiful environment, superior ecological conditions, and distinct regional characteristics have become important ecological tourism attractions in cities. Parks integrate ecology, culture, science, and art, conforming to the ecological principles that people demand from their environment. They can better promote human physical and mental health, cultivate people's sentiments, and improve the quality of life. Parks have become an indispensable element in modern urban living and spatial structure. However, current park construction mainly focuses on planning and landscape design, with relatively little attention paid to the configuration of various service facilities. The design of facilities generally lacks distinctive features, and there is a serious phenomenon of homogenization, which fails to reflect unique cultural and environmental characteristics. The comfort and layout are not reasonably designed, and the needs for recreational experience are not well met, showing a disregard for the environment and a deviation from the public's lifestyle. Ecological recreational spaces are important venues for residents' leisure activities and are a type of public product that affects residents'

recreational rights, well-being, and environmental equity^[2]. Therefore, analyzing the characteristics of ecological recreational spaces and the recreational service needs of residents, and then measuring the supply-demand match has become an important research topic^[3].

This paper takes the recreational facilities of two suburban parks in Shanghai as examples. By analyzing the recreational needs of users and the current status of recreational facilities, it points out the main existing problems in the construction of recreational facilities. Based on this, it proposes suggestions for the construction and design of recreational facilities. The study aims to improve and enhance the quality of the public service facility system in ecological recreational spaces, create a strong personalized atmosphere, shape a spatial brand image, and better adapt to the needs of modern urban development.

2. Relevant Concepts

2.1 Ecological Recreational Spaces

Currently, there is no unified definition for the concept of "urban ecological recreational space." The academic community generally believes that "urban ecological recreational space (UERS)" has two aspects of characteristics: one is the natural ecological characteristics within the city, which refers to the spatial form dominated by natural ecosystems, including urban green spaces, wetlands, farmlands, forests, water bodies, and other unutilized land types, in contrast to the spatial forms of urban artificial environments (buildings, roads, etc.). The other is the recreational characteristics, which can meet people's multiple functions such as entertainment, social interaction, exercise, play, and socializing. Wang believe that urban ecological recreational spaces refer to open spaces based on urban ecological spaces that are accessible to residents and have recreational functions such as rest, social interaction, exercise, sightseeing, and tourism. These spaces include scenic spots, forest parks, geological parks, water conservancy scenic areas, eco-tourism attractions, and urban park green spaces^[4]. Tan considers urban ecological recreational spaces to be spatial units located in or near cities, based on the natural urban

ecosystem. These spaces can utilize natural elements to provide ecosystem services and are available for people to engage in rest, social interaction, exercise, communication, and recreational activities such as sightseeing. They are an important component of the urban spatial structure and play a significant role in the construction of urban ecological civilization and the creation of a high-quality urban lifestyle^[5]. Cong believes that urban ecological recreational spaces refer to areas or places that possess the function of ecosystem services and can simultaneously meet the daily outdoor recreational needs of residents^[6].

The author, through extensive field investigations and case analyses, largely agrees with the views of Zhang Shuying, Xu Xin, and others, considering that urban ecological recreational spaces refer to areas or places within the city and its suburbs that possess ecosystem service functions and can meet the daily outdoor recreational needs of residents. These spaces include formal and informal spatial units with natural attributes and public service characteristics, constituted by natural or artificial landscapes. They encompass urban parks, botanical gardens, forest parks, wetland parks, street and community green spaces, waterfront spaces, and so on^[7].

2.2 Recreational Facilities

Recreational facilities are the most common and frequently used public amenities in parks, green spaces, and other ecological recreational areas. They are one of the critical factors that determine the visitor experience, and their quality directly affects the overall quality of the space^[8]. Recreational facilities primarily refer to amenities in public green spaces that allow visitors to sit, rest, converse, and enjoy the view. The types of facilities include benches, seats, pavilions, and corridors, which are specifically designed for these purposes. Additionally, auxiliary facilities such as tree pits, steps, and flower beds, which also serve the aforementioned functions, are considered recreational facilities^[9]. In suburban parks, recreational facilities are the basic conditions for visitors to stop and rest, communicate, and enjoy the view. They are also an important means to shape the park's distinctive landscape and improve service quality. Good design is of great significance for improving visitor

satisfaction.

3. Research on Recreational Facility Design

3.1 Research Location

Suburban parks are large urban ecological recreational spaces. Suburban parks are typically located in the outskirts of cities, featuring good natural landscapes, rural vegetation, and pastoral scenery. They serve the dual functions of ecological conservation and providing residents with leisure and recreation^[10]. Shanghai's suburban parks have been vigorously promoted since 2012, with the construction requirement to fully leverage the unique environmental and resource advantages of each suburban park. The parks are designed to develop their distinctive characteristics according to local conditions, enabling differentiated development among the suburban parks across the city and avoiding homogenized competition. Now, as large recreational spaces, suburban parks attract millions of citizens for leisure and recreational activities each year, becoming a popular destination for residents in Shanghai and surrounding areas to relax and take vacations. After more than a decade of construction, overall, the ecological protection in Shanghai's suburban parks is effective, and their landscape features are prominent, essentially achieving the expected outcomes of their development. This study selects Changxing Island Suburban Park and Langxia Suburban Park for investigation. The basic situation of the survey area is shown in the following table (Table 1).

Table 1. The Basic Situation of the Survey Area

Park Name	Area (km)	Distance (km)	Type	Features
Changxing Island Suburban Park	29.75	45	Wetland Type	Lake water bodies and aquatic plant and animal communities.
Langxia Suburban Park	21.4	60	Agricultural Type	Agricultural landscapes and rural settlements.

3.2 Recreational User Behavior and Needs Survey

(1) Visitor Basic Characteristics

The survey was conducted from December 21, 2022, to January 3, 2023, covering three time periods: weekdays, weekends, and holidays

(New Year's Day). The survey questionnaire included content on the basic characteristics of recreational users, their motivations and purposes for visiting, and their needs for recreational facilities. A total of 261 questionnaires were collected, and 25 were excluded due to missing information, multiple selections, or obvious inattentive responses. This left 236 valid questionnaires, with a valid rate of 90.19%. The results of the data analysis are as follows (Table 2):

Table 2. Visitor Basic Characteristics

Characteristic	Project Indicator	Sample Size (persons)	Proportion (%)
Gender	Male	105	44.49
	Female	131	55.51
Age	Under 18	3	1.27
	18-30	95	40.25
	31-40	74	31.36
	41-50	52	22.03
	51-60	5	2.12
	Over 60	7	2.97
Occupation	Student	30	12.71
	Government/Institutional Staff	48	20.34
	Corporate Staff	47	19.92
	Professional	50	21.19
	Retired	7	2.97
	Self-employed	51	21.61
Education Level	Unemployed	3	1.27
	High School or Below	44	18.64
	Associate Degree	79	33.47
	Bachelor's Degree	88	37.29
	Master's Degree or Above	25	10.59
Residence	Near Suburban Parks	80	33.9
	Shanghai Urban Area	94	39.83
	Jiangsu and Zhejiang Area	56	23.75
	Other Provinces	6	2.54
Mode of Transportation	Walking	40	16.59
	Bicycle (Electric Bike)	59	25
	Public Transportation	52	22.03
	Private Car	59	25
	Other	26	11.02
Play Time	Weekends	117	49.58
	Holidays	96	40.68
	Weekdays	11	4.66
	Daily	12	5.08
Type for Outing	Friends	63	26.69
	Colleagues/Team	32	13.55
	Family Members	125	52.96
	Alone	16	6.77

Table 2 shows the basic characteristics of the visitors. In this survey, there were 105 male respondents, accounting for 44.49% of the total sample, and 131 female respondents, accounting for 55.51% of the total sample, with a nearly balanced gender ratio. The age of the respondents is mainly between 18-50 years old, especially with a higher number of people aged 18-30, accounting for 40.25%. Table 3-2 indicates that 81.36% of the leisure visitors have a college degree or higher. Regarding

occupation, the majority of leisure visitors are self-employed (21.61%), followed by professionals (21.19%), government and public institution staff (20.34%), and corporate employees (19.92%) with similar numbers. Students make up 12.71% of the sample, and those unemployed account for 1.27%. In terms of visitor origin, the majority of visitors come from urban Shanghai, accounting for 39.83% of the total visitor count; followed by nearby areas of the rural park, which make up 33.9%. Regarding the mode of transportation for leisure visitors, driving and cycling are the most common methods. Leisure visitors primarily engage in activities as families, representing 52.96% of the group; friends traveling together come in second at 26.69%, followed by colleagues at 13.55%, with solo visitors being the least, comprising the smallest percentage. In terms of the timing of visits, 117 people choose weekends, which is the most popular choice; holidays see 96 visitors, accounting for 40.68% of the total; and only 4.66% visit on weekdays.

The data indicates that the majority of visitors to the rural park are middle-aged and younger individuals. They generally have a higher level of education and place a significant emphasis on the quality of life. In terms of occupation, there is a notable presence of freelancers and professionals, likely due to the fact that the pressures of their work lead them to prefer relaxation in an ecological and natural environment. The visitor origin data suggests that the rural park primarily serves as a leisure destination for citizens of the Shanghai area, with an influence that extends to neighboring provinces such as Zhejiang and Jiangsu. As a large ecological leisure space, it is currently in the phase of construction and development and has a relatively minor impact in other regions and internationally. Visitors to the rural park mostly engage in activities as family units, with the majority of visits occurring on weekends and holidays.

(2) Main Purposes, Activities, and Behaviors of Recreation Visitors

From the motivations of visitors to the rural park (interested factors survey), it can be seen that the main features of the rural park are the natural and cultural characteristics of the place (see Table 3). A total of 44.07% of visitors are attracted by the natural and rustic environment, 30.08% choose regional culture; the proportion

of visitors choosing distinctive architecture is 20.76%, and those choosing culinary delights is 2.12%. The number of visitors choosing proximity to their residence (2.54%) and convenient transportation (0.42%) is relatively low. The top three purposes of visiting the rural park are to relax and relieve stress (41.95%), to bond and expand children's horizons (41.53%), and to appreciate natural scenery (40.25%).

Table 3. Visitors' Purposes, Activities, and Behaviors

Characteristic	Project Indicator	Sample Size (persons)	Proportion (%)
Motivation	Close to Residence	6	2.54
	Convenient Transportation	1	0.42
	Natural and Rustic Environment	104	44.07
	Regional Culture	71	30.08
	Distinctive Architecture	49	20.76
	Culinary Delights	5	2.12
Purpose	Relaxing and Reducing Stress	99	41.95
	Appreciating Natural Scenery	95	40.25
	Learning about Regional Culture and Folk Customs	92	38.98
	Bonding and Expanding Children's Horizons	98	41.53
	Health and Rehabilitation	80	33.9
	Tasting Local Cuisine	78	33.05
Rest Areas	Crowded Plazas	34	14.4
	Waterfronts	41	17.37
	Along Trails	38	16.1
	Under Trees, on Lawns	80	33.89
	Pavilions and Corridors	43	18.22
	Other	115	48.73
Forms of Recreation	Sitting	68	28.81
	Leaning	5	2.12
	Lying Down	44	18.64
	Other	4	1.69
	Browsing the Internet, Using Mobile Phones	17	7.63
Recreational Activities	Appreciating the Scenery	86	36.44
	Watching Activities	60	25.42
	Chatting	62	26.27
	Eating and Drinking	10	4.24

Ecological leisure spaces offer the opportunity to interact with nature, alleviate stress, and promote the physical and mental health development of urban residents. Engaging in activities in nature and increasing parent-child communication to relax the mind and body are the main purposes of leisure visitors. Therefore, in the design of leisure spaces, attention should be paid to harmonizing with the ecological environment and deeply integrating with nature. For family outings, the communicative function of leisure facilities should also be considered. Visitors prefer to rest on lawns and under trees, where they can both interact with nature and enjoy the scenery.

A significant number of visitors choose pavilions and corridors, mainly for the need for shade and shelter from rain. However, currently, leisure space facilities are primarily set up in plazas and along trails. Some areas lack shelter, which is insufficient for comfort.

(3) Analysis of Visitors' Perception and Demand for Recreation Facilities

Table 4. Analysis of Visitors' Perception and Demand for Recreation Facilities

Characteristic	Project Indicator	Sample Size (persons)	Proportion (%)
Cognition	Not Satisfied	16	6.77
	Satisfied	11	4.66
	Partially Satisfied	118	50
	Needs Improvement	91	38.55
Characteristics Embodied	Not Reflected at All	23	9.7
	Partially Reflected	51	21.6
	Generally Reflected, but Mostly Lacks Distinctiveness	144	61
Problem	Adequately Reflected	18	7.62
	Insufficient Quantity	78	33.05
	Lack of Unique Design	87	36.86
	Inharmonious with the Environment	55	23.31
	Irregular Distribution	5	2.12
	Uncomfortable to Use	11	4.66
Usage Requirements	Comfortable seating with backrests	48	20.34
	Seats that offer privacy	51	21.61
	Distinctive design features	58	24.58
	Materials that are close to nature	41	17.37
	Facilitates communication	38	16.1
Location Requirements	Privacy	45	19.06
	Scenic views	52	22.03
	Shade provision	98	41.52
	Facilitates social interaction	41	17.37
	Diverse functionality	46	19.49
Improvement Requirements	Reasonable distribution	50	21.19
	Harmonious and coordinated with the environment	41	17.37
	Comfortable to use	51	21.61
	Distinctive design features	48	20.34

From the perspective of visitor perception (see Table 4), the existing types of recreational facilities have not achieved the desired effect. 50% of visitors believe that their needs are partially met, 38.55% think there is a need for improvement, 6.77% of visitors feel that their rest needs are not met, and only 4.66% of visitors believe that their rest needs are fully met. Regarding whether the recreational facilities can reflect the spatial characteristics, 61% of visitors believe that the existing recreational facilities in the rural park generally lack distinctiveness and do not sufficiently represent the park's culture and

features; 21.6% of visitors think there is some reflection, but it is still insufficient. The majority of visitors believe that the main issues with the existing recreational facilities in the rural park are the lack of distinctive design (36.86%), followed by insufficient quantity (33.05%) and lack of harmony with the environment (23.31%). The existing recreational facilities in the rural park do not adequately meet the leisure needs of most visitors, and the overall design lacks a clear distinctiveness. Although some facilities can be integrated with regional culture, the reflection is not yet fully sufficient. Field research has revealed that the issue of recreational facilities not being well integrated with the characteristics of the site is quite evident. In the rural park, some public seating areas such as the farmhouse courtyards and the large stages of the Lianxiang Square feature simple public benches, white plastic chairs, and blue fast-food seats, with relatively monotonous design forms. These facilities are rudimentary in shape and have not considered whether their design, materials, and colors are in harmony with the surrounding environment. They do not provide an aesthetically pleasing visual experience, nor do they reflect the regional cultural characteristics and humanistic features of the Langxia Rural Park. In fact, they may even have a negative impact on the overall environment.

33.05% of leisure visitors believe that there is an insufficient number of recreational facilities in some areas of the rural park, which cannot meet the actual needs. During on-site research, it was found that between the Jinjiang Chinese Village and the Langxia Ecological Garden attractions in the Langxia Rural Park, there is a trail of about 1000 meters, on which only three recreational facilities have been designed for rest. The landscape pavilions and riverside corridors are at a certain distance from the main trail, making them inconvenient to use. In the Changxing Island Rural Park, there are no recreational facilities in the children's activity area, leaving waiting parents with no choice but to stand or sit on simple plastic stools, resulting in a poor experience. Although pavilions and corridors in the park can provide rest areas, they do not meet people's psychological needs for quietness and rest, nor do they fulfill the function of communication. Some recreational facilities

lack armrests and backrests, making them less convenient to use, and they do not meet the actual needs of parent-child families and elderly visitors.

From the perspective of visitor needs, distinctive recreational facility designs are popular among leisure visitors (24.58%); followed by the desire for privacy in seating (21.61%), then the comfort of sitting with backrests (20.34%), materials that are close to nature (17.37%), and facilities that facilitate communication (16.1%). For instance, within the "Cute Pets Paradise" area, seats designed for sitting with small dogs are favored by visitors and children, with many people waiting in line and taking photos to commemorate the experience. Most visitors and children prefer to sit in places that are close to nature, choosing to sit under trees or by the water. However, there are fewer facilities in such areas, and many people have to sit on the ground. The comfort of the facilities also needs improvement; for example, the seats by the river have a small depth and lack backrests, allowing users only for a brief stop and not providing a relaxing rest for the body and mind. The recreational facilities have not considered sunshade design, resulting in low usage rates, and some recreational facilities have become damaged due to poor management.

In terms of the location of recreational facilities, most leisure visitors prefer areas under trees and on lawns, followed by pavilions, corridors, and waterfronts, with crowded squares being the least preferred. The majority of visitors believe that the design of recreational facilities should prioritize shade provision, followed by scenic views. This reflects people's desire to be close to nature, seeking the shade of trees, enjoying the scenery, and having privacy protection. Currently, a large number of recreational facilities are placed in open squares and along trails without tree cover. Due to weather conditions, many visitors prefer to stand against trees rather than sit in the square, leading to a waste of facilities. People have curiosity, and outdoor activities are about obtaining information through sight. Ignoring people's need for views can also lead to the waste of facilities.

In terms of improvement suggestions, visitors believe that the design of recreational facilities

should take into account the needs of users, be reasonably distributed, comfortable to use, and have distinctive designs, which are issues of great concern to everyone. Visitors to the rural park hope to receive high-quality leisure services, experience the ecological and rustic charm of the rural park, immerse themselves in the natural environment, and enjoy a refreshing and pleasant experience.

4. Conclusion

Based on research and case analysis, the improvement and construction design of recreational facilities in urban ecological leisure spaces should consider the behavior and needs of users, moderately increase facilities under trees and by the water, reasonably layout recreational facilities according to the needs of activities, and the facilities should be designed to create local characteristics in conjunction with the environment.

(1) Design Considerations for User Needs

The most attractive aspect of urban ecological leisure spaces is the ecological and rustic natural environment. Visitors prefer that leisure spaces and facilities blend with nature, facilitating viewing and communication. The design of recreational facilities should aim to integrate into the natural ecology as much as possible. For example, designing wooden platforms or tree pits under trees or in the forest, or boat-shaped seats in waterfront areas, can serve as both landscape features and places for rest. The shape, color, and materials of the facilities should be as close to nature as possible, creating a spatial atmosphere while providing a place for rest to meet leisure needs. For instance, many parks in South Korea often design circular wooden seats or tree pits around trees, which have yielded very good results, thereby achieving a harmonious coordination between the facilities and natural features.

(2) Principle of Regional Characteristics

The design of recreational facilities in urban ecological leisure spaces should take into account the natural and cultural resource elements of the area, focusing on the organic combination of rural elements with leisure activities to create a rich and diverse rural landscape atmosphere. The design should integrate the characteristics of the site in terms of shape, color, materials, and details, and

infuse the essence of regional culture, thereby enhancing the overall environmental quality of the park. For example, in Shanghai's Pujiang Rural Park, the recreational facilities of the Sky City are designed with forms and colors that blend with the buildings, forming a cohesive entity and becoming a landmark and a check-in spot in the space. The Miracle Garden area also becomes a highlight and symbol of the park due to its distinctive recreational facilities.

(3) Principle of Ecological Development

Urban ecological leisure spaces possess unique natural landscapes and functions for ecological conservation and environmental protection. The design of recreational facilities should consider using various natural materials and eco-friendly materials that are in harmony with the regional ecological development, such as wood, stone, and bamboo, advocating for green construction.

(4) Layout Design Considering Visitor Characteristics

Recreational facilities should be designed and improved with full consideration of the characteristics and needs of users. Urban ecological leisure spaces are primarily used for leisure activities by families, friends, and other groups. The layout of recreational facilities should consider group lifestyles. Seats along squares and roads should not affect traffic and should maintain an appropriate distance from pedestrian flows to provide sufficient activity space. However, they should not be too far from activity areas to facilitate rest and viewing. The design of recreational facilities should consider shade provision and communication, ensuring effective and rational design to guarantee the smooth conduct of leisure activities in the space and a pleasant experience. This is especially true for large urban ecological leisure spaces such as rural parks and wetland parks, which generally cover large areas and have a wide range of activities for visitors. It is necessary to enrich the recreational facilities according to different locations and activities to enhance the pleasure of the experience and better serve visitors.

References

- [1] Chang Qing, Li Shuangcheng, Li Hongyuan, et al. Progress and Prospects in Urban Green Space Research. *Journal of Applied Ecology*, 2007, 18(7): 1640-1646.
- [2] Yan Wentao, Li Zihao, Chen Hui, et al. Analysis of the Supply and Demand Characteristics and Pattern of Recreational Services in the Ecological Space of the Yangtze River Delta Urban Agglomeration. *Chinese Landscape Architecture*, 2023, 39(05): 109-115.
- [3] Vallecillo S, La Notte A, Zulian G, et al. Ecosystem Services Accounts: Valuing the Actual Flow of Nature Based Recreation from Ecosystems to People. *Ecological Modelling*, 2019, 392: 196-211.
- [4] Wang Fuyuan. Research on the Pattern, Process, and Optimization of Recreational Use of Ecological Space in the Pearl River Delta Urban Agglomeration. Beijing: University of Chinese Academy of Sciences, 2018.
- [5] Tan Wenkai. Research on the Evaluation of Service Level and Equity of Urban Ecological Recreational Space: A Case Study of the Central Urban Area of Hengyang City. Zhuzhou: Hunan University of Technology, 2020.
- [6] Cong Jing. Research on the Spatial Accessibility of Urban Ecological Recreational Space Based on Spatial Syntax: A Case Study of Weihai City. *Architecture and Culture*, 2024, (02): 131-135.
- [7] Xu Xin. Research on the Evaluation and Optimization of Equity in Urban Ecological Recreational Space: A Case Study of the Metropolitan Development Area of Wuhan. Wuhan: Central China Normal University, 2022.
- [8] Liao Jiayuan, Tang Xiaomin. Evaluation and Optimization Strategies for Recreational Facilities in the Riverside Public Green Spaces of the Central Section of the Huangpu River. *Chinese Landscape Architecture*, 2018, 34(09): 84-88.
- [9] Liao Jiayuan, Tang Xiaomin. Quality Evaluation of Recreational Facilities in the Riverside Green Space of Xuhui District, Shanghai. *Journal of Shanghai Jiao Tong University (Agricultural Science)*, 2017, 35(06): 74-79.
- [10] Lin Xiqian. A Preliminary Analysis of High-Quality Development of Tourism in Shanghai's Rural Parks. *Shanghai Rural Economy*, 2024, (03): 20-21.