IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

VOLUME : 10 ISSUE : 12 Print / Issue Publication Date: April 2026

ISSN : 2455-2143

DOI : 10.33564/IJEAST.2026.v10i12.002

Indexed In

Google SCHOLAR | OPEN ACCESS | doi | Crossref

WWW.IJEAST.COM

editor@ijeast.com

International Journal of Engineering Applied Sciences and Technology, 2026
Vol. 10, Issue 12, ISSN No. 2455-2143, Pages 11-19
Published Online April 2026 in IJEAST (http://www.ijeast.com)

ASSESSING THE ACCESSIBILITY AND EQUITY OF GREEN SPACES IN CALEB UNIVERSITY

Dr. Ademakinwa Olasunmbo O.
Academic Lecturer
Department of Architecture
College of Environmental Science
Caleb University, Imota, Lagos State, Nigeria

Lawal Sophia Ifunanya, Okoh Justin Ebhaleman, Kolawole Oluwapelumi
Students
Department of Architecture
College of Postgraduate Studies
Caleb University, Imota, Lagos State, Nigeria

Arc Dr. Akindele Abosede
Chief Architect, District Head.
Lagos State Building Control Agency (LASBCA).
Lagos State, Nigeria

Abstract— **Green spaces support environmental sustainability, mental well-being, and social interaction within university campuses. Although landscaped spaces exist at Caleb University, their adequacy, distribution, and inclusiveness remain uncertain. This research addresses a gap in the literature, as most studies focus on public urban parks rather than Nigerian university campuses. This study assessed the accessibility and equity of green spaces at Caleb University, evaluating spatial distribution, physical accessibility, user equity, and perceptions of safety and usability. A quantitative survey design was employed, with 200 respondents selected through stratified random sampling from students and staff. Data were collected using a structured questionnaire covering awareness, usage patterns, accessibility, equity, quality, and barriers to use. Descriptive statistics, including frequencies and percentages, were used for analysis. Key findings reveal that while 93% of respondents are aware of campus green spaces, usage remains moderate, with only 20% using them daily. Relaxation (40%) and socializing (22%) are the primary purposes of use. However, 55% of respondents disagree that green spaces are evenly distributed across campus, and 45% state that green spaces are not accessible to persons with disabilities. Major barriers include heat (30%), lack of seating (20%), and poor maintenance (18%). Only 25% of respondents rate pathway safety as "very safe," and 35% report insufficient seating and shade. The study concludes that while green spaces exist at Caleb University, their impact is limited by uneven distribution, inadequate accessibility for persons with disabilities, and poor thermal comfort. Recommendations include equitable distribution of green spaces, inclusive design for mobility-challenged users, provision of shade and seating, enhanced maintenance, and improved safety through better lighting and landscaping.**

Keywords—**Accessibility, Equity, Green spaces, Well-being, Inclusiveness, Caleb University**

I. INTRODUCTION

Green spaces are widely recognized as essential components of sustainable urban and institutional environments due to their environmental, social, and psychological benefits. Green infrastructure contributes to ecological balance, improves air quality, mitigates urban heat island effects, and enhances biodiversity while also providing spaces for recreation, relaxation, and social interaction. In educational environments, particularly university campuses, green spaces such as gardens, lawns, courtyards, and tree-lined walkways contribute significantly to students' mental and physical well-being. Studies have shown that exposure to natural environments can reduce stress, improve emotional restoration, and enhance cognitive performance among students and staff (Soga et al., 2021; Xiao et al., 2022). University campuses function as complex spatial environments where academic, social, and recreational activities coexist. As such, the integration of green spaces into campus planning is increasingly recognized as an important strategy for improving environmental quality and enhancing

user experience. Interaction with natural landscapes within campuses has been shown to promote relaxation, increase concentration, and support social interaction among students (Zhang et al., 2021). Similarly, Li et.al., (2022) note that exposure to campus greenery contributes to psychological restoration and improved mental health outcomes, particularly among students experiencing academic stress.

Beyond individual well-being, green spaces also promote social cohesion and inclusiveness within campus communities. Outdoor environments often function as informal learning and gathering spaces where students engage in academic discussions, leisure activities, and collaborative work. Research indicates that well-designed campus landscapes can strengthen social connections, enhance place attachment, and improve the overall quality of campus life (Liu et al., 2021). However, the benefits of green spaces depend largely on their accessibility, spatial distribution, and usability. When green spaces are unevenly distributed or difficult to access, certain groups of users may be excluded from experiencing their environmental and psychological benefits (Rigolon et al., 2021). In recent years, scholars within Nigerian institutions have also emphasized the role of sustainable design and green infrastructure in improving environmental quality and human well-being. Studies conducted by researchers from the Department of Architecture at Caleb University highlight the importance of integrating nature-based solutions such as green roofs, green facades, and biophilic design strategies in the built environment. For instance, research by Ogunnaike et al., (2025) emphasizes that sustainable architectural strategies, including the integration of greenery and passive environmental design, can significantly improve thermal comfort, environmental quality, and user satisfaction in buildings. Similarly, studies on green roofs and urban vegetation demonstrate their potential to improve air quality and reduce environmental pollution in rapidly urbanizing cities such as Lagos (Adokiye et al., 2025). These findings highlight the growing relevance of nature-based solutions in contemporary architectural and urban planning practices.

Despite the increasing recognition of the importance of green infrastructure, the accessibility and equitable distribution of green spaces remain important planning challenges. In many institutional environments, green spaces may exist but are not evenly distributed or equally accessible to all users. Accessibility involves both physical and perceptual dimensions, including proximity, connectivity, safety, and comfort. Research suggests that individuals who have easier access to green environments are more likely to benefit from their restorative and health-related advantages (Rigolon et al., 2021). Consequently, assessing the accessibility and equity of green spaces is critical for ensuring that their benefits are shared by all members of the campus community. Although a growing body of research has examined urban parks and public green infrastructure, relatively limited attention has been given to the accessibility of green spaces within university campuses, particularly in developing countries. In Nigeria, rapid campus expansion has often prioritized building development over landscape planning, leading to uncertainties regarding the adequacy and inclusiveness of campus green spaces. Addressing this gap requires systematic evaluation of how green spaces are distributed across campuses, how accessible they are to users, and how they are perceived in terms of safety and usability. This study, therefore, assesses the accessibility and equity of green spaces at Caleb University. The research examines the spatial distribution of campus green spaces, evaluates their physical accessibility, and investigates users' perceptions of safety, usability, and inclusiveness. By combining site survey observations with questionnaire based data collection, the study aims to provide insights that can support more sustainable, inclusive, and user-centered campus landscape planning.

1.2 Aim

This study aims to assess the accessibility and equity of green spaces at Caleb University to determine how effectively they support well-being, inclusiveness, and usability within the campus environment.

1.3 Objectives

To achieve this aim, the study will pursue the following objectives to: 1) examine the spatial distribution of green spaces within Caleb University. 2) evaluate the physical accessibility of green spaces for different users within the campus. 3) assess the level of equity in the availability and use of green spaces among members of the university community. 4) investigate users' perceptions of safety, usability, and comfort within the existing green spaces and 5) provide recommendations for improving the accessibility and inclusiveness of campus green spaces to enhance well-being and sustainable campus planning.

1.4 Research Questions

This study is guided by the following research questions: 1. How are green spaces distributed across Caleb University? 2. What barriers limit equitable access to green spaces for different user groups? 3. How do users perceive the quality, safety, and usability of existing green spaces? 4. To what extent are green spaces accessible to persons with mobility challenges?

II. LITERATURE REVIEW

2.1 Conceptualizing Green Spaces

Green spaces are broadly defined as vegetated areas within urban or institutional settings that provide environmental, social, and psychological benefits. These include parks, gardens, lawns, courtyards, green roofs, and landscaped walkways (Kabisch et al., 2021). In institutional settings such as universities, green spaces are integral to the campus environment, offering students, faculty, and staff areas for recreation, relaxation, and informal learning. Browning and Rigolon (2020) highlight that the quality, accessibility, and

spatial distribution of green spaces significantly influence their ability to support mental well-being and social cohesion.

Green spaces can be categorized into two main types: active green spaces, which support physical activities and organized events (e.g., sports fields, amphitheaters), and passive green spaces, which are designed for relaxation, contemplation, and informal social interaction (e.g., gardens, shaded lawns, courtyards). Both types serve complementary functions within a university campus, and an effective landscape plan integrates both to meet diverse user needs. Furthermore, the distinction between formal green spaces (planned, maintained, with amenities) and informal green spaces (semi natural, less maintained, often peripheral) is important for understanding accessibility and equity, as informal spaces may be less visible or perceived as less safe.

2.2 Green Spaces and Well-Being

A growing body of research indicates that exposure to green spaces has measurable benefits for psychological health. Access to vegetation and natural landscapes within campus environments reduces stress, improves cognitive function, and enhances emotional resilience (Soga et al., 2021). Larson, Jennings, and Cloutier (2021) further argue that the presence of green spaces fosters social interaction and strengthens social networks, contributing to a sense of belonging and campus satisfaction. This evidence underscores the role of green spaces as both restorative and social resources, essential for student and staff well-being. However, it is important to note that not all green spaces produce positive outcomes. Poorly maintained green spaces, those with overgrown vegetation, litter, inadequate lighting, or the absence of seating, can actually increase anxiety and discourage use. Research by Speake, et al., (2020) found that students often avoid underutilized or poorly connected green areas due to perceived safety risks. Thus, the presence of green space alone is insufficient; quality, maintenance, and perceived safety are equally critical.

2.3 Accessibility and Equity in Green Spaces

Accessibility refers to the ease with which individuals can reach and use green spaces, while equity concerns the fair distribution of these spaces among diverse user groups. Rigolon et al., (2021) emphasize that unequal access to green spaces can exacerbate social disparities, limiting the benefits for specific groups such as students with mobility challenges or marginalized populations. Factors affecting accessibility include distance, connectivity, pathway design, physical barriers, and perceived safety. Research suggests that green spaces within a 5-minute walking distance (approximately 400 meters) are considered highly accessible, while those beyond 10 minutes (800+ meters) are considered poorly accessible. Distance decay effects mean that usage drops significantly as travel time increases. Additionally, accessibility is not merely physical but also perceptual: if a green space is visible from frequently traveled routes, it is more likely to be used than an equally close but visually hidden space. Speake et al., (2020) found that students often avoid underutilized or poorly connected green areas due to perceived safety risks, inadequate seating, or poor maintenance. Therefore, accessibility and equity are critical considerations in campus landscape planning.

2.4 Green Spaces in University Campuses

University campuses serve as micro-urban environments, where green spaces support diverse functions including recreation, study, and social interaction. Liu et al., (2021) highlight that well-planned campus landscapes improve place attachment, encouraging students to engage more with their environment. Campus green spaces also act as venues for community building and informal learning, fostering collaboration and creativity. However, research indicates that the effectiveness of green spaces is contingent upon thoughtful design and planning. Spaces that are fragmented, poorly maintained, or concentrated in limited areas reduce their potential benefits (Zhang et al., 2021).

2.5 Sustainability and Nature-Based Solutions in Nigerian Campuses

In Nigerian higher education contexts, sustainable landscape design is gradually gaining attention. Researchers at Caleb University have advocated for integrating nature-based solutions into campus planning to enhance environmental quality and user well-being. Ogunnaike et al., (2025) argue that incorporating greenery and passive design strategies improves thermal comfort, reduces energy demands, and increases user satisfaction in buildings. Adokiye et al., (2025) further highlight the role of urban vegetation and green roofs in mitigating air pollution and enhancing environmental performance in dense urban environments. These studies underscore the relevance of context-specific, sustainable landscape strategies for Nigerian campuses.

2.6 Gaps in Current Research

Despite increasing research on green spaces globally, most studies have focused on urban public parks rather than university campuses in developing countries. Limited empirical evidence exists on the spatial distribution, accessibility, and equity of green spaces within Nigerian universities, particularly regarding user perceptions of safety and usability. Moreover, while global studies emphasize the role of green spaces in mental health and social well-being, there is a lack of research integrating these findings with local institutional contexts and sustainability strategies. This study directly addresses this gap by providing empirical data from Caleb University, a private Nigerian institution, and by applying both Biophilia and Environmental Justice frameworks to campus green space assessment.

2.7 Theoretical Framework

This study is grounded in two complementary theoretical perspectives:

2.7.1 Biophilia Hypothesis

The Biophilia Hypothesis posits that humans have an innate affinity for nature and natural environments (Wilson, 1984; Kellert & Wilson, 2020). Exposure to natural elements, including vegetation and landscaped spaces, promotes psychological restoration, reduces stress, and enhances cognitive performance. Applied to campus design, this theory suggests that integrating accessible and visually engaging green spaces supports students' mental health and well-being. In this study, the Biophilia Hypothesis will be used to interpret findings related to usage patterns (e.g., relaxation and socializing as primary purposes) and barriers (e.g., heat as a deterrent to nature exposure).

2.7.2 Environmental Justice Theory

Environmental Justice Theory emphasizes equitable access to environmental resources and services for all individuals, regardless of social, economic, or physical constraints (Bullard, 2021). Within the context of campus green spaces, this theory provides a framework for evaluating whether all members of the university community have fair access to green areas and can benefit from their environmental, social, and psychological advantages. In this study, Environmental Justice Theory will be applied to interpret findings on uneven distribution (55% disagree with even distribution), exclusion of persons with disabilities (45% state no access), and disparities across faculties and hostels. Combining these theories provides a comprehensive lens to assess both the well-being benefits (biophilia) and the equitable distribution (environmental justice) of green spaces, aligning with the objectives of this study. The Discussion section will explicitly return to these frameworks.

III. METHODOLOGY

3.1 Research Design

This study employed a mixed-methods design with a dominant quantitative approach, using a structured questionnaire to assess accessibility, equity, and user satisfaction of green spaces at Caleb University. The survey method is appropriate for gathering systematic data from a large population, enabling statistical analysis of user perceptions and experiences (Creswell & Creswell, 2023). Open-ended questions in Section F provided qualitative insights into user suggestions for improvement. This approach allowed the study to explore awareness, usage patterns, accessibility, equity, and quality of campus green spaces.

3.2 Study Area

The study was conducted at Caleb University, Imota, Lagos State, which features multiple campus green spaces, including lawns, courtyards, gardens, and landscaped walkways. These spaces serve as recreational, social, and study areas for students and staff. The campus context provides an ideal environment to examine spatial accessibility, equity, and user perceptions, in line with previous research on sustainable campus landscapes (Ogunnaike etal., 2025; Adokiye et al., 2025). The proposed scheme is tested using image processing. From the simulation of the experiment results, we can draw to the conclusion that this method is robust to many kinds of watermark images.

3.3 Population and Sampling

The target population included all students, academic staff, and administrative personnel who regularly use campus green spaces. The estimated total population of the university is approximately 3,500 (students and staff combined). Using the Krejcie & Morgan (1970) sample size determination table, a population of 3,500 yields a recommended sample size of approximately 346 for a 95% confidence level and 5% margin of error. However, due to resource constraints and accessibility, a sample size of 200 was determined to be adequate for this exploratory study.

Using stratified random sampling, respondents were divided into student categories (100–200 Level, 300–400 Level, and Postgraduate) and staff categories to ensure proportional representation. A total of 200 respondents were selected. The distribution was as follows:

- 100–200 Level: 100 respondents (50%)
- 300–400 Level: 70 respondents (35%)
- Postgraduate: 30 respondents (15%)

3.4 Questionnaire Structure

The questionnaire was structured into six sections to capture multiple dimensions of green space use:

SECTION A: Respondent Information

- Status (100–200 Level / 300–400 Level / Postgraduate / Staff)
- Faculty/College
- Residence (On-campus / Off-campus)
- Mobility challenges (Yes / No / Prefer not to say)

SECTION B: Awareness & Usage

- Awareness of campus green spaces (Yes / No)
- Frequency of use (Daily / Weekly / Occasionally / Rarely / Never)
- Main purpose of use (Relaxation / Studying / Social interaction / Religious activities / Events / Passing through)

SECTION C: Accessibility

- Travel time to nearest green space (Less than 5 minutes / 5–10 minutes / More than 10 minutes)
- Safety and convenience of pathways (Very safe / Safe / Unsafe / Very unsafe)
- Accessibility for persons with disabilities (Yes / No / Not sure)

International Journal of Engineering Applied Sciences and Technology, 2026
Vol. 10, Issue 12, ISSN No. 2455-2143, Pages 11-19
Published Online April 2026 in IJEAST (http://www.ijeast.com)

SECTION D: Equity & Distribution
- Evenness of green space distribution (5-point Likert scale: Strongly Agree to Strongly Disagree)
- Equal access across faculties and hostels (Yes / No / Not sure)
- Experiences of exclusion (Yes / No; If yes, reason)

SECTION E: Quality & Satisfaction
- Overall quality (Excellent / Good / Fair / Poor)
- Adequacy of seating and shaded areas (Yes / No / Partially)
- Maintenance rating (Very good / Good / Poor / Very poor)

SECTION F: Barriers & Improvement
- Factors limiting use (Select all that apply: Heat / Lack of seating / Poor maintenance / Distance / Safety concerns / Academic workload / Nothing)
- Suggested improvements (Open-ended)

3.5 Data Analysis
Quantitative data were analyzed using descriptive statistics, specifically frequencies, percentages, and mean scores. For Likert-scale items (Section D, Statement 1), the mean score was calculated using the formula:
Mean = $\Sigma(f \times x) / N$
Where f = frequency of each response, x = Likert value (1 = Strongly Disagree to 4 = Strongly Disagree – or 5-point scale as appropriate), and N = total respondents (200). Qualitative open-ended responses (Section F) were subjected to thematic analysis to identify recurring patterns in user suggestions.

3.6 Ethical Considerations
Participation was voluntary, and informed consent was obtained from all respondents. Anonymity was guaranteed, and no personally identifiable information was collected. Data were used solely for academic research purposes.

IV. RESULTS AND DISCUSSION

4.1 Response Rate and Demographics
A total of 200 questionnaires were distributed, and 200 were returned fully completed, representing a 100% response rate. This high response rate was achieved through in-person administration and immediate collection.

Demographic Variable	Category	Frequency (N)	Percentage (%)
Status	100–200 Level	100	50.0
	300–400 Level	70	35.0
	Postgraduate	30	15.0
Residence	On-campus	124	62.0
	Off-campus	76	38.0
Mobility Challenges	Yes	10	5.0
	No	180	90.0
	Prefer not to say	10	5.0

Fig 4.1: Demographic Characteristics of Respondents (N=200)

Variable	Category	Frequency (N)	Percentage (%)
Awareness of green spaces	Yes	186	93.0
	No	14	7.0
Frequency of use	Daily	40	20.0
	Weekly	64	32.0
	Occasionally	60	30.0
	Rarely	24	12.0
	Never	12	6.0

Fig 4.2: Awareness and Frequency of Use

Awareness of green spaces is very high (93%), indicating that green spaces are visible and recognized by the campus community. However, usage is only moderate, with only 20% using green spaces daily. The largest groups use green spaces weekly (32%) or occasionally (30%). This gap between awareness and frequent use suggests the presence of barriers that limit regular engagement.

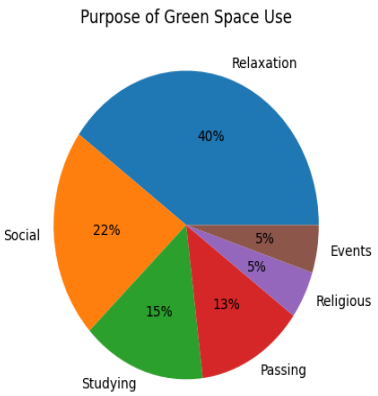

Figure 4.3: Purpose of Green Space Use

Interpretation: The primary purposes for using green spaces are relaxation (40%) and social interaction (22%), which aligns with the Biophilia Hypothesis – users seek natural environments for psychological restoration and social connection. Studying (15%) and passing through (13%) are secondary. The low percentage for events (5%) suggests that green spaces are not currently being activated for organized campus activities, representing an opportunity for university programming.

International Journal of Engineering Applied Sciences and Technology, 2026
Vol. 10, Issue 12, ISSN No. 2455-2143, Pages 11-19
Published Online April 2026 in IJEAST (http://www.ijeast.com)

Variable	Category	Frequency (N)	Percentage (%)
Travel time to nearest green space	Under 5 minutes	90	45.0
	5–10 minutes	80	40.0
	Over 10 minutes	30	15.0
Pathway safety	Very safe	40	20.0
	Safe	110	55.0
	Unsafe	50	25.0
Accessibility for persons with disabilities	Yes	60	30.0
	No	90	45.0
	Not sure	50	25.0

Fig 4.4: Accessibility Indicators

The majority of respondents (85%) can reach a green space within 10 minutes, indicating reasonable spatial proximity. However, 25% of users feel pathways are unsafe, which is a significant concern. Most critically, 45% of respondents explicitly state that green spaces are not accessible to persons with disabilities, and another 25% are uncertain. This represents a serious equity failure from an Environmental Justice perspective.

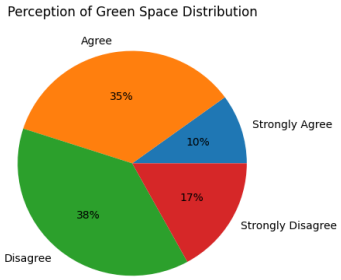

Fig 4.5: Perception of Green Space Distribution

Overall quality	Excellent	20	10.0
	Good	80	40.0
	Fair	64	32.0
	Poor	36	18.0
Seating and shade adequacy	Yes	50	25.0
	Partially	80	40.0
	No	70	35.0
Maintenance rating	Very good	20	10.0
	Good	76	38.0
	Poor	68	34.0
	Very poor	36	18.0

Fig 4.6: Quality and Satisfaction Indicators

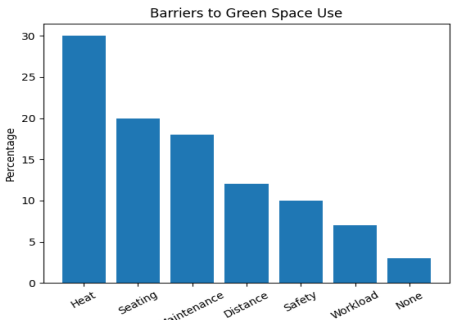

Fig 4.7: Barriers to Green Space Use

Heat is the most significant barrier (30%), which is particularly relevant in Lagos's tropical climate. This finding directly supports the need for shaded structures and tree planting – interventions that align with the Biophilia Hypothesis (increasing positive nature contact). Lack of seating (20%) and poor maintenance (18%) are also major barriers. Safety concerns (10%) are present but less dominant than environmental comfort issues. Only 3% report no barriers, indicating that almost all users face at least one obstacle to green space use.

4.7 Suggested Improvements (Thematic Analysis)

Open-ended responses were analyzed for recurring themes. The following table presents the most frequently mentioned suggestions:

Theme	Frequency of Mention	Example Quote
More trees and shaded areas	High	*"Plant more trees near the walkways; the sun is too harsh by 2pm."*
More seating	High	*"There are not enough benches to sit and relax."*
Maintenance and landscaping	Medium	*"The grass is often overgrown and looks abandoned."*
Better lighting and security	Medium	*"Some areas are dark at night, so I avoid them."*
Equitable distribution	Medium	*"The hostels at the back have no green space at all."*

Fig 4.8: Thematic Summary of Suggested Improvements

4.8 Discussion of Findings

4.8.1 Spatial Distribution and Environmental Justice

The finding that 55% of respondents disagree that green spaces are evenly distributed, and 50% state that access is not equal across faculties and hostels, represents a clear violation of Environmental Justice Theory (Bullard, 2021). From an environmental justice perspective, all members of a community, regardless of their faculty, hostel location, or

physical ability, should have equitable access to the benefits of green spaces. The current distribution pattern at Caleb University appears to concentrate
green spaces in certain zones (likely near administrative buildings or specific hostels) while leaving other areas underserved. This uneven distribution limits the ability of green spaces to function as campus-wide resources for well-being and social cohesion.

4.8.2 Biophilia, Usage Patterns, and Barriers
The finding that relaxation (40%) and social interaction (22%) are the primary purposes of green space use aligns strongly with the Biophilia Hypothesis (Wilson, 1984; Kellert & Wilson, 2020). Users are instinctively drawn to natural environments for psychological restoration and social connection. However, the gap between high awareness (93%) and daily usage (20%) indicates that existing green spaces are not fully meeting biophilic needs. The identification of heat (30%) as the most significant barrier is particularly important: in Lagos's tropical climate, unshaded green spaces become unusable during peak daylight hours. From a biophilic perspective, this represents a failure to create comfortable nature-contact experiences. Providing shade through trees, pergolas, and canopies would directly address this barrier and likely increase usage.

4.8.3 Accessibility and Inclusive Design
The finding that 45% of respondents state green spaces are not accessible to persons with disabilities, with another 25% uncertain, is a critical equity failure. Accessible design is not merely a matter of compliance but a fundamental requirement of Environmental Justice. The absence of accessible pathways, ramps, and seating excludes a significant portion of the campus community from the psychological and social benefits of green spaces. This finding is particularly concerning given that only 5% of respondents self-identified as having mobility challenges the actual percentage of campus users with disabilities may be higher, and their exclusion may be even more severe than reported.

4.8.4 Quality, Maintenance, and the CPTED Connection
The finding that 52% rate maintenance as poor or very poor, and only 25% feel that seating and shade are adequate, aligns with broader environmental design principles. While this study does not focus on safety, the poor maintenance finding echoes concerns raised in previous Caleb University research on lighting and landscape management (Ademakinwa et al., 2024; Onyekwere et al., 2024). Poorly maintained green spaces – with overgrown vegetation, litter, and broken amenities – signal neglect and can increase perceptions of unsafety, further discouraging use. This creates a negative feedback loop: low usage leads to further neglect, which reduces usage even more.

4.8.5 Comparison with Existing Literature
The findings of this study are consistent with international research on campus green spaces. Zhang et al. (2021) found that well-designed campus landscapes improve place attachment and student satisfaction – a finding supported by the 50% of respondents who rate green space quality as good or excellent. However, the barriers identified in this study (heat, lack of seating, poor maintenance) mirror those reported by Speake, Edmondson, and Nawaz (2020) in their study of UK university campuses, suggesting that these are universal challenges rather than context-specific failures. The contribution of this study is to document these challenges within a Nigerian private university context, where limited empirical research exists.

4.8.6 Limitations of the Study
Several limitations should be acknowledged. First, the sample size of 200, while adequate for exploratory analysis, limits the generalizability of findings to other Nigerian universities. Second, the study focused exclusively on Caleb University, a private institution with resources that may differ from public universities. Third, the study did not include objective measurements of green space area, vegetation density, or shade coverage – relying instead on user perceptions. Fourth, staff perspectives were underrepresented compared to those of students. Future research should include objective spatial analysis using GIS, comparative studies across multiple Nigerian universities, and qualitative interviews to capture richer user experiences.

V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion
This study assessed the accessibility and equity of green spaces at Caleb University, guided by two theoretical frameworks: the Biophilia Hypothesis and Environmental Justice Theory. The research examined spatial distribution, physical accessibility, user equity, and perceptions of quality and safety among 200 students and staff.
The study found that while awareness of green spaces is high (93%) and users primarily seek relaxation and social interaction – consistent with biophilic needs – several significant barriers limit equitable access and regular use. A majority of respondents (55%) disagree that green spaces are evenly distributed across campus, and 50% state that access is not equal across faculties and hostels, directly contradicting Environmental Justice principles. Most critically, 45% of respondents state that green spaces are not accessible to persons with disabilities, representing a serious exclusionary practice.
Barriers to use include heat (30%), lack of seating (20%), poor maintenance (18%), and safety concerns (10%). Only 25% of respondents feel that seating and shade are adequate, and 52% rate maintenance as poor or very poor. These quality deficits directly reduce the psychological and social benefits that green spaces are intended to provide.

The study concludes that while green spaces exist at Caleb University, their impact is substantially limited by uneven distribution, inadequate accessibility for persons with disabilities, poor thermal comfort, and insufficient maintenance. Addressing these limitations is essential for realizing the full biophilic and environmental justice potential of campus green spaces.

5.2 Recommendations

The following recommendations are organized by priority and include responsible parties and estimated cost levels.

Priority	Recommendation	Responsible Body	Estimated Cost	Urgency
1	Provide shade structures and plant more trees to address heat barriers	Estates Department	Medium	High
2	Ensure accessible pathways, ramps, and seating for persons with disabilities	Estates Department / Disability Unit	Medium	High
3	Distribute green spaces more evenly across all faculties and hostels	University Management / Physical Planner	High	High
4	Implement a regular maintenance schedule for lawns, pathways, and landscaping	Estates Department	Low	High
5	Install adequate seating and benches in all green spaces	Estates Department	Low	Medium
6	Improve lighting and visibility in and around green spaces for nighttime safety	Estates Department / Security	Medium	Medium
7	Promote green spaces through programming (outdoor classes, events, study groups)	Student Affairs / Academic Affairs	Low	Low

Fig 5.1: Summary of Recommendations for Improving Green Spaces

5.2.1 Address Thermal Comfort (Priority 1)

Heat is the most significant barrier to green space use (30%). The university should:
- Plant additional shade trees, particularly fast-growing native species
- Install pergolas, canopies, and shade sails in exposed areas
- Design new green spaces with east-west orientation to maximize natural shade

5.2.2 Ensure Inclusive Design for Persons with Disabilities (Priority 2)

The finding that 45% state green spaces are inaccessible to persons with disabilities is unacceptable. The university must:
- Conduct an accessibility audit of all existing green spaces
- Install accessible pathways (minimum 1.2m width, firm surfaces, gentle gradients)
- Provide accessible seating with armrests and back support
- Ensure that all new green space projects comply with universal design principles

5.2.3 Improve Spatial Distribution of Green Spaces (Priority 3)

To address the 55% who disagree with even distribution, the university should:
- Conduct a spatial analysis (GIS mapping) of existing green space distribution
- Prioritize underserved areas (e.g., hostels at the campus periphery, specific faculties)
- Develop smaller, decentralized "pocket parks" rather than concentrating all green space in one zone

5.2.4 Enhance Maintenance and Management (Priority 4)

Given that 52% rate maintenance as poor or very poor, the university should:
- Establish a routine maintenance schedule (weekly mowing, monthly pruning, quarterly inspections)
- Assign dedicated groundskeeping staff to specific campus zones with clear accountability
- Create a reporting system for users to flag maintenance issues (e.g., overgrown vegetation, broken seating)

5.2.5 Provide Adequate Seating and Amenities (Priority 5)

To address the 20% who cite lack of seating as a barrier, the university should:
- Install benches at regular intervals (every 50–100 meters) along pathways
- Provide a mix of seating types (individual, group, shaded, sun-exposed for winter – though less relevant in Lagos)
- Include tables for studying and eating outdoors

5.2.6 Improve Safety and Security (Priority 6)

While safety concerns (10%) are less dominant than heat or seating, they remain significant. The university should:
- Install adequate lighting in and around green spaces for evening use
- Ensure landscaping does not create concealed areas (apply CPTED principles)
- Increase security patrols in less-frequented green spaces

5.2.7 Promote Awareness and Engagement (Priority 7)

To increase the 20% daily usage rate, the university should:
- Integrate green spaces into orientation programs for new students
- Host outdoor classes, study groups, and social events in green spaces
- Create signage highlighting the location and amenities of each green space

VI. REFERENCE

[1]. Ademakinwa, O. O., Onamade, A. O., Adewumi, B. J., Adenubi, O. O., & Alagbe, O. A. (2024). Impact of accommodation on job performance at Caleb University, Imota, Lagos State, Nigeria. Caleb International Journal of Development Studies, 7(1). https://doi.org/10.26772/cijds-2024-07-01-013

[2]. Adokiye, D., Dayomi, M., Ademakinwa, O. O., & Babamboni, A. (2025). The role of green roofs in urban air filtration. International Journal of Latest Technology in Engineering, Management & Applied

Science (IJLTEMAS), 14(8), 211–217. https://doi.org/10.51583/IJLTEMAS

[3]. Browning, M. H. E. M., & Rigolon, A. (2020). School green space and its impact on academic performance and mental well-being. Landscape and Urban Planning, 198, 103788. https://doi.org/10.1016/j.landurbplan.2020.103788

[4]. Creswell, J. W., & Creswell, J. D. (2023). Research design: Qualitative, quantitative, and mixed methods approaches (6th ed.). SAGE Publications.

[5]. Kabisch, N., Korn, H., Stadler, J., & Bonn, A. (2021). Nature-based solutions to climate change adaptation in urban areas. Springer. https://doi.org/10.1007/978-3-319-56091-5

[6]. Kellert, S. R., & Wilson, E. O. (2020). The biophilia hypothesis. Island Press. (Original work published 1993)

[7]. Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607–610.

[8]. Larson, L. R., Jennings, V., & Cloutier, S. A. (2021). Public parks and wellbeing in urban areas: Equity and access considerations. Landscape and Urban Planning, 209, 104020. https://doi.org/10.1016/j.landurbplan.2021.104020

[9]. Li, C., Wang, H., Paulussen, J., & Liu, Y. (2022). Campus greenery and psychological restoration: The mediating role of perceived stress. Journal of Environmental Psychology, 79, 101734. https://doi.org/10.1016/j.jenvp.2021.101734

[10]. Rigolon, A., Browning, M. H. E. M., Lee, K., & Shin, S. (2021). Access to urban green space in cities worldwide: A systematic review. Landscape and Urban Planning, 214, 104179. https://doi.org/10.1016/j.landurbplan.2021.104179

[11]. Soga, M., Evans, M. J., Tsuchiya, K., & Fukano, Y. (2021). A room with a green view: The importance of nearby nature for mental health. Ecological Applications, 31(2), e02248. https://doi.org/10.1002/eap.2248

[12]. Speake, J., Edmondson, S., & Nawaz, H. (2020). Everyday encounters with nature: Students' perceptions of campus green spaces. Urban Forestry & Urban Greening, 49, 126604. https://doi.org/10.1016/j.ufug.2020.126604

[13]. Xiao, Y., Li, C., Wang, H., Liu, Y., & Zhang, J. (2022). Exposure to campus green space and student mental health: A meta-analysis. International Journal of Environmental Research and Public Health, 19(8), 4562. https://doi.org/10.3390/ijerph19084562

[14]. Zhang, Y., van den Berg, A. E., van Dijk, T., & Weitkamp, G. (2021). The role of campus green space in student well-being: A cross-cultural study. Landscape and Urban Planning, 207, 104003. https://doi.org/10.1016/j.landurbplan.2020.104003

IJEAST

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

ABOUT IJEAST

International Journal of Engineering Applied Science and Technology (IJEAST) is a peer-reviewed, open access journal that publishes high-quality research papers in the field of Engineering, Applied Science and Technology.

IJEAST aims to provide a platform for researchers, academicians, and professionals to share their innovative ideas, research findings, and practical experiences with the global scientific community.

FOCUS AREAS

- Engineering
- Applied Science
- Technology
- Innovation & Development
- Interdisciplinary Studies

PEER REVIEWED
All submissions are rigorously peer reviewed to ensure quality.

OPEN ACCESS
Free and unrestricted access to research for all.

GLOBAL REACH
Connecting researchers and professionals worldwide.

TIMELY PUBLICATION
We ensure a swift and efficient publication process.

For more information, visit our website
www.ijeast.com

INTERNATIONAL JOURNAL
OF ENGINEERING APPLIED SCIENCE
AND TECHNOLOGY

editor@ijeast.com
www.ijeast.com
India

2455-2143