SCHOOL OF ENVIRONMENTAL TECHNOLOGY,
FEDERAL UNIVERSITY OF TECHNOLOGY
MINNA, NIGER STATE, NIGERIA

4th INTERNATIONAL CONFERENCE (SETIC2022)

BOOK OF PROCEEDINGS

MAIN THEME:

SUSTAINABLE DEVELOPMENT AND RESILIENCE OF THE BUILT ENVIRONMENT IN THE ERA OF PANDEMIC

6th - 8th February, 2023

VENUE: NITDA Centre,
Federal University of Technology,
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School of Environmental Technology International Conference (SETIC 2022)

6th – 8th February, 2023

Federal University of Technology Minna, Niger State, Nigeria

BOOK OF PROCEEDINGS

EDITOR IN CHIEF
B. J. Olawuyi

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PREFACE

The 4th edition of School of Environmental Technology International Conference (SETIC2022) is organised by School of Environmental Technology, Federal University of Technology Minna, Nigeria. In collaboration with Massey University New Zealand, University of Namibia, Namibia, Department of Architectural Technology, Najran University, Saudi Arabia, Deapartment of Civil Engineering, Stellenbosch University, Stellenbosch, South Africa and the Global Sustainable Futures, UK.

The main theme for this year conference is "**Sustainable Development and Resilience of the Built Environment in the Era of Pandemic**" and is of interest to everyone going by the fact that housing is a necessity following only after food and clothing while living in crowded places and poor sanitation is a concern and possible cause of spread of diseases and occurrence of epidemic/pandemic. This promotes and encourage innovative and novelty for emerging property management strategies in a pandemic era; modern geospatial tools for epidemiology; architecture, resilience and healthy buildings in pandemic era; planning for sustainable resilient neighbourhoods and cities in COVID-19 era; sustainable and resilient cities; sustainable cost management of built environment projects in the era of covid-19; wellbeing and resilience of the built environment.

The responses from participants for this conference are overwhelming, well attended, and successful. The operation mode was virtual for all participants with presentations in mode Our participants are from various Universities and other sector across the globe, from countries like United Kingdom, New Zealand, Saudi Arabia, South Africa, Namibia, Ethiopia and Nigeria just to mention a few. Hence, this conference provides a good platform for professionals, academicians and researchers to widen their knowledge and approach on latest advances in research and innovation. Papers presented in this conference cover a wide spectrum of science, engineering and social sciences.

Finally, a note of thanks must go to SETIC 2022 Local Organizing Committee (LOC) for their remarkable dedication in making this conference a success. We hope the event will prove to be an inspiring experience to all committee members and participants.

ACKNOWLEDGEMENTS

The effort put together in achieving the success of SETIC 2022 is predicated on the feat of the previous three edition of School of Environmental Technology International Conference held in 2016, 2018 and 2021, respectively. The support and goodwill from Vice-Chancellor of Federal University of Technology, Dean School of Environmental Technology, Dr. Renuka Thakore, Dr Dodo Y. A., Prof. James O.B. Rotimi and many other highly motivated people are highly appreciated.
It is also my privilege and honour to welcome you all, on behalf of the Local Organizing Committee (LOC) to the 4th edition of the Biennial School of Environmental International Conference (SETIC2022). This Conference which was earlier schedule for April, 2022 is holding now (6th to 8th th February, 2023) due to the prolonged ASUU-FGN crisis which made our public Universities in Nigeria to be closed for over Eight Months. Our experience in the 3rd edition held in 2021 after the COVID-19 Pandemic has thought us on new ways of doing things with the Virtual Conferencing offering us a wider coverage, it is our hope that SETIC2022 will be an improvement on the Participants experience of opportunity available for global networking and interaction at Conferences via the Virtual mode of presentation.

The conference provides an international forum for researchers and professionals in the built environment and allied professions to address fundamental problems, challenges and prospects of **Sustainable Development and Resilience of the Built Environment in the Era of Pandemic**. The conference is a platform where recognized best practices, theories and concepts are shared and discussed amongst academics, practitioners and researchers. This 2022 edition of SETIC has listed in the program a Round Table Talk on on Housing Affordability Beyond COVID-19 with selected Speakers from across the globe available to do justice on the topic of discussion. Distinguished Conference participants, permit me to warmly welcome our Keynote:

- Dr. Ibrahim Idris, *Director Public health, State Ministry of Health, Niger State, Nigeria;*
- Dr. A.A. Bilau, *Lecturer and expert in Disaster Risk Management, Department of Building, Federal University of Technology, Minna, Nigeria and;*
- Dr. Yakubu Aminu Dodo, *Ass. Prof. Architecture Engineering Department, Faculty of Engineering, Najran University, Najran, Saudi Arabia;*

And the lead Discussants for the Round Table Talk:

- Prof. James O.B. Rotimi, *Professor of Construction Economics & Management, School of Built Environment, College of Sciences, Massey University of New Zealand;*
- Prof. O.A. Kemiki, *Professor of Estate Management and Valuation, Federal University of Technology, Minna, Nigeria;*
- Dr. Renuka Thakore, *Founder, Institute for Global Sustainable Futures, Progress through Partnership, UK;*
- Dr. Guillermo Delgado, *Senior Lecturer, Architecture and Acting Director, Institute of Land, Livelihoods and Housing (ILlH), Namibia University of Science and Technology, Namibia;*
- Prof. Adewumi John Babafemi, *Associate Professor and Head of Construction Materials and Unit; Stellenbosch University, Stellenbosch, South Africa;*
- Dr. Yakubu Aminu Dodo, *Ass. Prof. Architecture Engineering Department, Faculty of Engineering, Najran University, Najran, Saudi Arabia.*

for accepting to share from their knowledge, wealth of experience and be available to interact with participants on varied issues on "**Sustainable Development and Resilience of the Built Environment in the Era of Pandemic**".
As reflected on the Conference program, the Conference activities will be Virtual for all presenters to run in four parallel sessions on the Zoon platform. With a total of Seventy (70) articles captured in the Conference Proceedings covering the six subthemes of the Conference, I have no doubt that we are all in for an impactful experience at SETIC2022 as we brainstorm, exchange ideas, share knowledge and participate in evolving more approach to sustainable housing and land management drives.

I implore us all to enjoy every moment of the deliberations and ensure we maximize the great opportunity offered by the Conference to network for better research and career development as we also make new friends.

I also on behalf of myself and the LOC express our appreciation to the Dean, School of Environmental Technology and the entire Staff of the School for giving us the opportunity to steer the ship for SETIC2022. To the Reviewers and various Committees that served with us, I say thank you for helping us through despite the pressure of work.

Thanks, and God bless you all.

Olawuyi, B.J. (PhD)
Chairman, LOC
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DECLARATION

PEER REVIEW AND SCIENTIFIC PUBLISHING POLICY STATEMENT

6th February, 2023

TO WHOM IT MAY CONCERN

I wish to state that all the papers published in SETIC2022 Conference Proceedings have passed through the peer review process which involved an initial review of abstracts, review of full papers by minimum of two referees, forwarding of reviewers' comments to authors, submission of revised papers by authors and subsequent evaluation of submitted papers by the Scientific Committee to determine content quality.

It is the policy of the School of Environmental Technology International Conference (SETIC) that for papers to be accepted for inclusion in the conference proceedings it must have undergone the review process and passed the academic integrity test. All papers are only published based on the recommendation of the Reviewers and the Scientific Committee of SETIC

Babatunde James OLAWUYI
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Papers in the SETIC2022 Conference Proceedings are published on www.futminna.edu.ng, AND ALSO SELECTED PAPERS WILL BE PUBLISHED IN REPUTABLE JOURNALS

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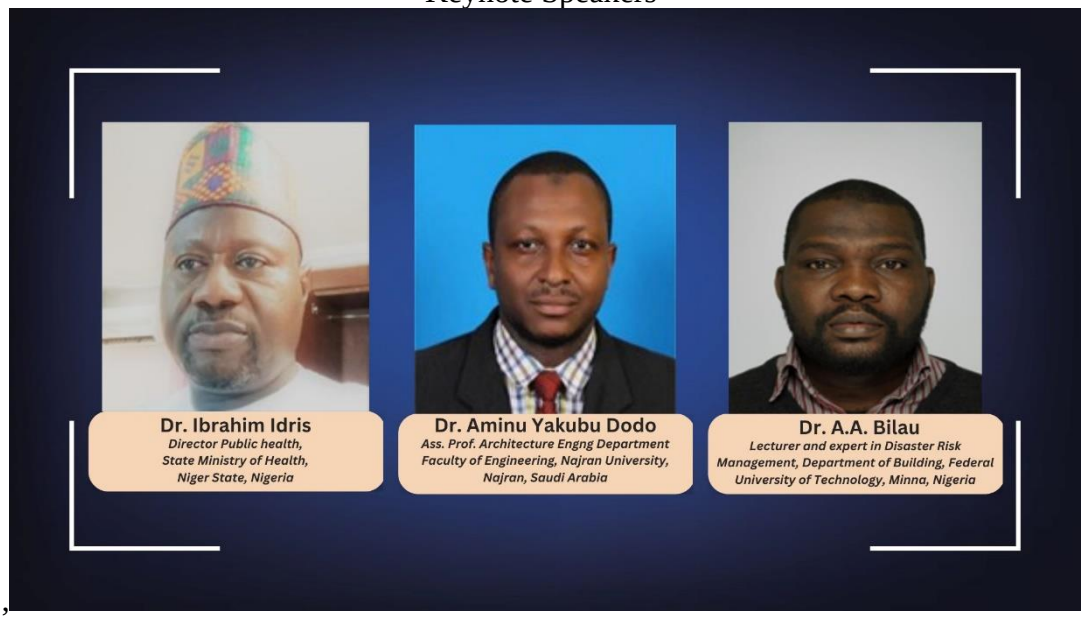
Acknowledgement To Keynote Speakers and Lead Discussants

SETIC 2022 organisers wishes to thank our keynote speakers, and Guest speakers for accepting to create time to share from their rich wealth of knowledge and interact with delegates and participants on varied issues being examined at this year's conference. A brief profile of each keynote speaker is provided here, this would allow for future interaction and networking with them.

Keynote Speakers



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Roundtable Talk Lead Discussants

Residents' Perceptions of Urban Green Spaces and Park Qualities in AMAC Abuja

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Abstract:

The characteristics of the parks are one of the main factors determining how the local population views urban green spaces and parks as being usable. This study examines how Abuja Municipal Area Council residents perceive the qualities and characteristics of urban green areas and parks. The study used a quantitative method using a questionnaire and a cross-sectional research design. The study sampled 430 people from the estimated 1,775,432 inhabitants of the AMAC in 2021 using Dilman's (2007) sampling method. According to the standard and service radius of the parks, the survey was conducted using stratified random sampling, with strata within 500m for small parks and 800m for larger parks, and then respondents were chosen at random. The physical characteristics were examined using eight criteria. The results show that, there are 43 urban green spaces in the research region, and based on residents' satisfaction with the parks' quality, 9.5% are extremely satisfied, 72.3% are satisfied, 7.9% are indifferent, and just 10% are dissatisfied. Additionally, it was found that 46.7% of the population is satisfied with the urban green spaces and parks, 35.6% is extremely satisfied, 9.8% is unsure, and 7.7% is not satisfied. The findings suggest that locals do have positive perceptions of the parks and green spaces in the research region, and as a result, the development of further parks and green spaces is promoted in residential communities.

Keywords: Park Characteristics, Residents Perception, Physical Characteristic and Urban Green Spaces

Introduction

Green spaces are a key determinant of how liveable an urban region is, and studies of access to nature have been conducted for over 20 years. They are associated with a wide range of advantages, including health and relaxation. Recent studies have turned their attention to figuring out what motivates city dwellers to engage with and use green spaces. Residents derive varied benefits from urban green spaces, including enhanced air quality, noise reduction, health benefits, improved aesthetics, and buffer zones. Positive opinions of green areas are significant predictors of neighbourhood satisfaction.

The attitude and wellbeing of urban residents are significantly influenced by how easily accessible parks and other green areas are. Goode Vick (2007) stressed the need for the parks and recreation department to have site-specific plans for each of its facilities in addition to a system-wide master plan for parks and recreation. The overall strategic plan for the entire city should include the park and recreation programmes. The sad reality of today is that the majority of urban activities are vying for little space. This study evaluates the effect of urban green spaces and parks on residents' perceptions.

The administration and provision of public parks and recreation has had a significant impact on society, with changes in population patterns, economic expansion, political changes, and new social challenges. A hierarchical framework developed by Driver and Brown in 1978 identified four separate levels of recreational demands: those for activities, those for certain environmental features, those for particular psychological outcomes, experiences, or satisfactions, and those for benefits. Knopp (1972) states that a place's qualities will affect whether or not a certain person will go there to have pleasure. To increase the success of greening developments and treatments, it is important to learn about people' opinions of and preferences for green areas and involve them in the planning process. This study contributes to local literature, the planning process, and policy development by evaluating the effect of urban green spaces and parks on residents' perceptions.

Methods

This study used a cross-sectional design to collect information from many case studies simultaneously. The distribution of urban green spaces and parks in the study area was mapped using GIS spatial mapping and nearest neighbour analysis. A structured questionnaire was used to collect quantitative data on resident opinions of the characteristics and quality of urban green space, as well as user socio-demographic parameters. A total of 430 residents were sampled using stratified random sampling. Questionnaire was administered within 500m radius for small parks and 800m for bigger parks based on the standard and service radius of the parks, then respondents was selected at random

Results

Sociodemographic Characteristics of Residents

Among the total of 430 participants in this study, 206 were males (47.9%) and 224 were females (52.1%). The respondents' ages varied from 25 to 64 years, with the highest activity coming from those in the 25–34 age group (Table 1). A total of 80.7% of respondents have jobs or run businesses that bring in money, while 19.3% are unemployed. Based on the results of the survey, most residents have lived in AMAC for 6–10 years.

Table 46: Sociodemographic Characteristics of Residents (*n* = 430)

Sociodemographic	Variables	Frequency	Percent
Gender	Male	206	47.9
	Female	224	52.1
Age Group (in years)	25-34	146	34
	35-44	106	24.7
	45-54	141	32.8
	55-64	37	8.6
Level of Education	Secondary education	176	40.9
	Tertiary education	253	58.8
Marital status	Single	188	43.7
	Married	241	56
	Widowed	1	0.2
Occupation	Employed	347	80.7
	Unemployed	83	19.3
	Total	430	100
Length of stay	Less than a year	67	15.6
	1-5 years	202	47
	6-10 years	107	24.9
	11-15 years	51	11.9
	Above 16 years	3	0.7

Urban Green Spaces and Parks in AMAC Types, Size and Distribution

The results of the field analysis reveals that there are 43 urban green spaces within the study area and can be seen in figure 1. There are 2 regional parks, 7 district parks, and 34 neighborhood parks distributed within the study area. The parks have an average land size of 1.42 ha. Cachez Gardens Wuse has the most land area (7.92 ha), while Emerald Park and Recreational Centre Garki has the lowest (0.09 ha). This means that parks in the study area have enough acreage for recreation and outdoor activities.

The distribution of the urban green spaces and parks within the study area was assessed using the nearest neighbour analysis. The result reveals the observed mean distance score of x = 422.91 meters, the expected mean distance score of 611.06 meters, the nearest neighbour ratio of 0.692, the z-score of -3.86, and the *p*-value of 0.0001. The index (average nearest neighbor ratio) is 0.69, which is <1, indicating that the distribution pattern of urban green spaces and parks in the Abuja area Council appears to be clustered. The z-score (-3.86) suggests that there

is a less than 1% likelihood that the clustered pattern could be the result of random chance as presented in Figure 2.

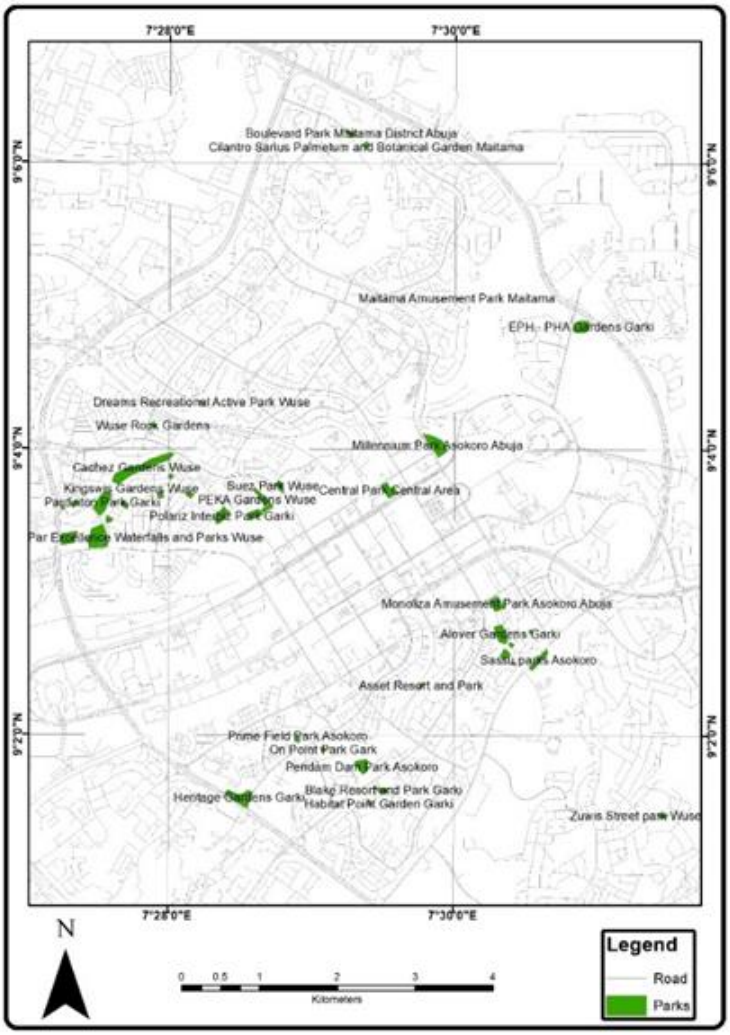

Figure 1: Green spaces and parks in AMAC

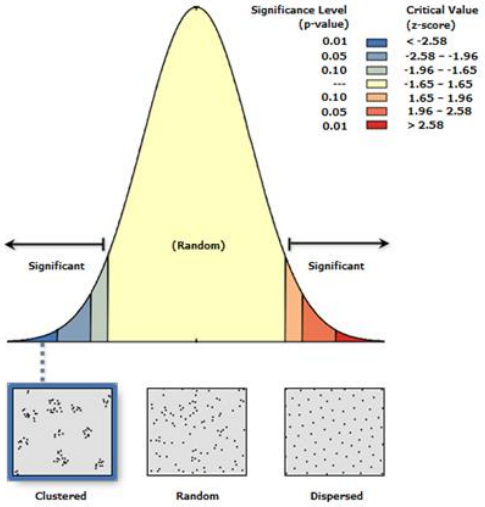

Figure 2: Nearest Neighbour Analysis of Green Spaces and Parks in AMAC

This means that the urban green spaces and parks in the area are close to each other in space, and their distribution is clustered. This finding is supported by other related studies (Bao *et al*., 2023; Bian, Chen, and Zeng, 2022; Xie and Wu, 2008).

Physical Characteristics of the Green Spaces and Park

The residents' perceptions of eight physical characteristics of urban green spaces and parks in AMAC were assessed using a 5-point Likert scale. The results (see Table 2) showed that 68.6% of residents believe the parks are clean and well-maintained, 63.5%) have good facilities, and 77% have sufficient car parks.

Table 47: Residents' Perception on Physical Characteristics of Urban Green Spaces and Park in AMAC

Characteristics	Degree of Agreement (n = 430)				
	Strongly Agreed	Agreed	Neutral	Disagreed	Strongly Disagreed
Park Cleanliness and maintenance	14.0%	68.6%	17.4%		
Park facilities	7.4%	63.5%	17.4%	9.3%	2.3%
Existence of car parks	7.4%	77%	7.7%	7.9%	
Existence of water bodies	16%	13.5%		49.8%	20.7%
Tranquillity of parks	2.1%	68.4%	11.9%	17.7%	
Existence of playground	7.2%	41.2%	34.7%	16.5%	0.5%
Richness in animal species	2.3%	12.6%	7.7%	30%	47.4%
Opportunities for sport activities	11.9%	35.3%	20.2%	27.7%	4.9%
Sanitation facilities	2.6%	63%	20%	6.5%	7.9%

The survey findings suggest that the urban green spaces and parks in the research region have no attractive water features, but 68.4% of respondents believe that they are serene. Playgrounds are essential for children to engage in outdoor activities, and the abundance of animal species is a major draw for visitors. The chance for athletic activities is also evaluated, with 35.3% of inhabitants agreeing that the parks provide opportunity for sporting activities, 27.7% disagreeing, 20.2% remaining neutral, 11.9% strongly agreeing, and 4.7% strongly disagreed. Additionally, the necessity for cleanliness in parks is crucial, with 63% of respondents agreeing that there are sanitation facilities in parks, 20% were neutral regarding sanitation facilities, 7.9% strongly disagreed, 6.5% disagreed, and 2.6% strongly agreed. This finding corroborates the findings of Madureira, et al.,2018 and Schipperijn et al.,2013.

Spatial Characteristics of Urban Green Spaces and Park

The outcome of residents' perceptions on spatial aspects of urban green spaces and parks in AMAC can be seen in Table 3.

Table 48: Residents' Perception on Spatial Characteristics of Urban Green Spaces and Park in AMAC

Characteristics	Degree of Agreement (n = 430)				
	Strongly Agreed	Agreed	Neutral	Disagreed	Strongly Disagreed
Large size of the park	0.088	0.377	0.402	0.133	
Existence of quiet and privacy	0.026	0.388	0.36	0.223	0.002
Frequency of visitors	0.253	0.47	0.251	0.026	
Richness in plant species	0.414	0.47	0.077		0.04
Sufficient benches / seat-outs	0.087	0.374	0.2	0.34	
Security	0.14	0.68	0.174		
Attractiveness	0.07	0.605	0.279	0.047	
Scenic value	0.079	0.6	0.237	0.084	
Accessibility	0.321	0.505	0.174		
Economic activities	0.435	0.467	0.098		

In a spatial context, the size of the park was evaluated, and it was determined that 40.2% of respondents were neutral (undecided) about the size of the parks, 37.7% of respondents agreed that the sizes of parks are large, 13.3% of respondents disagreed that the sizes of parks are large, and 8.8% of respondents

strongly agreed that parks are large. Similarly, the parks' environments were evaluated for their amount of seclusion. 38% of respondents agreed that parks are peaceful and private; 36% were indifferent on the parks' quietness and privacy; 22.3% disagreed that parks are quiet and private; 2.6% strongly agreed; and 0.2% strongly disagreed that parks are quiet and private.

The analysis of the rate of visitors to urban green spaces and parks revealed that 47% agreed that parks have a high frequency of visitors, 25.3% strongly agreed, 25.1% were neutral, and 2.6% were opposed. Residents' perceptions of the richness of plant species (see plate I) in parks were evaluated, with 47% agreeing that urban green spaces are rich in plant species, 41.4% strongly agreeing, 7.7% disagreeing, and 4% strongly disagreeing. It is important to note that certain green spaces and parks have been established solely for the purpose of preserving plant diversity.

Plate I: Cilantro Sarius Palmetum and Botanical Garden Maitama

The availability of benches and seat-outs in the parks were surveyed and it was discovered that 37.4% agrees that most urban green spaces and parks in AMAC do have sufficient seat-outs, 34% disagrees that green spaces do have sufficient seat-outs, 20% were neutral about the sufficiency of seat-outs while 8.6% strongly agrees that there are sufficient seat-outs for users in urban green spaces (Plate II).

Plate II: Benches at NAF Arcade Water Park Wuse

The majority of AMAC's parks have a high level of security, with 68.6% of locals believing that parks are secure, 17.4% are unsure, and 14% strongly agree. Additionally, over 60.5% of people think that urban green spaces and parks are appealing, with 27.9% being ambivalent about the park's beauty, 7% of respondents strongly agree that parks are beautiful, and 4.7% disagree with the park's attractiveness. Additionally, over 82.6% of respondents agree that urban green spaces within the study area are accessible, and economic activities are also present in most of the urban green spaces and parks in AMAC.

Urban Green Spaces and Park Quality

The level of resident satisfaction with the quality of urban spaces and parks in the study area was found to be 72.3%, 9.5% highly satisfied, 10% dissatisfied, 7.9% indifferent, and 0.2% extremely dissatisfied (See Table 4). Additionally, the preference for investing in the quality of public green spaces was found to be 59.8%, while 25.1% indifferent, 10.2% dissatisfied, and 4.9% extremely satisfied. This indicates that residents were satisfied with the investment on the quality of public green areas in AMAC. Similarly, 58.6% of respondents were satisfied with the functions of the urban green space and park, whereas 20.2% were neutral, 18.4% were extremely satisfied, and 2.8% were dissatisfied. Also, the degree of satisfaction among residents based on the frequency of visitations to public parks reveals that 55.8% are satisfied, 24.7% are highly satisfied, 17.4% are neutral, and 2.1% are dissatisfied. This is evidence that residents are satisfied with the function of the urban green space and parks in their neighbourhood, as well as their visitations.

Regarding resident satisfaction, park aesthetic preferences were evaluated, and it was determined that 71.9% of residents are satisfied, 15.6% are dissatisfied, 8.1% are neutral, and 4.4% are highly satisfied. To discover how residents perceived the park's suitability, its compatibility was also evaluated. The results show that, 59.3% are satisfied with park compatibility, 23.0% are extremely satisfied, 15.3% are neutral, and 2.3% are dissatisfied.

Table 4 Residents Degree of Perceived Residents Satisfaction of Parks Characteristics

Characteristics	Residents Degree of Satisfaction				
	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Quality	9.5%	72.3%	7.9%	10.0%	0.2%
preference in investing	4.9%	59.8%	25.1%	10.2%	
Park's function	18.4%	58.6%	20.2%	2.8%	
Park visitation	24.7%	55.8%	17.4%	2.1%	
Aesthetic	4.4%	71.9%	8.1%	15.6%	
Compatibility	23%	59.7%	15.3%	2.3%	

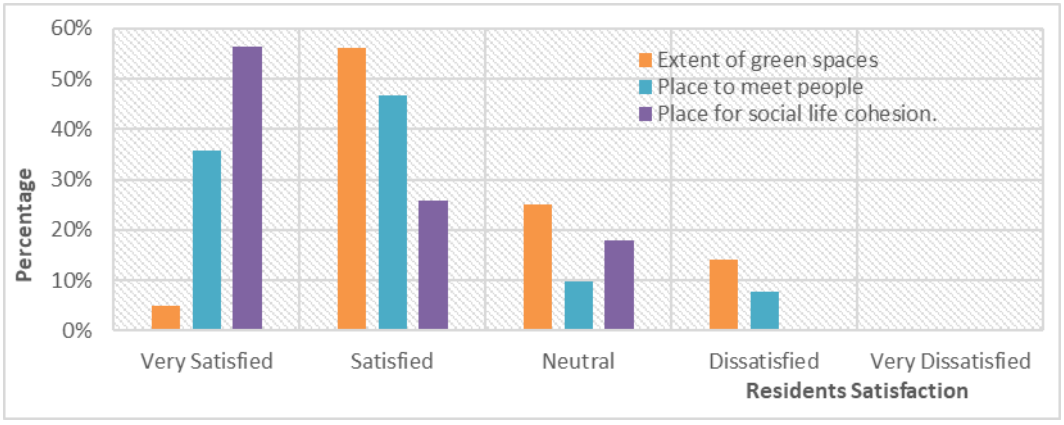

Figure 3: Residents satisfaction on parks as a place for social life cohesion.

The number of green spaces available influences the number of facilities and activities that can be accommodated. Survey result in Figure 3 shows that 56% of residents are satisfied with the number of

green space available, 25% are neutral, 14% are dissatisfied, and 4.9% are extremely satisfied. Urban green spaces and parks offer a friendly atmosphere and are in good spots, they are places where people gather. According to the research result, 46.7% of AMAC residents are satisfied with the urban green spaces and parks, 35.6% are very satisfied, 9.8% are not sure, and 7.7% are not happy. Parks have been regarded as a location for social cohesion in 82.1% of cases.

When the amenities provided for physical activity in parks were assessed by the residents, the results presented in Figure 4 revealed that 46.3% were satisfied, 37.9% were unsatisfied, 12.6% were indifferent, 2.8% were highly satisfied, and 0.5% were very dissatisfied. The utilization and safety of public parks and urban green spaces are directly impacted by park security. In the study, 61.2% of participants said they were satisfied with the level of protection at the parks, and 11.6% said they were extremely satisfied. Regarding park security, 19.3% of respondents were undecided, while 7.9% expressed dissatisfaction. This implies that park visitors will experience a sense of security while they are there.

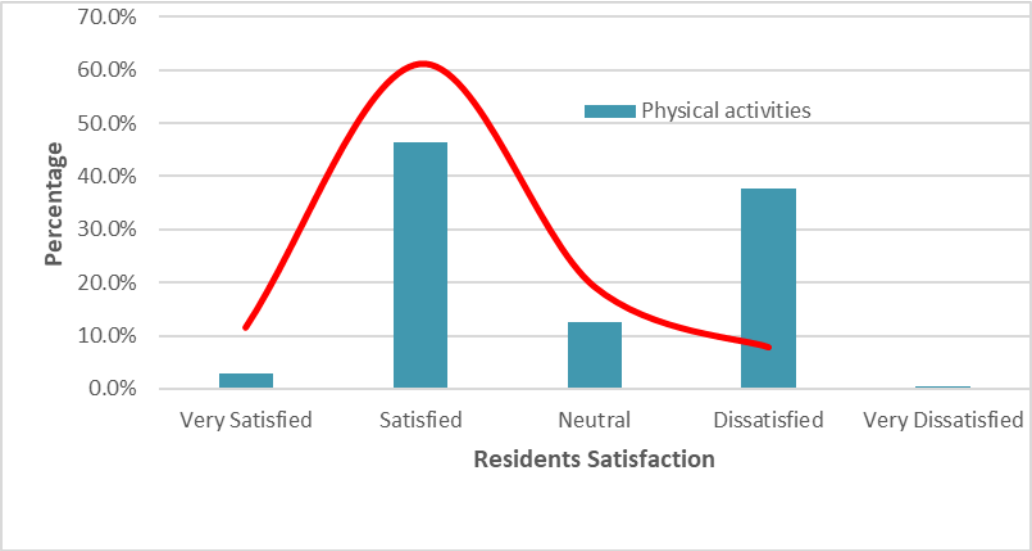

Table 4: Level of Physical Activities and Security at the Parks

A Pearson's correlation analysis was conducted on the resident's perception of green spaces and park characteristics and quality in AMAC and the result is seen in Table 5. The result revealed a statistically significant relationship between residents' perceptions of green space and park characteristics and residents' perceptions of quality (rs = 0.8; *p*-value = 0.001), indicating a strong positive relationship between characteristics and quality of urban green spaces and parks as perceived by residents.

Table 5: link between characteristics and quality of urban green spaces and parks

		Residents' perception of green spaces and park characteristics	Residents' perception of green spaces and park quality
Residents' perception of green spaces and park characteristics	Pearson's r	—	
	p-value	—	
Residents' perception of green spaces and park quality	Pearson's r	0.8	—
	p-value	< .001	—

Conclusions

The findings of this study demonstrate that residents are contented with the state of the urban green spaces and parks in the study region, as evidenced by their favourable perceptions of and use of the

parks. This further emphasises the value of including parks in residential neighbourhoods. The development of new parks in residential communities is strongly urged based on the study's findings.

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