Nakhara: Journal of Environmental Design and Planning (2022)
Volume 21(2), Article 216
DOI: https://doi.org/10.54028/NJ202221216
Article Type: Research Article

User Satisfaction and the Social and Environmental Benefits of Urban Green Spaces: A Case Study of Thimphu City, Bhutan

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Received 2022-09-04; Revised 2022-10-11; Accepted 2022-10-25

ABSTRACT

Urban green spaces provide important recreational, social, and ecological benefits in urban settings. Understanding of the use and benefits associated with green spaces amongst urban residents is crucial in developing appropriate urban green infrastructure strategies. This study explored visitors' levels of satisfaction with the benefits, characteristics, and determined factors influencing visitor satisfaction with urban green spaces. Data were collected through a questionnaire survey from a random sample of 125 visitors from three urban green spaces in the capital city of Bhutan, Thimphu. Visitors' satisfaction with urban parks was assessed based on their quality, social, and environmental benefits. Descriptive statistics and an ordered logistic-regression model were used to analyze the data. Results indicate that visitors were satisfied with quality as well as the social and ecological benefits of green spaces. Results also revealed that factors significantly influencing visitor satisfaction included educational level, frequency of visit, day visit, distance from home, quality of the urban park, social benefits, and ecological benefits. Overall, the study stresses the importance of optimizing green infrastructure planning in order to promote social and environmental well-being in the face of the growing populations in urban areas.

Keywords: urban green space, social benefits, environmental benefits, urban park quality

INTRODUCTION

Urban Green Spaces (UGS) — which include parks, botanical gardens, playgrounds, and residential greenery— constitute key elements of modern urban design (Lafortezza et al., 2013), providing space for the interaction between humans, the built environment, and the natural environment (Adinolfi et al., 2014). According to World Health Organization [WHO], (2016), UGS promote mental and physical health by providing psychological relaxation and stress alleviation, stimulating social cohesion, supporting physical activity, and reducing exposure to air pollutants, noise, and excessive heat. Improving access to UGS in cities is also recognized in United Nations Sustainable Development Goal 11, which aims to make cities and human settlements inclusive, safe, resilient, and sustainable (Maes et al., 2019; Ma et al., 2019).

The various characteristics of UGS offer real benefits to users; notably, proximity, size, and availability affecting the use of UGS as they are interconnected, varied, and complex (Kabisch, 2019; Lee & Kim, 2015; Su et al., 2010)The size of a UGS determines how it is used as larger spaces may be more likely to be used for physical activity, while smaller spaces are more frequently used for socializing and relaxation (Peschardt & Stigsdotter, 2013). The proximity of UGS to residential areas also plays a vital role in park use as people living nearer to a park were four times more likely to use it once a week or more than those living further away (Cohen et al., 2007). Coombes et al. (2010) also mentioned that the frequency of visits declined with increasing distance from the green space.

The qualities and characteristics of urban green space play important roles in providing satisfaction with the use of UGS (Van Herzele & De Vries, 2012). This includes maintenance, availability of facilities, and appeal of the green space, such as a UGS that has features that facilitate physical activity, like good path networks and a perception of safety (Coombes et al., 2010). The presence of larger spaces with green vegetation facilitates the formation of neighborhood social ties in UGS, and it contributes to residents' sense of safety and adjustment (Panter et al., 2008).

Socio-economic characteristics also influence the public's use of UGS. It has been noted that people with low incomes were more likely to adopt low levels of activity and were least well served by affordable facilities of UGS, whereas households with high income were more likely to be in close proximity to any type of UGS (Panter et al., 2008). Zhou and Rana (2012) observed that people with different cultures and educational statuses prefer diverse landscapes, which shows that professional bias also affects the connections between people and nature (Fleming et al., 2016). Cerin et al. (2008) reported that teenagers and older persons were less frequent users, while Cohen et al. (2007) reported on gender differences in green space use, where males were found to use parks more often than females.

Since the benefits derived from UGS are becoming central to urban society, understanding visitors' attitudes and perceptions of UGS is very important for the urban planner (Grahn & Stigsdotter, 2010). The perceptions of green spaces are individually different as they depend on cognitive, affective, and behavioral components (Ma & Dill, 2015). Scholars have widely studied the theories of urban green spaces having a positive influence on residents' well-being (Ekkel & de Vries, 2017) and found that UGS attract residents, and, consequently, promote a general sense of community, decreased feelings of loneliness, and increased social support, which lead to greater personal resilience and wellbeing (Arnberger, 2012).

Mackay and Neill (2010) mentioned that a UGS provides both mental and physical health benefits that researchers refer to as 'green exercise', such as walking or cycling that are usually performed in natural environments like parks. Maas et al. (2009) reported the associations between access to green space and a variety of psychological, emotional, and mental health benefits. Barton and Pretty (2010) have reported that UGS has measurable positive effects on health and well-being that include improving mental wellbeing, enhancing the longevity of the elderly, reducing stress, increasing attentional functioning, and providing positive effects on cognitive functions and psychophysiological states.

One very important role of UGS is to provide social spaces and cultural activities improving social capital and cohesion (Braubach et al., 2017) by providing outdoor spaces where residents can have frequent social interactions

that promote a sense of community, decreasing feelings of loneliness, and increased social support. Moreover, the characteristics of the built environment and amenities of the urban green spaces may be associated with social cohesion (Fan et al., 2011). Moreover, urban green space provides residents with opportunities for contact with the natural environment (Lee & Kim, 2015).

UGS is also essential in mitigating high summer temperature heat and is vital in air pollution removal and noise abatement (Escobedo et al., 2011). Other environmental benefits include improving air quality, mitigating noise, and limiting urban heat island effects (Sicard et al., 2018). Moreover, Chen and Jim (2008) stated that urban green space also acts as a second classroom for children as it helps in the development of imagination and a sense of diversity. Additionally, it also serves as a good site for scientific studies of vegetation, animal science, and ecology (Zhou & Rana, 2012).

Due to economic progress and globalization, developing countries are going through rapid urbanization and expansion, to which Bhutan is no exception. After the introduction of the first five-year plan in 1961, Bhutan began to witness fast changes in its economic progress (Yangzom et al., 2017). Thimphu city, the capital of Bhutan, was the first settlement to undergo urbanization and expansion, and Thimphu now hosts more than a fifth of the country's total population, with numbers expected to double by 2030 (Khamrang, 2020).

The Strategic Environmental Assessment of the Thimphu Structure Plan (TSP) developed by the Ministry of Work and Human Settlement (MoWHS), clearly points out that the development of recreational spaces needs to be prioritized in order to facilitate a good quality of life in the city. The absence of well-designed and organized UGS limits opportunities for local residents to gather, socialize, and experience elements of wholesome living. Without these spaces, residents will have to travel further, and children will be compelled to play in unsafe areas such as the streets, parking lots, and vacant plots, or they will be confined in their apartments, leading to an environment of urban isolation. This study, therefore, framed questions such as:

1. What are the characteristics or features of good urban green spaces or urban parks that allow visitors to use them for optimal benefit?
2. Do urban green spaces provide social and environmental benefits to the users?.

The objectives of the study were to assess, in the capital city of Thimphu, Bhutan, satisfaction with the quality of UGS and their perceived social and environmental benefits. The study also identified factors influencing satisfaction with urban green spaces. The results of our study are crucial for environmental planning and green infrastructure development in urban areas to promote social and environmental well-being.

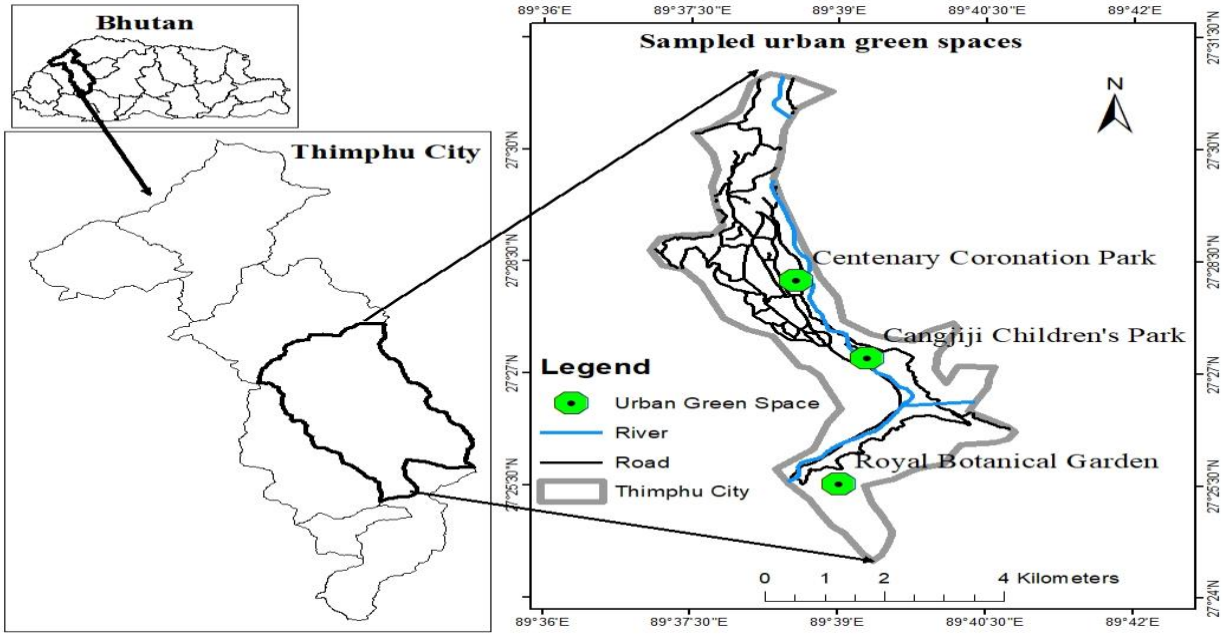
METHODS AND MATERIALS

Study area

The study was carried out in three UGS within Thimphu city (27.4712° N, 89.6339° E), the capital of Bhutan. The population of Thimphu in 2017 was 138,736 (National Statistics Bureau [NSB], 2018), making it the most populous city in the country. With increasing rural-urban migration and a growing population, rapid development is turning the city's expansion into an urban sprawl that has changed the socio-spatial structure of the city. The three UGSs (Figure 1) were chosen using stratification samples based on the representativeness of the various urban locations, and encompassing a range of socioeconomic settings, sizes, designs, infrastructure, and landscape features. The Centenary Coronation Park, which was inaugurated in 2006, is located in the heart of the city below Changlimithang football stadium and adjacent to the Wangchu River. The park was established to honor the coronation of His Majesty the Fifth King Jigme Khesar Namgyal Wangchuck, upon his ascension to the throne of Bhutan. The park has an area of 5.6 acres situated along the river bank, with a playground, stone-paved walks, canopy structures, and benches. Small sand football fields, a miniature basketball court, and swings and slides are also present. The park features a 45-foot tall statue of a walking Buddha. In addition, the park has gardens with more than 60 different kinds of flowers and plants.

Figure 1

Map Showing Study Area and Sampled Urban Green Spaces



The Changjiji Children's Park was opened in 2015 and is located within closed residential areas. The park was built along with a community library and resource center, which is the part of Rural Education and Development Center. The inauguration of the park and the center coincided with the anniversary of the birth of His Majesty the Fourth Druk Gyalpo of Bhutan. The park has a playground, outdoor gyms, play stations, and a prayer wheel. The park is also intended to promote social cohesion among the residents of the housing colony, which has more than 600 tenants.

The Royal Botanical Garden was constructed in 1999 to commemorate the silver jubilee of His Majesty the Fourth King's golden reign. It is located to the south, and lies at the periphery of the city. It is the only botanical garden in the country, and has a total area of 32 acres. The garden was established to provide a site for ex-situ conservation of plant species, educational resources for users and students, and a recreational site for the public (National Biodiversity Center [NBC], 2022). Today, it has over 800 species of native plants, footpaths, a children's play area, greenhouses and nurseries, an orchid house, and a glass house. The entry fee for this garden is Nu. 40, whereas the other two UGS have no entry fees.

Sampling procedures and data collection

The study targeted a population of visitors to the three UGS. The survey of visitors was administered using a semi-structured questionnaire with both closed and open-ended questions. An opportunistic approach was utilized, which entailed interviewing any park visitors willing to participate over two days of sampling at each space. The sample unit is days and consists of visitors who utilized the green space on any weekday (Monday to Friday) or either weekend day (Saturday and Sunday). The authors and enumerators spent the entire day on each day of sampling in the UGS in order to achieve sampling across a full range of visitors to the green spaces during three time periods: the morning (8 am-noon), afternoon (noon - 5 pm), and evening (5 pm - 7 pm). These specific days and times were selected to gain a representative profile of garden visitors and an adequate sample size, representing visitors with different socio-economic characteristics and demographic variables including age, gender, education, and professional background, among others. The adequacy of the sample size was validated by literature review of similar prior research (Paul & Nagendra, 2017), which reported a saturation

point where further new responses were not varied, yet providing an adequate and representative sample. A total of 125 respondents were interviewed by the authors during two days spent at each site (one weekday and one weekend day), across all three sites, with the help of three enumerators. Data collection was carried out in the months of October and November 2020.

Research instrument

The research instrument was a semi-structured questionnaire consisting of four parts labeled from A to D. The questionnaire was prefaced with an explanation of the purpose of the study and a statement about the definition of UGS. The first section of the survey comprised questions about socio-demographics. The second part included questions about frequency characteristics such as frequency of visit, time of visit, distance from home, and duration of visit. The third part dealt with questions about the quality of the UGS such as characteristics, facilities, and infrastructure development. The fourth part of the survey measured understanding or perception of the benefits of UGS.

Ten green space benefits referenced broadly in the literature were selected, and the respondents' level of agreement against each statement was measured using a 5-level Likert scale (1= Very dissatisfied, 2=Dissatisfied, 3= Moderately satisfied, 4= Satisfied, 5= Very satisfied). The 10 Likert items included a balanced distribution among 5 social benefits and 5 environmental benefits. Similarly, 10 Likert items for the quality of urban green space were identified. The reliability of the Likert items was tested using Cronbach's Alpha. According to Taber (2018), in which 0.7 is a sufficient measure of the reliability of an instrument. In this study, quality (α = 0.857), social benefits (α = 0.790), and environmental benefits (α = 0.836) items each showed high reliability with an alpha value of more than 0.7.

Data Analysis

The quantitative data were analyzed using R version 4.1.1. Descriptive analysis items such as mean, frequency, and the percentage were identified to analyze the data. An ordered logit model was conducted to determine factors influencing satisfaction with use of urban green spaces. The ordered logit model is used with dependent variables with more than two responses (Harrell, 2015; McKelvey & Zavoina, 1975) and it is more robust and offers more advantages than the ANOVA used for categorical outcome variables (Jaeger, 2008). The dependent variable is the satisfaction derived from the use of the urban green spaces, and explanatory variables are those hypothesized to influence the satisfaction (Table 1). Respondents' satisfaction with each green space was rated on a 5-point Likert scale on three aspects: quality, social benefits, and environmental benefits. These aspects contain a number of items; therefore, a composite score of each of these aspects was obtained using factorial analysis. Generating composite scores using weighted factor scores is essential for scores to be used as independent or dependent variables (Starkweather, 2012).

In R, factanal() function is used to conduct factorial analysis, and Thompson's estimator (scores= "regression") was used to estimate factor scores (Hartmann et al., 2018).

The ordered logit model used in the study is based on Equation (1):

$$y_i^* = \beta' X_i + \epsilon \quad (1)$$

where y_i^* is the unobserved measure of the satisfaction (dependent variables), X_i is the vector of explanatory variables, β' is the vector of regression coefficient to be estimated, and ε is the error effect.

The ordered-logistic regression model used in the study to determine the factors influencing the satisfaction on urban green space is given by Equation (2):

$$SAT = \beta0 + \beta1\ AGE + \beta2\ GEN + \beta3MAS + \beta4OCC + \beta5EDL + \beta6MOI + \beta7FQV + \beta8WEK + \beta9DAY + \beta10DSP + \beta11DIS + \beta12MTT + \beta13QLT + \beta14SOB + \beta15EOB + \varepsilon \quad (2)$$

In R, the lrm() function, which is designed to fit a logistic regression model, is used to perform the ordered logit model (Harrell, 2015; Zhang & Kattan, 2017).

Table 1

Variables used in the Ordered Logit Model to Determine the Factors Influencing the Satisfaction with Urban Green Space

Variables	Logit name	Measurement descriptions
Dependent		
Satisfaction	SAT	Satisfaction with urban green space (1= Very dissatisfied, 2=Dissatisfied, 3=Moderately satisfied, 4= Satisfied, 5= Very satisfied)
Independent		
Age	AGE	Age of respondents (years)
Gender	GEN	Gender of respondents (dummy variable, 1=Male, 2=Female)
Marital status	MAS	Marital status of respondents (1=married, 2=Single, 3=Divorced)
Occupation	OCC	Occupation of the respondents (1= Government, 2= Private, 3= Housewife/husband, 4= Pensioner, 5= Students, 6= Unemployed)
Education level	EDL	Education level of the respondents (1=Uneducated, 2= Primary or middle school, 3= High School, 4= Bachelor Degree, 5= Post Graduate, 6= Monastic education)
Monthly income	MOI	Monthly income of the respondents (1= < Nu. 20,000, 2= Nu. 21,000-40,000, 3= Nu. 41,000-60,000, 4= Nu. 61,000-81,000)
Frequency of visit	FQV	Frequency of visits by the respondents (1= Every day, 2= Several times a week, 3= Once a week, 4= Once or twice a month, 5= A few times a year, 6= At least once a year)
Week visit	WEK	Visit during week (1= During weekdays, 2= During weekends)
Day visit	DAY	Visit during day (1= Morning hours (8am- noon), 2= Afternoon (Noon-5pm), 3= Evening (After 5 pm-7pm)
Duration spent	DSP	Time spent in urban green space (1 = Less than 1 hour, 2= 1-2 hours, 3= 2-3 hours, 4= More than 3 hours)
Distance	DIS	Distance between home and the green urban space (1= Within 1km, 2= 1-2 km, 3= 2-5 km, 4= 5-10km, 5= More than 10 km)
Mode of transport	MTT	Mode of transport used for visiting green spaces (1= Taxi, 2= Personal car, 3= Walking, 4= Bicycle)
Quality	QLT	Characteristics, facilities, and infrastructure development in urban green spaces (factorial analysis)
Social benefits	SOB	Perceived social benefits from urban green spaces (factorial analysis)
Environmental benefits	EOB	Perceived environmental benefits from urban green spaces (factorial analysis)

RESULTS

Demographic characteristics of the respondents

Table 2 shows demographic variables — age, gender, marital status, occupation, education, and monthly incomes — of the participants. The majority of the respondents were female and dominated by the 19-35 year old age group. A slight majority of respondents were married, and most were educated, with a monthly income of less than Nu. 40,000. With respect to occupation, most of the visitors were government workers or students, followed by those who worked in the private sector.

Table 2

Socio-Economic Characteristics of the Visitors

Variable (n=151)		Frequency	Percentage
Gender	Male	58	46.4
	Female	67	53.6
Age	15-18	18	14.4
	19-35	79	63.2
	36-50	16	12.8
	Above 50	12	9.6
Education	Uneducated	11	8.8
	Primary and middle school	25	20.0
	High School	31	24.8
	Bachelor Degree	50	40.0
	Post Graduate	6	4.8
	Monastic education	2	1.6
Marital status	Married	62	49.6
	Single	59	47.2
	Divorced	4	3.2
Occupation	Government	41	32.8
	Private	26	20.8
	Housewife/husband	17	13.6
	Depends on pension	2	1.6
	Students	34	27.2
	Unemployed	5	4
Monthly income	Nu. Below 20,000	60	48.0
	Nu. 21,000-40,000	51	40.8
	Nu. 41,000-60,000	8	6.4
	Nu. 61,000-81,000	6	4.8

Visiting characteristics of the visitors

The visiting characteristics of the respondents, including frequency, time of day, duration of time spent, mode of transport to visit the urban space, and the distance between home and the urban space, are presented in Table 3. The frequency of visits to urban green spaces varied greatly, with the largest group of respondents being those who visit a few times a year. Respondents mostly visited during the afternoon and on the weekends, and most of them reported spending 1-2 hours in the green spaces. The majority of the respondents traveled to the urban space by personal car, with the distance between home and the green space ranges from than 1 km to more than 10 kms.

Table 3

Visiting Characteristics to the Urban Green Spaces

	Variable (n=125)	Frequency	Percentage
Frequency of visits	Everyday	10	8.0
	Several times a week	16	12.8
	Once a week	21	16.8
	Once or twice a month	29	23.2
	Few times a year	41	32.8
	At least once a year	8	6.4
Week visit	During weekdays	29	23.2
	During weekends	96	76.8
Day visit	Morning hours (8 am-noon)	14	11.2
	Afternoon (Noon - 5 pm)	94	75.2
	Evening (5 pm - 7 pm)	17	13.6
Duration spent	Less than 1 hour	18	14.4
	1-2 hours	71	56.8
	2-3 hours	23	18.4
	More than 3 hours	13	10.4
Distance	Within 1km	22	17.6
	1-2 km	24	19.2
	2-5 km	31	24.8
	5-10km	22	17.6
	More than 10 km	26	20.8
Transport	Taxi	26	20.8
	Personal car	68	54.4
	Walk	30	24.0
	Bike	1	.8

Respondents' satisfaction with urban green space

Results from questions about the respondents' satisfaction with the three urban green spaces are shown in Figure 2. Overall, the visitors were satisfied with urban green spaces (mean= 3.99, standard deviation= 0.746). Respondents found visiting Serbithang Botanical Garden more satisfying than the other two parks. This could be due to the fact that this garden is maintained with adequate facilities such as restrooms, which other UGS lack. Moreover, it has better environmental characteristics, such as more greener area due to higher coverage of trees and plants. Details of each attribute regarding the satisfaction with urban green spaces are provided below.

Satisfaction with quality of urban green space

The respondents' satisfaction with the urban green spaces derived from the qualities of those green spaces as shown in Table 4. The average satisfaction ranged from 3.18 to 4.09 with an overall mean of 3.81, indicating that respondents were satisfied with the quality of the urban green spaces. The respondents rated the availability of trails and paths for movement, places to sit and rest, presence of rich natural plants, presence of grass lawns and flower gardens, and overall naturalness of landscape with clean air, as the factors with the highest satisfactory quality (mean > or = 4), while the presence of children's playgrounds, an abundance of tall trees with a good canopy, and the availability of waste bins provided the second highest satisfaction group (mean 3.5-4), and clean restrooms and light facilities accounted for the least satisfaction in visiting the urban green spaces (mean < 3.5).

Satisfaction with social benefits derived from the urban green space

The overall mean for social benefits derived from the utility of urban green space was 4.09 (Table 5) indicating that respondents were satisfied with the social benefits of using the green space. The results show that respondents were satisfied, with a mean value ranging between 4.05 and 4.3, with all social benefits, such as improving health and wellbeing, recreation opportunities, exposure to nature, fostering social cohesion, and enhancing the city's image. Visitors rated highest satisfaction with urban green space as opportunities for outdoor activities or recreation (mean=4.26, SD=0.67), followed by enhancing health and wellbeing (mean=4.18, SD=0.81), providing a place to come into contact with nature (mean=4.1, SD=0.79), enhancing the city's image (mean=4.12, SD=0.71), and fostering social cohesion (mean=4.05, SD=0.8).

Figure 2

Visitors' Satisfaction with Green Urban Spaces

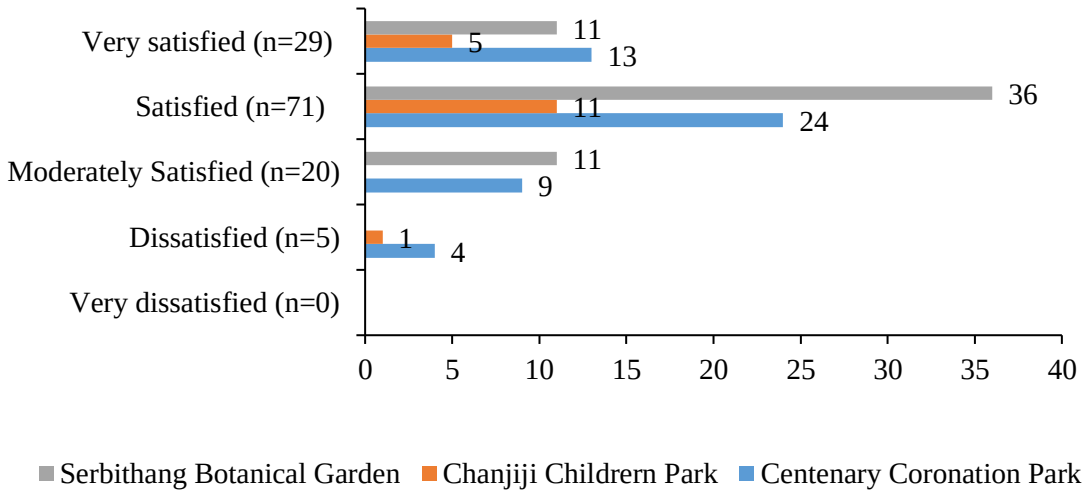


Table 4

Distribution of Respondents according to their Satisfaction with Quality of UGS

	Very dissatisfied		Dissatisfied		Moderately satisfied		Satisfied		Very satisfied		Mean	SD
Quality	F	%	F	%	F	%	F	%	F	%		
Trails and path for movement	2	1.6	5	4	4	3.2	84	67.2	30	24	4.08	0.76
Places to sit and rest	2	1.6	6	4.8	8	6.4	71	56.8	38	30.4	4.1	0.84
Clean restrooms	10	8	20	16	43	34.4	41	32.8	11	8.8	3.18	1.07
Children playgrounds	3	2.4	18	14.4	13	10.4	73	58.4	18	14.4	3.68	0.97
Presence of rich natural plants	0	0	8	6.4	23	18.4	55	44	39	31.2	4	0.87
Grass lawns and flower gardens	1	0.8	6	4.8	14	11.2	64	51.2	40	32	4.09	0.83
Abundance of tall trees with good canopy	0	0	11	8.8	17	13.6	68	54.4	29	23.2	3.92	0.85
Overall naturalness of landscape with clean air	0	0	8	6.4	15	12	64	51.2	38	30.4	4.06	0.83
Waste bin	5	4	19	15.2	18	14.4	59	47.2	24	19.2	3.62	1.08
Illumination (Light facilities)	2	1.6	18	14.4	52	41.6	42	33.6	11	8.8	3.34	0.89
Overall satisfaction											3.81	0.9

Table 5

Distribution of Respondents according to their Satisfaction with Social Benefits from UGS

Social benefits	Very dissatisfied		Dissatisfied		Moderately satisfied		Satisfied		Very satisfied		Mean	SD
	F	%	F	%	F	%	F	%	F	%		
Enhance health and wellbeing	2	1.6	4.18	0.81	14	11.2	61	48.8	46	36.8	4.18	0.81
Provide contact with nature	2	1.6	4.1	0.79	9	7.2	75	60	35	28	4.1	0.79
Opportunities for outdoor activities/recreation	0	0	4.26	0.67	7	5.6	70	56	45	36	4.26	0.67
Foster family-social cohesion	2	1.6	4.05	0.8	16	12.8	70	56	34	27.2	4.05	0.8
City image enhancement	1	0.8	4.12	0.71	13	10.4	74	59.2	35	28	4.12	0.71
Overall satisfaction											4.09	4.14

Satisfaction with environmental benefits derived from the urban green space

The average satisfaction ranged from 3.82 to 4.05, with an overall mean of 3.90, indicating respondents are satisfied with the environmental benefits derived from the urban green space (Table 6). Urban green spaces are mainly established in city areas to provide visitors with environmental benefits. When all five environmental benefits are assessed, all variables provided a similar level of satisfaction without a large variation although visitors expressed that they were more satisfied with urban green spaces in promoting biodiversity conservation and creating environmental awareness (mean=4.05, SD=0.96), while they rated satisfaction levels (mean=3.91) with urban green space in terms of its effect on reducing urban air pollution and the urban heat island effect equally. Similarly, visitors identified the same satisfaction level (mean=3.82) with both urban green spaces' impact on sequestrating carbon dioxide and buffering of noise pollution.

Factors affecting respondents' level of satisfaction with urban green spaces

The socio-economic characteristics, the frequency of visits, and the facilities, social benefits, and environmental benefits are hypothesized to influence the satisfaction with the use of urban green space as depicted in Table 7. The chi-squared value of 60.60 shows significant likelihood ratio statistics ($P < 0.01$), suggesting many variations in respondents' satisfaction. The pseudo-R^2 was 0.431, indicating that the explanatory variables explained 43.1% of the variation in respondents' satisfaction with using the urban green space. The findings show that educational level, frequency of visits, day of visit, distance from home, quality, social benefits, and environmental benefits were significant determinants of respondents' satisfaction, while the variables of age, gender, marital status, occupation, income, duration spent, and mode of transport are not significant predictors.

Educational level of the respondents showed the effect of availing urban green space on satisfaction was negatively significant. The probability of being satisfied with the urban green space was 0.564 times smaller for respondents with higher education than for those who had a lower level of education. Similarly, the results for frequency of visits shows a negative significant contribution to the satisfaction with urban green spaces. The odds of satisfaction were found to decrease by a factor of 0.718 when respondents visited urban green spaces less frequently, i.e., monthly or yearly. Furthermore, the time of day influenced the likelihood of visitors' satisfaction with the urban green spaces. The odds of satisfaction were found to decrease by a factor of 0.344 when visitors visited urban spaces in the evening. The results also revealed that greater distance from home negatively satisfied the visitors with urban green spaces. For every one kilometer increase in distance, the odds of being satisfied with urban green spaces decreased by 0.646, holding constant all other variables. The results for facilities confirmed that respondents are satisfied with the urban green spaces. For every one-unit increase in facilities, the odds of being satisfied with urban green spaces increase by 3.490, holding constant all other variables. The social benefits results indicate a negatively significant contribution to the satisfaction of urban green spaces. The odds of satisfaction were found to decrease by a factor of 0.287 when respondents derived social benefits. The environmental benefits were also a significant determinant of respondents' satisfaction with urban green space. The odds of satisfaction were found to increase by a factor of 2.806 when respondents obtained environmental benefits.

Table 6

Distribution of Respondents according to their Satisfaction with Environmental Benefits from UGS

Environmental benefits	Very dissatisfied		Dissatisfied		Moderately satisfied		Satisfied		Very satisfied		Mean	SD
	F	%	F	%	F	%	F	%	F	%		
Diminution of urban air pollution	1	.8	4	3.2	32	25.6	56	44.8	32	25.6	3.91	0.84
Reduction of the urban heat island effect	1	.8	3	2.4	37	29.6	49	39.2	35	28.0	3.91	0.86
Carbon dioxide sequestration	1	.8	5	4.0	41	32.8	47	37.6	31	24.8	3.82	0.88
Biodiversity promotion and environmental awareness	3	2.4	4	3.2	24	19.2	47	37.6	47	37.6	4.05	0.96
Helps in anthropogenic noise buffering	1	.8	9	7.2	35	28.0	47	37.6	33	26.4	3.82	0.94
Overall satisfaction											3.90	0.90

Table 7

Ordered-Logit Model Estimates of Factors Determining the Satisfaction of Urban Green Space

Variables	Coeff.	S.E	P-value	Odd ratio
Age	0.10	0.26	0.697	1.106
Gender	-0.49	0.41	0.232	0.613
Marital status	-0.01	0.40	0.990	0.995
Occupation	0.05	0.15	0.751	1.048
Education level	-0.59	0.21	0.006***	0.557
Monthly income	0.44	0.29	0.135	1.552
Frequency of visit	-0.33	0.19	0.085*	0.718
Week visit	0.67	0.63	0.291	1.948
Day visit	-1.07	0.43	0.012**	0.344
Duration spent	0.35	0.25	0.173	1.414
Distance	-0.44	0.18	0.014**	0.646
Mode of transport	-0.18	0.23	0.423	0.833
Quality	1.98	0.35	<0.0001***	7.208
Social benefits	-1.25	0.61	0.039**	0.287
Environmental benefits	0.94	0.51	0.067*	2.564
R^2	0.431			
Chi-square	60.60***			
	(df = 15)			

Note. *p<0.1; **p<0.05; ***p<0.01

DISCUSSION

Satisfaction with the quality of urban green space

Overall visitors were satisfied with the urban green spaces as well as quality of UGS. The result is consistent with that of Coldwell and Evans (2018), Gozalo et al. (2019), Nath et al. (2018), and Southon et al. (2018), who found that visitors were satisfied with the urban green space. In the current study, user satisfaction with the built environment such as infrastructure development and facilities, as well as natural environment such as plants, trees, lawns, and natural landscape was measured. The satisfaction with the availability of facilities in UGS is consistent with the work of Cerina et al. (2017), in which respondents were satisfied with green spaces facilities. Our findings also corroborate the results of Madureira et al. (2018), who found that half of the respondents were satisfied with both the quantity and quality of public green spaces. When a UGS has features that facilitate physical activity, such as good path networks and a perception of safety (Coombes et al., 2010), the facilities in the UGS are directly associated with its utility. Moreover, Francis et al. (2012) found that the quality of the space, as determined by factors like the presence of walking paths, places to sit and rest, washroom facilities, lighting, playgrounds, and abundance of trees and naturalness, was more important than quantity, which was also observed in this study. People choose to use green spaces not only by looking at their features but also the conditions of facilities and features. For example, places which are in disrepair are less likely to be visited and are perceived as unsafe (Bedimo-Rung et al., 2005).

Satisfaction with social benefits derived from the urban green space

The findings about visitors' satisfaction with urban green spaces in terms of social benefits in this study are supported by the findings of Zhou and Rana (2012), who disintegrated the social benefits of urban green spaces into recreational opportunities, aesthetic pleasures, improving psychological and physical health, strengthening social bonds, and offering educational prospects. The results are also congruent with the findings of Morris (2003), who discussed the positive effects of urban green spaces on psychophysical well-being. Urban green spaces have been connected to physical and psychological benefits due to their putative effects on physical activity (Lee & Maheswaran, 2011). Urban spaces that are conducive to physical exercise are especially important for health benefits such as disease prevention, good mental health and well-being, and other psychological benefits (Astell-Burt & Feng, 2020; Liu et al., 2022; Nutsford et al., 2013). In the current study, respondents were satisfied with the quality of the UGS, particularly with trails and footpaths, places to sit and rest, the presence of children's playgrounds, and illumination facilities. These facilities might have allowed visitors to perform desired physical activities, and to interact with other visitors, thereby enabling them to derive social benefits from the UGS. Moreover, a number of previous studies have found that urban green spaces provide a place for social interaction, and help in building social cohesion (Jennings & Bamkole, 2019; Peters et al., 2010; Wan et al., 2021). People visit urban green spaces for various reasons, including physical activities, contact with nature, and trips with family and friends, among others that are essential for improving physical and mental health and promoting social cohesion.

Satisfaction with environmental benefits derived from the urban green space

Our study and others (Braubach et al., 2017; Chen et al., 2019) have found that people were satisfied with the environmental benefits of the urban green spaces. The green spaces are crucial in provisioning environmental benefits like reducing air pollution, controlling the urban heat island effect, sequestrating carbon dioxide, promoting environmental awareness, and buffering noise pollution (Dzhambov & Dimitrova, 2014; Jaung et al., 2020; Selmi et al., 2016). Moreover, in the current study areas, visitors were satisfied with environmental facilities such as the presence of plants, grass lawns, flower gardens, trees with good canopy, and the overall

naturalness of the landscape. The presence of these facilities might have led visitors to perceive the environmental benefits of the UGS, enhancing their satisfaction. Similarly, Bonnes et al. (2007) and Wang and Zhao (2021) revealed that visitors were more satisfied with good environmental quality of the urban green spaces as they perceived that it provided better environmental benefits.

Factors affecting respondents' level of satisfaction with urban green spaces

The findings show that educational level, frequency of visits, day of visit, distance form home, quality, social benefits, and environmental benefits were significant determinants of respondents' satisfaction. Education is necessary for visitors to understand the quality of the urban spaces, and their social, and environmental benefits. The heterogeneous environment in the three green spaces might have provided respondents with different levels of satisfaction; for instance, the levels of plant and tree diversity and coverage is relatively higher in the Serbithang Botanical Park than in two other parks. Moreover, with higher education, visitors will better understand the positive impact of the urban green infrastructure. Our results are consistent with a study by Duan et al. (2018) that found that urban space users with higher education levels are most sensitive to the impacts of the urban green infrastructure of public urban spaces on human well-being.

Our findings are also in line with the results of Zuniga-Teran et al. (2019), which showed that the frequency of weekly visits influenced people's satisfaction with the green spaces, although they did not find significant results for monthly or yearly visits. Moreover, the study also revealed that the probability of greenspace visitation is influenced by perceptions of safety, surveillance, and spaces that allow for social interaction. Visitation to parks is influenced by several factors, including the proximity, ability to meet specific needs of visitors, and green space quality.

Furthermore, the time of day was found to negatively influence the likelihood of visitors' satisfaction with the urban green spaces. This could be due to more crowds or congestion in the evening or at night. One previous study (Shan, 2020) has shown that people often visit urban spaces at night and on weekends to avoid the blazing noonday sun. The result also revealed that greater distance from home negatively satisfied the visitors with urban green spaces. In short, the larger the distance between the public green space and home, the more a visitor's satisfaction is likely to be negatively impacted. Having to travel a longer distance mostly demotivates individuals to visit the urban spaces. Previous studies (Conedera et al., 2015) have confirmed that the proximity of an urban green spaces to a user's residence is presumed to enhance the quality of life, thereby increasing satisfaction from the use of the urban space. Nearby urban green spaces provide immediate access, allowing people to contact nature, and to have a potential venue for meeting with neighbors, enabling social cohesion and social well-being (Kuo et al., 1998).

The results for facilities also confirmed that respondents are satisfied with the urban green spaces. It can be concluded that urban spaces with better facilities encourage people to visit more often and stay for longer a longer duration, increasing their satisfaction. In most cases, ample facilities serve the purposes of visitors and lead to a more inviting environment. For instance, the availability of places to sit and rest will have an impact on the amount of time spent in the UGS. These findings support the result of previous studies (Artmann et al., 2017; Van Dinter et al., 2022) that confirmed that adequate and improved facilities encourage people to visit and be satisfied with urban green spaces.

Despite the importance of urban green spaces with respect to social benefits such as boosting positive emotions, reducing stress, and improving human health (Gascon et al., 2015; Kondo et al., 2018; Maas et al., 2009), their effect on respondents' satisfaction is negatively significant. This could be because respondents did not immediately realize the social benefits, or because they were mostly influenced by the environmental benefits. A previous study found that distance between home and urban green spaces reinforced negative perceptions of urban green spaces, indicating priority for provision of spaces near people's homes (Jim & Shan, 2013). In contrast, a number of studies (Irvine et al.,

2013; Reyes-Riveros et al., 2021; Wang et al., 2022) have found a positive effect of urban green space on users' satisfaction with social benefits.

The environmental benefits were a significant determinant of respondents' satisfaction with urban green space. In fact, better environmental quality of the green spaces through improved greenery and scenery creates areas that are conducive to more satisfying visits. Accordingly, it is plausible that the higher the environmental advantages offered, the greater the likelihood of visitors' overall satisfaction with the green spaces. These findings are aligned with the results of Arghavani et al. (2020), Lopez and Souza (2018), and Song et al. (2020), who associated environmental benefits with respondents' satisfaction with urban green spaces.

Results show that age, gender, and marital status are not significant determinants of satisfaction. This may be attributed to the fact that these respondents did not really vary in their views of facilities, social benefits, and environmental benefits. Therefore, respondents' satisfaction gained from visiting urban green was similar among different gender and age groups. Our finding contradicts Dasgupta et al. (2022), who found that marital status significantly influenced people's satisfaction with the green spaces. Further, Ma et al. (2019) found that marital status has a significant impact on the usage of urban green spaces. The findings also reveal that the influence of occupation and income on respondents' satisfaction with green spaces was insignificant. It seems that the decision to visit public green spaces is not defined by the occupations or incomes of the visitors, but by other factors and the benefits obtained from the urban spaces. Despite our expectations, the day of visit and duration of time spent in green spaces were insignificant in terms of their satisfaction. This could be attributed to the fact that respondents did not equate satisfaction with urban green spaces with the amount of time spent in the space. The mode of transport was also not a significant predictor of satisfaction with the urban green spaces. However, difficulties faced due to mode of transportation did lead to dissatisfaction with the urban green spaces.

CONCLUSION

The study examined the satisfaction of urban green space users based on the availability of facilities (quality), social benefits, and environmental benefits. Moreover, factors influencing satisfaction with urban green spaces were also determined. We concluded that respondents were satisfied with quality, and social and environmental benefits gained from the urban green spaces. The results of the ordered-logit model indicated that education level, frequency of visit, time of day, distance from home, quality, and social and environmental benefits influenced users' satisfaction with the urban green spaces. Therefore, urban green spaces must be improved and upgraded with basic facilities and green infrastructure to enhance the image of the urban spaces and to attract more visitors so as to enhance the level of social benefits. In a similar way, urban spaces must be well developed with nature and greenery to avail more environmental benefits. Further, it is recommended to create more small green spaces to minimize the need to travel far from home to reach green space. Overall, better quality and characteristics of the public green spaces mediated the relations among urban green spaces, social, and environmental benefits. Therefore, it is recommended that urban green spaces must be initiated in the town and cities for a variety of reasons it provides in terms of social and environmental advantages.

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