ENHANCING VISUAL AND SPATIAL QUALITY IN STREETSCAPE FOR VISUAL SUSTAINABILITY
Special Reference to Coastal City Matara, Sri Lanka

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Abstract: Visual identities play an important role in shaping urban landscapes. The ad-hoc response to development pressure has significant impact on the visual landscapes of streetscape in cities. Going beyond traditional considerations of guidelines on functionality and environmental concerns in urban planning, this study focuses on enhancing visual and spatial quality in the streetscape for visual sustainability, with a particular emphasis on the coastal city of Matara, a Coastal tourist Destination in Sri Lanka. It explores the interplay between tangible (physical) and intangible (perceptual) elements shaping urban landscapes, highlighting the importance of cultivating unique visual identities. Five key visual qualities - imageability, visual enclosure, human scale, transparency and complexity are assessed for their contributions to aesthetic appeal, psychological comfort, economic vitality, and heritage preservation. The research highlights the critical role of community participation and education in fostering visual sustainability, an aspect frequently overlooked in urban planning. A visual quality assessment framework is developed through a comprehensive literature review, and three streetscapes are selected based on urban character, historical significance, and socio-economic contexts. A comparative analysis is conducted through field observations, photographic documentation, and qualitative assessments to explore strategies for visual Sustainability in streetscapes. Considering both aesthetics and functionality, the proposed strategies aim to enhance streetscape identity, social engagement, and environmental responsiveness, contributing to more vibrant and resilient streetscapes.

Keywords: *Visual Sustainability, Visual Identity, Sustainable Streetscapes, Visual Quality assessment, Coastal Cities*

1. Introduction

Measuring sustainability today involves significant complexities, presenting challenges in understanding. Despite efforts, modern sustainability initiatives often struggle to reduce negative social impacts from widespread developments. This issue is evident even within the Sustainable Development Goals (SDGs), where the concept of visual sustainability is not well-defined, indicating a critical need to address this knowledge gap. Additionally, there's a notable disconnect in how architecture is traditionally viewed in urban streets planning. Often seen merely as a cultural icon, architecture's role as a product of logical thought and introspection is overlooked. This calls for a paradigm shift in how architecture is perceived, advocating for a focus on logical reasoning and reflective thinking in architectural design. To bridge this gap, a more thoughtful, education-focused approach is necessary, especially in terms of visual perception of sustainability in urban streetscape planning and design.

1.1 SUSTAINABILITY IN URBAN STREETSCAPE

A streetscape encompasses the combined visual and physical components that define the character of a street, including buildings, sidewalks, vegetation, lighting, and street furniture. It represents the spatial and perceptual experience of the street as a continuous public realm that supports movement and frames visual observation (Lynch, 1960; Gehl, 2010; Jacobs, 1961). Incorporating both natural and built elements, the streetscape contributes to the overall design quality, aesthetic coherence, and environmental atmosphere of the urban setting (Rehan, 2013).

A sustainable streetscape extends these qualities by integrating environmental responsibility, social inclusiveness, and economic efficiency within the broader urban ecosystem. It creates visually coherent and functional spaces that remain effective over time and respond to the needs of diverse users (Rehan, 2013). Such streetscapes help improve environmental performance, support equitable mobility, and offer safe, comfortable public environments. They also contribute to local economic activity by enhancing the attractiveness and usability of urban areas. By aligning environmental, social, and economic considerations, sustainable streetscapes play a critical factor in shaping healthy and resilient cities.

1.1.1 Visual Sustainability in the Urban streetscape

'Visual sustainability' refers to the enduring exchange of meanings within the visual environment of a city, shaping how people perceive and interact with urban spaces. Drawing from de Kock's (2019) "The Meaning in Seeing," the concept parallels the exchange of intangible goods such as money's value through collective agreement with the way visual elements in streetscapes hold meaning through shared recognition.

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DOI: https://doi.org/10.31705/FARU.2025.31

Education and awareness play a pivotal role in this process. Much like the experience of viewing an optical illusion where once an alternative perception is revealed, it becomes impossible to "unsee" informed awareness has the power to transform how people interpret, engage and experience their surroundings.

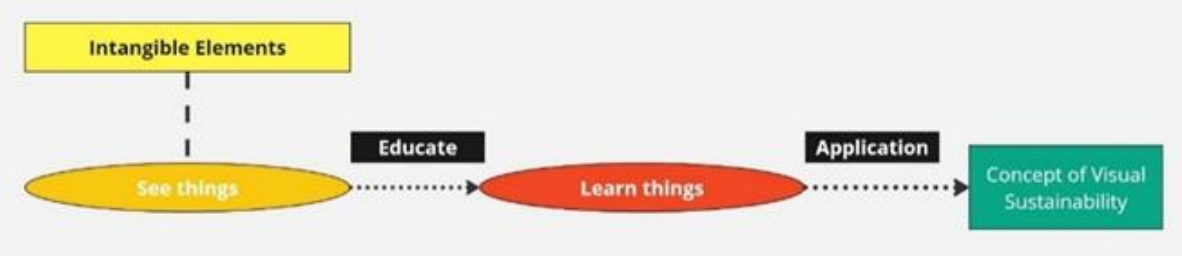


Figure 1 : Concept behind Visual Sustainability
Source: by Author

This phenomenon illustrates the impact of education and awareness in altering our perception. Once educated or made aware, our understanding deepens, and we begin to perceive things differently. This transformation is significantly influenced by visual elements, highlighting how visual cues can fundamentally change our understanding and perception of the world around us. The core idea introduced how understanding this idea can help us make better designs and connect different areas like construction. It also says that just like we exchange things, our visual world works by exchanging meanings. This concept, called "visual sustainability," helps us understand these exchanges of meaning, which affects how we learn and work on designing urban fabric.

1.1.2 Implanting concept of Visual Sustainability - Integrating Intangible Elements into Tangible Environment
Streetscape design shapes perception, behavior, and learning, going beyond aesthetics to influence how people experience urban spaces, making it a key tool for fostering visual sustainability.

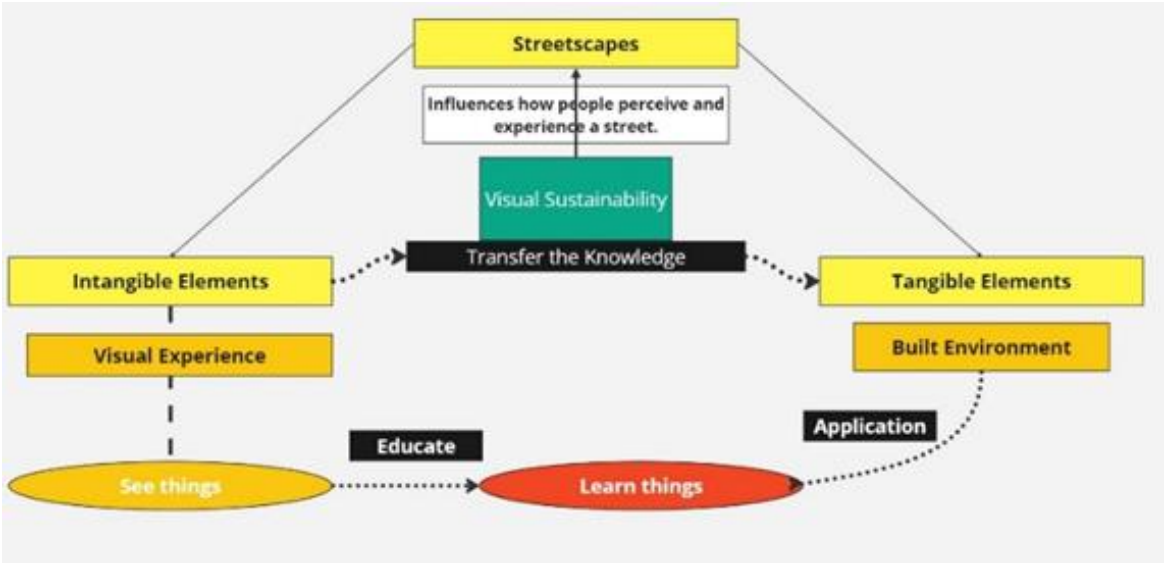


Figure 2 : Integrating Intangible Elements into Tangible Environment, Source: By Author

- **Visual Transactions:** Streetscapes visually communicate through built and natural elements, influencing emotions, behaviors, and interactions.
- **Education Through Design:** Walkable, green, and sustainable layouts educate communities about urban life and environmental responsibility.
- **Impact on Perception and Learning**: Thoughtful streetscapes shape understanding of architecture, community dynamics, and sustainability principles.
- **Enhancing Visual Sustainability:** Attractive, functional streetscapes support lasting meaning exchange and environmental, social, cultural goals.

1.2 VISUAL SUSTAINABILITY & VISUAL QUALITY IN IMPROVING STREETSCAPE
In Urban Space, Krier (1979) defines "Visual quality" as the aesthetic character of street space, shaped by the size, form, color, texture, and arrangement of both natural and built elements. These include architectural styles, building forms, landscape features, facades, and the spatial relationships between structures along primary streets and pedestrian routes.

Views toward natural landscapes and distinctive landmarks further reinforce a city's sense of place and contribute to its broader visual identity (Aedo, 2024). Complementing this perspective, Lynch (1960) highlights the importance of visual quality in enhancing street spaces, describing cities as visible, coherent landscapes that delight the eye, organize space and time, and serve as enduring symbols of urban life.

Visual sustainability and visual quality are intrinsically linked, as maintaining the distinct visual character of a streetscape strengthens its legibility, coherence, and aesthetic experience. Improvements in spatial organization and continuity directly enhance how street environments are perceived, contributing to higher visual quality within the urban context (Al-Shammari & Mohsin, 2024).

Assessing streetscape visual quality is challenging due to intangible, subjective factors influenced by individual perceptions and visual literacy. Objectivity can be introduced by measuring elements affecting visual impact. Tools like photographs and digital models systematically evaluate building arrangement, greenery, public spaces, and coherence (Nasar, 1998). The Book *Measuring Urban Design* authored by Reid Ewing and Otto Clemente in 2013 outlines five intangible qualities of urban design which can be used to understand the visual quality within urban Streetscape. Those qualities are,

• **Imageability** - Refers to a place's ability to be easily recognized and remembered through distinctive features, creating a strong sense of place and attachment, even though it can be challenging to measure. Key aspects that enhance imageability include memorability, the spatial arrangement and visual harmony of elements, prominent landmarks, the character of the area, traditional architectural styles, striking viewpoints and varied topography.
• **Visual enclosure** - Creates when buildings, trees, or walls define streets and open spaces like "outdoor rooms." Strong street edges, aligned forms, and continuous elements foster comfort, while gaps or wide streets weaken this spatial definition.
• **Human scale** - Ensures streetscape elements match human proportions and walking pace, using balanced building dimensions, articulated details, and features like tree canopies to create comfortable, welcoming, and visually appealing spaces.
• **Transparency** - Refers to the extent to which people can perceive activity beyond the edges of streets or public spaces. It is influenced by physical elements such as windows, doors, walls, fences, and landscaping. While literal transparency allows light or air to pass through, perceptual transparency reflects the sense of activity and vibrancy in an area. Streets with multiple access points convey liveliness, whereas blank walls or reflective surfaces reduce visibility.
• **Complexity** - The visual richness created by diverse elements - architecture, materials, landscapes, signage, and activity offering interest, vibrancy, and safety. Balanced variety engages pedestrians, while excessive uniformity can reduce appeal and perceived walking comfort

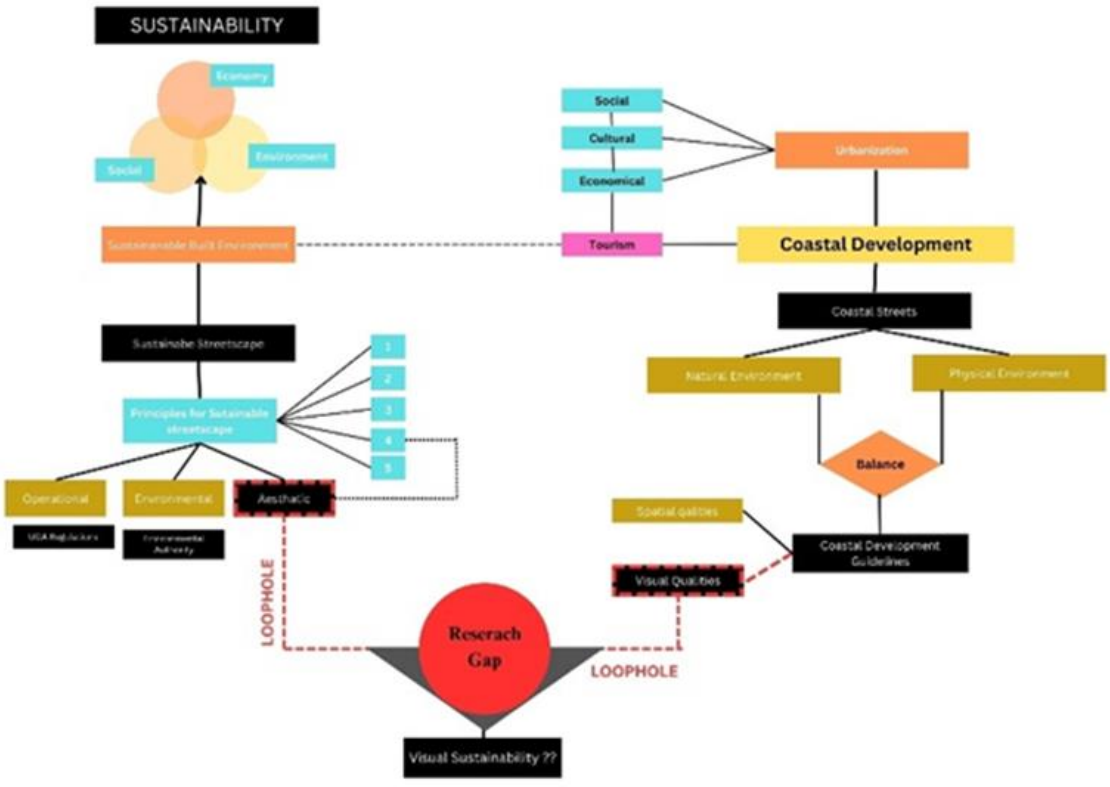


Figure 3 : Research Gap: Visual Sustainability,
Source: by Author

According to the authors, in a trial conducted in New York City, this instrument showcased its effectiveness in large-scale studies exploring the correlation between the constructed environment and various social, psychological, and health outcomes. This demonstrates its potential to facilitate thorough analyses concerning the impact of urban design on broader societal and individual well-being.

Focusing on Sri Lanka, the country faces challenges in maintaining high visual standards in urban development, largely due to the absence of mandatory Visual Quality Assessments and a regulatory focus that prioritizes operational and environmental concerns over visual impact. Although basic standards for building form and appearance exist, they are insufficient to prevent disruptions to urban aesthetics. These issues stem from inconsistent enforcement, special exemptions that compromise neighborhood character, the growth of informal settlements due to weak regulation, and fragmented governance across multiple agencies, all of which hinder the preservation of cohesive and visually appealing urban environments.

Despite these challenges in enhancing urban visual quality and protecting cityscapes in Sri Lanka, it's essential to recall Kevin Lynch's words from "The Image of the City", "What is remembered in planning is the vivid image." This underscores the importance of crafting distinctive, memorable urban landscapes that resonate positively with the people of Sri Lanka, even amidst difficulties

2. Research Methodology

The research aims to develop a visual sustainability framework for Sri Lankan coastal city streets. To achieve this, the study conducts a comprehensive mapping of existing literature on streetscape visual quality to identify guidelines and conditions that support visually appealing and sustainable urban environments. This process involves examining academic research, urban planning standards, and relevant case studies to understand effective strategies for enhancing visual quality. The identified guidelines are then critically evaluated against predetermined criteria to assess their applicability in real-world practice. The research analysis phase synthesizes all collected data to reveal gaps between theoretical recommendations and practical implementation, ultimately contributing to the development of a context-specific visual sustainability framework for Sri Lanka's coastal city streets.

The case study follows a few main stages,

a. Formulating assessment and evaluation criteria.
b. Selecting suitable case studies.
c. Collecting and sampling relevant data.
d. Conducting both individual and comparative analyses of the selected cases.
e. Drawing conclusions from the case study findings.

A mixed-method approach supports this process, initially incorporating quantitative data to identify gaps in the integration of urban aesthetics and sustainability. In later stages, the study intends to combine qualitative and quantitative insights through a scorecard system, enabling comprehensive evaluation and validation of the proposed visual sustainability framework.

2.1 THEORETICAL FRAMEWORK.

Table 1 : Imageability,
Source : By Author

Imageability			
			Reference
Condition		Description	Literature, Author
1.1	Recognizability (Memorable)	Involves creating memorable and distinct urban features that stand out in people's minds. The design elements should be unique and engaging, making them easily recognizable and aiding in wayfinding.	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
1.2	Arrangement - Capture Attention	Refers to the strategic organization of urban elements to create visually stimulating and attention-grabbing scenes. It involves considering visual hierarchy, contrast, and focal points in the urban landscape.	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
1.3	Harmony of the Elements	Emphasizes the aesthetic and functional integration of various urban elements. It requires a balance between different components (like architecture, landscaping, and street furniture) to create a cohesive and harmonious environment	Measuring Urban Design Reid Ewing and Otto Clemente (2013)

1.4	Landmarks	Landmarks act as key reference points within an urban setting. They are significant for their historical, architectural, or cultural value and aid in navigation and creating a sense of identity for the area.	The Image of the City Kevin Lynch (1960)
1.5	Sense of Place	Revolves around creating an urban environment with a unique character and atmosphere, evoking a strong sense of belonging and identity among its inhabitants and visitors.	The Concise Townscape Gorden Culen (1961)
1.6	Vernacular Architecture	Involves incorporating local architectural styles and building techniques, reflecting the cultural and historical context of the area and enhancing the authenticity of the streetscape.	Measuring the Unmeasurable: Urban Design Qualities Related to Walkability Ewing, R., and S. Handy. (2009)
1.7	Striking Views	Striking views are those that provide a visually impressive or unexpected perspective within an urban landscape. This could be a panoramic city view, a unique street vista, or an intriguing architectural detail.	Measuring the Unmeasurable: Urban Design Qualities Related to Walkability Ewing, R., and S. Handy. (2009)
1.8	Unusual Topography	creatively using natural land contours, slopes, and elevations to design streetscapes that adapt to and highlight unique geographical features, enhancing aesthetics, functionality, drainage, visibility, and accessibility.	Measuring the Unmeasurable: Urban Design Qualities Related to Walkability Ewing, R., and S. Handy. (2009)
1.9	Marquee Signages	Marquee signages are large, often illuminated signs that serve as a bold visual element in the streetscape. They can be used for advertising or as iconic markers, contributing to the urban identity and night-time aesthetics.	Measuring the Unmeasurable: Urban Design Qualities Related to Walkability Ewing, R., and S. Handy. (2009)

Table 2 : Visual Enclosure,
Source : By Author

Visual Enclosure				
				Reference
Condition			Description	Literature,Author
2.1	Room-like Quality		Spaces where the height of vertical elements is proportionally related to the width of space between them	The Concise Townscape Gorden Culen (1961)
	a	Buildings roughly equal heights Sky projects		Fundamentals of Urban Design Richard Hedman (1984)
	b	Total width of the 'street, should not exceed the building heights		Pattern Language Alexandar et al (1984)
	c	Walls and Fences	Low 6 ft tall	The image of the city Kevin Lynch (1960)
	d	**Highly Urbanized** Building Height: Street Width	Best 1:2, Max 3:2, Min 1:6	Great Streets Allan Jacob (1993)
		Suburban Building/Trees Height: Street Width	Buildings ~ Less Trees ~ Dominant Best 1:2, Max 3:2, Min 1:6	Trees in Urban Design Henry Arnold (1993)
2.2	Physical Elements		When Streets are not strongly Defined by buildings	
	Visual Termination points & enclosure		Things see at the end of a street or in the distance gives enclosure Big building, A monument, A fountain, Something noticeable structure	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
2.3	Street Layout			
	a	Very straight Grid Pattern	Where can see for down the street (Less enclosed)	The Second Coming of the American Small town Duany A and E.Plater (1992)

	b	Irregular shapes/End abruptly	Make more enclosed and cosy	
2.4	Interruptions/ Gaps			Pattern Language Alexander et al (1997)
	a	Breaks in Continuity	Interrupt the lines of buildings or trees along the street (Empty spaces, Gaps)	
	b	Dead space	Have no much activities or human presence Inviting less – Lack of enclosure Vacant lots Parking Area Drive ways Other places people are not present	
	c	Building Setbacks	Large Building setbacks from the street **Aim -**For getting light and ventilation to the building**,** Sense of openness **Cons -**Dead spaces Large setbacks between building, Street create inactive dead spaces Dead spaces devoid of human activities Reduced social interaction Discourage social engagement among people walking along the street	
2.5	Visual Barriers			Measuring Urban Design Reid Ewing and Otto Clemente (2013)
	a	Street Parking		
	b	Planted Medians		
	C	Visual disturbing Elements	Overhead wires, cellular towers, electrical distribution towers and cables	
2.6		Continuous Facades	Building should have front sides that lined up closely with each other – Unbroken line More interesting by adding doors and windows, it makes area more inviting and attractive for people walking by	Denver Colorado;s Design Manual City of Denver (1993)

Table 3 : Human Scale,
Source : By Author

Human Scale				
				Reference
Condition			Description	Literature, Author
3.1	Building Heights			
	a	Building Height < 3 stories	Ideal	"Scale in Civic Design." Town Planning Review Blumenfeld, H. (1953)
	b	Building Height < 4 stories	Maximum	Pattern Language Alexander et al (1977)
	c	Building Height > 6 stories	Out of proportions	Liveable Cities—People and Places: Social and Design Principles for the Future of the City Lennard, S. H. C., and H. L. Lennard. (1987)
3.2	Building Floors Spread-out		Lower floors should be more spread out, while the upper floors should have a step-back design before rising further	Finding Lost Space: Theories of Urban Design Roger Trancik(1986)
3.3	Articulated Architecture		Articulated architecture uses elements like belt courses - horizontal decorative bands and cornices - projecting moldings at the top of buildings to visually break up large structures, making them more proportionate, human-scaled, and engaging within their urban surroundings.	Fundamentals of Urban Design Richard Hedman
	a	Belt Course		
	b	Cornices		
3.4	Human Speed		city or building that are underutilized or uninviting, often due to their design being oriented towards vehicles rather than people. prioritizes the requirements of automobiles (elements like oversized signage with large lettering,) over human needs,	Asphalt Nation: How the Automobile Took over America, and How We Can Take It Back Jane Holtz Kay, (1997)

			leading to a disconnect in the scale and pace of our environments (Urban and architectural designs are tailored for the "60 mph" perspective)	
	a	Signs and Lettering	Large lettered signs for high-speed motorist Small lettered signs for Pedestrians	
	b	Dead space	Such spaces can feel alienating or unwelcoming at a pedestrian speed, lacking the intimacy and detail that make urban spaces liveable and engaging at a human scale	
3.5	Street Trees		Streets are over 40 feet wide additional rows of trees are needed to archive human scale	Trees in Urban Design Henry Arnold (1993)
3.6	Scale moderative Elements		Use of small-scale additional elements such as clock towers to moderate the scale of buildings and streets	Fundamentals of Urban Design Richard Hedman
3.7	Amount of Street Furniture		Carefully Throughout benches Paving	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
3.9	Ornaments of Buildings		Architectural details and ornamentation add character and interest to building facades, making them more engaging at a pedestrian level. Such details can break up the monotony of large walls and help to scale down large buildings to more human proportions.	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
3.10	Spacing of windows and Doors		Regular spacing of windows and doors on building facades provides a rhythm and human scale to the streetscape. It helps Street users gauge distance and building size, contributing to a more comprehensible and approachable urban environment	Measuring Urban Design Reid Ewing and Otto Clemente (2013)

Table 4 : Transparency,
Source : By Author

Transparency				
				Reference
Condition			Description	Literature, Author
4.1	Materials of streetscape		Material condition that is provide Light E.g.- Glass walls, Glass windows	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
4.2	Streets with many Entryways		Streets lined with numerous entrances enhance the impression of human activity extending beyond the street itself, whereas streets featuring blank walls and garages give the impression that people are distant or absent.	Urban Planning: Developing Baltimore City's Master Plan , Jane Jacob (1993)
4.3	Trees as "Partially" Transparent tents		**High canopies: around 20 feet (6 meters)** providing a sense of enclosure and coziness, still allow for visibility and awareness of the surrounding space. **Lower canopies, small trees: starting at less than 20 feet (6 meters) high, and in some cases, much lower** might obstruct views and create a more closed-off feeling Should Consider to locate, allowing for clear visibility underneath and contributing to a sense of openness while still providing shade and enclosure.	Trees in Urban Design Henry Arnold (1993)
4.4	Externalized Indoor Activities on streets			Urban Design Compendium Llewelyn – Davies (2000)
	a	Indoor Dining		
	b	Outdoor merchandising		
4.5	Use of Space			
	a	Courtyards	In a streetscape, courtyards act as breathing spaces amidst the urban density. They provide visual relief from continuous building facades and offer opportunities for greenery and social interaction	Measuring Urban Design Reid Ewing and Otto Clemente (2013)

	b	Effective Signs	Effective signage in a streetscape acts as a guide, providing clear information and direction. It helps people to easily identify locations and navigate through the urban space. Transparent and straightforward signage reduces confusion	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
	c	Buildings Convey specific uses (Schools,Churches)	Enhance transparency by serving as easily recognizable landmarks with known purposes. When someone sees a school or church, there's an immediate understanding of the function of that space. This familiarity adds to the clarity of the streetscape's layout and function	Measuring Urban Design Reid Ewing and Otto Clemente (2013)
4.6	Transparency Distraction			Measuring Urban Design Reid Ewing and Otto Clemente (2013)
	a	Reflective Glasses	The reflections on the glass can sometimes be disorienting or visually overwhelming, particularly in highly urbanized areas with a lot of movement and activity	
	b	Large setback of buildings	Large setbacks create a substantial physical gap between a building and the street, which can detach it from street life, reducing interaction between occupants and passersby. They also limit visual connection, making it harder to appreciate or understand the building's architecture and purpose from the street.	
4.7		Windows as percentage of ground floor façade in Commercial buildings	60-80% for retail spaces	City of Seattle Seattle Zoning Codes (n.d)

Table 5 : Complexity,
Source: By Author

Complexity				
				Reference
Condition			Description	Literature, Author
5.1	Psychological Effect on 'Distance'		An interesting walking network creates a perception of shorter distances by dividing the journey into engaging, visually diverse stages	Life between Buildings Jan Gehl (1987)
5.2	Number of façades per distance		Narrow façades – Enhance Complexity Wide facades – Decrease Complexity Narrow buildings in vary-ing arrangements add to complexity, while wide buildings subtract.	Toward an Urban Design Manifesto Jacobs, A., and D. Appleyard (1987).
5.3	Building Surface			Visions for a New American Dream Tony Neleseen (1994)
	a	Repetition of Buildings	Mass produced building give dull or boring visual picture. (1 to 3 buildings in a row) Variation on basic pattern encouraged in order to prevent dull sameness Building orientation plan Building setback line	
	b	Numerous Doors and Windows		
	c	Variation of Colours		
	d	Material usage		
5.4	Function of Tress		Light filtered through trees Manipulation of light and shadow	Trees in Urban Design Henry Arnold (1993)
5.5	Street Furniture		Pedestrian Scaled Streetlights Fountains Carefully Throughout benches	

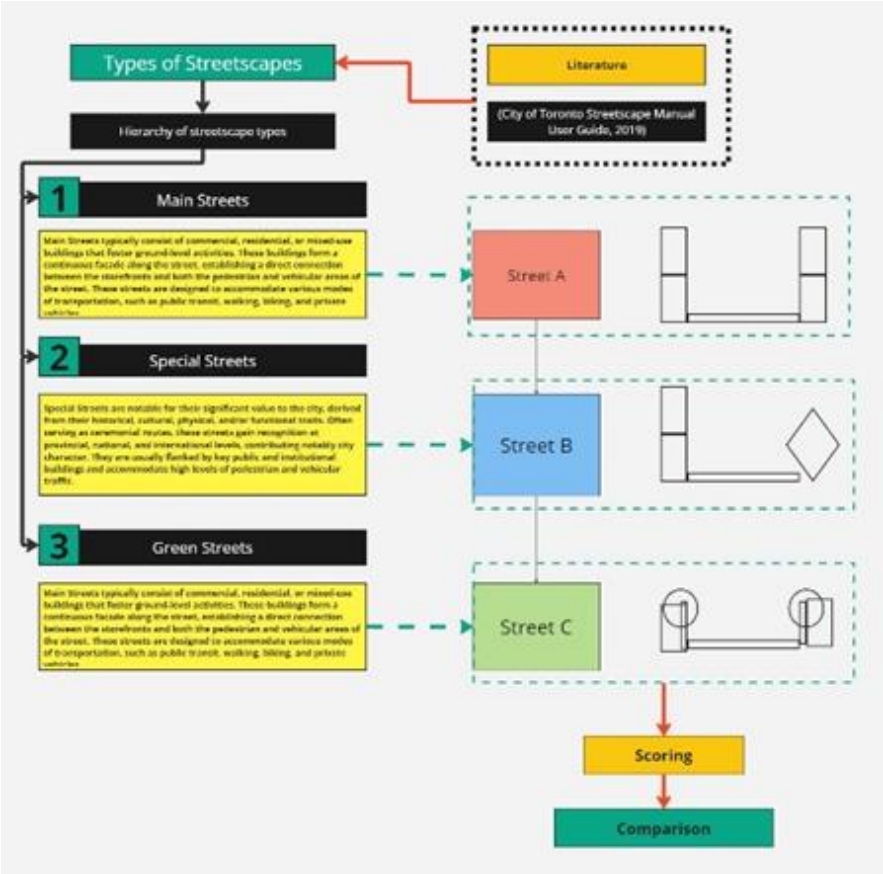
		Paving	
5.6	Signages	Too much variation can be overwhelming or confusing. People prefer Moderate complexity in signage which provides enough diversity to be engaging and helpful without causing confusion or visual clutter. **Location**: Consistent and predictable sign placement. **Shape**: Diverse yet cohesive shapes. **Colour:** Strategic, message-specific colours without disorganization. (eg- Red for stop/ warning) **Direction:** Clear, non-contradictory directional signage. **Lettering:** Consistent font style and size for readability.	The Effect of Sign Complexity and Coherence on the Perceived Quality of Retail Scenes Nazar J.L. (1987)
5.7	The Presence & Activity of People	Various Activities Land Use (Commercial, Residential ,Civic) Transportation modes	Life between Buildings Jan Gehl (1987)

2.2 SELECTION OF THE CASES – MATARA STREETSCAPES

Matara, a coastal city in Sri Lanka, was chosen for its unique combination of natural landscapes and urban form shaped by its proximity to the Indian Ocean. Many of its streets run parallel to the coastline, offering opportunities to examine how visual quality and spatial design integrate with environmental and cultural contexts. The city's urban fabric reflects a rich heritage through its blend of colonial and modern architecture, highlighting the challenge of preserving historical identity while meeting contemporary needs. As transport corridors and vibrant public spaces, these streets unite built form, natural features, and human activity, making Matara ideal for studying strategies that enhance visual sustainability and community well-being.

For this study, three segments of streetscapes in Matara were chosen to represent distinct streetscape categories identified in the 2019 *Streetscape Manual User Guide* issued by the City of Toronto, allowing for the examination of visual quality impacts across varied urban contexts in the coastal city of Matara.

Segment 1, **Broadway Road**, is an urban, commercial, and linear streetscape serving multi-functional purposes within a 600 m long study area. Segment 2, **Beach Road**, is also urban and linear but primarily recreational, engaging residents and visitors in multi-functional activities across its 600 m stretch. Segment 3, **Polhena Road**, represents a suburban setting with an irregular form, functioning as a mixed residential and hotel area, and maintaining a multi-functional relationship with the city and its dwellers over the same 600 m length. This selection enables the study to explore how visual qualities adapt to and shape the unique identity of each streetscape type.



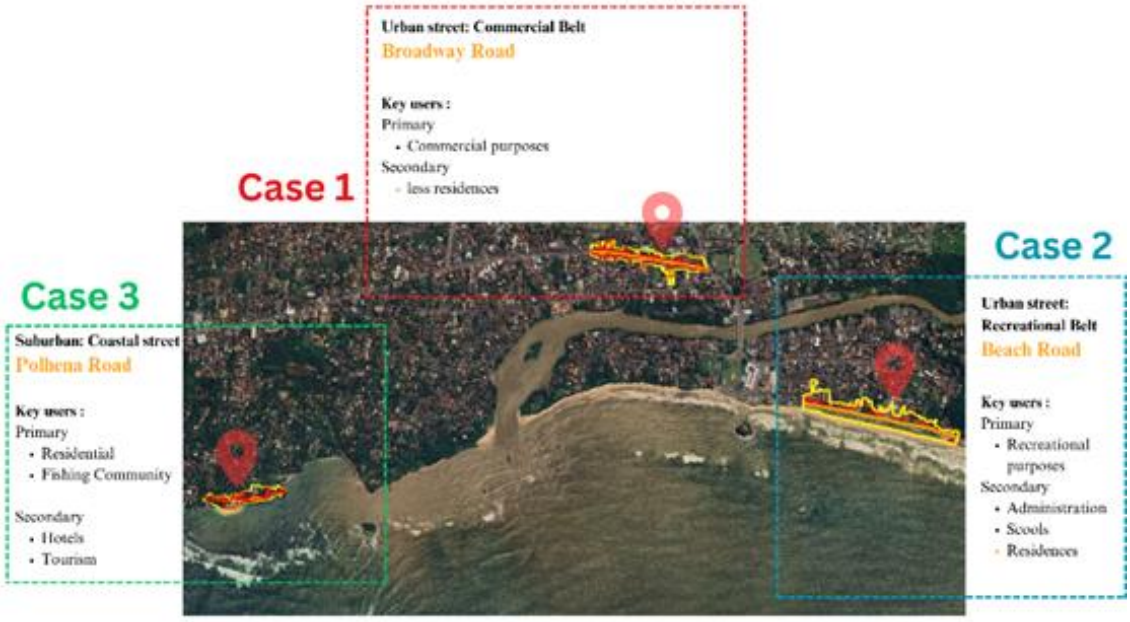


Figure 4 : Case Studies Selection criteria
source: By Author

Table 6 : Case studies selection
Source by Author

Segment		Streetscape	Description
1	**Street A - Broadway Road** 5°56'56.6" N 80°32'42.5 "E		key commercial and socio-cultural axis in Matara, integrates diverse retail, residential, and service activities. Featuring a blend of colonial and modern architecture, it serves as a dynamic hub for trade, community interaction, and cultural expression within the city.
2	**Street B - Beach Road** 5°56'56.6" N 80°32'42.5 "E		located along the scenic coastline of Matara,functions as a vibrant leisure and commercial corridor. Lined with restaurants, cafés, and shops, it blends traditional and modern architecture, offering cultural engagement, recreational spaces, and picturesque views that enhance both local life and tourism..
3	**Street C - Polhena Road** 5°56'11.8" N 80°31'34.9 "E		Rapidly evolving area centered around the renowned Polhena Beach. Once a quiet residential street, it now hosts a growing hotel industry serving increasing tourist demand, while retaining its fishing community heritage. The juxtaposition of modern hospitality facilities with traditional homes reflects the area's transformation, blending local character with contemporary development.

2.3 DATA COLLECTION METHODS AND TOOLS

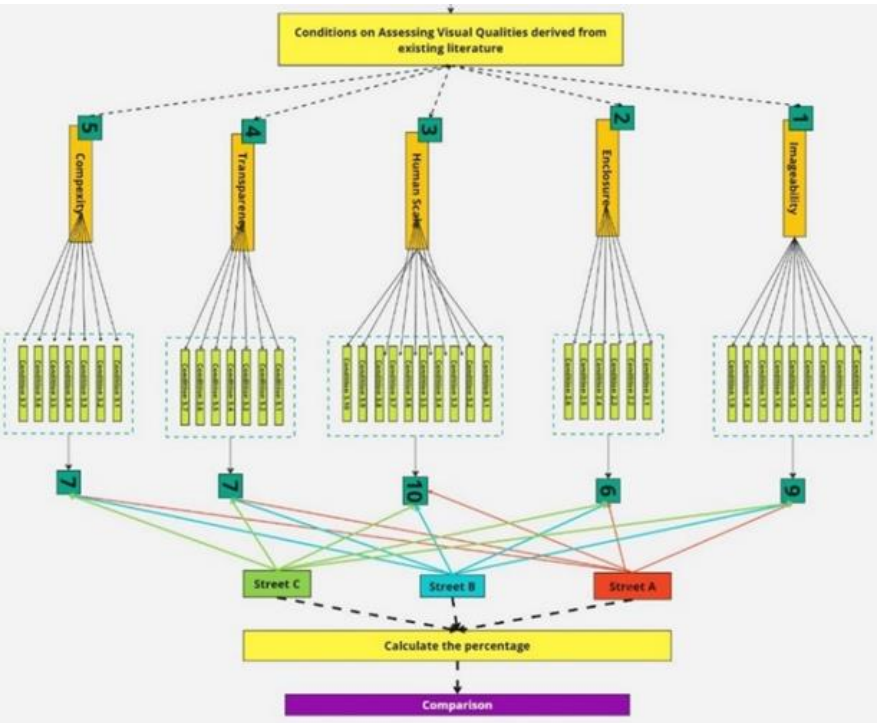


Figure 5 : Structure of Assessing Visual Qualities.
Source: By Author

The Data were collected through observations, site assessments, and on-site photography. Observations and assessments evaluated visual and spatial qualities in the built environment, following the visual quality criteria from Measuring Urban Design by Reid Ewing and Otto Clemente (2013) to ensure a structured approach. During site visits to the case study locations, specific elements from the theoretical framework were examined in detail. After collecting the data for each condition, scores were recorded (-5 to +5) for each street to be used later for comparative evaluation. On-site photographs, captured with an iPhone XR, documented various spatial and aesthetic characteristics, serving as qualitative evidence to enhance the description and analysis of observed factors.

Figure 6 : Assessing Visual Qualities -Sample data collections
source: By Author

3. Analysis and Results

1

		Street A											Street B											Street C										
	Mark	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11	1	2	3	4	5	6	7	8	9	10	11
	Condition	-5	-4	-3	-2	-1	0	1	2	3	4	5	-5	-4	-3	-2	-1	0	1	2	3	4	5	-5	-4	-3	-2	-1	0	1	2	3	4	5
Imageability	1.1										X		10										X	11			X							3
	1.2				X								4								X			9	X									1
	1.3					X							5								X			9				X						4
	1.4									X			9										X	11								X		9
	1.5										X		11										X	11									X	10
	1.6									X			9								X			9						X				8
	1.7										X		10										X	11								X		9
	1.8						X						6									X		10					X					6
	1.9	X											1							X				8								X		9
													65/99											89/99										59/99
	Total Mark																																	
	Percentage%												65											89										59

2

		Street A											Street B											Street C										
	Condition	-5	-4	-3	-2	-1	0	1	2	3	4	5	-5	-4	-3	-2	-1	0	1	2	3	4	5	-5	-4	-3	-2	-1	0	1	2	3	4	5
Visual Enclosure	2.1											X	11					X						5					X					5
	2.2						X						6						X					6						X				6
	2.3								X				8										X	11			X							2
	2.4					X							5				X							4				X						3
	2.5		X										2				X							4					X					4
	2.6										X		10									X		9				X						3
													42/66											39/66										23/66
	Total Mark																																	
	Percentage												47											43										34

3

		Street A											Street B											Street C										
	Condition	-5	-4	-3	-2	-1	0	1	2	3	4	5	-5	-4	-3	-2	-1	0	1	2	3	4	5	-5	-4	-3	-2	-1	0	1	2	3	4	5
Human Scale	3.1							X					7								X			9									X	10
	3.2		X										2	X										1	X										1
	3.3									X			9								X			8							X				6
	3.4	X											1					X						4		X									2
	3.5										X		10										X	10							X				6
	3.6							X					6							X				6							X				6
	3.7	X											1										X	11								X			8
	3.8	X											1	X										1								X			8
	3.9										X		10									X		9										X	9
	3.10									X			9					X						5					X						5
													56/110											64/110											61/110
	Total Mark																																	
	Percentage												51											58											55

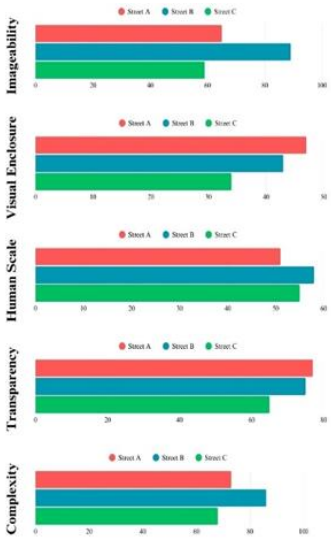


Figure 7 : Visual Qualities Conditions Evaluation
Source: By Author

After assessing each condition identified under visual perception qualities for all three cases, the results can be compared as follows,

Imageability is highest in Street B, reflecting strong memorability, while Street C scores lowest. **Visual enclosure** is generally low across all streets, suggesting limited spatial definition. **Human scale** peaks in Street B, indicating better proportion and pedestrian comfort, whereas Street A ranks lowest. **Transparency** is strongest in Street A, enhancing visual connectivity, and **complexity** is highest in Street B, showcasing diverse and engaging visual elements. These variations highlight the differing strengths and weaknesses of each quality in shaping overall streetscape perception.

4	Condition	Street A											Street B										Street C									
		-5	-4	-3	-2	-1	0	1	2	3	4	5		-5	-4	-3	-2	-1	0	1	2	3	4	5		-5	-4	-3	-2	-1	0	1	2	3	4	5	
Transparency	4.1										X		10								X				8			X								2
	4.2											X	11										X		10								X				8
	4.3							X					8										X		10											X	11
	4.4										X		10											X	11								X			9
	4.5										X		10										X		10									X		10
	4.6			X									3		X										2					X						6
	4.7							X					7								X				7				X							4
													59/77												58/77											50/77
Total Mark																																					
Percentage													77												75											65

5	Condition	Street A											Street B										Street C									
		-5	-4	-3	-2	-1	0	1	2	3	4	5		-5	-4	-3	-2	-1	0	1	2	3	4	5		-5	-4	-3	-2	-1	0	1	2	3	4	5	
Complexity	5.1											X	11									X			9				X							4
	5.2											X	11								X				8							X				8
	5.3											X	11									X			9							X				8
	5.4		X										2										X		10										X	11
	5.5									X			9										X		10			X								3
	5.6	X											1									X			9								X			10
	5.7											X	11											X	11							X				8
													56/77												66/77											52/77
Total Mark																																					
Percentage													73												86											68

Street	Imageability	Visual Enclosure	Human Scale	Transparency	Complexity	Overall Percentage
Street A	65%	47%	51%	77%	73%	62.6%
Street B	89%	43%	58%	75%	86%	70.2%
Street C	59%	34%	55%	65%	68%	56.2%

Figure 8 : Visual Quality conditions Evaluation Overall Summery
Source: By Author

3.1 EVALUATION OF VISUAL PERCEPTION QUALITIES IN STREETS

3.1.1 Evaluation of Visual Perception Qualities in Street A

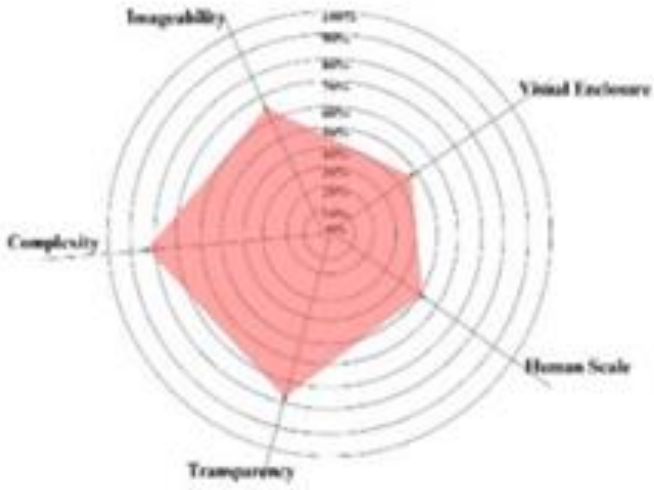


Figure 9: Visual Qualities Evaluation Street A

Broadway Road presents a dense and visually crowded environment, shaped by rapid commercial growth and minimal design control. The streetscape shows a mix of building styles, bright signboards, and busy storefronts, but without a clear visual hierarchy. Signage dominates facades and often blocks landmark buildings, creating visual barriers and making it difficult to focus on any single element. Pedestrian movement feels restricted due to limited space and clutter. Most buildings

rise directly from the street with little regard for human scale or setbacks. Overall, the street appears lively yet lacks harmony, coherence, and adequate street furniture even during festive periods.

3.1.2 Evaluation of Visual Perception Qualities in Street B

An open, visually balanced streetscape where urban elements complement the natural beachfront. Building heights are controlled to maintain human scale, keeping the beach as the focal point, while landmarks like St. Mary's Church and historic schools provide visual interest. Enclosure is relatively weak, as frequent gaps mostly used as parking facilities, these gaps create minor visual interruptions in the otherwise continuous facades. Buildings average three storeys, with active edges, cafes, outdoor dining, street furniture, and shading trees enhancing transparency. Multiple entryways, moderate signage, streetlights, and quality paving further support safety and a comfortable pedestrian environment.

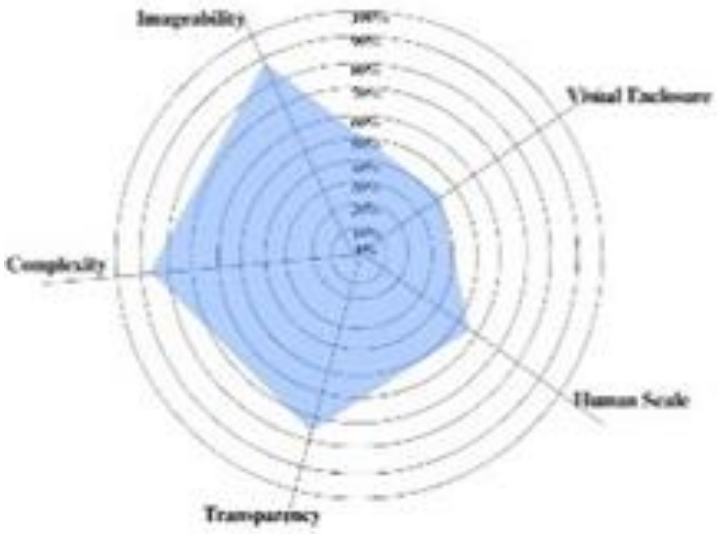


Figure 10: Visual Qualities Evaluation Street B

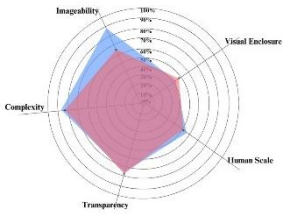
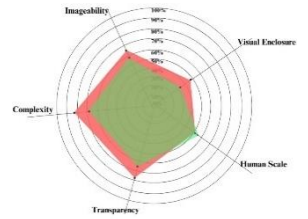
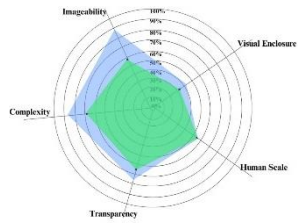
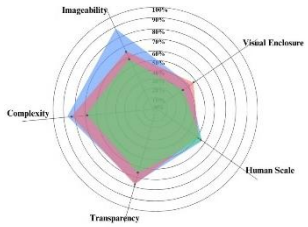
3.1.3 Evaluation of Visual Perception Qualities in Street C

Polhena Road lacks a clear visual identity, with an unmarked entrance and minimal distinctive features.Scenic sea views are increasingly blocked by hotel developments,while high boundary walls and fences interrupt façade continuity, creating visual barriers and a narrower feel. Attempts to introduce unique façade ornaments for tourism exist but are inconsistently applied, though some houses use landscaping to create a softer sense of opennes. Dead spaces and limited active frontages reduce safety. Dense tree cover lowers transparency and obscures visibility, making navigation difficult. lacks of street lighting, pavements, and street furniture, resulting in a weak overall streetscape, although a few nightlife spots add some character. Outdoor merchandising appears only near the Polhena bathing spot, while the rest of the street lacks active frontages, resulting in fewer people even during the day time.

Figure 11: Visual Qualities Evaluation Street C

3.2 COMPARISON OF VISUAL PERCEPTION QUALITIES IN STREETS

Table 7 : Comparison of visual perception qualities in streets,
Source by Author

Street	Graph	Comment
Street A - B		When comparing Street A and Street B, it's noticeable that imageability is significantly higher in Street B, while other qualities have similar proportions in both streets. The abundance of historical buildings and landmarks in Street A, coupled with the balance of natural elements and scenery, are likely contributors to this difference. This distinction in imageability between the two streets underscores the unique characteristics and attractions each street offers.
Street A - C		In comparison with Streets A and C, Street A stands out with higher qualities except in human scale. Building heights in Street A particularly affects the human scale, altering space perception and influencing human comfort. Street C, with its lower building heights and a harmonious integration of natural elements such as trees resulting in a proportionally more comfortable spatial experience.
Street B - C		In the comparison between Streets B and C, Street B shows significantly higher imageability along with greater levels of complexity, transparency, and visual enclosure. However, both streets have similar ratings in human scale. The lower visual enclosure in Street C is due to its narrower street layout and intermittent gaps, resulting in a less visually comfortable environment because of the proportion of building height to street width.
Street A - B - C		Considering all five visual qualities, Street B shows the highest overall percentage, (figure 8) highlighting that a balanced integration of natural elements with the built environment contributes significantly to creating sustainable and visually appealing streets. Historical and cultural landmarks help create memorable streetscapes, strengthen a sense of identity and emotional connection. Appropriate building heights and proportions enhance visual comfort, while creating spaces for active social engagement increases transparency. However, dead spots interrupt the continuity of facades and affect safety, indicating areas that need improvement to enhance the overall streetscape experience.

4. Discussion and Conclusion

This study investigates visual sustainability as a critical yet frequently neglected dimension of streetscape design, with reference to the Sri Lankan urban context. It offers a systematic assessment of existing design practices and identifies key areas requiring intervention to enhance visual sustainability.

The study proposes a framework that focuses on how intangible qualities can be implemented in the tangible environment through education. To construct this framework, the literature despite being widely dispersed was rigorously collected, critically analyzed, and selectively synthesized to ensure relevance to the Local context. This developed framework addresses the identified knowledge gap by lacking a proper regulatory framework for this purpose. It specifically focuses on sustainable principles for streets, as identified by the Congress for New Urbanism (CNU).

Visual quality is assessed by evaluating both the built and natural environments. This process involves gauging the overall visual experience of viewers, considering both positive and negative aspects to arrive at an overall score. This approach aims to refine the scorecard, making it a more quantitative and comprehensive tool for assessing streets and buildings. To further improve the scorecard in future extensions of this research, the framework is recommended to be combined with a human-perspective evaluation. This involves comparing human observations with other measured data, valuing not only the physical features of streetscapes but also how people experience them. Incorporating subjective perception alongside objective measures ensures a better balance for developing more effective sustainability strategies.

The research also suggests potential directions for future studies, focusing on the development and modification of "evaluation conditions".

Enhancing visual qualities in urban development, particularly in developing countries like Sri Lanka, often takes a backseat to pressing goals like economic development and poverty reduction. Consequently, visual quality and aesthetic considerations in urban environments are frequently regarded as luxuries. This perspective, however, is not entirely accurate. The unique urban character and distinctive architecture of many cities and countries significantly contribute to economic growth. The objective is to foster a dynamic and evolving urban landscape that continuously develops. Similar to how functionality and environmental factors are measured in sustainability, visual sustainability should also be considered. Enhancing visual quality does not necessarily require substantial government funding. Rather, it necessitates stringent regulations and strategies to control and monitor urban development, ensuring that any new additions or subtractions to the urban scene are in harmony with the city's overall aesthetic and character. Like farmers creating the right conditions for crops or educators fostering learning environments, city professionals should focus on creating settings where people can thrive not just constructing buildings. When streets are designed to please the eye and enhance well-being, they become vital to building vibrant, happy, and sustainable cities.

The Importance of educating is further emphasized in Visual Sustainability.

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