RESEARCH PAPER

EVALUATING THE VISITORS' PERCEPTION AND AVAILABLE ECOSYSTEM SERVICES IN URBAN PARKS OF LAHORE (PAKISTAN)

Aysha Hanif[1], Safdar A. Shirazi[2], Muhammad Jabbar[3*], Anum Liaqat[2], Sahar Zia[1], Mariney M. Yusoff[3]

[1]Lahore College for Women University, Lahore, Pakistan

[2]University of the Punjab, Lahore, Pakistan

[3]University of Malaya, Malaysia

***Corresponding author:** jabbar.lhr@gmail.com

Received: December 3rd, 2022 / Accepted: November 11th, 2022 / Published: December 31st, 2022

https://DOI-10.24057/2071-9388-2021-133

ABSTRACT. Ecosystem services provided by urban parks play a significant role in visitors' well-being. The provision of these services depends upon the well-designed green spaces built to fulfil the needs of people. As these services are linked with visitors' well-being, particular emphasis to indicate them is needed. However, minimal documentation is found regarding these valuable services, particularly in the context of Lahore. So, in this study, an effort was made to highlight visitors' preferences for the available ecosystem services provided by urban parks in Lahore, Pakistan. These ecosystem services are beneficial in enhancing the well-being of people. Fifteen parks in Lahore were selected in this study to highlight the visitors' preferences in visiting the parks. A questionnaire-based survey was conducted in these parks to collect information. The questionnaire was compiled to record socio-demographical profiles, usage patterns, choices, and visitors' opinions about the services provided by the parks. A total of 300 responses were recorded to depict the survey findings. The result highlights that 60-80% of visitors like to come to the parks having maximum services regardless of how distant is from their residence. It also reveals that large-sized parks with maximum facilities attract more visitors than small and medium-sized parks. As in these parks, people only from neighbouring areas visit due to their accessibility. The findings will be helpful for the managers and planners of the urban park to improve the ecosystem services for the well-being of people. It will also indicate the choices of people based on that information, the status of parks can be improved, and new parks can be developed to meet the visitors' needs.

KEYWORDS: Ecosystem Services; preferences; urban parks; Visitors' Well-being; Principal Component Analysis

CITATION: Hanif A., Shirazi S.A., Jabbar M., Liaqat A., Zia S., Yusoff M.M. (2022). Evaluating The Visitors' Perception And Available Ecosystem Services In Urban Parks Of Lahore (Pakistan). Geography, Environment, Sustainability, 4(15), 32-38
https://DOI-10.24057/2071-9388-2021-133

ACKNOWLEDGEMENTS: We are thankful to the respondents who spare time to respond to the questionnaire. We highly appreciate the role of editors and reviewers who provide their intensive input to make this piece of research into a research article.

Conflict of interests: The authors reported no potential conflict of interest.

INTRODUCTION

As urbanization is increasing worldwide, enhancing the quality of life for citizens in a sustainable way is becoming challenging. However, it also creates opportunities by focusing on the areas for improvement. More people are living in urban areas as compared to rural areas globally. 55% of the world's population resided in cities in 2018, which is expected to be 68% in 2050 (McCormack et al. 2010). In this scenario, ecosystem services are considered a practical approach in achieving sustainable development goals. They also support the environmental policies in designing urban plans for cities. Various methods can be applied to assess city ecosystem services (Gatersleben et al. 2014). Primarily they are based on one of these three approaches; spatially precise biophysical measurements, models, or web-based modelling platforms and qualitative approaches based on experts' evaluation (Battisti et al. 2019). The literature revealed that the benefits rendered by urban green spaces are mostly related to environmental, social, and economic values as urban green space contributes significantly to social aspects by promoting physical activities, space for relaxing, reducing stress, and enhancing social interaction (Ambiental et al. 2010). They also play their role economically by increasing the property value due to proximity and generating revenues from tourist attractions. Similarly, environmental benefits are also rendered by urban green spaces like regulation and conservation services. Thus, their presence in cities is considered a significant sustainability indicator (Delgadillo Polanco, 2012).

Ecosystem services assist humanity in various ways and are referred to as ecosystem benefits. Natural drivers can be evaluated but not controlled; anthropogenic drivers, on the other hand, may be evaluated and controlled. The most obvious reason for this is to represent the effects of human actions on

ecological services (Dalton 2011; Lü et al. 2012; Sinchembe & Ellery 2010; Wang et al. 2009). Purification of air, temperature and noise regulation, carbon absorption, flood reduction, recreational opportunities, and provision of social connections can be provided by urban parks as ecosystem services (Hanif et al. 2020b). Ecosystem services can be supplied for natural, semi-natural, or controlled ecosystems to satisfy societal development demands. However, due to the rapid rise of the economy and society, the current gap between ecosystems' capability to offer services and human requirements increases. Furthermore, humans affect ecosystem services by changing the land habitat, ecosystem structure, and biogeochemical cycle. These human activities positively and negatively affect ecosystem services (Jardine et al. 2007; Liu et al. 2013; Rechkemmer & Von Falkenhayn 2009).

Various factors influence the use of green spaces/parks in cities. These factors encompass the quality and quantity of space, attributes of potential users (age, gender, race, socio-economic profile), psychological factors (capability, identified hindrance) influencing personal preferences, accessibility, provision of facilities according to needs of users, parks maintenance and safety (Giles-Corti et al. 2005). Green areas create a better human environment by controlling the city's climate, cooling temperature and filtering air (Jabbar & Yusoff, 2022a). It has been recognized that green space is a vital source of a sustainable urban environment (Jabbar et al. 2021).

As the quality of green spaces is essential for optimizing benefits, the characteristics of parks are also considered keystone aspects. Pieces of evidence show that the characteristics of every park vary according to its community to get maximum advantages (Jabbar & Mohd Yusoff 2022b). Thus to enhance the well-being of people, a comprehensive study of the urban parks is inevitable (Ayala-Azcárraga et al. 2019). Variables like type and area covered by vegetation in adjacent areas, accessibility to green spaces, people's participation in outdoor activities, nearness of water bodies and any association with the natural environment can be utilized to gauge people's exposure to their natural surroundings within cities. Research also shows that various landscape variables in various scenarios impact physical, social, and mental health and well-being, enhancing the mood of people and kids (Dushkova & Ignatieva 2020). Although the provision of ecosystem services and the well-being of people in cities are associated, written documents to reflect their importance are rare in Lahore. Similarly, people benefit from these facilities by visiting the parks; however, they are unaware of ecosystem services. In this context, this study aims to highlight the visitors' preferences to visit the parks by examining the available ecosystem services. It will be helpful for the park's administration and planners to improve the ecosystem services for the well-being of people according to their choices.

MATERIAL AND METHODS

Study area

Lahore, a metropolitan city, has an almost 11 million population, according to the census of 2017. The urban population worldwide ranked 56th in 1975, 38th in 2007, and will be at 24th in 2025. Due to the high growth rate and fast urbanization, the city has physically and socially transformed. The metropolitan has just 3% green area, which is very low compared to the global standard, 25-30% minimum value (Imran & Mehmood 2020). They were classified into three categories based on their size, i.e., small <1 hectare, medium 1.1 – 4.5 ha, and large >4.6 ha, according to Ballester-Olmos and Morata's classification. Thus, available green spaces become insufficient for many people, and parks' constraints can be easily observed. It is also worth mentioning that per capita green space is shallow in Lahore except for Gulberg town, compared to the world's minimum value of 9 m^2 per inhabitant (Alam et al. 2014). Consequently, the parks in the study area are insufficient and unequally distributed, directly influencing the quality of life. In this study, fifteen parks in Lahore (Bagh e Jinnah, Botanical Garden Jallo, Family Park Samanabad, Fatima Jinnah Ladies Park, FCC Park, Greater Iqbal Park, Gulabi Park, Gulshan e Iqbal Park, Jam e Shirin Park, Jillani Park, Nadra begum Park, Nasir Bagh, National Bank Park, Rahmania Park and Tomb Nur Jahan Park) were chosen for the study as shown in figure 1.

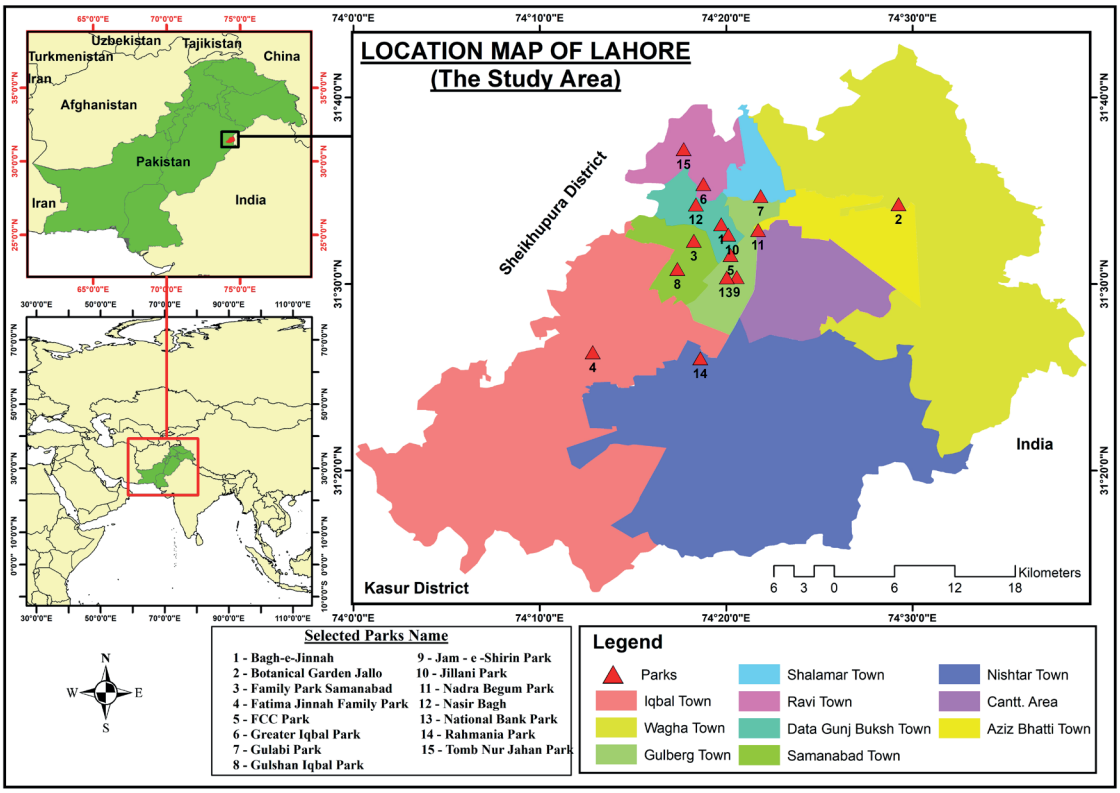

Fig. 1. Location of the Study Area and Selected parks

Data Collection

The study was based on primary data; therefore, a questionnaire-based survey was conducted in the selected parks (shown in figure 1) to observe and record the information. The questionnaire was divided into socio-demographic information, usage pattern, visitors' preferences, and perceptions. A total of 300 questionnaires were get filled out by visitors.

Statistical analysis

The study performed Principal Component Analysis (PCA) according to the nature of the data. The usage of PCA was to highlight the association between spatial, socio-economic, and ecological components and the park's area (Ayala-Azcárraga et al. 2019). In contrast, the suitability of the data was checked by performing the KMO and Bartlett's test of sphericity. Previously, European researchers performed it to check the homogeneity of variance (Kothencz & Blaschke 2017). In addition, the agglomerative Hierarchical Clusters and Preference Map was drafted in XLstat version 2014.05.03. A Chi-square test was also conducted to show the association between different variables identified in parks. For example, the Chi-square test with Cramer's V showed the association of socio-demographic attributes and visitors' choices to the parks (Mak & Jim 2019).

The variables computed by SPSS for conducting PCA were denoted under eight factors shown in table 1.

The perceived variables by the visitors, as shown in table 1, were utilized in Principal Component Analysis. The Correlation Matrix examined the association between these variables. KMO and Bartlett's test depicts a .000 significance level smaller than the alpha value .05, as shown in table 2. Kaiser-Meyer-Olkin also indicates the significant means of variables with a sampling adequacy value of .726. In this way, a total of eight factors were generated through PCA. The Rotated component matrix of these eight factors is shown in Annexure A.

RESULTS AND DISCUSSION

The results showed that visitors rated small size parks with the lowest score due to few facilities. It is also evident that very few visitors came to these parks. Usually, the people residing near these parks come there more often. In comparison, parks of medium and large size have spacious areas and generate many ecosystem services. Thus, more people came to visit these parks. The number of visitors to various parks is depicted

Table 1. Variables that integrate the eight factors evaluated for urban parks

Sr. No.	Factors	Variables
1	Visitors' opinions on the present condition of the park	• Vegetation in park • Size of park • Diversity in Parks • Attractiveness • Accessibility • Crowd in park • Pleasant to spend time in parks
2	Usage pattern of Parks	• Means of transportation. • Distance of park from residency • Frequency of visit • The most satisfying facility in a park
3	Socio-environmental perspective	• Accompanied with • Importance to live near a park
4	Social status of visitors	• People's familiarity with the benefits of park • Education level • Employment status
5	Health satisfaction with parks	• Satisfaction level of health by visiting a park. • Gender
6	Preference dependency and age group	• Preference for any green area near the residence • Age Groups
7	The socio-economic pattern of visitors	• Time to stay. • Income group
8	Services attraction	• Wish to find any activity to do in a park. • Preferred activity to do in a park. • Quality of park for which it is famous. • Purpose of visit

Table 2. KMO and Bartlett's test of sphericity

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.726
Bartlett's Test of Sphericity	Approx. Chi-Square	1468.768
	Df	300
	Sig.	.000

in figure 2. The maximum number of people coming to Greater Iqbal Park is due to its vast area, ideal location, and various ecosystem services. Similarly, many visitors visited Jillani park due to its scenic beauty and good quality of services.

People usually do not compromise on the facilities. So, they travel a long distance to seek their desired services in parks. Therefore, it can be assumed that the visitors' preference is available parks' services rather than the size. It can also be understood from figure 3 that without considering the park's size, 225 respondents (75%) had to travel for more than 1000 meters distance to access the park.

It also shows that 9.3% of people visit the parks between 500-1000 meters. At the same time, 15.7% can access parks by covering 500 meters distance. It can be assessed that these are mostly community parks or located very near people's residences.

PCA was performed based on the park's attributes and availability of facilities. On the x-axis and y-axis, the value range of Pearson's Correlation matrix is shown from -1 to +1, as shown in figure 4. PCA was also used to highlight respondents' preferences for the existing infrastructure of urban green spaces in Oslo, Norway (Soy Massoni, Barton, Rusch, & Gundersen 2018). According to the result, principal component analysis reveals 60.35% of the total variance. Previously, a similar result (60.74%) was shown between environmental and infrastructural attributes in the study of urban parks in Mexico City (Ayala-Azcárraga et al. 2019). Fig 4 indicates the variation in visitors' opinion on these attributes with a change in parks. It is worth mentioning that only positively associated variables are shown through PCA. Variables of parks analyzed for PCA are mentioned in Annexure A. Most visitors choose to visit those parks, where different appetence is fulfilled such as near the homes, a speciality of the park for which they are famous, the most satisfying services.

On the other hand, few visitors do not choose to visit the parks due to little greenery, populace place, and minor diversities. The parks with medium and large areas provide many facilities, e.g., more greenery, silent area, rich diversities, more panoramic views, spacious places, and leisure time. Thus, large and medium parks provide much more facilities and have a good framework than small parks.

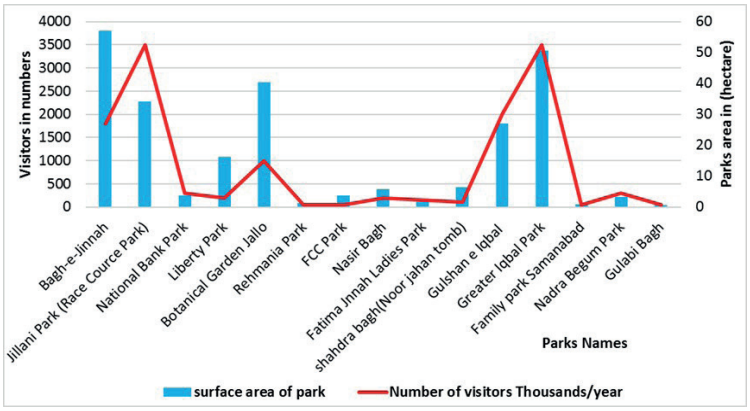

Fig. 2. Park area and number of visitors

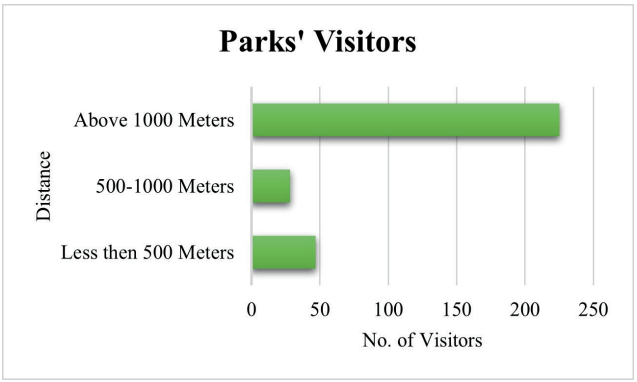

Fig. 3. Number of respondents and range of distance to access parks

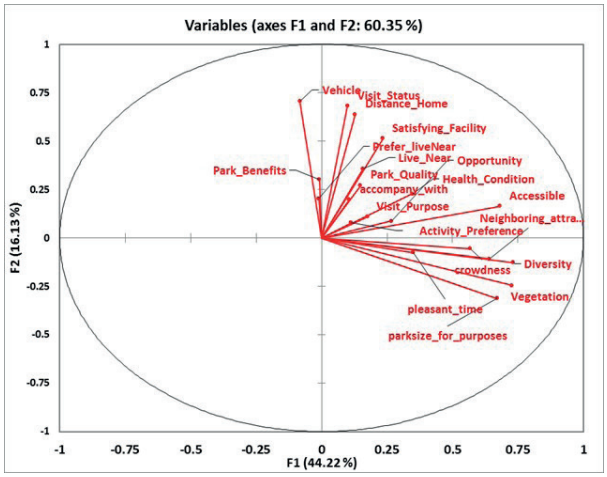

Fig. 4. Patterns of association between variables and size of parks

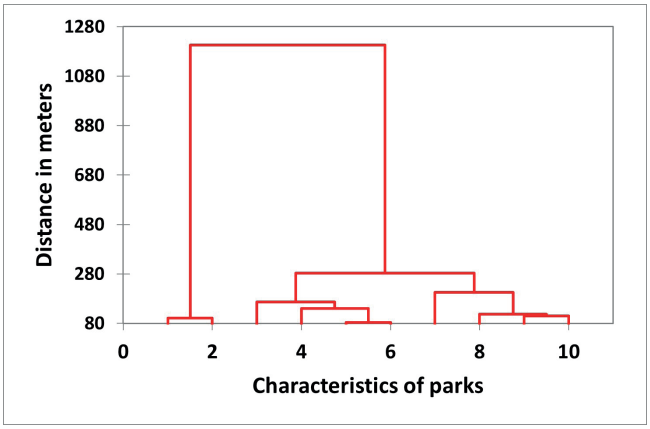

Fig. 5. The dendrogram based on Dissimilarity

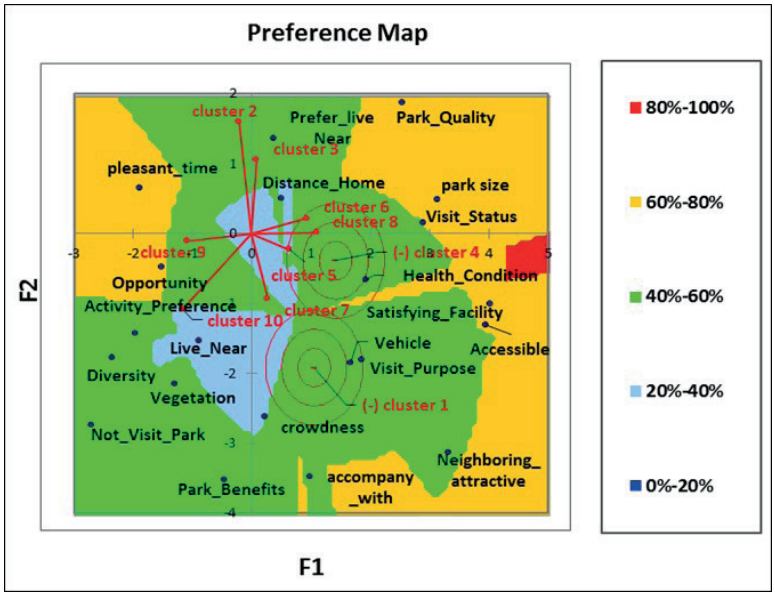

Fig. 6. Preference map

Ten (10) parcels based on dissimilarities found in the attributes of parks according to people's preferences for visiting the parks are shown in figure 5. Dendrogram usually shows natural grouping among a set of variables. The two adjacent parcels fuse at every phase of analysis until all the attributes form a set of clusters called dendrogram (Vieira et al. 2018). The dendrogram highlights ten parcels generated by utilizing the factor loading value of PCA.

In figure 6, the preferences of people who visit the parks are presented based on their liking scores. It is observed that 20-40% of visitors preferably visit the parks near or at a minimum distance from their homes. So, most of the time, people residing adjacent to parks choose to visit small and medium-sized parks. While, 40-60% of visitors come to medium-sized parks, where various services like high diversity, more greenery, satisfactory health level, and accessibility of preferred services can be found. Despite that, 60-80% of visitors like to come to large parks due to the wide range of facilities both in quantity and quality, as they have passion and want to enjoy nature by investing time in large-sized parks. So, they covered a long distance to come to large parks to utilize the services generated by parks. Therefore, it shows that visitors are attracted to the services regardless of the distance to reach the parks.

CONCLUSION AND SUGGESTIONS

Urban parks provide various ecosystem services, which are beneficial for the citizens. Identification of these services is essential for the better management of green spaces in cities. Due to their contribution to improving well-being, visitors' preferences are also inevitable for improving existing and developing new parks. In this context, 15 parks in Lahore, a megapolitan city in Pakistan, were studied to record the visitors' preferences for visiting the parks. The study found that visitors have different preferences in visiting the parks. They mostly preferred those parks with maximum ecosystem services regardless of the distance of parks. Therefore, it is concluded that the availability of ecosystem services is a primary preference for visitors visiting Lahore parks.

Moreover, the city residents ignored distance to avail more ecosystem services as people enjoy services even though they must travel long distances like more than 1000 meters. This study also determines that the attributes of urban parks in generating services for the well-being of people cannot be ignored. Therefore, it is suggested that the attributes of parks like the diversity of vegetation, recreational activities, and easy access to parks should be considered for future planning. These specified attributes should be identified and conveyed to the management for developing urban parks in this context. It is expected that the study may be helpful in the improvement of existing facilities and the establishment of parks in the future to gain maximum benefits for the visitors' well-being.

REFERENCES

Alam R., Shirazi S.A., Zia S., & Minallah M. (2014). SPATIAL DISTRIBUTION OF URBAN GREEN SPACES IN LAHORE, PAKISTAN: A CASE STUDY OF GULBERG TOWN. Pakistan journal of science, 66, 277-281.

Ambiental P., & del Distrito Federal O. T. (2010). Presente y Futuro de las Áreas Verdes y del Arbolado de la Ciudad de México. México, DF, México.

Ayala-Azcárraga C., Diaz D., & Zambrano L. (2019). Characteristics of urban parks and their relation to user well-being. Landscape and Urban Planning, 189, 27-35.

Battisti L., Pomatto E., & Larcher F. (2019). Assessment and Mapping Green Areas Ecosystem Services and Socio-Demographic Characteristics in Turin Neighborhoods (Italy). Forests, 11, 25, DOI:10.3390/f11010025

Dalton S.E. (2011). Application of the human ecosystem model in warfare ecology. In Warfare Ecology (pp. 245-257): Springer.

Delgadillo Polanco V.M. (2012). El derecho a la ciudad en la Ciudad de México.¿ Una retórica progresista para una gestión urbana neoliberal? Andamios, 9(18), 117-139.

Dushkova D., & Ignatieva M. (2020). New trends in urban environmental health research: from geography of diseases to therapeutic landscapes and healing gardens. GEOGRAPHY, ENVIRONMENT, SUSTAINABILITY, 13, 159-171, DOI:10.24057/2071-9388-2019-99

Gatersleben B., & Andrews M. (2013). When walking in nature is not restorative—The role of prospect and refuge. Health & place, 20, 91-101.

Giles-Corti B., Johnson M., Knuiman M., Collins C., Douglas K., Ng K., . . . Donovan R. (2005). Increasing walking:: How important is distance to, attractiveness, and size of public open space? American journal of preventive medicine, 28, 169-176.

Hanif A., Shirazi S.A., & Majid A. (2020a). ASSESSING QUALITY OF LIFE THROUGH PEOPLE'S PERCEPTION: A CASE STUDY OF LAHORE-PAKISTAN. J. Agric. Res, 58(4), 289-295.

Hanif A., Shirazi S.A., & Majid A. (2020b). Role of community for improvement of ecosystem services in urban parks. Pakistan Journal of Agricultural Sciences, 57(6).

Imran M., & Mehmood A. (2020). Analysis and mapping of present and future drivers of local urban climate using remote sensing: a case of Lahore, Pakistan. Arabian Journal of Geosciences, 13, DOI:10.1007/s12517-020-5214-2

Jabbar M., Yusoff M.M. & Shafie A. (2021). Assessing the role of urban green spaces for human well-being: a systematic review. GeoJournal, DOI:10.1007/s10708-021-10474-7

Jabbar M., Yusoff M.M. (2022a). Assessing The Spatiotemporal Urban Green Cover Changes and Their Impact on Land Surface Temperature and Urban Heat Island in Lahore (Pakistan). GEOGRAPHY, ENVIRONMENT, SUSTAINABILITY, 15(1):130-140, DOI:10.24057/2071-9388-2021-005

Jabbar M., & Yusoff M.M. (2022b). Assessing and Modelling the role of urban green spaces for human well-being in Lahore (Pakistan), Geocarto International, DOI: 10.1080/10106049.2022.2087757

Jardine A., Speldewinde P., Carver S., & Weinstein P. (2007). Dryland salinity and ecosystem distress syndrome: human health implications. EcoHealth, 4(1), 10-17.

Kothencz G., & Blaschke T. (2017). Urban parks: Visitors' perceptions versus spatial indicators. Land Use Policy, 64, 233-244, DOI:10.1016/j.landusepol.2017.02.012

Liu Y., Fan Y., & Huang K. (2013). Service ecosystem evolution and controlling: A research framework for the effects of dynamic services. Paper presented at the 2013 International Conference on Service Sciences (ICSS).

Lü Y., Fu B., Feng X., Zeng Y., Liu Y., Chang R., . . . Wu, B. (2012). A policy-driven large scale ecological restoration: quantifying ecosystem services changes in the Loess Plateau of China. PloS one, 7(2), e31782.

Mak B.K.L., & Jim C.Y. (2019). Linking park users' socio-demographic characteristics and visit-related preferences to improve urban parks. Cities, 92, 97-111, DOI: 10.1016/j.cities.2019.03.008

McCormack G.R., Rock M., Toohey A. M., & Hignell D. (2010). Characteristics of urban parks associated with park use and physical activity: A review of qualitative research. Health & place, 16(4), 712-726.

Pazhouhanfar M., & Kamal M. (2014). Effect of predictors of visual preference as characteristics of urban natural landscapes in increasing perceived restorative potential. Urban Forestry & Urban Greening, 13(1), 145-151.

Rechkemmer A., & Von Falkenhayn L. (2009). The human dimensions of global environmental change: Ecosystem services, resilience, and governance. Paper presented at the EPJ Web of Conferences.

Rey Gozalo G., Morillas J., González D., & Moraga P. (2017). Relationships among satisfaction, noise perception, and use of urban green spaces. Science of The Total Environment, 624, 438-450, DOI:10.1016/j.scitotenv.2017.12.148

Sinchembe M., & Ellery W. (2010). Human impacts on hydrological health and the provision of ecosystem services: a case study of the eMthonjeni–Fairview Spring Wetland, Grahamstown, South Africa. African Journal of Aquatic Science, 35(3), 227-239.

Vieira J., Matos P., Mexia T., Silva P., Lopes N., Freitas C., . . . Pinho P. (2018). Green spaces are not all the same for the provision of air purification and climate regulation services: The case of urban parks. Environmental research, 160, 306-313.

Wang Z., Liu Z., Song K., Zhang B., Zhang S., Liu D., . . . Yang F. (2009). Land use changes in Northeast China driven by human activities and climatic variation. Chinese Geographical Science, 19 (3), 225-230.

Annexure A

Rotated Component Matrix

	Component							
	1	2	3	4	5	6	7	8
Present condition of vegetation in park	.770							
Presence of diversity	.764							
Present condition of park's size	.721							
crowd in park	.676							
Accessibility	.670							
Attractiveness	.646							
Means of transportation		.772						
Distance of park from residency		.763						
Frequency of visit		.741						
Most satisfying facility in park		.510						
Time to stay			.798					
Income group			.728					
Accompanied with			.698					
Employment status			.697					
Importance to live near park			-.513					
Satisfaction level of health by visiting park				.696				
Gender				-.660				
Feel pleasant to spend time in park								
Preference of any green area near residence					.692			
Age Groups					-.516			
Quality of park for which it is famous						.754		
Purpose of visit						.818		
Preferred activity to do in park						.601		
people's familiarity about benefits of park							.688	
Education level							.592	