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Landscape Architecture Psychology: Investigating Pedestrian Non-Compliance with Paved Pathways in Caleb University

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Abstract: This study investigates the spatial and behavioral factors that drive pedestrians to abandon established paved pathways in favour of naturally occurring desire lines across campus lawnscapes. Central to this phenomenon is the Principle of Least Effort, which posits that human behavior is largely driven by the desire to minimize the average rate of work required to complete a task (Zipf, 1949, as cited in Chang, 2016, p. 659). Utilizing a mixed-methods approach—comprising qualitative verbal interviews and structured digital questionnaires—the research analyzes how this principle, alongside route efficiency and visual connectivity, dictates pedestrian movement. The empirical findings from campus users provide actionable insights to guide sustainable landscape interventions, inform cost-effective path restoration, and optimize pedestrian flow design in university environments.

Keywords: *Desire Lines, Landscape Architecture, Pedestrian Behavior, Route Efficiency, Soil Compaction, Bio-Engineering.*

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I. INTRODUCTION

The built environment often fails to align with intuitive human navigation, leading pedestrians to create "desire lines"—unplanned shortcuts across lawnscapes. Conventional transportation studies typically assume utilitarian decision-making, where individuals select routes specifically to maximize utility, such as the shortest travel time (Hoogendoorn & Bovy, 2004). However, in complex urban landscapes like university campuses—characterized by intricate layouts, diffuse pathways, and a lack of clear spatial hierarchies—route choices are often subconscious and nuanced (Chan et al., 2024).

This spatial friction is particularly evident on Nigerian university campuses like Caleb University, where the network features narrow, raised concrete walkways. Driven by physical constraints and the "Law of Least Effort," pedestrians prioritize energy conservation and comfort, stepping down onto the flat grass to pass others, quickly forming permanent dirt tracks. Furthermore, the mismanagement of open spaces in Nigerian universities often exerts a major strain on campus environment and landscape sustainability (Adekunle & Basorun, 2016).

The consequences are severe: continuous foot traffic causes soil compaction and, in the tropical climate, heavy rains lead to erosion, turning these unreinforced shortcuts into muddy trenches. The core problem is that rigid landscaping ignores the psychological realities of pedestrian movement, causing continuous landscape degradation. Understanding these behavioral drivers is critical for designing low-cost, durable green infrastructure.

II. LITERATURE REVIEW

➢ *The Psychology of the Shortcut*

The emergence of desire lines is rooted in environmental psychology and behavioral geography, which challenge conventional assumptions of intended route optimality. Traditional transportation models often assume strict utilitarian decision-making, where pedestrians select routes solely to maximize efficiency and minimize travel time (Hoogendoorn &

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Bovy, 2004). However, recent empirical evidence suggests that pedestrian navigation is a much more complex interplay of human-environment interactions. While the "Law of Least Effort" remains a core driver, pedestrians in densely populated urban and institutional communities frequently rely on socio-sensory wayfinding strategies, leading to route choices that are subconscious and deeply nuanced (Chan et al., 2024).

This drive is heavily influenced by "visual connectivity" and environmental comfort. Studies analyzing spatial preferences reveal that pedestrians frequently cover longer distances than typically assumed if a route offers better aesthetic comfort, shade, or space to walk abreast with peers (Weinstein Agrawal et al., 2008). If a destination is in sight but the formal programmed path curves away, the natural instinct is to subvert the architecture and walk in a straight line.

➢ *Pedestrian Dynamics in Institutional Spaces*

University campuses represent uniquely complex navigational environments. They often feature intricate layout planning, shared social spaces, and a lack of clear functional spatial hierarchies, all of which diminish legibility and complicate human wayfinding behaviors (Iftikhar et al., 2020). In such environments, unpaved desire lines act as physical "votes" or spatial feedback, signaling that the master plan structures are functionally inadequate for daily users.

In the Nigerian context, the spatial friction between pedestrians and planned infrastructure is frequently intensified by institutional oversight. The aesthetic quality and sustainability of campus environments are often compromised by the mismanagement and misuse of open spaces, which exerts a major strain on the campus landscape (Adekunle & Basorun, 2016). Attempts by institutions to artificially correct pedestrian non-compliance without addressing the underlying spatial failures are largely ineffective. Theories on behavioral architecture suggest that subtle environmental features heavily influence decision-making, and the human drive for spatial efficiency easily overrides arbitrary physical barriers like fences or warning signs (Thaler & Sunstein, 2008).

➢ *Sustainable Landscape Engineering*

Addressing persistent landscape degradation, particularly in tropical climates, requires shifting from strictly impervious concrete to adaptive, permeable landscape architecture. Heavy rains on unreinforced desire lines cause severe topsoil loss and erosion. Contemporary architectural research advocates for holistic "Green Campus Initiatives" to mitigate these impacts through the integration of sustainable practices in space management (Dada & Chukwuemeka, 2024).

By utilizing bio-engineering, permeable paving, and locally sourced vegetative stabilization (such as bamboo geogrids or stabilized earth), institutions can formalize natural shortcuts into durable, erosion-resistant networks. While extensive literature exists on desire lines in Western contexts or highly urbanized city centers, there is a distinct gap in applying these behavioral theories to the specific constraints of Nigerian university campuses. This research addresses that gap by linking the "social vote" of the desire line to actionable, low-cost bio-engineering solutions designed for the local climate.

III. RESEARCH METHODOLOGY

➢ *Research Design*

This study adopted a qualitative research design. It relied primarily on semi-structured, face-to-face interviews to extract deep phenomenological insights into the "in-the-moment" cognitive decisions made by pedestrians. This verbal data collection was supplemented by spatial observation and direct physical mapping of the existing desire lines superimposed over the university's master plan to provide architectural and geographic context.

➢ *Study Area*

The study was conducted at the Caleb University campus located in Imota, Lagos State, Nigeria. The site's established network of raised concrete walkways, high-traffic dirt tracks, and distinct wet/dry tropical seasons provided the essential context for studying soil degradation and pedestrian behavior.

➢ *Population and Sample Size Determination*

The target population encompassed the active students and staff of Caleb University. Given the qualitative nature of the research design, a purposive sampling technique was employed. A targeted sample of 20 respondents was selected, comprising individuals intercepted near active desire lines. This sample size was deemed appropriate and sufficient to achieve data saturation for qualitative thematic analysis, ensuring a comprehensive understanding of the diverse psychological and physical drivers influencing route choice across different campus demographics.

➢ *Data Collection Instruments*

- Semi-structured Interview Guide - A 5- question verbal framework designed to capture the immediate psychological triggers, environmental friction (weather, crowding),and responses to the built environment
- Site Mapping: Photographic and observational mapping of the physical conditions of the soil (compaction and erosion levels) at the most heavily utilized desire lines.

➢ *Method of Data Analysis*

Data collected from the verbal interviews were transcribed and subjected to qualitative thematic analysis (identifying recurring codes and categorizing them into broader behavioral themes) to extract narrative context and spatial frustrations. This qualitative framework allowed for the translation of raw human behavior into measurable architectural parameters. Concurrently, site observations were translated into architectural diagrams to inform the proposed green infrastructure interventions.

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IV. DATA PRESENTATION AND ANALYSIS

➢ *Qualitative Demographic Profile*

To gain a comprehensive understanding of pedestrian spatial behavior, qualitative interviews were conducted with a purposive sample of 20 respondents. Data saturation was achieved at this sample size, as no new themes emerged after the 18th interview. The demographic matrix captures a wide cross-section of campus users, categorized as follows:

Table 1 Qualitative Demographic Profile

Respondent Group	Description
Respondents 1–3	Male Undergraduates (100-300 Level): High-speed walkers focused entirely on route efficiency
Respondents 4–7	Female Undergraduates (100-300 Level): Route-efficient walkers influenced by footwear constraints and weather
Respondents 8–10	Mixed Undergraduates: Pedestrians who navigate campus in social groups
Respondents 11–14	Architecture/Senior Students (400-500 Level): Time-constrained students carrying materials or heading to studios
Respondents 15–17	Academic Staff (Age 30+): Users prioritizing safety, formal aesthetics, and pathway structural integrity
Respondents 18–20	Non-Academic/Support Staff: Users focused on functional width and usability of paths for movement

➢ *Thematic Analysis of Interview Responses*

- *Theme 1: The Decision Moment & Route Efficiency*

Across all 20 profiles, the primary driver for abandoning paved walkways was the universal desire for the shortest, fastest route. The "Law of Least Effort" was evident across every demographic. Senior students (R11–R14) emphasized the pressure of academic schedules, explicitly noting that cutting across the grass is necessary "to get to the studio faster." Older staff members (R15, R16) noted that stepping off concrete is often a tactical decision to experience "less foot traffic when branching off a main path," effectively using desire lines as bypasses to avoid congested primary routes.

- *Theme 2: Environmental Comfort and the Mud Factor*

The tropical climate plays a massive role in dictating route choice, creating a dichotomy between sun and rain behavior. Multiple respondents (R4, R6, R17) highlighted that harsh sun forces them onto unpaved grass because it offers better shade from surrounding trees than exposed concrete paths. Conversely, rain completely alters compliance. Female undergraduates (R5, R7) reported a common "fear of muddy ground," forcing them back onto concrete to protect their shoes. Interestingly, R15 observed a micro-behavior: when desire lines get muddy, some pedestrians refuse to return to concrete, instead opting to "walk on the fresh grass right beside the mud," widening the zone of landscape degradation.

- *Theme 3: Spatial Friction and the "Raised Edge" Problem*

The geometric design of existing paved paths—specifically their narrow width and elevated edges—was identified as a major source of spatial frustration. High-speed students (R1, R12) expressed intense frustration with getting stuck behind slow-moving individuals. The necessity to awkwardly shuffle or step off a raised edge to overtake someone makes them "prefer walking on the flat grass instead." Furthermore, female respondents and staff members (R6, R16) pointed out that walking on grass is actually "safer when wearing high heels, as shoes can get caught in the cracks, and loose interlocking blocks or void spaces can trip pedestrians." Group walkers (R8, R9) and staff (R19) recommended that for a paved path to be comfortable, it requires a minimum width capable of accommodating "four people walking abreast."

- *Theme 4: Unspoken Rules and Psychological Freedom*

When asked why informal dirt tracks feel like the "better" choice, younger students (R4, R5) relied heavily on social proof, stating, "people pass there so it's okay." R15 summarized this as a collective "mental acceptance of the unpaved path as a second, and sometimes better, option." For several respondents (R8, R10), grass offers a psychological release from rigid geometry of the master plan, articulating that "there is a sense of not being bound by space." R9 noted a preference for the natural look and a "fear of ruining something that works perfectly as it is."

- *Theme 5: Material Upgrades and Future Interventions*

When pitched the idea of upgrading dirt tracks with low-cost, firm materials like packed earth or fine gravel, responses were overwhelmingly utilitarian. The vast majority (R1–R3, R11–R14) stated they "don't really care about the aesthetics or material used, as long as it gets me to my destination fast, stress-free, and water-resistant." Senior students and staff explicitly agreed that an upgrade to a "nice gravel path" would be the ideal

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compromise—retaining the unbound feel of the desire line while eliminating mud and tripping hazards.

➢ *Matrix Analysis: Relational Variables Influencing Route Choice (N=20)*

- Cross-tabulating the coded responses of the 20 interviewees reveals the direct relationship between specific *environmental/social variables and the decision to abandon* paved pathways.

Table 2: Cross-Tabulation of Weather Conditions vs. Pathway Preference (N=20)

Weather Condition	Prefer Paved Concrete Path	Prefer Unpaved Desire Line	Total Respondents
Heavy Rain / Muddy Ground	18	2	20
Harsh Sun / High Heat	4	16	20

Analysis of Table 2: This table demonstrates severe behavioral polarity dictated by climate. During heavy rain, pedestrian compliance with formal architecture is almost absolute (18 out of 20 respondents), driven by psychological aversion to mud. Conversely, under harsh sun, non-compliance flips entirely, with 16 out of 20 respondents abandoning concrete. Unpaved desire lines typically run closer to existing tree canopies, proving pedestrians actively subvert the master plan to prioritize thermal comfort.

Table 3: Cross-Tabulation of Spatial Friction (Crowding) vs. Pathway Preference (N=20)

Campus Traffic Level	Prefer Paved Concrete Path	Prefer Unpaved Desire Line	Total Respondents
Low Traffic (Empty paths)	14	6	20
Peak Hours (High Traffic)	2	18	20

Analysis of Table 3: This table establishes a direct correlation between pedestrian density and architectural non-compliance. When campus traffic is low, the majority (14 out of 20) utilize formally paved paths. The 6 respondents who choose grass during low traffic are strictly driven by the "Law of Least Effort" to minimize travel distance. However, during peak hours, non-compliance surges to 18 out of 20. When narrow, raised paths become congested, spatial friction from awkward shuffling forces almost all demographics off concrete, validating that formal pathways are not wide enough to support peak social carrying capacity.

V. CONCLUSION AND RECOMMENDATIONS

➢ *Summary of Findings*

The study investigated the psychological and spatial factors driving pedestrians to create and utilize unpaved desire lines. The findings confirm that pedestrian movement is not random; it is highly calculated and deeply influenced by the Principle of Least Effort. Specifically, the research found that:

- Geometric Inefficiency: Formal walkways featuring sharp 90-degree turns are routinely subverted by pedestrains seeking visual connectivity and the shortest possible route to their destinations.

- Spatial Friction: The physical design of existing pathways—specifically their narrow widths and raised, elevated edges—creates significant social friction during peak hours. Pedestrians actively step onto lawns to avoid awkward single-file shuffling and tripping hazards (such as loose interlocking blocks).

- Environmental Determinism: Route choice is heavily conditional on tropical climate. While heavy rains temporarily force pedestrians onto paved paths to avoid mud, harsh sunlight drives pedestrians off concrete to seek thermal comfort and shade naturally offered by unpaved desire lines under tree canopies.

➢ *Conclusion*

The persistent degradation of campus lawnscapes is not a result of student vandalism, but rather a functional failure of the built environment. Master plans that prioritize rigid, orthogonal geometries over intuitive human navigation inevitably create spatial friction. The desire lines observed at Caleb University serve as a physical "vote" from users, signaling exactly where pathways are actually needed. Research on institutional environments has consistently shown that physical environmental quality directly influences user behavior, satisfaction, and overall campus experience (Ademakinwa et al., 2024). Attempts to correct non-compliance through physical barricades or arbitrary enforcement are fundamentally flawed because they conflict with human psychology. Sustainable campus design requires landscape architecture that adapts to the

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Law of Least Effort, formalizing intuitive routes rather than fighting them.

➢ *Recommendations*

To address continuous landscape degradation and improve pedestrian flow, the following interventions are recommended for Caleb University:

- *Formalization of Major Desire Lines*

Instead of investing in fencing, the university should officially adopt the most heavily trafficked desire lines. These tracks should be formalized using low-cost, permeable materials such as packed earth, fine gravel, or woodchips. Qualitative data proves that students do not require expensive concrete; they merely require a firm, water-resistant surface to avoid mud.

- *Implementation of Bio-Engineering Solutions*

To prevent topsoil loss and erosion without pouring impervious concrete, the landscape master plan should utilize ecosystem-based stabilization. Localized green infrastructure, such as bamboo geogrids or deep-rooted stabilizing vegetation (e.g., Vetiver grass), should be deployed along the edges of newly formalized dirt paths to reinforce soil shear strength.

- *Redesigning Path Geometry (The 4-Person Rule)*

Future paved pathways connecting high-traffic nodes (e.g., Dorcas Hostel to main academic blocks) must be widened to comfortably accommodate a minimum of four people walking abreast. This translates to a recommended minimum width of 2.4–3.0 meters for primary campus pedestrian corridors.

- *Elimination of Raised Edges*

Where possible, raised pathway curbing should be retrofitted or replaced with flush, ground-level edging. This removes tripping hazards and allows pedestrians to naturally spill onto grass during peak crowding without the physical awkwardness of stepping up and down.

➢ *Areas for Further Research*

While this study establishes the psychological and spatial drivers of desire lines, future research should focus on physical implementation of solutions. Further studies should conduct physical load testing and life-cycle cost analyses of specific bio-engineering materials (such as bamboo reinforcement vs. recycled gravel) within the Caleb University soil profile to determine the most economically viable material for long-term campus path restoration.

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