INFLUENCE OF PAVING AND BUILDING FACADES ON PEDESTRIAN WALKABILITY IN D.S. SENANAYAKE ROAD, KANDY, SRI LANKA

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Abstract: This study examines how building facades and paving affect pedestrian walkability along D.S. Senanayake Road in Kandy, Sri Lanka, emphasizing how these two features work together to influence pedestrian experience and enhance the streetscape as a whole. The research systematically aimed the types and patterns of paving, as well as the structural and visual attributes of building facades across various street segments, using a mixed-method approach that integrated survey-based evaluations with physical assessments. Because characteristics like surface evenness, slip resistance, and comfort have a direct impact on safety, ease of movement, and pedestrians' willingness to use the area. the results showed that paving has the most direct and immediate influence on pedestrian walkability. In contrast, well-maintained paving improved comfort and accessibility, resulting in a safer and more welcoming pedestrian environment. Uneven, poorly maintained, or slippery paving surfaces were found to discourage walking and reduce the street's functional appeal. The street's perceptual and aesthetic qualities are shaped in part by building facades, which also contribute to a sense of enclosure, rhythm, and visual interest that affects how pedestrians view and interact with the urban environment. The social and cultural value of walkability was reinforced by coherent, visually appealing, and contextually appropriate facades that not only made the street more aesthetically pleasing but also promoted longer pedestrian stays and higher levels of satisfaction. Therefore, the study shows that combining high-quality paving with well-planned and maintained facades can significantly improve pedestrian walkability, promoting both practical mobility and visual appeal. These results highlight how crucial it is to implement integrated streetscape strategies in Kandy's urban core, where enhancing façade coherence and paving quality could create safer, more welcoming, and livelier pedestrian-oriented public areas that cater to both perceptual and physical needs.

Keywords: *Pedestrian walkability; Paving; Building facades; Urban streetscape; Kandy; Sri Lanka*

1. Introduction

Urban walkability has increasingly emerged as a central theme in sustainable urban design and planning, as it directly contributes to the livability, accessibility, and social vibrancy of cities while promoting environmentally friendly modes of transport. Due to the city's historic character, high population density, and constrained street capacity, which limits vehicular dominance, pedestrian movement dominates in compact cities like Kandy, Sri Lanka. For this reason, it is crucial to design and maintain pedestrian environments. In a broad sense, walkability is the extent to which the built environment promotes and facilitates walking by providing accessible, safe, and comfortable conditions. Physical features like building facades and paving surfaces are crucial in forming the pedestrian realm. Building facades provide a sense of rhythm, scale, enclosure, and visual engagement that heavily influences how pedestrians perceive and experience the street environment, while pavement influences surface evenness, durability, slip resistance, and continuity of walking paths to determine the quality of mobility. The city's increasing pedestrian demand, poor maintenance practices, and pressures from mixed land uses along the road have all contributed to the noticeable deterioration of the paving and facades on D.S. Senanayake Road, one of Kandy's busiest and most historically significant streets. These factors taken together negatively impact the quality of the walking environment. While irregular paving patterns frequently break the continuity of walking routes, uneven and damaged pavements impair mobility, raise safety risks, and discourage smooth pedestrian flow.

However, instead of offering a unified and interesting urban edge, the building facades along this road frequently seem visually disjointed, badly maintained, or overflowing with signage, which reduces aesthetic appeal and undermines the sense of enclosure and orientation necessary for comfortable pedestrian navigation. By causing visual monotony or confusion, the lack of façade rhythm and harmony detracts from the walking experience and makes the area seem less welcoming and pedestrian-friendly. Together, these difficulties show that understanding the obstacles and possibilities for enhancing Kandy's walkability depends heavily on the streetscape's perceptual features as well as its physical surface conditions.

Therefore, this study focuses on how building facades and paving conditions affect walkability on D.S. Senanayake Road, highlighting the importance of surface quality, accessibility, and façade rhythm as not only functional factors but also important factors that affect pedestrian comfort, safety, and satisfaction. The majority of walkability studies to date have been carried out in global or large metropolitan contexts, leaving mid-sized historic cities like Kandy under-researched despite their particular urban challenges. This focus also fills a significant research gap in the Sri Lankan context. The research emphasizes the pressing need to incorporate context-specific approaches into walkability assessments and urban

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DOI: https://doi.org/10.31705/FARU.2025.54

design strategies by placing the study within Kandy's historic urban character and dense built fabric. By encouraging more inclusive and pleasurable pedestrian experiences, it shows that raising paving standards and reviving building facades along major streets is not just a matter of updating the physical infrastructure but also an intervention that improves social interaction, cultural continuity, and urban sustainability. As a result, walkability along D.S. Senanayake Road serves as a concrete and symbolic example of how mid-sized cities in Sri Lanka can apply global sustainability principles to their own circumstances, guaranteeing that walking will continue to be a convenient, safe, and attractive form of transportation despite increasing urbanization and mobility demands.

2. Literature Review

One of the most important aspects of pedestrian walkability is pavement quality, which has a direct impact on accessibility, comfort, and the general experience of moving through cities. Safe and even pavements provide a fundamental basis for sustainable walking practices, according to scholars like Southworth (2005), who emphasize that the smoothness, slip resistance, and durability of paving surfaces not only reduce potential hazards but also encourage longer and more confident pedestrian journeys. Gehl (2010) goes on to say that paving patterns and materials are essential components that support both the practical movement of pedestrians and the visual coherence of the streetscape, rather than merely being functional elements.

Poor paving creates trip hazards that affect safety, especially for vulnerable populations like the elderly, children, and people with disabilities. Poor paving is uneven, cracked, or irregular. Walking is discouraged as a preferred mode of mobility as a result of these shortcomings, which also limit accessibility, decrease comfort, and disrupt pedestrian traffic. Contrarily, regular, well-aligned, and carefully planned paving offers a feeling of rhythm, continuity, and ease that not only promotes safe and effective walking but also improves the urban environment's sensory appeal. Walking is elevated from a merely functional necessity to a pleasant and interesting activity by such attention to paving quality, highlighting its significance for both mobility and place-making.

In addition to paving, building facades are equally important in determining the pedestrian experience because they serve as the street's "walls" and delineate the mental and physical space that pedestrians walk in. While boring, blank, or badly maintained facades create feelings of exposure, neglect, or even insecurity, which discourage pedestrian activity, human-scaled facades, which are designed with articulation, proportion, and detail, create a sense of enclosure and safety that makes walking routes more attractive and inviting (Jacobs 1993). Shopfronts, windows, and open entrances are examples of visually active and transparent frontages that enable passive surveillance and encourage interaction between the public and private spheres, both of which contribute to the street's lively and engaged atmosphere.

To elaborate, Ewing and Handy (2009) point out that using different façade elements (such as different colours, textures, materials, or building heights) improves the pedestrian experience by reducing monotony, facilitating orientation, and making urban space easier to read. These variances give streets personality and individuality, which makes walking routes more interesting and memorable and entices people to stop, look, and engage. Facades lacking in transparency, articulation, or variation, on the other hand, decrease visual engagement, hinder wayfinding, and detract from the pedestrian appeal of urban areas. In this way, building facades play a role that goes beyond architecture to actively influence the social and psychological aspects of streets, influencing how people feel about comfort, safety, and enjoyment.

Paving and facades work together to create a multi-layered approach to walkability. While paving offers a practical platform for safe and easy mobility, facades create the emotional and perceptual framework that makes streets interesting and readable. Understanding and enhancing these two interrelated aspects is essential for promoting inclusive mobility, improving urban sustainability, and guaranteeing that walking continues to be a useful and enjoyable form of transportation in small historic cities like Kandy where pedestrian activity is the predominant mode of transportation.

3. Methodology

The case study focuses on D.S. Senanayake Road, located in the core of Kandy. The road is a vital connector, bordered by commercial, educational, and institutional functions, with a high pedestrian flow throughout the day. Its historic setting, combined with modern development, has resulted in inconsistent urban form.

The site was divided into:

- Four paving segments (D1–D4)- representing different pavement materials, conditions, and patterns.
- Three facade observation points (A–C)- selected based on variations in building height, frontage design, and colour schemes.

This division enabled a comparative assessment of how distinct segments of the same road perform differently in terms of walkability. The case study approach was appropriate because it allowed for micro-scale analysis of spatial design factors

that affect every day pedestrian movement.

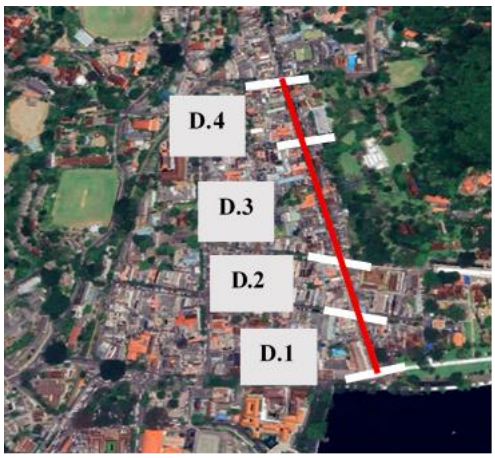

Figure 1-Segments of D.S. Senanayake Road for paving analysis

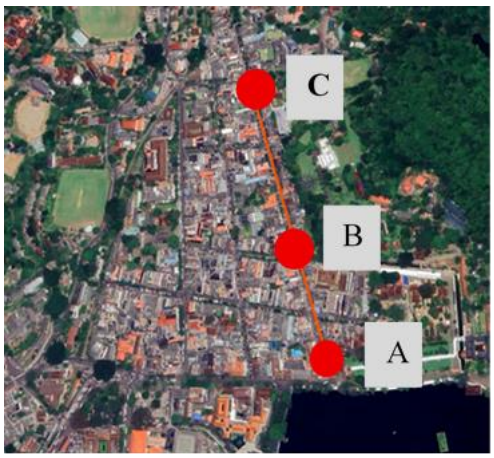

Figure 2-Points of facade analysis

A mixed-methods design was adopted to examine pedestrian walkability, integrating quantitative evaluation and qualitative observation.

- Physical Assessment of Paving: Each street segment was rated using a five-point Likert scale across indicators such as surface evenness, slip resistance, accessibility, comfort, and durability. This numerical analysis provided a comparative measure of how paving conditions affected walkability.
- Visual Analysis of Building Facades: Facade points were studied in terms of height, colour, and rhythm of frontage. A Likert scale was used to assess how these physical features shaped pedestrian orientation and street enclosure.
- Observation of Pedestrian Flow: Pedestrian volumes were recorded in each segment to understand how paving and facade conditions correlated with actual walking patterns.

4. Analysis and findings

4.1. Analysis of paving

Table 1-Category of the Different Paving in the Street

Image	size	
	200x100 mm	D1
	200x100 mm	D2.1
	500x500 mm	D2.2

Image	size	
	Tactile block- 300x300 mm Regular block- 200x100 mm	D3
	200x100 mm	D4

D.S. Senanayake Road, paving was divided into five segments (D1–D4), and each was evaluated for surface evenness, slip resistance, accessibility, comfort, and durability. The results show that paving type and pattern directly affect pedestrian walkability. Segment D1, with long-sized concrete blocks and a consistent running bond pattern, scored the highest (average walkability = **4.8**), indicating smooth surfaces and good comfort for walking. Segment D3, which included tactile paving blocks, also performed well (4.3), enhancing accessibility for visually impaired users. In contrast, D2.1 (wave-shaped

interlocking concrete paving) recorded the lowest performance (3.7), due to unevenness and less comfort, reducing overall pedestrian flow.

Table 2-Five-point Likert scale

Likert numeration	1	2	3	4	5
Assessment	Low	Moderate to Low	Moderate	Moderate to High	High

Table 3-Average of paving impact to the walkability

	Paving type avarage	Paving pattern avarage	avarage	Walkability
D1	4.6	5	4.8	4.8
D2.1	3.4	4	3.7	
D2.2	4.2	4.6	4.4	4.05
D3	4.4	4.2	4.3	4.3
D4	4	4.8	4.4	4.4

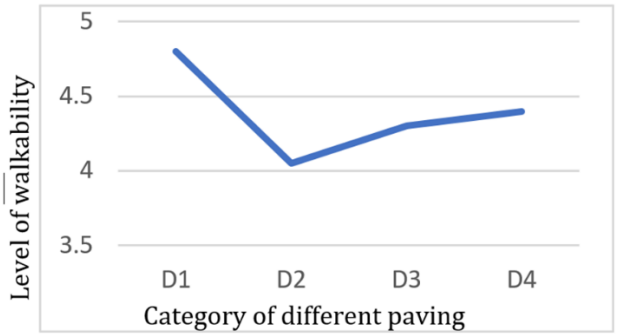

Figure 3-Analysis of street section impact to walkability

Based on the analysis of paving quality along D.S. Senanayake Road, it is clear that section D1 demonstrates the highest level of walkability, scoring 4.8/ 5. This section benefits from smooth, even paving surfaces and a consistent running bond pattern, which together enhance comfort, accessibility, and safety for pedestrians. The combination of durability and slip resistance means that users can walk with confidence and ease, making this part of the road the most pedestrian-friendly. In comparison, sections D3 and D4 also perform fairly well, with walkability scores of 4.3 and 4.4 respectively, though they show slightly less consistency in paving type and pattern. By contrast, section D2.1 records the lowest performance, with a score of 3.7, mainly due to uneven paving and reduced comfort levels, which limit accessibility and reduce the quality of the pedestrian experience.

Overall, the road demonstrates a moderate to high level of walkability, averaging around 4.1 out of 5 across all sections. This suggests that D.S. Senanayake Road is generally supportive of pedestrian movement and safety. However, the walkability is not uniform throughout, as some stretches (D1) offer excellent walking conditions, while others (D2.1) present challenges that hinder pedestrian comfort and flow. Therefore, while the road can be considered walkable, improvements in weaker segments are necessary to ensure a consistently positive walking experience across the entire stretch.

4.2. ANALYSIS OF BUILDING FACADES

The analysis of building facades along D.S. Senanayake Road reveals that their height, color, and frontage characteristics strongly influence pedestrian walkability and satisfaction. At Point A, the presence of medium-height buildings with bright-colored facades created a visually engaging streetscape that supported both functional walkability and psychological comfort. This section attracted the highest pedestrian volumes, indicating that people are drawn to vibrant and accessible facades. In contrast, Point B featured mixed building heights with tone-down colors, which provided functional walkability but lowered satisfaction due to monotony and less engaging street edges. Point C, dominated by smaller and subdued

facades, offered moderate walkability but very low satisfaction as the dull and inactive street character discouraged pedestrian us.

Point A has moderate-height buildings with bright facades. Walkability benefits from clear visibility and active frontage.

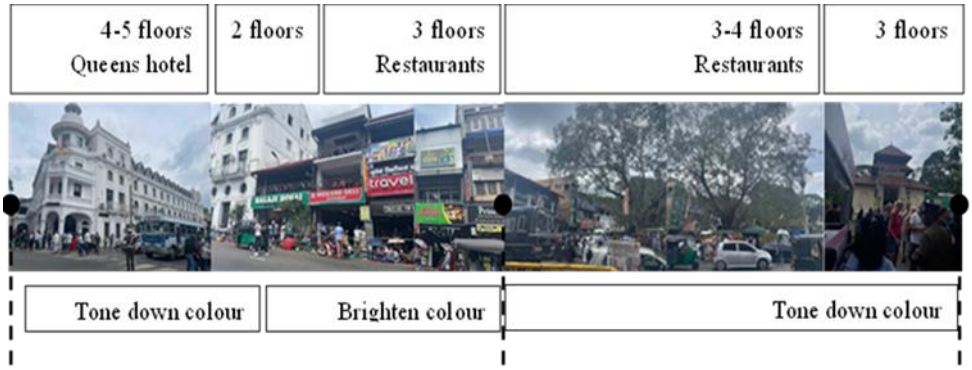

Figure 4 - Point A (Building façade analysis of D.S.Senanayake road)

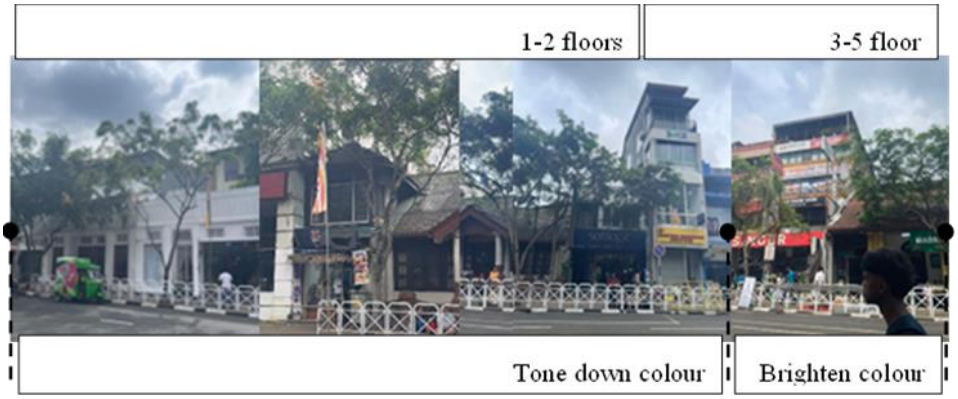

Figure 5 - Point B (Building façade analysis of D.S.Senanayake road)

Point C features smaller, tone-down coloured facades. Walkability is not hindered but satisfaction drops compared to Point A.

Figure 6 - Point C (Building façade analysis of D.S.Sennayake road)

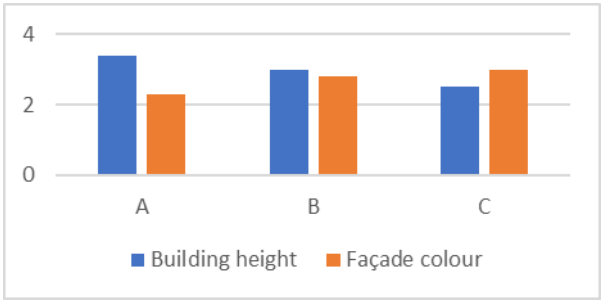

Figure 7 -Comparison of the Building height & colour

Three distinct street segments, designated A, B, and C, are compared in the chart to see how building height and façade colour affect pedestrian walkability. Building height in segment A is more significant than façade color, indicating that vertical scale influences pedestrian perception more strongly than visual treatment. Building height and façade colour are equal in segment B, suggesting a balanced influence where walkability is enhanced by both aesthetic quality and physical proportion. The colour of the façade in segment C receives a higher score than building height, indicating that pedestrian perception and interaction with the street are more significantly influenced by the façade's visual vibrancy and attractiveness. Overall, the analysis shows that while building height consistently contributes to walkability, façade color becomes more significant, especially when its design elements are well-integrated, resulting in a more comfortable and engaging pedestrian environment.

Table 4 - Five-point Likert scale for Building Height

Likert numeration	1	2	3	4	5
Assessment	Small height (3< floors)		Moderate height (3 floors)	Extreme height (>3 floors)	

Table 5 -Five-point Likert scale for Building colours

Likert numeration	1	2	3	4	5
Assessment	Tone down colour		Brighten Colour		

Provides rating system for Building facades. Higher scores correlate with improved walkability emphasizing the role facades in pedestrian flow.

Table 6- Average of building colours & height for walkability

	Building Height	Façade colour	Average
A	3.4	2.3	2.85
B	3	2.8	2.9
C	2.5	3	2.75

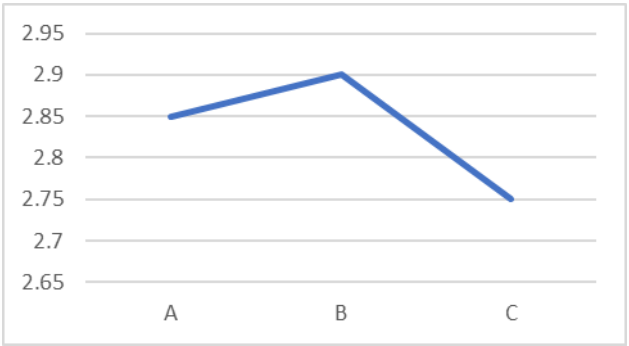

Figure 8- - Analysis the Impact of walkability

The three segments, A, B, and C, of the line graph show how building facades affect pedestrian walkability. The walkability value in segment A is approximately 2.85, suggesting that facades have a moderate effect on the pedestrian experience. As we move to segment B, the value increases marginally to 2.9, indicating that improvements in façade features—like color, coherence, or upkeep—help to improve walkability. The value, however, falls to roughly 2.75 in segment C, indicating a reduction in the façade's ability to promote pedestrian comfort and engagement. This variation shows that while well-designed facades can have a positive impact on walkability, inconsistent or subpar design elements can lessen their impact and create less comfortable and appealing pedestrian environments**.** Overall, the trend shows that building facades have a

significant impact on walkability, although how much of an impact they have depends on the quality of the design, the integration of the visual elements, and the upkeep of the various street segments.

5. Results and Discussion

The results of this study provide a comprehensive understanding of how paving conditions and building facades collectively influence pedestrian walkability along D.S. Senanayake Road in Kandy. By assessing paving segments (D1–D4) and façade points (A–C), the findings highlight the distinct yet interconnected roles these two urban design features play in shaping pedestrian comfort, safety and mobility. This section presents the results of the physical and perceptual assessments, compares paving and façade influences, and discusses their broader implications for pedestrian walkability in the context of mid-sized Sri Lankan cities

5.1 PAVING RESULTS

Four sections of D.S. Senanayake Road were used for the paving quality assessment. Each section was given a rating on a five-point Likert scale based on surface evenness, durability, accessibility, comfort, and slip resistance. The findings showed distinct differences in the segments' walkability for pedestrians. The highest walkability score of 4.8 was obtained by Segment D1, which used long-sized concrete blocks in a regular running bond pattern. The even, smooth surfaces in this area gave pedestrians comfort and ease of use. This section is the most pedestrian-friendly along the stretch because of the paving material's durability and slip resistance, which increased walking confidence, especially in wet weather.

With tactile paving blocks, Segment D3 received a score of 4.3, which was marginally lower than D1 but noteworthy for its inclusivity. The equity aspect of walkability was raised by the tactile paving, which greatly increased accessibility for pedestrians with visual impairments. This segment illustrated the significance of inclusive design interventions, despite not being as seamless as D1. Although Segment D4's paving type and pattern were less consistent, it still performed fairly well. Segment D2.1, on the other hand, performed the worst, scoring 3.7. Mobility was hampered by the unevenness and discomfort caused by the wave-shaped interlocking concrete paving. Additionally, this unevenness limited accessibility for vulnerable groups, like the elderly or those utilizing mobility aids, and interfered with pedestrian traffic flow. This section's discomfort made walking less appealing and made it more likely that people would veer onto nearby car lanes, endangering safety**.**

Overall, D.S. Senanayake Road's paving received an average walkability score of 4.1, indicating a generally encouraging walking environment with some noticeable irregularities. The results unequivocally show that paving quality has a direct and immediate impact on pedestrian walkability because well-maintained, consistent surfaces encourage mobility, accessibility, and walking confidence, while poor paving not only increases hazards but also deters people from using walking routes. These findings support Gehl's (2010) claim that paving promotes both functional movement and aesthetic continuity, as well as Southworth's (2005) contention that durability, smoothness, and slip resistance are essential for lowering risks and promoting longer pedestrian trips.

5.2 FACADE RESULTS

Three observation points (A, B, and C) were used to evaluate building facades in order to gain insight into how structural and visual characteristics affect pedestrian satisfaction and perception. The streetscape at Point A was lively and captivating due to the medium-height buildings with colourful facades. Pedestrians were encouraged to stay and engage with the surroundings by the buildings' active frontage, visibility, and rhythmic alignment. The highest pedestrian volumes were recorded in this section, demonstrating the close connection between pedestrian attraction and façade quality. Both aesthetic appeal and psychological comfort were strengthened by the combination of human-scaled proportions and visual vibrancy.

Point B, on the other hand, featured muted colours and a variety of building heights. Although it was still functionally walkable, this section lacked Point A's coherence and vibrancy. The monotony of the facades reduced visual engagement, resulting in lower satisfaction levels. Because it was functionally necessary, pedestrians kept using this area, but the overall experience was of lower quality.

Only moderate walkability but extremely low satisfaction were provided by Point C, which was dominated by smaller, more subdued facades with little transparency or active frontage. Reduced pedestrian volumes resulted from the frontage's lack of activity and muted character, which deterred pedestrian use. Although physical mobility was not significantly impeded, this section of the road was less appealing due to its lack of variation and visual rhythm.

Building height continuously improves walkability by creating a sense of enclosure, but façade colour and vibrancy are more important in raising engagement, according to the comparative study of façade quality. Because of its bright façades and clear proportions, Point A received higher satisfaction ratings, Point B received moderate ratings, and Point C performed the worst, as shown by the Likert-based scores. These results support Jacobs' (1993) claim that human-scaled facades offer

safety and enclosure, as well as Ewing and Handy's (2009) focus on the value of transparent, dynamic frontages and visual element variation to improve walking routes' legibility and appeal.

5.3 COMPARATIVE DISCUSSION

The findings highlight the different but complementary ways that building facades and paving affect pedestrian walkability. Paving determines the safety, comfort, and accessibility of walking surfaces, which has the most direct and immediate effect on mobility. As demonstrated in Segment D1, pedestrian volumes rose in areas with smooth and uniform paving, irrespective of façade quality. On the other hand, as seen in Segment D2.1, inadequate paving made it difficult to walk even in places with moderately interesting facades. This emphasizes how important paving is to pedestrian spaces' usability.

Conversely, facades affect how walking is perceived and experienced. Although they have a smaller impact on immediate mobility, they have a big impact on pedestrian satisfaction, orientation, and lingering willingness. While subdued facades at Point C discouraged walking despite acceptable paving, vibrant facades at Point A enhanced pedestrian attraction even in the presence of subpar paving. Facades therefore serve as stimulants for extended visits, social engagement, and cultural continuity.

Paving and facades work together to produce a multi-layered pedestrian experience. While facades influence the level of engagement, paving guarantees the functionality of movement. Paving improvements made without consideration for facades could create environments that are aesthetically boring but still functional. On the other hand, streets that are aesthetically pleasing but physically unsafe or uncomfortable may result from improving facades without improving paving. Therefore, to optimize walkability's perceptual and physical aspects, integrated approaches are needed.

6. Conclusion

According to the study, the most direct and immediate factor influencing pedestrian walkability along D.S. Senanayake Road in Kandy is the quality of the pavement. While uneven surfaces, like those in Segment D2.1, discouraged pedestrian movement and limited accessibility for vulnerable groups, smooth, long-lasting, and slip-resistant pavements, like those in Segment D1, offered the safest and most comfortable walking conditions. This demonstrates that by guaranteeing safety, mobility, and walking confidence, paving serves as the physical basis for walkability.

In addition, building facades have a significant influence on how walkability is perceived and perceived psychologically. Vibrantly coloured facades that were medium in height and had active frontages, like those at Point A, produced aesthetically pleasing spaces that enticed people to stay, socialize, and take pleasure in strolling. On the other hand, even in cases where the paving conditions were satisfactory, boring or uninteresting facades, like those at Point C, decreased satisfaction levels and diminished the street's appeal. As a result, facades serve as the street's "walls," affecting how pedestrians experience visual rhythm, comfort, and enclosure.

The comparison shows that while facades improve the streets' experiential quality, paving guarantees the streets' functional usability. While concentrating solely on facades without addressing paving runs the risk of creating aesthetically pleasing but physically uncomfortable environments, improving paving alone can make streets safer but visually boring. Therefore, to achieve both mobility and liveability in pedestrian spaces, an integrated approach that revitalizes facades and upgrades paving is necessary.

The findings have wider implications for sustainable urban design in mid-sized historic cities like Kandy. Streets can develop into lively, inclusive public areas that promote social interaction, cultural identity, and environmental sustainability by enhancing façade coherence and paving standards. In this context, walkability refers to the creation of areas where people want to spend time, not just the ability to move around. Future initiatives should focus on city-wide plans rather than just specific streets to make sure that walking is still a popular, safe, and essential part of urban life.

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