

An Investigation of Preferences for Urban Forest Recreation in China: Case Study of Baoji Botanical Garden

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Abstract — Given that 58 Chinese cities have been awarded the title “Forest City”, numerous domestic experts have extensively discussed the ecological significance of urban forests. Urban forest recreation forms a key part of the planning and design of city forests. However, both the government and general public appear to be more concerned about the establishment of recreational sites and facilities as opposed to the consideration of recreational behavior. Using a questionnaire, we explore the contrasting attitudes of citizens in different demographic groups and their recreational preferences in urban forest. The results show that people prefer to visit urban forests in spring and summer. They prefer areas with thick woods or coverts. Most visitors stay in the forest for over 2 hours and walk to the Botanical Garden. As all of the age group, occupation, and personal income of the respondents are closely related to their recreational preferences regarding urban forest, we hope that our information will enable urban planners to optimize the allocation of resources.

Keywords - Forest recreation; urban green space; environmental experience; landscape design

I. INTRODUCTION

Extensive studies have been conducted on urban forests in many countries worldwide. The contents of these studies have included urban forest structure analysis, ecosystem service assessment [1-2], planning and management [3], ecological function and urban environment improvement [4], carbon emission offsets [5], air quality improvement and community beautification [6], aesthetic value [7], and economic value [8,9]

In China, studies on urban forests cover three main themes[10]: resource inventories, ecological functions, and assessment indicator systems. The deterioration of city environments and destruction of ecosystems along with the pressure and restrictions caused by narrow living spaces exert a negative influence on the daily lives of city residents. The social function of urban forests becomes increasingly important for the improvement of city environment and quality of life. Urban forests not only offer visitors a better quality of life [11] but also provide various cultural services, such as recreation [12], and aesthetic, educational, religious and cultural heritage value[13]. The opinion of the public represents the common value of urban communities and is a crucial indicator for forest planning and design. It is important for

Increasing numbers of studies have examined urban forest recreation. They relish green spaces and wish to embrace nature and enjoy the scenery[15]. Vries and Goossen[16] studied the number of visitors and proposed that the suggestions of visitors on forest management should be taken into account. Bjerke, Østdahl, Thrane and Strumse [12] carried out a study on the influence of plants on

recreation. Arnberger and Eder[17] studied forest recreation using video recordings. Other studies have been conducted on emotion[14], distance and convenience [18-19], the individual and the environment [20], and the human behavior and landscape perception [21] of forest recreation. The correlation between biodiversity and landscape preference has been studied by surveying both ordinary persons and specialists, using photographs[22]. Many studies of urban forest recreation have been carried out in Europe. In Asia, Korean [23-24] and Japanese researchers[25], have conducted studies on urban forest recreation. As the Chinese government gives full support to the urban forest construction, city's green area is increasing year by year. However, the landscapes of different cities look similar to each other, giving people an impression of the same image. The research on the recreational preference of urban forest contributes to the preservation of traditional culture and the diversification of city.

Using Eisenhardt's “theory construction based on case study”, this paper analyzed recreational preferences by asking through specific questions. Various questions were asked to determine the most important recreational preferences for urban forest, and we then constructed a theory.

II. MATERIALS AND METHODS

A. Site Selection

Located in the central western part of China, Baoji has vegetation coverage of over 90%. The site of the questionnaire survey is Baoji Botanical Garden (See figure 1) in Shaanxi Province, which was created in 1979 and covers

an area of 1054 mu. There are over 700,000 flowers and plants, which belong to 110 families, 250 genera, and 700 species. Characterized by thick forests and rich plant communities, the botanical garden is an important urban forest.

B. Participants and procedure

To conduct an exhaustive survey, we distributed questionnaires to visitors of different ages in the main scenic spots and recreational areas of the Botanical Garden on sunny days in July 2014. We distributed 150 questionnaires on weekdays and another 150 on weekends. All 300 questionnaires were completed by the respondents with the assistance of six graduate students and a teacher. Of the 300 questionnaires, 15 were subsequently deemed invalid and 285 provided useful data (95%).

C. Survey Design

Base on recognized questionnaire methods, we designed a two-part questionnaire that examined the general characteristics of the visitors, their recreational preferences, and their recreational characteristics.

The recreational preferences and characteristics of the visitors were determined by asking five questions: (1) In which season do you go outside more frequently? (2) What attracts you most in the Botanical Garden?(3) What kind of urban forest landscape space do you like? (4) How long do you spend in the Botanical Garden each time you visit? and (5) How do you reach the botanical garden?

D. Data analysis

The software R v3.2.2 for Win7 was used to analyze the two-factor homogeneity of variance. The preference was Factor 1, and other data such as mode of travel and age group formed Factor 2. There are two *P*-values in the Table: the first refers to Factor 1 and the second to Factor2. The level of significance was taken to be *P*<0.05. The smaller the *P*-value, the more significant the Factor.

III. RESULTS

A. Recreational preferences and educationa background

There was a significant difference in the preferred traveling season by educational level. Of undergraduates and junior college students, 21%, 15%, 9%, and 4% preferred traveling in summer, spring, autumn, and winter, respectively (*P*1=0.011225). There was also a significant difference in the preferred traveling season of respondents with different educational backgrounds (*P*2=0.000298). For example, the numbers of individuals with a Masters or above, bachelors/college, high school/secondary, vocational school, and junior high school or below, who liked to travel in spring ranged from1% 3to 28%. Significant differences (*P*<0.05) were also found in the other preferences of respondents with different educational backgrounds (See table I).

TABLE I THE PROMIMENT DIFFERENCE RECREATIONAL PREFERENCE AND EDUCATION BACKGROUND

| Education background | All Categories combined | | P1 | | P2 | | |
|--|-----------------------------|---|------------------|------------------|-----|----------|----------|
| | Junior high school or below | High school/secondary,vocational school | Bachelor/college | Masters or above | | | |
| In which season do you prefer to travel? | | | | | | 0.011225 | 0.000298 |
| Spring | 32 | 79 | 44 | 3 | 158 | | |
| Summer | 35 | 79 | 61 | 1 | 176 | | |
| Autumn | 21 | 59 | 27 | 0 | 107 | | |
| Winter | 9 | 26 | 10 | 0 | 45 | | |
| What interests you in the botanical garden? | | | | | | 0.000373 | 4.13e-06 |
| fresh air | 23 | 77 | 58 | 2 | 160 | | |
| enjoy the scenery | 29 | 71 | 56 | 2 | 158 | | |
| take a walk | 18 | 53 | 42 | 2 | 115 | | |
| physical exercise | 25 | 53 | 31 | 1 | 110 | | |
| release phychological tensions | 10 | 44 | 43 | 0 | 97 | | |
| contact | 1 | 8 | 2 | 0 | 11 | | |
| local characteristics | 0 | 7 | 8 | 0 | 15 | | |
| close to home | 14 | 31 | 25 | 1 | 71 | | |
| dance | 3 | 6 | 5 | 1 | 15 | | |
| What kind of urban forest landscape space do you like? | | | | | | 0.0340 | 0.0396 |
| densely wooded areas | 36 | 65 | 51 | 1 | 154 | | |
| open and bright space | 30 | 90 | 70 | 2 | 192 | | |
| enclosed space | 3 | 13 | 5 | 0 | 21 | | |
| How much time do you spend in the botanical garden? | | | | | | 0.02802 | 0.00951 |
| 1 hour | 5 | 15 | 13 | 0 | 33 | | |
| 2 hours | 27 | 61 | 41 | 2 | 131 | | |
| 3 hours | 23 | 57 | 40 | 1 | 121 | | |
| How do you get to the botanical garden? | | | | | | 0.00543 | 0.02501 |
| On foot | 32 | 70 | 57 | 2 | 161 | | |
| By bike | 6 | 11 | 12 | 1 | 30 | | |
| Taking public | 12 | 40 | 15 | 0 | 67 | | |

| | | | | | | | |
|--|---|---|---|---|----|--|--|
| transportation | | | | | | | |
| Driving | 3 | 9 | 7 | 0 | 19 | | |
| Jogging | 2 | 3 | 3 | 0 | 8 | | |
| P1 represents prominent difference among recreational preferences, and P2 the prominent difference education background. | | | | | | | |

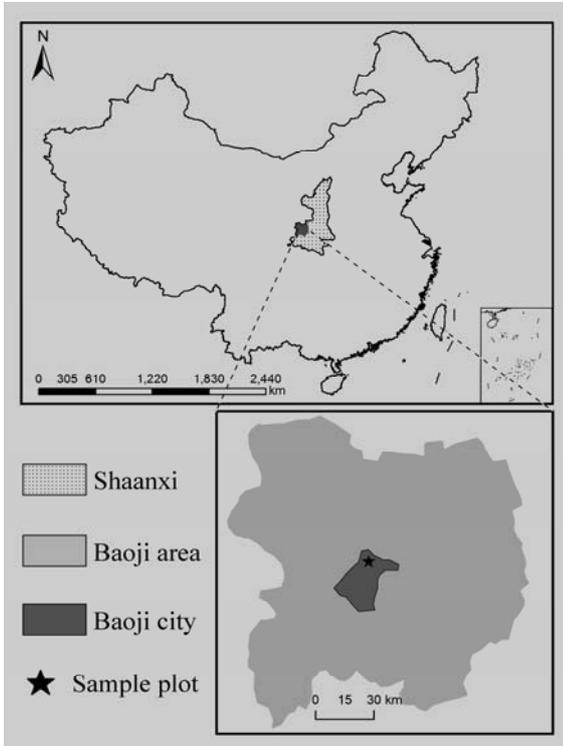


Figure 1. Figure 1. Location of Baoji Botanical Garden

B. Recreational preferences and monthly income

Of people with no income, 3%, 7%, and 6% chose to stay in the Botanical Garden for 1, 2, and 3 hours, respectively ($P1=0.00235$). Of people who stayed for 2 hours, 5% earned more than 5000 yuan a month, while 17% earned 1000- 2500 yuan ($P2=0.00435$). There were also significant differences ($P<0.05$) in the preferences for other items, by income (See table II).

C. Recreational preferences and employment status

When asked about what attracted them most in the Botanical Garden, 13% retired individuals said it was physical exercise, while only 0.7% each said it was personal contact and local characteristics ($P1=0.002605$). There was also a significant ($P1=0.000109$) difference in preferred attraction by employment status. For example, the number of people who preferred walking in the Botanical Garden increased progressively from the unemployed, to people of other backgrounds, to the retired, to students, to the employed. There was also a significant difference ($P<0.05$) in preferences for other items in terms of employment status (See table III).

TABLE II THE PROMIMENT DIFFERENCE RECREATIONAL PREFERENCE AND MONTHLY INCOME.

| | Monthly income | | | | | All Categories combined | P1 | P2 |
|--|----------------|--------|------------|------------|--------|-------------------------|----------|----------|
| | ¥0 | <¥1000 | ¥1000-2500 | ¥2501-5000 | >¥5000 | | | |
| In which season do you prefer to travel? | | | | | | | 0.017001 | 0.00281 |
| Spring | 22 | 17 | 65 | 60 | 13 | 177 | | |
| Summer | 26 | 17 | 67 | 79 | 18 | 207 | | |
| Autumn | 7 | 13 | 58 | 83 | 12 | 173 | | |
| Winter | 2 | 1 | 28 | 2 | 9 | 42 | | |
| What interests you in the botanical garden? | | | | | | | 7.21e-07 | 1.51e-06 |
| fresh air | 22 | 20 | 60 | 39 | 16 | 157 | | |
| enjoy the scenery | 24 | 21 | 59 | 41 | 14 | 159 | | |
| take a walk | 19 | 20 | 39 | 26 | 11 | 107 | | |
| physical exercise | 7 | 15 | 48 | 26 | 7 | 103 | | |
| release pychological tensions | 11 | 20 | 39 | 23 | 6 | 99 | | |
| contact | 8 | 2 | 3 | 4 | 2 | 19 | | |
| local characteristics | 4 | 2 | 5 | 3 | 1 | 15 | | |
| close to home | 7 | 25 | 28 | 15 | 3 | 78 | | |
| dance | 2 | 4 | 9 | 4 | 2 | 21 | | |
| What kind of urban forest landscape space do you like? | | | | | | | 0.00592 | 0.01923 |
| densely wooded areas | 27 | 27 | 62 | 39 | 2 | 157 | | |
| open and bright space | 25 | 40 | 71 | 42 | 4 | 182 | | |
| enclosed space | 5 | 4 | 9 | 3 | 0 | 21 | | |
| How much time do you spend in the botanical garden? | | | | | | | 0.00235 | 0.00435 |
| 1 hour | 8 | 2 | 13 | 9 | 2 | 34 | | |
| 2 hours | 21 | 16 | 51 | 30 | 13 | 131 | | |
| 3 hours | 16 | 14 | 49 | 28 | 13 | 120 | | |
| How do you reach the botanical garden? | | | | | | | 0.00235 | 0.00435 |

| | | | | | | | | |
|------------------------------|----|----|----|----|----|-----|--|--|
| On foot | 21 | 20 | 68 | 36 | 15 | 160 | | |
| By bike | 3 | 4 | 7 | 3 | 2 | 19 | | |
| Taking public transportation | 12 | 5 | 27 | 18 | 3 | 65 | | |
| Driving | 2 | 2 | 7 | 8 | 8 | 27 | | |
| Jogging | 7 | 1 | 4 | 2 | 0 | 14 | | |

P1 represents prominent difference among recreational preferences, and P2 the prominent difference monthly income.

TABLE III THE PROMINENT DIFFERENCE RECREATIONAL PREFERENCE AND EMPLOYMENT STATUS.

| | Employment status | | | | | All Categories combined | P1 | P2 |
|--|-------------------|----------|---------|-----------|-------------------|-------------------------|----------|----------|
| | Unemployed | Employed | Retired | At school | Other information | | | |
| In which season do you prefer to travel? | | | | | | | 0.000665 | 0.043085 |
| Spring | 8 | 55 | 45 | 25 | 29 | 162 | | |
| Summer | 4 | 53 | 48 | 37 | 34 | 176 | | |
| Autumn | 1 | 43 | 42 | 12 | 20 | 294 | | |
| Winter | 0 | 9 | 38 | 2 | 6 | 55 | | |
| What interests you in the botanical garden? | | | | | | | 0.002605 | 0.000109 |
| fresh air | 4 | 52 | 30 | 34 | 35 | 155 | | |
| enjoy the scenery | 4 | 57 | 33 | 36 | 27 | 157 | | |
| take a walk | 2 | 41 | 22 | 29 | 21 | 115 | | |
| physical exercise | 3 | 31 | 38 | 15 | 18 | 105 | | |
| release psychological tensions | 4 | 36 | 8 | 29 | 21 | 98 | | |
| contact | 0 | 1 | 2 | 5 | 1 | 9 | | |
| local characteristics | 0 | 3 | 2 | 6 | 3 | 14 | | |
| close to home | 2 | 23 | 24 | 16 | 12 | 77 | | |
| dance | 1 | 3 | 8 | 2 | 4 | 18 | | |
| What kind of urban forest landscape space do you like? | | | | | | | 1.62e-06 | 1.61e-05 |
| densely wooded areas | 10 | 51 | 37 | 33 | 27 | 158 | | |
| open and bright space | 5 | 61 | 26 | 33 | 33 | 158 | | |
| enclosed space | 3 | 43 | 12 | 26 | 25 | 109 | | |
| How much time do you spend in the botanical garden? | | | | | | | 0.036926 | 0.000133 |
| 1 hour | 1 | 13 | 10 | 7 | 3 | 34 | | |
| 2 hours | 3 | 49 | 24 | 30 | 24 | 130 | | |
| 3 hours | 4 | 42 | 18 | 27 | 30 | 121 | | |
| How do you reach the botanical garden? | | | | | | | 0.00594 | 0.01065 |
| On foot | 4 | 58 | 39 | 37 | 24 | 162 | | |
| By bike | 2 | 6 | 5 | 11 | 14 | 38 | | |
| Taking public transportation | 1 | 28 | 5 | 11 | 14 | 59 | | |
| Driving | 1 | 11 | 0 | 5 | 4 | 21 | | |
| Jogging | 0 | 1 | 3 | 0 | 1 | 5 | | |

P1 represents prominent difference among recreational preferences, and P2 the prominent difference employment status.

IV. DISCUSSION AND CONCLUSIONS

In China, it is quite common that one city copies the landscape of the other regardless of climate, vegetation, water resource, and people's recreational preference. The needs, tastes, and interests of citizens make a city diversified. Thus, it is quite necessary to maintain the diversification of city, create more dynamic space, and respect the recreational preference of local citizens in urban forest construction. Natural resources and recreational functions in urban forests are closely related (See Fig. 2). The urban forest park should match the ecological environment and meet the needs of recreation target groups. We found strong correlations between environmental attitudes, net income, and educational level; and other differences were based on respondent age, gender, employment type, and location of residence[27]. Their requirements and suggestions should be

broadly representative of the general opinions of Baoji citizens. Intangible services and benefits are important for the establishment of urban forests. The forest designer can build a sustainable forest city by taking the opinions of the general public into consideration. Urban forest recreation should primarily match the lifestyle and aesthetic orientation of city residents. According to the analyses summarized in Tables I-III, people prefer traveling in summer (or spring). As winter is long and cold, and imposes restrictions on outdoor activities, planners should place more importance on summer by building cool facilities and reducing strong light to offer a more comfortable environment. Planners should consider the functional requirements at each season.

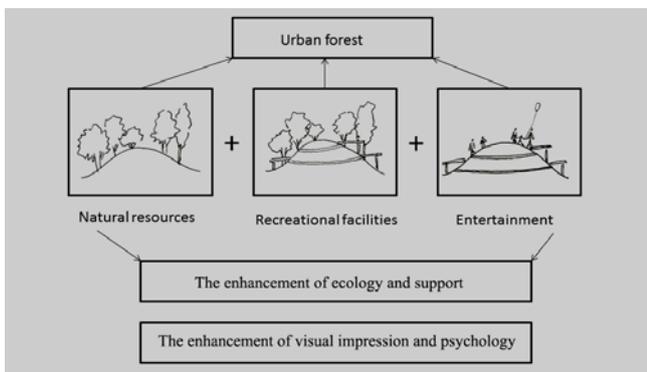


Figure 2. Figure 2. Functions of urban forest recreation

With their different recreation motivations, visitors of each age group take part in different activities. Therefore, consideration of the requirements of each target group is important. Fry [28] proposed that outdoor recreation close to nature was always about visual perception. Although visual perception is intangible, it has a positive impact on health. Urban green space plays an important role in the daily life of city residents and offers visitors a place where they can temporarily seek refuge from crowded streets and buildings and relax [14].

The time respondents spend in the Botanical Garden and their space requirements are of great importance. The visitors to Baoji Botanical Garden suggested holding forest celebrations on festival days such as New Year's Day, Mid-Autumn Festival, and Spring Festival. By knowing the requirements for such activities, different kinds of space can be offered, which should increase the time people spend in the Botanical Garden. Better recreational facilities should be constructed to improve the outdoor experience of Baoji citizens and their quality of life. The urban forest should provide people with a comprehensive recreational place where they can relax and enjoy the scenery safely [29]. The

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above-mentioned studies have promoted the optimization of urban forest establishment.

According to the results of this study, the majority of people visit the garden on foot or by public transportation. They wish to reach the garden within 30 minutes. This is similar to the findings of Koppen [30]. The closer the garden, the better it will contribute to the full use of the recreational functions of its green spaces. Therefore, improved facilities and public transport network distribution are needed to ensure that citizens will reach the urban forest easily and conveniently.

Each city faces different challenges in urban forest development, and the residents of each city have different recreational preferences. The planning and design of urban forests should prioritize the recreational experience of visitors, which will eventually promote the development of tourism in Baoji. In the Chinese context, this means that the urban forests should be in harmony with both the environment and socioeconomic development, thereby accounting for Chinese esthetic principles [31].

Since all of the questionnaires in this survey were identical, the results may not reflect all motivations for visits to urban forests. Moreover, because the questions and responses thereto were fixed, the opinions of the respondents could not be expressed in detail. Additionally, the survey results were based on objective data, while other opinions of respondents were excluded. Thus, the accuracy of the results may be limited and not fully representative of preferences of urban forest recreation in other cities. However, the research approach (questionnaire survey) adopted in this study may be suitable for research on urban forest recreation in other cities.

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