Comfort of Streets as a Public Space:

The Case of Selected Segments of LRT Streets in Addis Ababa

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment for a Master Degree in Urban Design and Development

By:

Hunde Motera Wakjira

February 2024

Addis Ababa, Ethiopia

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Advisor:

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February 2024

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Declaration

I hereby declare that all the information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Hunde Motera Wakjira

Signature: _____

Date: _____

Confirmation

The thesis can be submitted for examination with my approval as the institute's advisor.

Advisor

Darik Zebenegus

Signature: _____

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Approval

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Finally, I would like to thank the reader of this thesis. I hope that this work has been informative and thought-provoking.

Abstract

Despite being an important part of urban public space, streets are often designed primarily for cars, not people. This can make them hostile and uninviting, which discourages people from using them. This study examined the selected street segments along the Light Rail Transit (LRT) of Addis Ababa for one of the qualities of the place-making approach, which is comfort from aspects of the physical setting, safety, and sense of pleasure. With the methods of literature review, observation, and survey, the study attempts to understand the expected qualities and limitations on the ground. Three objectives are set to address the issue. One is to grasp quality parameters and attributes from existing literature by using content analysis. The second objective is to investigate the physical context and pedestrian activity on the street using observation and pedestrian counting with the descriptive statistics analysis method. The third objective is to evaluate the performance of the pedestrian environment as a public space using Vikas Mehta's "public space index" (PSI) analysis. Based on the results and discussion, the streets were found to be crowded, lack diversity in user types, and have limitations in the provision of optional activities. There is compromised overall comfort in the physical setting, safety, and sense of pleasure caused by a lack of provision of sidewalk elements, maintenance, and appropriate use.

Keywords: *street, pedestrian, comfort, public space, street as a public space.*

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Acronyms

AA: Addis Ababa

AACA: Addis Ababa City Administration

AAPC: Addis Ababa Plan Commission

LRT: Light Rail Transit

NACTO: National Association of City Transportation Officials

NGOs: Non-governmental Organizations

NUA: New Urban Agenda

PAS: Primary Arterial Street

PMV: Personal Motor Vehicle

PPS: Project for Public Space

PSI: Public Space Index

SDGs: Sustainable Development Goals

UN: United Nations

CHAPTER ONE
1. INTRODUCTION

"Streets and their sidewalks, the main public places of a city, are its most vital organs. Think of a city, and what comes to mind? Its streets. " "If a city's streets look interesting, the city looks interesting; if they look dull, the city looks dull." J. Jacobs, 1961, p. 37

"As well as providing access to buildings and the services they provide, streets are our most important public spaces." "Streets serve many functions, not only the circulation of traffic but also walking, cycling, playing, and meeting people." Llewelyn-Davies (Firm), 2007, p. 76

1.1. Background of the Study

Rapid urbanization and population growth, with their undesirable impacts, have become global issues. Urban areas are home to 54% of the world's population (UN-Habitat, 2016), 56% in 2021, and are predicted to grow to 68% in 2050 (UN-Habitat, 2022). Therefore, cities are under enormous strain nowadays to keep up with rising urbanization (UN-Habitat, 2017), which deals with issues of affordable housing, air pollution, inadequate infrastructure, environmental concerns, a lack of open space, and traffic congestion. (P. Deore, S. Lathia, 2019). As a result, the urban environment is losing its quality, and the positive experiences of the residents are being impacted. As car traffic, for example, increases precipitously, competitive pressures for city space increase. Year after year, the circumstances for urban life and pedestrians have deteriorated (J.Gehl, 2010).

According to Addis Ababa city administration (AACA), Ethiopia's urban population grew from 8.5% in 1967 to 17.4% in 2012 (AACA, 2018), making it one of the fastest urbanizing countries in Sub-Saharan Africa (AACA, 2018). Addis Ababa, the capital, is home to 17% of the country's urban population (AACA, 2018). The city is rich in natural beauty and cultural history, but these qualities are being challenged by the city's fast urbanization with unmatched development (a population of 3.4 million and predicted to grow to 4.5 million by 2030), rising traffic, and unprecedented levels of development and demolition (UN-Habitat, 2018). This rapid urbanization resulted in different transportation, housing, and infrastructure deficiencies, as well as significant damage to the urban environment (AACA, 2018).

For this global issue, a world-wide effort is being attempted to mitigate the undesirable impacts. One attempt is the Conference of the United Nations on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador, on October 20, 2016, which set the New Urban Agenda (NUA), which is an international effort to rethink urban systems and the physical shape of our urban spaces in order to reach a more promising and sustainable future in which all people enjoy equal rights and access to the advantages and possibilities that cities can provide. (UnitedNations, 2017). The other is the United Nations Sustainable Development Goals (SDGs), specifically Goal 11, which states, "Make cities and human settlements inclusive, safe, resilient, and sustainable." (UN, 2015) Section 11.7 focuses on ensuring that everyone has access to green spaces and public areas that are safe, inclusive, and accessible. (UN, 2015).

UN-Habitat, in its publication "City-Wide Public Space Strategies: A Compendium of Inspiring Practices," reflected the need for this effort. The demand for a diverse, secure, and easily accessible public space is growing more and more urgent in a society that is quickly urbanizing. A city that is healthy encourages coexistence, fosters harmony, has an abundance of green space and promotes good public health and well-being (UN-Habitat, 2019).

A number of publications and books indicate the needs and benefits of public spaces for better cities and urban life qualities. The city image is framed by public space (UN-Habitat, 2018). A flourishing city must have a healthy public realm. The city's ability to function depends on its public spaces, which should be well planned and managed since they have a positive effect on the city's economics, environment, safety, health, integration, and connectedness. The condition of a city's public areas directly affects its residents' quality of life. (UN-Habitat, 2018). Public spaces are well-known for being multipurpose environments that encourage social interaction and inclusion, as well as human health and well-being. (P. Deore, S. Lathia, 2019)

Streets account for 25% to 35% of all developed land in urban areas, making public rights-of-way the most important single land use. This makes it our most significant public space and stage for social interaction in addition to access provision. (A. Jacobs, 1993), (Llewelyn-Davies, 2007), (Moughtin, 2003). Therefore, streets are multi-functional spaces with the potential for conflict between uses. The best approach is to design for all possible applications and users (Llewelyn-Davies, 2007). If not, the effect of unmanaged urbanization has an enormous undesirable impact on residents' urban experiences and on quality, function, and image at large.

Figure 1.1 Pedestrians and cars sharing the same space

1.2. Statement of the Problem

"The modern city street has become, in some cases, a place of danger for citizens or so unattractive that it forces people to stay within the privacy of their homes and move about in the relative sanctuary of the private motor car." (Moughtin, 2003, *p. 134*)

As a result of the rapid unmanaged urbanization in Addis Ababa and the multifunctional nature of the urban street space, there is competition for the limited space and conflict between users. As a result, the comfort and positive experience of the pedestrian are impacted. This limited the role of streets in serving as a public space where people could walk, stay, and enjoy, rather than a mere corridor for movement. In support of this statement, on-site observation and literature reviewed indicated that there are issues with the provision, maintenance, and management of elements of the pedestrian environment.

Walking is the dominant means of transport, taking more than half (54%) of daily trips in Addis Ababa. (AACA, 2018); (WorldBank, 2022). The proportion of trips taken on foot varies greatly around the city; as an example, 78% in the *Addis Ketema* sub-city and 40% in the *Bole* sub-city (AACA, 2018). But the car-oriented design approach of streets in Addis Ababa (AA) favored vehicular speed while compromising the safety of pedestrians. (AACA, 2018). Most people on foot face several challenges in the urban environment, including inadequately sized walkways, unsafe crossings, insufficient illumination, poorly maintained infrastructure, an unsafe environment for children, and a lack of opportunity to stay, play, and exercise. (AACA, 2018). The city's weather conditions favor healthy and environmentally friendly means of

transportation (WorldBank, 2022). However, pedestrian infrastructure like sidewalks is often "narrow, uneven, obstructed, or nonexistent," which makes them uncomfortable and a safety concern for the "most vulnerable road users": pedestrians (WorldBank, 2022).

Despite their smaller share as a mode of transport, which is 15%, personal motor vehicles (PMV) have a substantial effect on the city's transportation system (AACA, 2018). This contributes to increased congestion, loss of public space, air and noise pollution, and traffic fatalities (AACA, 2018). In spite of its increased import taxes, the number of private vehicles is increasing, and approximately 70% of the country's vehicles are registered in Addis Ababa (AACA, 2018). From 110,000 cars imported in 2016, a 50% increase was noted in 2017 and 2018 (AACA, 2018). Recently, vehicle growth has averaged 8 percent per year, with 630,000 vehicles on the road by 2020 (WorldBank, 2022).

In an attempt to accommodate the growing number of vehicles, efforts mostly prioritize car-related demands over pedestrians (WorldBank, 2022). As a result, traffic accidents and fatalities are becoming more common (AACA, 2018). Fatalities increased from 374 in 2013 to 463 in 2016, of which 80% were pedestrians (AACA, 2018). One reason for such fatalities is the fact that only 14% of the roads are rated acceptable for pedestrian safety (AACA, 2018). Recently, the fatality rate reached nearly 500 every year, of which 76% are pedestrians (WorldBank, 2022).

Over the next century, the challenges and pressures placed on the urban streets will grow in number and complexity, and they will have to meet an ever-expanding set of demands. (NACTO, 2013). In the city of Addis Ababa, pedestrian infrastructure and services have yet to meet the rapid urban growth. (WorldBank, 2022). Immediate interventions are required to address the city's demand for high-quality pedestrian facilities. (AACA, 2018).

Urbanization necessitates that street serve not only as transportation corridors but also as public spaces. (NACTO, 2013). Streets should be meant for staying rather than merely passing through, as they currently are. (Moughtin, 2003). For this to become a reality, streets should provide a comfortable environment for pedestrians.


Street vending, parked cars, street signs, and poles at the sidewalks


Bus stop shades that take up a large portion of the sidewalks and pedestrians on the street


Unpaved and/or damaged pavement, holes, and related maintenance issues on sidewalks


Building elements that take up a portion of the sidewalk, pushing people to the street


non-functioning sidewalk lights at night and runoff and drainage issues on rainy days


interrupted tactile pavements affecting visually impaired and non-wheelchair-friendly conditions

Figure 1.2 Illustrations of existing sidewalk conditions

1.3. Objectives of the Study

1.3.1. General Objective

The general objective of this research is to investigate pedestrian comfort at the selected street segments along the Light Rail Transit (LRT) of Addis Ababa with the aim of promoting the utilization of streets as public spaces for a livable and vibrant urban environment.

1.3.2. Specific Objectives

The specific objectives of the study are as follows:

- To understand the quality indicators of the comfort of the pedestrian environment for the utilization of streets as a public space.
- To investigate the physical context and pedestrian activity of the three selected street segments along the LRT from Lideta to Meskel Square at peak hours of the day.
- To evaluate the performance of the street pedestrian environment as a public space.

1.4 Research Questions

The general research question is: How well are the selected streets' pedestrian environments functioning as a comfortable public space that enhances the user's (pedestrian) experience more than a mere corridor for movement?

- What are the quality indicators of the comfort of the pedestrian environment for the utilization of streets as a public space?
- What do the physical context and pedestrian activity on the three selected street segments along the LRT from Lideta to Meskel Square at peak hours of the day look like?
- How well does the street pedestrian environment perform as a public space?

1.5 Scope of the Study

Thematic Scope: This study's thematic scope is confined to investigating the multidimensional aspects of comfort in streets as public spaces. According to the theory by the team of "Project for Public Space (PPS)," the four core issues in making "great" public space are sociability, uses and activity, access and linkage, and comfort and image.

Spatial Scope: Spatially, this study is confined to the pedestrian walkways, specifically the sidewalks, that border public streets.

Temporal Scope: The temporal scope of this study is confined to daytime hours, with a particular focus on periods of heightened pedestrian activity, encompassing peak hours on both weekdays and weekends.

1.6 Description of the Study Area

The study was conducted in Addis Ababa on the selected streets along the Light Rail Transit (LRT) from Lideta to Meskel Square. For the purpose of this study, the streets are studied in three segments. The first is the segment from Lideta to Mexico; the second is from Mexico to Legehar; and the third is from Legehar to Meskel Square. The lengths of the streets are 1.0 km, 0.8 km, and 0.6 km, respectively.For the selection criteria, refer to Section 3.1.

Figure 1.3 Study Area Location

1.7 Limitation of the Study

This study employed a repetitive data collection approach, encompassing both the physical environment and its interaction with pedestrians and user perception surveys. While this methodology provided valuable insights into the interaction between environmental factors and human experience, it was subject to time and budget limitations that influenced the extensibility of the case studies.

1.7 Significance of the Study

For Urban Designers, Policymakers, Environmental and Public Health Officials

This study could contribute as an input for designers and government policymakers by providing essential inputs from the existing context and the users' perceptions for designing and improving the urban street environment. The focus of those officials' improvements might be on promoting a healthy, pedestrian-friendly, walkable, clean, comfortable environment and sustainable cities that promote physical activity, reduce reliance on automobiles, foster a sense of community, and improve the overall livability of cities.

For Researchers

This study can serve as a reference for other researchers and a starting point for further studies on the concept of using streets as public spaces or other place-making theory approaches.

1.9 Organization Of the Study

This paper is organized into five chapters. The first chapter, the introduction, compiles the background, problem statement, objectives, research questions, scope, study area description, limitations and significance, and organization of the document. The second chapter, the literature review, discusses the existing theoretical knowledge about the topic. It begins with the definition of key words, and then existing theoretical concepts, renowned individuals' work, quality parameters, best practices, and design approaches are reviewed. The third chapter, the methodology, covers all the methods and the research design issues. Under the fourth chapter, Result and Discussion, data presentation, analysis, and discussion on the results are compiled. The fifth chapter, Conclusion and Recommendations, is a section in which a conclusion is made based on the previous chapter and recommendations for improvement, general and specific.

Table 1 1 Thesis structure

Chapters	Topic	Contents In Brief
One	Introduction	What? - *Introducing the study*
Two	Literature Review	What is the knowledge basis? - *Theoretical Review*
Three	Research Methodology	How? - *Research Methods and Design*
Four	Results and Discussion	What are the results? • *How is the Context?* • *What is the pedestrian activity and type?* • *What is the user's perception?* • *How well is the street environment functioning?* Discussion on the result based on literatures *Investigations, observation, survey, PSI evaluation*
Five	Conclusion and Recommendations	Conclude the results and their implications. What could be done? General and Specific design strategies and approaches

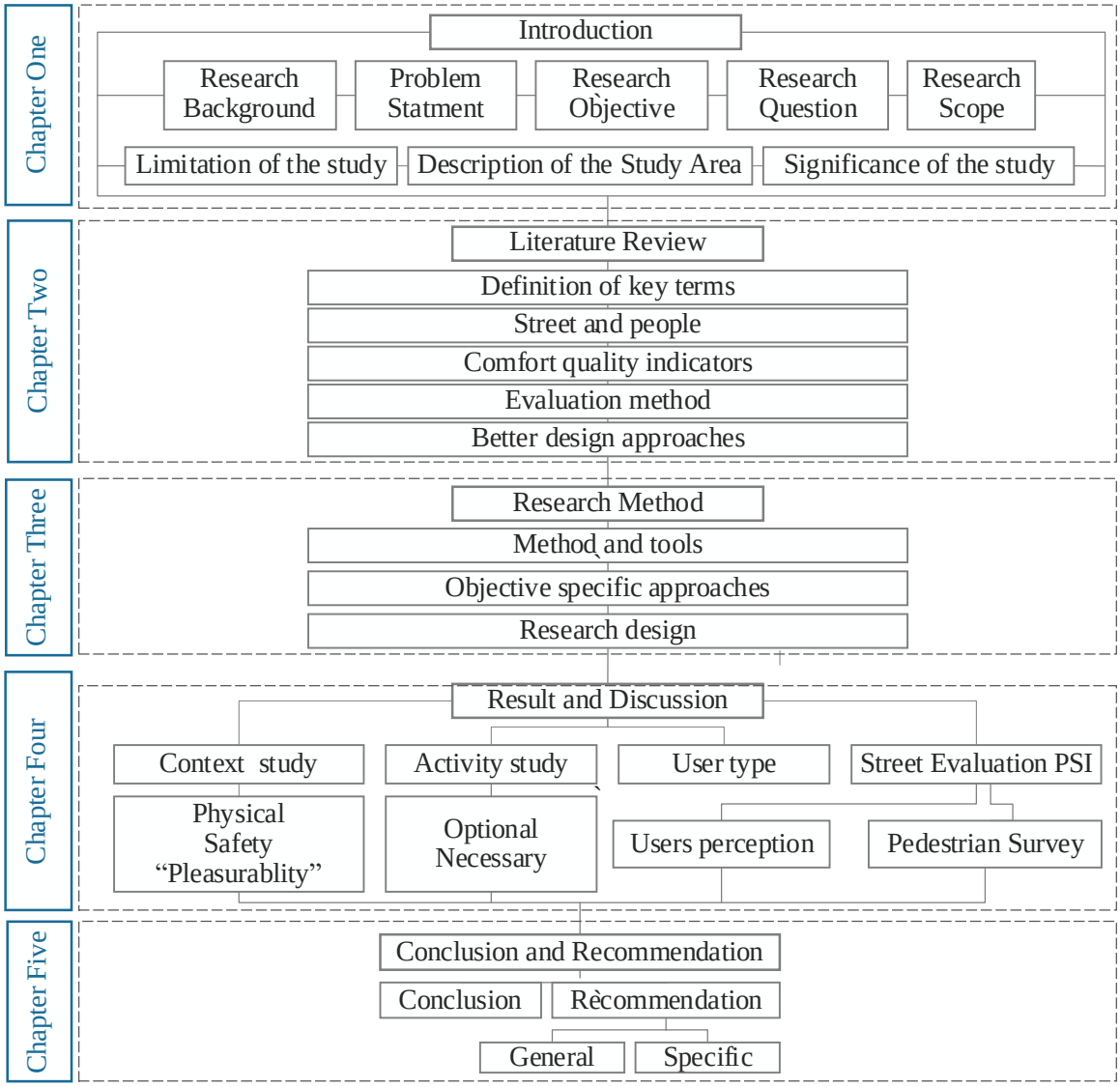


Figure 1.4 Organization of the work

CHAPTER TWO

2. LITERATURE REVIEW

2.1 Terms and Definitions

2.1.1 What is Public?

Based on the UN-Habitat (2015) statement, the term “public” here is to indicate “Space of the Public," which refers to the "public sector realm," where citizens delegate authority, provide resources, and commit management to local officials.

2.1.2 What is Public Space?

Regardless of its wider, multi-disciplinary, and context-dependent meaning, UN-Habitat (2015) states the definition as: “Public spaces are all places publicly owned or of public use, accessible and enjoyable by all for free and without a profit motive.” It also states its role as “public spaces are a key element of individual and social well-being, the places of a community’s collective life, expressions of the diversity of their common, natural, and cultural richness, and a foundation of their identity.”

Types of public spaces

UN-Habitat (2015) broadly classifies public spaces into three categories.

1. **Streets as public spaces**: This refers to streets, avenues, boulevards, squares, plazas, including pavements, passages and galleries, and bicycle paths.
2. Public Open Spaces: This refers to “parks, gardens, playgrounds, public beaches, riverbanks, and waterfronts.”
3. Public Urban Facilities: This refers to “public libraries, civic/community centers, municipal markets, and public sports facilities.”

2.1.3 What is a Street?

There are several perceptions, definitions, and representations of a street. Mehta (2013) describes that the definitions may have a morphological perspective: “the street as a physical entity, the emphasis on circulation over other activities,” a sociological perspective: “as a social space rather than just a channel for movement,” and a political perspective: “spaces that citizens have used to express their social and political beliefs, needs, and rights.” He states that the streets are places for economic survival, information and education, debate and demonstrations, expression of identities, leisure and play, and refuge for the homeless. According to NACTO

(2016), streets are multidimensional spaces that provide movement space, access, and activities and evolve with time to meet the demand for a sustainable environment, economic activity, and cultural importance.

2.1.4 Why the Street?

Streets are an essential element that plays a crucial role in the urban environment. Therefore, its consideration could impact the overall functioning of a city. Mehta (2013) states that streets form a “basic unit of space in our experience of the city,” and they are the most immediate public spaces in cities, supporting cultural, economic, political, and social activities. Streets in urban areas constitute a “significant part of the public open space” and “hold a special place in the domain of public space.” They are also the “most fitting symbol of the public realm." Mehta also states the fact that “more than half of the world's population currently lives in cities,” resulting in a significant number of people encountering street and People rely on the streets for functional, social, and recreational activities such as transport, shopping, play, meeting and interacting with others, relaxation, and even survival. He argues that streets that meet people's daily functional, social, and recreational demands have been linked to economic development, physical wellbeing, and a sense of community.

2.1.5 What is Comfort?

The Oxford dictionary describes “comfort" as a state of physical ease and freedom from pain or constraint. The Merriam-Webster dictionary describes comfort as “a feeling of relief or encouragement, assistance and support, contented well-being, a satisfying or enjoyable experience, one that gives or brings comfort." Comfort in public spaces is the physical ease and psychological relief for users despite their differences while engaging in universal human activities (J.Gehl, 2010).

2.1.6 Why Comfort?

Studies support the idea that comfort is a major factor in using the street as a public space. Mehta, with his research, finds that “the more sociable and livelier places on the street were those that were better able to satisfy the range of physical, social, and psychological human functions on the street.” “The number of people and/or their duration of stay,” according to his research, was an indicator of “how comfortable, pleasurable, and meaningful these locations were” and “how well they served basic human needs” (Mehta, 2013). Lang (1987), as cited on Mehta (2013), also described the necessity of comfort with the following statement, “A comfortable, pleasurable, and meaningful environment is one that provides physiological comfort, affords standing patterns of behavior, provides pleasing sensory experiences, and has positive symbolic associations for its users.”

2.2. Streets and Pedestrians: The Human Dimension

The human dimension of urban planning has been overlooked for decades, while other issues such as car traffic accommodations have come into focus. Gehl (2010) supports the above statement and describes that, when car traffic increases, the competition for city space intensifies, leading to less and less dignified conditions for urban life and pedestrians. City dwellers in many cities have been increasingly poorly treated, leading to limited space, noise, obstacles, pollution, accident risk, and "disgraceful" conditions. He stated that this has reduced the opportunities for pedestrianism and placed the social and cultural functions of city space under siege, reducing its traditional function as a meeting place and social forum.

Currently, a shift is happening. Gehl (2010) and NACTO (2016) state that cities are rediscovering the advantages of creating safe, livable streets that balance the needs of all users, and both argue that streets should be evaluated as opportunities to gain overall benefits rather than as transportation corridors. Increased concern for the human dimension of city planning reflects a demand for better urban quality, with direct connections between improvements for people in city space and visions for achieving lively, safe, sustainable, and healthy cities.

Streets serve a range of users, including pedestrians. NACTO (2016) describes pedestrians as persons of "all abilities and ages" who sit, walk, pause, and rest along city streets. It also argues that "designing for pedestrians" means "making streets accessible to the most vulnerable users" by creating safe environments with continuous, clear pathways, including visual variety, engaging building frontages, designing for human size, and including weather protection to produce a pleasant street. Various variables influence the variety of users and the number of people on a specific street, including the time of day, the size of the street, the urban surroundings, and the local weather. Creating an inviting environment that promotes access, safety, comfort, and enjoyment by designing streets that balance the demands of varied users is essential.

2.2.1 Streets and Pedestrian Activity

As mentioned in Gehl (2010), life in city space is characterized by a "variety of activities," such as purposeful walks, promenades, short stops, longer stays, window shopping, conversations and meetings, exercise, dancing, recreation, street trade, children's play, begging, and street entertainment. Unpredictable and unplanned spontaneous actions are also part of street activities. According to Gehl (2010), outdoor activities in public areas like streets are

generally classified into three types: “necessary activities, optional activities, and social activities."

Types of activities on the street

a) Necessary activities

These are the purposeful necessary activities, “activities that people generally have to undertake,” which include “going to work or school, waiting for the bus, bringing goods to customers”. This type of activity is conducted under all circumstances.

b) Optional activities

Such activities are the largely recreational, optional activities that people might like, which include walking down the promenade, standing up to get a good look at the city, or sitting down to enjoy the view or the good weather. City quality is a decisive prerequisite for this important group of activities.

c) Social activities

Include all sorts of human connection and occur everywhere as individuals go in the city.

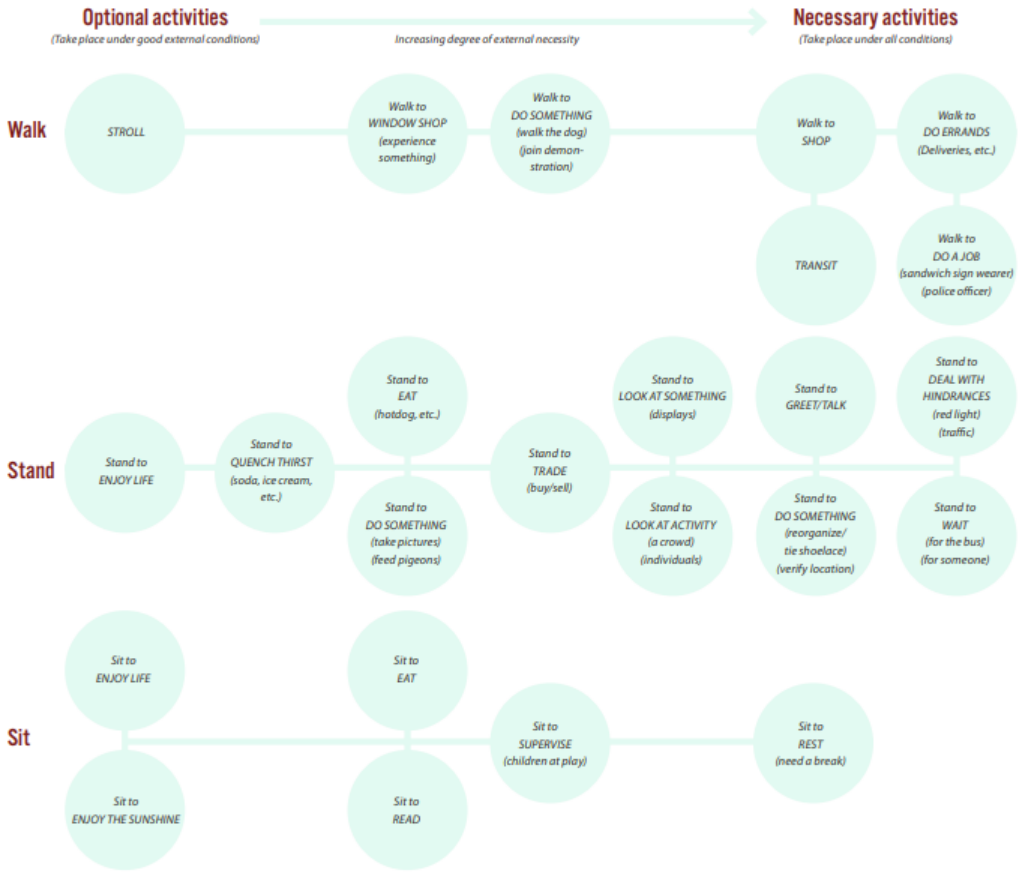


Figure 2.1 Examples of Necessary and Optional Activities

Source: (Gehl and Svarre 2013)

2.2.2 Streets and Pedestrian Experience

Streets are the stage upon which much of human experience unfolds; they bring life to a city's living fabric, showcasing daily activities, fostering connection and belongingness, and creating memories. They offer a variety of sights, sounds, and smells that shape our perception of the urban environment. NACTO (2016) mentioned that the streets shape the human experience of neighborhoods and cities. The ease with which individuals travel from one location to another, access services, enjoy their environment, and feel safe has an influence on their positive experience. Some of the aspects related to the pedestrian experience are summarized below.

a) Human senses

Walking on sidewalks offers an intimate street experience, requiring evaluation at human eye level and walking pace. Pedestrians utilize all senses, with comfort influenced by smells, noises, textures, and visual attractions. The combination of textures, materials, noises, and visual cues can create a welcoming and appealing environment for all abilities.

b) Social interaction

People can meet new people and friends and feel socially engaged on well-designed streets. Streets with a lower number of traffic and speeds expand the domain of the private areas that border the street, boosting the possibility of social contact.

c) Empowerment and social inclusion

The streets should be “places of empowerment” for the most disadvantaged people. Streets should be an inclusive area for varied users, especially “persons burdened with poverty or living in cultures that suffer social inclusion issues.”

d) Expression

Streets, being the major network of public space in a city, are frequently used “for political or cultural expression, as seen by parades, marches, and festivities." To accommodate such activities, streets should be built on neutral ground.

e) Spiritual and personal meaning

Streets hold “memories of places and events" as settings for everyday activities and rituals. Streets may have “personal meaning” and have special significance for people; as a result, the design of streets should promote safe, pleasant, and joyful experiences.

f) Comfort and safety

People feel "more comfortable" on streets that are safe. To ensure a safe experience, urban streets must be planned for reduced vehicle speed and feature walkways with lighting, furniture, and shade.

2.2.3 Streets and Pedestrian Health

According to the World Health Organization, as mentioned in NACTO (2016), “health is a state of complete physical, mental, and social well-being and not merely the absence of disease." Because urban streets serve as a platform for everyday experiences, they must be designed to promote human health and well-being for all. Some aspects related to pedestrian health from the book are described below.

a. Air quality

The air quality in the urban environment could impact health and comfort of the pedestrians. The air we breathe while walking through the city is intricately linked to our overall comfort and well-being. While the design of a street might entice us with its aesthetics and functionality, poor air quality can quickly deter us from enjoying it.

b. Physical activity

Streets with a good pedestrian environment offer a unique opportunity to seamlessly integrate physical activity into the fabric of daily life. The design of streets could incorporate elements that promote physical activity, like wide sidewalks and dedicated cycling lanes, which provide safe and accessible spaces for movement. Playgrounds, fitness equipment, and green spaces further encourage people to be active, engaging in recreational activities, and enjoying the outdoors.

c. Access to nature

The presence of nature on streets, even in small amounts, plays a significant role in improving our physical and mental well-being. Weaving natural elements into the urban landscape provides opportunities for stress reduction, improved cognitive function, and a stronger connection to the environment.

d. Noise pollution

Noise pollution on city streets, from traffic to construction work, can create an unhealthy environment, negatively impacting our physical and mental well-being. Addressing noise pollution and taking proactive measures can lead to healthier and more comfortable urban environments for everyone.

e. Traffic fatality and injury

Traffic crashes are a major global health threat, causing death and injury and causing long-term physical, emotional, and financial consequences for numerous individuals. By implementing comprehensive strategies that address unsafe infrastructure and the needs of vulnerable road users, it is possible to create safer streets and save lives.

2.3. Concepts of the Street as Public Space

2.3.1 Streets as a Public Space

The concept of a street as a public space goes beyond its mere function as a transportation route. It recognizes the multifaceted role streets play in shaping the social, economic, and cultural fabric of a community. Gehl argues that cities are "places where people meet" to exchange ideas, trade, or simply relax (J.Gehl, 2010).

The street serves as a public space, and it encompasses various aspects and roles, as outlined in various literatures, including J. Gehl (2010), Mehta (2013), NACTO (2016), UN-Habitat (2013), and PPS (2000).

a. A stage for all

Streets are open and free to access by all members of the community, regardless of age, income, or background. This characteristic makes them inherently democratic and inclusive spaces.

b. Social Hub

Streets are natural meeting points and gathering spaces. People come together to socialize, share stories, and witness events. Children play, teenagers hang out, and neighbors catch up, fostering a sense of community and belonging.

c. Economic Engine

Streets are vital for economic activity. They provide access to shops, businesses, and markets, fostering trade and commerce. Street vendors, in particular, contribute significantly to local economies by offering affordable goods and services.

d. Cultural Canvas

Streets reflect the cultural identity of a community. They showcase local art, architecture, and traditions, serving as a permanent exhibition of a city's unique character.

e. Platform for Civic Engagement

Streets are often the stage for protests, demonstrations, and other forms of civic engagement. They provide a space for people to express their views, participate in democratic processes, and challenge injustices.

f. Promoter of Health and Well-being

Streets designed for pedestrians, cyclists, and public transport encourage physical activity and healthy lifestyles. They also contribute to mental well-being by providing opportunities for social interaction and connection with nature.

2.3.2 A Historical Perspective of Streets as A Public Space

Streets have always played a crucial role in shaping the social, economic, and cultural life of cities. Their design and function have continuously evolved throughout history, reflecting the changing needs and values of society. Understanding the historical perspective allows us to appreciate the importance of streets as public spaces and learn from past successes and mistakes in shaping our cities for the future. UN-Habitat (2013), in the opening section of the book "Streets as Public Spaces and Drivers of Urban Prosperity," describes the historical evolution of streets as public spaces, tracing their significance across different periods and geographical contexts. The key points are summarized below:

a. Ancient Era:

Streets played a central role in the development of ancient cities, serving as vital commercial centers, religious sites, and social gathering places. Examples include the Agora in Athens, the Forum Romanum in Rome, and the market streets of Mesopotamia. These early streets were often designed to accommodate pedestrians, with wide sidewalks, plazas, and colonnades providing shade and shelter.

b. Medieval Era:

Streets continued to be important public spaces in medieval cities, though their function shifted slightly. With growing populations and commercial activity, streets became more crowded and bustling, often serving as marketplaces and workshops. However, sanitation and safety concerns became pressing issues, leading to the development of regulations and street cleaning practices.

c. Renaissance and Enlightenment:

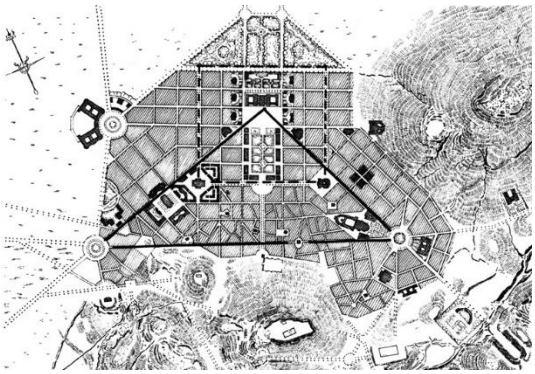
During this period, a renewed emphasis on aesthetics and urban planning led to the creation of grand boulevards and plazas. These spaces were designed to showcase the wealth and power of cities, and they became popular venues for social gatherings and cultural events. Examples include the Champs-Élysées in Paris and the Piazza San Marco in Venice.

d. Industrial Revolution:

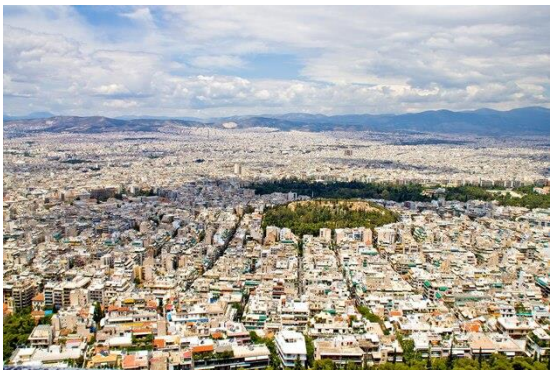
The Industrial Revolution brought about significant changes to the urban landscape, with the rise of factories and working-class neighborhoods. Streets became increasingly dominated by traffic, leading to congestion, pollution, and safety hazards. This period also saw the emergence of public health concerns and the need for improved street sanitation and infrastructure.

e. Modern Era:

The 20th century witnessed a shift towards automobile-centric urban planning, prioritizing car traffic over other modes of transportation. This resulted in the widening of streets, the construction of highways, and the decline of pedestrian-friendly spaces. However, recent decades have seen a growing recognition of the importance of streets as public spaces, leading to a renewed focus on pedestrian-friendly design, mixed-use development, and sustainable transportation options.



Plan for the City of Athens designed by Kleanthis and Schaubert in 1833.
Source: https://www.athenssocialatlas.gr



A view of Athens from Lycabettus hill.
Source: © Alena Stalmashonak/Shutterstock, as mentioned on UN-Habitat (2013)

Street Network ending in broad boulevards in Barcelona, Spain.
Source: https://www.airpano.com/gallery

Champs Elysees boulevard. France, Europe.
Source: Paris Convention and Visitors Bureau website

Figure 2.2 Historical Street systems of different eras

2.3.3 Studies on Streets as a Public Space

Streets are frequently the most important yet underutilized public places in cities. Streets, in addition to providing travel space, play an important role in the “public life of cities” and communities and need to be built as both public areas and circulation routes. 13 literatures with concepts related to the use of the street as a public space from different literatures by different renowned planners and designers from 1960 to 2020 have been reviewed and summarized as follows:

1. The Image of the City (1960)

"The Image of the City" by Kevin Lynch explores how people perceive and mentally map the cities they inhabit. It investigates the elements that contribute to a city's "imageability," the ease with which its residents can form mental pictures of it. Although it mainly focuses on imageability, it also considers the pedestrian experience and interaction with the environment.

Key points

a. **People create mental maps of their city:** These mental maps are based on their sensory experiences and interactions with the urban environment.
b. **Five key elements shape urban imageability:** Paths, edges, districts, nodes, and landmarks. These elements contribute to the legibility and memorability of a city.
c. **Imageability is crucial for wayfinding and navigation:** A well-imaged city is easier for people to navigate and feel connected to.
d. **Urban design should consider the human experience:** Planning cities solely based on function and efficiency can lead to sterile and unmemorable environments.

"The Image of the City" has helped shift the focus from purely functional concerns to the importance of creating cities that are both livable and memorable.

2. The Death and Life of Great American Cities (1961)

In her influential book, "The Death and Life of Great American Cities" (1961), Jane Jacobs critiques the dominant urban planning practices of the time, arguing that they were destroying the very essence of what makes cities vital and vibrant. Her arguments include criticism of modern urban planning, the importance of diversity and mixed uses, the importance of **public space and streets**, and the importance of local knowledge and community engagement.

Here are the key points of Jacobs' argument in the book:

a) **Streets as Public Spaces:**
    - Jacobs argues that streets are not just for transportation, but also vital public spaces where people interact, socialize, and build community.
    - This social interaction, in turn, creates a natural form of surveillance that deters crime and ensures the safety of residents.

b) **Eyes on the Street:**
    - Jacobs emphasizes the importance of street design that promotes "eyes on the street." This means creating spaces that are well-lit, open, and encourage people to be present and observe their surroundings.
    - Examples include mixed-use development, active building frontages, and well-maintained sidewalks with seating areas.

c) **Community Engagement:**
    - Jacobs advocates for mixed-use development that brings together residences, businesses, and other uses in close proximity. This creates a continuous flow of activity throughout the day, providing natural surveillance and reducing opportunities for crime.
    - Additionally, diversity in demographics and land use fosters a vibrant and dynamic environment, further contributing to safety and social cohesion.

d) **Diversity and Mixed-Use:**
    - Jacobs advocates for mixed-use development that brings together residences, businesses, and other uses in close proximity. This creates a continuous flow of activity throughout the day, providing natural surveillance and reducing opportunities for crime.
    - Additionally, diversity in demographics and land use fosters a vibrant and dynamic environment, further contributing to safety and social cohesion.

"The Death and Life of Great American Cities" has helped to shift the focus from large-scale projects to the needs of people and communities, and it has inspired a generation of planners and activists to work for more livable and sustainable cities.

3. Life Between Buildings (1971)

In his influential book "Life Between Buildings," Jan Gehl argues for a paradigm shift in urban design, prioritizing the needs and experiences of people in public spaces. He critiques the dominance of car-centric infrastructure and functionalist architecture, highlighting the negative impacts on social interaction, community building, and overall quality of life in cities.

Here is a summary of the key points from the book.

a) **Public Spaces as Living Places:**
    - Gehl challenges the perception of public spaces as mere connectors between buildings, advocating for their recognition as essential components of a vibrant and livable city.
    - He emphasizes the importance of designing spaces that encourage people to linger, interact, and engage in various activities.

b) **Human Needs and Sensory Perception:**
    - Gehl argues that successful public spaces cater to fundamental human needs for contact, stimulation, and security.
    - He encourages designers to consider human scale, sensory experiences, and diverse uses when creating public realms.

c) **Streets as Social Hubs:**
    - Gehl identifies streets as crucial for social interaction, economic activity, and cultural expression.
    - He criticizes car-dominated streets and advocates for prioritizing pedestrians, cyclists, and public transport.

d) **Design Principles for Vibrant Public Spaces:**
    - Gehl proposes several design principles for creating inviting and functional public spaces, including:
        - Human scale and walkability: prioritizing pedestrian comfort and accessibility.
        - Mixed-use development: integrating residential, commercial, and cultural uses to create lively and dynamic spaces.
        - Seating and public furniture: providing opportunities for people to rest, socialize, and observe the surrounding environment.
        - Openness and transparency: ensuring clear lines of sight and fostering a sense of safety.
        - Greenery and landscaping: integrating nature into the urban fabric to improve aesthetics and well-being.

"Life Between Buildings" has had a significant impact on the way we think about and design public spaces around the world. Gehl's ideas have inspired a generation of architects, planners, and urban designers to create more human-centered and livable cities.

4. A Pattern Language (1977)

A Pattern Language, written by Christopher Alexander, Sara Ishikawa, and Murray Silverstein, is a unique and influential book that proposes a new way of thinking about architecture and design. This influential book proposes a new approach to architecture and design based on the concept of "patterns." These patterns are recurring solutions to design problems that have been developed and refined over centuries. By understanding and utilizing these patterns, designers can create buildings and communities that are more humane, livable, and sustainable.

Here is a summary of the key points from the book.

a) Patterns As a Language:

- The book presents a collection of 253 patterns, each addressing a specific design problem.
- These patterns are not prescriptive rules but rather flexible guidelines that can be adapted to different contexts and needs.
- The patterns are organized hierarchically, from larger-scale patterns like "towns" and "neighborhoods" to smaller-scale patterns like "windows" and "doors.". This allows users to build up a design from individual elements to create a coherent whole.
- Examples of Patterns:
    - **The Courtyard:** A central courtyard surrounded by buildings creates a sense of community and provides a space for outdoor living.
    - **The Window Seat:** A window seat provides a comfortable place to sit and observe the street life outside.
    - **The Walkable Street:** A street designed for pedestrians, with narrow lanes, wide sidewalks, and plenty of shade.
    - **The Neighborhood Park:** A small park within walking distance of homes provides a place for people to gather, play, and relax.
    - **The Mixed-Use Building:** A building that contains a variety of uses, such as shops, offices, and apartments, creates a more vibrant and active community.

b) Human-Centered Design:

- A Pattern Language emphasizes the importance of designing for people and their needs.

- The patterns encourage creating spaces that are comfortable, functional, and aesthetically pleasing.
- They promote social interaction, community building, and a sense of belonging.

c) Participation and Community Ownership:

- The book encourages public participation in the design process.
- It provides tools and resources that enable people to understand and use the patterns to create their own environments.
- This participatory approach fosters a sense of community ownership and responsibility for the built environment.

d) sustainability and Environmental Considerations:

- A Pattern Language promotes sustainable design practices that respect the natural world and minimize environmental impact.
- The patterns encourage the use of local materials, energy-efficient technologies, and sustainable building techniques.
- They also encourage the creation of spaces that promote healthy lifestyles and connection with nature.

"A Pattern Language" has had a profound impact on architecture, urban design, and environmental design. It has inspired a generation of designers to think more holistically about the built environment and to create spaces that are more livable and sustainable.

5. The Social Life of Small Urban Spaces (1980)

The Social Life of Small Urban Spaces, by William H. Whyte, delves into the relationship between people and small public spaces in urban environments. Using observation, interviews, and time-lapse photography, Whyte explores how these spaces function and evolve based on user interaction and design.

Here is a summary of the key points from the book.

a) Beyond Functionality:

- Whyte challenges the traditional view of public spaces as mere connectors between buildings, emphasizing their crucial role in fostering social interaction, community building, and economic activity.
- He argues that people are drawn to these spaces not just for their function but also for the opportunities they provide for social engagement and observation.

b) The factors for successful public spaces:

- Through detailed observations and interviews, Whyte analyzes various public spaces, identifying the factors that make them successful or unsuccessful in fostering social life.

  Key findings

  - **Seating arrangements:**

    The placement and type of seating significantly impact how people use a space. Seats facing each other and arranged in small clusters promote conversation and interaction, while long rows of seats facing outward discourage social activity.

  - **Sun and shade:**

    People are naturally drawn to areas with a balance of sun and shade. This allows for flexibility in usage throughout the day and encourages lingering.

  - **Pedestrian activity:**

    Spaces located on busy pedestrian paths attract more people and create a sense of energy and vibrancy.

  - **Activities and events:**

    Public spaces that host regular events or activities attract diverse audiences and foster community engagement.

  - **Food and drink:**

    The availability of food and beverage vendors can significantly enhance the attractiveness and social function of a space.

  - **Accessibility and enclosure:**

    Public spaces should be easily accessible and provide a sense of enclosure and comfort. This can be achieved through landscaping, architectural elements, and street furniture.

c) People-Centered Design:

- Whyte advocates for designing public spaces that prioritize people over cars and prioritize social interaction.
- He encourages incorporating features like ample seating, shade, and landscaping, along with diverse uses such as cafes, shops, and street performers, to create vibrant and dynamic spaces.

d) Adaptability and Change:

- Whyte emphasizes the dynamic nature of public spaces, highlighting how their use and character can change over time.
- He encourages flexible design solutions that can adapt to evolving needs and preferences of the community.

By highlighting the importance of social interaction in public spaces, Whyte's work inspired a shift away from large, barren plazas and towards smaller, more human-scaled spaces designed to encourage social contact. His findings continue to inform the design and revitalization of public spaces around the world.

6. Livable Streets (1981)

Livable Streets, written by Donald Appleyard, explores the relationship between the design of our streets and the quality of life in cities. He argues that streets are not merely transportation arteries, but rather vital public spaces that shape the character and vibrancy of our communities.

Here is a summary of the key points from the book.

a) Streets are Public Spaces:

- Appleyard emphasizes that streets are not just transportation corridors, but also essential public spaces where people live, work, play, and interact. He advocates for a shift in focus from prioritizing the movement of vehicles to prioritizing the needs of people by creating safe, inviting, and aesthetically pleasing streets that encourage walking, cycling, and social interaction.

b) Traffic danger and safety:

- Appleyard demonstrates that streets dominated by high-speed traffic create dangerous environments for pedestrians, cyclists, and children. These environments also contribute to noise and air pollution, making them unpleasant and unhealthy places to be.
- By contrast, he argues that streets with lower levels of traffic are safer, more pleasant, and encourage social interaction. These streets become extensions of the living space, allowing children to play, neighbors to socialize, and residents to enjoy the outdoors.

c) Street design and social interaction:

- Appleyard identifies various design elements that can promote social interaction on streets, including:

- Narrowing streets and reducing traffic speeds
- Creating pedestrian-only zones and plazas
- Providing attractive and comfortable seating areas
- Planting trees and other greenery for shade and visual appeal
- Encouraging mixed-use development with shops, cafes, and other attractions

d) Resident control and community building:

- Appleyard emphasizes the importance of empowering residents to participate in the design and management of their streets. He argues that this can lead to more responsive and adaptable street environments that better reflect the needs and desires of the community.

"Livable Streets" has been a major influence on the field of urban design and planning. Its call for streets that prioritize people over cars has inspired numerous initiatives around the world to reclaim streets for social interaction, community building, and public health.

7. Great Streets (1995)

Allan Jacobs, in his book "Great Streets," sets out to identify the design characteristics and qualities that make some streets remarkably successful and vibrant. He analyzes streets around the world, comparing and contrasting them to determine the key elements that contribute to their greatness.

Key findings

a) Physical characteristics: Some key characteristics contribute to a great street, are:

- **Human scale:** Streets that are designed for pedestrians, with a comfortable width and height, encourage walking and lingering.
- **Mix of uses:** Streets that have a mix of shops, cafes, residences, and other uses create vibrant and active environments.
- **Street furniture and landscaping:** Attractive Street furniture, such as benches, trees, and fountains, provide places for people to stop and enjoy the street.
- **Facade design:** Buildings with interesting facades and entrances contribute to the visual appeal of the street and encourage interaction with the street environment.
- **Activities and events:** Streets that host regular events or activities attract diverse audiences and create a sense of community.

b) Social and cultural aspects: In addition to physical characteristics, social and cultural factors also contribute to a great street, including:

- **Sense of community:** Streets that foster a sense of community encourage residents to feel ownership and pride in their street.
- **Safety and security:** Streets that are safe and well-lit encourage people to use them at night and contribute to a vibrant 24-hour city.
- **Accessibility:** Streets that are accessible to everyone, regardless of age or ability, promote inclusivity and social interaction.

Great Streets has been influential in the field of urban design and planning. Its emphasis on the importance of designing streets for people and fostering social interaction has inspired numerous initiatives to create more livable and sustainable cities.

8. How to Turn a Place Around (2000)

The "Project for Public Spaces" (PPS), led by Fred Kent, argues that great public spaces are essential for celebrations, social interactions, and cultural mixing. When designed well, they serve as "front porches" for public institutions such as libraries, field houses, and schools, allowing for interaction with friends and government while also acting as a stage for public lives. PPS's "How to Turn a Place Around" from 2000 is a handbook that offers practical advice on how to change conditions through public participation and transformation processes. (Gehl, and Svarre, 2013).

Key Principles

- What Makes a Successful Place?
  - **Access & Linkages**

    The accessibility of a place is determined by its visual and physical connections to its surroundings, including visibility, interesting edges, and proximity to public transit. Successful public spaces are easily accessible and visually appealing.
  - **Comfort & Image**

    A space's success relies on its comfort and image, including safety, cleanliness, and seating options, often overlooked but crucial for attracting and retaining customers.
  - **Uses & Activities**

    Activities are the foundation of great places, driving visitors to return for more. If a place lacks activities, it becomes deserted and unused. It's an indication to update or improve.

- **Sociability**

  People feel more connected to their community when they interact with friends, neighbors, and strangers; fostering such social activities is a quality of good places.

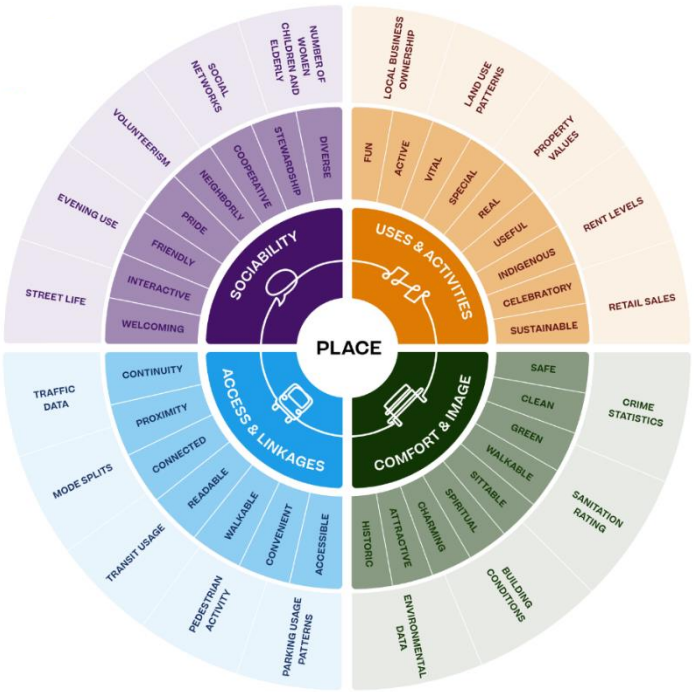


Figure 2.3 Key attributes to make a great place by PPS

Source: https://www.pps.org

9. Convivial Urban Spaces: Creating Effective Public Places (2008)

Henry Shaftoe, in his book, argues for the importance of designing public spaces that are convivial: places that encourage social interaction, foster a sense of community, and contribute to the overall livability of cities. Successful public spaces are essential for a sustainable built environment. Despite advancements in urban design, architects and planners often create bland, commercially-driven spaces that lack social sustainability and can generate future problems.

Key findings

a) **Designing for social interaction:**

The book emphasizes the importance of designing public spaces that encourage people to linger, interact, and engage in social activities. This can be achieved through various design elements, including:

- **Seating arrangements:** Placing seating in clusters or facing each other encourages conversation, while long rows of seats facing outward discourage interaction.
- **Activities and events:** Hosting regular events or activities attracts diverse audiences and creates a sense of community.

- **Accessibility:** Public spaces should be easily accessible to people of all abilities.
- **Comfort and safety:** Spaces should feel comfortable and safe, with adequate lighting, shade, and protection from the elements.
- **Human scale:** Public spaces should be designed for people, not cars. This means using smaller scales, providing pedestrian-friendly environments, and prioritizing human interaction.

b) **The importance of context:**

The book stresses that successful public spaces are not one-size-fits-all solutions. They must be designed to be responsive to the specific context and needs of the community they serve. This includes considering factors such as:

- **Culture and traditions:** Public spaces should reflect the cultural and historical context of the community.
- **Climate and environment:** The design of the space should be adapted to the local climate and environmental conditions.
- **Existing infrastructure and land use:** The space should be integrated with the surrounding area and complement existing infrastructure and land use patterns.

c) **The role of community engagement:**

The book advocates for actively engaging the community in the planning and design of public spaces. This ensures that the spaces meet the needs and desires of the people who will use them and fosters a sense of ownership and responsibility for the space.

10. The Street: A Quintessential Social Public Space (2013)

Vikas Mehta, in his book, Streets are not simply transportation corridors; they are vital public spaces that play a crucial role in fostering social interaction and building vibrant communities. Through detailed observations and interviews, Mehta examines how physical design, land use, and management practices can influence the social life of streets.

Key findings

a) **Physical design:** The arrangement of sidewalks, street furniture, and landscaping can significantly impact how people use the street. Seating areas, shade trees, and pedestrian-friendly features encourage lingering and interaction, while wide lanes and heavy traffic discourage social activity.

b) **Land use:** The mix of uses along a street influences its social vibrancy. Streets with a diverse mix of shops, cafes, residences, and workplaces attract a broader range of people and create opportunities for spontaneous encounters.
c) **Management practices:** The way streets are managed and maintained can impact their social atmosphere. Street closures, festivals, and events can create a sense of community and encourage people to use the street as a social space.
d) **Social interactions:** Streets serve as a platform for various social interactions, including informal conversations, planned gatherings, and observation of others. These interactions contribute to a sense of belonging and community.
e) **Meaning and perception:** People assign meaning and significance to streets based on their individual experiences and cultural contexts. These perceptions influence how they use the street and contribute to its overall social life.

"The street**:** a quintessential social public space" remains a seminal work in the field of urban design and social science. It provides valuable insights into the importance of streets as public spaces and offers practical guidance for creating more vibrant, inclusive, and socially sustainable communities.

11. Street Design: The Secret to Great Cities and Towns (2014)

Victor Dover and John Massengale, building upon the foundational work of the first edition (2006), this revised and expanded edition of "Street Design" argues that well-designed streets are the cornerstone of thriving cities and towns. It emphasizes the importance of creating streets that are not just functional transportation corridors, but also vibrant public spaces that contribute to the social, economic, and environmental well-being of communities.

The summary of the core principles is:

a) **Human-centered design:** Streets should be designed for people, not cars. This means prioritizing pedestrians, cyclists, and public transit users.
b) **Mixed-use development:** A diverse mix of shops, residences, workplaces, and cultural attractions creates vibrant and active streets.
c) **Walkability and accessibility:** Streets should be safe, comfortable, and accessible to all people, regardless of their age or ability.
d) **Greening the streets:** Trees, landscaping, and green spaces create a more attractive and inviting environment.

e) **Public spaces and gathering places:** Streets should offer opportunities for social interaction and community engagement.
f) **Design for all senses:** Streets should be designed to be visually appealing, comfortable to walk on, and offer interesting sounds and textures.
g) **Community engagement:** Residents should be involved in the planning and design of their streets.

12. Global Street Design Guide (2016)

The Global Street Design Guide (GSDG), published by the National Association of City Transportation Officials (NACTO), is a comprehensive and practical resource for designing streets that prioritize safety, pedestrians, cyclists, and transit riders. It was developed with input from experts in over 70 cities across 40 countries.

Key points

a. Sets a global baseline for street design: The GSDG establishes a common framework for designing streets that contribute to livable, equitable, and sustainable cities.
b. Prioritizes safety and accessibility: The guide emphasizes the importance of designing streets that are safe for all users, regardless of age, ability, or mode of transport.
c. Encourages multimodality: The GSDG promotes the integration of various transportation modes, including walking, cycling, public transit, and private vehicles, within the street design.
d. Focuses on public spaces: The guide emphasizes the importance of creating vibrant public spaces that encourage social interaction and contribute to the overall quality of life.

13. Principles for Public Space Design: Planning to Do Better (2019)

In "Principles for Public Space Design," Matthew Carmona argues for a positive, normative framework for shaping and managing public spaces. He emphasizes the importance of public spaces in contributing to the overall livability and experience of cities, and proposes a series of principles to guide planners and designers in creating successful public spaces.

Key principles

a) **Attractive and Welcoming:**
    - **Delineation:** Public spaces should be clearly defined and visually distinct from their surroundings, creating a sense of arrival and invitation

- **Accessibility:** Public spaces should be accessible to everyone, regardless of physical limitations or ability. This includes providing ramps, lifts, and other amenities for people with disabilities.
- **Safety and Security:** Public spaces should be safe and secure for everyone to use. This means providing adequate lighting, security patrols, and clear sightlines.

b) **Responsive to Context:**

- **Local distinctiveness:** Public spaces should reflect the unique character and history of the surrounding community. This can be achieved through design elements, artwork, and programming that celebrates local culture.
- **Integration with surrounding land uses:** Public spaces should be well-connected to surrounding buildings, streets, and other public spaces. This creates a sense of cohesion and makes the space more inviting and accessible.
- **Flexibility and adaptability:** Public spaces should be designed to accommodate a variety of uses and activities. This means providing flexible spaces that can be easily adapted to changing needs and events.

c) **Functional and Usable:**

- **Comfort and amenity:** Public spaces should be comfortable and inviting for people to linger and enjoy. This means providing seating, shade, and other amenities that cater to different needs and preferences.
- **Legibility and wayfinding:** Public spaces should be easy to navigate and understand. This means providing clear signage, consistent design elements, and well-defined pathways.
- **Maintenance and upkeep:** Public spaces require ongoing maintenance and upkeep to remain attractive and functional. This includes regular cleaning, repairs, and landscaping.

d) **Socially Sustainable:**

- **Promotion of social interaction:** Public spaces should encourage people to interact with each other. This can be achieved through design elements that promote conversation and community building, such as seating arrangements, gathering spaces, and public art.
- **Inclusivity and accessibility:** Public spaces should be welcoming and inclusive for people of all backgrounds and abilities. This means avoiding physical

barriers, providing accessible amenities, and promoting a culture of respect and tolerance.

- **Community ownership and engagement:** Public spaces should be designed with the community in mind. This means involving residents in the planning and design process, and providing opportunities for ongoing engagement and stewardship.

e) **Environmentally Sustainable:**

- **Climate-resilient design:** Public spaces should be designed to be resilient to the impacts of climate change. This includes using sustainable materials, planting trees for shade and stormwater management, and designing spaces that are adaptable to extreme weather events.
- **Ecological sensitivity:** Public spaces should be designed to be sensitive to the surrounding environment. This means minimizing negative impacts on ecosystems, promoting biodiversity, and using sustainable landscaping practices.
- **Connectivity and walkability:** Public spaces should be designed to encourage walking, cycling, and public transit use. This reduces reliance on cars and contributes to a more sustainable transportation system.

2.4. Summary of the literatures

This section summarizes the literature review based on two basic aims it was conducted to address. The first aim of this literature review was to grasp the basic theoretical issues on the topic of comfort, streets, and pedestrians in relation to the concept of a street as a public space. The second aim was to understand the quality indicators of the comfort of the pedestrian environment for the utilization of streets as a public space and how the street spaces could be evaluated based on those quality indicators.

2.4.1. Street and Public Spaces

Streets are essential public spaces that serve multiple functions beyond transportation, including community life and social interaction. They are the heart of a city, connecting people, places, and experiences. Streets are democratic and inclusive, open to all community members regardless of age, income, or background. They foster a sense of belonging, contribute to economic activity by providing access to shops, businesses, and markets, reflect a community's cultural identity, and encourage physical activity and healthy lifestyles.

The design of streets prioritizes cars and often neglects the needs of pedestrians, resulting in discomfort and reduced accessibility. The concept of the street as a public space is essential for creating healthy, livable, and sustainable communities. By investing in the streets and designing them with people in mind, it is possible to create spaces that promote physical activity, social interaction, and economic prosperity.

2.4.2. Quality Indicators of the Comfort of the Streets as a Public Space

Since the first research question is: What are the quality indicators of the comfort of the pedestrian environment for the utilization of streets as a public space? The study aimed to determine the quality indicators through an intensive literature review conducted from 1960 to 2020, focusing on 13 works related to the use of the street as a public space by renowned planners and designers (refer to Section 2.33). Content analysis was used to identify frequently mentioned points. The results indicated that the overall qualities of street spaces are a combination of safety, physical setting, and creating a sense of pleasure.

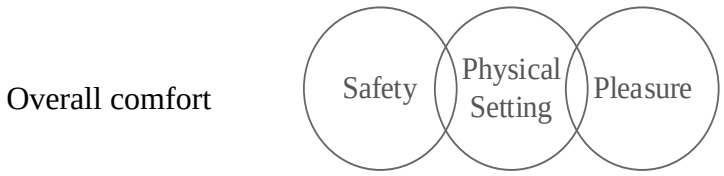


Figure 2.4 Essential quality aspects for comfortable street space. Source: Developed by the author

Table 2.1 Literature reviewed and its summary for quality indicators of comfortable street space

No	Title (Book, Journal, Article)	Author	Year
[1]	The Image of the City	Kevin Lynch	1960
[2]	The Death and Life of Great American Cities	Jane Jacobs	1961
[3]	Life Between Buildings	Jan Gehl	1971
[4]	A Pattern Language (1977)	C. Alexander et al.	1977
[5]	The social life of small urban spaces	William H. White	1980
[6]	Livable Streets	Donald Appleyard	1981
[7]	Great streets	Allan B. Jacobs	1993
[8]	How to Turn a Place Around	Project for public space	2000
[9]	Convivial Urban Spaces: Creating Effective P. Places	Henry Shaftoe	2008
[10]	The Street: A Quintessential Social Public Space	Vikas Mehta	2013
[11]	Street DESIGN The Secret to Great Cities and Towns	J. Massengale & V. Dover	2014
[12]	Global Street Design Guide	NACTO	2016
[13]	Principles for public space design, planning to do better	Matthew Carmona	2019
[14]	Evaluating Public Space	Vikas Mehta	2013

Comfort Aspects	Variables / Attributes	References														Freq.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Physical Comfort	Appropriate maintenance and physical condition	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Spaces to sit (public)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Spaces to sit (by business)							✓	✓		✓		✓		✓	
	Street furniture and artifacts	✓	✓	✓	✓		✓	✓		✓	✓		✓	✓	✓	
	Microclimatic comfort (shade and shelter)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Free of elements that discourage the use of space	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	
	Noise pollution						✓						✓		✓	
Safety	Visual/ physical connection to adjacent street	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
	Physical condition and maintenance appropriate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Lighting quality after dark	✓	✓	✓	✓	✓	✓			✓	✓	✓			✓	
	Presence of surveillances		✓								✓				✓	
	Safety from crime at day time		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Safety from crime after dark		✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	
	Safety from traffic	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	
Pleasurable Street	Memorable features architectural or landscape (imageability)	✓							✓	✓	✓	✓	✓	✓	✓	
	Sense of enclosure	✓		✓	✓	✓	✓	✓			✓				✓	
	Building facade Permeability	✓		✓		✓	✓	✓			✓	✓			✓	
	Personalization of the buildings on the street front			✓	✓	✓		✓			✓				✓	
	Façade Articulation & variety	✓				✓	✓	✓		✓	✓	✓			✓	
	Sensory complexity (density of sidewalk elements)	✓	✓	✓	✓	✓		✓			✓				✓	
	Sensory complexity (variety of sidewalk elements)	✓	✓		✓	✓		✓			✓				✓	
	Attractiveness of space	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Interestingness of space	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

2.4.3. Evaluation of the Street for Comfort as a Public Space

The second aim of the literature review was to understand the question: how could the street space be evaluated based on those indicators? The above summary of the quality indicators summarizes the quality aspects and their attributes (refer to Table 2.1). reference 14, "Evaluating public space," which considers most attributes for the overall comfort of street space for pedestrians. Vikas Mehta has already developed a PSI method to evaluate street performance. (See Section 3.11, under Subsection Objective 3b.) This method was adopted and utilized for this study.

- **Evaluate The Street Pedestrian Environment - Using the PSI**

  The public space index (PSI), developed by Vikas Mehta, is constructed to evaluate the five dimensions of public space (inclusiveness, meaningful activities, comfort, safety, and "pleasurability"). (Mehta, 2013). The points of interest for this research are the last three. The index measures both the observed character and users' perceptions of the street space. 14 points of the evaluations are observable and are rated by the author by observing the space and the interaction between the space and its occupants. Eight variables are perceptual and have to be rated by the people using the street space. The scoring criteria for each variable are based on a rating scale ranging from 0 to 3. The quality indicators to be determined by observation and users' perceptions are attached at annex 5A, 5B, and 5C.

- **Weighting the variables**

  This is an essential part of the evaluation; weighting must depend on the expected performance of a given space. For example, if safety is the foremost concern, then all the characteristics of the public space that support safety must be weighted more than others. For the three dimensions, this study adapts Vikas Mehta's weighting values, which have been developed based on research. Refer to annex 5A, 5B, and 5C.

2.4.4. Observation assessment of the physical context of the Street

The second objective of this study is to investigate the physical context and pedestrian activity of the study streets. The first aim of this objective is to investigate the context of the pedestrian environment and observation was conducted based on the quality aspects and their attributes. Their variables, attributes, and measurement descriptions are attached to Annex 6.

CHAPTER THREE

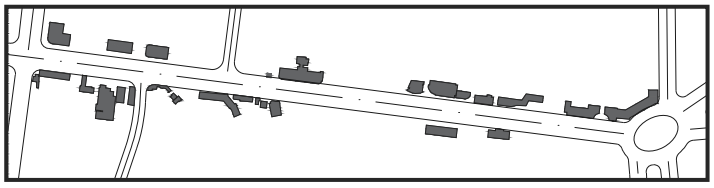
3. RESEARCH METHODOLOGY

3.1. Study Area

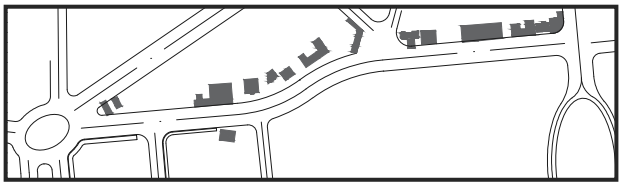
The study was conducted in Addis Ababa on the selected streets along the Light Rail Transit (LRT) from Lideta to Meskel Square. For the purpose of this study, the streets are studied in three segments. The first is the segment from Lideta to Mexico; the second is from Mexico to Legehar; and the third is from Legehar to Meskel Square. The lengths of the streets are 1.0 km, 0.8 km, and 0.6 km, respectively.

Figure 3.2 Zoom-in location of the study area

Street from Lideta to *Mexico*
Henceforth, referred
to as Street 1



Street from *Mexico* to Legehar
Henceforth, referred
to as Street 2



Street from
Legehar to *Meskel-Square*
Henceforth, referred to as Street 3

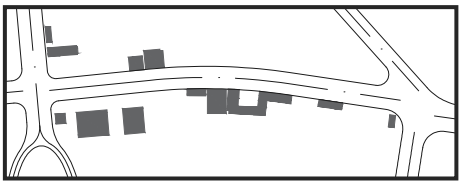


Figure 3.1 Segments of the study

The selection criteria are made based on the aim of best understanding and addressing the objectives. As a result, potential areas to study challenges and limitations related to pedestrian comfort are selected based on the combination of the following contexts:

Centrality

Centrality in urban areas has a number of impacts on pedestrian comfort. For example, nodes are often major intersections or transportation hubs. These areas can be congested and noisy, which can make them uncomfortable for pedestrians. However, they can also be important places for pedestrians to access different parts of the city. Pedestrian comfort in these areas could be impacted due to pedestrian density, noise levels, air quality, and a lack of proper infrastructure to support the traffic. The study site was selected from the main center of the city based on data from the Addis Ababa Plan Commission (AAPC). Refer to Figure 3.1.

Street Hierarchy

Streets with a higher hierarchy are typically designed for higher speeds and traffic volumes. This can make them less comfortable for pedestrians due to higher noise levels, air pollution, reduced pedestrian safety, and a less pedestrian-friendly design. Regardless of their hierarchy, pedestrian comfort is important on all streets. However, the streets with higher hierarchy are relatively more impacted. Primary Arterial Street (PAS) is selected based on data from the Addis Ababa Plan Commission (AAPC).

Modal Diversity and Traffic

Modal diversity is important for a number of reasons. One is that it gives people more choices about how they get around. This can be important for people with different needs and preferences. If there are a number of transportation options to reach a destination, there will be increased pedestrian and motorized traffic in these main city centers, which stresses the street environment if not designed and managed accordingly. The following three points are used to identify areas with diverse transport options and traffic.

1. The street preferred to be along the Light Rail Transit (LRT) line, with at least one station area.
2. It is preferred to include the intersection of the NS and EW orientations of the LRT route since there will be a relative increase in users.
3. The area is preferred to have at least one bus stop, one taxi station, and either a school, hospital, religious institution, or government institution.

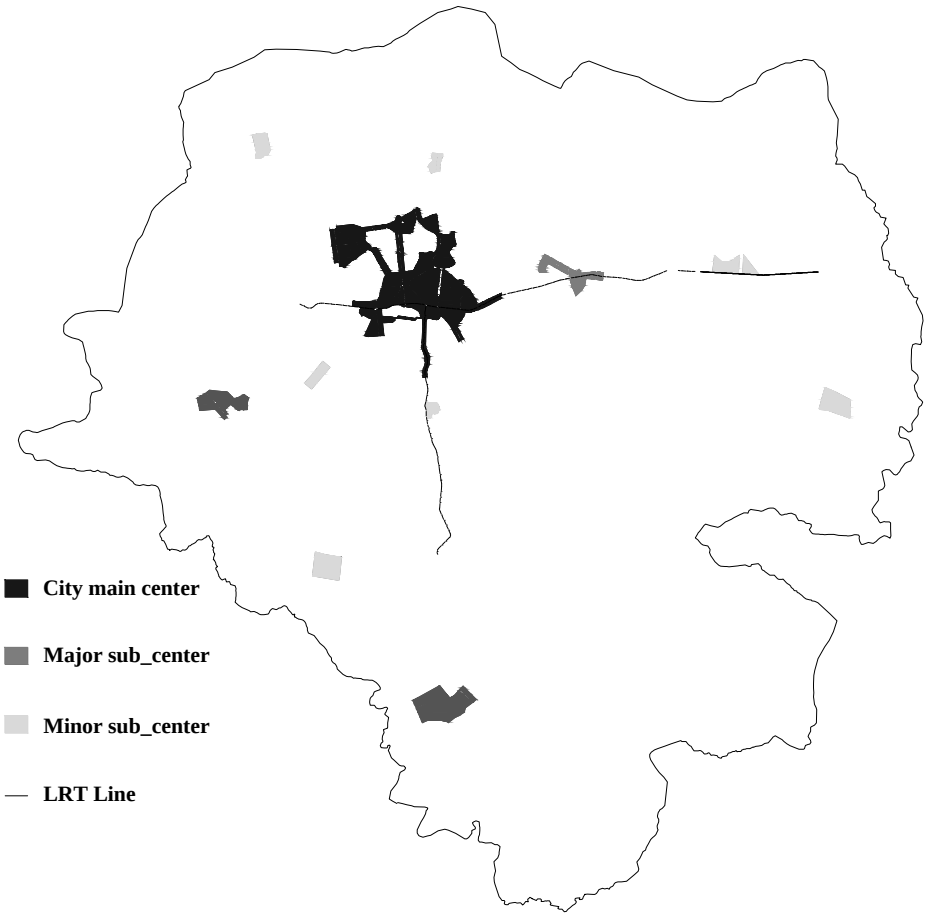


Figure 3.3 Centrality and LRT Line - Site Selection Criteria. Source – AAPC acquired on 2021

4.2. Selection Of the Research Design

This research attempted to study and explore the physical context and activities, investigate the limitations of the pedestrian environment, and evaluate the street as a public space (see Section 1.2) based on observation and user perception within a given specific area. As a result, the appropriate type of design is found to be qualitative in nature and case study-based exploratory. Qualitative research is a means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. (Creswell, 2009). The researchers typically collect data in the field, at the location where participants encounter the issue or problem under investigation. (Creswell, 2009).This direct information is obtained by talking directly to people and observing how they behave and act in their context. (Creswell, 2009). Through case studies, a researcher can investigate a particular program, event, activity, process, or one or more people in depth, and the cases are restricted in both time and activity. (E.Stake, 1995)

3.3. Research Design

Research designs are strategies for conducting studies that include everything from general assumptions to specific techniques for data gathering and analysis. (Creswell, 2009). The overall decision involves determining which design should be used to investigate a topic. (Creswell, 2009). The design is specifically made for each of the three objectives. which include the objective statement, the question to be addressed, the type of data required, the method and tool to be used, and the analysis technique. See Figure 3.3 for detailed research design and Section 3.11 for objective-specific approaches.

3.4. Data Types

Since the research is going to collect non-numerical data about the experience and activity of people in an attempt to understand how pedestrians experience the street environment, what factors are influencing their comfort, and what the pedestrian's perceptions of their experience are, the research uses qualitative data.

3.5. Data Sources

Data for the study was collected from both primary and secondary sources.

3.5.1. Primary Data Sources

In the existing context, both pedestrian activities, which involve staying (stationary) and movement (transitory), user perceptions about their experience, and performance evaluations of the street are studied with primary research data sources.

3.5.2. Secondary Data Sources

The secondary research data that has been used for this study includes documented files on existing context, research, and reports on the issue. The significant sources of such data will be individuals, non-governmental organizations (NGOs), and governmental institutions.

3.6. Sampling Design

The study conducted a survey with a questionnaire to understand pedestrian perceptions about their experience. Sampling techniques, sample population, and sample size for the study are described below.

3.6.1. Sampling Techniques

The approach for the selection of survey samples is simple random sampling, which allows unbiased inclusion for each member of the population with an equal and independent chance of being selected for the sample.

3.6.2. Sample Population

The sample population for this survey is pedestrians who have been available during the study schedule on the study streets.

3.6.3. Sample Size

The respondents for this study have 60 samples, 20 participants from each segment of the three streets. The sampling is done based on experiences from other individuals with previous related works and the concept of "theoretical saturation." One example from such similar studies is Vikas Mehta, who, in his public space study that evaluated the performance of street spaces, used respondents of 23, 16, 13, and 25. (Mehta, 2013). In qualitative research, "theoretical saturation" can also serve as a guide (Boddy, 2016); (Mason, 2010); (Dworkin, 2012). Theoretical saturation can also be useful as a guide in qualitative research, with practical research illustrating that "samples of 12 may be cases where data saturation occurs among a relatively homogenous population." (Boddy, 2016).

3.7. Method of Data Collection

The data required for this study are categorized into three categories to determine the appropriate method of inquiry. One is the information about the quality indicators and evaluation methods obtained from the literature review; the second is the data from the physical context of the pedestrian environment and activity obtained from observation; and the third is the perception of the users obtained from pedestrians through survey questionnaires. Therefore, the methods used for data collection are literature review, observation, and survey.

3.7.1. Literature Review

To have a clear understanding of quality indicators and evaluation methods, different pieces of literature were reviewed. This includes different publications, articles, journals, and books.

3.7.2. Observation

Qualitative observations are methods by which the researcher collects information on the behavior and activities of people at the study site. The data could be recorded in an unstructured or semi-structured way (based on the required information) (Creswell, 2009); (E.Stake, 1995).

Repeated site observation has been conducted by the researcher with a role as an observer based on the quality indicators from the literature. Two approaches were used for this: one is to simply watch people on the street and record their activities. This helps to identify the different types of activities that people engage in on the street as well as the factors that influence their use of that street. The second approach is to study the limitations of the physical environment based

on the measured degree of availability of the quality indicators. For example, the percentage of paved sidewalks and what proportion of the sidewalks have adequate room for walking. Structured and tabular quality indicator evaluations will be adapted and used. Along with this data, images will be used to capture the overall situation. For the observation data collection, counting is used as a tool, as described in Section 3.11, Objective 2.

3.7.3. Survey

According to Stake, Qualitative researchers look for data that reflects personal experience in specific situations. A survey is a collection of questions, statements, or scales that are typically asked of all participants in the same manner. Totals, medians, percentages, comparisons, and correlations are calculated from the data. (E.Stake, 1995).

Survey data is conducted to understand the perceptions and experiences of pedestrians and how safe, comfortable, and pleased they are while in this street space. The survey will be conducted based on the quality indicators. The rating for the indicators uses the Likert scale tool, running from 0 to 3. This helps to understand people's perceptions of the street and their satisfaction, preferences, and suggestions for improvement.

3.8. Method of Data Analysis

This section involves both analysis and interpretation, or synthesis, of the data collected. Analysis is the process of "making sense out of data" (Creswell, 2009), "taking things apart" analysis, and "putting things together" synthesis. (E.Stake, 1995). After conducting data collection, organization, and intensive reading through all the data, they are categorized into three themes: literature reviews, observations, and survey data. The literature review is analyzed using the content analysis method. Observation data from the context study and counting were analyzed with the descriptive statistics method. The evaluation of the street space performance was analyzed with PSI developed by Vikas Mehta. (Mehta, 2013)

3.8.1. Content Analysis

Content analysis is the process of conceptualizing qualitative data into groups of related things or themes in order to find recurrent patterns and connections between variables or themes. (M.Given, 2008). The qualitative data on the quality indicators collected through the literature review were summarized and then used to study the case and evaluate the space.

3.8.2. Descriptive Statics

Descriptive statistics are a mathematical summarization of data in which many observed values are converted to a few numbers. (M.Given, 2008). In a qualitative study, the process of

condensing a lot of information into a concise summary is essential (M.Given, 2008). This analysis method was used for the quantitative data from the qualitative study. This includes Likert-scale rating survey data, pedestrian counts, and analysis of the physical conditions of the street.

3.8.3. Public Space Index (PSI)

Public space index (PSI) is a method used to evaluate the quality performance of public spaces—streets in this case—considering quality aspects and their attributes with observation and survey data from users. (Mehta, 2013). This adapted method was developed by Vikas Mehta. For a detailed application, see Section 3.11, Objective 3.

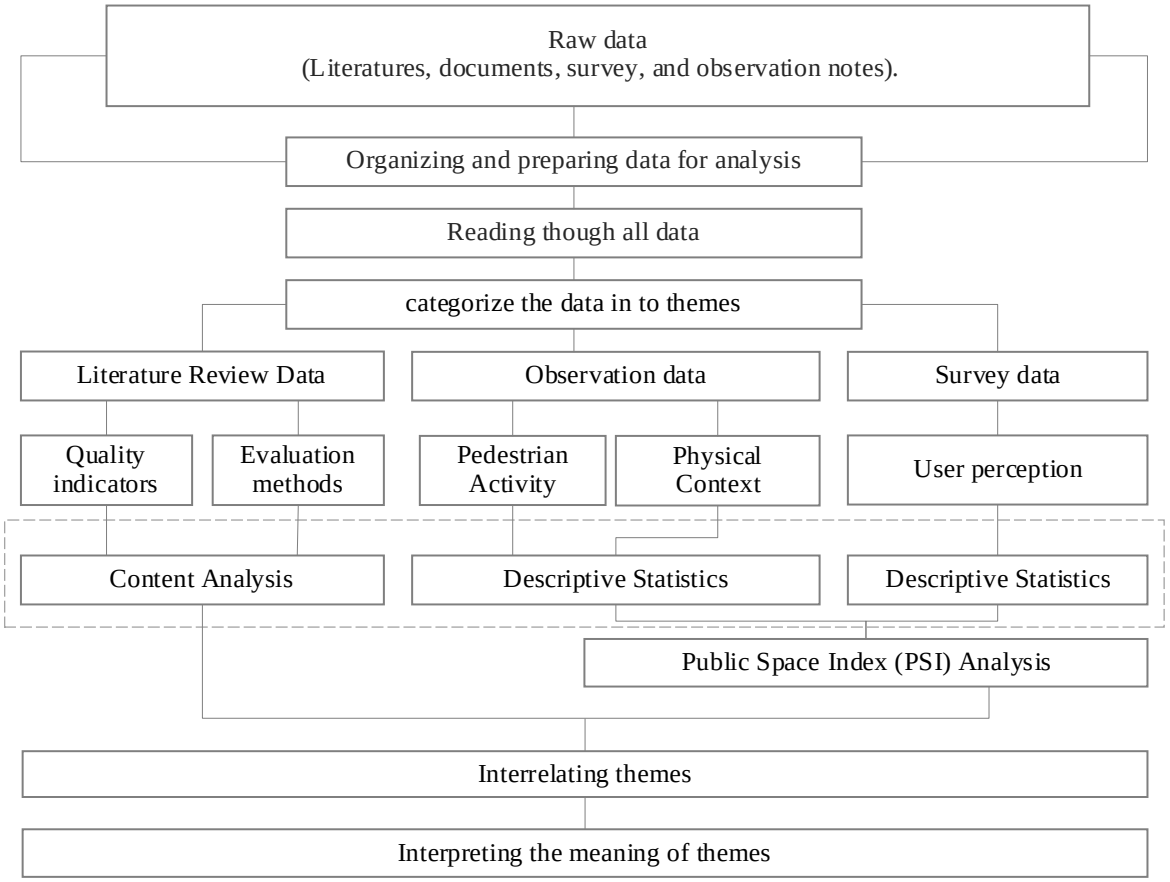


Figure 3.4 Method of Data Analysis

source: developed by the author

3.9. Method Of Data Presentation

To present the data and analyze it, this research utilizes MS Office Word for documentation, MS Office Excel for data analysis, MS Office Visio for graphic illustration, and AutoCAD for spatial data illustration and map production. Pictures, tables, and graphs with descriptions are used in support of the observation and survey data.

3.10. Validation And Reliability

Qualitative researchers try to find data and evidence that have a straight meaning, and they should be confident that the evidence is good. (Stake, 2010). As a result, different "triangulation" approaches were used; one is methodological triangulation, which uses a number of methods and tools. To further validate the result, repetitive collection of data was used: “look again and again several times.” This study used observation, survey, and in-depth literature review methods to collect data. For evaluation, the PSI analysis tool was used, which considers both observational and user perception data. The observation and survey were conducted seven days a week.

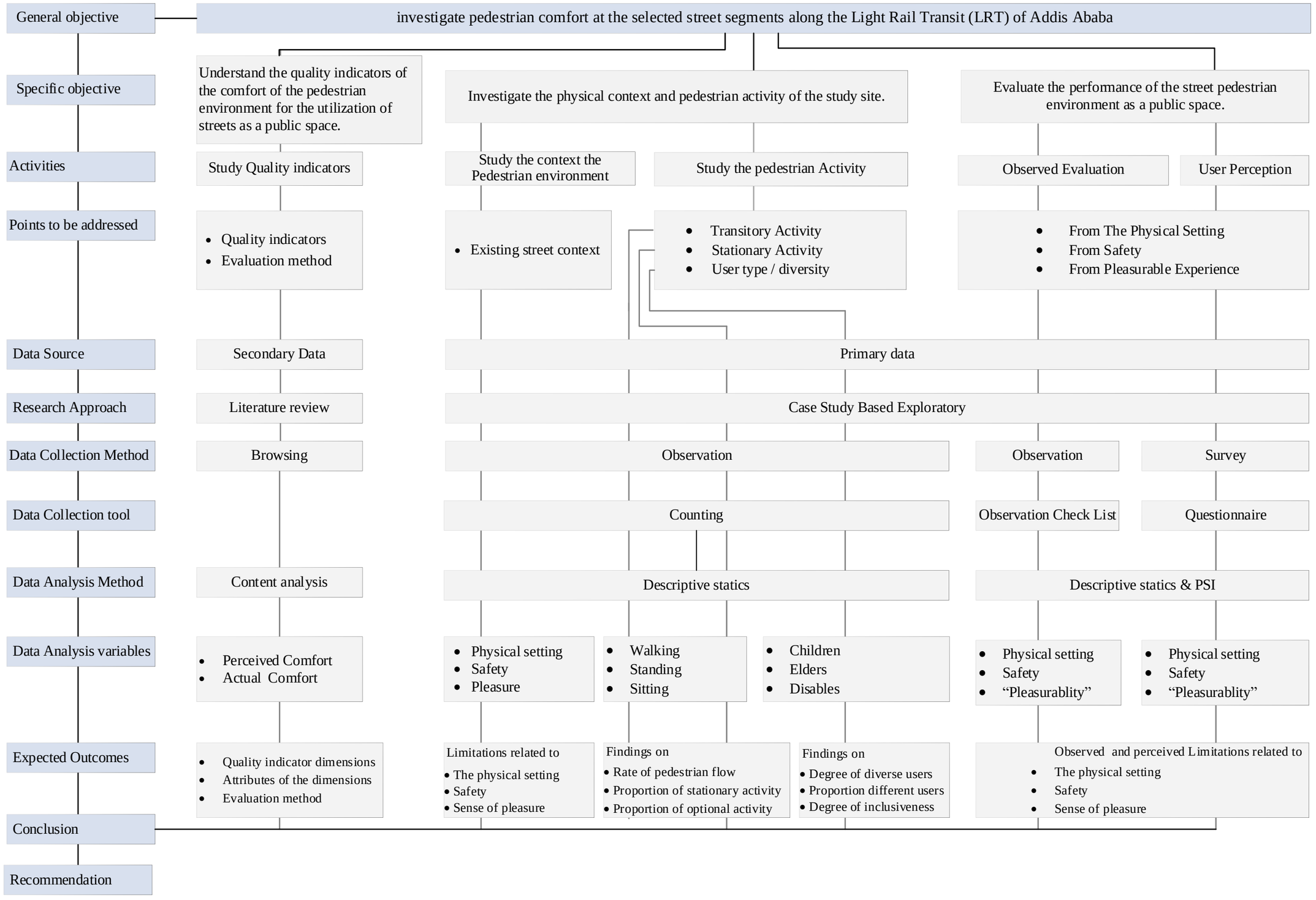


Figure 3. 5 Research Design

3.11. Objective Specific Approaches

Objective 1

Understand the quality indicators of the comfort of the pedestrian environment for the utilization of streets as a public space.

Questions to be addressed

1. What are the quality indicators of comfortable street space?
2. How could the street space be evaluated based on those indicators?

Table 3.1 Specific approach for the first objective

Data types	Qualitative data type
Sources of data	Secondary data source
Method of data collection	Literature review
Method of data analysis	Content analysis

1. What are the quality Indicators of comfortable street space?

With an intensive literature review, the overall comfort indicators are summarized as comfort from a physical setting, safety, and pleasurable experiences. Refer to Chapter 2, Section 2.42, and Table 2.1. These indicators were used for the second and third objectives.

2. How could the street space be evaluated based on those indicators?

After an intensive literature review by different scholars on the topic, a method that considers most attributes for the overall comfort of street space for pedestrians has been adopted. The PSI method developed by Vikas Mehta to evaluate street performance was used for this study. Refer to Chapter 2, Section 2.4.3. This evaluation method was used for the third objective. Refer to Objective 3 under this topic.

Objective 2

Investigate the physical context and pedestrian activity of the study site.

Issues to be addressed: street context, user type, and activity

Questions to be addressed

1. What is the user type and activity?
2. How is context of the pedestrian environment

Table 3.2 Specific approach for the second objective

Data types	Qualitative data type
Sources of data	Primary data source
Method of data collection	Observation
Method of data analysis	Descriptive statistic

1. **What is the user type and activity?**

The end points to be understood from the study on different pedestrian activities are pointed out in the following table:

Table 3.3 Issues to be addressed under the study of user type and activity

Study	Study points	Questions to be addressed
Pedestrian type & Activity	Transitory activity	What is the rate of pedestrian flow?
	Stationary activity	Proportion of stationary activity Proportion of optional activities
	User type/ diversity	Degree of diversity in users Proportion of different users

Method	Question	Variables	Comparation	Indication
Counting Pedestrian	How many?	Walking standing sitting	Compare the three variables	Availability of Optional and necessary activities Stationary and transitory
	Who uses the space?	Children Elders disabled	Compare the three variables	Is it for all ages, and physical ability

2. **How is context of the pedestrian environment?**

The end points to be understood from the investigation of the context of the pedestrian environment are pointed out in the following table:

Table 3.4 Issues to be addressed under the study of the context of the pedestrian environment

Study	Study points	Questions to be addressed
Existing street context	Transitory activity	Does the physical environment provide comfort?
	Stationary activity	Does the street environment create a sense of safety?
	User type/ diversity	Does the street environment create pleasure?

Method	Question	Variables	Indication
Counting Elements for comfort	Does it support comfort?	Physical setting Safety pleasure	Limitation of the steers Areas for improvement

Study approach

The study of the existing street context was conducted based on the quality indicators from the literature reviewed, focusing on comfort aspects. Their variables, attributes, and measurement descriptions are attached to Annex 6.

Counting

Counting was used as an instrument for this study, and the numbers are used for comparison, as described in Table 3.3. The schedule of counting conducted for different activities, techniques, and locations is described below.

Schedule of the study

Transitory activity

The study of transitory activity has been conducted at peak hours: morning, noon/midday, and afternoon peak time. Morning Peak Time: 07:00 a.m.–8:30 a.m. Noon/Mid-Day peak time: 12:30 p.m.–01:30 p.m., and afternoon peak time: 04:30 p.m.–06:00 p.m. The study has a time frame of one week, which is five weekday days and two weekend days. The schedule for the study of transitory activity and its sample record table are attached to Annex 7A and 7B.

Stationary activity

The study of stationary activity has been conducted in the afternoon hours for 20 minutes for each street, in between the hours of 04:30 PM and 06:00 PM. The study has a time frame of one week, which is five weekday days and two weekend days. The schedule for the study of stationary activity and its sample record table are attached to Annex 8A and 8B.

Counting technique

For pedestrian traffic counting, an imaginary line will be set, and results will be recorded for 10 minutes and repeated to get the hourly result. For the stationary activity, the author records different types of activities and the number of people engaged in those activities by conducting a 20-minute slow walk.

Counting point

For pedestrian traffic counting, locations were set, at points where the flow to the street begins and/or ends.

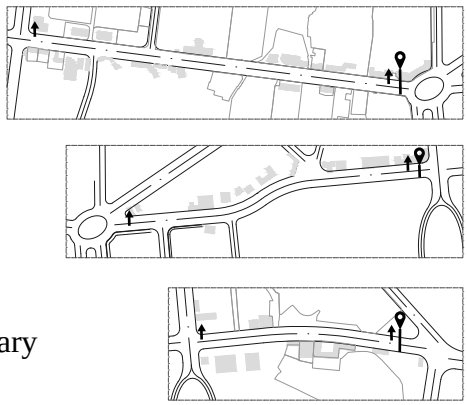


Figure 3.6 Transitory counting point and stationary activity recording

Objective 3

Evaluate the performance of the street pedestrian environment as a public space.

The PSI method assess performance based on author observation and user perception.

Points to be addressed

1. Observation of the pedestrian environment
2. User perception of their experience.

Table 3.5 Specific approach for the evaluation if the pedestrian environment

Data types	Qualitative data type
Sources of data	Primary data source
Method of data collection	Observation and survey
Method of data analysis	PSI by Vikas Mehta

1. **Observation of the pedestrian environment**

   14 points of the evaluations are observable and are rated by the author by observing the space and the interaction between the space and its occupants. The quality indicators to be determined by observation and their attributes and weighting score are attached to Annex 5A, 5B, and 5C.

2. **User perception of their experience.**

   Eight variables are perceptual and have to be rated by the people using the street space. The scoring criteria for each variable are based on a rating scale ranging from 0 to 3. The quality indicators to be determined by users' perceptions and their attributes and weighting score are attached to annex 5A, 5B, and 5C.

Application Of The PSI

Step 1: Calculating the average rating for the quality attribute by the user

User rating (R1, R2, R3, … Rn) is used to calculate the average rating (Rav) for each attribute.

R av = {[R1 + R2 +... Rn]/n}

R_{av} = average rating

n = the total number of surveys conducted for users' opinions.

Rn = individual rating for the respective attribute

Step 2: Calculating the attribute score

The attribute score (Sat) is calculated by multiplying the average rating for each attribute by the weights (Wat) of the respective attributes.

Attribute Score (S at) = R av x Wat.

The score is calculated for each attribute S1, S2, ... Sn

Where S_{at} = attribute score

R av = average rating

Wat = weight of an attribute

Step 3: Calculating the dimension score

The overall dimension score (Ds) is calculated by adding the attribute scores for that respective dimension to get an overall performance score of a public space for that particular dimension.

$D_s = \sum S_1, S_2, \ldots S_n$

Where D_s = dimension score

S_n = attribute scores

The maximum possible score for each dimension is 30, which is 100%; for clarity, the score is converted to a percentage.

Step 4: Calculating overall comfort

The overall performance score, indicating the comfort quality of the street spaces, is calculated by averaging the total scores achieved for each of the three dimensions.

CP = D1 + D2 +... Dn/d; in this case, D1 + D2 + D3/d

Where C_P = overall comfort performance

Dn = dimension score for each of the dimensions

d = the total number of dimensions

The table below demonstrates the application of the evaluation with examples.

Table 3.6 Procedures to evaluate the street pedestrian environment using the PSI

Street from Lideta to Mexico						
Dimensions (aspects) of Quality	Attributes for Dimension (Variables)	Weightage (W_{at})	Average Rating by users $R_{av} = \{[R_1 + R_2 + \ldots R_n]/n\}$	Attribute Score (S_{at}) = R_{av} x W_{at}	Dimension Score $D_s = \sum S_1, S_2, \ldots S_n$	Dimension score out of 100
Comfort from Physical setting	Sitting area (free)	W_1	$R_{av\,1}$	S_1	$D_s = S_1 + S_2 + S_3 + S_4 + S_5 + S_6 + S_7$	D_s *100 /30=% D_s
	Sitting area (business)	W_2	$R_{av\,2}$	S_2		
	Other furniture	W_3	$R_{av\,3}$	S_3		
	shade and shelter	W_4	$R_{av\,4}$	S_4		
	Free from obstacle	W_5	$R_{av\,5}$	S_5		
	Good maintenance	W_6	$R_{av\,6}$	S_6		
	noise	W_7	$R_{av\,7}$	S_7		

CHAPTER FOUR

4. RESULT AND DISCUSSION

In this result and discussion chapter, the data collected will be presented, analyzed, and discussed to answer the research questions. The section is organized according to the three objectives. The first objective is to understand the quality indicators of the comfort of the pedestrian environment for the utilization of streets as a public space. This focuses on the results of the study for the identification of quality indicators and evaluation methods for the performance of the street. The second objective is to investigate the physical context and pedestrian activity of the study streets. The results of the pedestrian activity study focus on transitory activities, user types, and stationary activities. The investigation of the physical context presents results based on aspects of comfort quality indicators, which are physical condition, safety, and sense of pleasure. The third objective is to evaluate the performance of the street pedestrian environment as a public space. The evaluation is based on the PSI method, which uses both observation and user perception results.

4.1. Quality Indicators of Comfortable Streets as a Public Space

The first objective aims to understand the quality indicators of pedestrian comfort in streets as public spaces, focusing on identifying comfortable street space quality indicators and a method to evaluate them.

4.1.1. Quality Indicators

The result of the literature review from 1960 to 2020 identified overall comfort indicators of the street as a public space as a combination of physical comfort, safety, and pleasurable experiences. (Refer to Section 2.4.2.) The study identified these quality aspects and their attributes. The results were used to investigate the physical context and evaluate street performance, focusing on the attributes of these aspects. Refer to Annex 5A, 5B, and 5C.

4.1.2. Evaluation Method

The result from the content analysis of the literature used to identify a method that considers most attributes for the overall comfort of street space for pedestrians The PSI method developed by Vikas Mehta to evaluate street performance was adopted for this study. (Refer to Section 2.4.3.)

4.2. The Pedestrian Activity and Physical Context

The second objective of this study is to investigate the physical context and pedestrian activity of the study streets. The two main questions to be addressed under this objective were: What is the user type and activity? And what is the context of the pedestrian environment? The results and discussion are as follows:

4.2.1. User Type and Activity

This section aims to answer: What is the user type and their activity on the study streets? The activities were categorized as transitory and stationary. From the transitory results, the pedestrian flow on each street was identified, and the flow rate was calculated. The user-type study was used to identify the degree of diversity in use and users. From the transitory results, the rate of staying at activities, what proportion is free and public, and the proportion between optional and necessary activities were identified.

1. Transitory Activities

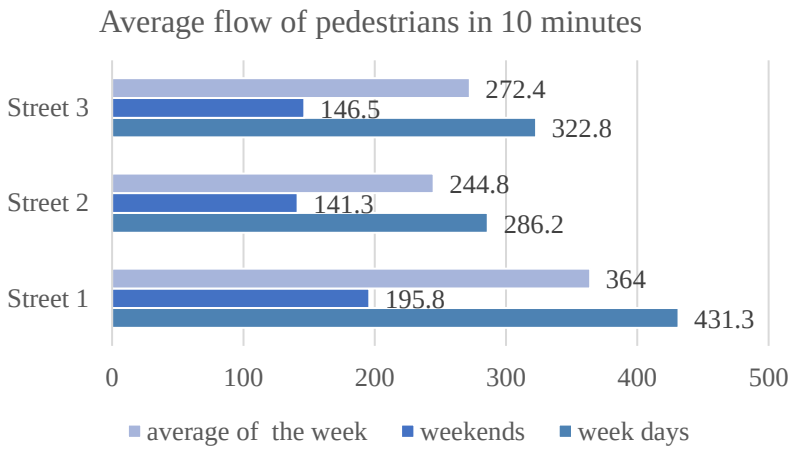


Figure 4.1 Summary of transitory pedestrian activities within 10 minutes

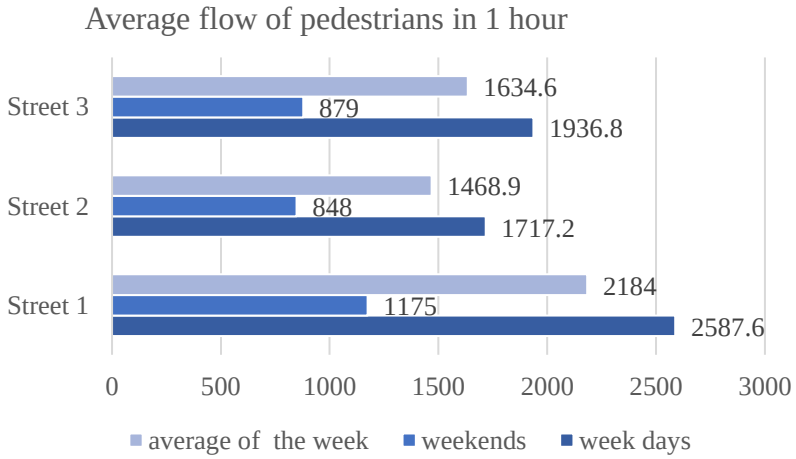


Figure 4.2 Summary of transitory pedestrian activities within 1 hour

Pedestrian traffic at different locations on the study streets

Figure 4.3 Transitory activities: pedestrian traffic on the study streets

According to **A. Jacobs (1995)** and others from the literature, the width of sidewalks needs to be adequate, and they need to allow people to walk at different speeds, particularly at a leisurely pace. It is also essential that people's experiences or perceptions of the sidewalk be neither crowded nor deserted. and it is expected to provide safety from traffic. Jacob states that a street with 13 people per minute per meter is crowded, and a street with 3 or 4 people per minute per meter is empty or deserted.

Based on the results of the average flow of pedestrians on weekdays in 10 minutes, which is 431 and has a width of 2.8 meters, the pedestrian flow rate on Street 1 is 15.39 people per minute per meter. With 286 people and a width of 2.4 meters, Street 2 has a flow rate of 11.91 people per minute per meter. With 322.8 people and a width of 3.8 meters, Street 3 has a flow rate of 8.49 people per minute per meter.

$$pedestrian\ flow\ rate = (number\ of\ people)/(width\ of\ facility * time\ period)$$

The results indicate that street 1 is higher than the crowded level, and street 2 is closer. The results might suggest that the condition of the sidewalk needs to be improved to align with the concept of “room for walking” (J.Gehl, 2010) and that the sidewalk “should be a place for people to walk with some leisure.” (A. Jacobs, 1993).

2. User Type

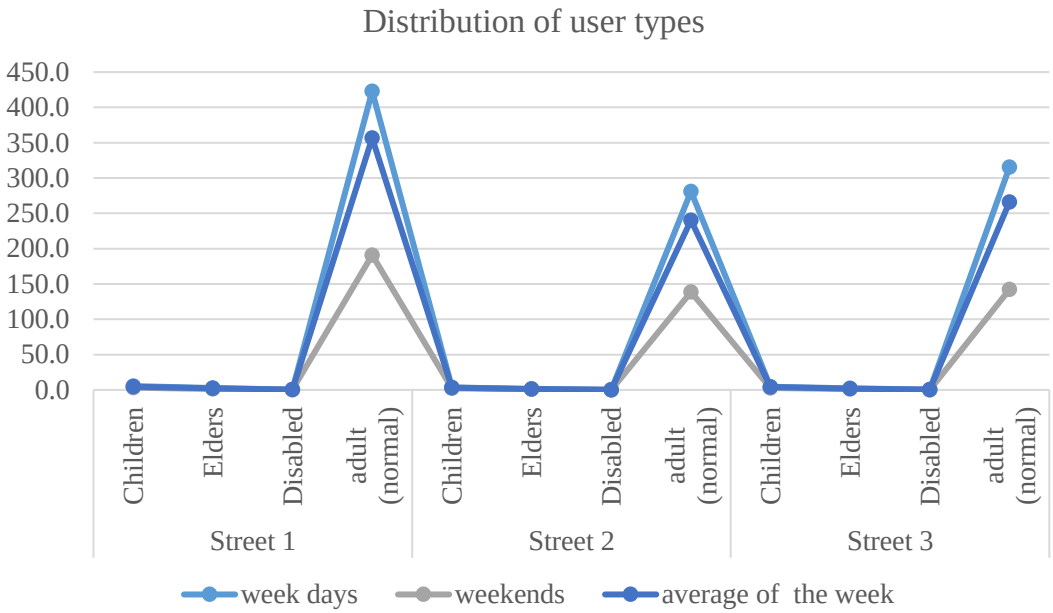


Figure 4.4 Summary of user type distribution on the study streets

Street 1: The proportion of children using the sidewalk on this street is 1.29%, elders are 0.63%, and disabled people of different types are 0.1%. Users of children, elders, and disabled people combined only have a proportion of 2.02%, while the remaining 97.98% are normal adults. Refer to table 4.1.

Street 2: The proportion of children using the sidewalk on this street is 1.22%, elders are 0.5%, and disabled people of different types are 0.04%. Users of children, elders, and disabled people combined only have a proportion of 1.76%, while the remaining 98.24% are normal adults. Refer to table 4.2.

Street 3: The proportion of children using the sidewalk on this street is 1.43%, elders are 0.73%, and disabled people of different types are 0.18%. Users of children, elders, and disabled people combined only have a proportion of 2.34%, while the remaining 97.66% are normal adults. Refer to table 4.3.

Wheelchair user traveling in the car lane

Few children are seen on the street and carried by parents.

Figure 4.5 Vulnerable user types in the context of the study streets

The literature reviewed indicated that one of the essential qualities of a street as a public space is that it must incorporate diverse user needs, from children's play to elders' mobility and individuals with disabilities.

Jane Jacobs believes that cities should be designed for people, not cars, and that children should be able to play and explore in their neighborhood without fear. She argued that the presence of children on the street is a sign of a healthy and vibrant city. **William H. White**, who studied urban life and behavior in his book "The Social Life of Small Urban Spaces," showed that the presence of children on the street makes people safer and more connected to their community. He also found that children's play can help revitalize public spaces.

The results from the three street segments indicate that the pedestrian environment lacks a variety of user types of different ages and physical abilities. The finding is an indication of the limitations of quality described by White and Jacobs. One of the reasons for such a significantly small proportion of children's elders and disabled people might be an indication of issues related to the safety and design of the street space.

Table 4.1 Pedestrian Flow Count, Street 1

Transitory Activities: Pedestrian Flow Count, Street 1									
Day	Peak Times in The Morning, Noon, And Afternoon	Recorded Time	Adults (Normal)	Children	Elders	Disabled	Total	Daily Average Flow/ 10 min.	Daily Average Flow/ 1 hr.
Jun 23 Friday	07:00 am - 08:30 am	07:10 am - 07:20 am	490	5	3	0	498	411.0	2466
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	319	2	1	0	322		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	403	7	3	0	413		
Jun 24 Saturday	07:00 am - 08:30 am	07:10 am - 07:20 am	313	4	2	0	319	254.0	1524
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	228	2	1	1	232		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	203	6	2	0	211		
Jun 25 Sunday	07:00 am - 08:30 am	07:10 am - 07:20 am	148	4	0	0	152	137.7	826
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	121	1	0	1	123		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	133	3	2	0	138		
Jun 26 Monday	07:00 am - 08:30 am	07:10 am - 07:20 am	533	4	3	0	540	456.7	2740
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	419	6	2	0	427		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	391	7	4	1	403		
Jun 27 Tuesday	07:00 am - 08:30 am	07:10 am - 07:20 am	491	4	5	2	502	412.7	2476
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	334	5	4	1	344		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	382	8	2	0	392		
28 (July 5) Wednesday	07:00 am - 08:30 am	07:10 am - 07:20 am	516	3	1	1	521	431.7	2590
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	348	9	5	0	362		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	404	6	2	0	412		
Jun 29 Thursday	07:00 am - 08:30 am	07:10 am - 07:20 am	542	4	3	0	549	444.3	2666
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	351	3	2	1	357		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	421	5	1	0	427		

Transitory Activities: Pedestrian Flow Count, Street 1									
Day	Peak Times in the Morning, Noon, and Afternoon	Recorded Time	Adults (Normal)	Children	Elders	Disabled	Total	Daily Average Flow/ 10 min.	Daily Average Flow/ 1 hr.
Average of week days	07:00 am - 08:30 am	07:10 am - 07:20 am	514.4	4	3	0.6	522	431.3	2587.6
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	354.2	5	2.8	0.4	362.4		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	400.2	6.6	2.4	0.2	409.4		
Average of weekends	07:00 am - 08:30 am	07:10 am - 07:20 am	230.5	4	1	0	235.5	195.8	1175
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	174.5	1.5	0.5	1	177.5		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	168	4.5	2	0	174.5		
Average of the week	07:00 am - 08:30 am	07:10 am - 07:20 am	433.3	4	2.4	0.4	440.1	364.0	2184
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	302.9	4	2.1	0.6	309.6		
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	333.9	6	2.3	0.1	342.3		
Average of the peak hours of the week			356.7	4.7	2.3	0.4	364		2184

Table 4.2 Pedestrian Flow Count, Street 2

Transitory Activities: Pedestrian Flow Count, Street 2									
Day	Peak Times in The Morning, Noon, And Afternoon	Recorded Time	Adults (Normal)	Children	Elders	Disabled	Total	Daily Average Flow/ 10 min.	Daily Average Flow/ 1 hr.
Jun 23 Friday	07:00 am - 08:30 am	07:30 am - 07:40 am	280	3	3	0	286	301.3	1808
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	299	2	1	0	302		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	308	5	2	1	316		
Jun 24 Saturday	07:00 am - 08:30 am	07:30 am - 07:40 am	190	0	1	0	191	173.0	1038
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	155	3	0	0	158		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	165	4	1	0	170		
Jun 25 Sunday	07:00 am - 08:30 am	07:30 am - 07:40 am	116	3	1	0	120	109.7	658
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	96	1	0	0	97		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	109	2	1	0	112		
Jun 26 Monday	07:00 am - 08:30 am	07:30 am - 07:40 am	208	2	1	1	312	263.0	1578
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	233	3	0	0	236		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	337	3	1	0	341		
Jun 27 Tuesday	07:00 am - 08:30 am	07:30 am - 07:40 am	284	4	0	0	288	280.7	1684
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	219	6	3	0	328		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	321	3	2	0	326		
28 (July 5) Wednesday	07:00 am - 08:30 am	07:30 am - 07:40 am	297	2	1	0	300	292.7	1756
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	266	4	1	0	271		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	302	3	1	1	307		
Jun 29 Thursday	07:00 am - 08:30 am	07:30 am - 07:40 am	245	2	3	0	250	293.3	1760
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	286	5	2	0	293		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	332	4	1	0	337		

Transitory Activities: Pedestrian Flow Count, Street 2									
Day	Peak Times in the Morning, Noon, and Afternoon	Recorded Time	Adults (Normal)	Children	Elders	Disabled	Total	Daily Average Flow/ 10 min.	Daily Average Flow/ 1 hr.
Average of week days	07:00 am - 08:30 am	07:30 am - 07:40 am	262.8	2.6	1.6	0.2	267.2	286.2	1717.2
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	260.6	4	1.4	0	266		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	320	3.6	1.4	0.4	325.4		
Average of weekends	07:00 am - 08:30 am	07:30 am - 07:40 am	153	1.5	1	0	155.5	141.3	848
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	125.5	2	0	0	127.5		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	137	3	1	0	141		
Average of the week	07:00 am - 08:30 am	07:30 am - 07:40 am	231.4	2.3	1.4	0.1	235.3	244.8	1468.9
	12:30 pm - 01:30 pm	12:50 pm - 01:00 pm	222.0	3.4	1.0	0.0	226.4		
	04:30 pm - 06:00 pm	04:50 pm - 05:00 pm	267.7	3.4	1.3	0.3	272.7		
Average of the peak hours of the week			240.4	3.0	1.2	0.1	244.8		1468.9

Table 4.3 Pedestrian Flow Count, Street 3

Transitory Activities: Pedestrian Flow Count, Street 3									
Day	Peak Times in The Morning, Noon, And Afternoon	Recorded Time	Adults (Normal)	Children	Elders	Disabled	Total	Daily Average Flow/ 10 min.	Daily Average Flow/ 1 hr.
Jun 23 Friday	07:00 am - 08:30 am	07:50 am - 08:00 am	223	1	2	0	226	287.0	1722
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	235	4	3	1	243		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	383	6	1	2	392		
Jun 24 Saturday	07:00 am - 08:30 am	07:50 am - 08:00 am	183	1	0	0	184	168.3	1010
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	154	3	1	0	158		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	157	4	2	0	163		
Jun 25 Sunday	07:00 am - 08:30 am	07:50 am - 08:00 am	124	3	1	1	129	124.7	748
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	101	5	2	0	108		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	136	0	1	0	137		
Jun 26 Monday	07:00 am - 08:30 am	07:50 am - 08:00 am	296	4	2	0	302	329.7	1978
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	270	4	0	2	276		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	402	6	3	0	411		
Jun 27 Tuesday	07:00 am - 08:30 am	07:50 am - 08:00 am	293	3	0	1	297	323.7	1942
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	242	5	4	0	251		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	411	8	4	0	423		
28 (July 5) Wednesday	07:00 am - 08:30 am	07:50 am - 08:00 am	298	2	2	0	302	331.7	1990
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	276	7	3	0	286		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	399	5	3	0	407		
Jun 29 Thursday	07:00 am - 08:30 am	07:50 am - 08:00 am	321	3	1	0	325	342.0	2025
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	261	5	3	0	269		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	423	2	4	3	432		

Transitory Activities: Pedestrian Flow Count, Street 3									
Day	Peak Times in the Morning, Noon, and Afternoon	Recorded Time	Adults (Normal)	Children	Elders	Disabled	Total	Daily Average Flow/ 10 min.	Daily Average Flow/ 1 hr.
Average of week days	07:00 am - 08:30 am	07:50 am - 08:00 am	286.2	2.6	1.4	0.2	290.4	322.8	1936.5
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	256.8	5	2.6	0.6	265		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	403.6	5.4	3	1	413		
Average of weekends	07:00 am - 08:30 am	07:50 am - 08:00 am	153.5	2	0.5	0.5	156.5	146.5	879
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	127.5	4	1.5	0	133		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	146.5	2	1.5	0	150		
Average of the week	07:00 am - 08:30 am	07:50 am - 08:00 am	248.3	2.43	1.1	0.3	252.1	272.4	1634.6
	12:30 pm - 01:30 pm	01:10 pm - 01:20 pm	219.9	4.71	2.3	0.4	227.3		
	04:30 pm - 06:00 pm	05:10 pm - 05:20 pm	330.1	4.43	2.6	0.7	337.9		
Average of the peak hours of the week			266.1	3.9	2.0	0.5	272.4		1634.6

3. Stationary Activities

Street 1

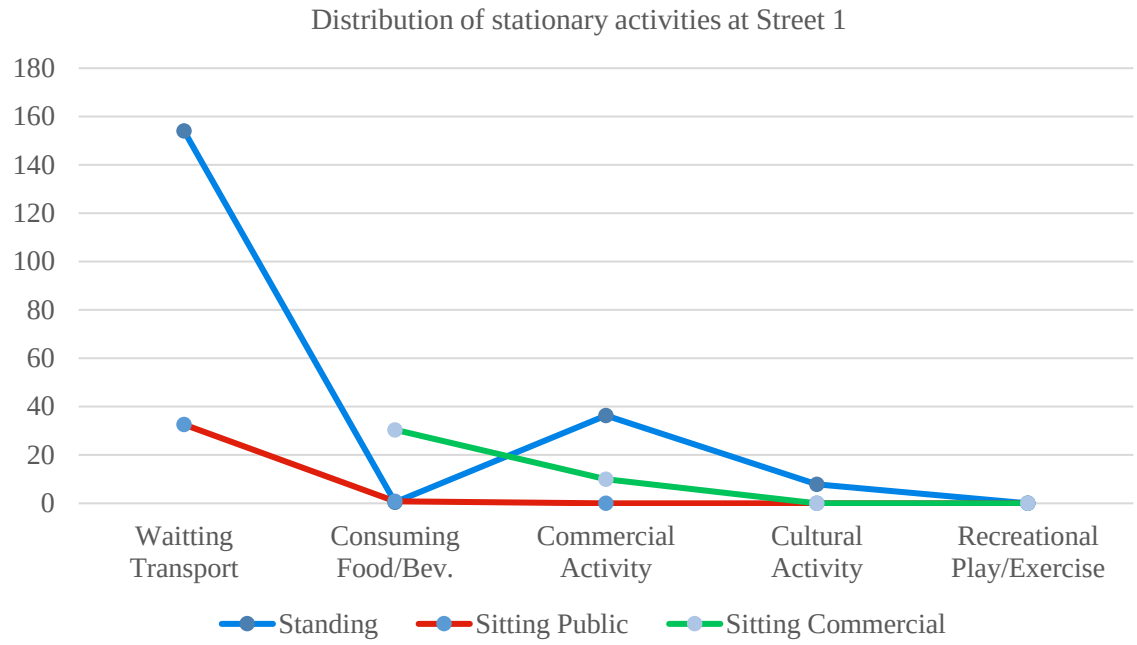


Figure 4.6 Summary of stationary pedestrian activities on Street 1

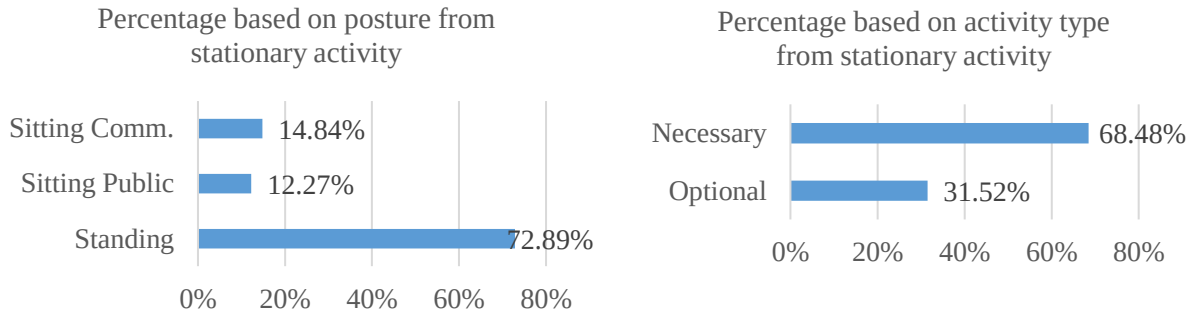


Figure 4.7 Summary of activity on Street 1 based on pedestrian posture and activity type

Results

- The average total stationary activity on this street is 272.43 within a 20-minute slow walk.
- 72.89% of stationary activities are standing, and 27.11% are sitting activities.
- Out of 27.11% of sitting activities, only 12.27% are free of charge for goods or services, and the majority of this proportion is on secondary seating since there is limited provision of primary seating facilities.
- 68.48% of activities are waiting for transport, which is a necessary activity.
- 2.88% of cultural activities observed are religious activities at St. Lideta Church.
- No recreational activities like play and exercise have been recorded.

Street 2

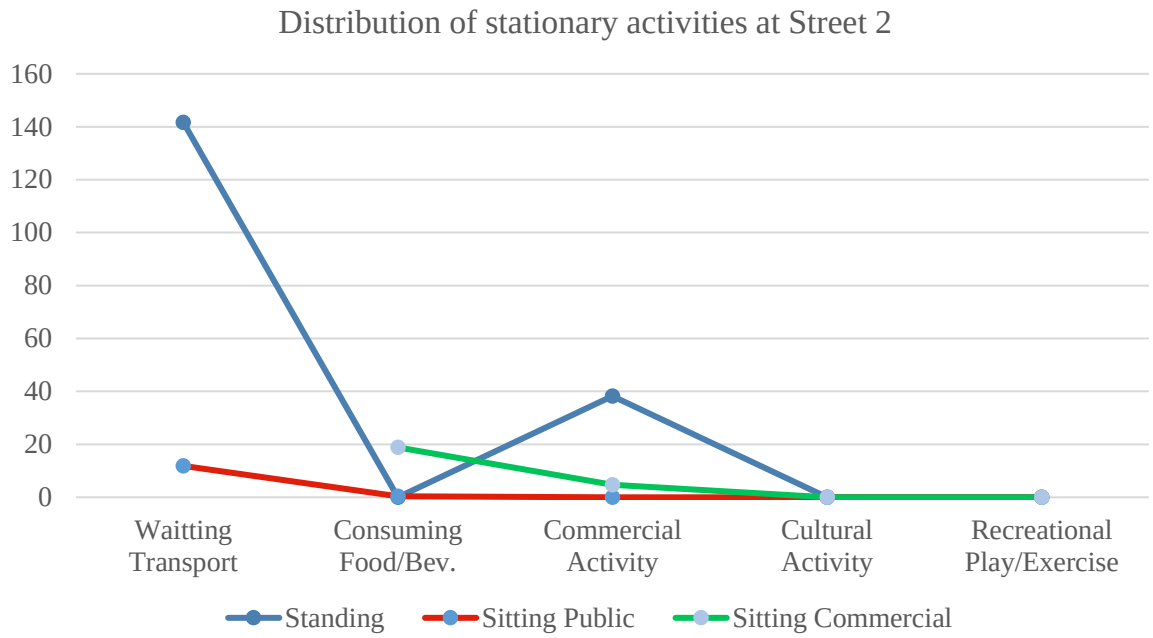


Figure 4.8 Summary of stationary pedestrian activities on Street 2

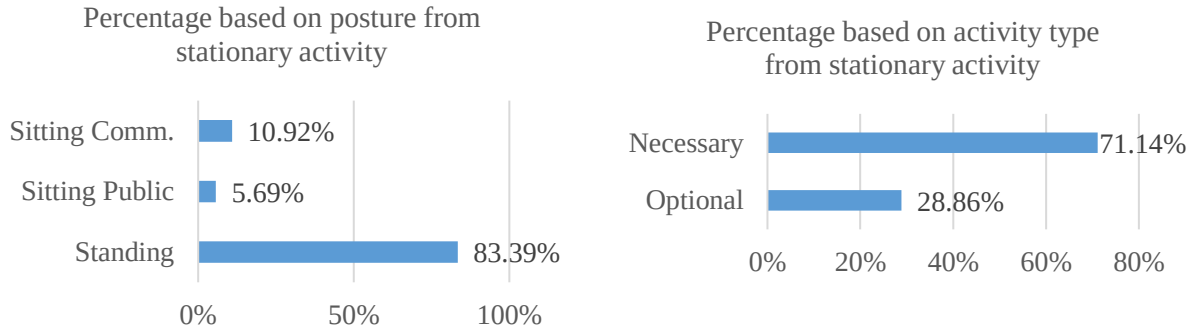


Figure 4.9 Summary of activity on Street 2 based on pedestrian posture and activity type

Results

- The average total stationary activity on this street is 215.86.
- 83.39% of stationary activities are standing, and 16.61 are sitting activities.
- From 16.61% of sitting activities, only 5.69% are free of charge for goods or services, so there is limited provision of primary and secondary seating facilities on this street.
- 71.14% of activities are waiting for transport, which is a necessary activity.
- No cultural activities were observed on this street.
- No recreational activities like play or exercise have been recorded.

Street 3

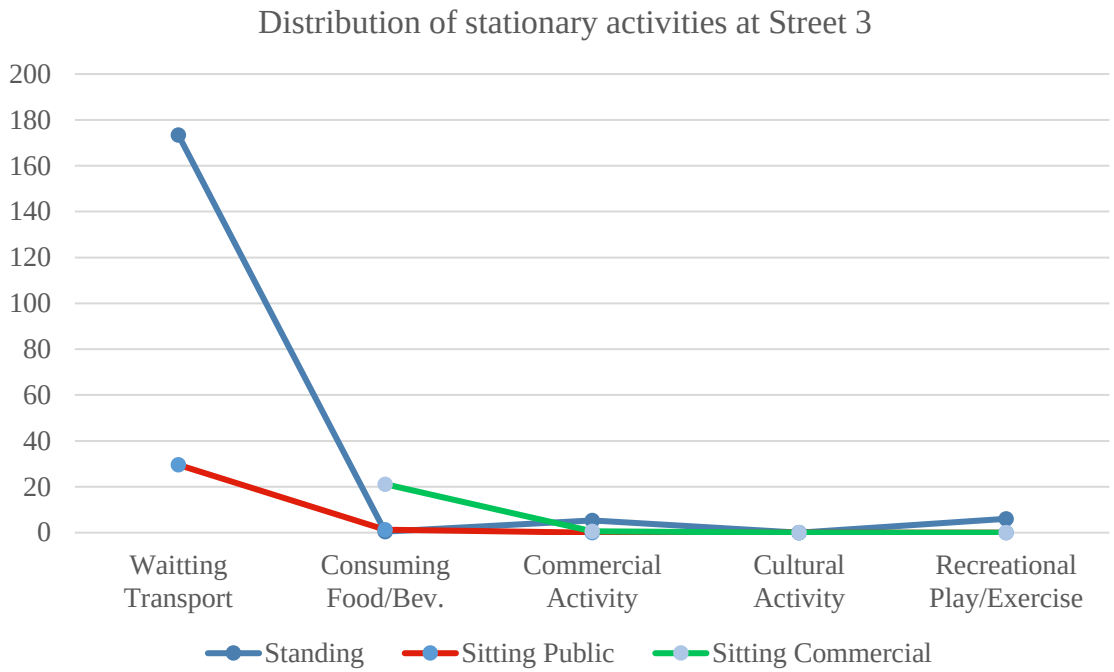


Figure 4.11 Summary of stationary pedestrian activities on Street 3

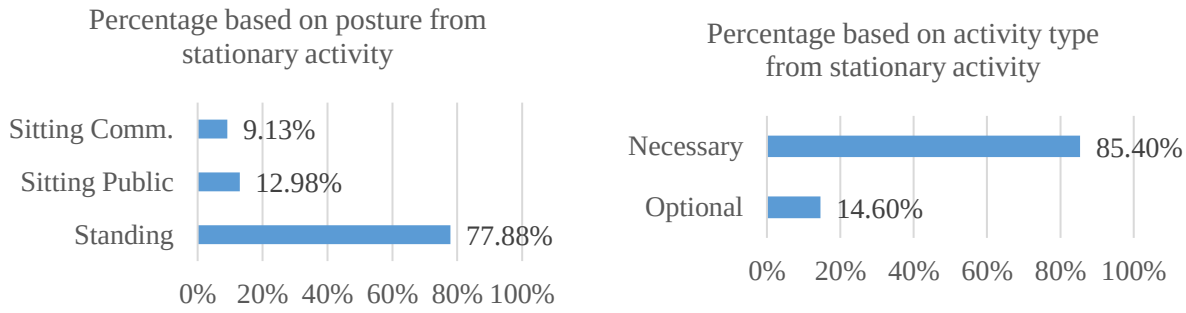


Figure 4.10 Summary of activity on Street 2 based on pedestrian posture and activity type

Results

- The average total stationary activity on this street is 237.71.
- 77.88% of stationary activities are standing, and 22.11 are sitting activities.
- Out of 22.11% of sitting activities, only 12.98% are free of charge for goods or services. There are some provisions for primary and secondary seating facilities in one area on this street.
- 85.40% of activities are waiting for transport, which is a necessary activity. No cultural activities were observed on this street.
- 2.52% of recreational activities like play or exercise have been recorded mostly at one end of the street.

Pedestrians standing at building edges and on the street waiting for transport

Pedestrians sitting and waiting for transport

Pedestrians standing and engaging in commercial activity *Pedestrians standing, leaning against a wall*

Pedestrians standing and sitting to attend the church *Pedestrians sitting on the stairs at a building front*

Figure 4.12 Stationary activities on the study streets

The literature reviewed indicated that one of the essential qualities of a street as a public space is that it should be designed to invite and be comfortable for people to sit, walk, shop, eat, and play. The street space, specifically the pedestrian walkways, should allow for a variety of activities to afford the stay.

The results from the stationary activities indicate that most of the stationary activities involve standing to wait for transport, and the sitting activities are significantly smaller. From the smaller share of the sitting activities, even the smaller share is free and public, including secondary seating facilities. The proportion of necessary activities is significantly higher, and optional activities like cultural and recreational activities take smaller shares.

Jan Gehl argues that streets should be designed to be "invitational" and "comfortable" for people to sit, walk, shop, eat, and play. He also believes that streets should be designed to be safe and inviting for people of all ages and abilities. For staying on the street, the spaces should enhance the standing experience with the provision of support to lean on, have the character of an "edge effect," and be enclosed. To enhance sitting activity, facilities like benches and chairs (primary seating) and stairs and other building elements (secondary seating) should be provided. The street space, specifically the pedestrian walkways, should allow for a variety of activities to afford the stay.

Table 4.4 Summary of stationary activities: street 1

Stationary Activities: Staying on Street 1									
Day	Time	Posture	Waiting Transport	Consuming Food/Bev.	Commercial Activity	Cultural Activity	Recreational Play/Exercise	Total	Total Staying
Jun 30 Friday	04:30 - 04:50 am	Standing	163	2	47	5	0	217	292
		Sitting Public	34	0	0	0	0	34	
		Sitting Comm.	-	32	9	0	0	41	
Jul 1 Saturday	04:30 - 04:50 am	Standing	132	0	31	6	0	169	247
		Sitting Public	23	1	0	0	0	24	
		Sitting Comm.	-	39	15	0	0	54	
Jul 2 Sunday	04:30 - 04:50 am	Standing	85	1	25	10	0	121	177
		Sitting Public	6	0	0	0	0	6	
		Sitting Comm.	-	43	7	0	0	50	
Jul 3 Monday	04:30 - 04:50 am	Standing	193	0	41	9	0	243	321
		Sitting Public	41	2	0	0	0	43	
		Sitting Comm.	-	23	12	0	0	35	
Jul 4 Tuesday	04:30 - 04:50 am	Standing	182	0	51	11	0	244	333
		Sitting Public	51	0	0	0	0	51	
		Sitting Comm.	-	30	8	0	0	38	
Jul 5 Wednesday	04:30 - 04:50 am	Standing	151	0	33	8	0	192	256
		Sitting Public	38	0	0	0	0	38	
		Sitting Comm.	-	20	6	0	0	26	
Jul 6 Thursday	04:30 - 04:50 am	Standing	172	0	26	6	0	204	281
		Sitting Public	35	3	0	0	0	38	
		Sitting Comm.	-	26	13	0	0	39	

Summary of the Stationary Activities: Staying on Street 1								
Day	Time	Posture	Waiting Transport	Consuming Food/Bev.	Commercial Activity	Cultural Activity	Recreational Play/Exercise	Total
Average of the week	04:30 - 04:50 am	Standing	154	0.43	36.29	7.86	0	198.57
		Sitting Public	32.6	0.86	0.00	0.00	0	33.43
		Sitting Comm.	-	30.43	10.00	0.00	0	40.43
Averaged total			186.57	31.71	46.29	7.86	0	272.43

Table 4. 5 Summary of stationary activities: street 2

Stationary Activities: Staying on Street 2									
Day	Time	Posture	Waiting Transport	Consuming Food/Bev.	Commercial Activity	Cultural Activity	Recreational Play/Exercise	Total	Total Staying
Jun 30 Friday	05:00 - 05:20 am	Standing	138	0	26	0	0	164	197
		Sitting Public	16	0	0	0	0	16	
		Sitting Comm.	-	13	4	0	0	17	
Jul 1 Saturday	05:00 - 05:20 am	Standing	129	0	36	0	0	165	188
		Sitting Public	10	0	0	0	0	10	
		Sitting Comm.	-	10	3	0	0	13	
Jul 2 Sunday	05:00 - 05:20 am	Standing	64	0	41	0	0	105	129
		Sitting Public	6	0	0	0	0	6	
		Sitting Comm.	-	14	4	0	0	18	
Jul 3 Monday	05:00 - 05:20 am	Standing	168	0	39	0	0	207	245
		Sitting Public	12	2	0	0	0	14	
		Sitting Comm.	-	23	1	0	0	24	
Jul 4 Tuesday	05:00 - 05:20 am	Standing	152	0	51	0	0	203	247
		Sitting Public	11	0	0	0	0	11	
		Sitting Comm.	-	25	8	0	0	33	
Jul 5 Wednesday	05:00 - 05:20 am	Standing	195	0	42	0	0	237	267
		Sitting Public	13	0	0	0	0	13	
		Sitting Comm.	-	17	0	0	0	17	
Jul 6 Thursday	05:00 - 05:20 am	Standing	146	0	33	0	0	179	238
		Sitting Public	15	1	0	0	0	16	
		Sitting Comm.	-	30	13	0	0	43	

Summary of the Stationary Activities: Staying on Street 2								
Day	Time	Posture	Waiting Transport	Consuming Food/Bev.	Commercial Activity	Cultural Activity	Recreational Play/Exercise	Total
Average of the week	05:00 - 05:20 am	Standing	141.71	0.00	38.29	0.00	0.00	180.00
		Sitting Public	11.9	0.43	0.00	0.00	0.00	12.29
		Sitting Comm.	-	18.86	4.71	0.00	0.00	23.57
Averaged total			153.57	19.29	43.00	0.00	0.00	215.86

Table 4.6 Summary of stationary activities: street 3

Stationary Activities: Staying on Street 3									
Day	Time	Posture	Waiting Transport	Consuming Food/Bev.	Commercial Activity	Cultural Activity	Recreational Play/Exercise	Total	Total Staying
Jun 30 Friday	05:30 - 05:50 am	Standing	188	0	10	0	9	207	265
		Sitting Public	30	0	0	0	0	30	
		Sitting Comm.	-	28	0	0	0	28	
Jul 1 Saturday	05:30 - 05:50 am	Standing	203	0	6	0	6	215	263
		Sitting Public	22	4	0	0	0	26	
		Sitting Comm.	-	20	2	0	0	22	
Jul 2 Sunday	05:30 - 05:50 am	Standing	72	1	3	0	16	92	140
		Sitting Public	29	2	0	0	0	31	
		Sitting Comm.	-	17	0	0	0	17	
Jul 3 Monday	05:30 - 05:50 am	Standing	220	0	7	0	3	230	291
		Sitting Public	36	0	0	0	0	36	
		Sitting Comm.	-	25	0	0	0	25	
Jul 4 Tuesday	05:30 - 05:50 am	Standing	176	0	4	0	8	188	236
		Sitting Public	26	0	0	0	0	26	
		Sitting Comm.	-	22	0	0	0	22	
Jul 5 Wednesday	05:30 - 05:50 am	Standing	189	0	3	0	0	192	235
		Sitting Public	23	2	0	0	0	25	
		Sitting Comm.	-	17	1	0	0	18	
Jul 6 Thursday	05:30 - 05:50 am	Standing	166	2	4	0	0	172	234
		Sitting Public	41	1	0	0	0	42	
		Sitting Comm.	-	19	1	0	0	20	

Summary of the Stationary Activities: Staying on Street 3								
Day	Time	Posture	Waiting Transport	Consuming Food/Bev.	Commercial Activity	Cultural Activity	Recreational Play/Exercise	Total
Average of the week	05:30 - 05:50 am	Standing	173.43	0.43	5.29	0.00	6.00	185.14
		Sitting Public	29.6	1.29	0.00	0.00	0.00	30.86
		Sitting Comm.	-	21.14	0.57	0.00	0.00	21.71
Averaged total			203.00	22.86	5.86	0.00	6.00	237.71

4.2.2. Context of the Pedestrian Environment

The study of the context of the pedestrian environment is based on a summary of the quality indicators from the literature, which are comfort from the physical setting, safety, and sense of pleasure. This section is organized accordingly.

A. Physical Condition

The study of comfort from the perspective of the physical condition, according to the literature, was based on 11 attributes. which is sidewalk width, building setback, shade and shelter from buildings and trees, the presence of obstacles from design elements and by users, the availability of public and commercial seating, pavement condition, the provision and continuity of tactile pavement, and the presence of other street furniture and artifacts.

1. **Sidewalk width**

   Street 1: Under normal conditions, the sidewalk width ranges from 2.4 m to 5.6 m, with an average of 4 m. At some places, most of the side walks are taken by the adjacent properties, leaving only 0.6 to 1.2 m. This makes it uniform and significantly narrow for the number of users.

   Street 2: The sidewalk width is 1.8 to 2 meters. In one area where the building has a setback that could be used by pedestrians, the width reaches 5.4 meters. There is an area that doesn't have any sidewalk at all and is taken up by high-rise buildings under construction. A very narrow sidewalk with 1.2 meters of width has been observed.

   Street 3: The sidewalk width varies between 3.8 m and 10.4 m (around the stadium area), with an average of 7.3 m. This area does not have very narrow streets like streets 1 and 2, which makes it relatively better.

side walk, which only passes a person, and sidewalk space completely taken up by adjacent buildings

Figure 4.13 Sidewalk width at the study streets

According to the literature reviewed, one of the essential qualities of a street is an appropriate sidewalk environment with adequate sidewalk width, which is crucial for creating a safe, comfortable, and accessible pedestrian environment.

The results from the observation study indicate that the sidewalk width is consistent and nonexistent at different locations, with some points showing a complete lack of sidewalk and narrow areas ranging from 0.6 to 1.2 meters.

The literature points out that walking reasonably freely and unhindered, without having to "weave in and out" or be "pushed and shoved" by others, is a key requirement for a "comfortable and pleasurable" walk. Children, the elderly, and those with impairments have specific requirements for being able to walk freely. People pulling strollers, grocery carts, and walkers require plenty of walking space. Sidewalks must be properly equipped with traffic signs, lampposts, parking meters, and other technical control equipment. If the sidewalk is nonexistent and narrow, such qualities and services will be lost.

2. **Percentage of buildings with setback**

   Street 1: The total number of multistory buildings that have direct contact with the adjacent street is 15, and only 4 (26.6%) have a setback that could be used by pedestrians.

   Street 2: There are 10 multistory buildings that have direct contact with the adjacent street, and only 3 (30%) have a setback that could be used by pedestrians.

   Street 3: There are 13 multistory buildings with direct street contact, and 9 (69.2 percent) have a setback that pedestrians could use. This aspect relatively elevates the street above the preceding two.

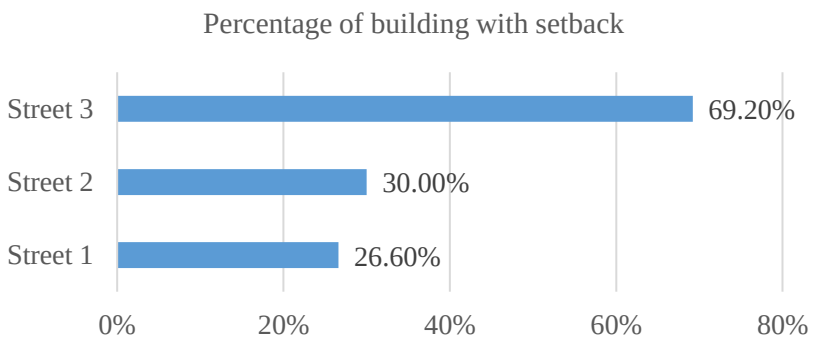


Figure 4.14 Percentage of the building with a setback that could be used by pedestrians

Buildings with a setback that could be used by pedestrians

Buildings with no setback or taking the existing space instead of providing

Figure 4.15 Building setbacks and the pedestrian sidewalk environment

According to the literature, streets with building setbacks offer a multitude of benefits for pedestrians, making them a valuable tool in creating more vibrant, walkable, and livable cities.

The results from the observation study indicate that buildings that have no setbacks or those that even go beyond their property lines at streets 1 and 2 take the dominant proportion. The number of multi-story buildings that provide setbacks that could be used by pedestrians on streets 1 and 2 is relatively low, and the 3rd street segment has a relatively better performance.

The literature points out that setbacks create space for wider sidewalks, which can accommodate more pedestrians comfortably and safely, especially during busy times. This reduces congestion and the risk of collisions between pedestrians and other users of the street. It also creates more inviting and engaging street frontages, encouraging people to linger and interact with each other. This can foster a stronger sense of community and make the streets more vibrant and alive.

3. **Percentage of adjacent buildings that provide shade and shelter for pedestrians**

   Street 1: From the total 15 buildings, only 1 (6.66%) have overhangs, awnings, or shading devices that provide shade and shelter for the sidewalk.

   Street 2: None of the 10 buildings have overhangs, awnings, or shading devices that provide shade and shelter for the sidewalk.

   Street 3: There are no overhangs, awnings, or shading devices on any of the 13 buildings, providing shade and shelter for the sidewalk.

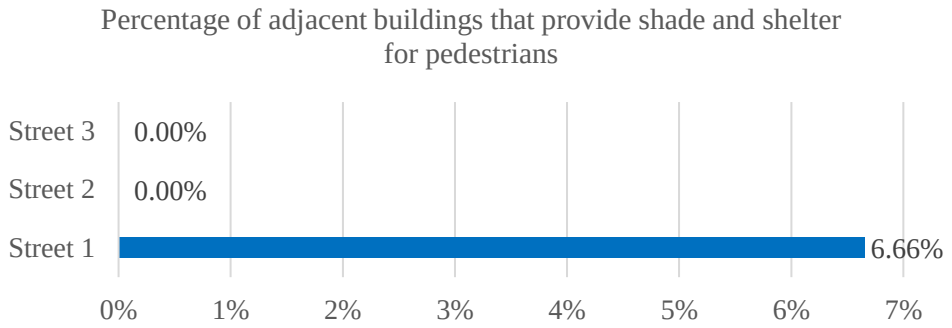


Figure 4.16 Percentage of adjacent buildings that provide shade and shelter for pedestrians

Figure 4.17 Buildings that do and don't provide shade and shelter for pedestrians

The literature suggests that buildings along the sidewalk with shade and shelter can improve the pedestrian experience, providing comfort, safety, walkability, economic activity, and a sense of place, thus enhancing the quality of public service and fostering a sense of community.

The results from the observation study indicate that buildings that provide shade and shelter for pedestrians are significantly low on Street 1 and don't exist on Streets 2 and 3. This could have an impact on comfort and safety, as it lacks the qualities it would provide.

The literature emphasizes that a well-placed awning and sturdy overhang shield from the sun and rain make streets more accessible and enjoyable for everyone. This fosters a more inclusive public realm where everyone feels welcome to participate in the city's life.

Buildings offering shade and shelter attract pedestrians, creating opportunities for businesses to engage with them, leading to increased foot traffic and potential customers. Examples include cafes with shaded patios and bookstores with cozy alcoves under overhangs.

4. **Percentage of shade and shelter from trees and canopy**

   Street 1: 51 tree canopies have been counted along a 1-kilometer sidewalk. This means there is one tree every 20 meters, which doesn't provide proper shade and shelter for pedestrians.

   Street 2: Along the 800-meter sidewalk, 83 tree canopies were counted. This equates to one tree every 9.6 meters, which is better than Street 1, but not sufficient.

   Street 3: Across a 600-meter sidewalk, 71 tree canopies were counted. This means that there is one tree every 8.4 meters, making it relatively shaded in comparison to the previous streets.

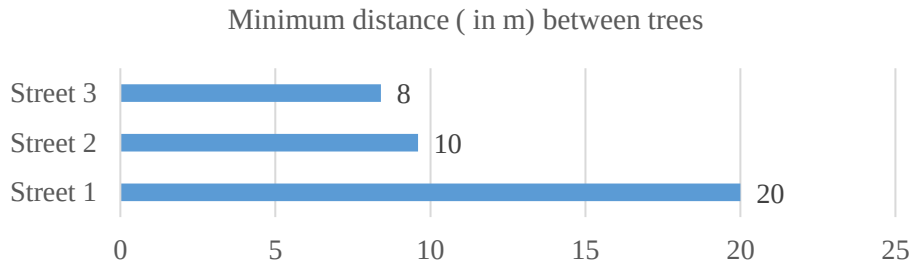


Figure 4.18 Minimum distance between trees

Based on the literature, the essential quality of street sidewalks is the appropriate provision of trees and canopy, as it provides a benefit of climate control, improved well-being, safety, and accessibility.

The results from the observation study indicate that the availability of trees and canopy is not adequate since the spacing between trees could not provide appropriate shade for pedestrians. This could have an impact on comfort and safety, as it lacks the qualities it would provide.

The literature points out that trees serve as natural air conditioners, providing shade and comfort during hot weather. They also improve mental and physical health by making sidewalks safer and more inviting. They reduce glare, making walking more comfortable for those with visual impairments. Trees also act as physical barriers, protecting pedestrians from harsh weather and traffic noise.

5. **Degree of presence of obstacles from design elements**

Street 1: Along one side of the 1 km pedestrian path, 375 obstacles have been counted from design elements, which include manholes, buildings, poles, signs, trees, maintenance issues, and other obstacles that hinder the movement of people. which is 1.12 obstacles per 3 meters.

Street 2: 213 obstacles, which are design elements that hinder people's movement, have been counted along one side of the 800-meter pedestrian path. This equates to 0.8 obstacles every 3 meters.

Street 3: 45 design elements have been counted as obstacles along one side of the 600-meter pedestrian path. This equates to one obstacle every 13.3 meters.

Figure 4.19 Presence of different obstructions on the sidewalk from design elements.

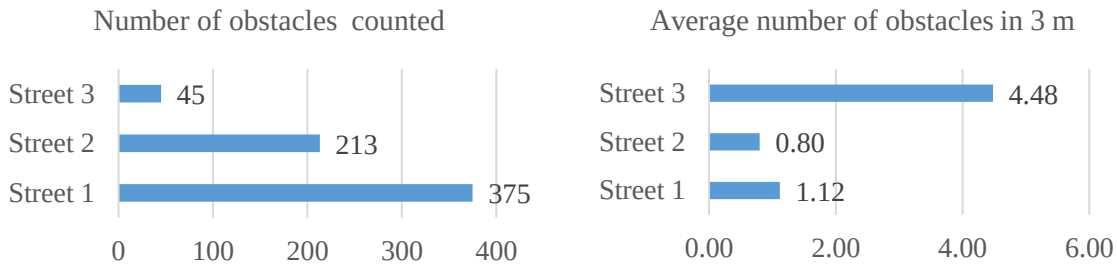


Figure 4.20 Degree of presence of obstacles from design elements

The literature indicates that one of the essential qualities of street sidewalks is being free from obstacles from building elements like manholes, building parts, poles, signs, maintenance issues, and others that hinder the movement of people, as it provides a benefit related to safety, accessibility, and a positive urban experience.

The results from the observation study indicate that there is a higher number of obstructions on streets 1 and 2, while street 3 has a relatively lower count. This could have an impact on comfort and safety, as it lacks the qualities it would provide.

The literature states that clear sidewalks and unimpeded paths can improve safety, encourage exploration, and foster an inclusive streetscape. Cluttered sidewalks can create a chaotic and visually overwhelming environment, while clear paths offer order and ease, reducing stress and making walking a more enjoyable experience. This reduces reliance on cars, reduces traffic congestion, and enhances the urban experience by reducing traffic and promoting a more streamlined urban experience.

6. Degree of presence of obstacles by users

Street 1: Along one side of the 1-kilometer pedestrian walkway, 205 obstacles have been identified, which include parked cars, advertisements, goods, trade, trash, and related issues that obstruct the movement of people. This means one obstacle every 5 meters.

Street 2: 176 user-created obstacles have been identified along one side of the 800-meter pedestrian walkway, resulting in 1.1 obstacles every 5 meters.

Street 3: There are 61 obstacles along one side of the 600-meter pedestrian walkway. This translates to 0.5 obstacles every 5 meters. (1 in 2.5 m)

Figure 4.21 Degree of presence of obstacles by users

Figure 4.22 Avariety of user-created obstacles on the sidewalk

Literature suggests that street sidewalks that are free from user-created obstacles are also essential. This includes parked cars, advertisements, goods, trash, and related issues that obstruct the movement of people.

The results from the observation study indicate that there is a higher number of obstructions created by the user on streets 1 and 2, while street 3 has a relatively lower count. This could have an impact on comfort and safety, as it lacks the qualities it should provide.

7. **Number of seating areas (public)**

   Street 1: Along the first side, 20 non-commercial seating items like benches and chairs where people could sit without having to pay for goods or services have been counted. which is 1 seat per 50 meters, including seating at the bus stops. Along the second side, only 5 (4 are at the bus stop) seats are provided, which is 1 seat per 200 meters. On average, there is one seat every 80 meters. 25 seats in 2 km.

   Street 2: Along both sides of the 800-meter road, only nine public seats are provided, of which six are at the bus stops. This means there is one seat every 100 meters.

   Street 3: On the first side, 12 non-commercial primary seating items and 13 secondary seating areas have been counted. which is 1 seat per 24 meters, including 2 seating areas at the bus stops. Along the second side, only 3 (2 of which are at the bus stop) seats are provided, which is 1 seat per 200 meters. On average, there is one seat every 42.9 meters. 28 seats in 1.2 km

Figure 4.23 Availability of seating areas (public)

Figure 4.24 Public seating areas on the sidewalk

The literature indicates that one of the essential qualities of street sidewalks is the availability of free public seating, as it provides enhanced accessibility, a social platform, boosted economic activity, and improved mental well-being.

The results from the observation study indicate that there is little provision for public seating, and proximity between them might exhaust pedestrians. This could have an impact on comfort and safety, as it lacks the qualities it would provide.

Literature suggests that public seating is essential for everyone, from shoppers to elderly residents, as it encourages walking and creates a diverse streetscape. Benches and chairs serve as natural gathering spots, fostering conversations and a sense of belonging. enhancing local businesses. Strategically placed chairs outside cafes or bookstores transform sidewalks into storefronts, inviting patrons to relax. Outdoor spending positively impacts mental health by reducing stress and fostering community.

8. Number of seating areas (business)

Street 1: Only one seating area is supplied by private businesses, which provide goods and services along one side of 1 km of the pedestrian. The second side has nine seating areas, bringing the average seating provided by private businesses to 10 in 2 km, which is 1 in every 100 meters.

Street 2: Only five seating areas are provided by private businesses along both sides of the 800-meter pedestrian walkway. which is 1 in every 160 meters.

Street 3: Private businesses have provided 14 seating areas along both sides of the 600-meter pedestrian walkway. This equates to one in every 42.8 meters.

Figure 4.25 seating provided by private businesses

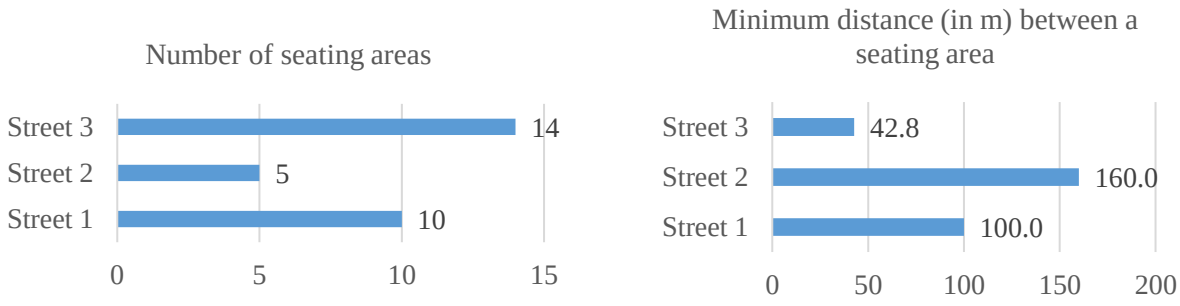


Figure 4.26 Availability of seating areas by private businesses

According to the literature, one of the important characteristics of street sidewalks is the availability of seating provided by businesses along the street, as it improves the pedestrian experience, human connection and well-being, economic activity, and urban aesthetic.

The results from the observation study indicate that there is little provision of business-owned seating, and proximity between them might exhaust pedestrians. On streets 1 and 2, the provision is one in 100 and 160 meters, respectively; on street 3, there is relatively better provision and proximity between seating areas. The condition could have an impact on comfort and safety, as it lacks the qualities it would provide.

The literature points out that a well-placed chair or bench not only serves as furniture but also invites pedestrians to enjoy the street's sights and sounds. This creates a more attractive option for short trips and fosters a sense of belonging among pedestrians. Business-owned seating areas can add visual interest and character to the streetscape, enhancing the pedestrian experience and contributing to a more aesthetically pleasing urban environment. Strategically placed chairs outside cafes or restaurants can become extended storefronts, attracting customers and boosting foot traffic, ultimately benefiting local businesses.

9. Pavement condition

Street 1: Along the 1 km pedestrian route, 430 m (43%) of the pavement condition is deteriorated and needs major maintenance. This means there are 1.3 maintenance issues per 3 m.

Street 2: Along the 800-meter pedestrian route, 371 m (46.3%) of the pavement condition is deteriorated and needs major maintenance. This means there are 1.4 maintenance issues per 3 m.

Street 3: Along the 600-meter pedestrian route, 36 m (6%) of the pavement condition needs minor maintenance. This means there are 0.18 maintenance issues per 3 m.

Figure 4.28 Unpaved and/or deteriorated pavement condition

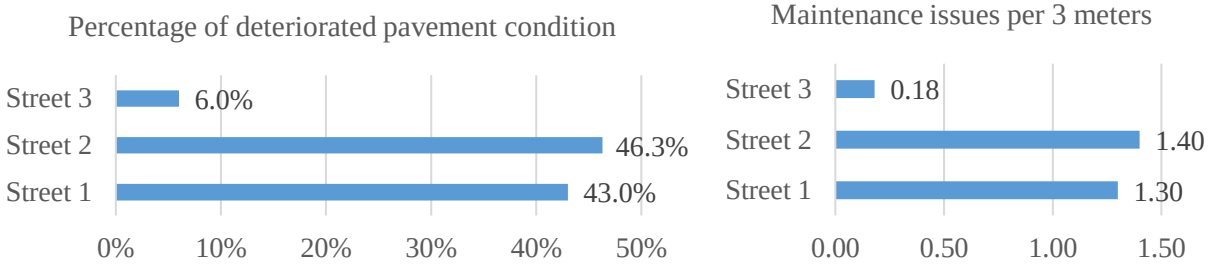


Figure 4.27 Sidewalk pavement condition

According to the literature, one of the important characteristics of street sidewalks is adequate pavement provision and continuous maintenance, as it is essential for safety and accessibility, as well as improved walkability and flow, health and well-being, and the overall image of the city.

The observation study results show that there is a visible maintenance issue, as streets 1 and 2 have 43 and 46 percent of the pavement deteriorated, respectively, and there is more than one maintenance issue within 3 meters. Street 3 has relatively better provisions and maintenance. The condition may have an impact on the comfort and safety of pedestrians because it lacks the qualities it would provide.

The literature argues that proper pavement maintenance and repairs, along with smooth surfaces and well-designed ramps, can help prevent tripping hazards, especially for elderly and disabled individuals. These surfaces encourage safe passage and inclusivity, making walking a more enjoyable and accessible activity. Uneven surfaces slow down foot traffic, making walking a frustrating and inefficient choice. Walking also contributes to improved cardiovascular health, reduced stress levels, and boosted cognitive function. Overall, well-maintained sidewalks make walking a more enjoyable and accessible activity for everyone.

10. Degree of provision and continuity of tactile pavement

Street 1: The percentage of sidewalks with tactile pavement provision for the visually impaired within 1 km is 610 m (61%); the remaining 390 m (39%) are not provided. From the available tactile pavement, 82 counts of interruptions in continuity are observed.

Street 2: From the 800-meter sidewalk, 560 m (70%) have tactile pavement provision for the visually impaired; the remaining 240 m (30%) do not. There are 65 counts of interruptions in continuity observed on the available tactile pavement.

Street 3: Among the 600 m, 540 m (90 percent) have tactile pavement provision for the visually impaired; the remaining 60 m (10 percent) do not. 21 counts of interruptions in continuity are observed on the available tactile pavement.

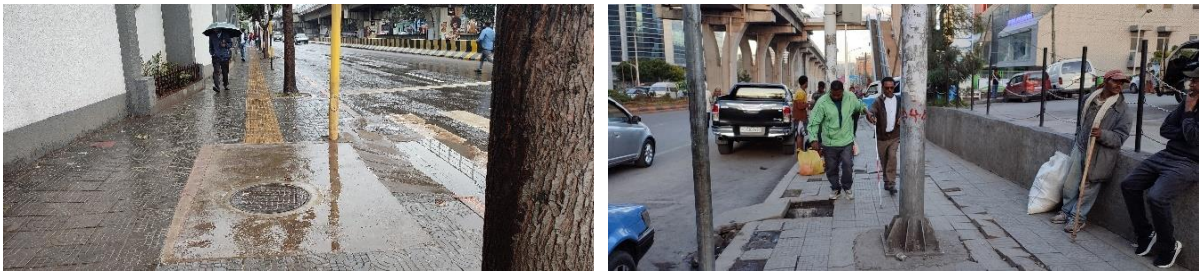


Figure 4.30 Obstructions and interruptions in the continuity of tactile pavement

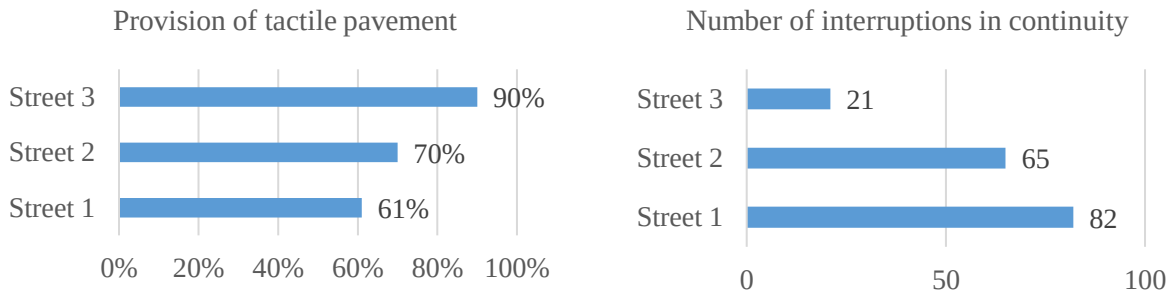


Figure 4.29 Degree of provision and continuity of tactile pavement

According to the literature, one of the important characteristics of street sidewalks is accessibility and inclusion. Tactile pavement allows the visually impaired to navigate public spaces independently, fostering a sense of inclusion and belonging in the city.

The observation study results show that there is a limitation in the provision and continuity of tactile pavements; on streets 1, 2, and 3, respectively, 39, 30, and 10 percent of the sidewalk lack pavement provision. 82, 65, and 20 interruptions as a result of different factors were counted. This makes it challenging for people who are visually impaired.

The literature argues that tactile pavements provide essential information about curbs, crosswalks, and directions, enabling the visually impaired to navigate public spaces independently. This reduces fear of the unknown and increases safety. Cities without tactile pavements create invisible barriers, excluding those who rely on non-visual cues. Tactile pavements dismantle these barriers, allowing everyone to participate in the vibrant street life and fostering a more equitable and inclusive urban environment. This increased foot traffic strengthens local businesses and contributes to a diverse and thriving urban economy.

11. Degree of presence of other street furniture and artifacts

Street 1: Street furniture other than seating is counted. A bollard, dustbin, and traffic sign were provided. There are 55 bollards on both sides that were used to mark the way for the buildings that obstruct pedestrian traffic. 46 dustbins are provided along both sides, which means 2.3 per 100 meters. 42 traffic signs were counted on both sides, which is 2.1 per 100 meters. Beside the quality and maintenance, the design of these becomes an additional element that obstructs sidewalks.

Street 2: There are 18 trash cans on both sides, for a total of 1.1 per 100 meters. On both sides, 46 traffic signs were counted, for a total of 2.9 per 100 meters. Aside from the quality and maintenance, the design of these becomes an additional obstructive element on sidewalks.

Street 3: On both sides, there are 37 trash cans, for a total of 6.1 per 100 meters. 33 traffic signs were counted on both sides, for a total of 5.5 per 100 meters. It is improved by the availability of 20 bicycle racks. Aside from the quality and maintenance, the design of these becomes another obstructive element on sidewalks.

Figure 4.31 Available Street furniture other than seating

One of the important characteristics of street sidewalks is the availability of street furniture other than seats, including artifacts. Beside their availability, proper design and fixing are necessary in order not to create additional obstructions.

B. Safety

For the limitations on the safety aspect of the study, based on the literature, four points were considered. which is the activeness of the street frontage, building permeability, stores remaining open late, and lighting after dark. The result and discussion are stated concurrently.

1. Degree of activeness of street frontage

One of the essential qualities of street sidewalk is activeness of building frontage. Active frontages create a safer, more inviting street environment, attracting pedestrians and customers, leading to increased foot traffic and economic prosperity for local businesses. They also foster social interaction, connecting communities and creating a dynamic hub of commerce, thereby making the entire neighborhood safe and vibrant.

Street 1: On one side of the sidewalk, 45 doors are counted along the 1 km of walkway, resulting in an average of 4.5 doors per 100 meters. which is categorized under D (2–5 doors per 100 m)—"boring." The other side has 105 doors, which is 10.5 doors per 100 meters. under B (10–14 doors per 100 m): "friendly." Here the result is computed on average; each segment of 100 m might have a different result.

Street 2: On one side of the sidewalk, 43 doors are counted along the 800meter of walkway, resulting in an average of 5.3 doors per 100 meters. which is categorized under D (2–5 doors per 100 m)—"boring." The other side has 50 doors, which is 6.2 door per 100 meters. under C (6–10 doors per 100 m): "mixture.". Here the result is computed on average; each segment of 100 m might have a different result.

Street 3: On one side of the sidewalk, 55 doors are counted along the 600 meters of walkway, resulting in an average of 9.1 doors per 100 meters. which is categorized under C (6–10 doors per 100 m): "mixture.” The other side has 14 doors, which is 2.3 doors per 100 meters. which is categorized under D (2–5 doors per 100 m)—"boring." Here the result is computed on average; each segment of 100 m might have a different result.

Figure 4.32Blind Street frontage impacted the activeness of the sidewalk.

2. Degree of permeability of the building frontage

One of the essential qualities of street sidewalks for safety is the permeability of the building frontage alongside the sidewalk. Frontages that are open and active have a "natural surveillance" effect, which deters crime and vandalism. A sense of security improves with eyes on the street, making the city feel more welcoming and accessible to all.

Street 1: Among the multistory buildings adjacent to the street, none are effectively permeable; 8 (53.3%) are found to be partially permeable, and 7 (46.6%) are found to be non-permeable.

Street 2: None of the multistory buildings adjacent to the street are effectively permeable; four (40%) are partially permeable, and six (60%) are non-permeable.

Street 3: Four (26.6 percent) of the multistory buildings adjacent to the street are effectively permeable, five (33.3 percent) are partially permeable, and six (40 percent) are non-permeable.

Figure 4.34 Buildings that are permeable and impermeable from the

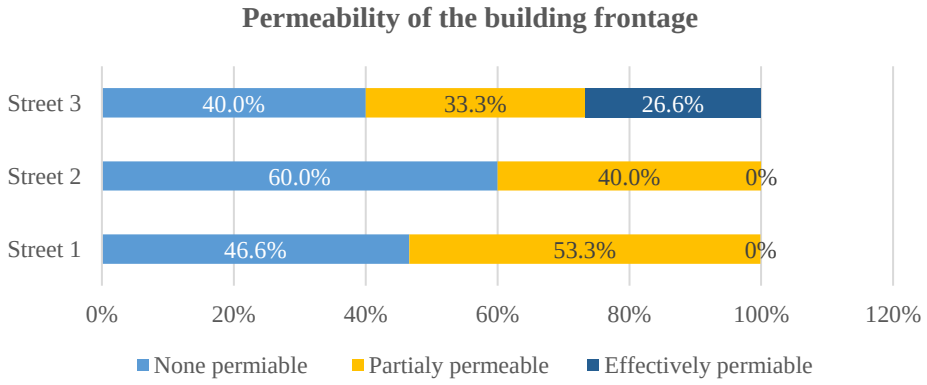


Figure 4.33 Degree of permeability of the building frontage

Based on the results, streets 1 and 2 have no effectively permeable building fronts. This might compromise pedestrian safety and comfort. Street 3 appears relatively better since 26.6 percent of the buildings are permeable.

3. **Stores remained open late**

   Street 1: The number of stores open after dark after 8:30 p.m. (2:30 LT) is only two. one nightclub and one small-scale food provider. The street appears to be silent and lifeless, creating a feeling of insecurity.

   Street 2: There were only three stores open after dark after 8:30 p.m. (2:30 LT), all of which are restaurants. The street appears to be lifeless and silent, creating a sense of insecurity.

   Street 3: There were five stores open after dark after 8:30 p.m. (2:30 LT); three were fast-food providers, and two were restaurants. The street appears to be better in comparison to the previous streets.

The results indicate that shops, cafes, and boutiques that could make the street appear active and safe close early, and on the streets, safety during the night becomes an issue.

4. **Lighting after dark.**

   Street 1: A total of 34 street lights are provided along one side of the street in 1 km, which is one every 30 meters. 10 were not functioning, which is 28.5%. With inactive frontage and stores being closed early, the light after dark is not adequate.

   Street 2: A total of 32 street lights are installed along one side of the 800-meter sidewalk, one every 25 meters. 7 were not operational, accounting for 21.8 percent of the total. With inactive frontage and stores closing early, the light after dark is insufficient.

   Street 3: A total of 25 street lights are provided along one side of the street in 600 meters, which is one in every 24 meters. 4 were not functioning, which is 16%.

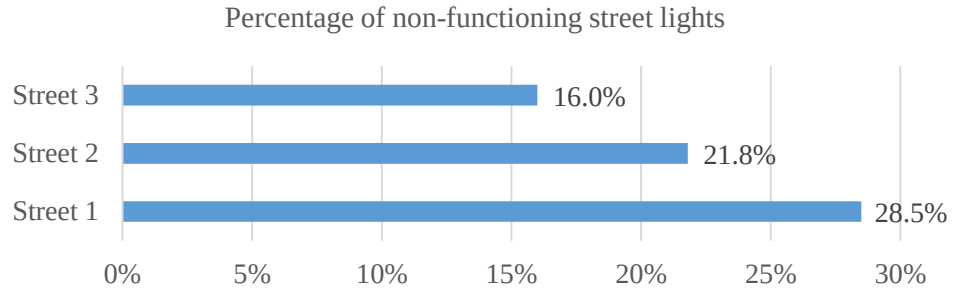


Figure 4.35 Non-functioning Street lights

The results indicate that the lack of proper maintenance, with the previous discussed challenges, is impacting users' safety and comfort during the night.

C. Pleasure

For the limitations on comfort from being on a pleasurable street, based on the literature, five points were considered. which are building front personalization, façade articulation and variety, sense of enclosure, sensory complexity, and attractiveness and interestingness.

1. **Degree of personalization of the buildings on the street front**

   Shops, building facades, and entrances have been observed for being designed with customized touches such as displays, decorations, signs, banners, planters, flower boxes, and other wares. All three streets lack such qualities, but some attempts are made at three stores on the first street, two on the second, and one on the third street.

2. **Façade articulation and variety**

   The articulation of the building façade was determined by observing how articulated and punctuated buildings are with edges, corners, alcoves, small setbacks, and steps at street level. On the first street, only five buildings have either of the qualities mentioned. Most lack the combination of those qualities, but Philips's building appears to be better articulated. On the second street, two buildings (the Ethiopian Tea and Coffee Authority and the Ethiopian Insurance Corporation) and on the third street, one building (the building where Lalibela Restaurant is found) appear to be relatively better articulated. Most of the buildings lack variety in material design and articulation.

3. **Sense of enclosure**

   Spaces enclosed by buildings, structures, vegetation, or other elements are counted along the streets. On the first street, only two enclosed spaces exist: one is the open space provided between the condominiums, and the second is the space at the Philips building, defined by the building setback and vegetation. Most other buildings even take space from the walkway rather than providing and defining it. On the second street, no enclosed space has been observed. On the third street, one building (the building where Lalibela Restaurant is found) has a better space that is well defined and could be used for pedestrians in combination with different services. But currently, such space is only serving as parking for a few cars. Other buildings were not generous enough in providing such essential space.

4. **Sensory complexity (variety and density of sidewalk elements)**

   Observation of the presence of a variety of plants, granaries, water features, street furniture, and artwork indicates that all the tree streets have a common character.

Mostly, only two plant types are used for the sidewalks; greenery work is ignored; and only two water features are provided at the Awash building and at Wegagen Bank, which functions occasionally. Street furniture is not well provided and lacks variety in type and arrangement; in terms of provision, the third street is better. Artwork is not available on any of the sidewalks.

5. **Attractiveness and interestingness**

   On the study streets No place for play or exercise is available. Cleanliness and tidiness are highly compromised; there are places where trash is dumped openly, and people urinate at the edge of the sidewalk and under the railway bridge. Damaged pavements create potholes and splash water on users. Pleasant landscaping works are not considered at all. With these conditions and the previously discussed limitations, the place lacks the qualities of attractiveness and interestingness. Some exceptions to this are the area around the stadium, which is wider, relatively furnished, and clean, shaded by the train bridge above.

4.3. Performance Evaluation of the Pedestrian Environment

The third objective of this study is to evaluate the performance of the street pedestrian environment as a public space using the PSI method by Vikas Mehta. The PSI method assesses performance based on author observation and user perceptions and evaluations of their experience.

4.3.1. Observation and user perception Evaluation of the Physical Setting

The observation evaluation points are five attributes: public seating, seating by businesses, other street furniture and artifacts, shade and shelter, and elements discouraging the use of spaces. The average point out of 3 is 0.6, 0.8, and 1.6 for streets 1, 2, and 3, respectively. The user perception evaluation is based on two points: physical condition and maintenance appropriateness and noise from traffic or other sources. The average points are 0.9, 1.02, and 1.62 for streets 1, 2, and 3, respectively. The results are an indication of the limitations on the streets. Refer to tables 4.9 and 4.10.

4.3.2. Observation and User Perception of the Safety

The observation evaluation points of safety have three attributes: first, visual and physical connection and building openness; second, physical condition and maintenance; and third, lighting quality after dark. The average point out of 3 is 0.66, 0.66, and 0.85 for streets 1, 2,

and 3, respectively. The user perception evaluation is based on four points: perceived safety from surveillance and related issues, daytime crime, nighttime crime, and traffic. The average points are 1.23, 1.16, and 1.33 for streets 1, 2, and 3, respectively. The results are an indication of safety issues. Refer to tables 4.9 and 4.10.

4.3.3. Observation and User Perception of Comfort from Pleasurable Experiences

The observation evaluation points for a street with a pleasurable experience have seven attributes: first, memorable architecture and landscaping (imageability); second, sense of enclosure; third, permeability of the building front; fourth, personalization of the building front; fifth, permeability of buildings; sixth, density of sidewalk elements; and seventh, variety of sidewalk elements. The average point out of 3 is 0.71, 0.71, and 0.85 for streets 1, 2, and 3, respectively. The user perception evaluation is based on two points: the perceived attractiveness and the interestingness of the street space. The average points are 1.02, 1.17, and 1.57 for streets 1, 2, and 3, respectively. The results could indicate concerns about enjoying the street. Refer to tables 4.9 and 4.10.

Result- Outcome of the PSI

For the comfort of the physical setting, the total score out of 30 is 6.5, 9.1, and 16.9, which means 21.66, 30.33, and 56.33 out of 100, respectively, for streets 1, 2, and 3. The results show Street 3 performed relatively better, but still only slightly above half of the score. Streets 1 and 2 scored the lowest number, indicating the lowest performance. Refer to tables 4.12 and 4.13.

For safety, the total score out of 30 is 10.9, 9.85, and 15.25, which is 34.5, 32.85, and 50.83 out of 100, respectively, for the three streets. The results indicate safety is compromised, with relatively better performance at Street 3, which is only half the score.

The score for comfort from being on a pleasurable street is 8.1, 8.55, and 10.85, which is 27, 28.5, and 36.16 out of 100, respectively, for the three streets. This indicates that the street performed way below half the score, and the first two streets scored the least.

Discussion

According to the literature, the overall comfort of pedestrians is a result of the combination of physical comfort, safety, and a pleasurable experience. The average score of comfort from the physical setting for all the streets is 39.4, safety is 39.3, and pleasure is 30.53. The overall PSI

of the study streets is 36.41, and the result indicates the extent of the limitations on the study streets.

A similar study on public space evaluation by Vikas Mehta is discussed below.

Comparison - with "Evaluating Public Space" by Vikas Mehta

The average score of comfort from the physical setting for all the streets is 39.4, safety is 39.3, and pleasure is 30.53. The overall PSI of the study streets is 36.41. A similar study on public space evaluation by Vikas Mehta is discussed below.

The index examines four public spaces in downtown Tampa, Florida: "Gaslight Park, Bank of America Plaza, Franklin Street, and pedestrian-only Franklin Street (Poe Plaza)." Since the focus of this study is on the street, the findings on Franklin Street and pedestrian-only Franklin Street (Poe Plaza) are discussed. For physical comfort, the scores out of 30 are 22.57 and 23.46, respectively, which are 75 and 78 out of 100. For safety, the scores are 20.70 and 20.43, which are 69 and 68 out of 100, respectively. For the experience of pleasure, the scores are 17.86 and 17.79, which are 60 and 59 out of 100, respectively.

When the findings of the study on this research are compared with the above work, there is a visible gap in performance. This is possibly due to the differences in the context of the study areas. One is in a developed nation, and the other is in a developing nation. The other factor is that the perception and expectations of the pedestrian may vary between the two countries. Despite these conditions, the findings of this research have implications for the improvement of weak performance and compromised pedestrian comfort in experiencing the street.

Observation Evaluation

Table 4.7 Observation rating for the PSI evaluation

	Aspect of public space	Variables / Attributes	Rating 0, 1, 2, and 3		
			Street 1	Street 2	Street 3
Results from observation (site inventory)	Comfort from Physical setting	Places to sit without paying for goods and services	1	1	2
		Seating provided by businesses	1	1	2
		Other furniture and artifacts in the space	1	1	1
		Climatic comfort of the space: shade and shelter	0	1	2
		Clear from design elements discouraging use of space	0	0	1
	average		**0.6**	**0.8**	**1.6**
	Comfort from safety	Visual and physical connection and openness of the building to the streets	1	1	2
		Good physical condition and good maintenance	0	0	2
		Lighting quality after dark	1	1	2
	average		**0.66**	**0.66**	**2**
	Comfort from being at pleasurable street	Presence of memorable architectural or landscape features (imageability)	1	1	1
		Sense of enclosure	0	0	0
		Building façade Permeability at the street front	1	1	2
		Personalization of the buildings on the street front	1	1	1
		Articulation and variety in architectural features of building facades	0	0	0
		The density of elements on sidewalks or streets adds sensory complexity.	1	1	1
		The variety of elements on the sidewalk or street offer sensory complexity.	1	1	1
	average		**0.71**	**0.71**	**0.85**
	Overall total observation ratting (from maximum achievable point 15*3 = 45		**10**	**11**	**20**

User Perception and Evaluation

Table 4.8 Demographic characteristics of survey respondents

		Street 1 Mexico to Lideta		Street 2 Lideta to Legehar		Street 3 Legehar to M. Square		Total	Percentage
Total respondent		Count	Percentage	Count	Percentage	Count	Percentage		
		20		20		20		60	
Age	18-24	4	20%	3	15%	5	25%	12	20.00%
	25-34	6	30%	5	25%	5	25%	16	26.67%
	35-44	4	20%	6	30%	3	15%	13	21.67%
	45-54	3	15%	4	20%	3	15%	10	16.67%
	55-64	2	10%	1	5%	2	10%	5	8.33%
	65-74	1	5%	1	5%	1	5%	3	5.00%
	≥ 75	0	0%	0	0%	1	5%	1	1.67%
Gender	Male	12	60%	15	75%	14	70%	41	68.33%
	female	8	40%	5	25%	6	30%	19	31.67%
Live/work	Live	2	10%	1	5%	1	5%	4	6.67%
	Work	10	50%	11	55%	7	35%	28	46.67%
	Both	2	10%	2	10%	2	10%	6	10.00%
	Transit	6	30%	6	30%	10	50%	22	36.67%
Frequency of use	Once a day or more	11	55%	10	50%	11	55%	32	53.33%
	Few times a week	6	30%	7	35%	7	35%	20	33.33%
	Few times a month	2	10%	3	15%	2	10%	7	11.67%
	Once occasionally	1	5%	0	0%	0	0%	1	1.67%

Average of the three streets for sex, gender, reason for the visit, and visit frequency.

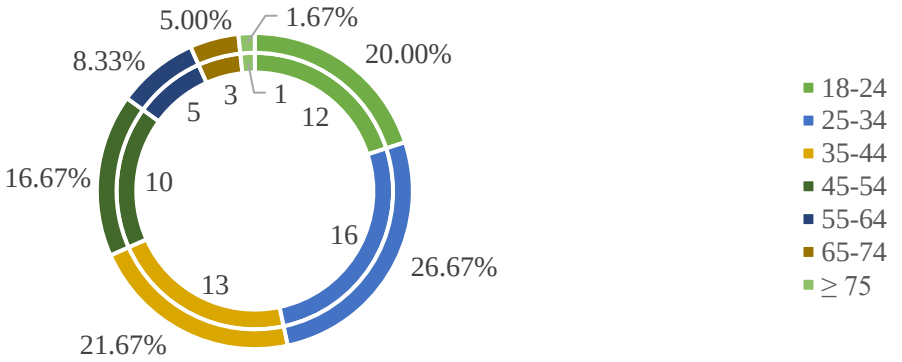


Figure 4.36 Average age proportion of survey respondent

The survey participants have an age proportion of 20%, 26.67%, 21.67%, 16.67%, 8.33%, 5%, and 1.67%, respectively, for 18–24, 25–34, 35–44, 45–54, 55–64, 65–74, and 75 and above. This helped to understand the perceptions of different age groups.

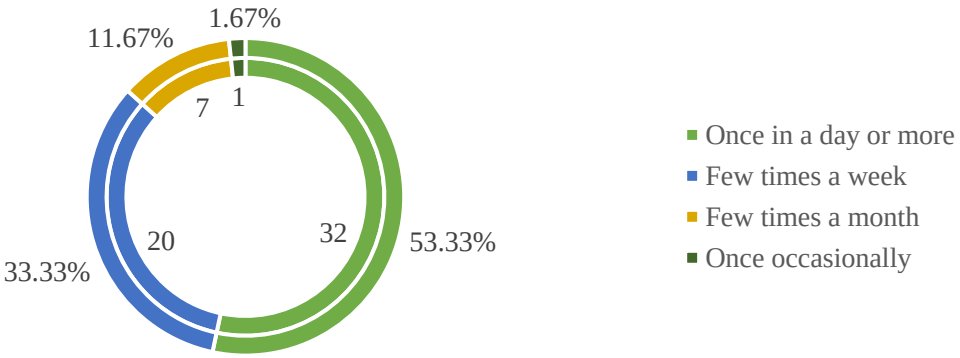


Figure 4.38 Average frequency of visit proportion of survey respondent

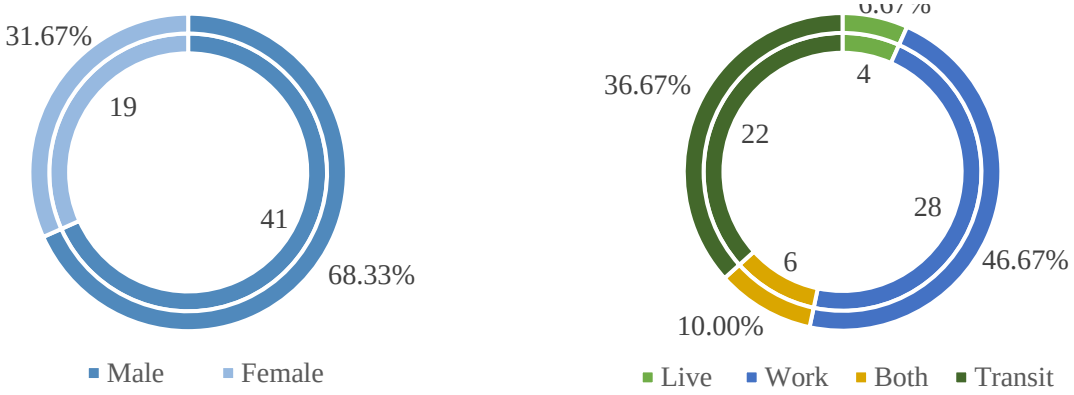


Figure 4.37 Average gender and reason for visit proportion of survey respondents

86.66% of the respondents were frequent users of the street, with a proportion of 53.33% once a day or more and 33.33% a few times a week. 13.34% were users a few times a week and once occasionally. This helped to get the perception of the day-to-day users. The gender ratio was 68.33% to 31.67%. 63.34% of the respondents either live (6.67%), work (46.67%), or both (10%) in the area of the street. The remaining 36.67% were users for a transitory purpose. This helped establish the perception of familiar users.

Users Ratting for Street 1

Perceived Comfort from Physical Setting

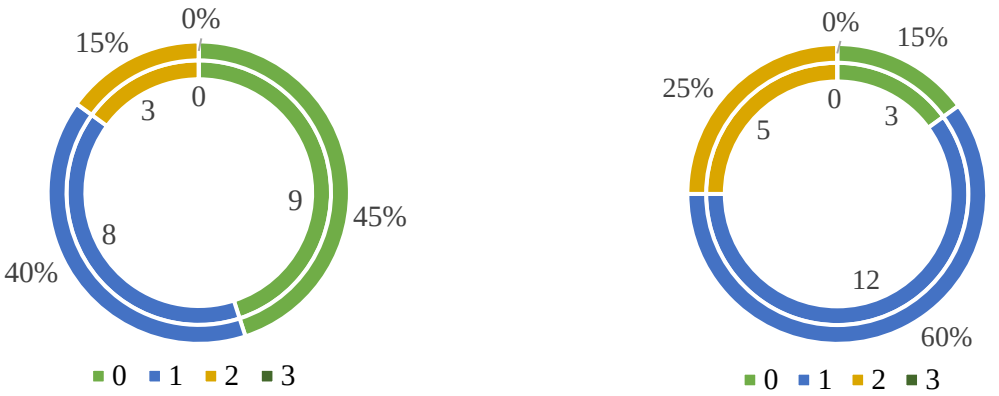


Figure 4.39 User rating of perceived physical condition and maintenance appropriateness and nuisance noise from traffic or otherwise for street 1

For qualities of perceived physical condition and maintenance appropriateness, 85% of respondents rated 0 (45%) and 1 (40%). 0 is no such quality at all, and 1 somehow is. for perceived nuisance noise from traffic or otherwise, 75% rated 0 (15%) and 1 (60%). 0 is high, and 1 is moderate.

Perceived Comfort from Safety

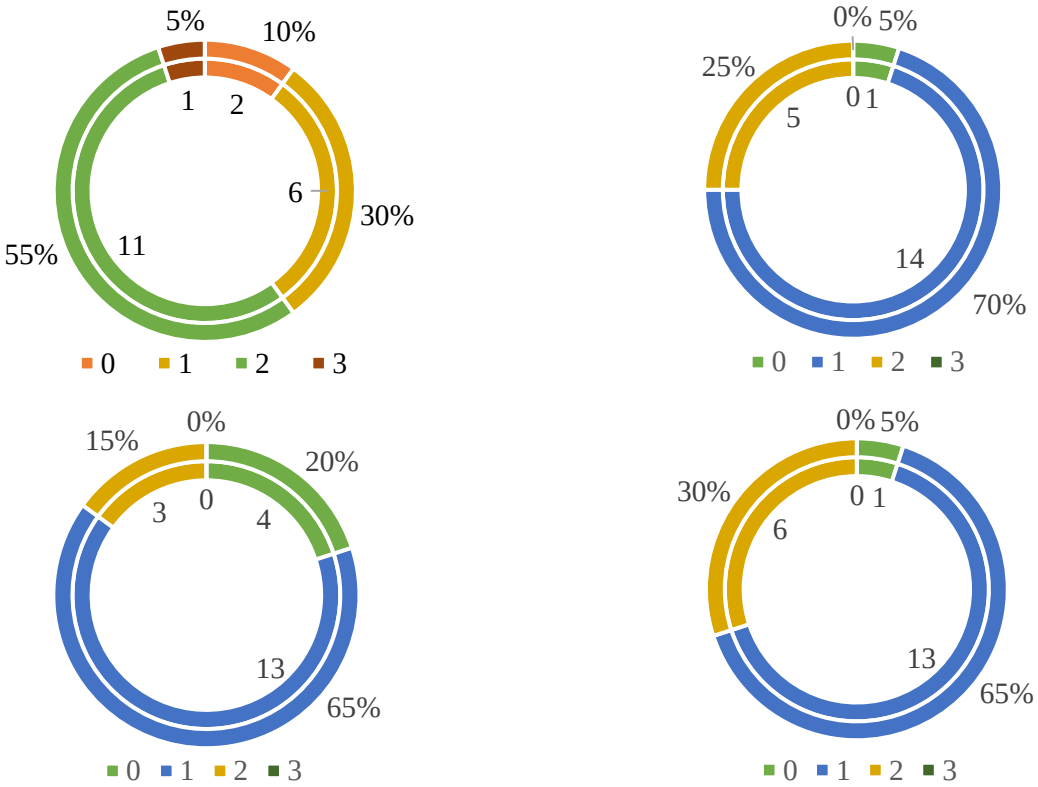


Figure 4.40 User rating of Perceived sense of safety from surveillance cameras, security guards, the presence of other road users, etc. (1), protection from criminal activity during the day (2), protection from nighttime crime (3), and from traffic accidents (4) for street 1

For qualities of perceived safety from surveillance cameras, security guards, the presence of other road users, etc. 40% of respondents rated 0 (10%) and 1 (30%). 0 is “make me feel unsafe," and 1 is perceived to have no such quality at all. 55% rated 2 (felt some sense of safety).

For perceived qualities of safety in terms of protection from criminal activity during the day, 75% of respondents rated 0 (5%) and 1 (70%). 0 is not safe at all, 1 is somewhat unsafe, and 25% rated 2 (felt mostly safe).

For perceived Safety in terms of protection from nighttime crime 85% of respondents rated 0 (20%) and 1 (65%). 0 is not safe at all, and 1 is somewhat unsafe and 15% rated 2(felt mostly safe).

For perceived safety from traffic accidents, 70% of respondents rated 0 (5%) and 1 (65%). 0 is not safe at all, 1 is somewhat unsafe, and 30% rated 2 (felt mostly safe).

comfort From Being on Pleasurable Street

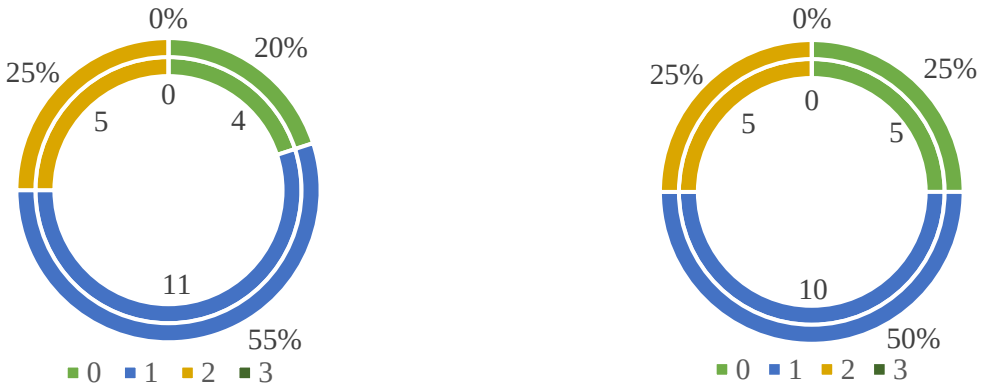


Figure 4.41 User rating of the perceived attractiveness and interestingness of street 1

For the perceived attractiveness of the street, 75% of respondents rated 0 (20%) and 1 (55%). 0 is “not at all” and 1 is "somewhat." 25% are rated 2 (moderate).

For the perceived interestingness of the street 75% of respondents rated 0 (25%) and 1 (50%). 0 is “not at all”, and 1 “somewhat”. 25% rated 2(moderate).

Users Ratting for Street 2

Perceived Comfort from Physical Setting

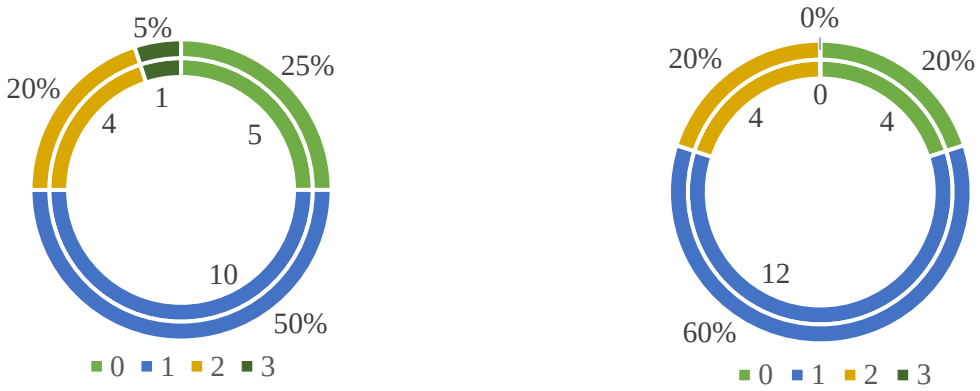


Figure 4.42 User rating of perceived physical condition and maintenance appropriateness and nuisance noise from traffic or otherwise for street 2

For qualities of perceived physical condition and maintenance appropriateness, 75% of respondents rated 0 (25%) and 1 (50%). 0 is no such quality at all, and 1 somehow is. for perceived nuisance noise from traffic or otherwise 80% rated 0 (20%) and 1 (60%). 0 is high, and 1 is moderate.

Perceived Comfort from Safety

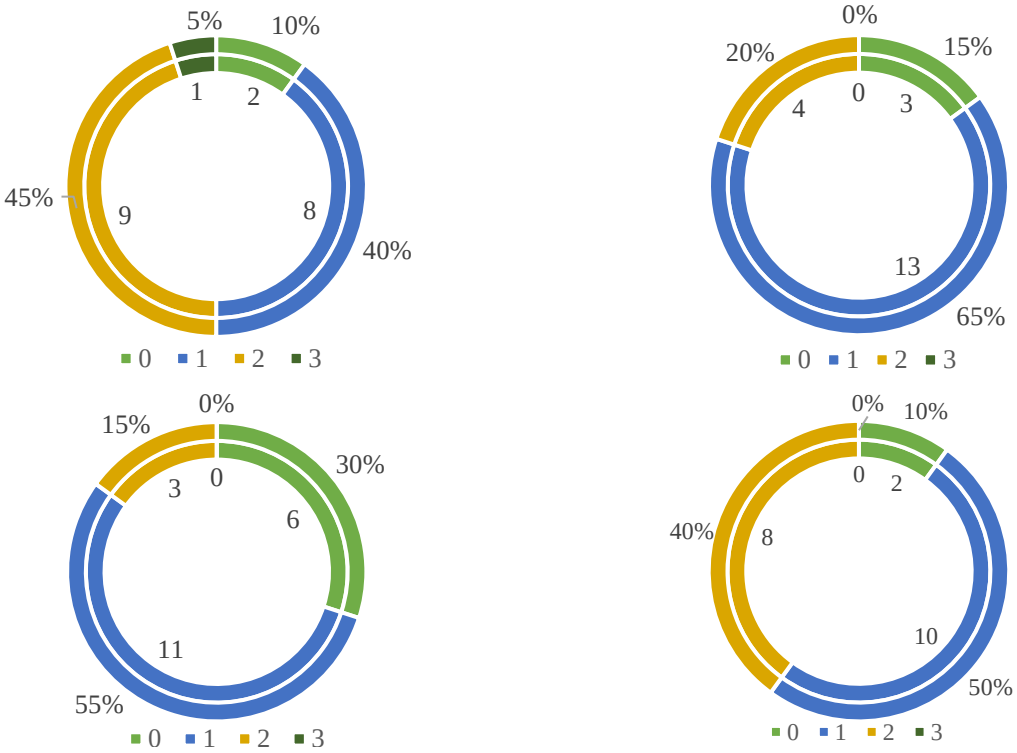


Figure 4. 43 User rating of Perceived sense of safety from surveillance cameras, security guards, the presence of other road users, etc. (1), protection from criminal activity during the day (2), protection from nighttime crime (3), and from traffic accidents (4) for street 2

For qualities of perceived safety from surveillance cameras, security guards, the presence of other road users, etc. 50% of respondents rated 0 (10%) and 1 (40%). 0 is “make me feel unsafe," and 1 is perceived to have no such quality at all. 45% rated 2 (felt some sense of safety). 5% rated 3 (felt a much sense of safety).

For perceived qualities of safety in terms of protection from criminal activity during the day, 80% of respondents rated 0 (15%) and 1 (65%). 0 is not safe at all, 1 is somewhat unsafe, and 20% rated 2 (felt mostly safe).

For perceived safety in terms of protection from nighttime crime, 85% of respondents rated 0 (30%) and 1 (55%). 0 is not safe at all, 1 is somewhat unsafe, and 15% rated 2 (felt mostly safe).

For perceived safety from traffic accidents, 60% of respondents rated 0 (10%) and 1 (50%). 0 is not safe at all, 1 is somewhat unsafe, and 40% rated 2 (felt mostly safe).

Comfort From Being on Pleasurable Street

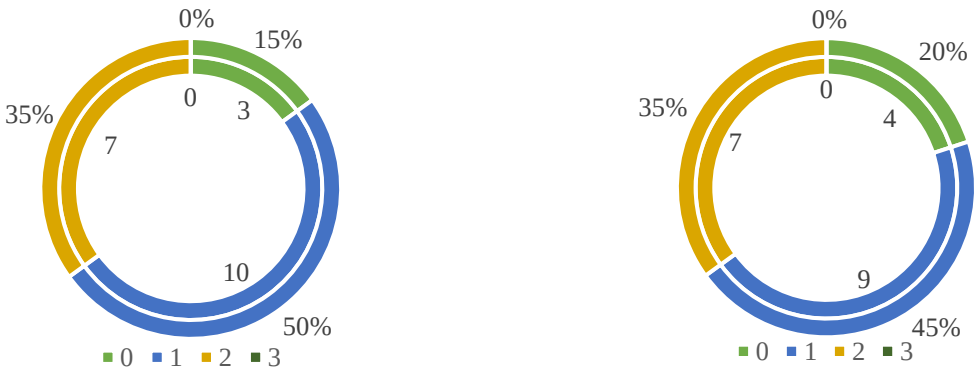


Figure 4. 44 User rating of the perceived attractiveness and interestingness of street 2

For the perceived attractiveness of the street, 65% of respondents rated 0 (15%) and 1 (50%). 0 is “not at all” and 1 is "somewhat." 35% rated 2 (moderate).

For the perceived interestingness of the street, 65% of respondents rated 0 (20%) and 1 (45%). 0 is “not at all” and 1 is "somewhat." 35% rated 2 (moderate).

Users Ratting for Street 3

Perceived Comfort from Physical Setting

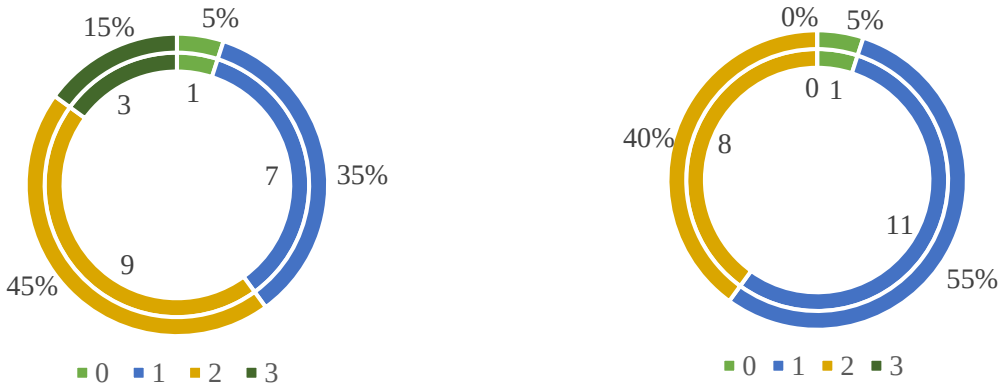


Figure 4.45 User rating of perceived physical condition and maintenance appropriateness and nuisance noise from traffic or otherwise for street 3

For qualities of perceived physical condition and maintenance appropriateness, 40% of respondents rated 0 (5%) and 1 (35%). 0 is no such quality at all, and 1 somehow is. 45% rated 2 (mostly) and 15% rated 3 (very much). for perceived nuisance noise from traffic or otherwise 60% rated 0 (5%) and 1 (55%). 0 is high, and 1 is moderate. 40% rated 2 (very little).

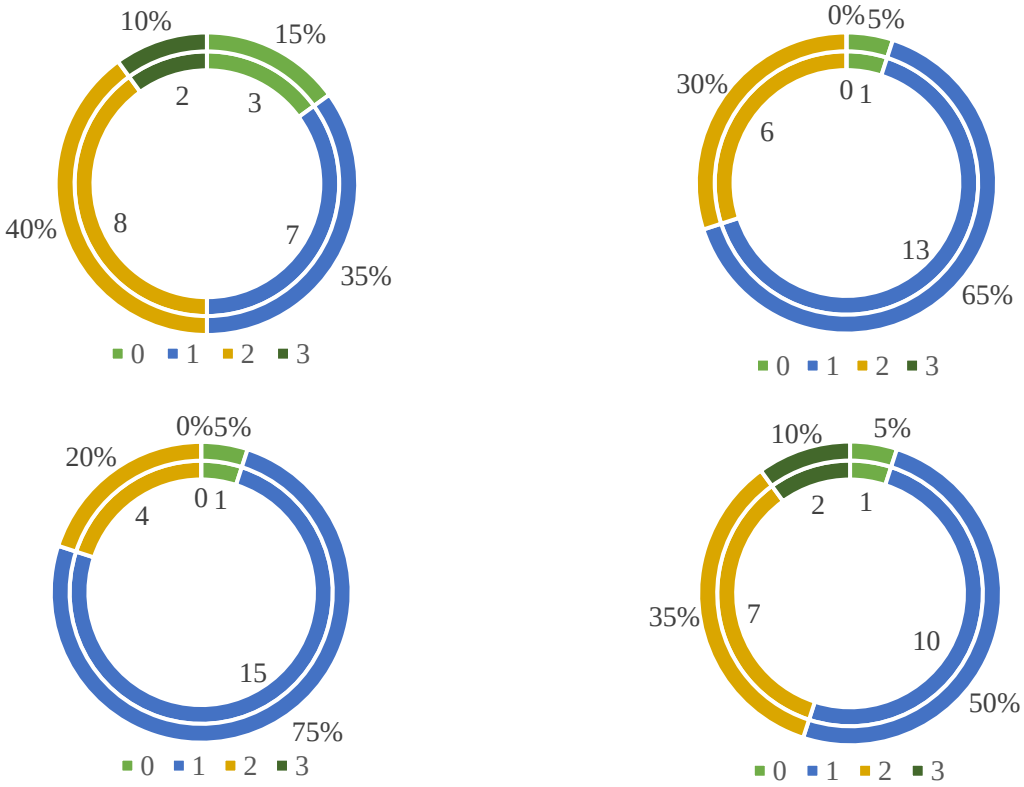


Figure 4. 46 User rating of Perceived sense of safety from surveillance cameras, security guards, the presence of other road users, etc. (1), protection from criminal activity during the day (2), protection from nighttime crime (3), and from traffic accidents (4) for street 3

For qualities of perceived safety from surveillance cameras, security guards, the presence of other road users, etc. 50% of respondents rated 0 (15%) and 1 (35%). 0 is “make me feel unsafe," and 1 is perceived to have no such quality at all. 40% rated 2 (felt some sense of safety). 10% rated 3 (felt a much sense of safety).

For perceived qualities of safety in terms of protection from criminal activity during the day, 70% of respondents rated 0 (5%) and 1 (65%). 0 is not safe at all, 1 is somewhat unsafe, and 30% rated 2 (felt mostly safe).

For perceived safety in terms of protection from nighttime crime, 80% of respondents rated 0 (5%) and 1 (75%). 0 is not safe at all, 1 is somewhat unsafe, and 20% rated 2 (felt mostly safe).

For perceived Safety from traffic accidents 55% of respondents rated 0 (5%) and 1 (50%). 0 is not safe at all, and 1 is somewhat unsafe and 35% rated 2(felt mostly safe). The remaining 10% rated 3(felt very safe).

Comfort From Being at Pleasurable Street

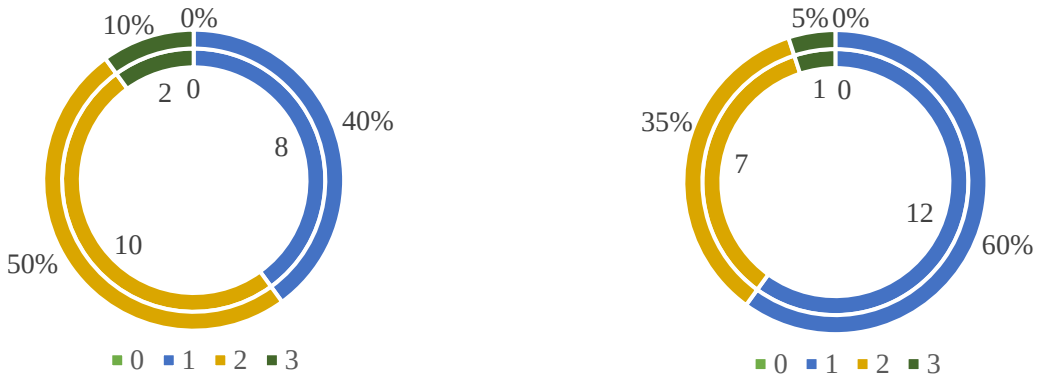


Figure 4. 47 User rating of the perceived attractiveness and interestingness of street 3

For the perceived attractiveness of the street, 40% of respondents rated 0 (0%) and 1 (40%). 0 is “not at all” and 1 is "somewhat." 50% rated 2 (moderate). The remaining 10% were rated 3 (very much).

For the perceived interestingness of the street 60% of respondents rated 0 (0%) and 1 (60%). 0 is “not at all”, and 1 “somewhat”. 35% rated 2(moderate). The remaining 10% rated 3(very much)

Summary Of User Evaluation

Table 4.9 Average rating by the users

	Aspects of public space	Variables / Attributes	Rating 0, 1, 2, and 3		
			Street 1	Street 2	Street 3
Result from users subjective ratting	Comfort from a Physical Setting	Perceived physical condition and maintenance appropriate	0.7	1.05	1.7
		Perceived nuisance noise from traffic or otherwise	1.1	1	1.5
	average		**0.9**	**1.02**	**1.62**
	Comfort from safety	Perceived safety from the presence of surveillance cameras, security guards, guides, ushers, etc. providing safety	1.55	1.45	1.45
		Perceived safety from crime during the daytime	1.2	1.05	1.25
		Perceived safety from crime after dark	0.95	0.85	1.15
		Perceived safety from traffic	1.25	1.3	1.5
	average		**1.23**	**1.16**	**1.33**
	Comfort from being at pleasurable street	Perceived attractiveness of the street space	1.05	1.2	1.7
		Perceived interestingness of the street space	1	1.15	1.45
	average		**1.02**	**1.17**	**1.57**
Overall total average ratting (from maximum achievable point 8*3 = 24			**8.8**	**9.05**	**11.7**

Performance Based on Public Space Index

Table 4.10 Outcomes of the Public Space Index

Aspects of public space	Variables / Attributes	W	Street 1		Street 2		Street 3	
			Ratting	Score	Ratting	Score	Ratting	Score
Comfort from a Physical Setting	Places to sit without paying for goods and services	2	1	2	1	2	2	4
	Seating provided by businesses	1	1	1	1	1	2	2
	Other furniture and artifacts in the space	1	1	1	1	1	1	1
	Climatic comfort of the space: shade and shelter	2	0	0	1	2	2	4
	Clear from design elements discouraging use of space	1	0	0	0	0	1	1
	Perceived physical condition and maintenance appropriate	2	0.7	1.4	1.05	2.1	1.7	3.4
	Perceived nuisance noise from traffic or otherwise	1	1.1	1.1	1	1	1.5	1.5
Total score		**10**		**6.5**		**9.1**		**16.9**
Index rating for comfort out of 100				**21.66**		**30.33**		**56.33**
Comfort from safety	Visual and physical connection and openness to adjacent street	1	1	1	1	1	2	2
	physical condition and maintenance appropriate for the pedestrian space	1	0	0	0	0	2	2
	Lighting quality after dark	1	1	1	1	1	2	2

	Perceived safety from the presence of surveillance cameras, security guards, guides, ushers, etc. providing safety	1	1.55	1.55	1.45	1.45	1.45	1.45
	Perceived safety from crime during daytime	2	1.2	2.4	1.05	2.1	1.25	2.5
	Perceived safety from crime after dark	2	0.95	1.9	0.85	1.7	1.15	2.3
	Perceived safety from traffic	2	1.25	2.5	1.3	2.6	1.5	3
Total score		**10**		**10.35**		**9.85**		**15.25**
Index rating for comfort from safety out of 100				**34.5**		**32.83**		**50.83**
Comfort from being at pleasurable street	Presence of memorable architectural or landscape features (imageability)	1	1	1	1	1	1	1
	Sense of enclosure	1	0	0	0	0	0	0
	Building façade Permeability at street front	1	1	1	1	1	2	2
	Personalization of the buildings on the street front	1	1	1	1	1	1	1
	Articulation and variety in architectural features of building façade.	1	0	0	0	0	0	0
	Density of elements on sidewalk/ street providing sensory complexity	1	1	1	1	1	1	1
	Variety of elements on sidewalk/ street providing sensory complexity	1	1	1	1	1	1	1
	Perceived attractiveness of the street space	2	1.05	2.1	1.2	2.4	1.7	3.4
	Perceived interestingness of the street space	1	1	1	1.15	1.15	1.45	1.45
Total score		**10**		**8.1**		**8.55**		**10.85**
Index rating for comfort from pleasure out of 100				**27**		**28.5**		**36.16**

Table 4.11 Combined mean ratings for each variable for all three streets

Aspect of public space	Variables / Attributes	Ave. rating for all 3 streets (out	Ave. index score for all streets
Comfort from Physical setting	Places to sit without paying for goods and services	2.66	
	Seating provided by businesses	1.33	
	Other furniture and artifacts in the space	1.00	
	Climatic comfort of the space – shade and shelter	3.00	
	Clear from Design elements discouraging use of space	0.33	
	Perceived physical condition and maintenance appropriate	2.30	
	Perceived nuisance noise from traffic or otherwise	1.20	
Total score of comfort from Physical setting (out of 100) for all 3 streets			**39.4**
Comfort from safety	Visual and physical connection and openness to adjacent street	1.33	
	physical condition and maintenance appropriate	0.66	
	Lighting quality after dark	1.33	
	Perceived safety from presence of surveillance cameras, security guards, guides, ushers, etc. providing safety	1.48	
	Perceived safety from crime during daytime	2.33	
	Perceived safety from crime after dark	1.96	
	Perceived safety from traffic	2.70	
Total score of comfort from safety (out of 100) for all 3 streets			**39.3**
Comfort from being at pleasurable street	Presence of memorable architectural or landscape features (imageability)	1.00	
	Sense of enclosure	0.00	
	Building façade Permeability at street front	1.33	
	Personalization of the buildings on the street front	1.00	
	Articulation and variety in architectural features of building façade.	0.00	
	Density of sidewalk elements / sensory complexity	1.00	
	Variety of sidewalk elements / sensory complexity	1.00	
	Perceived attractiveness of the street space	2.63	
	Perceived interestingness of the street space	1.20	
Total score of comfort from being at pleasurable street (out of 100) for all 3 streets			**30.53**
Average public space index (out of 100) for all three streets			**36.41**

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATIONS

This chapter concludes the key research findings based on the results and discussion, which aim to answer the research questions. The section is organized according to the objectives in the same way as the previous section of the result and discussion. Since the first objective is to identify the quality indicators and evaluation method, the section proceeds from the second objective.

5.1. Conclusion: The Pedestrian Activity and Physical Context

5.1.1. User Type and Activity

1. Transitory activities

The transitory user activity study found that the two streets, Lideta to Mexico and Mexico to Legehar, were crowded during peak hours, with levels slightly above and below the designated level of crowding for each street. The high levels of pedestrian crowding during peak hours have a number of negative implications for pedestrian comfort and safety. Reduced space to walk, increased risk of collisions, and increased stress levels can make walking unpleasant and discouraging for everyone, but especially for people with disabilities, older people, and families with young children. This can lead to increased car use, which further worsens traffic congestion and compromises comfort.

The results indicated the need to improve pedestrian comfort and safety on these streets. A number of measures could be implemented, such as widening sidewalks, creating more pedestrian-friendly infrastructure, these measures would make it safer and more enjoyable for people to walk, which would benefit everyone by leading to a more vibrant and livable city.

2. User type

The results and discussion of the user type study indicate that the diversity in user types is significantly less. Urban street spaces are vital for their diverse users, including children, elders, and individuals with disabilities. These spaces foster empathy, understanding, and responsiveness to a variety of needs. By providing a safe and welcoming environment for children, elders, and individuals with disabilities, street spaces become vibrant threads in the urban fabric, allowing everyone to feel seen and part of something bigger than themselves.

3. Stationary activities

The user activity study found that a majority of stationary activities are necessary, such as standing in line and waiting for transport. There is little provision for optional activities, such as cultural or recreational activities. Standing activities are more common than sitting activities, and public and free-of-charge seating activities are the least common.

The findings have a number of implications for the design and management of public spaces. First, the fact that a majority of stationary activities are necessary, such as waiting for transport or standing in line, suggests that there is a need for the street spaces that are designed for these types of activities. This could include providing more seating as well as creating spaces that are protected from unpleasant experiences. Second, the lack of provision for optional activities, such as cultural or recreational activities, suggests that there is an opportunity to create more pedestrian spaces that are designed for a variety of purposes. This could include providing spaces for people to sit and socialize, as well as spaces for people to engage in activities such as reading, playing games, or enjoying the arts. Third, the fact that standing activities are more common than sitting activities suggests that there is a need for more public spaces that are designed for people to stand and move around. This could include providing more standing surfaces as well as creating spaces that are designed to encourage people to be active. Finally, the fact that public and free-of-charge seating activities are the least common suggests that there is a need for street spaces that provide free and accessible seating. This is particularly important for people who are unable to afford to pay for seating. Overall, the findings of the user activity study suggest that there is a need for street spaces that are designed for a variety of stationary activities, including both necessary and optional activities. Pedestrian spaces should also be designed to be inclusive and accessible for all users.

5.1.2. Context of the Pedestrian Environment

A. Physical conditions

Based on the result and discussion, it is possible to conclude that the physical condition of the street environment has limitations in elements that support comfort qualities and requirements, which contribute to a compromised comfort in using the street as a public space. This includes a lack of proper room for walking, limitations in the provision of building setbacks, in the provision of shade and shelter from buildings and trees, obstruction from design elements and users, limited pavement maintenance, as well as a lack of seating or other places to rest.

B. Safety

Based on the result and discussion, it is possible to conclude that the pedestrian environment has limitations in elements that support safety qualities and requirements, which contribute to a compromised comfort in using the street as a public space. This includes a lack of liveliness and activeness in building frontages during the day and night, limitations in the permeability of building frontages, proper maintenance, and lighting at different times of the day. Additionally, sidewalk elements that are poorly designed and maintained, such as narrow sidewalks or sidewalks that are blocked by obstacles, contribute to the pedestrian environment becoming less safe.

C. Sense of pleasure

Based on the result and discussion, it is possible to conclude that the pedestrian environment has limitations in elements that support qualities and requirements that provide a sense of pleasure while experiencing the street as a public space. The lack of sidewalk elements that support a pleasurable experience contributed to the pedestrian environment becoming less enjoyable. This includes a lack of public art, a limited provision of street furniture other than seating, and other amenities. Limitation of personalized storefronts, façade articulation and variety, limitation in the sense of enclosure from buildings or other elements, sensory complexity, attractiveness, and interestingness of the space

5.2. Conclusion: Performance Evaluation of the Pedestrian Environment

5.2.1. Observation and user perception Evaluation of the Physical Setting

Based on the evaluation and discussion of the physical environment, it is possible to conclude that the pedestrian environment has limitations in its ability to function comfortably as a public space. The findings of the user perception study back up the preceding statement. This indicates that the street environment should be improved to effectively serve pedestrians.

5.2.2. Observation and user perception Evaluation of the Safety

The study reveals that the pedestrian environment has safety limitations, and user perception results suggest that street environments should be enhanced to improve comfort and safety considerations.

5.2.3. Observation and User Perception Evaluation of a Pleasurable Experience

From the results, it is possible to conclude that the pedestrian environment has limitations in elements that promote pleasure and satisfaction while using the street sidewalk.

5.3. Recommendations

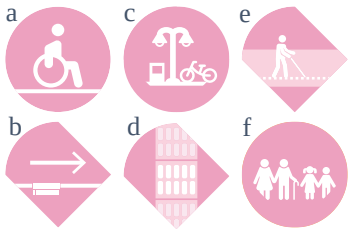
Overall, the findings of the study suggest that there is a need for pedestrian street spaces that are designed and managed to support pedestrian comfort, safety, and a pleasurable experience. This can be achieved by providing more sidewalk elements that support these qualities, as well as by maintaining and properly using existing sidewalk elements. Based on the findings, discussion, and conclusion, the following general and specific recommendations are suggested:

5.3.1. General Recommendation

1. The streets are for everyone

The streets should be inclusive, providing accessibility for all, regardless of income, disability, sex, or age. emphasizing accessibility for people with disabilities, the elderly, and children, and encouraging use as meeting places, ensuring equal opportunities for all.

Measures that could be implemented



a. Wheelchair-accessible sidewalks
b. Sidewalks built at the same level
c. Avoiding street obstacles and integrating the design elements
d. Provide tactile pavements with appropriate maintenance
e. Design with natural guiding lines
f. Design the streets for all ages

The street environment, which is wheelchair accessible, built with minimized level differences, free from obstacles and integrated design elements, pavements with a proper guiding line, a playground for children, and support for elders when standing and seating, may diversify the user variety of the street.

Tactile paving: provide a safer, more accessible environment for people who are visually impaired
Source: https://www.allaboutvision.com

Mariahilfer Straße, Vienna's most important shopping street: similar level differences
Source: https://gabriels-apartments.at

Figure 5.1 References for possible approaches that make streets serve everyone

2. Safe street

People need to feel safe on the street. This is critical for their well-being and applies to both traffic and social well-being. The physical design of the street space can help improve its safety and quality. Safety from traffic, proper room for walking, proper maintenance, good lighting, and surveillance from other people may improve pedestrian safety.

Measures that could be implemented

a. Proper lighting provision and maintenance
b. Design the streets with clear layouts and signs
c. Link adjacent buildings with the street space and encourage different uses throughout the day to increase social control in the streets.

Sidewalks that are activated by adjacent buildings, Rue Mouffetard, Paris, France
Source: https://matadornetwork.com

Clear layout of sidewalk, Buchanan Street, Glasgow, Scotland
Source: https://matadornetwork.com

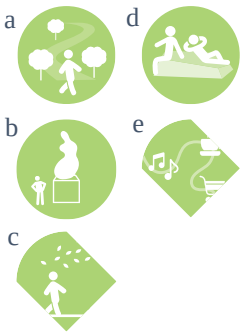
A clear layout of the street sidewalk that could possibly improve pedestrian safety. Frontage, pedestrian through, street furniture/ Curb, enhancement/ Buffer zone
Source: NACTO, Urban Street Design Guide, 2013

Figure 5.2 References for possible approaches that make streets safe

3. Streets create an experience

Streets are dynamic, multidimensional spaces that people interact with using all of their senses. The first step toward creating a walkable environment is to focus on positive street experiences. Some consideration of pedestrian experience may improve the experience on the study streets.

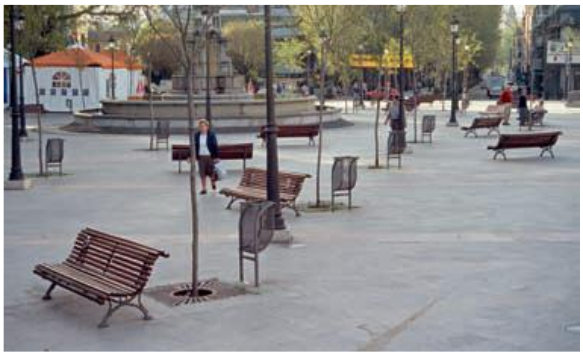
Measures that could be implemented



a. Enhancing the sidewalks with sufficient sensory complexity and variety, such as diverse green areas, landscaping, water features, building elements and materials
b. promoting public art
c. Design of obstacle-free walkways
d. Provide sufficient and diverse seating areas
e. Facilitate sufficient destinations along the route with proper shading and shelter

The fountain, monument, building details, and music performance on the street provide a positive pedestrian experience. Strøget, Copenhagen, Denmark. Source: https://matadornetwork.com

(a)



(b)

Examples of primary (a) and secondary (b) seating that could be considered Source: (Cities for People, 2010)

Figure 5.3 References for possible approaches that could create a positive experience.

4. Healthy street environments

A well-designed street environment promotes a healthy lifestyle by offering opportunities for physical activity, leading to more people choosing walking as a mode of transportation over driving. In addition, healthy street environments provide spaces for social interaction, play, and relaxation, reducing stress and enhancing mental and emotional well-being.

Measures that could be implemented

a. Providing exercise facilities
b. Giving people the option of taking different walks with varying experiences and distances.
c. Providing meeting spaces.
d. Providing formal and informal children's play areas.
e. Ensure there are enough walking and running trails.
f. providing room for gardening and landscaping.

Transforming streets for kids, queens
Source: https://www.streetlab.org

Public Exercise Equipment along streets
Source: https://www.pinterest.com

12th Avenue Green Street
Source: City of Portland, Environmental Services

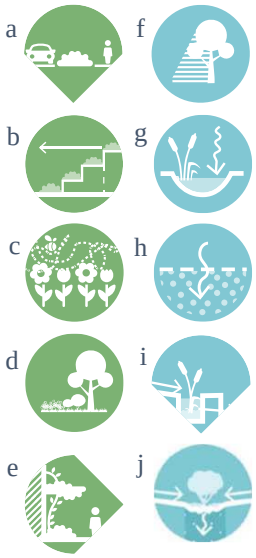
The plank seating in Paris is a multi-layered design that allows for flexibility and comfort for its users.
Source: https://www.sociallifeproject.org

Figure 5.4 References for possible approaches that could create healthy street environments

5. Green and climate-adaptive streets

Green streets provide pedestrian comfort, safety, and a pleasurable experience. Trees and vegetation provide shade, reduce noise and air pollution, and make walking more comfortable. Porous pavement and rain gardens reduce flooding during rainy times. Green streets also make the environment visually appealing and inviting. Features like diversity in vegetation, integration of green elements into sidewalks and buildings, mature trees with proper shade and cooling the air, integration of bioswale and rain gardens that collect and filter stormwater and reduce flooding and pollution, disposing of runoff to adjacent green areas, and provision of porous pavement for rainwater infiltration may improve the pedestrian environment and enhance the positive experience.

Measures that could be implemented



a. Green sidewalk environment
b. Integrated design of buildings and sidewalks
c. Enhance the greenery with flowering plants.
d. Diversity and variety in vegetation
e. Integrate granaries into the building facades.
f. Planting trees that could provide shade
g. Integrate Bioswale for storm water management
h. Design for infiltration in greenery
i. Design for delayed disposal of precipitation.
j. Design for the disposal of precipitation in adjacent green spaces.

Greenery, and landscaping
Source: https://doee.dc.gov

Greenery and shade on sidewalks from trees
Source: https://www.archdaily.com

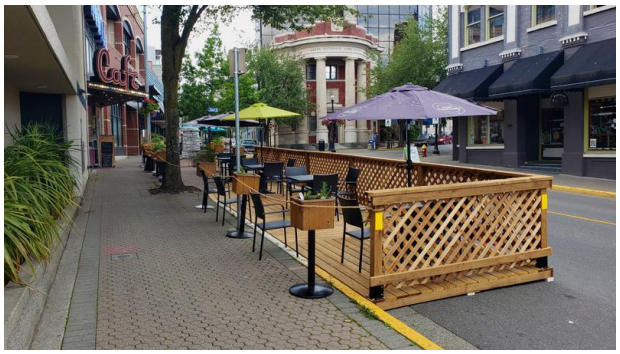
Figure 5.5 References for possible approaches for green and climate-adaptive streets

6. Streets create value

Streets are crucial economic drivers in cities, and a well-designed pedestrian environment that is safe, accessible, and inviting can create economic value. It allows people to easily access their homes, jobs, and destinations without relying on cars. This environment also encourages shopping, dining, and socializing, attracting more people to local businesses, leading to increased retail sales, tourism, property values, and tax revenue. Making it safe and accessible with wide and obstacle-free sidewalks, crosswalks, accessible ramps, and curb cuts, creating a welcoming and inviting atmosphere with trees and other vegetation, street furniture, and public spaces, as well as an active and inviting building frontage, could improve the environment.

Measures that could be implemented

k. Provide outdoor seating space at cafes and restaurants.
l. Facilitate room for different events.
m. Comfortable and well-designed, green, livable streets increase property value.



Cafe on Commercial St. was able to add four extra tables on an outdoor patio, which generates income while providing space to socialize.
Source: https://nanaimonewsnow.com

Street side patio
Source: https://www.tripadvisor.com

Figure 5.6 References for possible approaches to the street that create value

5.3.2. Specific Recommendations

Based on the findings, the following recommendations are suggested specifically for aspects of comfort from the physical environment, safety, and a pleasurable experience.

1. **Public seating**

   Public seating is crucial in urban planning and design as it offers free and comfortable space for pedestrians to rest, socialize, and observe while also promoting walking and other active transportation. They can also make the street space more vibrant and inviting. When providing public seating, several factors should be taken into account, such as:

   - **Location:** Public seating might be better if located in areas where people are likely to use it, such as near bus stops and train stations. and in reasonable proximity along the pedestrian route.
   - **Type of seating:** A variety of different types of public seating could be used, including benches, chairs, and tables. A variety of orientations could be used to promote socialization. Both primary and secondary seating could be used for variety and sensory complexity. The seating provided needs to be appropriate for the location and the activities that are likely to take place there.
   - **Accessibility:** Everyone, including those with disabilities, should be able to use public seating. This includes providing seating at various heights, with and without backrests, and, where possible, armrests.
   - **Durability:** Public seating should be both long-lasting and resistant to vandalism. This is especially important in high-traffic areas.
   - **Comfort:** The design of public seating should be comfortable, inviting, and harmonious with the surrounding environment. It needs to be easy for maintenance and cleaning. Perforated materials are better to avoid moisture after rain. Materials like mesh, wooden strips, and grills could be used. Adequate lighting with proper shade and shelter from trees or buildings could improve comfort.

Metal bench for durability and vandal resistance Source: https://abes-online.com.

Seat orientation and sociability Source: https://www.pps.org

Seat that considers a wheelchair user Source: https://www.buzz.ie

Figure 5.7 References for possible approaches while providing public seating.

2. Commercial seating

Businesses and public agencies can contribute to a more walkable and livable community by providing comfortable commercial seating for pedestrians. By attracting pedestrians to businesses, commercial seating can also help promote economic development.

Here are some recommended examples of how commercial seating can be used to ensure pedestrian comfort in specific settings.

- **Sidewalk cafes and restaurants:** Sidewalk cafes and restaurants could provide seating for pedestrians to enjoy meals or drinks while people-watching; the arrangements have to be made in such a way that the seating doesn't block pedestrian traffic.
- **Benches and chairs in front of businesses:** Benches and chairs can be placed in front of businesses to offer pedestrians a place to rest or wait for friends or relatives. Businesses can provide pedestrian seating by placing benches and chairs in front of their storefronts. The placement needs to ensure it doesn't obstruct the business's view or block the sidewalk.
- S**eating at taxi and bus stops: S**eating at taxi and bus stops provides a place for pedestrians to wait for their transportation in comfort. This could be done by providing seating by placing benches and chairs underneath sheltered and safe areas. The seating and shade should be arranged in a way that does not block pedestrian traffic or interfere with the operation of the transportation facility.

3. Pavements

Sidewalk pavement needs to be designed and maintained to be smooth, even, and defect-free for enhanced pedestrian comfort. It also needs to be wide enough to accommodate pedestrians walking in opposite directions, as well as those with special needs, such as wheelchairs.

The following are some specific guidelines for the design of sidewalk pavement that promote pedestrian comfort:

- **Smoothness:** The surface of the sidewalk should be smooth and free of gaps, potholes, and other obstructions. This will help pedestrians avoid tripping and falling.
- **Evenness:** The sidewalk needs to be designed and maintained to be level. This will make walking easier for people of all ages and abilities.
- **Width:** The sidewalk should be wide enough to accommodate people walking in opposite directions and those in wheelchairs while maintaining a reasonable width along the route, avoiding the narrow width observed on study streets.

- **Materials:** The design and construction of sidewalk and pavement material should be durable and can withstand weather conditions and heavy foot traffic to avoid deterioration and maintenance-related issues.
- **Texture:** For the purpose of providing traction and avoiding slipping, the pavement should be textured and maintained if it wears off. This is particularly useful when it gets wet during the rain.
- **Maintenance:** Regular inspection and maintenance of sidewalk pavement needs to be conducted to sustain good condition, which includes repairs like pothole and debris removal.

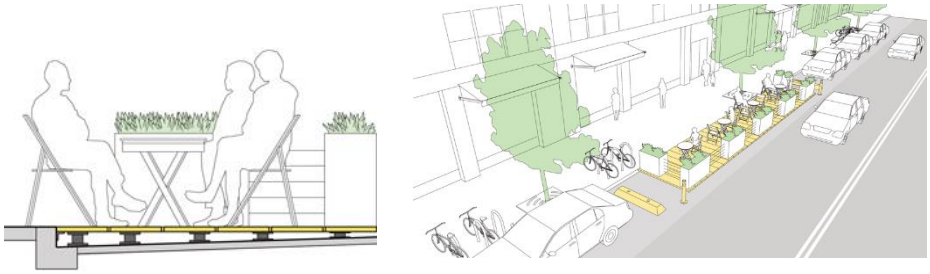
4. Curb treatment

Curb treatment can improve pedestrian safety and comfort by adding more space for the sidewalk, shortening crossing distances, increasing visibility, and providing a smoother transition between the sidewalk and the street.

Possible curb treatments for pedestrian comfort include:

- **Curb extensions:** Curb extensions, also known as neckdowns or bulb-outs, improve pedestrian safety and comfort at intersections and mid-block crossings while also making more space available for pedestrian amenities in commercial areas.
- **Curb ramps:** Curb ramps could make crossings accessible to elders, people with disabilities, and those using wheelchairs.

Gateways, bus bulbs, and pinch points: curb extensions that widen sidewalks and could enhance pedestrian safety and comfort. Source: https://nacto.org



Parklets that could be provided in between parking spaces. Source: https://nacto.org

Figure 5.8 References for possible approaches to curb treatment.

5. Vegetations

Urban areas can create pedestrian environments that are more comfortable and inviting by incorporating vegetation. Here are some possible strategies to implement:

- **Trees:** Trees can be planted along sidewalks to effectively provide shade and wind protection. Shades can help reduce heat stress and improve walking comfort.
- **Shrubs:** Shrubs can be planted around seats and other pedestrian facilities to make them feel more intimate and private.
- **Groundcover:** Groundcover plants could be used to visually soften sidewalk edges and pedestrian areas, making the space visually attractive.
- **Vertical gardens:** Vertical gardens, which can be installed on walls and fences, can add greenery to pedestrian areas while taking up no ground space.

Sectional view of the street with trees, shrubs, and ground cover. Source: https://bestinamericanliving.com

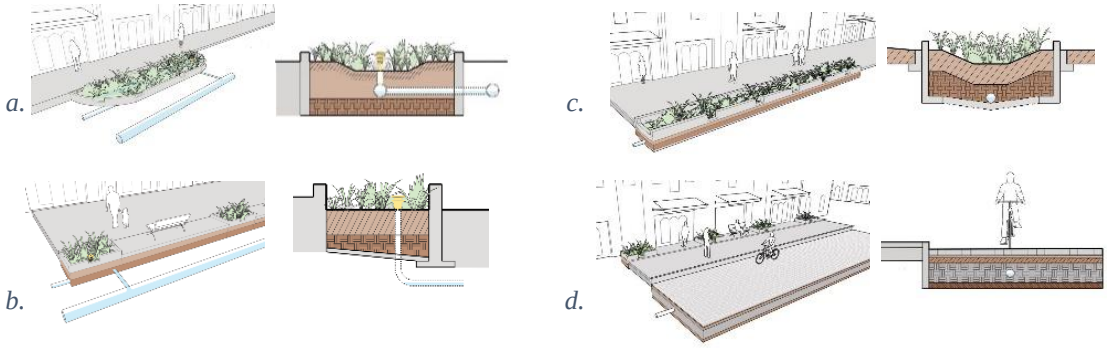
Figure 5.9 References for possible approaches for the integration of vegetation on streets

6. Storm water management

Stormwater management enhances pedestrian safety and comfort by reducing flooding, improving visibility, and increasing biodiversity. It indirectly reduces runoff and sewer overflows, creating sustainable, pedestrian-friendly sidewalks. Here are some possible strategies to implement:

- **Pervious sidewalk pavers:** Pervious sidewalk pavers, made from materials like concrete, asphalt, and brick, can be integrated to create sidewalks free of standing water, making walking more comfortable and enjoyable, especially for those with mobility impairments.
- **Pervious strips**: Pervious strips, which are long, linearly landscaped areas or pervious pavement areas that collect and slow runoff, could be used along the sidewalks.

- **Rain gardens at curb extensions:** Curb extensions can be used to plant rain gardens, which absorb stormwater runoff and reduce flooding, thereby preventing pedestrians from walking through puddles or flooded areas.
- **Flow-through planters:** are planters that have been designed to allow stormwater runoff to flow through them. This helps to reduce flooding.



Storm water Management: (a) Bioswales, (b) Flow-Through Planters, (c) Pervious Strips, (d) Pervious Pavement. Source: https://nacto.org

Figure 5.10 References for possible approaches to curb treatment.

7. Street Lighting

Street lighting enhances pedestrian comfort and safety by providing visibility of the environment and oncoming traffic and hazards, especially at night and in low-light conditions. It reduces crime by deterring it and creating a more welcoming environment, making sidewalks and pedestrian areas more enjoyable to walk through.

Here are some possible considerations to implement:

- **Light levels:** Street lighting could be enhanced to provide adequate lighting for proper visibility with a continuous and appropriate illumination level, avoiding extreme contrast and glare.
- **Light distribution:** Street lighting should be evenly distributed and aligned with one another along the sidewalk to avoid creating dark areas where pedestrians may be difficult to see.
- **Color temperature:** Warm color temperatures could be installed in street lighting, which is more visually pleasing as well as less likely to cause glare.
- **Placement:** Lighting placed at pedestrian-scale fixtures could function better. The placement could be on poles or attached to the building facades in areas with narrow walkways to avoid obstruction. Shadow and glare minimization and even light distribution should be considered in doing so.

8. Provision of Pedestrian Amenities

Pedestrian amenities can play an important role in creating pedestrian-friendly environments that are both functional and aesthetically pleasing.

Here are some possible considerations to implement:

- **Seating:** Provide a variety of seating options, such as benches, tables, and chairs, in pedestrian areas. This will give pedestrians places to rest and socialize, which can make the pedestrian environment more enjoyable.
- **Shade and shelter:** Ensure pedestrian areas provide shade and shelter from the sun and rain to enhance comfort. Implementing tree planting, awning installation, or arcade construction can enhance the pedestrian environment.
- **Public restrooms:** Provide public restrooms in pedestrian areas. This is especially important for families with young children and people with disabilities.
- **Wayfinding:** Provide clear and concise wayfinding signage in pedestrian areas. This will help pedestrians find their way around.
- **Public art:** Install public art in pedestrian areas. This can add interest and character to the area and make it more enjoyable for pedestrians.
- **Events and programming:** Host events and programs in pedestrian areas. This can help attract pedestrians and make the area more vibrant.

When providing pedestrian amenities, the following additional considerations should be made:

- **Make sure that pedestrian amenities are accessible to everyone,** including people with disabilities. This includes providing ramps and curb cuts to all amenities and making sure that all amenities are wide enough to accommodate wheelchairs and other mobility devices.
- **Design pedestrian amenities to be visually appealing and inviting.** Use attractive materials and finishes, and incorporate public art and murals into the design.
- **Place pedestrian amenities in strategic locations.** For example, place seating areas near bus stops and other transit hubs.
- **Maintain pedestrian amenities in good condition.** This includes cleaning them regularly and repairing them promptly when damaged.

9. Building Level Considerations

Building-level design can improve pedestrian safety and comfort by incorporating features like sidewalk setbacks, enclosures, ground floor uses, active frontages, and clear entrances. Amenities like arcades and seating areas make pedestrian areas more inviting, while public art and visually appealing materials promote interest and attractiveness.

Here are some possible considerations to implement:

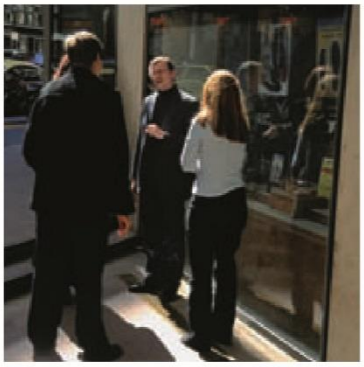
- **Setbacks:** This will create a more spacious and inviting pedestrian environment.
  Here are some specific examples to improve pedestrian comfort, safety, and pleasure:
  - A setback can be used to create a wider sidewalk, which can make it easier for pedestrians to walk safely and comfortably.
  - A setback can be used to create a landscaped area, which can provide shade and shelter for pedestrians and also make the area more visually appealing.
  - A setback can be used to create a public space, which can provide a place for people to gather and socialize.
  - A setback can be used to create a more visible and inviting pedestrian environment, especially at corners and intersections.
- **Arcades:** Arcades along walkways can offer shade, shelter, and amenities for pedestrians. They should be well-lit, ventilated, and visually appealing, with comfortable seating areas and smooth, even floors.
- **Ground floor uses that are compatible with pedestrians:** This could include shops, restaurants, cafes, and other businesses that attract pedestrians. Refer to Figures 5.11 and 5.12.
- **Windows and doors that face the street:** Design buildings with windows and doors that face the street. This helps to create a more active and vibrant pedestrian environment. The presence of a number of doors could indicate activeness; materials and design should allow permeability from and to the sidewalk. Refer to figure 5.13
- **Materials and finishes that are visually appealing and inviting:** Use visually appealing materials like brick, wood, and stone, considering variety, articulation, scale, and maintenance. Enhance buildings and storefronts with distinctive personalization, allowing positive sensory complexity.
- **Public art and murals:** Incorporate public art and murals into the building design. This can add interest and character to pedestrian areas.


Chatting by


Entering and leaving


Walking alongside

Standing alongside


Taking a break by


Standing in doorways


Shopping next to


Interacting with


Looking at displays with


Sitting on


Sitting next to


Looking in and out of

The edge—where buildings and streets meet—and its interaction with pedestrians
Source: (Cities for people, 2010)

Scale and Rhythm
The 5 km/h – 3 mph scale, compact and full of interest with narrow units and many doors.
The 60 km/h – 37 mph scale works for drivers on the move, but not for pedestrians.

5 km/h – 3 mph

or 60 km/h –37 mph scale

Transparency
Walking in the city is enhanced for pedestrians if they can see goods on display and what is going on inside buildings. And that works both ways.

Open

or closed

Appeal to Many Senses
All our senses are activated when we are close to buildings that provide interesting impressions and opportunities.
In contrast, eight posters do not inspire.

Interactive

or passive

Texture and Details
City buildings hold attractions for pedestrians walking slowly. Appealing *ground floors offer texture, good materials* and a wealth of details.

Interesting

or boring

Mixed Functions
Narrow units and many doors supplemented by a wide variation in functions provide many points of exchange between in and out and many types of experiences.

Varied

or uniform

Vertical Façade Rhythms
Ground floors with primarily vertical façade rhythms make walks more interesting. They seem shorter too, compared to walks along horizontally oriented façades.

Vertical

or horizontal

Softness and hardness of the edge of a street sidewalk and its interaction with pedestrians
Source: (Cities for people, 2010)

Figure 5.12 References for consideration of possible approaches to enhance the edge

A — active

Small units, many doors
(15 – 20 doors per 100 m/328 feet)
Large variation in function
No blind and few passive units
Lots of character in façade relief
Primarily vertical façade articulation
Good details and materials

B — friendly

Relatively small units (10 – 14 doors per 100 m/328 feet)
Some variation in function
Few blind and passive units
Façade relief
Many details

C — mixture

Large and small units (6 – 10 doors per 100 m/328 feet)
Modest variation in function
Some blind and passive units
Modest façade relief
Few details

D — boring

Large units, few doors (2 – 5 doors per 100 m/328 feet)
Almost no variation in function
Many blind or uninteresting units
Few or no details

E — inactive

Large units, few or no doors (0 – 2 doors per 100 m/328 feet)
No visible variation in function
Blind or passive units
Uniform façades, no details, nothing to look at

The city at eye level, ground-floor design for the activeness of street sidewalks
Source: (Cities for people, 2010)

Figure 5.13 References for consideration of possible approaches to active building frontage

10. City Level Considerations

Working with the human dimension is an essential quality of a street environment or a city as a whole. These require principles that consider how people and events are assembled in built environments, as well as improving the quality of city space in attempt to attract people to spend more time there.

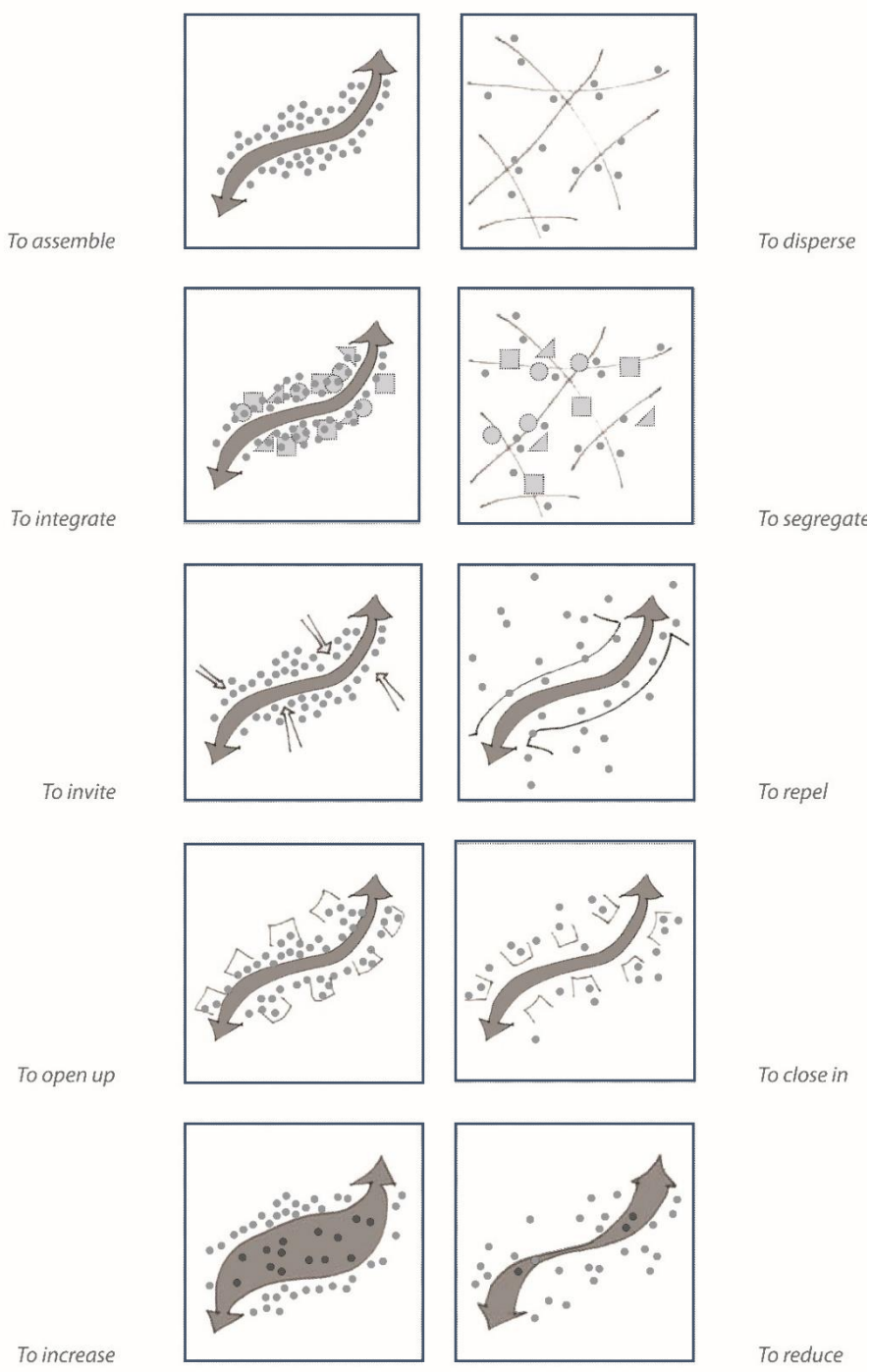


Figure 5.14 Planning principles to assemble and disperse people and events in a built environment

Source: (Cities for people, 2010)

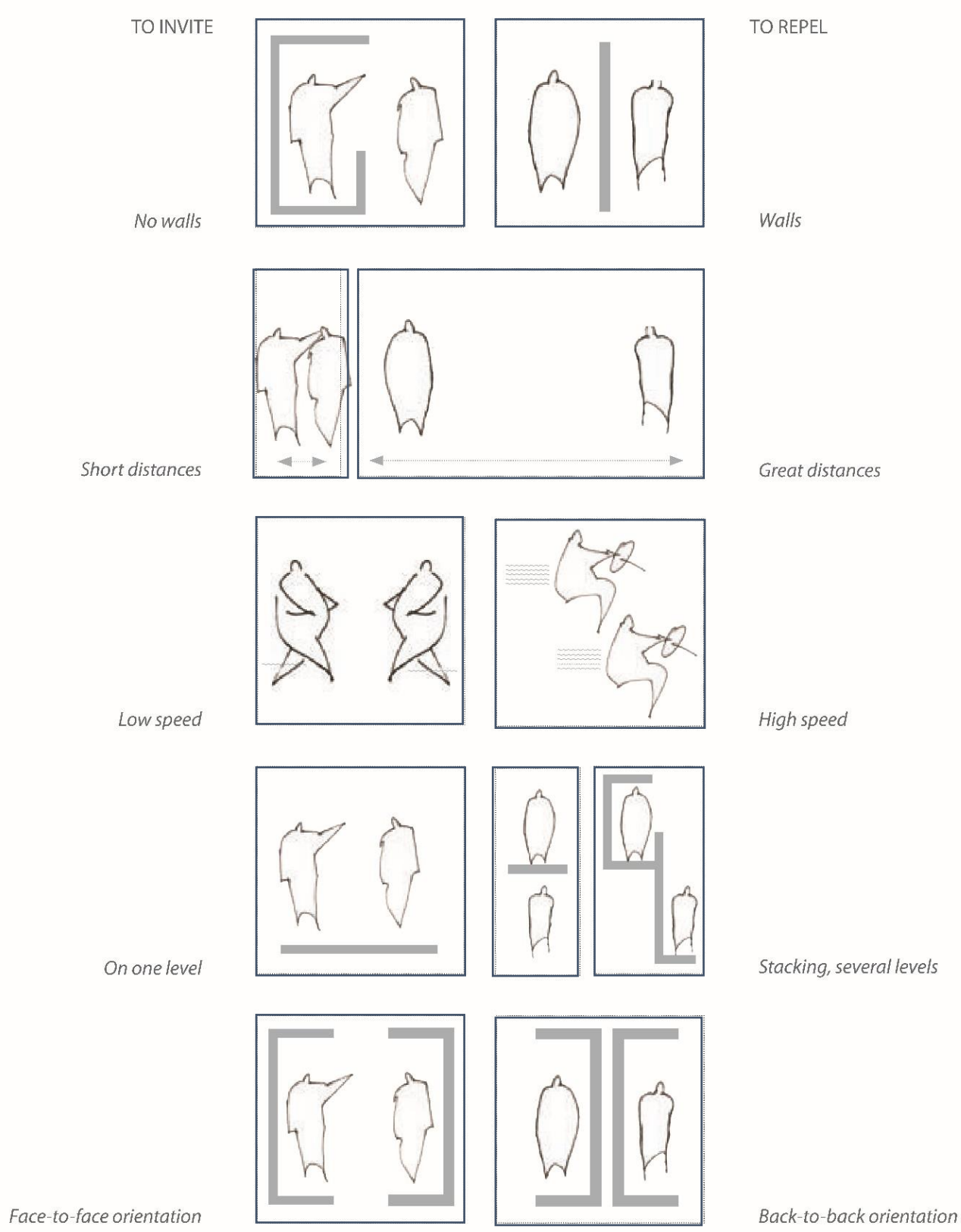
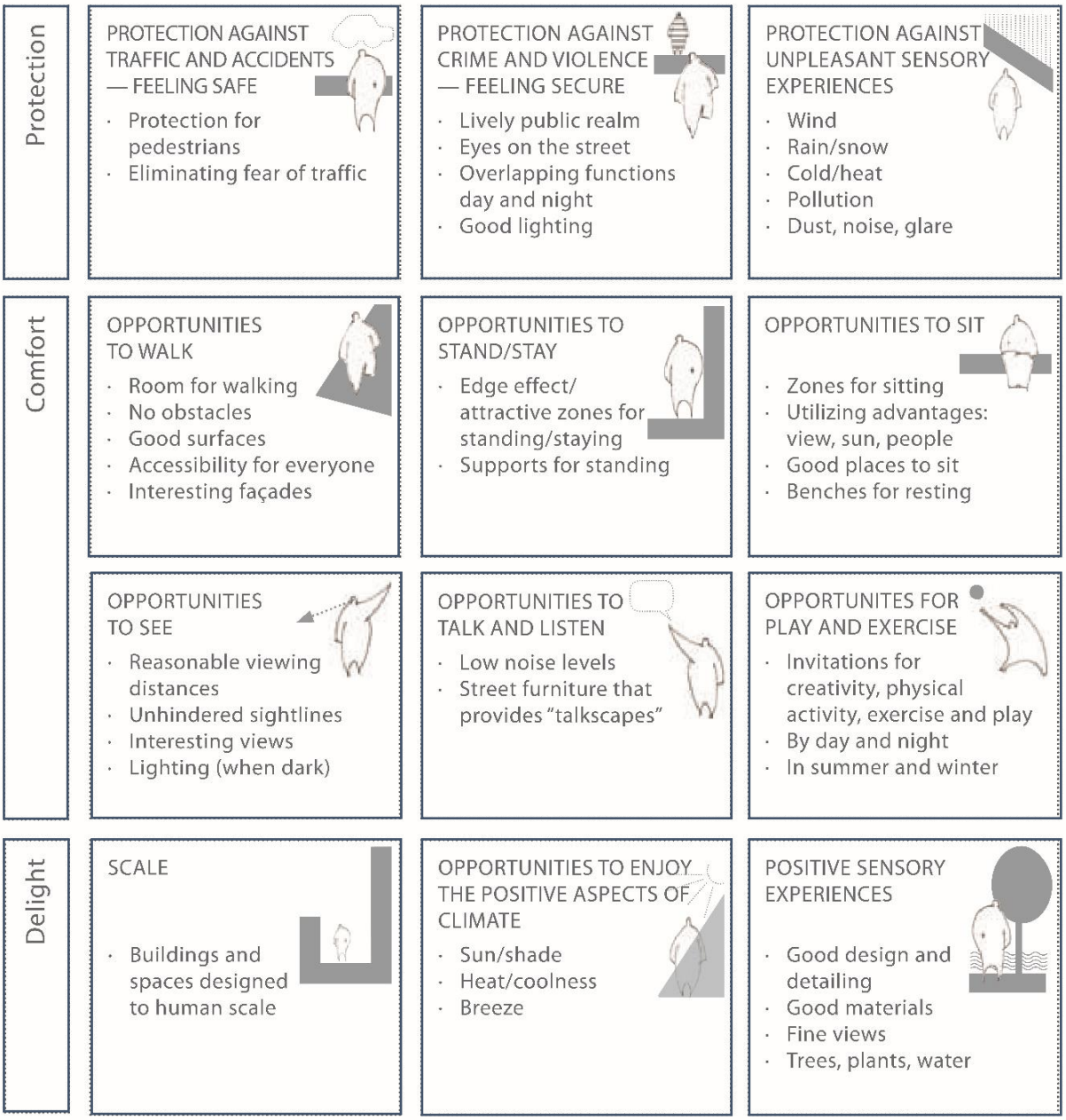


Figure 5.15 Possible approach to invite or repel seeing and hearing contacts

Source: (Cities for people, 2010)



12 quality criteria by, Jan Gehl, concerning the pedestrian landscape
Source: (Cities for people, 2010)

Figure 5.16 Reference for possible approaches for pedestrian comfort and safety

References

AACA. (2018). *Addis Ababa Non-Motorised Transport (NMT) Strategy.* Addis Ababa: Addis Ababa City Administration Road and Transport Bureau.

Alexander, C., Ishikawa, S., & Silverstein. (1977). *A pattern language: towns, buildings, construction.* New York: Oxford University Press.

Boddy, C. R. (2016). *Sample Size for Qualitative Research. Qualitative Market Research.* An International Journal, 19, 426-432.

Bruce, D. Appleyard. (2021). *Livable Streets 2.0.* United States: Elsevier Inc.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* California: SAGE Publications, Inc.

Dworkin, S. L. (2012). Sample Size Policy for Qualitative Studies Using In-Depth. *Springer Science*, 1-2.

E.Stake, R. (1995). *The art of case study research.* california: SAGE Publication, inc.

Gehl, J. (2011). *Life between buildings (6th ed.).* Washington, DC: Island Press.

J.Gehl. (2010). *Cities for people.* Washington: island press.

Jacobs, A. B. (1993). *Great Streets.* MIT Press.

Jacobs, J. (1961). *The Death and Life of Great American Cities.* New York: Random House.

jan Gehl, Birgitte Svarre. (2013). *How To Study Public Life.* washington, DC: Island Press/Center for Resource.

John Massengale, Victor Dover. (2014). *Street Design The Secret to Great Cities and Towns.* New Jersey: John Wiley & Sons, Inc.

Llewelyn-Davies. (2007). *urban design compendium.* London: English Partnerships & The Housing Copporation.

Lynch, K. (1960). *The image of the city.* Cambridge: MIT Press.

M. Carmona, T. Heath, T. Oc, S. Tiesdell. (2003). *PPublic Places - Urban Spaces: The Dimensions of Urban Design.* OXFORD: Architectural Press.

M.Given, L. (2008). *The SAGE Encyclopedia of Qualitative Research Methods Volumes 1&2.* London: SAGE Publications, Inc.

Madden, K. (2018). *How to turn a place around : a placemaking handbook.* New York, NY: Project for Public Spaces, Inc.

Mason, M. (2010). Sample Size and Saturation in PhD Studies Using Qualitative Interviews. *ResearchGate*, 2-4.

Mehta, V. (2013). Evaluating Public Space. *Journal of Urban Design*, 69-71.

Mehta, V. (2013). *The Street: A Quintessential Social Public Space.* New York: Taylor & Francis Group.

Moughtin, C. (2003). *Urban Design: Street and Square.* Amsterdam: Architectural Press.

NACTO. (2013). *Urban Street Design Guide.* Washington: Island Press.

NACTO. (2016). *Global Street Design Guide.* Washington: Island Press.

P. Deore, S. Lathia. (2019). Streets as Public Spaces: Lessons from Street Vending. *Urban Planning*, 138–153.

Reid Ewing,Otto Clemente. (2013). *Measuring Urban Design: Metrics for Livable Places.* Washington: Island Press.

Richard T. LeGates, Frederic Stout. (2016). *The City Reader, Sixth edition.* New York: Routledge.

Shaftoe, H. (2008). *Convivial Urban Spaces: Creating Effective Public Places.* Sterling, VA: Earthscan.

Stake, R. E. (2010). *Qualitative Research: Studying How Things Work.* New York, London: The Guilford Press.

TPH. (2014). *Healthy Streets: Evidence Review.* Toronto: Toronto Public Health.

UCLG. (2016). *Public space policy framework: by and for local governments.*

UN. (2015). *Transforming our world : the 2030 Agenda for Sustainable Development, A/RES/70/1.* United Nations General Assembly.

UN-Habitat. (2013). *Streets As Public Spaces and Drivers of Urban Prosperity.* Nairobi: United Nations Human Settlements Programme.

UN-Habitat. (2015). *Global Public Space Toolkit: From Global Principles to Local Policies and Practice.* Nairobi: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2016). *Urbanization and Development:Emerging Futures.* Nairobi, Kenya: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2017). *Fundamentals Of Planned Urbanization: Training Companion.* Nairobi,Kenya: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2018). *Global Public Space Programme: Annual Report 2017.* Nairobi: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2018). *SDG Indicator 11.7.1 Training Module: Public Space.* Nairobi: United Nations Human Settlement.

UN-Habitat. (2019). *City-Wide Public Space Strategies: A Compendium of Inspiring Practices.* Nairobi: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2022). *World Cities Report:Envisaging the Future of Cities.* Nairobi, Kenya: United Nations Human Settlements Programme (UN-Habitat).

UnitedNations. (2017). *New Urban Agenda.* Quito: Habitat III Secretariat.

Whyte, W. H. (1980). *The Social Life of Small Urban Spaces.* Washington, D.C.: Conservation Foundation.

WorldBank. (2022). *Addis Ababa Sidewalk Safety and Improvement Study.* Washington: The World Bank.

Annex 1: Publishable Manuscript

Evaluate the comfort performance of the street pedestrian environment as a public space using the method of PSI: The Case of Selected Segments of LRT Streets in Addis Ababa.

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Abstract:

Streets are a crucial public space in cities; besides providing a way for people to get around, they also provide a place to gather, socialize, and relax. The street environment must provide comfort to encourage the use of it as a public space. Pedestrian comfort is an important consideration in the design and management of streets, which results in them being more likely to be used by people, which can lead to a number of benefits, such as reduced traffic congestion, improved air quality, increased local interaction, the health and well-being of people, and a better livability and image of a city. Despite being an important part of urban public space, streets are often designed primarily for cars, not people. This can make them hostile and uninviting, which discourages people from using them. This study examined the selected street segments along the Light Rail Transit (LRT) of Addis Ababa for one of the qualities of the place-making approach, which is comfort from aspects of the physical setting, safety, and sense of pleasure. With the methods of literature review, observation, and survey, the study attempts to evaluate the performance on the ground. The method used is Vikas Mehta's "public space index" (PSI), specifically for the three aspects mentioned above. The results indicated that there is compromised overall comfort in the physical setting, safety, and sense of pleasure caused by a lack of provision of sidewalk elements, maintenance, and appropriate use.

Keywords: *street, pedestrian, comfort, public space, street as a public space.*

Introduction:

Rapid urbanization and population growth, with their undesirable impacts, have become global issues. Urban areas are home to 54% of the world's population (UN-Habitat, 2016), 56% in 2021, and are predicted to grow to 68% in 2050 (UN-Habitat, 2022). Therefore, cities are under enormous strain nowadays to keep up with rising urbanization (UN-Habitat, 2017), which deal with issues of affordable housing, air pollution, inadequate infrastructure, environmental concerns, a lack of open space, and traffic congestion. (P. Deore, S. Lathia, 2019). As a result,

the urban environment is losing its quality, and positive experiences for the residents are being impacted. As car traffic, for example, increases precipitously, competitive pressures for city space increase. Year after year, the circumstances for urban life and pedestrians have deteriorated. (J.Gehl, 2010)

Ethiopia's urban population grew from 8.5% in 1967 to 17.4% in 2012 (AACA, 2018), making it one of the fastest urbanizing countries in Sub-Saharan Africa (AACA, 2018). Addis Ababa, the capital, is home to 17% of the country's urban population (AACA, 2018). The city is rich in natural beauty and cultural history, but these qualities are being challenged by the city's fast urbanization (with a population of 3.4 million and predicted to grow to 4.5 million by 2030), rising traffic, and unprecedented levels of development and demolition (UN-Habitat, 2018). This rapid urbanization resulted in different transportation, housing, and infrastructure deficiencies, as well as significant damage to the urban environment. (AACA, 2018).

For this global issue, a world-wide effort is being attempted to mitigate the undesirable impacts urbanization and one is through urban public spaces. UN-Habitat, reflected the need for this effort. The demand for a diverse, secure, and easily accessible public space is growing more and more urgent in a society that is quickly urbanizing. A city that is healthy encourages coexistence, fosters harmony, promotes democratic involvement, and has an abundance of green space. It also promotes good public health and well-being (UN-Habitat, 2019). Two major examples are one, the Conference of the United Nations on Housing and Sustainable Urban Development (Habitat III) in Quito, Ecuador, on October 20, 2016, which set the New Urban Agenda (NUA), which is an international effort to rethink urban systems and the physical shape of our urban spaces in order to reach a more promising and sustainable future in which all people enjoy equal rights and access to the advantages and possibilities that cities can provide. (UnitedNations, 2017). The other is the United Nations Sustainable Development Goals (SDGs), specifically Goal 11, which states, "Make cities and human settlements inclusive, safe, resilient, and sustainable." (UN, 2015) Section 11.7 focuses on ensuring that everyone has access to green spaces and public areas that are safe, inclusive, and accessible. (UN, 2015).

Streets account for 25% to 35% of all developed land in urban areas, making public rights-of-way the most important single land use. (A. Jacobs, 1993). which makes it our most significant public space in addition to access provision. (Llewelyn-Davies, 2007), the most crucial component of the public space. (Reid Ewing,Otto Clemente, 2013), which serves as both a

route of access and a stage for social interaction. (Moughtin, 2003). Therefore, streets are multi-functional spaces with the potential for conflict between uses. The best approach is to design for all possible applications and users. (Llewelyn-Davies, 2007). If not, the effect of unmanaged urbanization has an enormous undesirable impact on residents' urban experiences and on quality, function, and image at large.

Walking is the dominant means of transport, taking more than half (54%) of daily trips in Addis Ababa. (AACA, 2018); (WorldBank, 2022). The car-oriented design approach of streets in Addis Ababa favored vehicular speed while compromising the safety of pedestrians. (AACA, 2018). Most people on foot face several challenges in the urban environment, including inadequately sized walkways, unsafe crossings, insufficient illumination, poorly maintained infrastructure, an unsafe environment for children, and a lack of opportunity to stay, play, and exercise. (AACA, 2018). The city's weather conditions favor healthy and environmentally friendly means of transportation. (WorldBank, 2022) However, pedestrian infrastructure like sidewalks is often "narrow, uneven, obstructed, or nonexistent," which makes them uncomfortable and a safety concern for the "most vulnerable road users": pedestrians. (WorldBank, 2022).

The study is conducted in Addis Ababa on the transit-oriented development street from *Lideta* through *Mexico* to *Meskel-Square*. For the purpose of this research, the streets are studied in three sections. The first is the section from *Lideta* to *Mexico*; the second is from *Mexico* to Legehar; and the third is from Legehar to *Meskel-Square*. The lengths of the streets are 1 km, 0.8 km, and 0.6 km, respectively. This study attempts to investigate how well the selected streets are serving as a comfortable space that enhances the users' (pedestrians) experience, with the aim of promoting the use of streets as a public space for a livable and vibrant urban environment.

This study could contribute to the effort to enhance the pedestrian environment by providing input on comfort and promoting walking as a preferred mode of transportation with a pleasant and dignified experience while using the streets. It could assist designers and government policymakers in designing urban street environments. contribute to environmental officials' efforts and serve as a reference for further studies on using streets as public spaces or other place-making theory approaches.

Litrature Review:

The literature review was conducted to answer two basic aims. The first was to grasp the basic theoretical issues on the topic of comfort, streets, and pedestrians in relation to the concept of a street as a public space. The second aim was to understand the quality indicators of the comfort of the pedestrian environment for the utilization of streets as a public space and how the street spaces could be evaluated based on those quality indicators. the results are summarized below.

General summary

Streets are essential public spaces that serve multiple functions beyond transportation, including community life and social interaction. They are the heart of a city, connecting people, places, and experiences. Streets are democratic and inclusive, open to all community members regardless of age, income, or background. They foster a sense of belonging, contribute to economic activity by providing access to shops, businesses, and markets, reflect a community's cultural identity, and encourage physical activity and healthy lifestyles.

The design of streets prioritizes cars and often neglects the needs of pedestrians, resulting in discomfort and reduced accessibility. The concept of the street as a public space is essential for creating healthy, livable, and sustainable communities. By investing in the streets and designing them with people in mind, it is possible to create spaces that promote physical activity, social interaction, and economic prosperity.

Quality Indicators of the Comfort of the Streets as a Public Space

The study aimed to determine the quality indicators through an intensive literature review conducted from 1960 to 2020, focusing on 13 works related to the use of the street as a public space by renowned planners and designers. Content analysis was used to identify frequently mentioned points. The results indicated that the overall qualities of street spaces are a combination of safety, physical setting, and creating a sense of pleasure.

Figure1: Essential quality aspects for comfortable street space

The literature helped to understand the concept of the street as a public space and its quality parameters. Cities are “places where people meet” to exchange ideas, trade, or simply relax (J.Gehl, 2010). Urbanization necessitates that street serve not only as transportation corridors but also as public spaces. (NACTO, 2013). Streets should be meant for staying rather than merely passing through, as they currently are. (Moughtin, 2003). Some of the literature concerning the street environment and its role as a public space is Jane Jacobs, “Death and Life of Great American Cities” (1961), Jan Gehl, “Life Between Buildings” (1971), Christopher Alexander, Sara Ishikawa, and Murray Silverstein: “A Pattern Language” (1977), William H. Whyte, “The Social Life of Small Urban Spaces” (1980), Donald Appleyard, “Livable Streets” (1980), Allan Jacobs, “Great Streets” (1995), PPS: “How to Turn a Place Around” (1999).

Different scholars, planners, designers, and architects have written about quality indicators for public spaces, and comfort is one of those qualities. For example, according to the PPS, one of the four quality dimensions is comfort, and the comfort aspects constitute the quality of being safe, walkable, sittable, and attractive. Jan Gehl, Cities for People (2010), describes the quality criteria concerning the pedestrian as qualities of protection, comfort, and delight, each having sub-quality criteria. Vikas Mehta: The Street as a Quintessential Social Public Space (2013) states the factors as physical qualities, social qualities, and land use qualities. Bruce Appleyard states the qualities as peaceful (safe and comfortable), enjoyable (place-making and aesthetic), and convenient (connected and accessible). Therefore, based on this and other literature, the overall qualities of street spaces are a combination of safety, physical setting, and creating a sense of pleasure.

The results of the content analysis in Table 2 below indicate that "evaluating public space," which considers most attributes for the overall comfort of street space for pedestrians, Vikas Mehta has already developed a PSI method to evaluate street performance. This method was adopted and utilized for this study.

Table 2: Literature reviewed and its summary for quality indicators of comfortable street space

No	Title (Book, Journal, Article)	Author	Year
[1]	The Image of the City	Kevin Lynch	1960
[2]	The Death and Life of Great American Cities	Jane Jacobs	1961
[3]	Life Between Buildings	Jan Gehl	1971
[4]	A Pattern Language (1977)	C. Alexander et al.	1977
[5]	The social life of small urban spaces	William H. White	1980
[6]	Livable Streets	Donald Appleyard	1981
[7]	Great streets	Allan B. Jacobs	1993
[8]	How to Turn a Place Around	Project for public space	2000
[9]	Convivial Urban Spaces: Creating Effective P. Places	Henry Shaftoe	2008
[10]	The Street: A Quintessential Social Public Space	Vikas Mehta	2013
[11]	Street DESIGN The Secret to Great Cities and Towns	J. Massengale & V. Dover	2014
[12]	Global Street Design Guide	NACTO	2016
[13]	Principles for public space design, planning to do better	Matthew Carmona	2019
[14]	Evaluating Public Space	Vikas Mehta	2013

Comfort Aspects	Variables / Attributes	References														Freq.
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Physical Comfort	Appropriate maintenance and physical condition	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Spaces to sit (public)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Spaces to sit (by business)							✓	✓		✓		✓		✓	
	Street furniture and artifacts	✓	✓	✓	✓		✓	✓		✓	✓		✓	✓	✓	
	Microclimatic comfort (shade and shelter)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Free of elements that discourage the use of space	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			✓	
	Noise pollution						✓						✓		✓	
Safety	Visual/ physical connection to adjacent street	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	
	Physical condition and maintenance appropriate	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Lighting quality after dark	✓	✓	✓	✓	✓	✓			✓	✓	✓			✓	
	Presence of surveillances		✓								✓				✓	
	Safety from crime at day time		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Safety from crime after dark		✓			✓	✓	✓	✓	✓	✓	✓	✓		✓	
	Safety from traffic	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	
Pleasurable Street	Memorable features architectural or landscape (imageability)	✓							✓	✓	✓	✓	✓	✓	✓	
	Sense of enclosure	✓		✓	✓	✓	✓	✓			✓				✓	
	Building facade Permeability	✓		✓		✓	✓	✓			✓	✓			✓	
	Personalization of the buildings on the street front			✓	✓	✓		✓			✓				✓	
	Façade Articulation & variety	✓				✓	✓	✓		✓	✓	✓			✓	
	Sensory complexity (density of sidewalk elements)	✓	✓	✓	✓	✓		✓			✓				✓	
	Sensory complexity (variety of sidewalk elements)	✓	✓		✓	✓		✓			✓				✓	
	Attractiveness of space	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	Interestingness of space	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Method and Tools:

This study attempts to evaluate the performance of the street pedestrian environment in serving as a public space, specifically for one of the qualities of the place-making approach, which is comfort. A number of pieces of literature are reviewed for quality indicators and attempt to evaluate how well the streets are performing within a specific area. As a result, the appropriate type of research design is found to be qualitative in nature and case study-based exploratory. The method used is Vikas Mehta's "public space index" (PSI), specifically for the three comfort aspects, which are the physical setting, safety, and sense of pleasure. The study streets are selected segments along the LRT streets in Addis Ababa. The selection is based on the criteria of first, centrality, selected from the main center of the city based on data from the Addis Ababa Plan Commission (AAPC). Second, street hierarchy: primary arterial streets (PAS) are selected based on data from AAPC. Third, modal diversity and traffic on the street

Evaluate the Street Pedestrian Environment: Using the PSI

The public space index (PSI), developed by Vikas Mehta, is constructed to evaluate the five dimensions of public space (inclusiveness, meaningful activities, comfort, safety, and "pleasurability"). (Mehta, 2013). The points of interest for this research are the last three. The index measures both the observed character and users' perceptions of the street space. 14 points of the evaluations are observable and are rated by the author by observing the space and the interaction between the space and its occupants. Eight variables are perceptual and have to be rated by the people using the street space. The scoring criteria for each variable are based on a rating scale ranging from 0 to 3.

Table 3: Quality indicators determined by observations and users' perceptions

	Aspect of public space	**Variables / Attributes**
Determined by observations (site inventory)	Comfort from a Physical Setting	Places to sit without paying for goods and services
		Seating provided by businesses
		Other furniture and artifacts in the space
		Climatic comfort of the space: shade and shelter
		Design elements discouraging the use of space
	Comfort from safety	Visual and physical connection and openness to adjacent streets
		Appropriate physical condition and maintenance
		Lighting quality after dark

	Comfort from being on a pleasurable street	Presence of memorable architectural or landscape features (imageability)
		Sense of enclosure
		Building Permeability
		Personalization of the buildings on the street front
		Articulation and variety
		The density of elements on the sidewalk or street provides sensory complexity.

User ' s subjective rating	Comfort from a Physical Setting	Perceived physical condition and maintenance appropriate
		Perceived nuisance noise from traffic or otherwise
	Comfort from safety	Perceived safety from the presence of surveillance cameras, security guards, guides, ushers, etc. Providing safety
		Perceived safety from crime during the daytime
		Perceived safety from crime after dark
		Perceived safety from traffic
	Comfort from being on a pleasurable street	Perceived attractiveness of the street space
		Perceived interestingness of the street space

Source: (Mehta, Evaluating Public Space, 2013)

Weighting the variables

This is an essential part of the evaluation; weighting must depend on the expected performance of a given space. For example, if safety is the foremost concern, then all the characteristics of the public space that support safety must be weighted more than others.

Application Of The PSI

Step 1: Calculating the average rating for the quality attribute by the user

User rating (R1, R2, R3, … Rn) is used to calculate the average rating (Rav) for each attribute.

R av = {[R1 + R2 +... Rn]/n}

R_{av} = average rating

n = the total number of surveys conducted for users' opinions.

Rn = individual rating for the respective attribute

Step 2: Calculating the attribute score

The attribute score (Sat) is calculated by multiplying the average rating for each attribute by the weights (Wat) of the respective attributes.

Attribute Score (S at) = R av x Wat.

The score is calculated for each attribute S1, S2, ... Sn

Where S_{at} = attribute score

R av = average rating

Wat = weight of an attribute

Step 3: Calculating the dimension score

The overall dimension score (Ds) is calculated by adding the attribute scores for that respective dimension to get an overall performance score of a public space for that particular dimension.

$D_s = \sum S_1, S_2, \ldots S_n$

Where D_s = dimension score

S_n = attribute scores

The maximum possible score for each dimension is 30, which is 100%; for clarity, the score is converted to a percentage.

Step 4: Calculating overall comfort

The overall performance score, indicating the comfort quality of the street spaces, is calculated by averaging the total scores achieved for each of the three dimensions.

CP = D1 + D2 +... Dn/d; in this case, D1 + D2 + D3/d

Where C_P = overall comfort performance

Dn = dimension score for each of the dimensions

d = the total number of dimensions

The table below demonstrates the application of the evaluation with examples.

Table 4: Procedures to evaluate the street pedestrian environment using the PSI

Street from Lideta to Mexico						
Dimensions (aspects) of Quality	Attributes for Dimension (Variables)	Weightage (W_{at})	Average Rating by users $R_{av} = \{[R_1 + R_2 + \ldots R_n]/n\}$	Attribute Score $(S_{at}) = R_{av} \times W_{at}$	Dimension Score $D_s = \sum S_1, S_2, \ldots S_n$	Dimension score out of 100
Comfort from Physical setting	Sitting area (free)	W_1	$R_{av\,1}$	S_1	$D_s = S_1 + S_2 + S_3 + S_4 + S_5 + S_6 + S_7$	$D_s * 100 / 30 = \% D_s$
	Sitting area (business)	W_2	$R_{av\,2}$	S_2		
	Other furniture	W_3	$R_{av\,3}$	S_3		
	shade and shelter	W_4	$R_{av\,4}$	S_4		
	Free from obstacle	W_5	$R_{av\,5}$	S_5		
	Good maintenance	W_6	$R_{av\,6}$	S_6		
	noise	W_7	$R_{av\,7}$	S_7		

Results and Discussion:

Table 5: Characteristics of survey respondents

		Street 1 Mexico to Lideta		Street 2 Lideta to Legehar		Street 3 Legehar to M. Square		Total	Percentage
Total respondent		Count	Percentage	Count	Percentage	Count	Percentage		
		20		20		20		60	
Age	18-24	4	20%	3	15%	5	25%	12	20.00%
	25-34	6	30%	5	25%	5	25%	16	26.67%
	35-44	4	20%	6	30%	3	15%	13	21.67%
	45-54	3	15%	4	20%	3	15%	10	16.67%
	55-64	2	10%	1	5%	2	10%	5	8.33%
	65-74	1	5%	1	5%	1	5%	3	5.00%
	≥ 75	0	0%	0	0%	1	5%	1	1.67%
Gender	Male	12	60%	15	75%	14	70%	41	68.33%
	female	8	40%	5	25%	6	30%	19	31.67%
Live/work	Live	2	10%	1	5%	1	5%	4	6.67%
	Work	10	50%	11	55%	7	35%	28	46.67%
	Both	2	10%	2	10%	2	10%	6	10.00%
	Transit	6	30%	6	30%	10	50%	22	36.67%
Frequency of use	Once a day or more	11	55%	10	50%	11	55%	32	53.33%
	Few times a week	6	30%	7	35%	7	35%	20	33.33%
	Few times a month	2	10%	3	15%	2	10%	7	11.67%
	Once occasionally	1	5%	0	0%	0	0%	1	1.67%

Table 6: Average rating by the users

	Aspects of public space	Variables / Attributes	Rating 0, 1, 2, and 3		
			Street 1	Street 2	Street 3
Result from users subjective ratting	Comfort from a Physical Setting	Perceived physical condition and maintenance appropriate	0.7	1.05	1.7
		Perceived nuisance noise from traffic or otherwise	1.1	1	1.5
	average		**0.9**	**1.02**	**1.62**
	Comfort from safety	Perceived safety from the presence of surveillance cameras, security guards, guides, ushers, etc. providing safety	1.55	1.45	1.45
		Perceived safety from crime during the daytime	1.2	1.05	1.25
		Perceived safety from crime after dark	0.95	0.85	1.15
		Perceived safety from traffic	1.25	1.3	1.5
	average		**1.23**	**1.16**	**1.33**
	Comfort from being at pleasurable street	Perceived attractiveness of the street space	1.05	1.2	1.7
		Perceived interestingness of the street space	1	1.15	1.45
	average		**1.02**	**1.17**	**1.57**
Overall total average ratting (from maximum achievable point 8*3 = 24			**8.8**	**9.05**	**11.7**

Table 7: Observation rating for the PSI evaluation

	Aspect of public space	Variables / Attributes	Rating 0, 1, 2, and 3		
			Street 1	Street 2	Street 3
Results from observation (site inventory)	Comfort from Physical setting	Places to sit without paying for goods and services	1	1	2
		Seating provided by businesses	1	1	2
		Other furniture and artifacts in the space	1	1	1
		Climatic comfort of the space: shade and shelter	0	1	2
		Clear from design elements discouraging use of space	0	0	1
	average		**0.6**	**0.8**	**1.6**
	Comfort from safety	Visual and physical connection and openness of the building to the streets	1	1	2
		Good physical condition and good maintenance	0	0	2
		Lighting quality after dark	1	1	2
	average		**0.66**	**0.66**	**2**
	Comfort from being at pleasurable street	Presence of memorable architectural or landscape features (imageability)	1	1	1
		Sense of enclosure	0	0	0
		Building façade Permeability at the street front	1	1	2
		Personalization of the buildings on the street front	1	1	1
		Articulation and variety in architectural features of building facades	0	0	0
		The density of elements on sidewalks or streets adds sensory complexity.	1	1	1
		The variety of elements on the sidewalk or street offer sensory complexity.	1	1	1
	average		**0.71**	**0.71**	**0.85**
	Overall total observation ratting (from maximum achievable point 15*3 = 45		**10**	**11**	**20**

Table 8: Outcomes of the Public Space Index

Aspects of public space	Variables / Attributes	W	Street 1		Street 2		Street 3	
			Ratting	Score	Ratting	Score	Ratting	Score
Comfort from a Physical Setting	Places to sit without paying for goods and services	2	1	2	1	2	2	4
	Seating provided by businesses	1	1	1	1	1	2	2
	Other furniture and artifacts in the space	1	1	1	1	1	1	1
	Climatic comfort of the space: shade and shelter	2	0	0	1	2	2	4
	Clear from design elements discouraging use of space	1	0	0	0	0	1	1
	Perceived physical condition and maintenance appropriate	2	0.7	1.4	1.05	2.1	1.7	3.4
	Perceived nuisance noise from traffic or otherwise	1	1.1	1.1	1	1	1.5	1.5
Total score		**10**		**6.5**		**9.1**		**16.9**
Index rating for comfort out of 100				**21.66**		**30.33**		**56.33**
Comfort from safety	Visual and physical connection and openness to adjacent street	1	1	1	1	1	2	2
	physical condition and maintenance appropriate for the pedestrian space	1	0	0	0	0	2	2
	Lighting quality after dark	1	1	1	1	1	2	2
	Perceived safety from the presence of surveillance cameras, security guards, guides, ushers, etc. providing safety	1	1.55	1.55	1.45	1.45	1.45	1.45

	Perceived safety from crime during daytime	2	1.2	2.4	1.05	2.1	1.25	2.5
	Perceived safety from crime after dark	2	0.95	1.9	0.85	1.7	1.15	2.3
	Perceived safety from traffic	2	1.25	2.5	1.3	2.6	1.5	3
Total score		**10**		**10.35**		**9.85**		**15.25**
Index rating for comfort from safety out of 100				**34.5**		**32.83**		**50.83**
Comfort from being at pleasurable street	Presence of memorable architectural or landscape features (imageability)	1	1	1	1	1	1	1
	Sense of enclosure	1	0	0	0	0	0	0
	Building façade Permeability at street front	1	1	1	1	1	2	2
	Personalization of the buildings on the street front	1	1	1	1	1	1	1
	Articulation and variety in architectural features of building façade.	1	0	0	0	0	0	0
	Density of elements on sidewalk/ street providing sensory complexity	1	1	1	1	1	1	1
	Variety of elements on sidewalk/ street providing sensory complexity	1	1	1	1	1	1	1
	Perceived attractiveness of the street space	2	1.05	2.1	1.2	2.4	1.7	3.4
	Perceived interestingness of the street space	1	1	1	1.15	1.15	1.45	1.45
Total score		**10**		**8.1**		**8.55**		**10.85**
Index rating for comfort from pleasure out of 100				**27**		**28.5**		**36.16**

Table 9: Combined mean ratings for each variable for all three streets

Aspect of public space	Variables / Attributes	Ave. rating for all 3 streets (out	Ave. index score for all streets
Comfort from Physical setting	Places to sit without paying for goods and services	2.66	
	Seating provided by businesses	1.33	
	Other furniture and artifacts in the space	1.00	
	Climatic comfort of the space – shade and shelter	3.00	
	Clear from Design elements discouraging use of space	0.33	
	Perceived physical condition and maintenance appropriate	2.30	
	Perceived nuisance noise from traffic or otherwise	1.20	
Total score of comfort from Physical setting (out of 100) for all 3 streets			**39.4**
Comfort from safety	Visual and physical connection and openness to adjacent street	1.33	
	physical condition and maintenance appropriate	0.66	
	Lighting quality after dark	1.33	
	Perceived safety from presence of surveillance cameras, security guards, guides, ushers, etc. providing safety	1.48	
	Perceived safety from crime during daytime	2.33	
	Perceived safety from crime after dark	1.96	
	Perceived safety from traffic	2.70	
Total score of comfort from safety (out of 100) for all 3 streets			**39.3**
Comfort from being at pleasurable street	Presence of memorable architectural or landscape features (imageability)	1.00	
	Sense of enclosure	0.00	
	Building façade Permeability at street front	1.33	
	Personalization of the buildings on the street front	1.00	
	Articulation and variety in architectural features of building façade.	0.00	
	Density of sidewalk elements / sensory complexity	1.00	
	Variety of sidewalk elements / sensory complexity	1.00	
	Perceived attractiveness of the street space	2.63	
	Perceived interestingness of the street space	1.20	
Total score of comfort from being at pleasurable street (out of 100) for all 3 streets			**30.53**
Average public space index (out of 100) for all three streets			**36.41**

Discussion:

For the comfort of the physical setting, the total score out of 30 is 6.5, 9.1, and 16.9, which means 21.66, 30.33, and 56.33 out of 100, respectively, for streets 1, 2, and 3. The results show Street 3 performed relatively better, but still only slightly above half of the score. Streets 1 and 2 scored the lowest number, indicating the lowest performance. For safety, the total score out of 30 is 10.9, 9.85, and 15.25, which is 34.5, 32.85, and 50.83 out of 100, respectively, for the three streets. The results indicate safety is compromised, with relatively better performance at Street 3, which is only half the score. The score for comfort from being on a pleasurable street is 8.1, 8.55, and 10.85, which is 27, 28.5, and 36.16 out of 100, respectively, for the three streets. This indicates that the street performed way below half the score, and the first two streets scored the least. The average score of comfort from the physical setting for all the streets is 39.4, safety is 39.3, and pleasure is 30.53. The overall PSI of the study streets is 36.41.

A similar study on public space evaluation by Vikas Mehta The index examines four public spaces in downtown Tampa, Florida: "Gaslight Park, Bank of America Plaza, Franklin Street, and pedestrian-only Franklin Street (Poe Plaza)." Since the focus of this study is on the street, the findings on Franklin Street and pedestrian-only Franklin Street (Poe Plaza) are discussed. For physical comfort, the scores out of 30 are 22.57 and 23.46, respectively, which are 75 and 78 out of 100. For safety, the scores are 20.70 and 20.43, which are 69 and 68 out of 100, respectively. For the experience of pleasure, the scores are 17.86 and 17.79, which are 60 and 59 out of 100, respectively. When the findings of the study on this research are compared with the above research, there is a visible gap in performance. This is possibly due to the differences in the context of the study areas. One is in a developed nation, and the other is in a developing nation. The other factor is that the perception and expectations of the pedestrian may vary between the two countries. Despite these conditions, the findings of this research have implications for the improvement of weak performance and compromised pedestrian comfort in experiencing the street.

Different studies, like Life Between Buildings (1971) by Jan Gehl, The Social Life of Small Urban Spaces (1980) by William Whyte, Great Streets (1995) by Allan Jacobs, and The Death and Life of Great American Cities (1961) by Jane Jacobs, argue that the physical environment, safety, and enjoyable experience on the street are essential to making the streets safe, comfortable, and inviting for pedestrians, as well as making cities vibrant and livable.

Conclusion:

This study found that the pedestrian environment is less comfortable due to limitations in the physical setting, safety, and pleasurable experience. These limitations are caused by the lack of provision, maintenance, and proper use of sidewalk elements that support comfort qualities and requirements on the streets.

The findings suggest that there are a number of implications for the design and management of street spaces. Physical setting: The lack of sidewalk elements that support comfort qualities and requirements can make the pedestrian environment less comfortable. This can include things like a lack of proper room for walking, the provision of shade and shelter from buildings or trees, obstruction from design elements and users, poor pavement conditions, as well as a lack of seating or other places to rest. Safety: The lack of sidewalk elements that support safety can make the pedestrian environment less comfortable. This can include things like a lack of liveliness and activeness in building frontages during the day and night, the permeability of building frontages, proper maintenance, and lighting at different times of the day. Additionally, sidewalk elements that are poorly designed or maintained, such as narrow sidewalks or sidewalks that are blocked by obstacles, can also make the pedestrian environment less safe. Pleasurable experience: The lack of sidewalk elements that support a pleasurable experience can make the pedestrian environment less enjoyable. This can include things like a lack of public art, street furniture, or other amenities. Lack of personalized storefronts, façade articulation and variety, sense of enclosure, sensory complexity, attractiveness, and interestingness of the space.

Overall, the findings of the study suggest that pedestrian street spaces should be designed and managed to support pedestrian comfort, safety, and enjoyment.

References

AACA. (2018). *Addis Ababa Non-Motorised Transport (NMT) Strategy.* Addis Ababa: Addis Ababa City Administration Road and Transport Bureau.

Alexander, C., Ishikawa, S., & Silverstein. (1977). *A pattern language: towns, buildings, construction.* New York: Oxford University Press.

Boddy, C. R. (2016). *Sample Size for Qualitative Research. Qualitative Market Research.* An International Journal, 19, 426-432.

Bruce, D. Appleyard. (2021). *Livable Streets 2.0.* United States: Elsevier Inc.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches.* California: SAGE Publications, Inc.

Dworkin, S. L. (2012). Sample Size Policy for Qualitative Studies Using In-Depth. *Springer Science*, 1-2.

E.Stake, R. (1995). *The art of case study research.* california: SAGE Publication, inc.

Gehl, J. (2011). *Life between buildings (6th ed.).* Washington, DC: Island Press.

J.Gehl. (2010). *Cities for people.* Washington: island press.

Jacobs, A. B. (1993). *Great Streets.* MIT Press.

Jacobs, J. (1961). *The Death and Life of Great American Cities.* New York: Random House.

jan Gehl, Birgitte Svarre. (2013). *How To Study Public Life.* washington, DC: Island Press/Center for Resource.

John Massengale, Victor Dover. (2014). *Street Design The Secret to Great Cities and Towns.* New Jersey: John Wiley & Sons, Inc.

Llewelyn-Davies. (2007). *urban design compendium.* London: English Partnerships & The Housing Copporation.

Lynch, K. (1960). *The image of the city.* Cambridge: MIT Press.

M. Carmona, T. Heath, T. Oc, S. Tiesdell. (2003). *PPublic Places - Urban Spaces: The Dimensions of Urban Design.* OXFORD: Architectural Press.

M.Given, L. (2008). *The SAGE Encyclopedia of Qualitative Research Methods Volumes 1&2.* London: SAGE Publications, Inc.

Madden, K. (2018). *How to turn a place around : a placemaking handbook.* New York, NY: Project for Public Spaces, Inc.

Mason, M. (2010). Sample Size and Saturation in PhD Studies Using Qualitative Interviews. *ResearchGate*, 2-4.

Mehta, V. (2013). Evaluating Public Space. *Journal of Urban Design*, 69-71.

Mehta, V. (2013). *The Street: A Quintessential Social Public Space.* New York: Taylor & Francis Group.

Moughtin, C. (2003). *Urban Design: Street and Square.* Amsterdam: Architectural Press.

NACTO. (2013). *Urban Street Design Guide.* Washington: Island Press.

NACTO. (2016). *Global Street Design Guide.* Washington: Island Press.

P. Deore, S. Lathia. (2019). Streets as Public Spaces: Lessons from Street Vending. *Urban Planning*, 138–153.

Reid Ewing,Otto Clemente. (2013). *Measuring Urban Design: Metrics for Livable Places.* Washington: Island Press.

Richard T. LeGates, Frederic Stout. (2016). *The City Reader, Sixth edition.* New York: Routledge.

Shaftoe, H. (2008). *Convivial Urban Spaces: Creating Effective Public Places.* Sterling, VA: Earthscan.

Stake, R. E. (2010). *Qualitative Research: Studying How Things Work.* New York, London: The Guilford Press.

TPH. (2014). *Healthy Streets: Evidence Review.* Toronto: Toronto Public Health.

UCLG. (2016). *Public space policy framework: by and for local governments.*

UN. (2015). *Transforming our world : the 2030 Agenda for Sustainable Development, A/RES/70/1.* United Nations General Assembly.

UN-Habitat. (2013). *Streets As Public Spaces and Drivers of Urban Prosperity.* Nairobi: United Nations Human Settlements Programme.

UN-Habitat. (2015). *Global Public Space Toolkit: From Global Principles to Local Policies and Practice.* Nairobi: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2016). *Urbanization and Development:Emerging Futures.* Nairobi, Kenya: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2017). *Fundamentals Of Planned Urbanization: Training Companion.* Nairobi,Kenya: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2018). *Global Public Space Programme: Annual Report 2017.* Nairobi: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2018). *SDG Indicator 11.7.1 Training Module: Public Space.* Nairobi: United Nations Human Settlement.

UN-Habitat. (2019). *City-Wide Public Space Strategies: A Compendium of Inspiring Practices.* Nairobi: United Nations Human Settlements Programme (UN-Habitat).

UN-Habitat. (2022). *World Cities Report:Envisaging the Future of Cities.* Nairobi, Kenya: United Nations Human Settlements Programme (UN-Habitat).

UnitedNations. (2017). *New Urban Agenda.* Quito: Habitat III Secretariat.

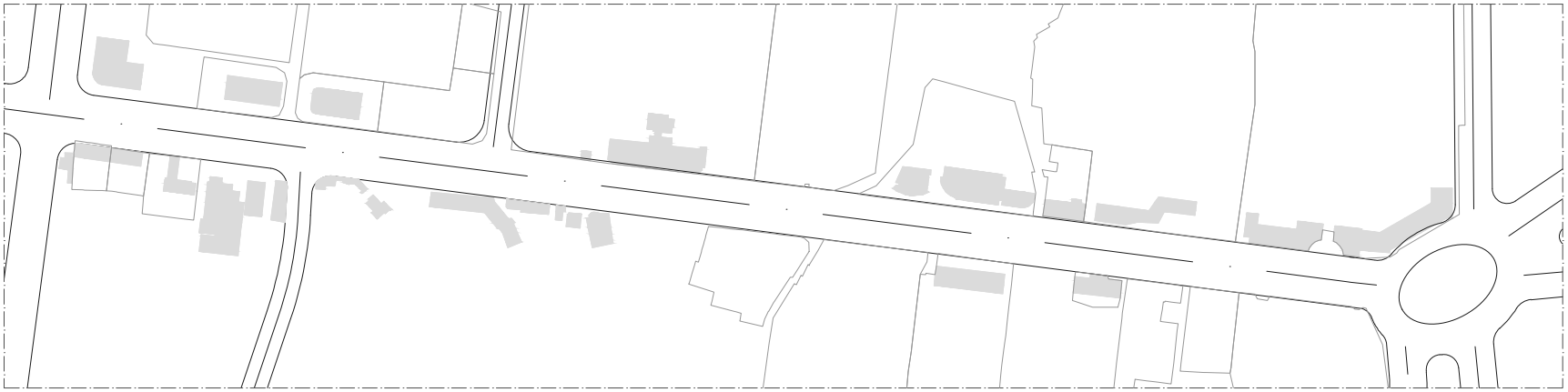
Whyte, W. H. (1980). *The Social Life of Small Urban Spaces.* Washington, D.C.: Conservation Foundation.

WorldBank. (2022). *Addis Ababa Sidewalk Safety and Improvement Study.* Washington: The World Bank.

Annex 2: Sample Stationary and Transitory Activities, Pedestrian Counting Sheet

Street		Date		Tool	Counting (1 of 7)
Condition		Time		Weather	

●	□	△
Standing	Sitting public	Sitting commercial



Posture	**Waiting Transport**	**Consuming Food/Bev.**	**Commercial Activity**	**Cultural Activity**	**Recreational Play/Exercise**	**TOTAL**
Standing						
Sitting Public						
Sitting Commercial						

Transitory Activities – Pedestrian Flow					
Pedestrian Flow	Adults	Children	Elders	Disabled	Total
Count					

Annex 3: PSI Evaluation Sheet, Observation (1 of 3)

Street		Date		Time		Tool	Observation

	Attributes	Rating			
		0	1	2	3
Physical Setting The comfort of the user arising from the physical environment	Places to sit without paying for goods and services	☐	☐	☐	☐
	Seating provided by businesses	☐	☐	☐	☐
	Other furniture and artifacts in the space	☐	☐	☐	☐
	Climatic comfort of the space – shade and shelter	☐	☐	☐	☐
	Clear from Design elements discouraging use of space	☐	☐	☐	☐
Safety The comfort of the user arising from protection from criminal activities and traffic accidents	Visual and physical connection and openness to adjacent street	☐	☐	☐	☐
	Good physical condition and good maintenance	☐	☐	☐	☐
	Lighting quality after dark	☐	☐	☐	☐
Sense of pleasure The comfort of the user that comes from being on a pleasurable street	Presence of memorable architectural or landscape features (imageability)	☐	☐	☐	☐
	Sense of enclosure	☐	☐	☐	☐
	Building Permeability	☐	☐	☐	☐
	Personalization of the buildings on the street front	☐	☐	☐	☐
	Articulation and variety	☐	☐	☐	☐
	Density of elements on sidewalk/street providing sensory complexity	☐	☐	☐	☐
	variety of elements on sidewalk/street providing sensory complexity	☐	☐	☐	☐

Annex 4: Survey Questionnaire for PSI Evaluation: User Subjective Rating

Hello! First of all, I would like to thank you for your willingness to participate in this survey. The survey was prepared by a student at Addis Ababa University, Ethiopian Institute of Architecture, Building Construction, and City Development (EiABC), for postgraduate studies. The main objective of the study is to get your opinion on the following questions that require the user's response to understand the comfort and safety of pedestrians on the main transportation routes: The research will be done on the street from Lidta to Meskel Square, and I humbly ask you to participate, understanding that the information collected is for educational purposes only.

Thank you for your time. Hunde Motera

Select your response using the "x" or "✓" symbol in the box provided. Rate your review from 0-3. 0 is a quality characteristic that doesn't exist at all; 1 is low; 2 is moderate; and 3 is high.

Age	☐ 18-24	☐ 23-34	☐ 35-44	☐ 45-54	☐ 55-64	☐ 65-74	☐ 75 ≥
Sex	☐ Male	☐ Female					
Reason of using the street			☐ Live	☐ Work	☐ Both	☐ Transit	
How frequently do you use the street?			☐ Once in a day or more			☐ Few times a month	
			☐ Few times a week			☐ Once occasionally	

	Attributes	Rating			
		0	1	2	3
Physical Setting The comfort of the user arising from the physical environment	The presence of appropriate pedestrian environment & facilities and the necessary maintenance and care for these?	☐	☐	☐	☐
	The existence of a pedestrian environment protected from traffic or other noise pollution?	☐	☐	☐	☐
Safety The comfort of the user arising from protection from criminal activities and traffic accidents	Sense of safety from surveillance cameras, security guards, the presence of other road users, etc.?	☐	☐	☐	☐
	Safety in terms of protection from criminal activity during the day?	☐	☐	☐	☐
	Safety in terms of protection from nighttime crime?	☐	☐	☐	☐
	Safety from traffic accidents?	☐	☐	☐	☐
Sense of pleasure The comfort of the user that comes from being on a pleasurable street	The attractiveness of the street	☐	☐	☐	☐
	Interestingness of the street	☐	☐	☐	☐

Street	Date	Time	Id No.

Annex 4B: Survey Questionnaire for PSI Evaluation

Amharic Version User Subjective Rating

EiABC
Ethiopian Institute of Architecture, Building Construction and City Development
Addis Ababa University
Building Ethiopia Since 1954

ሰላም! በ ቅድሚያ በዚህ መጠይቅ ለመሳተፍ ላሳዩት ቀናነት እያመሰገንኩ መጠይቁ በ አዲስ አበባ ዩኒቨርሲቲ አርክቴክቸር ህንፃ ግንባታና ከተማ ልማት ተቋም ህንፃ ኮሌጅ ለድህረ ምረቃ ትምህርት ማሟያ በተማሪ የተዘጋጀ ነው ። የጥናቱ ዋና አላማም በዋና የትራንስፖርት መሸጋገሪያ መንገዶች ላይ ላይ ያለውን የእግረኞች ምቾት እና ደህንነት ለመረዳት የተጠቃሚውን ምላሽ በሚሹ ቀጣይ ጥያቄዎች ላይ የእርሶን ሃሳብ ማግኘት ነው ። ጥናቱ የሚደረገው ከ ልደታ እስከ መስቀል አደባባይ ባለው መንገድ ላይ ሲሆን የሚሰበሰበው መረጃም ለትምህርታዊ አላማ ብቻ የሚዉል መሆኑን ተረድተው እንዲሳተፉ በትህትና እጠይቃለሁ ።

ሰለ ጊዜዎ አመሰግናለሁ ። ሁንዴ ሞተራ

ትክክለኛ ለሆነዉ ምላሽ የተቀመጠዉ ሳጥን ላይ የ “x” ወይም “✓” ምልክትን ይጠቀሙ። ለ ግምገማዎ ከ 0 - 3 የተቀመጡትን ደረጃዎች ይስጡ። 0 የተገለፀዉ ባህሪይ የለም ሲሆን ፡ 1 ዝቅተኛ ፡ 2 መካከለኛ ፡ 3 ከፍተኛ ናቸው።

ዕድሜ	☐ 18-24	☐ 23-34	☐ 35-44	☐ 45-54	☐ 55-64	☐ 65-74	☐ 75 ≥
ፆታ	☐ ወንድ	☐ ሴት					
ይህ አከባቢ መኖርያዎ/መስሪያ ቦታዎ ነው?	☐ መኖርያ	☐ መስሪያ	☐ ሁለቱም	☐ መተላለፊያ			
መንገዱን የሚጠቀሙበትን የ ድግግሞሽ መጠን ይግለፁልን	☐ በቀን አንዴና ከዚያ በላይ	☐ ጥቂት ቀናት በወር					
	☐ ጥቂት ቀናት በሳምንት	☐ አንዳንዴ አልፎ አልፎ					

	ባህሪያት	ደረጃ መስጠት			
		0	1	2	3
ከአካላዊ አቀማመጥ ከ ከባቢያዊ ሁኔታዉ (ከአካላዊ አቀማመጥ) የሚመነጩ የተጠቃሚዉ ምቾት	በ መንገዱ ላይ ተገቢነት ያለዉ የ እግረኞች ከባቢ (ቦታ) እና መገልገያዎች መኖርን ለነዚህም አስፈላጊ የሆኑ ጥገና እና እንክብካቤ መደረጉን እንዴት ይገመግሙታል?	☐	☐	☐	☐
	ከትራፊክ ወይም በሌላ መልኩ ከተፈጠሩ የድምፅ ብክለት (ከ ጫጫታ) የተጠበቀ የ እግረኞች ከባቢ (ቦታ) መኖርን እንዴት ይገመግሙታል?	☐	☐	☐	☐
ደህንነት ወንጀል ነክ ከሆኑ ድርጊቶች ከመጠበቅ እና ከትራፊክ አደጋ ደህንነት የሚመነጩ የተጠቃሚዉ ምቾት	ከክትትል ካሜራዎች፣ ከደህንነት አስከባሪዎች፣ ከሌሎች መንገድ ተጠቃሚዎች መኖር እና በመሳሰሉት ሁኔታዎች ምክንያት የሚሰማዎትን ደህንነት እንዴት ይገመግሙታል?	☐	☐	☐	☐
	በቀን ወቅት ወንጀል ነክ ከሆኑ ድርጊቶች ከመጠበቅ አኳያ የሚሰማዎትን ደህንነት እንዴት ይገመግሙታል?	☐	☐	☐	☐
	ከ በምሽት ሰዓት ወንጀል ነክ ከሆኑ ድርጊቶች ከመጠበቅ አኳያ የሚሰማዎትን ደህንነት እንዴት ይገመግሙታል?	☐	☐	☐	☐
	ከትራፊክ አደጋ ከመጠበቅ አኳያ የሚሰማዎትን ደህንነት እንዴት ይገመግሙታል?	☐	☐	☐	☐
አስደሳችነት በአስደሳች መንገድ ላይ ከመሆን የሚመነጩ የተጠቃሚዉ ምቾት	የመንገዱን ማራኪነት እንዴት ይገመግሙታል?	☐	☐	☐	☐
	የመንገዱን ሳቢነት እንዴት ይገመግሙታል?	☐	☐	☐	☐

መንገድ	ቀን	ሰዓት	መለያ ቁጥር

Annex 5A: PSI Evaluation:

Overall Pedestrian Comfort; Weighting and Scoring Criteria for Comfort in the Physical Setting

Over all comfort = Comfort from Physical setting + Comfort from safety + Comfort from being pleasurable	**Aspect of public space**	**Variables / Attributes**	**Weighting**	**Scoring criteria**	**Measuring criteria**
	Comfort from Physical setting	Places to sit without paying for goods and services	2.0	0= none 1= few 2 = several in some space 3 = several in many space	Determined by observations using count
		Seating provided by businesses	1.0	0= none 1= few 2 = several in some space 3 = several in many space	Determined by observations using count
		Other furniture and artifacts in the space	1.0	0= none 1= few 2 = several in some space 3 = several in many space	Determined by observations using count
		Climatic comfort of the space – shade and shelter	2.0	0= not comfortable 1= somewhat comfortable in some part 2 = comfortable in some part 3 = comfortable in most part	Determined by observations
		Design elements discouraging use of space	1.0	0= several 1= few 2 = one or two 3 = none	Determined by observations
		Perceived physical condition and maintenance appropriate	2.0	0= not at all 1= somewhat 2 = mostly 3 = very much	User ’s subjective rating
		Perceived nuisance noise from traffic or otherwise	1.0	0= high 1= moderate 2 = very little 3 = none	User ’s subjective rating
		Sub total	10	30 (maximum)	

Source: (Mehta, Evaluating Public Space, 2013)

Annex 5B: PSI Evaluation: Overall Pedestrian Comfort; Weighting and Scoring Criteria for Comfort from Safety

Over all comfort = Comfort from Physical setting + Comfort from safety + Comfort from being pleasurable	**Aspect of public space**	**Variables / Attributes**	**Weighting**	**Scoring criteria**	**Measuring criteria**
	Comfort from safety	Visual and physical connection and openness to adjacent street	1.0	0= almost none/very poor 1= somewhat tentative 2 = moderately well connected 3 = very well connected	Determined by observations
		physical condition and maintenance appropriate	1.0	0= not at all 1= somewhat 2 = mostly 3 = very much	Determined by observations
		Lighting quality after dark	1.0	0= very poor 1= many parts not well lit 2= mostly well lit 3 = very well lit	Determined by observations using count
		Perceived safety from presence of surveillance cameras, security guards, guides, ushers, etc. providing safety	1.0	0= make me feel unsafe 1= not at all 2 = provide some sense of safety 3 = VM. provide a sense of safety	User ’s subjective rating
		Perceived safety from crime during daytime	2.0	0= not safe at all 1= somewhat unsafe 2 = mostly safe 3 = very safe	User ’s subjective rating
		Perceived safety from crime after dark	2.0	0= not safe at all 1= somewhat unsafe 2 = mostly safe 3 = very safe	User ’s subjective rating
		Perceived safety from traffic	2.0	0= not safe at all 1= somewhat unsafe 2 = mostly safe 3 = very safe	User ’s subjective rating
		Sub total	10	30 (maximum)	

Source: (Mehta, Evaluating Public Space, 2013)

Annex 5C: PSI Evaluation: Overall Pedestrian Comfort; Weighting and Scoring Criteria for Being on a Pleasurable Street

	Aspect of public space	Variables / Attributes	Weighting	Scoring criteria	Measuring criteria
Over all comfort = Comfort from Physical setting + Comfort from safety + Comfort from being pleasurable	Comfort from being at pleasurable street	Presence of memorable architectural or landscape features (imageability)	1.0	0= none 1= very few 2 = moderate 3 = several	Determined by observations
		Sense of enclosure	1.0	0= VP sense of enclosure 1= moderately well enclosed 2 = good sense of enclosure 3 = VG sense of enclosure	Determined by observations
		Permeability of building facades on the street front	1.0	0= note at all 1= some part somewhat permeable 2= moderate permeability 3 = very permeable all along	Determined by observations
		Personalization of the buildings on the street front	1.0	0= not at all 1=some part somewhat personalized 2 = moderate personalization 3 = very personalized all along	Determined by observations
		Articulation and variety in architectural feature of the building façade on the street front	1.0	0= poor articulation and variety 1= somewhat articulated 2 = moderate articulation 3 = very well-articulated	Determined by observations
		Density of elements on sidewalk/street providing sensory complexity	1.0	0= none or very few 1= few 2 = moderate 3 = High	Determined by observations
		variety of elements on sidewalk/street providing sensory complexity	1.0	0= none or very few 1= few 2 = moderate 3 = High	Determined by observations
		Perceived attractiveness of the street space	2.0	0= note at all 1= somewhat 2 = moderate 3 = very much	User ’s subjective rating
		Perceived interestingness of the street space	1.0	0= note at all 1= somewhat 2 = moderate 3 = very much	User ’s subjective rating
		Sub total	10	30 (maximum)	

Source: (Mehta, Evaluating Public Space, 2013)

Annex 6: Aspect, attribute, and measurement description for existing street context study

	Variables / Attributes	Measurement description
Physical condition	Maximum, minimum, and average sidewalk width	The most and least wide sidewalk in meters which is a dedicated area for the pedestrian from the curb to the building edge or other element.
	Percentage of buildings with setbacks	This investigates buildings that have a setback from the street that could serve the public. counted and described in percentage.
	Percentage of adjacent buildings that provide shade and shelter for pedestrians	includes overhangs, awnings, and shading devices that provide shade and shelter for the sidewalk. It was measured as a percentage of the buildings that provide shade and shelter for pedestrians.
	Percentage of shade and shelter from trees and canopy	It was measured as the degree of provision of tree canopies for the side walk. The trees are counted, and the average distance at which one tree is provided is computed.
	Degree of presence of obstacles from design elements	Manholes, buildings, poles, signs, maintenance issues, and others that hinder the movement of people Such elements are counted and calculated to get the average number of interruptions per meter along each segment of the streets.
	Degree of presence of obstacles by users	Parked cars, advertisements, goods, trash, and related issues that obstruct the movement of people Such elements are counted and calculated to get the average number of interruptions per meter along each segment of the streets.
	Number of seating areas (public)	Non-commercial seating like benches and chairs where people could sit without having to pay for goods or services. Count and calculate the average number of seats per m along each segment of the streets.
	Number of seating areas (business)	number of seats, like chairs supplied by private businesses that provide good service. Count and calculate the average number of seats per m along each segment of the streets.
	Pavement condition	Percentage of sidewalk areas that require maintenance, count the deteriorated sections of the sidewalk, and calculate the degree of maintenance needed per m along each segment of the street.
	Degree of provision and continuity of tactile pavement	Provision and continuity of tactile pavement. Percentage of sidewalks with tactile pavement for the visually impaired and number of interruptions in continuity per m along each segment of the streets
	Degree of presence of other street furniture and artifacts	Street furniture (other than chairs, tables, benches, and other seating), like a bollard, dustbin, curb stone, and traffic sign Such elements are counted and calculated to get the average number per m along each segment of the streets.

Safety	Degree of activeness of street frontage	The average number of doors per 100 m is counted to determine the activity level of the frontage along the sidewalk. The category is rated from A-active to E-inactive.
	Degree of permeability of the building frontage	How well are activities inside the building visible from the street? Buildings with such qualities are counted and their proportions calculated along each segment of the street.
	Stores remained open late.	The number and percentage of stores open after dark are counted at 8:30 p.m. (2:30 LT) along the street sidewalks.
	Lighting after dark	The number of street lights provided along each segment of the sidewalk, the range in meters that one street light is provided, and the number and percentage of functioning sources.
Pleasure	Degree of personalization of the buildings on the street front	The degree of personalization was determined by observing how the frontage of the business (building façade, entrances, shop windows) was designed with customized touches such as displays, decorations, signs, banners, planters, flower boxes, and other wares. Count and calculate the average number of buildings with such qualities along each segment of the streets.
	Façade articulation and variety	The articulation of the building façade was determined by how articulated and punctuated buildings are with edges, corners, alcoves, small setbacks, and steps at street level. Buildings with such qualities along each segment of the streets are described.
	Sense of enclosure	Spaces enclosed with buildings, structures, vegetation, or other elements are counted and described along each segment of the streets.
	Sensory complexity (variety and density of sidewalk elements)	The presence and verity of plants, granaries, water features, street furniture, and artwork are observed and described along each segment of the streets.
	Attractiveness and interestingness	Cleanliness and tidiness, space for play and exercise, and landscape elements are observed along each segment of the streets.

Annex 7A: Schedule for the study of transitory activity

Transitory Activities – Pedestrian Flow Count				
Day	Morning - Peak Time Noon/Mid-Day Afternoon- Peak Time	Recorded Time Street 1	Recorded Time Street 2	Recorded Time Street 3
Jun 23 Friday	07:00 am - 08:30 am	07:10 am - 07:20 am	07:30 am - 07:40 am	07:50 am - 08:00 am
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	12:50 pm - 01:00 pm	01:10 pm - 01:20 pm
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	04:50 pm - 05:00 pm	05:10 pm - 05:20 pm
Jun 24 Saturday	07:00 am - 08:30 am	07:10 am - 07:20 am	07:30 am - 07:40 am	07:50 am - 08:00 am
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	12:50 pm - 01:00 pm	01:10 pm - 01:20 pm
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	04:50 pm - 05:00 pm	05:10 pm - 05:20 pm
Jun 25 Sunday	07:00 am - 08:30 am	07:10 am - 07:20 am	07:30 am - 07:40 am	07:50 am - 08:00 am
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	12:50 pm - 01:00 pm	01:10 pm - 01:20 pm
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	04:50 pm - 05:00 pm	05:10 pm - 05:20 pm
Jun 26 Monday	07:00 am - 08:30 am	07:10 am - 07:20 am	07:30 am - 07:40 am	07:50 am - 08:00 am
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	12:50 pm - 01:00 pm	01:10 pm - 01:20 pm
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	04:50 pm - 05:00 pm	05:10 pm - 05:20 pm
Jun 27 Tuesday	07:00 am - 08:30 am	07:10 am - 07:20 am	07:30 am - 07:40 am	07:50 am - 08:00 am
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	12:50 pm - 01:00 pm	01:10 pm - 01:20 pm
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	04:50 pm - 05:00 pm	05:10 pm - 05:20 pm
28 (July 5) Wednesday	07:00 am - 08:30 am	07:10 am - 07:20 am	07:30 am - 07:40 am	07:50 am - 08:00 am
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	12:50 pm - 01:00 pm	01:10 pm - 01:20 pm
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	04:50 pm - 05:00 pm	05:10 pm - 05:20 pm
Jun 29 Thursday	07:00 am - 08:30 am	07:10 am - 07:20 am	07:30 am - 07:40 am	07:50 am - 08:00 am
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm	12:50 pm - 01:00 pm	01:10 pm - 01:20 pm
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm	04:50 pm - 05:00 pm	05:10 pm - 05:20 pm

Annex 7B: Sample record table for transitory activities

Transitory Activities – Pedestrian Flow Count - Street 1									
Day	Morning - Peak Time Noon/Mid-Day Afternoon- Peak Time	Recorded Time	Adults (Normal)	Children	Elders	Disabled	Total	Daily Average Flow Per	
								10 min.	1 hr.
Jun 23 Friday	07:00 am - 08:30 am	07:10 am - 07:20 am							
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm							
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm							
Jun 24 Saturday	07:00 am - 08:30 am	07:10 am - 07:20 am							
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm							
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm							
Jun 25 Sunday	07:00 am - 08:30 am	07:10 am - 07:20 am							
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm							
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm							
Jun 26 Monday	07:00 am - 08:30 am	07:10 am - 07:20 am							
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm							
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm							
Jun 27 Tuesday	07:00 am - 08:30 am	07:10 am - 07:20 am							
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm							
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm							
28 (July 5) Wednesday	07:00 am - 08:30 am	07:10 am - 07:20 am							
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm							
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm							
Jun 29 Thursday	07:00 am - 08:30 am	07:10 am - 07:20 am							
	12:30 pm - 01:30 pm	12:30 pm - 12:40 pm							
	04:30 pm - 06:00 pm	04:30 pm - 04:40 pm							

Annex 8A: Schedule for the study of Stationary activity

Stationary Activities – Pedestrian Flow Count				
Day	Study Time	Recorded Time Street 1	Recorded Time Street 2	Recorded Time Street 3
Jun 30 Friday	04:30 PM–06:00 PM	04:30 PM–04:50 PM	05:00 PM–05:20 PM	05:30 PM–05:50 PM
Jul 1 Saturday	04:30 PM–06:00 PM	04:30 PM–04:50 PM	05:00 PM–05:20 PM	05:30 PM–05:50 PM
Jul 2 Sunday	04:30 PM–06:00 PM	04:30 PM–04:50 PM	05:00 PM–05:20 PM	05:30 PM–05:50 PM
Jul 3 Monday	04:30 PM–06:00 PM	04:30 PM–04:50 PM	05:00 PM–05:20 PM	05:30 PM–05:50 PM
Jul 4 Tuesday	04:30 PM–06:00 PM	04:30 PM–04:50 PM	05:00 PM–05:20 PM	05:30 PM–05:50 PM
Jul 5 Wednesday	04:30 PM–06:00 PM	04:30 PM–04:50 PM	05:00 PM–05:20 PM	05:30 PM–05:50 PM
Jul 6 Thursday	04:30 PM–06:00 PM	04:30 PM–04:50 PM	05:00 PM–05:20 PM	05:30 PM–05:50 PM

Annex 8B: Sample record table for Stationary activities

Stationary Activities – Staying – Street 2									
Day	Time	Posture	Waiting Transport	Consuming Food/Bev.	Commercial Activity	Cultural Activity	Recreational Play/Exercise	Total	Total Staying
Jun 30 Friday	05:00 PM–05:20 PM	Standing							
		Sitting Public							
		Sitting Comm.							
Jul 1 Saturday	05:00 PM–05:20 PM	Standing							
		Sitting Public							
		Sitting Comm.							
Jul 2 Sunday	05:00 PM–05:20 PM	Standing							
		Sitting Public							
		Sitting Comm.							
Jul 3 Monday	05:00 PM–05:20 PM	Standing							
		Sitting Public							
		Sitting Comm.							
Jul 4 Tuesday	05:00 PM–05:20 PM	Standing							
		Sitting Public							
		Sitting Comm.							
Jul 5 Wednesday	05:00 PM–05:20 PM	Standing							
		Sitting Public							
		Sitting Comm.							
Jul 6 Thursday	05:00 PM–05:20 PM	Standing							
		Sitting Public							
		Sitting Comm.							