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Recreational Opportunities and Services from Ecosystem Services Generated by Public Parks in Megacity Karachi-Pakistan

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Abstract: Urban public parks and green spaces could generate a wide variety of ecosystem services as well as pattern of public parks and green space and behavior of park user in Karachi city. The economic value that is not for monetary gain benefits were evaluated by the willingness to pay (WTP) approach through the contingent valuation method. A questionnaire was used to collect data by face-to-face interviews of 200 respondents in the 15-60 age group, representing two different socio-economic gradients (high and low income; Defence Housing Authority and Gulburg Town). Residential areas were chosen by a clustered sampling framework. Prophylactic methods were used to minimize sampling and survey prejudices. In general, residents in both areas have a dual nature (positive and negative) approach towards the current performance of public parks and green spaces and the negative impacts from public parks and green spaces are of relatively high importance. Respondents' socioeconomic factors are not highly related with their knowledge of ecosystem services created by public parks and green spaces in Karachi city. Public parks especially neighborhood parks were the most popular sites, whereas residential green spaces served as alternative parks. Visitation is mainly influenced not only by accessibility but also other factors including good quality of environment. Urbanities of Karachi City have realistic desires for passive recreation opportunities with submissive expectation for privacy and solitude. A precise estimate of average WTP was Pak Rs.10.00/person/day (US$1.00=Pak Rs.58.00 in 2004), which was not a high entrance fee. It is evident that WTP was considerably related with income, and its minimal effect verified by a systematic (statistical) probit model intimated at the conduct of urban public parks and green spaces as superior goods.

Keywords: Amenity use, Contingent valuation, Ecosystem Service, Karachi; Pakistan, Public parks and green spaces, Recreation use.

1. INTRODUCTION

Urban parks and green spaces have a tactical importance for the quality of life in increasingly urbanized society (Anwar 2008). Increasing empirical evidence (Greenhalgh and Worpole 1995); (Dunnett, Swanwick and Woolley 2002) (Taylor and Coalter 2001), indicates that the presence of natural assets (i.e. urban parks and forests, green belts) and components (i.e. trees, water) in urban contexts contributes to the quality of life in various styles. Quantitative valuation of ecosystem services of recreational prospects of urban green spaces is needed as a component for urban land use planning (Tahvanainen *et al.,* 2001).

This method is applicable to measure the value of recreational opportunities and services, ideally, based on field survey data gathered through face-to face interview about willingness-to-pay (WTP) for providing of these services (Garrod G and Willis K 1997); (Thomas 2004); (Colin 2003). The basic objective of this study was to gauge the recreational services provided by public parks and green spaces within built-up area of Karachi city. Also to calculate the monetary value by using CVM of such ecosystem services. Additionally following factors would be studied of residents i.e. awareness and understanding, expectation and their recreational activities and influence from ecosystem services provided by public parks and green spaces.

2. MATERIAL AND METHOD

Analysis of the survey data

Design of the questionnaire

The questionnaire consists of five segments. The first part included the instructions for answering

questions for the objective of the study as well as an explanation of two major terms; public parks and green spaces, recreational activities. This explanation would beneficial to respondents to understand the questions. Consequently, the second part categorized 25 types of ecosystem services and nine types of negative impacts associated to public parks and green spaces according to (Miller 2007). To make the questionnaire more understandable for respondents, several changes were suggested by city-dwellers. The third part included general questions concerning respondents' actual recreational knowledge. This part dealt with a group of seven questions, those associated with respondent preferences and experiences as well as money paid for using the places respectively. The fourth part included questions about respondents' expectation and willingness-to-pay for using public parks and green spaces. At first, respondents were questioned to classify their preference for plantation style as well as finding of existing green spaces within Karachi city in terms of vegetation variety, proportion of vegetated areas, administration of landscape design and green spacing. In the last part, questions were arranged to collect respondents' socio-economic data, i.e. gender, age, education level and monthly income.

Field Methodology

A pilot test was conducted before implementing the full-scale survey. The focus group consisted of 4 postgraduate (M.Sc.) students from Karachi University and, 2 experts from Karachi-Pakistan Landscape Bureau, and 10 residents from housing blocks. The pilot test survey was conducted to verify whether the questionnaire was logical and clearly understood by respondents. The final survey was conducted from June to August, 2004. A total of 200 respondents were questioned face-to-face. The sampling population was composed of neighborhood residents living within a distance of 500 to 1000 meter from the parks in both investigated areas, with six age cohorts ranging from 15-20, 21-30, 31-40, 41-50 and 51-60 years. At first, 3 residential blocks were chosen with the help of the information of Karachi Census Office, who have basic data of all the inhabitants of study areas, i.e. Park A, three phases of Defence Housing Authority (DHA) and Park B (Gulburg Town), (Anwar 2008).

Return Rate and Statistical Analysis

Personal interviews, also called face-to-face interviews resulted in a response rate of 40 % in Park A neighborhood and 37% in Park B neighborhood see **(Table 1)**. The low response rate may be due to the fact that urbanities were interested in public parks and green spaces and, they rarely have the chance to express their opinions about some public affairs.

Table 1, Distribution of sample in Park A and Park B neighborhoods.

Distribution and distance of samples in each park's neighborhood	Park **A** (Defence Housing Authority) High income area. Sample size		Park **B** (Gulburg Town) Low income area. Sample size	
Neighborhood within 500 meters	Asked 100	Returned 50	Asked 130	Returned 50
between 500-1000 meters	150	50	140	50
Total	250	100	270	100

Source: Anwar, 2008

3. RESULTS

Urbanities Awareness

The awareness of ecosystem services provided by public parks and green spaces was the target of the questionnaire. The respondents commonly thought that ecosystem services provided by public parks and green spaces were important, however some were clearly identified as more important than others. The extent of very important and important offers for ecosystem services varied from 96.5% to 47.2% (Table 2). The ecosystem services ranked as the most important (average score > 1.0) were the advantages associated to weather improvement, such as air pollutant absorption, shading, aesthetic betterment as well as spaces for recreational activities **(Table 2).** The residents in Park A neighborhood pay more attention to air quality, environmental pollution, and recreation.

Table 2 Importance of ecosystem services (percent of valid respondents Park A)

Ecosystem services	Very important	Important	Not important	Unclear
Lower air temperature	10	6	5	1
Shading	6	7	1	1
Increase relative humidity	16	3	0	0
Air pollutant absorption	2	0	0	0
Glare and reflection control	2	0	0	0
Demarcation of green spaces	0	1	0	0
Places for recreational activities	5	1	0	0
Aesthetic enhancement	4	2	0	0

Economic product value (wood, fruit, etc.)	0	0	0	0
Property value increase	8	2	2	0
Waste water management	0	0	0	0
Opportunities to know and contact nature	3	3	3	0
Cultural and educational connotation	3	3	0	0

Importance of ecosystem services (percent of valid respondents of Park B)

Ecosystem services	Very important	Important	Not important	Unclear
Lower air temperature	1	0	1	1
Shading	0	0	1	1
Increase relative humidity	5	0	1	1
Air pollutant absorption	16	2	2	1
Glare and reflection control	8	2	2	0
Demarcation of green spaces	8	6	3	1
Places for recreational activities	5	1	0	0
Aesthetic enhancement	4	2	0	0
Economic product value (wood, fruit, etc.)	0	0	0	0
Property value increase	8	2	2	0
Opportunities to know and contact nature	3	4	3	0
Waste water management	0	0	0	0
Cultural and educational connotation	3	0	0	0

N: 100 each neighborhood
Source: Anwar, 2008

The services ranked as the least important were economic product value, demarcation of green spaces, shading , cultural and educational connotation (Table 2) . Urban green spaces in Pakistan's cities, especially those in the built-up area of (Gulburg Town and Defence Housing Authority) Karachi city, were seldom or never planted tree for timber or fruits for their economic products.The high ranking accorded to these ecosystem services might be because educational programs, publicity, societal attitude, and formal and informal institutions played an effective role in the public's recognition (Lewan and Söderqvist 2002). A small proportion of the respondents stated some ecosystem services as unclear. The most unclear service was waste water management. None of the respondents declared that they did not know about or understand it **(Table 2).**

Identification of negative effects of urban green spaces

Some 14.8% of the respondents stated clearly that urban green spaces in Karachi-Pakistan city had no negative impacts. Moreover, all negative impacts listed in the questionnaire were considered as not important except for liability, with the percentage of "not important" ranging from 73.1% to 43.6% (Table 3). According to the average score, the negative impacts of green spaces ranked important were security **(Table 3).** Partly due to the public ownership of all land in the study area, the citizens did not have the chance to experience the responsibility to participate in any development and maintenance project of urban green spaces (Fraser and Kenney 2000). Therefore, liability was considered as an important negative impact. In addition, the clustered planting of trees and shrubs, especially those green spaces that were short of effective management, usually induce a sense of insecurity in visitors. Other negative impacts involved in the questionnaire were ranked as not important, including keeping out sunshine, obstacles and intruders, litter, and management costs. These findings may be attributed to the weather of Karachi-Pakistan that in long hot summer the hot direct sunshine is actually an annoying factor, and the shade of green spaces is earnestly desired. Moreover, the dominance of evergreen species (without seasonal falling of leaves and twigs) did not cause a litter problem(Anwar 2008).

Table 3 Importance of negative impacts (percent of valid respondents)

Negative impacts	Very important	Important	Not important	Unclear	Average score	Standard deviation
Keep out the sunshine	3.2	21.0	73.1	2.6	-0.46	0.93
Litter (leaves, twigs, etc.)	2.9	30.2	64.9	1.9	-0.29	0.99
Obstacles and intruders	4.9	22.7	69.1	3.2	-0.36	0.99
Security (inside the park)	9.7	33.2	49.7	7.4	0.03	1.10
Security (outside the park)	15.3	37.5	43.6	3.6	0.24	1.16
Liability	20.0	48.4	29.7	1.9	0.59	1.11
Management costs	7.0	31.0	50.8	11.2	-0.06	1.04
No negative impacts	14.8					

N=200 both parks neighborhood inhabitants
Source: Anwar, 2008

As a whole, the negative impacts were rated as less important than the ecosystem services provided by urban green spaces. Even the highest scoring of negative impacts (liability) was only 0.59, far less than 1, which represented as "important", whereas none of the ecosystem services were

considered as unimportant. This suggests that most of the residents enjoy the benefits that green spaces generate.

Expectation of public parks

Residents' attitudes towards the state of green spaces and their expectation of green spaces were estimated. On a scale of 1 to 4 (1 being unclear and 4 being excellent), respondents were asked to rate the overall performance of existing green spaces in Karachi-Pakistan. Meanwhile, their expectation on design style of urban green spaces and their most desirable green spaces within study area were explored, which would provide information for future greening programs.

City-dwellers WTP for recreational opportunities and amenities

Recreational use of urban green spaces

The analysis of the questionnaire survey revealed that parks were preferred places for recreation and amenity enjoy in Karachi-Pakistan: 22% of the respondents stated that their most often used green spaces were parks of their neighborhood and they visited parks frequently **(Table 4).** Moreover, residential green spaces and institutional green spaces were chosen for recreation by a smaller proportion of the respondents, 22.5% and 18.9% respectively. Small gardens in blocks were less frequently visited than others. This might be due to the fact that gardens were small and usually poorly maintained, but without professional design, and seldom equipped with recreational facilities. When there were no green spaces within respondents' walking distance (usually 1000 m), they would go to parks or institutional green spaces on weekends.

Table 4 Green spaces for recreation (percent of valid respondents)

Places	Frequency				Total
	Daily	Weekly	Monthly	None	
Home garden	2	0	0	0	2
Private resort	1	0	0	0	1
On sea/beach	10	4	2	76	92
In the public park of my neighborhood	22	10	3	57	92
In the natural landscape outside the city	3	0	0	8	11
Other (please specify)	1	0	0	1	2
Total	39	14	5	142	200

N: 200 (100 each) neighborhood inhabitants
Source: Anwar, 2008

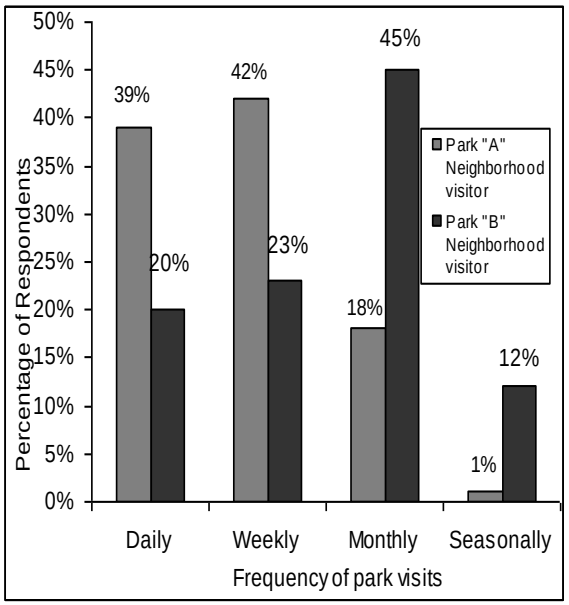


Fig. 1. Frequency of park visits for recreation (share of respondents, %)
Source: Anwar, 2008

The respondents were also asked to explain their purposes of using urban green spaces. A majority of the respondents stated purposes such as relaxation, nature appreciation, and physical exercise see **(Fig. 2)**. In contrast, nature studies, solitude and privacy were ranked as not important purposes. It suggests that recreation opportunities and services are primary ecosystem services that the residents would like to derive from green spaces in study areas. Companion during visiting to urban green spaces is suggested to be one of the most significant positive determinants of visitors' recreational satisfaction (Garrod and Willis 1999). In study areas, the visitors were often accompanied by their family members or friends **(Table 5)**. 12.5% of the respondents stated that they usually went to green spaces for recreation alone.70% of the respondents stated that they went to green spaces for recreation with family. For those respondents who came with family another reason was children, about 2/3 of them would visit green spaces with their children, and children's desires might be crucial in venue selection. The results could be explained by the fact that the relationships between neighbors were getting less close than before in cities, and children were an important factor for the residents to go to parks and green spaces in built up environment in Karachi-Pakistan(Anwar 2008).

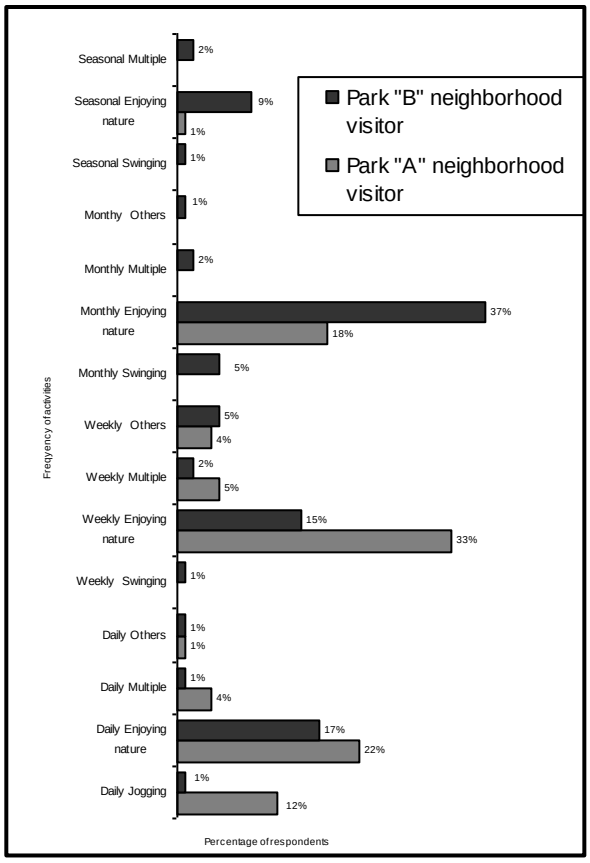


Fig. 2 Neighborhood inhabitant's activities undertaken in Parks N=200
Source: Anwar, 2008

Table 5 Companion during visiting urban green spaces (share of respondents, %)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Alone	25	12.5	12.5	12.5
	Family	140	70.0	70.0	82.5
	Friends	35	17.5	17.5	100.0
	Total	200	100.0	100.0	

N: 200 (100 each) neighborhood inhabitants
Source: Anwar, 2008

Willingness-to-pay for recreational opportunities and services supplied by urban green spaces

Among the questionnaires, 15% of the respondents stated that there is no need to pay entry fee for using green spaces for recreation (Figure 3). While 17.5% respondents stated that the present fee is not reasonable and 67.6% neighborhood respondents relied that the entry fee is quite reasonable. Usually those residents who used pocket green spaces near their home and or green spaces within their residential places respondent of no needed or not reasonable, because neither these places need to pay an entrance fee. The rest reported that they have paid for using green spaces and the highest stated amount was Pak Rs. 280/- (US$ 4.82) per month. This result suggested that a notable proportion of residents were willing to pay more for high quality green spaces.

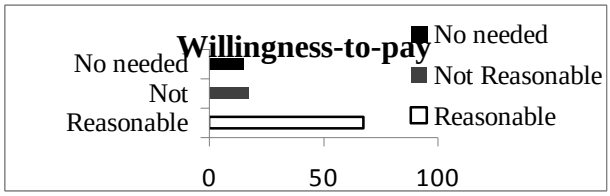


Fig. 3 Neighborhood inhabitant's activities undertaken in Parks, N=400
Source: Anwar, 2008

4. DISCUSSION AND CONCLUSION

Residents' high appreciation of urban green spaces

Nearly half of the respondents preferred a naturalistic style design of urban green spaces, while 29% of the respondents stated that they liked the style of an integration of western and oriental design. The results may reflect public preferences and interest up to the limit of the information that they can assimilate and understand about green spaces in Karachi-Pakistan. The green spaces in the built-up areas of Karachi-Pakistan(Anwar 2008) were actively used for recreation and amenity purpose, especially those well-maintained, with beautiful views and within a walking distance, such as parks and institutional grounds near living places. More than half of the respondents visited urban green spaces 2-3 times per week and 74.2% visited a green space at least once a week. The visits were usually happened in the morning and on the weekends. During the visits, the visitors were often accompanied by their family members or friends. Relaxation, quietude, nature appreciation, physical exercise, and aesthetic pleasure were the most typical motives for using urban green spaces. The estimate of WTP starts from the premise that social values should be based on individual values, which could be considered as consistent with democratic support of policies (Nunes 2002). The WTP estimate of this case study indicates that residents are willing to shoulder the burden to improve the quantity and quality of urban green spaces for recreational use, which is illustrated by a higher WTP than actual spending for recreation using urban green spaces in the questionnaire. The results

might serve to stimulate public awareness of ecosystem services generated by urban green spaces, to identify decisions through cost-benefit analysis, and to justify decisions in urban green space planning and related policy making.

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