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Comparing city parks and cemeteries: Which habitat better supports urban bird communities?

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ABSTRAK

Burung urban merupakan kelompok organisme yang beradaptasi dengan lingkungan yang ditandai dengan kedekatan aktivitas manusia; namun, gangguan seringkali memaksa mereka berpindah ke habitat yang kurang terganggu. Di Jakarta, taman kota dan pemakaman berfungsi sebagai ruang hijau dengan aktivitas relatif rendah yang menyediakan tempat perlindungan potensial bagi komunitas burung, sehingga memiliki nilai konservasi. Studi ini meneliti keanekaragaman burung dan vegetasi di dua jenis ruang terbuka hijau perkotaan (RTH) ini dan meneliti hubungannya dengan keanekaragaman vegetasi. Survei dilakukan di empat taman kota dan empat pemakaman dalam petak melingkar. Hasil menunjukkan bahwa keanekaragaman burung di taman kota tergolong sedang, sedangkan keanekaragaman pohon dan tumbuhan non-pohon berkisar dari rendah hingga sedang. Di pemakaman, keanekaragaman burung, pohon, dan tumbuhan non-pohon secara konsisten rendah hingga sedang. Terdapat korelasi positif antara keanekaragaman pohon dan keanekaragaman burung, dan korelasi negatif antara keanekaragaman tumbuhan non-pohon dan keanekaragaman burung, meskipun kedua hubungan tersebut tidak kuat. Terungkap juga bahwa keanekaragaman burung di taman umum dan pemakaman berbeda secara signifikan. Temuan ini menyoroti peran ekologis ruang hijau perkotaan dalam mendukung keanekaragaman burung dan menekankan pentingnya struktur vegetasi dalam membentuk komunitas burung di lanskap yang sangat terurbanisasi.

Kata kunci: biodiversitas urban, Jakarta, pengelolaan urban, pohon urban, vegetasi

ABSTRACT

Urban birds represent the group of organisms adapted to environments characterized by close proximity to human activity. However, disturbances often displacing them to less disturbed habitats. In Jakarta, city parks and cemeteries serve as relatively low-activity green spaces that provide potential refugia for avian communities, thus hold conservation value. This study investigated bird and vegetation diversity in these two types of urban green open spaces (GOS) and examined their relationships the vegetation diversity. Surveys were conducted in four city parks and four cemeteries in circular plots. Results indicated that bird diversity in city parks was moderate, while tree and non-tree diversity ranged from low to moderate. In cemeteries, bird, tree, and non-tree diversity were consistently low to moderate. It is a positive correlation between tree diversity and bird diversity, and a negative correlation between non-tree diversity and bird diversity, though both relationships were not strong. It is also revealed that bird diversity in both city parks and cemeteries differ markedly. These findings highlight the ecological role of urban

green spaces in supporting avian diversity and emphasize the importance of vegetation structure in shaping bird communities within highly urbanized landscapes.

Keywords: Jakarta, urban biodiversity, urban management, urban tree, vegetation

INTRODUCTION

Urban birds are species that inhabit and have become habituated to city environments. Their close proximity to human activity often alters key behaviours such as nesting, foraging, reproduction, and other ecological functions. Despite these behavioural adaptations, urban birds remain dependent on ecological requirements, particularly the availability of space within urban landscapes to sustain their populations. Vegetated areas are the primary habitats for wildlife, including birds; however, in metropolitan regions such as Jakarta, these areas have been increasingly reduced due to land conversion associated with urban development. Nevertheless, some vegetated areas remain available as habitats and foraging grounds for urban birds, commonly referred to as Green Open Spaces (GOS). The ecological condition of a GOS strongly influences avian life within it (Gil-Tena et al., 2007), affecting nesting activities, predator avoidance, and foraging behaviour (Campos et al., 2009).

According to the Ministry of Home Affairs Regulation No. 1 of 2007 on the Management of Urban GOS, these spaces are classified into 23 categories based on function, including city parks and cemeteries. While city parks primarily serve as recreational areas for urban residents, cemeteries function as burial grounds (Ministry of Public Works Regulation No. 5 of 2008). Beyond these distinct social roles, both types of GOS share an ecological function as bird habitats. The vegetation within city parks and cemeteries is deliberately managed by humans—determining plant criteria, species selection, planting location, and area coverage—under the same regulation. Consequently, each type of GOS exhibits distinct vegetation characteristics, which in turn influence the surrounding fauna, including urban birds.

Bird species richness and community structure vary across locations due to multiple factors, particularly vegetation diversity and structure. Elements such as canopy heterogeneity, vertical stratification, and plant phenology (availability of flowers and fruits) play critical roles in shaping avian communities. While studies on the relationship between vegetation diversity and urban bird diversity in Jakarta's city parks have been conducted (Fadrikal et al., 2015), similar research in cemeteries has not yet been undertaken. Thus, the ecological role of vegetation in cemeteries in supporting urban bird diversity remains poorly understood.

This study aims to examine the relationship between vegetation diversity and urban bird diversity in cemeteries within Jakarta, and to compare these findings with city parks. The results are expected to provide valuable information for both bird observers and the general public regarding the ecological functions of vegetation in different types of GOS, and to clarify whether city parks and cemeteries play similar roles in supporting avian diversity within urban ecosystems.

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METHODOLOGY

The study employed descriptive, correlational, and comparative approaches using survey techniques.

Studies sites and species sampling

The research was conducted in Green Open Spaces (GOS) of Jakarta, comprising four city parks—Menteng Park, Honda Tebet Park, Cattleya Park, and Cempaka Cipayung Park—and four cemeteries—Ereveld Menteng Pulo Cemetery, Menteng Pulo Public Cemetery I, Menteng Pulo Public Cemetery II, and Menteng Pulo Public Cemetery III. Fieldwork was carried out from March to May 2018.

Research procedures

Site Selection

Eight study sites were selected: four city parks and four cemeteries (**TABLE 1**). City parks were chosen based on vegetation conditions characterized by medium-height trees with moderately open canopies. Cemeteries were selected based on vegetation conditions with medium-height trees, variation in tree species, and location within densely populated areas.

At each site, the number and placement of plots were determined systematically. Plot numbers varied depending on site area, calculated as: number of plots = total area / (2 × plot area). The distribution of plots is in **TABLE 1**.

TABLE 1. The number of plots proportionately to area size of each GOS

SITE	AREA (m²)	NO. PLOTS
City Parks		
Menteng Park	25,878.43	2
Honda Tebet Park	84,296.83	5
Cattleya Park	61,507.09	4
Cempaka Cipayung Park	83,334.00	5
Cemeteries		
Ereveld Menteng Pulo Cemetery	29,117.86	2
TPU Menteng Pulo I	170,797.33	11
TPU Menteng Pulo II	121,287.48	8
TPU Menteng Pulo III	42,228.39	3

Bird observation

Circular plots with a diameter of 100 m (area 7,850 m²) were established at each site. Plot numbers varied according to site size. Data collection was conducted for two weeks per site, with observations carried out twice daily: morning (06:00–09:00) and afternoon (15:00–18:00). Each plot was observed for five consecutive days. Recorded variables included bird species and number of individuals observed within each plot. Observations were done using a pair of 8 X 25 binoculars and Canon EOS 6 Digital Camera.

Vegetation observation

Vegetation surveys were conducted using two plot types: (1) circular plots (diameter 100 m) coinciding with bird observation plots for tree species, and (2) four

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square plots (1 × 1 m) for non-tree vegetation, including shrubs, herbs, grasses, and palms. Recorded variables included plant species and number of individuals. Identification follows Backer & Bakhuizen van den Brink Jr. vol 1—3 (1963—1968).

Data analysis techniques

Data Bird, tree, and non-tree diversity were calculated for each plot using the *Shannon Wiener*'s Diversity Index:

$$H' = - \sum (pi \times \ln(pi))$$

Where:

H' = *Shannon Wiener*'s diversity index

pi = ni / N

ni = number of individuals of species i

N = total number of individuals

Relationships between vegetation diversity (trees and non-trees) and bird diversity were analysed using simple linear regression and *Pearson's product moment* correlation when the data distribution is normal.

RESULTS AND DISCUSSION

Species Composition of Birds, Trees, and Non-Trees at Each Site

TABLE 2 presents the number of bird, tree, and non-tree species recorded at each city park and cemetery. Among the city parks, Honda Tebet Park had the highest bird species richness, while Cempaka Cipayung Park had the highest tree species richness. Among cemeteries, Menteng Pulo Public Cemetery 1 had the highest number of non-tree species.

TABLE 2. Species richness and *Shannon Wiener*'s diversity index H' (in range) of birds, trees, and non-trees at each site

Site	Area (M^2)	Bird Sp. Numb.	Bird H'	Tree Sp. Numb.	Tree H'	Non-Tree Sp. Numb.	Non-Tree H'
City Parks							
Menteng Park	25,878.43	9	1.60 - 1.84	10	1.64 - 1.78	13	0.69 - 0.91
Honda Tebet Park	84,296.83	14	1.38 - 2.19	16	0.37 - 1.89	18	0.24 - 1.04
Cattleya Park	61,507.09	8	1.21 - 1.80	18	1.35 - 1.58	16	0.07 - 1.12
Cempaka Cipayung Park	83,334.00	13	1.46 - 1.72	24	1.30 - 2.13	18	0.05 - 1.28
Cemeteries							
Ereveld Menteng Pulo Cemetery	29,117.86	6	1.35 - 1.70	6	0.73 - 0.87	16	0.68 - 0.96
Menteng Pulo Cemetery I	170,797.33	12	0 - 1.59	20	0.53 - 1.75	40	0.54 - 1.64
Menteng Pulo Cemetery II	121,287.48	7	0 - 1.52	19	0.43 - 1.68	29	0.72 - 1.26
Menteng Pulo Cemetery III	42,228.39	6	1.14 - 1.66	6	0.42 - 1.69	16	0.92 - 1.25

A total of 21 bird species were recorded in city parks and 13 species in cemeteries. Honda Tebet Park had the highest bird species richness among parks (14 species), while Cattleya Park had the lowest (8 species). Among cemeteries, Menteng Pulo Cemetery I had the highest richness (12 species), and Menteng Pulo Cemetery III the lowest (6 species). The most abundant bird species in both habitat types was the Eurasian Tree Sparrow (*Passer montanus*), with 69 individuals in city parks and 75 in cemeteries. The least abundant species in city parks were the Common Myna (*Acridotheres tristis*) and

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the Javan Myna (*Acridotheres javanicus*), each with one individual. In cemeteries, the least abundant was the Plaintive Cuckoo (*Cacomantis merulinus*), also with one individual (**APPENDIX 1**).

A total of 44 tree species were recorded in city parks and 28 in cemeteries (**APPENDIX 2**). The highest tree species richness in parks was found in Cempaka Cipayung Park (24 species), while the lowest was in Menteng Park (10 species). In cemeteries, Menteng Pulo Cemetery I had the highest richness (20 species), and Ereveld Menteng Pulo Cemetery the lowest (6 species). The most abundant tree species in city parks was the Mango Tree (*Mangifera indica*) with 38 individuals. The least abundant tree species, each with one individual, included the Bintaro/Sea Mango (*Cerbera odollam*), Fiddle-leaf Fig (*Ficus lyrata*), Angsana/Narra (*Pterocarpus indicus),* Keranji (*Dialium indum*), Golden Trumpet (*Allamanda cathartica*), Teak (*Tectona grandis*), and Matoa (*Pometia pinnata*).

In cemeteries, the most abundant tree species was the White Frangipani (*Plumeria alba*) with 150 individuals. The least abundant species, each with one individual, included the Handkerchief Tree (*Maniltoa grandiflora*), Kembang Merak (*Caesalpinia pulcherrima*), White Champaca (*Magnolia* × *alba*), African Tulip Tree (*Spathodea campanulata*), Kemuning (*Murraya paniculata*), Red Ti Plant (*Cordyline fruticosa*), and Lamtoro (*Leucaena leucocephala*).

A total of 36 non-tree species were recorded in city parks and 48 in cemeteries. Cempaka Cipayung Park had the highest richness among parks (18 species), while Menteng Park had the lowest (13 species). Among cemeteries, Menteng Pulo Cemetery I had the highest richness (40 species), and Menteng Pulo Cemetery III the lowest (16 species).

The most abundant non-tree species in both habitat types was Carpet Grass (*Axonopus compressus*), with 2,271 grooves in city parks and 945 in cemeteries. The least abundant non-tree species in city parks, each with one individual, included Indian Shot (*Canna indica*), Asthma Weed (*Euphorbia hirta*), Ornamental Sweet Potato (*Ipomoea batatas*), Kyllinga Grass (*Kyllinga* sp.), and False Daisy (*Eclipta prostrata*). In cemeteries, the least abundant species, each with one individual, included Purslane (*Portulaca oleracea*), Muntingia saplings (*Muntingia calabura*), and Eragrostis (*Eragrostis tenella*) (**APPENDIX 3**).

TABLE 2 also indicates that larger areas tend to support higher bird species richness. For example, Honda Tebet Park, the largest city park (84,296.83 m²), hosted 14 bird species, while Menteng Pulo Cemetery I, the largest cemetery (170,797.33 m²), hosted 12 species. This suggests that area size influences bird species richness. This area-diversity relationship had been studies by numerous researchers, both in animals and plants, as noted by Sedayu et al. (2024). However, area alone does not fully explain species richness. City parks consistently supported more bird species than cemeteries, indicating that other factors—such as vegetation structure and diversity—may play a significant role in shaping urban bird communities.

Diversity of birds, trees, and non-trees

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Based on the calculated diversity indices, the results are summarized in **TABLE 3**. Bird diversity in city parks generally falls within the moderate range, while tree and non-tree diversity ranges from low to moderate. In cemeteries, the diversity of birds, trees, and non-trees is also categorized as low to moderate.

The highest bird diversity index in city parks was recorded at Honda Tebet Park (Plot 5) with a value of 2.19, categorized as moderate. The lowest was at Cattleya Park (Plot 4) with a value of 1.21, also in the moderate range. In cemeteries, the highest bird diversity index was at Ereveld Menteng Pulo (Plot 3) with 1.70 (moderate), while the lowest was 0.00 at TPU Menteng Pulo I (Plot 10) and TPU Menteng Pulo II (Plot 8), categorized as low. The highest tree diversity index in city parks was at Cempaka Cipayung Park (Plot 5) with 2.13 (moderate), and the lowest at Honda Tebet Park (Plot 2) with 0.37 (low). In cemeteries, the highest was at TPU Menteng Pulo I (Plot 5) with 1.67 (moderate), and the lowest at TPU Menteng Pulo II (Plot 6) with 0.27 (low). The highest non-tree diversity index in city parks was at Cempaka Cipayung Park (Plot 3) with 1.28 (moderate), and the lowest at the same park (Plot 5) with 0.05 (low). In cemeteries, the highest was at TPU Menteng Pulo I (Plot 6) with 1.64 (moderate), and the lowest at TPU Menteng Pulo I (Plot 9) with 0.54 (low).

TABLE 3. Correlation Between Bird Diversity and Vegetation Diversity Indices

VARIABLE	PEARSON CORRELATION	SIG. (2-TAILED)
Tree Diversity	0.342*	0.031
Non-Tree Diversity	-0.175	0.28

TABLE 3 shows a positive correlation between tree diversity and bird diversity with a moderate correlation coefficient ($r = 0.342$, $p < 0.05$), indicating statistical significance. In contrast, non-tree diversity showed a weak negative correlation with bird diversity ($r = -0.175$, $p > 0.05$), which was not statistically significant. These findings suggest that in urban environments such as city parks and cemeteries, tree vegetation plays a more critical role in supporting bird diversity than non-tree vegetation. Trees provide essential resources for birds, including food, shelter, nesting sites, and perching areas (Hernowo & Prasetyo, 1989). Vegetation diversity enhances food availability, offering a wider range of foraging options for birds (Tews et al., 2004). Although some non-tree species provide seeds for granivorous birds, their lower stature and visibility to predators make them less suitable for nesting and shelter (Fadrikal et al., 2015).

TABLE 4. The Pearson's correlation between bird species and tree/non-tree species

Variable	Pearson Correlation (R)		Sig. (2-Tailed)	
	Sp. Num.	Ind. Num.	Sp. Num.	Ind. Num.
Bird Species vs. Tree Species	0.231	**-0.041**	0.446	0.803
Bird Species vs. Non-Tree Species	0.268	0.547**	0.446	0

Palms (family Arecaceae) are categorized as non-tree vegetation in this study due to their lack of woody tissue typical of eudicotyledonous trees. Despite their tall stature, broad canopies, and fruit that can be consumed by birds, palms are excluded from the tree

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category. Functionally, palms resemble trees in terms of food and shelter provision. However, even when palms are excluded from the tree category, the correlation between tree diversity (excluding palms) and bird diversity remains statistically significant ($p = 0.031$; **TABLE 4**).

TABLE 4 shows no significant correlation between bird species richness and either tree or non-tree species richness. This suggests that the number of vegetation species does not directly influence the number of bird species in each area. **TABLE 4** also indicates that tree abundance does not correlate with bird abundance, while non-tree abundance shows a weak but significant correlation with bird abundance. This relationship is primarily driven by the Eurasian Tree Sparrow (*Passer montanus*), a common granivorous bird in urban areas that utilizes grass fields for foraging despite minimal shelter provided by such habitats. This confirms that bird diversity in urban environments (both parks and cemeteries) is significantly influenced by tree diversity, which provides essential ecological functions such as food, shelter, nesting, and perching sites. In contrast, non-tree vegetation plays a lesser role due to its limited structural complexity and lower suitability for nesting and protection. Wiens (1992) emphasized that food availability is a key factor influencing bird populations in a certain habitat. Birds tend to select habitats that meet their resource requirements. For example, *Treron vernans* was observed exclusively in tree vegetation within parks and cemeteries, never in non-tree vegetation. Conversely, some bird species were found only in non-tree vegetation, highlighting the complementary roles of different vegetation types in supporting urban bird communities.

TABLE 5. T-test results for biodiversity indices, species richness, and abundance

Variable	T	Sig. (2-Tailed)	Mean (Std. Error)
Bird Diversity Index (City Park)	3.486	**0.001**	1.644 (0.059)
Bird Diversity Index (Cemetery)	3.971	**0**	1.177 (0.101)
Tree Diversity Index (City Park)	2.665	**0.011**	1.456 (0.011)
Tree Diversity Index (Cemetery)	2.701	**0.011**	1.096 (0.087)
Non-Tree Diversity Index (City Park)	-3.991	**0**	0.645 (0.097)
Non-Tree Diversity Index (Cemetery)	-3.753	**0.011**	1.069 (0.057)
Bird Species Richness (City Park)	2.977	**0.005**	6.625 (0.590)
Bird Species Richness (Cemetery)	2.864	**0.008**	4.583 (0.398)
Tree Species Richness (City Park)	1.069	0.326	16.750 (2.926)
Tree Species Richness (Cemetery)	1.069	0.327	12.000 (3.341)
Non-Tree Species Richness (City Park)	-1.854	0.113	15.750 (2.926)
Non-Tree Species Richness (Cemetery)	-1.854	0.155	26.000 (5.431)
Bird Abundance (City Park)	3.466	**0.001**	39.937 (4.042)
Bird Abundance (Cemetery)	3.265	**0.003**	24.500 (2.450)
Tree Abundance (City Park)	-0.874	0.387	4.041 (1.391)
Tree Abundance (Cemetery)	-0.874	0.387	6.083 (1.875)
Non-Tree Abundance (City Park)	-1.054	0.298	15.416 (6.222)
Non-Tree Abundance (Cemetery)	-1.054	0.303	1.147 (94.030)

TABLE 5 shows that the bird and tree diversity indices in city parks are significantly higher than those in cemeteries. This indicates that both the number of bird species and

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their abundance are greater in city parks. However, the t-tests for tree and non-tree species richness and abundance show no significant differences between city parks and cemeteries. This suggests that while the number of tree and non-tree species may be similar, bird communities respond more strongly to the structural and ecological characteristics of city parks.

Interestingly, the non-tree diversity index was lower in city parks compared to cemeteries. This may be attributed to the intentional planting and regulation of non-tree vegetation in city parks, as opposed to the more spontaneous growth in cemeteries. Despite this, the number of non-tree individuals was higher in city parks, likely due to landscaping practices (Department of Public Works, 2008). According to Rahayuningsih (2010), significant differences in diversity indices reflect habitat variation, which influences bird species' ability to utilize different habitat types. Although city parks are generally smaller in area than cemeteries, they support similar tree abundance, possibly due to deliberate planting of bird-attracting species (Fadrikal et al., 2015).

Wiens (1992) emphasized that food availability is a primary factor influencing bird presence in a habitat. Birds tend to select habitats that fulfil their resource needs, which may explain the higher bird diversity observed in city parks. This may serve as input for the management of urban parks and cemeteries to incorporate more tree species, especially those with canopy providing shelter and food for urban avifauna, which has also been propose previously by many researchers as Hakamashe et al. (2022).

CONCLUSIONS

Vegetation diversity in city parks differs from that in cemeteries, with tree diversity in city parks is moderate, and non-tree diversity in city parks is low. Tree diversity in cemeteries is moderate, while non-tree diversity in cemeteries is moderate. Bird diversity in city parks is significantly different from those in cemeteries, with bird diversity index in city parks and cemeteries is moderate. Tree diversity is positively correlated with bird diversity in both city parks and cemeteries.

AUTHOR CONTRIBUTIONS

AS: project conception; AS, RK, EPA, EL: methodology; NMF: data analyses; NMF, AS: original manuscript draft; NMF, AS, RK: manuscript review and editing.

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CONFLICTS OF INTEREST STATEMENT

There are no conflicts to declare.

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DISCLOSURES AND ETHICS

No disclosure and ethics needed.

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APPENDIX 1. List of species of birds on each park and cemetery

Species Name	TM	THT	TC	TCC	PEMP	TMP1	TMP2	TMP3
Acridotheres javanicus	0	1	0	0	0	0	0	0
Acridotheres tristis	0	1	0	0	0	0	0	0
Anthreptes malacensis	0	0	1	0	0	0	0	0
Aplonis panayensis	0	1	0	0	0	0	0	0
Apus nipalensis	0	0	1	0	0	0	0	0
Artamus leucorynchus	0	0	1	0	0	0	0	0
Cacomantis merulinus	0	0	0	0	1	0	0	0
Cinnyris jugularis	1	1	0	1	1	1	0	1
Collocalia linchi	0	1	0	1	1	1	1	1
Dicaeum concolor	0	1	0	0	0	1	0	0
Dicaeum trochileum	1	1	1	1	1	1	1	0
Dreptocopos moluccensis	0	1	0	0	0	0	0	0
Hirundo tahitica	0	0	0	1	0	1	1	0
Lonchura leucogastroides	0	1	1	1	0	0	0	1
Lonchura maja	0	0	0	1	0	0	0	0
Lonchura punctulata	0	0	0	0	1	1	0	0
Megalaima haemacephala	1	1	0	0	0	0	0	0
Orthotomus sutorius	0	0	0	1	0	0	0	0
Passer montanus	1	1	1	1	1	1	1	1
Psittacula alexandri	1	0	0	0	0	1	0	0
Pycnonotus aurigaster	1	1	1	1	1	1	1	1
Pycnonotus goiavier	1	1	0	1	0	1	1	0
Streptopelia chinensis	1	1	0	0	1	1	0	1
Treron vernans	1	0	1	0	0	0	0	0

0: absent; 1: present
PEMP : Ereveld Menteng Pulo Cemetery
THT : Honda Tebet Park
TC : Cattleya Park
TCC : Cempaka Cipayung Park
TM : Menteng Park
TMP 1: TPU Menteng Pulo 1 Cemetery
TMP 2: TPU Menteng Pulo 2 Cemetery
TMP 3: TPU Menteng Pulo 3 Cemetery

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APPENDIX 2. List of tree species in each park and cemetery

Species	TM	THT	TC	TCC	PEMP	TMP1	TMP2	TMP3
Acacia auriculiformis	0	0	0	0	0	1	1	0
Acacia mangium	0	0	0	1	0	0	0	0
Adenanthera pavonina	0	1	1	1	0	0	0	0
Agathis dammara	1	0	0	0	0	0	0	0
Allamanda cathartica	0	0	1	0	0	0	0	0
Artocarpus altilis	0	1	0	1	0	0	0	0
Artocarpus heterophyllus	0	1	0	1	0	1	1	0
Averrhoa bilimbi	0	0	1	0	0	1	0	0
Bauhinia purpurea	1	1	0	0	0	0	0	0
Bougainvillea sp.	0	0	0	0	1	0	1	1
Caesalpinia pulcherima	0	0	0	1	0	1	0	0
Callistemon lanceolatus	0	0	0	1	0	0	0	0
Ceiba pentandra	0	1	0	0	0	1	0	0
Cerbera odollam	1	0	0	0	0	0	0	0
Chrysophyllum cainito	0	0	0	1	0	0	0	0
Cordia subcordata	0	0	1	1	0	1	0	0
Cordyline fruticosa	0	0	0	0	0	1	0	0
Delonix regia	0	1	0	0	0	1	0	0
Dialum indum	0	0	1	0	0	0	0	0
Diospyros blancoi	0	0	1	1	0	1	0	0
Erythrina crista-galli	0	0	0	0	0	1	1	1
Ficus benjamina	0	1	1	1	1	1	0	1
Ficus elastica	1	0	0	1	0	0	0	0
Ficus lyrata	1	0	0	0	0	0	0	0
Handroanthus chrysotrichus	0	0	1	0	0	0	0	0
Khaya senegalensis	1	0	0	0	0	0	0	0
Leucaena leucocephala	0	0	0	0	0	0	1	0
Magnolia champaca	0	0	0	1	0	0	0	0
Magnolia x alba	0	0	0	0	1	0	0	0
Mangifera indica	0	1	1	1	0	0	1	0
Manikara kauki	1	1	0	0	0	0	1	0
Maniltoa grandiflora	1	0	0	0	0	0	0	0
Mimosops elengi	0	1	0	0	0	0	0	0
Murraya paniculata	0	0	0	0	0	1	0	0
Nephelium lappaceum	0	0	0	1	0	1	1	0
Pinus merkusii	0	0	0	1	0	0	0	0
Plumeria alba	0	0	1	0	1	1	1	1
Plumeria rubra	0	0	0	0	1	1	1	1
Polyalthia longifolia	0	1	1	1	0	1	1	1
Pometia pinnata	0	0	0	1	0	0	0	0
Psidium guajava	0	0	0	1	1	1	0	0
Pterocarpus indicus	0	0	1	0	0	0	0	1
Salix babylonica	0	0	0	0	0	0	0	0
Samanea saman	1	1	1	1	0	1	0	0
Spathodea campanulata	0	0	0	0	0	1	0	0
Swietenia mahagoni	0	1	1	1	0	1	0	0
Syzygium aqueum	0	1	0	1	0	0	1	0
Syzygium malaccense	0	0	1	0	0	0	0	0
Syzygium polyanthum	0	1	1	0	0	0	0	0
Tamarindus indica	0	0	0	1	0	0	0	0
Tectona grandis	0	0	0	1	0	0	0	0
Terminalis catappa	1	1	0	1	0	0	1	0

0: absent; 1: present
PEMP : Ereveld Menteng Pulo Cemetery
THT : Honda Tebet Park
TC : Cattleya Park
TCC : Cempaka Cipayung Park
TM : Menteng Park
TMP 1: TPU Menteng Pulo 1 Cemetery
TMP 2: TPU Menteng Pulo 2 Cemetery
TMP 3: TPU Menteng Pulo 3 Cemetery

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APPENDIX 3. List of non-tree species in each park and cemetery

Species	TM	THT	TC	TCC	PEMP	TMP1	TMP2	TMP3
Ageratum conyzoides	1	0	0	0	0	0	0	0
Agrostis stolonifera	0	0	0	0	0	1	1	1
Amaranthus gracilis	0	0	0	0	1	1	0	0
Artanema longifolium	0	0	0	0	0	1	0	0
Axonopus compressus	1	1	1	1	1	1	1	1
Borassus flabellifer	0	0	0	0	0	1	0	0
Brachiaria eruciformis	0	0	0	0	0	1	1	0
Canna indica	1	0	0	0	0	0	0	0
Centella asiatica	0	0	0	0	0	1	1	1
Cleome rutidospema	0	0	0	0	0	1	1	0
Commelina diffusa	0	0	0	0	0	1	0	0
Commelina nudiflora	1	0	0	0	0	0	0	0
Compositae sp.	0	1	0	0	0	0	0	0
Cynodon dactylon	0	0	1	0	1	1	1	1
Cyperus brevifolius	0	0	0	0	0	1	0	0
Cyperus pygmaeus	1	1	1	1	0	1	1	1
Cyperus rotundus	1	1	0	1	1	1	1	1
Cyrtostachys renda	1	1	0	0	0	0	0	0
Dactyloctenium aegyptium	0	0	0	0	0	1	1	0
Desmodium triflorum.	0	1	0	1	1	1	0	0
Digitaria ciliaris	0	1	0	1	0	0	0	0
Digitaria fuscescens	0	0	0	0	0	1	1	0
Digitaria longiflora	0	0	0	0	0	1	0	0
Digitaria segitera	0	0	0	0	0	1	1	0
Digitaria sp.	1	0	1	1	0	1	1	1
Digitaria ternata	0	0	0	0	0	1	1	0
Echinochloa sp.	0	1	0	1	0	0	0	0
Eclipta alba	0	0	0	1	0	0	0	0
Eclipta prostrata	0	0	0	1	0	0	0	0
Eleusine indica	0	1	1	1	0	1	1	1
Eragrostris tenella	0	0	0	0	1	0	0	0
Euophorbia hirta	0	0	1	0	0	1	1	1
Evolvulus nummularius	0	0	1	0	1	1	1	1
Fimbristylis globulosa	0	0	0	1	0	0	0	0
Galinsoga sp.	0	1	1	1	1	1	1	0
Gomphrena celosioides	0	0	0	0	0	1	1	1
Hedyotis corymbosa	1	1	1	0	1	1	1	1
Hemigraphis reptans	0	1	0	0	0	1	0	0
Hymenachne acutigluma	0	0	0	0	0	1	1	0
Hymenocallis sp.	1	1	1	0	0	1	1	0
Imperata cylindrica	0	0	0	0	0	1	1	1
Ipomoea batatas	0	0	0	1	0	0	0	0
Isachne pulchella	0	0	0	0	0	1	1	0
Kyllinga sp.	0	0	0	1	0	0	0	0
Lindernia Procumbens	0	0	0	1	0	0	0	0
Mimosa pudica	0	0	1	0	0	0	0	0

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Species	TM	THT	TC	TCC	PEMP	TMP1	TMP2	TMP3
Oxalis corniculata	0	0	1	0	1	1	1	0
Paspalum distichum	0	0	0	0	0	1	0	0
Peperomia pellucida	0	1	0	0	1	0	0	0
Phyllanthuhs urinaria	1	0	1	1	1	0	1	1
Pilea microphylla	0	0	0	0	1	0	1	1
Portulaca oleracea	1	0	1	0	0	0	0	0
Portulaca randiflora	0	0	0	0	0	1	0	0
Rhoeo discolor	0	0	0	0	1	0	0	0
Richardia brasiliensis	0	0	0	0	0	1	0	0
Rivina humilis	0	0	0	0	1	0	0	0
Rostellularia sp.	0	1	0	0	0	0	0	0
Ruellia simplex	0	1	0	0	1	0	0	0
Ruellia tuberosa	0	0	0	0	0	1	0	0
Saccharum spontaneum	0	0	0	0	0	1	0	0
Scirpus sp.	0	0	0	1	0	0	0	0
Sonchus arvensis	0	0	0	0	1	0	0	0
Tridax procumbens	0	0	0	0	0	1	1	1
Vernonia cinerea	0	0	1	0	0	1	1	1

0: absent; 1: present
PEMP : Ereveld Menteng Pulo Cemetery
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