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LANDSCAPE ELEMENTS AS DETERMINANTS OF STREETSCAPE IDENTITY: A DESIGN FRAMEWORK FOR MALAYSIA'S HISTORIC ROYAL URBANISM

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Abstract

Street landscapes are pivotal in shaping the character of historic urban environments, particularly in royal towns where cultural heritage is embedded in the urban fabric. However, within the field of urban design, the role of landscape structures in shaping streetscape identity has received limited empirical attention, leading to a gradual decline in spatial and cultural distinctiveness in many heritage towns. This study aims to examine how landscape structures influence the visual-spatial and functional qualities of streets within the historic royal urban context of Kuala Kangsar, Perak, Malaysia. A mixed-methods approach involving field observations, historical analysis, 21 semi-structured interviews, and a survey of 330 respondents was employed to identify key landscape features and assess their role in reinforcing spatial identity. The analysis is guided by a conceptual framework that interprets landscape structures through four urban design attributes: attractiveness, visibility, human scale, and comfort. The findings demonstrate that landscape components enhance visual appeal, human scale, comfort, and social engagement, revealing a strong interdependence between physical aesthetics and street performance. The study proposes a landscape-oriented design framework tailored to heritage settings, contributing both theoretically to urban design discourse and practically to policy formulation for Malaysia's royal towns. It concludes by advocating a holistic, context-sensitive approach to preserving street character and cultural continuity in historic urban landscapes.

Keywords: cultural heritage, landscape, royal towns, street character, urban identity

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INTRODUCTION

Streets are more than circulation corridors. They are public realms where social, spatial, and symbolic elements come together (Gehl, 2010; Mehta, 2020). Street character in a heritage setting, such as Malaysia's Royal Towns, is not only characterised by its buildings, but also by its landscape features that add vitality to the visual-spatial space in-between and around buildings. The urban landscape, including trees, plantings, pavement, furniture, water features, and transitional spaces, is an important contributor to the experiential and aesthetic character of a street (Carmona et al., 2021). Within the discipline of urban design, streetscape identity is understood as the distinctive visual and spatial character of streets formed through the interaction between buildings, landscape structures, and street patterns.

However, the urban landscape has received limited attention in mainstream urban design discourse and practice in Malaysia, where architectural conservation has dominated, while its contribution to the reinforcement of cultural continuity, spatial memory, and place attachment has been overlooked (Shamsuddin et al., 2018; Khalid et al., 2023). Recent research has underscored the need to recognize streetscapes informed by culturally embedded landscape design as critical to ensuring the perpetuation and sustenance of the character and usability of heritage environments (Ma et al., 2023; Ismail et al., 2018). In historic royal towns, landscape structures such as ceremonial tree plantings, riverfront corridors, and shaded pedestrian routes often serve both symbolic and functional roles in reinforcing cultural identity and spatial hierarchy.

This research therefore focuses on the role of landscape structures within the field of urban design, specifically examining how these elements contribute to the formation of streetscape identity in historic royal urban environments. This study aims to examine how landscape structures influence the visual-spatial and functional qualities of streets within the historic royal urban context of Kuala Kangsar, Perak, Malaysia. To achieve this aim, the objective of this article is to identify key landscape components and evaluate their contribution to streetscape identity through four urban design attributes: attractiveness, visibility, human scale, and comfort. This evaluation focuses specifically on Kuala Kangsar, a municipal town functioning as a historic royal urban center.

OPERATIONAL DEFINITION

For the purpose of this study, several operational definitions are adopted. "Royal Town" refers to a historic urban settlement associated with royal institutions and ceremonial functions, where urban form, architecture, and landscape elements collectively express royal symbolism and cultural heritage. "Historic Royal Urbanism" refers to the spatial and morphological characteristics of towns shaped

by royal governance, ceremonial routes, and cultural institutions. “Streetscape identity” refers to the distinctive visual and spatial character of streets formed through the interaction between buildings, landscape structures, and street patterns within the public realm. ‘Urban Design Attributes’ are operationalized into four dimensions: (i) Attractiveness (aesthetic, natural, and cultural appeal), (ii) Visibility (spatial legibility and orientation clues), (iii) Human Scale (spatial proportion and enclosure relative to human dimensions), and (iv) Comfort (physical and microclimatic environmental protection)

PROBLEM STATEMENT

Urban design challenges in Malaysia's Royal Towns, such as Kuala Kangsar, have increasingly raised concerns regarding the gradual loss of streetscape identity due to modernization pressures and insufficient recognition of landscape elements in urban design practice. Although various studies have focused on architectural conservation in Malaysia's Royal Towns, the visual-spatial importance of streetscape elements such as tree canopies, boundary hedges, riverfront spaces, and culturally significant paving materials has received comparatively limited attention in urban design studies (Ismail & Adam, 2020; Abd Karim & Abdul Rahman, 2021).

The lack of integrated urban design strategies that incorporate landscape structures has contributed to a gradual erosion of spatial identity within Malaysia's historic royal towns. As landscape elements are altered or replaced without consideration of cultural and spatial significance, the visual coherence and symbolic character of royal streetscapes become increasingly fragmented (Ismail et al., 2018; Ma et al., 2023). Consequently, landscape structures are often treated as supplementary aesthetic elements rather than as fundamental determinants of urban morphology and streetscape identity within historic urban environments. This gap highlights the need for research that systematically examines the role of landscape structures in shaping the visual-spatial identity and experiential quality of streets within royal towns functioning as urban centers.

VISUAL-SPATIAL FOCUS AND CASE STUDY CONTEXT

This research has a specific focus on the visual-spatial qualities associated with landscape elements used to create street character in historic royal towns of Malaysia. The study emphasises landscape structures as key visual-spatial components that influence spatial legibility, orientation, and experiential quality within streetscapes. By focusing on physical attributes such as vegetation structure, pavement materials, street furniture, and open space boundaries, the study identifies specific landscape components that contribute to legibility, coherence, and cultural identity in the public realm.

Kuala Kangsar, Perak, was selected as the case study because it is officially recognised as the Royal Town of Perak and functions as an important ceremonial and cultural centre of the Perak Sultanate. Although modest in scale, Kuala Kangsar functions as a historic royal urban centre where landscape, architecture, and ceremonial routes collectively shape the character of the town. Three streets were selected for detailed analysis. Istana Street represents the royal and ceremonial corridor connecting the royal palace and mosque in Zone A, while Laksamana Street and Shahbandar Street represent commercial and communal streets located in Zone B near the Perak River edge. This variation in street function provides an opportunity to examine how landscape structures operate differently across ceremonial, commercial, and communal street environments within the same royal urban context.

RESEARCH METHODOLOGY

This study adopts a mixed-methods research design combining qualitative and quantitative approaches to examine the role of landscape structures in shaping streetscape identity within the historic royal town of Kuala Kangsar. The research design integrates visual-spatial observation, historical document analysis, semi-structured stakeholder interviews, and a questionnaire survey involving 330 street users. Visual-spatial observation was conducted to document key landscape structures and street attributes including vegetation, water elements, pavement materials, street furniture, and spatial configurations. The 21 semi-structured interviews targeted key urban development experts, planners, designers, and local heritage stakeholders. Qualitative interview data was structured through thematic coding, assigning specific indicators to individual respondents (coded sequentially from R-1 to R-21) to capture expert perspectives on cultural, planning, and historical significance. Quantitative reporting utilizes empirical descriptive frequencies from the field survey (n=330) to establish public consensus across four urban design domains. The analysis is guided by a conceptual framework (Figure 1) which proposes that landscape structures influence urban morphology and streetscape identity through four primary urban design attributes: attractiveness, visibility, human scale, and comfort. By triangulating spatial observation, stakeholder perspectives, and user perception surveys, the study integrates physical analysis with experiential understanding.

LITERATURE REVIEW

The presence and arrangement of landscape elements, such as tree canopies, paving, street furniture, and softscapes, are critical to the visual character and spatial organization of historic streetscapes. Within the field of urban design, streetscape identity is understood as the result of interactions between buildings, landscape structures, and street patterns that collectively shape the visual-spatial

character of urban environments (Carmona et al., 2021; Punter, 2011). From the heritage urbanism perspective, these elements not only contribute to environmental aesthetics but also embody cultural meaning, historical continuity, and spatial memory (Ismail et al., 2018). Contemporary urban design literature further emphasises the importance of landscape elements in shaping human scale, walkability, environmental comfort, and visual enclosure, which are essential considerations in culturally sensitive environments such as Malaysia's Royal Towns (Punter, 2021; Mohd Nor et al., 2020).

Urban morphology studies highlight that the character of historic streets emerges from the spatial configuration of street networks and the relationship between buildings, landscape structures, and public spaces (Mohd Nor et al., 2020). However, despite growing recognition of the significance of heritage landscapes, conservation approaches in Southeast Asia have often prioritised architectural preservation while giving comparatively limited attention to landscape character, resulting in visual fragmentation and gradual identity loss (Ismail & Adam, 2020). Recent studies advocate a more landscape-responsive approach that integrates vernacular design principles and ecological knowledge into the management of historic urban environments (Ma et al., 2023; Khalid et al., 2023). In the context of Malaysian Royal Towns, landscape elements such as ceremonial tree planting, indigenous vegetation, riverfront spaces, and shaded pedestrian corridors play both symbolic and functional roles in reinforcing royal identity and cultural continuity. Nevertheless, empirical research examining how these landscape structures shape the visual-spatial identity of historic streets remains limited. This study therefore contributes to the literature by examining landscape structures as key determinants of streetscape identity within the historic royal town of Kuala Kangsar.

INTEGRATED SOFT AND HARD LANDSCAPE VARIABLES IN SHAPING HERITAGE STREETSCAPE CHARACTER AND FUNCTIONALITY

Soft landscape variables such as topography, vegetation type, planting arrangements, scale, and spatial placement are of critical importance in creating the attractiveness, visibility, and human scale of the heritage streetscapes. Natural landscape elements such as hills and rivers can influence the alignment of streets and symbolic order, while vegetation can enhance the spatial experience through color, texture, and leaf canopies, which provide shelter from the sun, enclosure, and cultural significance (Ismail et al., 2018; Khalid et al., 2023; Ismail & Adam, 2020). Planting arrangements can influence formal and informal patterns of streetscapes, which can directly influence the streetscape characteristics such as visibility, attractiveness, and spatiality. The soft landscape variables can be

revealed not only as landscape modifiers but also as spatial ordering devices that can articulate hierarchy, rhythm, and symbolic significance of the royal streets.

Other variables, which are part of the hard landscape, including lighting, pavement, signage, gateways, routes for pedestrians, and street furniture, all play a part in the functionality of the street and the expression of the street's culture. Lighting improves the street's safety, pavement improves the street's texture, aesthetics, and comfort; while signage helps improve the street's recognition (Carmona et al., 2021; Celik & Yildirim, 2025; Mohd Nor et al., 2020). All these variables create a holistic approach to the design of the street, which is not only functional but also culturally significant to the royal heritage of Malaysia. The landscape has been identified as the significant physical feature associated with the concept of visual appearance, with various components of the landscape affecting the physical characteristics of streets, as conceptually presented in Figure 1. Hard landscapes play a mediating role as an interface between movement, perception, and cultural expression, with the tangible expression of heritage values being converted to spatial experience. The integration of hard and soft landscapes has been critical in creating streetscapes with both functional resilience and identity richness.

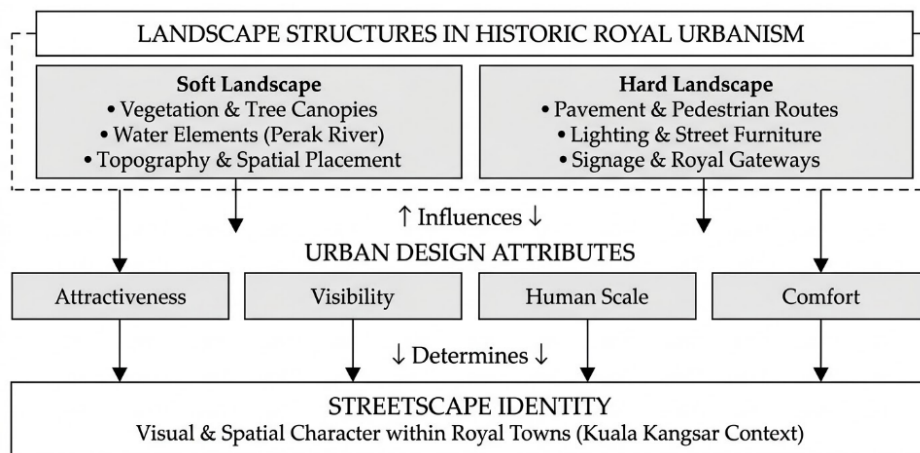


Figure 1: Conceptual model linking landscape components to the physical character of royal town streets

Source: Author's own work

ANALYSIS AND DISCUSSION

The study reveals that the visual layout of landscape structures in the royal town of Kuala Kangsar comprises important physical attributes which play an essential role in the formation of streetscape identity. Comprehensive data triangulation

demonstrates a clear alignment between physical mapping, historical legacy, expert stakeholder statements, and user survey frequencies.

a. Attractiveness Attributes

Quantitative survey data indicates a unanimous public consensus (100%, n=330) that the local landscape configuration is highly attractive, a finding reinforced by all 21 qualitative interviewees. Attractiveness attributes are structurally divided into soft landscape and hard landscape factors.

Soft Landscape: Water Element, Topography, and Vegetation

Water Elements: The empirical analysis verifies that natural water systems strongly underpin local aesthetic value, backed by 95.5% (n=315) of survey respondents and all 21 interviewees. Expert stakeholder R-10 emphasised that the natural aesthetics of the town are anchored by the Perak River, creating highly attractive panoramic views across multiple viewing corridors (Figure 2). Historical document analysis confirms the river's deep cultural symbolism, acting as the primary transit corridor and traditional royal stage for historic Coronations and Councils of Rulers since the 1870s (McNair, 1878). Physical mapping shows that streets parallel to the water edges maximize user experience, with pedestrian corridors along the river banks creating highly memorable node areas.



Figure 2: Street pattern network framed by Perak River creating scenic views and vibrant riverfront nodes in Zone A and Zone B

Source: Author's own work

Topographic Variation: Acts as another significant element, supported by 73.6% (n=243) of survey respondents as a key driver of visual interest. Stakeholder R-10 observed that layout development following the natural hilly contours produces beautiful vistas when moving from the palace hilltop down to the river plain (Figure 3). Physical observations confirm that topography directly influences development density patterns; the undulating terrain of Zone B

maintains low-density royal civic compounds, while the flat terrain of Zone A accommodates high-density mixed commercial clusters. This spatial pattern projects a strong visual hierarchy that represents royal sovereignty.

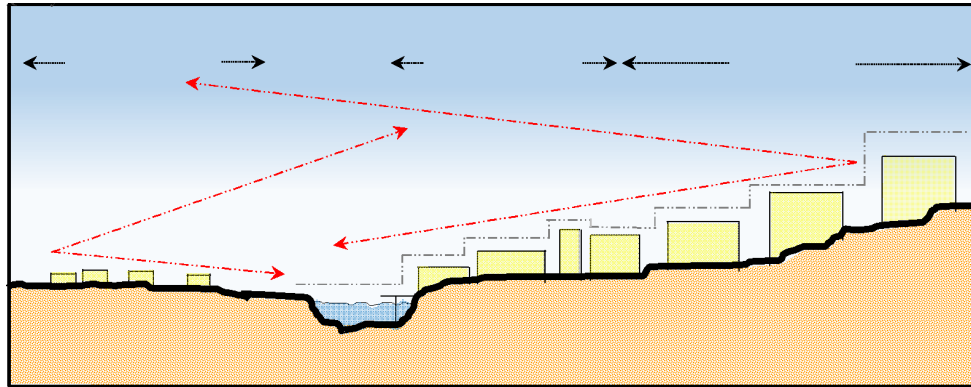


Figure 3: Topographic variation influencing development density patterns and scenic street views across Zones A and B

Source: Author's own work

Planting Patterns: Contribute substantially to local distinctiveness, endorsed by 66.6% (n=220) of survey respondents. Specific design guidelines require highly formal and structured layouts along the Zone B ceremonial axis (Istana Street), using official royal flora featuring distinct gold-yellow tones (e.g., Royal Palm, and Yellow Canna) to reinforce civic identity (Figure 4). Conversely, Zone A utilises informal planting layouts using domestic potted plants near old shophouses to add greenery within tight commercial spaces.



Figure 4: Landscape diversity in type and colour enhancing place identity and street character in Zone B.

Source: Author's own work

Hard Landscape: Lighting and Pavement Design

Decorative Lighting: Statistical survey analysis shows that 64.5% (n=213) of users explicitly associate decorative lighting with streetscape attractiveness, supported by 16 qualitative interviewees. Zone B utilises formal ceremonial lighting layouts to mark the protocol route. In Zone A, practical design rules control lighting configurations along the Perak riverfront by placing light fixtures at a fixed height of 2.8 meters at 4-to-5-meter intervals, successfully drawing night pedestrian crowds and establishing an active public node.

Pavement Design: Acts as an essential hardscape modifier, validated by 14 interviewees. Field observations indicate that Zone B pedestrian paths utilise red permeable pavement surfaces that control storm runoff while enhancing aesthetic continuity. Conversely, Zone A relies on interlocking precast elements, which frequently show poor installation quality, water ponding, and maintenance cracks, reducing pedestrian safety.



Figure 5: Permeable pavement along pedestrian paths in Zone B enhances pedestrian comfort, surface drainage, and streetscape attractiveness.

Source: Author's own work

b. Visibility Attributes

Visibility within the historic public realm relies on softscape legibility and hardscape wayfinding markers.

Soft Landscape: Water Element and Vegetation Layout

The Perak River Landmark: User surveys show that 88.78% (n=293) of respondents link the Perak River to high streetscape visibility, supported by all 21 interviewees. Expert stakeholder R-11 verified that the broad river system functions as a permanent reference landmark that aids spatial orientation (Figure 6). Historical archival records from the 1870s confirm the river's long-standing role as the foundational landmark of the town.

Vegetation Layout: Regarding landscape layouts, 79.1% (n=261) of users link planting layouts to visibility. Formal planting lines along Istana Street (Zone B) signal entry into royal civic zones, while loose configurations in Zone A mark mixed-use commercial spaces.

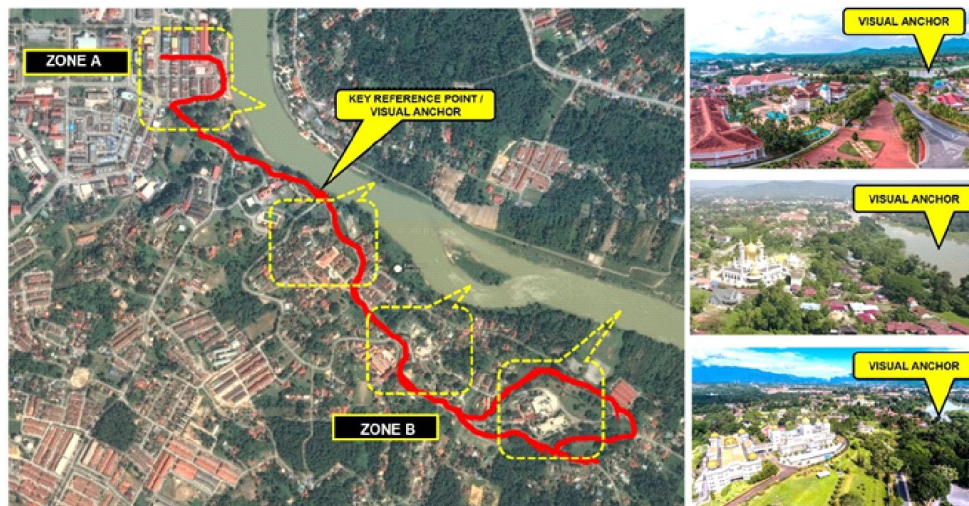


Figure 6: The presence of the Perak River serves as a key reference point in the Royal Town of Kuala Kangsar, enhancing visibility quality across both Zone A and Zone B.

Source: Author's own work

Hard Landscape: Gateways and Signage Units

Decorative Gateways: Gateways significantly improve wayfinding legibility, as stated by 68.2% (n=225) of survey respondents and 18 interviewees. Field observations mapped 22 decorative gateways across the town (Figure 7). The primary gateway at the base of Bukit Chandan uses durable stone and timber, standing 4.5 meters high with bold state colours and royal crests to signal entry into the royal core. Wrought iron arches in Zone B stand 6.5 meters high but lack strong colours, making them less visible. In Zone A, white precast concrete gateways standing 3 to 4 meters high mark key intersections.

Street Signage: Serves as a key wayfinding element, supported by 45.5% (n=150) of respondents. Expert R-11 noted that while signage is useful, the presence of more than five competing, non-uniform sign shapes along Istana Street (Zone B) creates visual confusion. Uniform signage in Zone A utilises consistent sizing, royal emblems, and distinct colours, improving legibility.

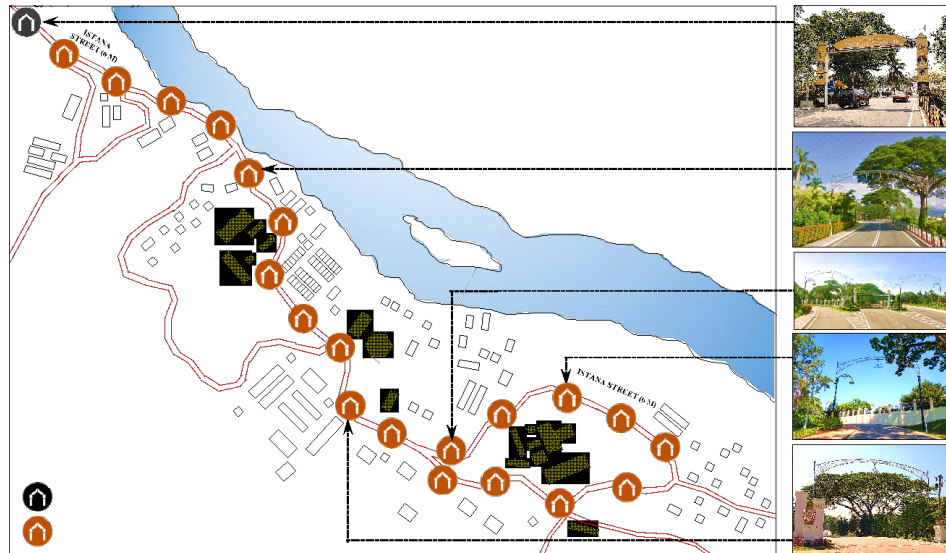


Figure 7: Royal-themed gateway design, which includes material, height, colour, quantity and location, enhances visibility and supports street recognition along Zone B.
 Source: Author's own work

c. Human Scale Attributes

Field observations and survey responses from 86.9% (n=287) of users show that spatial enclosure and human scale depend heavily on tree size and configuration. The empirical analysis reveals a clear descriptive alignment between plant sizing parameters and human scale perception:

Vegetation Sizing Parameters: Spatial mapping shows that medium-height vegetation controlled between 1.5 to 3.0 meters effectively bounds the pedestrian path without obstructing historic sightlines. In contrast, large canopy trees (such as *Samanea saman* reaching 7-10 meters in height with a 6-9 meter radius) shift the spatial profile away from an intimate human scale, though they provide exceptional shade.

Linear Planting Patterns: Linear planting analysis is strongly associated with user preferences for enclosure. In Zone B, formal rows of *Araucaria columnaris* and royal palms standing 5 to 7 meters high form distinct vertical street walls (Figure 8). This configuration generates processional corridors that connect the riverfront to royal landmarks, enhancing the entry experience.



Figure 8: Tree-lined planting creates a sense of enclosure with defined street edges, forming an entry point and a welcoming atmosphere in Zone B.

Source: Author's own work

d. Comfort Attributes

Environmental comfort is comprehensively evaluated across softscape elements and four specific hardscape infrastructure categories.

Soft Landscape Comfort: Microclimatic Elements

Evaporative Cooling: Sidewalk comfort is tied directly to natural water features by 86.1% (n=284) of respondents and 18 interviewees. Respondent R-13 observed that the Perak River and the historic clock tower fountain provide evaporative cooling, which reduces ambient heat and creates a comfortable pedestrian environment.

Hard Landscape Comfort: Infrastructure Controls

Pedestrian Pathways: Traditional five-foot walkways along the shophouses (Zone A) are highly valued for pedestrian comfort, endorsed by 95.5% (n=315) of survey respondents and all 21 interviewees. Specific design rules dictate sheltered commercial arcades with clear human-scaled overhead heights of 2.5 to 3.0 meters, shielding users from heavy rain and direct sun while encouraging active shopfront interactions (Figure 9). Conversely, standalone paths in some parts of Zone B narrow down to a minimum width of 600 mm and are frequently blocked by utilities and parked vehicles.



Figure 9: Human-scale, sheltered, and continuous five-foot walkways contribute to a comfortable pedestrian environment in Zone A.

Source: Author's own work

Pedestrian Amenities: Rest shelters provide clear comfort benefits, supported by 47.6% (n=157) of respondents. Design guidelines require an extended roof overhang of 900 to 1000 mm and a functional height of 2300 to 2500 mm to protect users from the elements (Figure 10). Public toilets (61.81%, n=204 survey dissatisfaction) require flat, zero-step entries to ensure universal access, avoiding the steep stairs found near the commercial bazaar. Seating (26.4%, n=87 support) is often placed directly in the sun near parking bays, forcing pedestrians to sit on shaded planter walls instead. Trash bins (20.9%, n=69 support) suffer from low-quality materials and poor maintenance, leading to vandalism and odour issues.



Figure 10: Comfortable atmosphere created by rest shelters along streets in Zones A and B enhancing a lively pedestrian environment.

Source: Author's own work

Traffic Amenities: Pedestrian crossings are prioritized by 23.6% (n=78) of users. In Zone B, narrow streets measuring 6 to 7 meters wide slow traffic down naturally, allowing safe crossings without painted lines. However, wider streets in Zone A require dedicated crossings due to faster vehicle speeds. Universal access ramps (16.1%, n=53 support) must maintain a maximum slope of 1:12 and a minimum width of 1500 mm to comply with universal design standards.

Utility Amenities: Open concrete drainage slabs and poorly placed electrical feeder pillars create major trip hazards in Zone B. In contrast, Zone A integrates utility pillars directly into the structural softscape beds behind the kerb line. This

shows that infrastructure elements can be integrated seamlessly into the cultural landscape through careful design coordination, preventing visual clutter while ensuring safe and continuous walkways.

LANDSCAPE STRUCTURES FRAMEWORK FOR HISTORIC ROYAL URBANISM

To fulfil the research objective of evaluating landscape components through specific urban design attributes, this framework provides direct design controls tailored to historic royal urban settings. Rather than treating landscapes as cosmetic additions, these empirical parameters translate the findings into actionable municipal planning policies to protect streetscape identity (refer to Table 1):

Table 1: Framework of Empirical Metric and Design Controls for Urban Design Attribute

Urban Design Attribute	Component Type	Empirical Performance Metric & Design Controls
a. Attractiveness	Soft Landscape	Preservation of natural river corridors and undulating topography; use of royal yellow flora (e.g., Royal Palm, Yellow Canna).
	Hard Landscape	Decorative lighting fixtures fixed at a height of 2.8 meters at 4-to-5-meter intervals; red permeable pavement.
b. Visibility	Soft Landscape	Preservation of the Perak River as a permanent landmark; formal linear rows of trees to signal civic transitions
	Hard Landscape	Standardized gateways (4.5m height using stone/timber with royal crests); uniform, non-competing signage sizes and emblems.
c. Human Scale	Vegetation Layout	Medium-height softscape controlled between 1.5 to 3.0 meters; formal lines of trees (5–7m) for street enclosure.
d. Comfort	Infrastructure	Continuous, sheltered five-foot walkways with 2.5 to 3.0m overhead height; rest shelters with 900–1000mm roof overhang.
	Accessibility	Universal access ramps with a strict maximum slope of 1:12 and minimum width of 1500 mm; zero-step public toilet entries.

Source: Author's own work

CONCLUSION

This study demonstrates that landscape structures function as primary visual-spatial and functional determinants of streetscape identity within historic royal urban environments. By systematically isolating the specific structural contributions of soft and hard landscape features, the empirical findings reveal

how integrated public realms shape overall urban distinctiveness. Triangulating these findings yields the significant conclusion that streetscape identity relies on a dynamic system where landscape aesthetics directly dictate public space usability and spatial hierarchy. The variables execute distinct structural roles across the town fabric: formal softscapes project civic protocol and symbolic sovereignty along ceremonial corridors, while integrated hardscape infrastructure ensures pedestrian continuity, universal safety, and microclimatic comfort within high-density communal hubs. Ultimately, to halt the gradual loss of cultural character caused by modernization pressures, municipal frameworks must shift from purely building-centric architectural conservation to embedding targeted, empirical landscape design controls into local planning guidelines. This balanced approach guarantees that historic royal towns successfully preserve their unique cultural continuity and spatial memory while maintaining highly practical, human-scaled public realms for contemporary users.

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