p-ISSN 2012-3612 | e-ISSN 2782-8824
www.edjournal.cfnr-uplb.org

Ecosystems and Development Journal
Volume 12 | Number 1 | pp. 25–42 | 2022

Visitation and perception of college students in selected urban parks in the city of Manila, Philippines

Arthur J. Lagbas[1,2,3]

[1]*Construction Engineering and Management Department, Integrated Research and Training Center, Technological University of the Philippines, Ayala Boulevard, Ermita, Manila, Philippines; Email: arthur_lagbas@tup.edu.ph, arthur09lagbas@gmail.com*
[2]*Chemistry Department, College of Science, Technological University of the Philippines, Ayala Boulevard, Ermita, Manila, Philippines*
[3]*Faculty of Management and Development Studies, University of the Philippines Open University, Los Baños, Laguna, Philippines*

ABSTRACT. The districts of Ermita and Intramuros in Manila, Philippines are important for outdoor recreation and urban resilience because of their large public green spaces. Arroceros Forest Park, Intramuros, Fort Santiago, Paco Park, and Rizal Park are public parks with notable historical and cultural heritage significance and are strongly appreciated for their ecological and cultural services. Three hundred forty-one college students of the Technological University of the Philippines (TUP), Manila campus answered an online questionnaire. The survey aimed to examine their park visitation activities before the COVID-19 pandemic, acquaintance with park photos, and perceptions of ecosystem services, disservices, urban environmental problems, and land use. Results showed that the open-access parks (Intramuros and Rizal Park) were the most frequently visited, while the gated parks (Arroceros Forest Park and Paco Park) were the least visited. In general, park visitation correlates significantly with allowance and familiarity with park photos and residences. Air pollutants removal and regulation of climate and stormwater were the most appreciated ecosystem services. The Arroceros Forest Park and Rizal Park were strongly appreciated for their air pollutants removal services. Loss of green spaces and increasing volume of vehicles were perceived as major urban environmental problems. A high proportion of respondents indicated that the city government should encourage the expansion of existing green spaces and permanently preserve tree-covered land. The high importance of regulating services as the students perceived represents the demand for and significance of urban parks for maintaining urban ecosystem quality. Findings could help park managers and decision-makers understand the influence of socio-demographic variables on park use, visit, and perceived demand for intangible ecosystem services. Integrating park use patterns and perceptions in park management and land use planning could potentially result in enhanced park services, improved quality of experience, and equitable access for all park visitors.

Keywords: cultural heritage, frequency of visits, perceived benefits, photo familiarity

INTRODUCTION

According to the 2020 Census of Population and Housing, approximately 13.5 M people (12%) live in the Philippines' National Capital Region (NCR). Among the 16 highly urbanized cities in NCR, the City of Manila comprised the second biggest population in the region (PSA 2021). Rapid population growth, intensive land use, and land scarcity have changed the city's layout, with vertical mixed-use developments taking place near business districts, government offices, educational institutions, and corridors of rail and busy roads to maximize land use efficiency. In addition, local land use policies such as adjusting the assessed value of the real property, amendment of the zoning ordinance, and implementing various national government infrastructure projects to enhance connectivity and scale up regional development significantly influence urban land use and supply of open spaces. Urbanization and development of open green spaces such as public parks have significant undesirable impacts on the urban environment such as congestion, land scarcity, higher temperature and urban heat island effect (Pereira & Lopez 2005), increased flood risk (Pornasdoro *et al*. 2014; Zoleta-Nantes 2000), and air quality deterioration due to emissions from public vehicles (Kecorius *et al*. 2017).

There is no legal definition of a public park in the Philippines. Senate Bill No. 1158 of Angara (2019) defined a public park as "a parcel of land or body of water, or a combination thereof, set aside for the recreation or relaxation of people and the promotion of public awareness of some historical, artistic, cultural or scientific matter." Public parks in the proposed law include parks that are of historical significance to the country, parks of cultural heritage, or parks with national monuments but do not include parks that are under the care and jurisdiction of other government agencies such as the National Integrated Protected Areas System (NIPAS) (Republic Act 7586 and Republic Act 11038) under the Biodiversity Management Bureau (BMB) of the Department of Environment and Natural Resources (DENR).

Even though urban parks contribute to the touristic attractiveness of cities and are strongly associated with multiple material and non-material benefits or ecosystem services, remaining vacant sites and open spaces in densely built-up cities are a hotspot for physical development. Planning for tree parks, greenbelts, and similar forest development projects in an urban area are often subordinated to other planning categories. Policies directed at improving, expanding, or creating a new public park in highly urbanized areas always compete with infrastructure and physical development (Vranic *et al*. 2016). Public parks planning is often considered secondary in policy prioritization at the local level due to tight budget, absence of a national policy and local legal framework (ordinance), and underappreciation of ecosystem services. In an urban setting, the recreational services of urban parks prevail over other ecosystem services. Only people with direct access to or adjacent to urban parks or other open green spaces gain full benefits. Ironically, trees and vegetation in urban parks and other open green spaces such as sidewalks can also create undesirable side effects to the urban environment and social system (*e.g.*, damage to the structure, allergen, injuries caused by falling tree or branches, and pest) or called disservices (Cariñanos *et al*. 2017; Lyytimaki & Sipila 2009).

A rational and coordinated land use policies integrating public park conservation, preservation, development, and management for urban sustainability, resiliency, and the general welfare of urban dwellers should be incorporated into mandated local land use and development plans of every city and urbanizing municipalities. The spatial and landscape structure, naturalness, biodiversity, tree cover area, accessibility, good facilities, protection of land use for cultural heritage properties, and threatened plant species are important considerations that should be integrated into public open green space planning and management. On the other hand, public perceptions analysis of urban parks, other green spaces, and urban environment problems help understand the existing demand for ecosystem services to promote the conservation of the remaining public open green spaces (Tian *et al*. 2020) and make cities resilient to climate change impacts and future global health crises.

On March 8, 2020, a State of Public Health Emergency (Proclamation No. 922) was declared in the Philippines due to local transmission of coronavirus disease (COVID-19), followed by the COVID-19 pandemic declaration by the World Health Organization (WHO) on 11 March 2020. Following the pandemic declaration, the national government declared a State of Calamity (Proclamation No. 929) on 16 March 2020. It imposed a strict quarantine (Enhanced Community Quarantine or ECQ) and a series of lockdowns that resulted in controlled mobility, social and physical distancing, and temporary closure of schools and public open spaces. The "stay-at-home" policy, self-isolation, limited social and outdoor activities, and economic uncertainty have caused physical and mental stress, particularly to the socially vulnerable population such as children, elders, persons with comorbidities, economically disadvantaged sectors, and students. The pandemic illustrated the interdependencies of city dwellers with the natural environment and highlighted the function of public parks and public open green spaces in a congested and highly artificial urban environment as the most readily accessible spaces for addressing physical and mental health challenges (Larson *et al*. 2022; Maury-Mora *et al*. 2022). However, some park management policies could limit equitable access to urban parks, such as daytime operation and charging entrance fees. Inequitable access to urban parks could situate some groups at a higher risk of emotional distress and health problems associated with physical inactivities such as diabetes, obesity, cardiovascular disease, and respiratory disorders associated with pollution.

Arroceros Forest Park, Fort Santiago, Intramuros, Paco Park, and Rizal Park in the city of Manila are all well-managed adjoining public parks with good landscape design and are accessible to the public. At the time of the study and before February 2022, Arroceros Forest Park was poorly-maintained and was not accessible for public access except for activities granted with permits from the city government. These five urban parks are worthwhile for research due to their ecological, recreational, tourism, and cultural heritage significance. An online literature search revealed that recently published works on urban parks in the city of Manila focused on Arroceros Forest Park (institutional arrangement of park management by Ancheta *et al*. (2017). It presents the perceived importance of regulating and cultural ecosystem services by Lagbas (2019), carbon stock estimation by Macaraig *et al*. (2021), and Rizal Park (protected needs assessment by Sahakian *et al*. 2020). However, there was no published work related to comparative studies assessing visitation and perceptions of park visitors/users of the five urban parks (Arroceros Forest Park, Fort Santiago, Intramuros, Paco Park, and Rizal Park). This paper then intends to fill this knowledge gap and expand

further research on perceived urban park benefits (focusing on park regulating services), perceived urban environmental problems, and perception of urban land use. Furthermore, this paper aims to add to local literature by analyzing the students' perceptions in a university close to the five urban parks, who are also regular park visitors.

This paper aims to assess the frequency of visits and familiarity of the students (who are respondents of this study) to Arroceros Forest Park, Fort Santiago, Intramuros, Paco Park, and Rizal Park and their perceived urban park benefits and urban environment problems. Specifically, this paper aims to answer the following questions: a) Which park is most frequented and least frequented? b) Which park is most and least familiar/popular to the respondents? c) Is there a relationship between socio-demographic profile, park visitation, and perceptions of park benefits? d) Which park regulating services is perceived as most and least important? e) What are their perceived disservices of trees/ green spaces? f) Which urban park is perceived as most and least important for air pollutant removal services? g) Which urban environment problems are perceived as most and least important? and h) Which urban land uses are perceived as allowable by the respondents?

While this study explored the frequency of visits, familiarity, and perceptions of students, the results might solely apply to the respondents and those in a similar situation. Nevertheless, this paper could provide new information about the five urban parks in Manila and help inform land use planners, park managers, policymakers, and the government to enhance the spatial structure, ecological and social benefits and create opportunities for equitable park access.

An online questionnaire survey was developed to capture and examine the respondents' socio-demographic profile, acquaintance with urban park photos, frequency of park visits, perceptions of ecosystem services, disservices, urban environmental problems, and urban land use of vacant and open green spaces. Reasons for park visitation, activities conducted in the park, visitation patterns, perception of park characteristics, and park preference were not part of the questionnaire survey and were beyond the scope of the study. The online survey was administered between December 2020 to February 2021 using Microsoft Teams quiz form due to General Community Quarantine (GCQ) restrictions and localized lockdown, which affected the conduct of on-site classes and park visitation.

The national government implemented the GCQ in the NCR during the online survey due to the COVID-19 pandemic. Public mobility was controlled, on-site classes were suspended, and large public gatherings and visitation to public places, including recreational parks, were regulated. Furthermore, study respondents were limited to students with access to Microsoft Teams. At the time of the study, the TUP adapted Microsoft Teams as its official platform for flexible learning in compliance with Memorandum Order No. 04 series of 2020 (Guidelines on the implementation of flexible learning) of the Commission on Higher Education (CHED). In agreement with the cybersecurity protocol, only students with Microsoft Teams accounts can access the hyperlink of the questionnaire survey.

The urban parks in this study were limited to the four national government and one local government-owned and managed park in Manila. Four recreational parks have protected status under the National Cultural Heritage Act of 2009 (Republic Act No. 10066), and one permanent forest park has legal protection by a city ordinance and the Municipal Forests and Watersheds Act (Republic Act No. 5752).

To assess respondents' familiarity with urban parks, some photos were avoided for possible bias: most popular site or spot (for example, the Rizal monument in Rizal Park and the front gateway of Fort Santiago), site or spot with the name of the urban park, and aerial photo of the urban park. Photos of the urban parks presented in the questionnaire survey were taken from *commons.wikimedia.org* (Arroceros Forest Park), *www.tripsavvy.com* (Fort Santiago), *www.tripadvisor.com.ph (Intramuros)*, *https://bluedreamer27.com/tag/paco-park/* (Paco Park), and *https://www.dreamstime.com/* (Rizal Park). Due to copyright reasons, the author replicated the original urban park photos in **Figures 2 a-e**.

METHODOLOGY

An online survey was used to examine the respondents' visitation, familiarity with urban parks using photos from the internet, and perceptions of ecosystem services, disservices, urban environmental problems, and land use. The respondents were TUP students enrolled during the first semester of the school year 2020–2021 and were recruited without preference for gender, program, residence, and year level. They were recruited through convenience sampling (a non-probability sampling) using the author's online learning platform account and social media account with the assistance of the author's co-teachers due to restrictions on public mobility and face-to-face meeting.

Study area

Manila was declared the Philippines' capital and the national government's permanent seat in 1976 through Presidential Decree No. 940. Since 1974, Manila has been a special class city through Presidential Decree No. 465 and proclaimed similar status in 1987 through Executive Order No. 249. A highly urbanized city with 13.70% of the population of the

NCR and a population density of about 3.4 times that of the NCR (PSA 2021), the city is a multiple land use for various institutions such as higher education institutions, national government agencies, United Nations agencies, and other international organizations (WHO, International Monetary Fund, and Embassy of the United States of America), private establishments, tertiary healthcare facilities, and public parks with notable local and national historical and cultural heritage significance. It has a total land area of 24.98 km² and is divided into six congressional districts. In comparison with other districts, District V (Ermita, Intramuros, Malate, Port Area, San Andres Bukid, and a portion of Paco) is particularly important for recreational parks and plazas and has more public open space. Under the zone classification of Ordinance No. 8119 or the Manila Comprehensive Land Use Plan and Zoning Ordinance 2005–2020, Paco Park, Rizal Park, and Club Intramuros Golf Course in Intramuros are located in the General Public Open Space Zone. On the other hand, Intramuros and Fort Santiago are in the University Cluster Zone, while Arroceros Forest Park is in the General Institutional Zone.

The five urban parks in this study are located in District V (**Figure 1**). These parks are relatively close and the university can be reached through walking or commuting. These parks were chosen based on touristic value and popularity as the most frequented public parks in Manila. The urban parks are an excellent venue for active and passive activities such as biking, dancing, walking with dogs, social gatherings, photography, and filmmaking. The parks are admired for their collection of various native and exotic flowering plant species and shade trees (Gonzales & Magnaye 2016; Valle 2018) and aesthetic landscape architecture. The four urban parks are under the management and administration of the national government (National Parks Development Committee (NPDC) for Paco Park and Rizal Park and Intramuros Administration (IA) for Intramuros and Fort Santiago). In contrast, the city government of Manila manages the Arroceros Forest Park. The IA and NPDC are attached agencies to the Department of Tourism (DOT) of the national government of the Philippines.

Except for Arroceros Forest Park, the four urban parks (Fort Santiago, Intramuros, Paco Park, and Rizal Park) are important cultural properties of the country under the National Cultural Heritage Act of 2009. The first park is Arroceros Forest Park, a 2.2 ha tree-planted riverside gated lot located in Arroceros Street and is adjacent to the Metropolitan Theatre (a national cultural treasure). It was declared a permanent forest park on January 20, 2020, through Ordinance No. 8607 or the Arroceros Forest Park Ordinance to recognize its scientific, educational and recreational use. Under this ordinance, park development commenced in September 2021, and the park was opened for public use in February 2022. The forest park is adjacent to the Bonifacio Shrine, Manila City Hall, Mehan Garden, train station, Universidad de Manila, and SM Mall. The second park is Fort Santiago, a national shrine within the Intramuros district and is the home to a museum dedicated to the lifework of the country's national hero, Dr. Jose Rizal. Fort Santiago served as a military camp during the Spanish occupation and is famous for its Guadalupe volcanic tuff wall. The third park is Intramuros, renowned for its stone walls/fortification (national historical monument proclaimed under Republic Act No. 597). It is bordered by Club Intramuros Golf Course (government property), formerly a moat before being repurposed. Other popular structures and sites within Intramuros are the ASEAN Garden, Manila Cathedral, Palacio del Gobernador, Puerta Real Garden, San Augustin Church (UNESCO World Heritage Site), San Diego Garden, and higher education institutions (Pamantasan ng Lungsod ng Maynila, Mapua University, Lyceum University of the Philippines and Colegio de San Juan de Letran). The fourth park is Paco Park or Cementerio Municipal de Manila y Capilla de San Pancracio, a national cultural treasure and formerly a municipal cemetery. It is about a 0.41 ha circular structure with a fountain at the center and a dome-shaped chapel and is the burial site of the three martyr priests (Fathers Jose A. Burgos, Mariano C. Gomez, and Jacinto Zamora) and Dr. Jose Rizal. Its preserved structure and garden appeal to photoshoots, filmmaking, and weddings. Likewise, the Saint Pancratius Chapel of the park is a Visita Iglesia destination for the Catholics during Holy Thursday and Good Friday (a tradition of visiting at least seven different churches during the holy week). Some schools adjacent to Paco Park are Araullo High School, Emilio Aguinaldo College, Manila Science High School, and the University of the Philippines Manila. The fifth park is Rizal Park, a national park proclaimed in 1967 through Proclamation No. 299 and a national historic site. Its famous landmark is the Rizal Monument (national monument) and the 105 ft high flagpole. Other popular recreational sites and structures within the Rizal Park are the relief map of the Philippine islands, Quirino Grandstand, kilometer zero, Children's Park, the Chinese and Japanese Gardens, the execution site of the three-martyr priest and Jose Rizal, dancing fountain, National Museum of Anthropology, National Museum of Natural History, National Planetarium, National Library of the Philippines, and the office of the National Parks Development Committee. Rizal Park is adjacent to Araullo High School, Adamson University, Emilio Aguinaldo College, Santa Isabel College, Philippine Normal University, and TUP. Information on the five urban parks are summarized in **Table 1**.

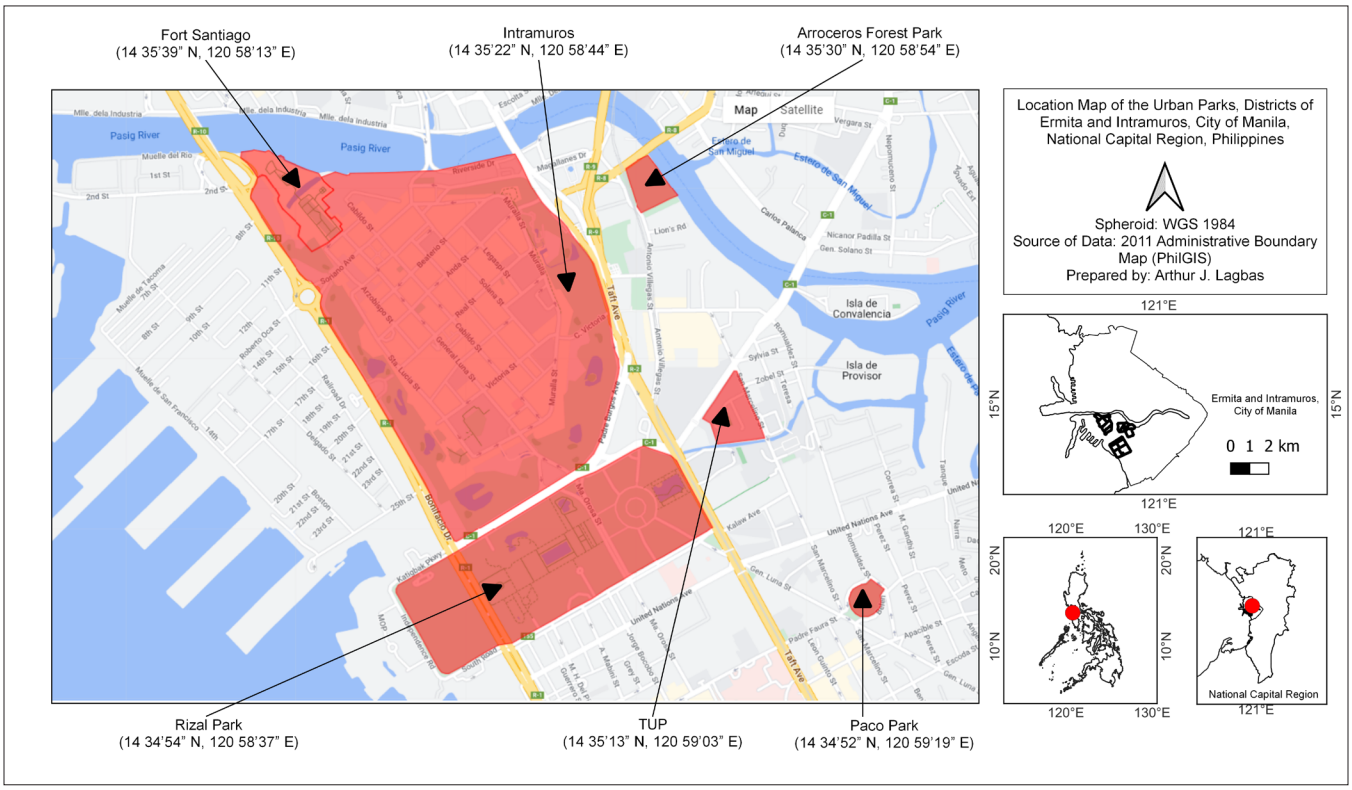


Figure 1. Location of the five urban parks and TUP in District V, City of Manila. The coordinates for Fort Santiago, Intramuros, and Rizal Park are assigned to the popular sites (iconic citadel, Baluarte de San Francisco de Dilao, and Rizal monument, respectively). The shaded area of the urban parks was drawn using Google Maps (2022) while the draw boundary tool of i-Tree canopy (https://canopy.itreetools.org/map) was used on May 3, 2022. The coordinates were determined using Google Earth.

Data collection

An online survey was done using the online educational platform Microsoft 365 quiz form. The questionnaire survey's uniform source locator or web address was electronically sent to the respondents during the first semester of 2021–2022. During the survey, the university and other public and private higher education institutions implemented flexible learning and teaching using Microsoft Teams and other online education platforms in compliance with the CHED Memorandum Order No. 04 series of 2020 as the COVID-19 pandemic had caused disruptions in traditional learning.

The survey consists of 60 questions distributed in 10 sections. The first section was a consent letter informing the respondents that participation was voluntary. This section also contained the study objectives, purpose, and confidentiality statement. The second section contained questions on demographic and socio-economic information such as age, sex, undergraduate program, year level, average daily allowance before the COVID-19 pandemic, and residence. The third section questions their familiarity with urban park photos (**Figure 2**) taken from different open-access websites. The respondents were asked to identify the park's name from the list. Photos of the urban parks were presented in the following sequence (due to copyright reasons, the original images were not presented here). The fourth section asked about the frequency of visits to the five urban parks in the last five years (0=not yet visited, 1=1 to 2 times, 2=3 to 4 times, and 3=5 or more times). Finally, Sections 5, 6, 7, 8, and 10 used a seven-point Likert scale to assess the world-view perceptions, ecosystem services, disservices, and urban environmental problems. Section 9 used three choices (1=encourage, 2=allow, 3=discourage) to assess their perceptions of urban land use of open and green spaces. The average time for respondents to complete the survey was 15 mins and 38 secs.

Data analysis

Microsoft Excel and Minitab statistical software version 17.1.0 were used for the descriptive statistics, correlation analysis, and comparison of the mean and median scores. Descriptive statistics such as frequency counts, percentages, mean, median, mode, standard error of the mean, and standard deviation described and analyzed the students' profile, acquaintance with urban park photos, frequency of visits to urban parks, and perceptions of ecosystem services, disservices, urban environmental problems, and land use.

Table 1. Summary of the description of the five urban parks.

	Arroceros Forest Park	Fort Santiago	Intramuros	Paco Park	Rizal Park
Location	District V, Ermita	District V, Intramuros	District V, Intramuros	District V, Paco	District V, Ermita
Approximate distance from the university	700 m	1.4 km	500 m (C. Victoria gate) 600 m (General Luna gate)	800 m	200 m
Zone classification[1]	General institutional zone	University cluster zone	General Public open space zone and University cluster zone	General public open space zone	General public open space zone
Category	Permanent forest park	National shrine; National cultural treasure	National historical monument	National cultural treasure	National park
Legal basis	RA No. 5752, Ordinance No. 8607	RA No. 1607, RA No. 10066	RA No. 597, RA No. 1607, RA No. 10066	RA No. 10066	Proclamation No. 234 (1955) and 299 (1967); RA No.10066
Government agency in charge	City of Manila	IA	IA	NPDC	NPDC
Entrance fee (PHP)	none	50 (discounted rate), 75 (regular fee)	none	10	none
Size	2.2 ha, including the 1,144.34 m^2 portion of Arroceros Street (Ordinance No. 8607)	4.73 ha (IA n.d.)	67 ha	1 ha (NPDC n.d.)	53 ha (NPDC n.d.)
Number of tree species	about 3,000 (Ramos 2021)	not available	not available	153 (NPDC n.d.)	3,164 (NPDC n.d.)
Tree canopy cover area[2]	not determined	not determined	15.93 ha of 130.42 ha total surveyed area[3]	not determined	14.24 ha of 39.57 ha total surveyed area

[1]Ordinance No. 8119 or the Manila Comprehensive Land Use Plan and Zoning Ordinance 2005–2020; [2]estimated using i-Tree Canopy version 7.1 (https://canopy.itreetools.org/) by photointerpretation of 1000 survey points; [3]included Fort Santiago in the tree canopy cover estimation.

Principal component analysis analyzed how the perceptions of land use can be grouped by selecting perceptions with eigenvalues greater than one. Spearman rank correlation analyzed the relationship between demographic variables (sex, allowance, and residence) with park visitation and familiarity with park photos. Similarly, visitation and familiarity with park photos were also analyzed. Mann-Whitney test assessed the significant median score difference of the perceptions of female and male respondents. One-way analysis of variance (ANOVA) and the Tukey method determined significant mean score differences among three or more variables. Results were interpreted as significant if the p-value was less than or equal to 0.05.

RESULTS

Characteristics of the respondents

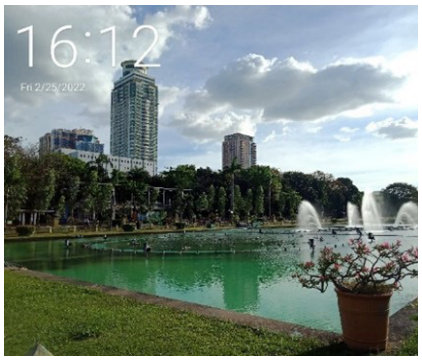
Table 2 presents the characteristics of the respondents. The sample respondents consist of 341 undergraduate students of TUP Manila enrolled in engineering, engineering technology, and technology-related undergraduate programs. About 58% of the respondents were enrolled in civil engineering and civil engineering technology programs. Thirty-seven percent (37%) or 125 were female, and about 63% or 216 were male, with an average age of 20.83 (SD=1.17). First-year students were about 19% (66), second-year students were 39% (133), third-year students were 41% (141), and fourth-year students were 0.29% (1). About 60% (205 students) had an average allowance of less than PHP 150, while about 40% (136 students) had an allowance greater than PHP 150. On the other hand, only about 20% (68 respondents) were residents of the city of Manila.

Park visitation and re-visitation

The frequency and percentage of park visits in **Table 3** (in decreasing order) show the proportion of students (n=341) who indicated to have visited the parks in the last five years: Rizal Park (97%) > Intramuros (90%) > Fort Santiago (62%)

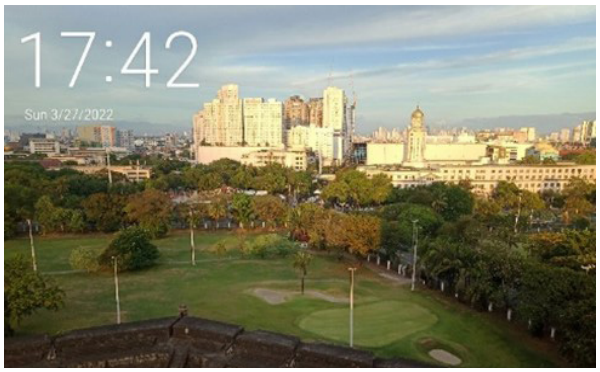
a. Fort Santiago

b. Arroceros Forest Park



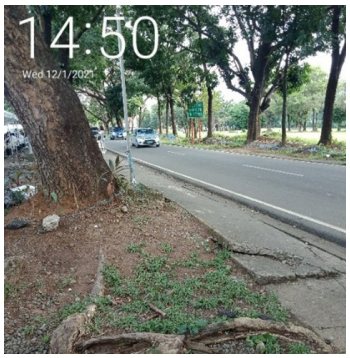
c. Rizal Park

d. Paco Park



e. Intramuros

f. Old growth Rain tree in Fort Santiago



g. A type of disservice

h. Execution site of Jose Rizal

Figure 2. Replicate urban park photos (**a-e**), a matured Rain tree in Fort Santiago with an extensive crown (**f**), damage to the footpath is a disservice to a large *acacia* tree in Veterans Memorial Medical Center (**g**), and the execution site of Rizal for history education of children (**h**).

> Paco Park (23%) > Arroceros Forest Park (14%). Further, the share of students who had multiple park visits (≥ 5) shows a similar profile. This indicates that the respondents highly prefer Intramuros and Rizal Park over other urban parks.

On the other hand, more than 75% of the students indicated that they have not yet visited Arroceros Forest Park (86%) and Paco Park (77%). In comparison, 3%, 10%, and 38% of the respondents shared that they had no visitation experience in Rizal Park, Intramuros, and Fort Santiago, respectively. This shows that the least visited parks are Arroceros Forest Park and Paco Park, while the most frequented parks are Rizal Park and Intramuros. Furthermore, a comparison of the park visitation of female and male respondents showed a similar visitation profile except for Arroceros Forest Park (female=9%, male=18%).

Familiarity with the park

The site-specific photos featuring a land cover of the urban parks could have sentimental and place attachments to the

respondents. Thus, correct identification of the photos may assess familiarity. The urban park photo identification results in **Table 3** shows that more than 60% of the respondents correctly identified the photos. Respondents were most familiar with the photos of Rizal Park and Intramuros, while they were least familiar with Fort Santiago and Paco Park. The first photo, which has outdoor lamp posts, trees, and a statue at the center of an open grass area, was identified by about 63% of the respondents as Fort Santiago. The second photo, which has a steel gate with trees, was correctly identified by about 70% of the respondents as Arroceros Forest Park. The third photo, which has a shallow body of water, a community of trees, and high-rise buildings, was correctly identified by about 92% of the respondents as Rizal Park. The fourth photo, which featured a garden and dome-shaped structure at the center, was correctly identified by about 64% of the respondents as Paco Park and cemetery. The last photo has a golf course, street trees, and high-rise buildings, including the Manila City Hall clock tower, which was correctly identified by about 89% of the respondents as Intramuros.

Table 2. Characteristics of respondents (n=341).

Category	f	%	Average
Age			20.83
17–18	31	9.09	
19–20	224	65.69	
21–22	84	24.63	
23–33	2	0.59	
Allowance (PhP)			
less than 50	26	7.62	
51 to 100	81	23.75	
101 to 150	98	28.74	
151 to 200	103	30.20	
more than 200	33	9.68	
Residence			
Manila	68	19.94	
Others	273	80.06	
Sex			
Female	125	36.66	
Male	216	63.34	
Year level			
First-year	66	19.35	
Second-year	133	39.00	
Third-year	141	41.35	
Fourth-year	1	0.29	
Program			
Architecture	1	0.29	
Civil Engineering	111	32.55	
Civil Engineering Technology	84	24.63	
Dies and Mould Technology	1	0.29	
Electronics and Communications Technology	11	3.23	
Electrical Engineering	18	5.28	
Electrical Engineering Technology	33	9.68	
Electronics Engineering Technology	34	9.97	
Food Technology	2	0.59	
Information Science	16	4.69	
Information Technology	8	2.35	
Mechanical Engineering	16	4.69	
Others (did not indicate)	6	1.76	

Correlation analysis

The result of correlation analysis in **Table 4** shows a significant weak positive correlation for the following: a) allowance (0=less than 50, 1=51 to 100, 2=101 to 150, 3=above 150) and frequency of visits (0=no visit, 1=1 to 2 visits, 2=3 to 4 visits, 3=5 or more visits) in Intramuros, Fort Santiago and Rizal Park (largest correlation coefficient), b) park visitation (0=no visit, 1=visited) and familiarity with park photo (0=correct, 1=incorrect) (except for Arroceros Forest Park, which is $\rho>0.05$), c) park visitation (0=no visit and 1–2 times visit, 1=3 to 4 times visit and 5 or more times) and familiarity with park photo (0=correct, 1=incorrect) (except for Arroceros Forest Park in which $\rho>0.05$), d) sex (0=female, 1=male) and park visitation in Arroceros Forest Park, which agrees with the data where the proportion of male respondents who had visited Arroceros Forest Park is larger than females, and e) residence (0=Manila, 1=others) and park visitation (Arroceros Forest Park, Paco Park, and Intramuros). There was no significant relationship between sex and residence (0=Manila, 1=others) and familiarity with the photo. This study showed that allowance, a form of student income, significantly influences park visitation and re-visitation. The positive correlation coefficients suggest that students with higher allowance prefer to visit large open-access urban parks.

Significant weak positive correlation was also observed for the following park visits: Intramuros and Fort Santiago ($\rho=0.496$, $\rho=0.000$), Intramuros and Rizal Park ($\rho=0.457$, $\rho=0.000$), Paco Park and Arroceros Forest Park ($\rho=0.361$, $\rho=0.000$), Fort Santiago and Rizal Park ($\rho=0.322$, $\rho=0.000$), Intramuros and Paco Park ($\rho=0.264$, $\rho=0.000$), Arroceros Forest Park and Fort Santiago ($\rho=0.227$, $\rho=0.000$), Paco Park and Fort Santiago ($\rho=0.238$, $\rho=0.000$), and Paco Park and Rizal Park ($\rho=0.197$, $\rho=0.000$). In general, larger positive correlation coefficients were observed for adjacent parks (Intramuros and Rizal Park, Intramuros and Fort Santiago)

Table 3. Descriptive statistics of the frequency of park visits and familiarity with park photos.

	Arroceros Forest Park		Fort Santiago		Intramuros		Paco Park and cemetery		Rizal Park	
	f	%	f	%	f	%	f	%	f	%
Not yet visited	292	85.63	129	37.83	35	10.26	261	76.54	11	3.23
1–2 times (a)	42	12.32	145	42.52	83	24.34	55	16.13	53	15.54
3–4 times (b)	2	0.59	30	8.80	74	21.70	10	2.93	48	14.08
> 5 times (c)	5	1.47	37	10.85	149	43.70	15	4.40	229	67.16
Total number and % of students with visitation experience (a+b+c) (n=341)	49	14.37	212	62.17	306	89.74	80	23.46	330	96.77
Number and % of females with visitation experience (n=125)	11	8.80	78	62.40	111	88.80	29	23.20	121	96.80
Number and % of males with visitation experience (n=216)	38	17.59	134	62.04	195	90.28	51	23.61	209	96.76
Number and % of the correctly identified photos (n=341)	238	69.79	215	63.05	303	88.86	219	64.22	315	92.38
Number and % of females with the correct answer (n=125)	84	67.20	77	61.60	109	87.20	76	60.80	112	89.60
Number and % of males with the correct answer (n=216)	154	71.30	138	63.89	194	89.81	143	66.20	203	93.98

Table 4. Spearman rank correlation of allowance, sex, residence, frequency of visits, and park photo familiarity (n=341).

	Frequency of visits (0=not yet visited, 1=1 to 2 times, 2=3 to 4 times, 3=5 or more times)									
	Arroceros Forest Park		Fort Santiago		Intramuros		Paco Park and cemetery		Rizal Park	
	ρ	p	ρ	p	ρ	p	ρ	p	ρ	p
Allowance (PHP) (0 = less than 50, 1 = 51 to 100, 2 = 101 to 150, 3 = above 150)	-0.093	0.088	0.140	0.009*	0.165	0.002*	0.006	0.917	0.240	0.000*
Visitation (1 = visited, 0 = not yet visited)										
Photo identification (1 = correct, 0 = incorrect)	0.106	0.051	0.192	0.000*	0.246	0.000*	0.226	0.000*	0.198	0.000*
Visitation (1 = 3 to 4 times and 5 or more, 0 = not yet visited and 1 to 2 times)										
Photo identification (1 = correct, 0 = incorrect)	0.095	0.079	0.119	0.029*	0.232	0.000*	0.140	0.010*	0.202	0.000*
Visitation (1 = visited, 0 = not yet visited)										
Sex (1 = male, 0 = female)	0.121	0.026*	-0.004	0.947	0.023	0.666	0.005	0.931	-0.001	0.984
Visitation (1 = visited, 0 = not yet visited)										
Residence (1 = Manila, 0 = others)	0.109	0.043*	0.102	0.060	0.120	0.026*	0.295	0.000*	0.091	0.093
Photo identification (1 = correct, 0 = incorrect)										
Sex (1 = male, 0 = female)	0.043	0.429	0.023	0.674	0.040	0.461	0.054	0.317	0.080	0.143
Residence (1 = Manila, 0 = others)	0.025	0.651	-0.044	0.421	-0.033	0.542	0.097	0.074	-0.050	0.355

*significant (p<=0.05)

than relatively distant parks (Paco Park and Rizal Park, Paco Park, and Fort Santiago).

Perceived importance of regulating ecosystem services of urban parks

Respondents were asked how important the regulating services of urban parks are on a seven-point scale. Regulating services are benefits from ecosystems that affect climate, flood, disease, waste, and water quality (MA 2005). Ecosystem processes that moderate natural phenomena and are considered important for urban ecosystems include climate regulation, carbon storage, stormwater and flood control, water purification, and mitigation of the urban heat island effect. Five regulating services (cooling of temperature, removal of air pollutants, regulation of stormwater and flood, absorption and removal of carbon dioxide, sequestration and storage of carbon dioxide) were presented in the questionnaire survey.

Of the five regulating services, the three most important were cooling of temperature (mean score=6.54), air pollutant removal (mean score=6.51), and stormwater and flood regulation (mean score=6.50). Considered least important was sequestration and storage of carbon dioxide, with a mean score of 6.38. One-way ANOVA and Tukey pairwise comparisons of means showed no significant difference in the perception of regulating services (ρ=0.175, f=1.59). Mann-Whitney test of female and male perception of urban park regulating services showed that the median scores were not significantly different (ρ>0.05).

When asked about perceptions of the six disservices of trees and green spaces (damage to infrastructure, pollen allergy, habitat for wild animals and pests, hiding places for thieves and criminals, causes injuries from falling branches and tree trunks, reduced visibility) on a seven-point Likert scale (1=strongly disagree to 7=strong agree), three highest mean scores were observed: damage to infrastructure (mean score=3.91), habitat for wild animals and pest (mean score=3.73), and pollen allergies (mean score=3.53). Mann-Whitney test of female and male perception of the disservices of trees showed that the median scores were not significantly different (ρ>0.05).

The perception of air pollutant removal services in urban parks showed that Arroceros Forest Park (with an average score of 6.59 on a 7-Likert scale) and Rizal Park (with an average score of 6.55) were perceived as the most important for the removal of urban air pollutants (**Table 5**) and were consistent with the findings of Lagbas (2019) regarding air quality regulation service of Arroceros Forest Park as the perceived most important ecosystem service. One-way ANOVA and Tukey pairwise comparisons of means showed no significant difference in means among the perception of air pollutant removal of urban parks (ρ=0.053, f=2.34). Mann-Whitney test of female and male perception of urban park air pollutant removal services indicated that the median scores were not significantly different (ρ>0.05).

Perception of urban environmental problems and land use

The perception of urban environment problems regarding respondents' level of concern to loss of green and open spaces, increasing volume of private and public vehicles, air quality degradation, urban heat effect, and increasing built-up area is shown in **Table 5**. Among the five urban problems, the greatest concern is the loss of green spaces (mean score of 6.39 on a 7-Likert scale), while the least concern is increasing built-up area (mean score=5.92). With their perceived most important ecosystem services of urban parks (cooling effect of the urban environment), the student might think that urban park is beneficial for heat mitigation, and reducing green spaces could result in a reduced urban cooling effect.

One-way ANOVA and Tukey pairwise comparisons showed a significant mean difference between the following urban problems (**Figure 3**): loss of green spaces (mean score=6.39) and urban heat (mean score=6.07), air quality degradation (mean score=6.20) and increasing built-up area (mean score=5.92), loss of green spaces (mean score=6.39) and increasing built-up area (mean score=5.92), and increasing vehicles (mean score=6.25) and increasing built-up area (mean score=5.92). Mann-Whitney test of female and male perception of urban environment problems showed no significant median score difference for loss of green spaces (p=0.0807). In addition, a significant median score difference was observed for urban heat (p=0.0186), increasing built-up area (p=0.0029), air quality degradation (p=0.0017) and increasing volume of vehicles (p=0.0051).

When asked about their perception on land use of open and green spaces using a three-point scale (1=encourage, 2=allow, 3=discourage), a high proportion of respondents indicated expansion of existing green spaces and creation of new green spaces (79%, mean=1.22) and permanent preservation of tree-covered land (73%, mean=1.28) should be encouraged by the city government. More than half of the respondents indicated that the city government should discourage the development of treeless vacant land (54%) and tree-covered land (58%–60%) and privatization of public parks and gardens (57%, mean=2.39). Mann-Whitney test of female and male perception of land use showed a significant median score difference for expansion and creation of new green spaces (ρ=0.0326), privatization of public parks and gardens (ρ=0.0060), and development of tree-covered lands into hospitals, schools, and recreational facilities (ρ=0.0038). In contrast, the median score of the rest was not significantly different.

Table 5. Descriptive statistics of the perception of regulating ecosystem services and air pollution removal of urban parks, urban environmental problems, and land use.

	Mean	Median	Mode	SE of mean	SD
Regulating services (1 = not important to 7 = very important)					
Cooling of the temperature	6.54	7	7	0.049	0.91
Removal of air pollutants	6.51	7	7	0.048	0.88
Regulation of stormwater and flood	6.50	7	7	0.050	0.92
Absorption and removal of carbon dioxide	6.44	7	7	0.052	0.95
Sequestration and storage of carbon dioxide	6.38	7	7	0.051	0.94
Disservices of trees (1 = strongly disagree to 7 = strongly agree)					
Damage to infrastructure (road, wall, building)	3.91	4	4	0.11	1.97
Dwelling places for wild animals	3.73	4	4	0.09	1.71
Pollen allergies	3.53	4	4	0.09	1.71
Cause injuries from falling branches and tree trunks	3.13	3	4	0.09	1.65
Reduce visibility of areas	2.99	3	1	0.10	1.76
Hiding places for thieves and criminals	2.88	3	1	0.10	1.78
Air pollutant removal services of urban parks (1 = not important to 7 = very important)					
Arroceros Forest Park	6.59	7	7	0.044	0.81
Rizal Park	6.55	7	7	0.047	0.86
Paco Park	6.47	7	7	0.047	0.86
Intramuros	6.47	7	7	0.048	0.88
Fort Santiago	6.41	7	7	0.050	0.93
Urban environment problem (1 = not concern to 7 = very concern)					
Loss of green spaces	6.39	7	7	0.050	0.92
Increasing number of vehicles	6.25	7	7	0.060	1.10
Air quality degradation	6.20	7	7	0.058	1.08
Urban heat or warming	6.07	6	7	0.058	1.06
Increasing built-up area	5.92	6	7	0.062	1.14

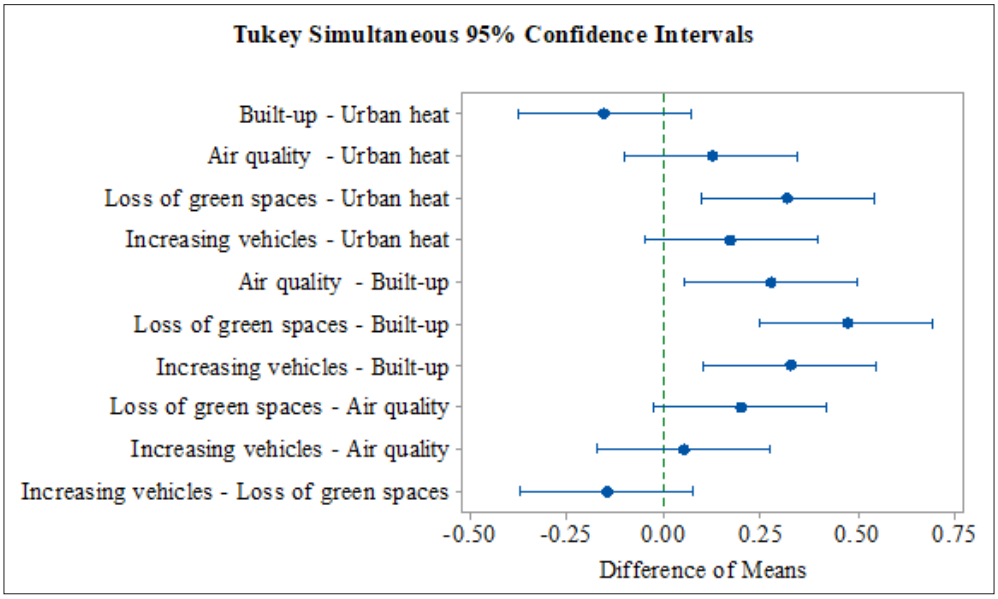


Figure 3. Tukey pairwise comparisons of perception of urban environmental problems. (Note: If an interval does not contain zero, the corresponding means are significantly different).

Principal component analysis

A principal component analysis analyzed how the perceptions of land use can be grouped into components. Based on the results, the first three principal components with variances equal to the eigenvalues greater than one represent 54% of the total variability that can adequately explain the variation in the data (**Table 6**). The perceptions of land use can be grouped into three: 1) development of treeless lands (eigenvalue=2.14), 2) development of tree-covered land (eigenvalue=2.00), and 3) retention of open and green spaces (eigenvalue=1.26).

The first component, the perception of vacant treeless land, accounted for 21% of the total variation and contains three perceptions (transportation terminal, development into business or commercial zone, housing project) with positive coefficients. The second component, perceptions of tree-covered land, accounted for 20% of the total variation and contains five components (four perceptions related to the development and one in terms of land privatization) with negative coefficients. The last component, perceptions of open and green spaces, accounted for 13% of the total variation and have positive coefficients (**Figure 4**). The result of descriptive statistics of the perceived urban environment problem where the loss of green spaces is the main concern and principal component analysis of their perception of land use of green spaces where more than 50% of respondents were not in favor of developing tree-covered land. More than 70% expressed support to encourage preservation and expansion of green spaces show consistency with their very high level of concern for the loss of green spaces.

DISCUSSION

The urban parks in this study are highly managed landscapes (except Arroceros Forest Park before the COVID-19 pandemic) and are not only valuable for the ecological balance of the city, tourism, learning environment, recreation, and outdoor activities of urban dwellers but are also significant protection land use as the habitat of birds, old-growth trees and threatened endemic plant species (Flores *et al*. 2020; Valle 2018), and conservation area of historical and cultural heritage structures and landscapes.

The five recreational parks are close to various educational institutions and mixed-use zone. Regular park visitors and users are students from nearby schools, working professionals from various government and private agencies, residents of nearby high-rise condominiums, local people, and people from other cities, with the greatest number of visitors in the late afternoon. Furthermore, economic activities resulting from tourism and park activities support micro-business and the livelihood of informal sectors within the vicinity of the park (Sahakian *et al*. 2020; Yotsumoto 2007). In Rizal Park and Intramuros, the direct beneficiaries of tourism and park use are the local people, food vendors, photographers, calesa drivers, operators, and pedicab drivers.

This study showed that Rizal Park and Intramuros, spacious and open access public parks were the most frequented parks. In contrast, the gated and comparatively small parks, Arroceros Forest Park and Paco Park were the least visited parks. Rizal Park was formerly known as the Luneta

Table 6. Frequency, percentage, and principal component analysis of the perception of land use.

	Encourage		Allow		Discourage		Principal component		
	f	%	f	%	f	%	1	2	2
Develop treeless vacant land into a transportation terminal	89	26.10	47	13.78	205	60.12	0.386		
Develop treeless vacant land into business or commercial zone	66	19.35	134	39.30	141	41.35	0.357		
Develop treeless vacant land into an affordable housing project	50	14.66	141	41.35	150	43.99	0.294		
Develop tree-covered land into affordable housing projects	89	26.10	47	13.78	205	60.12		-0.327	
Develop tree-covered lands into commercial areas and condominiums	67	19.65	77	22.58	197	57.77		-0.295	
Develop tree-covered land into hospitals, schools, and recreational facilities	59	17.30	89	26.10	193	56.50		-0.229	
Privatize public parks and gardens	97	28.45	122	35.78	122	35.78		-0.167	
Temporarily preserve tree tree-covered and develop later	54	15.84	125	36.66	162	47.51		-0.159	
Expand and create new green spaces	268	78.59	72	21.11	1	0.29			0.669
Permanently preserve and maintain tree-covered lands	250	73.31	85	24.93	6	1.76			0.627

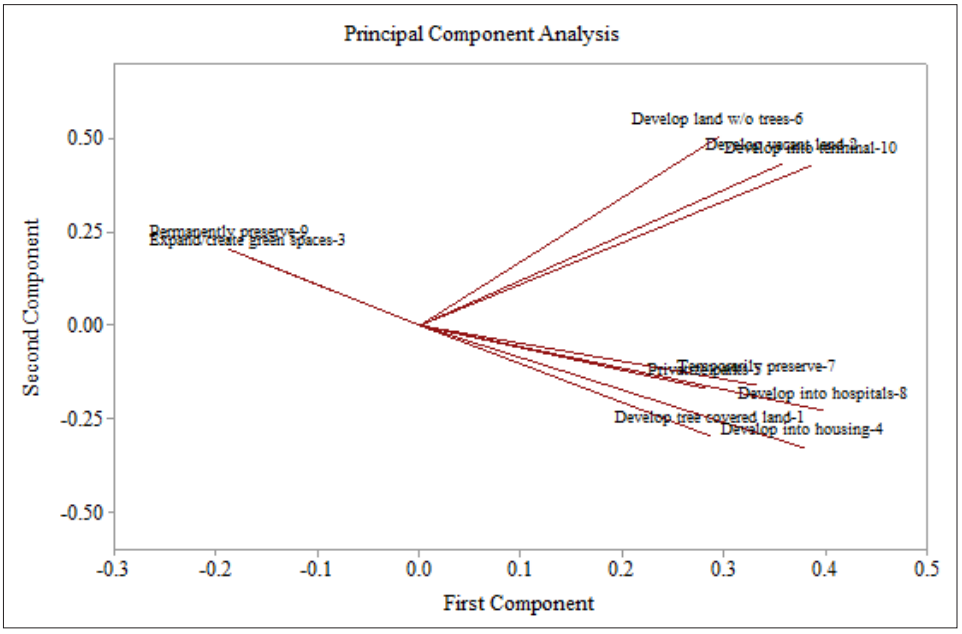


Figure 4. Loading plot of principal component analysis.

National Park (Proclamation No. 234 s. 1955) and was renamed Rizal Park in 1967 through Proclamation No. 299. In the same year, the national park was placed under the administration and management of the national government through Proclamation No. 273. The park is about 200 m from the university and could be strongly appealing for its recreation and outdoor activity service, nature experience, and history education value. The park open spaces (Quirino Grandstand, Parade Ground, Open Air Auditorium, and Lapulapu area) are mainly used as a venue for large social gatherings (*e.g.*, Feast of the Black Nazarene, Eid al-Fitr, and other religious gatherings) and outdoor physical activities (*e.g.*, running competition and group dancing). On the other hand, the botanical garden of the Chinese Garden is used for nature appreciation. Parents often use the Rizal monument and the statues depicting Dr. Jose Rizal's execution for their children's history education (author's personal experience) (**Figure 2h**). Regarding park visitation rate, the NPDC revealed that the five-year (2015 to 2019) average daily number of Rizal Park visitors before the COVID-19 pandemic was about 26,863 person day. The peak months were January, February, and December, while July and August had the lowest number of visitors. The average number of visitors decreased from 30,044 person a day in 2019 to 6,250 in 2020 and 4,280 in 2021. The park was closed from 2020 to 2021 due to surges in COVID-19 infections.

Intramuros, a cultural heritage district known for its adobe stone wall and Philippine-Spanish architecture of the sixteenth to the nineteenth century, is about 500 m to 600 m from the university. The Intramuros fortification (popularly called a wall) that stretches along Muralla Street to Sta Lucia Street is students' favorite hangout in the afternoon or during their free time. Before the COVID-19 pandemic, the wall is open for public use and enjoyment up to 5:00 pm. Baluarte de San Francisco de Dilao (entrance ramp in front of Mapua University) and Baluarte de San Andres (entrance ramp near the Department of Labor) are the favorite relaxation sites where students engage in relaxation activities such as sitting on the wall, observing the view of the golf course and city skyline and interactions with their friends. Students from the six learning institutions consisting of two public schools (Manila High School and Pamantasan ng Lungsod ng Maynila) and four private universities (Colegio de Santa Rosa, Colegio de San Juan de Letran, Lyceum of the Philippines University, and Mapua University) are the usual visitors. From 2012 to 2017, Intramuros' annual average student population was 42,898 (IA n.d.).

The Arroceros Forest Park, a newly redeveloped riverside public park, is about 700 m from the university. Before the COVID-19 pandemic, park access was regulated, and good park facilities were lacking. Due to its relatively undisturbed condition, low visitation rate, and lack of regular maintenance, the park was a breeding ground for mosquitoes and a habitat for birds and snakes (Lagbas 2019). The passage of the Arroceros Forest Park Ordinance in February 2020 was instrumental for the redevelopment into a permanent public park, enhancement of park facilities, and expansion of the parking area. In February 2022, the redeveloped park was opened to the public for nature appreciation and relaxation.

Like Arroceros Forest Park, Paco Park is also the least frequented park and is approximately 800 m from the university. It is a historical park, the burial site of the three-martyr priest (GOMBURZA) and Dr. Jose Rizal. The data from NPDC showed that from 2017 to 2019 (before the COVID-19 pandemic), the average number of park visitors was 584 person a day. When the COVID-19 pandemic was declared, the park was closed from April to December 2020 and was opened in January 2021. Possible reasons for its low visitation are travel distance from the university, low willingness to pay for the entrance fee, absence of a one-way trip of public utility jeepney from the university to the park, and limited operating hours (6:00 am up to 5:00 pm).

Fort Santiago, a historical and cultural heritage park of national significance, is a moderately frequented park. However, the frequency of visits and the re-visitation rate are comparatively low despite its good facilities and landscape. Aside from recreational value, the park provides a learning environment for the Second World War history and for appreciating the life and works of Dr. Jose Rizal. Possible reasons for the low frequency of students' visits to Fort Santiago could also be similar to Paco Park and its comparatively high entrance fee. Its distance from the university is about 1.4 km, and a long walk discourages park visitation. Before the COVID-19 pandemic, park operating hours were limited from 8:00 am to 5:00 pm from Tuesday to Sunday and from 1:00 pm to 5:00 pm on Mondays. In February 2022, the park operating hours were extended to nighttime (9:00 am to 8:30 pm during weekdays and 6:00 am to 9:30 pm during weekends) (IA 2022) to accommodate more visitors. Regarding the discounted entrance fee of PHP 50 for students (about 1 USD), the amount could be perceived as expensive for students with a minimum daily allowance of about PHP 150 to 250. Generally, students from private schools have a higher allowance. The allowance is spent on transportation, food, photocopy of learning material, and other school requirements (Canlas 2014). In this study, about 10% of the respondents indicated having a greater than PHP 200 average daily allowance, explaining the relatively lower frequency of park visits.

General attributes of parks such as naturalness (bird species richness, plant species richness, other animal species richness, biological diversity, varied landscape, natural design, and bodies of water), neatness (cleanliness, low crime, scenic beauty, good accessibility, easy to get, tranquility, and good facilities), sociability (playground, opportunities to spend time with kids and meet new people and sports activities) and spaciousness (large size, low visitor density, and opportunity to walk a dog) (Bertram & Rehdanz 2015), green space characteristics such as green (tree cover, tree richness, and flowering richness), spatial (inhabitant density and park size) and gray characteristics (lighting, seating possibilities, and sport facilities) (Palliwoda & Priess 2021), and general park types (natural-passive use park, recreational-active use park, and multi-use park) (Talal & Santelmann 2021) have significant influence to park use and visitation and are perceived differently according to age group and sex. In Leipzig, Germany, older age groups (>65 years) value aesthetic benefits, urban wilderness aspects of parks, and natural elements such as trees, flowering aspects, or water elements, whereas adults (31–64 years) value park facilities such as playgrounds, benches, and paths, while the young adults (19–30 years) placed more importance on park facilities (Palliwoda & Priess 2021). Meanwhile, Talal & Santelmann (2021) observed that park visitors in Portland, Oregon, United States are highest in recreational-active use parks, followed by natural-passive use and multi-use parks. On the other hand, a study by Kabisch *et al*. (2021) showed that women park visitors in Leipzig, Germany, were more concerned with security and safety and agreed with Talal & Santelmann (2021). This study did not investigate the relationship between park visits and park attributes and could be explored for comparison with other studies. Other factors such as time of the day (Kiplagat *et al*. 2022), climate (Kabisch *et al*. 2021), period of the dry season, fine weather, extended holidays, and mental health impacts of the COVID-19 pandemic (Larson *et al*. 2022; Maury-Mora *et al*. 2022) encourage more people to spend time visiting outdoor places. In this study, the reasons for park preference and usage pattern were also not part of the study and could be worthwhile for future studies.

The findings regarding the perceived importance of the cooling function and urban air quality maintenance function of urban parks as the two most important regulating services suggest that respondents' perceptions are influenced by their experience to heat stress. This perception is due to the urban heat island effect and climate change, and outdoor particle pollution or particulate matter (dust, dirt, soot, or smoke) from trucks and public vehicles on busy roads near the university (Ayala Boulevard, San Marcelino Street, and Taft Avenue in Ermita, Manila).

In a concentrated urban area with problematic car traffic situations and a high proportion of outdated public utility vehicles, city dwellers are exposed to high levels of ultrafine soot particles from vehicle emissions (Kecorius *et al*. 2017) and other air pollutants. The sectors significantly impacted by respiratory, cardiovascular, and other diseases associated with poor air quality are the children, elderly, and people with comorbidities.

The most important benefit of urban parks and public open green spaces in compact cities is air pollution removal (Selmi *et al*. 2016). In 2015, Irga *et al*. concluded that urban areas with a high proportion of forest cover may experience better air quality regarding the ambient particulate matter. Trees and vegetation help mitigate air

pollution by absorbing and trapping particle matter and chemical pollutants in their leaves, stem, and branches.

The findings regarding the perceived importance of Arroceros Forest Park and Rizal Park for removing urban air pollutants suggest that urban parks with large tree canopy cover and vegetation areas are highly appreciated for their ecological services. In terms of park size, Rizal Park is about 24 times as large as Arroceros Forest Park, but the latter has a higher tree density and a greater number of tree and plant species (**Table 1**). According to NPDC data, 3,164 tree species can be found in Rizal Park and are composed of *ficus* (3%, 5 species), fruit-bearing (9%, 18 species), palm (17%, 18 species), indigenous (33%, 44 species) and exotic species (38%, 24 species). Exotic tree species are composed of Indian tree (*Polyalthia longifolia*, 2%), rain tree (*Samanea saman*, 2%), African tulip (*Spathodea campanulata*, 3%), neem tree (*Azadirachta indica*, 3%), golden shower (*Cassia fistula*, 5%), fire tree (*Delonix regia*, 5%), and mahogany (*Swietenia* sp., 15%) as the most abundant tree species. Preference for planting exotic tree species is explained by their fast-growing characteristics, high transplant survival, and easy maintenance. In addition, when the trees mature, they form an extensive crown that provides shade and a cooling effect to the surroundings (Valle 2018). While the native tree species composition is hauili (*Ficus septica*, 1%), white lauan (*Shorea contorta*, 1%), banaba (*Lagerstroemia speciosa*, 2%), talisay (*Terminalia catappa*, 2%), molave (*Vitex parviflora*, 5%), and narra (*Pterocarpus indicus*, 16%) as the most abundant tree species. The presence of a relatively large number of native tree species and other plant species in Rizal Park indicates the importance of urban parks as a protection land use in urban areas and contributes to the conservation of native and threatened plant species such as *V. parviflora* (endangered tree species) and *S. contorta* (vulnerable species) (DENR 2017).

The undesirable effect of urban trees and public open green spaces on human well-being can result from their natural functions such as emissions of pollen that causes allergies, habitat of pest carrying diseases and venomous snakes and spiders, physical and structural barrier, damage to pavements and sidewalks, and a potential site for crimes has been termed ecosystem disservices (Cariñanos *et al*. 2017). Thus, one challenge in promoting green space conservation in urban land use planning and management decision-making processes is trees and vegetation's social and economic cost to infrastructure and public health. Planning and management of urban parks and green spaces should include appropriate features and facilities to reduce the impacts of disservices.

The potential of urban parks to provide full ecosystem services that significantly contribute to public health benefits is a function of its green space spatial characteristics such as tree canopy cover, vegetation area, species diversity and composition, and water cover (Mears *et al*. 2019; Daniels *et al*. 2018). The multi-model analysis of Mears *et al*. (2019) revealed a statistically significant association between high tree species diversity planting and high-water cover with lower levels of poor health. Conversely, lower tree habitat diversity and greater grass cover are associated with high levels of poor health. It is worth noting in their study that the association between tree cover and levels of poor health is irrelevant, but the tree habitat diversity index is significant for health. However, the result was based on the perspective of European urban park users and could not be appropriate for the Philippine setting. Integrating spatial, ecological, climatic, and social criteria of public open green spaces (Daniels *et al*. 2018) in land use planning and decision making can be used to optimize the ecosystem services use at the local and national scales. It can also increase the potential of public open green spaces to mitigate urban problems such as air quality problems and climate change-induced heat stress.

Lastly, large urban parks with national park status compete with local land use. Conservation and maintenance of large parks involve losses in opportunity cost for the local government's real estate tax, commercial lease agreement, and other forms of local income. Open spaces and vacant lands of highly urbanized cities are potential sites for real estate development and mixed commercial land use. For instance, Rizal Park has large open green spaces, but due to its protected status as a national park, it cannot be developed further by the city government. In an attempt to retrieve the ownership and management of the park from the national government to the city government, a proposed law (House Bill No. 2594) was filed by a party-list representative (a former city mayor who was also involved in the development of Mehan Garden and Arroceros Forest Park) in July 2019. In the proposed law, the city mayor will be given full control and supervision of Rizal Park (under Executive Order No. 160 s. 1999 one slot for NPDC membership is reserved for the Manila mayor). If the bill becomes a law, it could have implications for future planning, management, and land use of Rizal Park.

CONCLUSION AND RECOMMENDATION

In this paper, the cultural heritage urban parks that are accessible, multi-functional with good vegetation cover and open access, appeal to the students and possibly to other park users. The recreational services, restorative potential, and proximity of the urban parks could be the main reasons for park use and frequent visits. People who try to visit a park have a high demand for its cultural ecosystem services and could be more willing to pay for its conservation and maintenance. Frequent park users and visitors are more familiar with the site-specific and well-known attributes of the park. Their acquaintance with the features of urban

parks and perceptions of ecosystem services, including land use, reflect their interest, place attachment, interaction with the environment, as well as aesthetic and cultural value that could be valuable for revealing patterns of park use and visitation. Comparison of frequency of visits to the urban parks could help us understand park use patterns and could be used as decision support for identifying priorities for improvement. Further, understanding which park ecosystem services are strongly appreciated and which environmental problems are perceived most important are crucial for implementing park conservation while accounting for various social, economic, cultural, and political influences. Finally, their willingness to visit the park may be viewed as an opportunity to collect financial support for the sustainable financing of park operation, which is necessary for creating equitable park use and access.

This paper contributes toward improving understanding of the five cultural heritage parks within the boundaries of a highly urbanized city by providing baseline data and location-specific information such as surrounding environment, distance from the university, natural and cultural features, operation hours, and park use. Further, insights into the possible drivers of park visitation within the surrounding environment of the parks were given. The perceptions of ecosystem services and urban environment problems could help park managers and decision-makers understand the influence of sociodemographic variables on park use and visit and perceived demand for intangible ecosystem services. Furthermore, this paper provides information not readily available in the literature for land use planners, park managers, policymakers, and the government to enhance the parks' socio-economic and ecological benefits.

The regulating services of urban parks in the form of microclimate formation, noise regulation, air pollutants removal, and climate change mitigation are equally important as the cultural services in the form of natural relaxation, learning environment, spiritual satisfaction, and a venue for active participation and passive outdoor activities. The high importance of regulating services as perceived by the students represents the demand for and significance of public open green spaces for maintaining the quality of the urban ecosystem. In this connection, Rizal Park and some portions of Intramuros district with large tree cover and vegetation should be permanently protected from any future development and land use change through legislation at the national level. Also equally important for legal protection are the vista points and visual corridors of important cultural property of the country within urban parks (*e.g.*, the Rizal monument and Intramuros wall) for unobstructed viewing appreciation and photographic opportunities (NHCP 2012).

The expanding population in Manila, including the growing number of students in government-subsidized higher education institutions, such as TUP, is expected to increase the demand for and use of urban parks and other public open green spaces. These spaces are important for addressing physical and mental health challenges due to stress associated with academic load, separation from the natural environment, congestion, pollution, climate change impacts, and public health crises. National legislation that will establish and empower a single, dedicated national government agency to plan, develop, maintain, and operate non-NIPAS public parks is significant to ensure that public parks and other public open green spaces remain for the benefit of the public. In consideration of the urban poor and the economically disadvantaged, and to help meet the needs of urban communities during the post-COVID-19 pandemic scenario, park management should create opportunities and implement programs for fair access. Suggested programs include discounted access fees, free access fees on special occasions, and nighttime operation hours so that the benefits of parks will be shared equitably across all genders and sectors.

Findings could represent the five urban parks by recruiting a broader range of respondents and increasing the sample size. Also, conducting on-site observations and face-to-face surveys coupled with interviews and other mixed-methods approaches at different times and seasons can help determine reasons and motivations for park visit/revisitation, needs assessment, and perceived park management issues. Results of these methods can be integrated into policies and programs for enhancing park planning and management. While on-site and actual data gathering provides reliable information, these methods are generally limited by human resources, cost, geographic scope, and time. Recently, visual content analysis of photographs of urban parks uploaded on various social media platforms combined with spatial information analysis is increasingly used as a supplement for revealing motivations for park visits and park use patterns (Song *et al*. 2020; Donahue *et al*. 2018). Future work may combine existing approaches and social media data to improve understanding of where and why people visit urban parks.

LITERATURE CITED

Ancheta, A.A., Membrebe Jr., Z.O., Santos, A.J.G., & Valerosa, J.C. (2017) Institutional arrangements in management an urban forest park: Arroceros Forest Park, Manila, Philippines. *Journal of Nature Studies* 16(2): 14–23.

Angara, S. (2019) An act to reorganize the national parks development committee to the public parks development authority. Senate Bill No. 1158. Retrieved from: <https://legacy.senate.gov.ph/lisdata/3186128712!.pdf >

Bertram, C. & Rehdanz, K. (2015) Preferences for cultural urban ecosystem services: comparing attitudes, perception, and use. *Ecosystem Services* 12: 187–199.

https://doi.org/10.1016/j.ecoser.2014.12.011

Canlas, M. (2014) The breakdown of students' allowance. The Philippine Star. Retrieved from: <https://www.philstar.com/campus/extra-curricular-activities/2014/05/26/1327597/breakdown-students-allowance>

Cariñanos, P., Calaza-Martínez, P., O'Brien, L., & Calfapietra, C. (2017) The cost of greening: Disservices of urban trees. In: Pearlmutter, D. *et al*. (eds), The Urban Forest. Future City, Vol 7. Springer, Cham. https://doi.org/10.1007/978-3-319-50280-9_9

Daniels, B., Zaunbrecher, B.S., Paas, B., Ottermanns, R., Ziefle, M., & Ros-Nickoll, M. (2018) Assessment of urban green space structures and their quality from a multidimensional perspective. *Science of the Total Environment* 615: 1364–1378. https://doi.org/10.1016/j.scitotenv.2017.09.167

Donahue, M.L., Keeler, B., Wood, S.A., Fisher, D.M., Hamstead, Z.A. & McPhearson, T. (2018). Using social media to understand drivers of urban park visitation in the twin cities, MN. *Landscape and Urban Planning* 175:1–10. https://doi.org/10.1016/j.landurbplan.2018.02.006

DENR [Department of Environment and Natural Resources]. (2017) Updated national list of threatened Philippine plants and their categories. Administrative Order No. 11. Retrieved on 05 April 2022 from: <https://www.informea.org/sites/default/files/legislation/DENR%20Order%2011%202017%20%28Updated%20National%20List%20of%20Threatened%20Plants%20and%20their%20Categories%29.pdf>

Flores, P.M.C., Fernandez, A.I., Orozco, K.J.U., Endino, R.M.C., Picardal, J.P., & Garces, J.J.C. (2020) Ornamental plant diversity, richness and composition in urban parks: studies in Metro Cebu, Philippines. *Environmental and Experimental Biology* 18: 183–192. http://doi.org/10.22364/eeb.18.19

Gonzales, L. & Magnaye, D. (2016) Challenges to the multi-functional uses and multifarious benefits of urban green spaces: basis of urban biodiversity planning and management in the city of Manila, Philippines. *International Journal of Environmental Science & Sustainable Development* 1(1) 69–82. https://dx.doi.org/10.21625/essd.v1i1.33.

Intramuros Administration (IA). (n.d.) Statistics, Population of students. Retrieved from: <https://intramuros.gov.ph/statistics/>

Intramuros Administration (IA). (2022) Intramuros sites guidelines. Retrieved from: <https://www.facebook.com/OfficialIntramurosAdministration/photos/pcb.4433988923367224/4433987173367399/>

Irga, P.J., Burchett, M.D., & Torpy, F.R. (2015) Does urban forestry have a quantitative effect on ambient air quality in an urban environment. *Atmospheric Environment* 120: 173–181. https://doi.org/10.1016/j.atmosenv.2015.08.050

Kabisch, N., Kraemer, R., Masztalerz, O., Hemmerling, J., Puffel, C., & Haase, D. (2021) Impact of summer heat on urban park visitation, perceived health and ecosystem service appreciation. *Urban Forestry & Urban Greening* 60: 1–9. https://doi.org/10.1016/j.ufug.2021.127058.

Kecorius, S., Madueño, L., Vallar, E., Alas, H., Betito, G., Birmili, W., Cambaliza, M.O., Catipay, G., Gonzaga-Cayetano, M., Galvez, M.C., Lorenzo, G., Muller, T., Simpas, J.B., Tamayo, *E.g.*, & Wiedensohler, A. (2017) Aerosol particle mixing state, refractory particle number size distributions and emission factors in a polluted urban environment: Case study of Metro Manila, Philippines. *Atmospheric Environment* 170: 169–183. https://doi.org/10.1016/j.atmosenv.2017.09.037

Kiplagat, A.K., Koech, J.K., Ng'etich, J.K., Lagat, M.J., Khazenzi, J.A., & Odhiambo, K.O. (2022) Urban green spaces characteristics, visitation patterns and influence of visitors' socio-economic attributes on visitation in Kisumu City and Eldoret municipality, Kenya. Trees, *Forests and People* 7: 1–9. https://doi.org/10.1016/j.tfp.2021.100175

Lagbas, A.J. (2019) Social valuation of regulating and cultural ecosystem services of Arroceros Forest Park: a man-made forest in the city of Manila, Philippines. *Journal of Urban Management* 8(1): 159–177. https://doi.org/10.1016/j.jum.2018.09.002

Larson, L.R., Mullenbach, L.E., Browning, M.H.E.M., Rigolo, A., Thomsen, J., Metcalf, E.C., Reigner, N.P., Sharaievska, I., McAnirlin, O., D'Antonio, A., Cloutier, S. Helbich, M., & Labib, S.M. (2022) Greenspace and park use associated with less emotional distress among college students in the United States during the COVID-19 pandemic. *Environmental Research* 204: 112367. https://doi.org/10.1016/j.envres.2021.112367

Lyytimaki, J. & Sipila, M. (2009) Hopping on one leg – the challenge of ecosystem disservices for urban green management. *Urban Forestry & Urban Greening* 8(4) 309–315. https://doi.org/10.1016/j.ufug.2009.09.003

Macaraig, J.E.D., Dida, J.J.V., & Bantayan, N.C. (2021) Above ground biomass and carbon stock estimation of Arroceros Forest Park "the Manila's last lung" using geographic information system (GIS). *Journal of Biodiversity and Environmental Sciences* 18(1): 17–24.

Maury-Mora, M., Gomez-Villarino, M.T., &. Varela-Martinez, C. (2022) Urban green spaces and stress during COVID-19 lockdown: a case study for the city of Madrid. *Urban Forestry & Urban Greening* 69: 127492. https://doi.org/10.1016/j.ufug.2022.127492

Mears, M., Brindley, P., Jorgensen, A., Ersoy, E., & Maheswaran, R. (2019) Greenspace spatial characteristics and human health in an urban environment: an epidemiological study using landscape metrics in Sheffield, UK. *Ecological Indicators* 106. https://doi.org/10.1016/j.ecolind.2019.105464

Millennium Ecosystem Assessment (MA). (2005) Ecosystems and Human Well-being: Synthesis. Island Press, Washington, DC. Retrieved from: <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>

NHCP [National Historical Commission of the Philippines]. (2012) Guidelines on Monuments Honoring National

Heroes, Illustrious Filipinos and Other Personages. Retrieved from: <https://nhcp.gov.ph/resource/guidelines/nhcp-guidelines/>

NPDC [National Parks Development Committee]. (n.d.) Freedom of information. Retrieved from: <https://www.foi.gov.ph/requests/

Palliwoda, J. & Priess, J.A. (2021) What do people value in urban green? Linking characteristics of urban green spaces to users' perceptions of nature benefits, disturbances, and disservices. *Ecology and Society* 26(1): 28. https://doi.org/10.5751/ES-12204-260128

Pereira, R.A. & Lopez, E.D. (2004) Characterizing the spatial pattern changes of urban heat islands in metro manila using remote sensing techniques. *Philippine Engineering Journal* 25(1): 15–34.

PSA [Philippine Statistics Authority]. (2021) Highlights of the 2020 census of population and housing. Retrieved on 12 January 2022 from: <http://rssoncr.psa.gov.ph/sites/default/files/Manila_0.pdf>

Pornasdoro, K.P., Silva, L.C., Munarriz, M.L.T., Estepa, B.A., & Capaque, C.A. (2014) Flood risk of metro manila barangays: a GIS-based risk assessment using multi-criteria techniques. *Journal in Urban and Regional Planning*. 1, 1. Retrieved from: <https://journals.upd.edu.ph/index.PHP/19May2014_surp/article/view/4207/3817 on 27 November 2020>

Ramos, M.S. (2021) A paved forest? 'redevelopment' of Arroceros Forest Park questioned. Philippine Daily Inquirer. Retrieved on 05 April 2022 from: <https://newsinfo.inquirer.net/1517819/a-paved-forest-arroceros-parks-redevelopment-questioned>

Sahakian, M., Anantharaman, M., Di Giulio, A., Saloma-Akpedonu, C., Zhang, D., Khanna, R., Narasimalu, S., Favis, A. M. t., Alfiler, C.A., Narayanan, S., Gao, X., & Li, C. (2020) Green public spaces in the cities of South and Southeast Asia. protecting needs towards sustainable well-being. *The Journal of Public Space* 5(2): 89–110. https://doi.org/10.32891/jps.v5i2.1286

Selmi, W., Weber, C., Riviere, E., Blond, N., Mehdi, L., & Nowak, D. (2016) Air pollution removal by trees in public green spaces in Strasbourg city, France. *Urban Forestry & Urban Greening* 17: 192–201. https://doi.org/10.1016/j.ufug.2016.04.010

Song, X.P., Richards, D.R., He, P., & Tan, P.Y. (2020). Does geo-located social media reflect the visit frequency of urban parks? A city-wide analysis using the count and content of photographs. *Landscape and Urban Planning* 203: 103908. https://doi.org/10.1016/j.landurbplan.2020.103908

Talal, M.L. & Santelmann, M.V. (2021) Visitor access, use, and desired improvements in urban parks. *Urban Forestry & Urban Greening* 63: 127216. https://doi.org/10.1016/j.ufug.2021.127216

Tian, Y., Wu, H., Zhang, G., Wang, L., Zheng, D., & Li, S. (2020) Perceptions of ecosystem services, disservices and willingness-to-pay for urban green space conservation. *Journal of Environmental Management* 260: 110–140. https://doi.org/10.1016/j.jenvman.2020.110140

Valle, P.B.S. (2018) Comparison of species composition, species diversity, and structural distribution of urban trees in three types of urban greenspaces. *Ecosystems & Development Journal* 8(2): 28–40.

Vranic, P., Zhiyanski, M., & Milutinovic, S. (2016) A conceptual framework for linking urban green lands ecosystem services with planning and design tools for amelioration of micro-climate. J*ournal of Integrative Environmental Sciences* 13(2-4): 129–143. DOI:10.1080/1943815X.2016.1201516

Yotsumoto, Y. (2007) Does tourism help alleviate poverty? – a case of vendors in Rizal Park in Manila, Philippines. Retrieved from: <http://www.ritsumei.ac.jp/acd/re/k-rsc/hss/book/pdf/no89_01.pdf>

Zoleta-Nantes, D.B. (2000) Flood hazards in metro manila: recognizing commonalities, differences, and courses of action. *Social Science Diliman* 1(1). Retrieved from: <https://journals.upd.edu.ph/index.PHP/socialsciencediliman/article/view/36/7>