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Spatial Distribution and Quality Status of Open Green Spaces and Parks in Calabar Metropolitan Area, Cross River State, Nigeria

Rozkład przestrzenny oraz stan jakości otwartych przestrzeni zielonych i parków w obszarze metropolitalnym Calabar w stanie Cross River w Nigerii

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Abstract: Urban green areas are often seen in highly developed countries as urban green lungs because of their ability to mediate between man and nature. However, it is not the case in developing countries, where the means of subsistence are considered pivotal and paramount to human existential status. The study examined spatial distribution of open green spaces and parks in the study area and determined differences in their quality. Data for the study were obtained from both primary and secondary sources. A total of 400 copies of the questionnaire were issued to the respondents. Low-level analysis was done using non-parametric statistics, while a hypothesis was tested using Chi-Square parametric/inferential statistics. The result shows that there are significant differences in urban green areas quality at ($\chi^2 = 588.680$, $p < 0.05$) and accessibility ($\chi^2 = 942.200$, $p < 0.05$) in Calabar Metropolis. Further, a Global Positioning System (GPS) device was used to acquire the coordinates of the green spaces and parks in order to delineate them spatially. Geographic Information systems (GIS) infrastructure was used to visualize the spatial distribution of open green spaces and parks in the area. The result is presented in the map output. It was therefore recommended that the destruction of the flora components of the urban green spaces and parks associated with obtaining wood fuel for energy should be discouraged. Finally, the quality of the open green spaces and parks should be improved through the provision of signposts, walkways, tracks, hiking paths, and cycling routes.

Keywords: spatial distribution, open green spaces, green areas, quality status, parks

Streszczenie: Miejskie tereny zielone są często postrzegane w krajach wysoko rozwiniętych jako zielone płuca miast ze względu na ich rolę pośredniczenia między człowiekiem a naturą. Jednak sytuacja wygląda zupełnie inaczej w krajach rozwijających się, gdzie najważniejszy jest dostęp do środków umożliwiających przeżycie. Przeprowadzone badania dotyczą rozkładu przestrzennego otwartych terenów zielonych i parków na badanym obszarze oraz analizy ich zróżnicowania względem jakości. W badaniu wykorzystano zarówno źródła pierwotne, jak i wtórne. Łącznie 400 egzemplarzy kwestionariusza zostało rozdanych respondentom. Wstępna analiza została przeprowadzona przy użyciu statystyki nieparametrycznej, podczas gdy hipotezę przetestowano przy użyciu statystyki parametrycznej/wnioskowania chi-kwadrat. Wynik pokazuje, że istnieją istotne różnice w jakości miejskich terenów zielonych przy ($\chi^2 = 588,680$, $p < 0,05$) i dostępności ($\chi^2 = 942,200$, $p < 0,05$) w metropolii Calabar. Ponadto, wykorzystano urządzenie Global Positioning System (GPS) do zebrania współrzędnych terenów zielonych i parków, tak by wyznaczyć ich położenie. Do wizualizacji rozmieszczenia przestrzennego otwartych terenów zielonych i parków na tym obszarze wykorzystano system GIS. Wynik został przedsta-

wiony w formie mapy. We wnioskach końcowych zalecono dążenie do zaniechania niszczenia elementów flory miejskich terenów zielonych i parków związanego z pozyskiwaniem drewna opałowego. Dodatkowo zalecono dążenie do poprawy jakości otwartych terenów zielonych i parków poprzez wytyczenie oraz właściwe oznakowanie dróg, tras turystycznych i ścieżek rowerowych.

Słowa kluczowe: rozmieszczenie przestrzenne, otwarte tereny zielone, tereny zielone, status jakości, parki

Introduction

Urban green areas and parks are essential components of urban infrastructure, providing numerous benefits to human well-being. Research has consistently shown that exposure to nature in urban green spaces and parks positively affects physical and mental health, cognitive functioning, and social relationships. Physical Health: reduced risk of chronic diseases (Sullivan et al. 2019), improved air quality (Nowak et al. 2018), Increased physical activity (Sallis et al. 2016), Mental Health: Reduced stress levels (Kaplan 1995), Improved mood and reduced symptoms of depression (Sullivan et al. 2019), Improved sleep quality (Barton and Pretty 2010). Cognitive Functioning: Improved attention and concentration (Kaplan 1995), improved memory and creativity (Barton and Pretty 2010). Social Relationships: Increased social interactions and community engagement (Sullivan et al., 2019), Improved neighbourhood cohesion and social capital (Kaplan 1995).

Urban green areas and parks provide essential ecosystem services, including air purification, climate regulation, and habitat creation. Moreover, they offer opportunities for recreation, relaxation, and socialization, which are critical to human well-being. The provided information is based on scientific evidence highlighting the importance of urban green areas and parks in promoting human well-being.

Urban green areas, including parks, gardens, and natural landscapes within city boundaries, have been recognized for their crucial roles in enhancing urban environmental quality and residents' quality of life. These areas are vital for conservation of biodiversity, and they also serve as essential

components for urban recreation, physical activities, and mental relaxation (Hartig, Mitchell, de Vries, and Frumkin 2014).

Calabar, as a growing urban area, faces the challenge of balancing urban development with environmental sustainability and residents' wellbeing. The city's green spaces, ranging from formal parks to natural green areas are critical. However, rapid urbanization and development pressures threaten these green spaces and parks, necessitating a thorough investigation into their current status, accessibility, and impact on the wellbeing of Calabar's residents (Cobbinah and Gaisie 2021).

Also, given that there is substantial evidence of the benefits of urban green spaces and parks seen globally, there is a need for localized studies, especially in African cities such as Calabar, where urbanization patterns, cultural contexts, and environmental conditions differ significantly from Western contexts. This study aims to fill this gap by focusing specifically on mapping urban green areas and parks in Calabar Metropolis.

1. The Problematics

Rapid urbanization of cities in developing countries, including Nigeria, often comes at the expense of green spaces, parks and natural environments. In Calabar Metropolis, a city noted for its historical significance and natural beauty, the encroachment of urban development on green areas poses a potential threat to the wellbeing of its residents. Despite the known benefits of urban green spaces and parks on physical health, mental wellbeing, and social cohesion, there is a noticeable gap in empirical research focused on the African urban context, particularly in cities such as Calabar. This lack

of localized research hampers effective urban planning and policymaking aimed at leveraging green spaces and parks for public health and community wellbeing.

The mapping out of the distribution of green spaces and parks across Calabar Metropolis, evaluating their accessibility to different population groups, and assessing the quality of these areas in terms of maintenance, safety, and facilities is yet to be ascertained in the study area. Therefore, this will provide a foundational understanding of the current state of green spaces and parks in the city. The quantification of the extent to which engagement with these spaces (e.g., frequency of use, types of activities performed) correlates with physical health indicators such as body mass index (BMI), blood pressure, and overall fitness levels is yet to be studied. It is also pertinent to analyse the psychological effects of green spaces and parks on residents' mental health, including stress reduction, mood improvement, and overall mental wellbeing. However, understanding how green spaces and parks contribute to social interactions, community bonding, and a sense of belonging among residents, and the need to investigate the role of parks and green areas as venues for social events, community activities, and informal gatherings, and how these contribute to social cohesion and community wellbeing will further enhance the creation, development and management of green spaces and parks in the study area. This is so because open spaces or green areas and parks are seemingly not given proper attention, especially, in the area of infrastructural provision and maintenance for maximum utilization by the residents in the study area.

Therefore, this study will:

1. Investigate and delineate spatial distribution of open green spaces and parks.
2. Determine the quality and accessibility of these facilities in the study area.

A study hypothesis stated in null form states that "there is no significant difference in the quality and accessibility of urban green areas in Calabar Metropolis."

2. Study Area

The study area for this research is Calabar Metropolis. The area is in Southeastern Nigeria, situated along the waterfronts in Cross River State between longitude $8^{\circ}20'$ and $8^{\circ}24'$ East of the Greenwich Meridian and between latitude $4^{\circ}56'$ and $5^{\circ}40'$ north of the Equator. To the north and northwest, Calabar Metropolis is bounded by Odukpani Local Government Area, to the South by Atlantic Ocean channel and to the East by Akpabuyo Local Government Area as shown in Fig. 1.

Vegetation

Calabar Metropolis is in the tropical mangrove and rainforest belt, which consists of complex structures of woody species, now largely replaced by urban environment and agricultural ecosystem. However, given its location along the coast, mangrove swamp pre-dominates the western axis of its shoreline, while extensive freshwater swamp dominates its eastern axis and constitutes a wetland ecosystem characterized by raffia, woody species, hydrophytes as well as terrestrial plants, which combine to produce a unique swampy vegetative cover.

3. Research Methodology

Procedure for data collection

Data for the study were collected through direct field observation, measurement and enumeration. Besides, 400 copies of questionnaire were also issued to the respondents.

Techniques of data analysis

The data obtained from the field were analysed using both descriptive and inferential statistics. Descriptively, the researcher used tables, charts, graphs, mean, averages, diagrams, and photographs to give the study a clearer perspective.

An inferential statistics was used to test the proposed study hypotheses. GIS was also used to generate maps showing the spatial distribution of green areas.

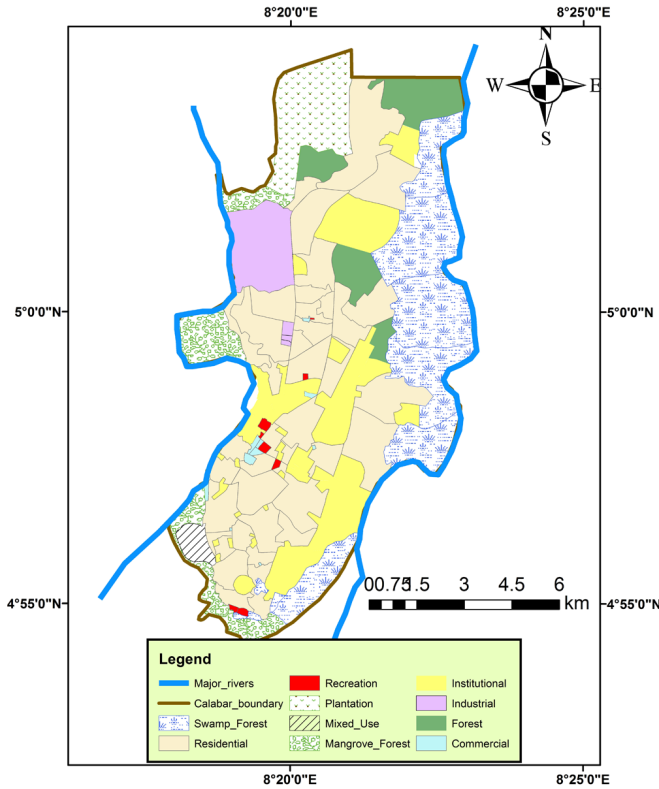


Figure 1. Calabar Metropolis showing the study area
 Source: Obiefuna et al. 2021.

4. Discussion of Findings

4.1. Spatial Distribution of Open Green Species in the Study Area

In the study area, 17 open green spaces and parks were identified and enumerated as shown in Figure 2. From figure 2, the various open green spaces and parks are Margaret Ekpo International Airport field locations 1, 2, 3, 4, and 5. Other points are the open spaces along IBB way by Essential Villa spot, Zoo garden, Cultural centre points 1 and 2, Eburutu Army barracks junction, the Calabar golf course, Recreational museum open space, recreational parks in State Housing Estate 1, 2, and 3. Also, the Eleven-Eleven recreational park and the Big Munch garden open green spaces.

Furthermore, the open spaces in the study area were seen to have different functions and uses. Some of the areas were used for sports, recreation, receptions, and other

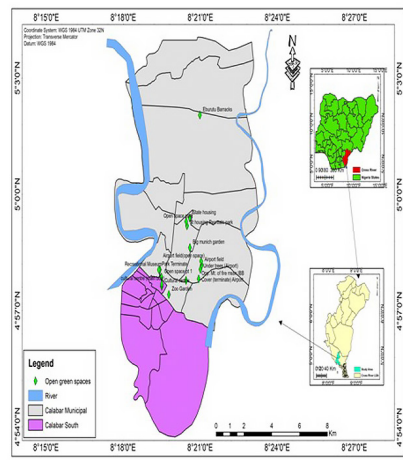


Figure 2. Spatial Distribution of Open Green Spaces and Parks in the Study Area
 Source; Visualization by the Authors, 2024.

functions depending on the size and extent of the space, location and accessibility.

4.2. Quality of Urban Green Spaces and Parks in the Study Area

With regard to objective 2, which centred on determining the quality of open green spaces and parks in the study area is presented in Table 1 and Figure 3. Based on Table 1, it can be observed that the major attributes of the open spaces and parks in the study area was “large open space” and “playgrounds for activities” as the option had the highest value of 37.3%. In the same vein, food and beverages facilities were seen to be the next with a value of 23%. Also, wildlife features and habitats with a value of 15 percent was a quality that was relatively predominant in the study area.

Nevertheless, other forms of open green spaces and parks were seen such as walking, hiking, and cycling paths with a value of 5%. Others were accessible amenities of 7%, seating and shelter facilities, sanitation facilities, lighting, and power infrastructure, etc.

4.3. Determining the Quality Accessibility Status of Open Green Spaces and Parks in the Study Area

This hypothesis was tested using the Chi-Square and the result is presented in Table 2. The result shows that there are significant differences in urban green areas quality ($\chi^2 = 588.680$, $p < 0.05$) and accessibility ($\chi^2 = 942.200$, $p < 0.05$) in Calabar Metropolis. This conclusion arises from the fact that the calculated χ^2 values of 588.680 and 942.200 are higher than probability values of 0.000 or because the probability values of 0.000 are lower than the 5% significance level. With this, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted implying that there is a significant difference in urban green areas quality and accessibility in Calabar Metropolis. This is expected as the infrastructural development (among others, through road construction and the availability of signage) of the area has increased geographic access and made it easier for people to easily access green areas. Many of these green areas in the Metropolis serve, among others, as relaxation spots, and places for recreation.

Some green areas such as those around the Airport Field and Cultural Centre serve as relaxation spots and event centres. This result pays credence to the findings of Ruiz-Apilánez et al., (2023) and Fan et al., (2017) who reported a significant difference in the quality and accessibility of public urban green space in Vitoria-Gasteiz, Spain, and the urban periphery of Shanghai respectively. Fan et al., (2017), in their study, attributed the improved accessibility and quality of green areas to the improvement of infrastructural facilities in the inner and outer suburbs of Shanghai.

Improvement of accessibility through infrastructural design and development of urban areas, as seen in Calabar Metropolis, combined with the increase in road networks, can break down barriers, foster social cohesion, and unlock the full potential of diverse populations. Accessibility is a pivotal concept that aims to create inclusive and equitable environments within the Metropolis (including people with disabilities). Improving access to green spaces and parks within the Metropolis does not only improve the quality of the area but also ensures that all individuals, regardless of their abilities, socioeconomic status, or other demographic factors, can easily navigate and access essential services, amenities, and opportunities within urban areas (Das 2022; Solá et al. 2018). In enhancing access to green areas, accessible transportation is essential to urban accessibility. This includes, besides improved road networks, the designing and availability of public transit systems with features such as ramps, lifts, and designated spaces for wheelchairs (Fan et al. 2017; Ferrari et al. 2014).

Additionally, creating pedestrian-friendly pathways and cycle lanes enhances mobility for all residents. Hence, improving accessibility entails the designing and implementation of infrastructure, transportation systems, and public spaces to accommodate the needs of all individuals, including those with disabilities, the elderly, and those from diverse socioeconomic backgrounds. It

Table 1. Quality of urban open green areas in the study area

s/n	Option	Frequency	Percentage
a	Large open spaces/playground for activities	150	37.5
b	Sanitation facilities	10	2.5
c	Accessible amenities	28	7
d	Wildlife features/habitats	60	15
e	Seating and shelter facilities	15	3.8
f	Lighting/power infrastructures	13	3.3
g	Walking/hiking/cycling trails	20	5
h	Food/beverage facilities	90	23
i	Innovative-smart ICT features	3	0.75
j	Arts and cultural facilities	4	1
k	Educational, caution and interpretive signages	7	1.75
Total		400	100

Source: Author's fieldwork, 2024.

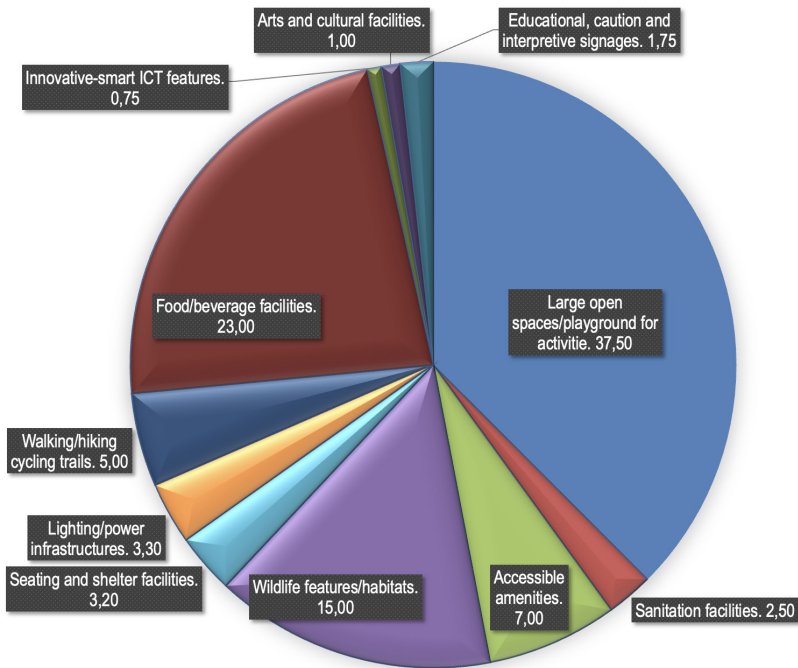


Figure 3. Quality of urban open green areas in the study area [%]

Source: Author's fieldwork, 2024.

Table 2. Chi-Square results of the difference in the quality and accessibility of urban green areas in Calabar Metropolis

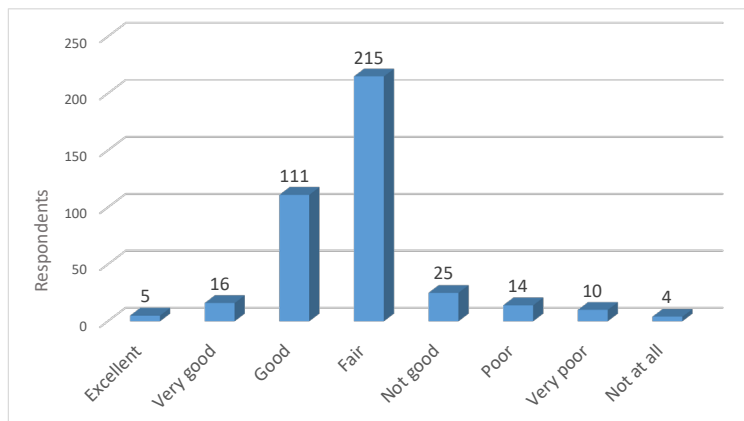
Test statistics	Quality of urban open green areas	Level of accessibility
Chi-Square	588.680*	942.200*
df	10	7
Asymp. Sig.	0	0

*Significant at 5% alpha level. Source: Author's analysis, 2024.

Table 3. Rating of the quality of urban open green space

s/n	Option	Frequency	Percentage (%)
A	Excellent	5	1.3
B	Very good	16	4
C	Good	111	27.8
D	Fair	215	53.8
e	Not good	25	6.3
f	Poor	14	3.5
g	Very poor	10	2.5
h	Not at all	4	1
		400	100

Source: Author's fieldwork, 2024.

**Figure 4. Rating of the quality of urban open green space**

Source: Author's fieldwork, 2024.

involves considering factors such as mobility, affordability, and proximity to essential services to ensure that no one is excluded from full participation in urban life (Solá et al. 2018). Infrastructure also plays a fundamental role in ensuring accessibility within urban areas. This involves having accessible buildings, parks, and recreational areas that comply with universal design principles. Moreover, installing amenities such as tactile paving, audible signals at pedestrian crossings, and Braille signage improves navigation for individuals with disabilities (Kanniah 2018). Accessible facilities are essential for ensuring that all attendees, regardless of their abilities, can fully participate and enjoy the event experience. In all, the result in Table 2 shows that the infrastructural development of the Metropolis

over time has caused substantial changes in green areas quality and improved accessibility to these areas. Accessibility to green spaces and parks is a fundamental determinant of its utilization.

4.4. Rating of Open Green Spaces and Parks in the Study Area

In the study area, the quality of open green spaces and parks was rated based on the qualities shown in Table 3 and depicted in Figure 4. From Table 3, it was observed that the quality of the open green spaces and parks was fairly good with a score of 53.8%. Further, 27.8% of the respondents in the study area stated that the quality was good. However, 4% of the respondents reported that the quality is good. Again, 4% and 1.3% of respondents felt that the quality

is very good and excellent respectively. Furthermore, 6.3 and 3.5% of the respondents posited that the quality of the open green spaces and parks in the study area was not very negligible percentage of the respondents, who said that the quality was very poor.

Conclusion

From the study findings, the open green spaces and parks found in the study area are spatially scattered across the study area. Given these, the open green spaces and parks are not playing their roles as urban greeneries as a result of poor management and utilization. Although these areas have been seen to play vital roles in the conservation of urban biodiversity, especially the flora components of the environment, their sustainability is not guaranteed as a result of poor and inefficient management.

Therefore, the significant role played by the urban open green spaces and parks in the study, has revealed that the physical and mental wellbeing of the residents in the study area is highly influenced by the open green spaces and parks. In spite of this, the level of the qualities of the areas is fairly good thereby providing ecological ambience for both humans and the environment regarding biodiversity. Hence, this study has been able to establish the fact that urban greeneries are not mainly for aesthetics, local climate control, and provision of spaces for social interactions but, a major driver of physical and mental wellbeing of the residents of Calabar.

Recommendations

Based on the findings, the following recommendations are, therefore, made.

1. Destruction of the flora components of the urban green spaces and parks for the purpose of obtaining fuel wood for energy should be discouraged.
2. The qualities of the open green spaces and parks should be improved through provision of signposts, walkways, tracks, hiking paths and, cycling routes.

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