

Active Frontage and Its Spatial Correlation with Crime Incidents: In case Study of Adama Town, Ethiopia



Selamawit Abeje Temtime

A Thesis Submitted to the Department of Architecture
College of Civil Engineering and Architecture

Presented in Partial Fulfillment of the Requirement for the Degree of
Masters of Science in Environmental Architecture

Office of Graduate Studies
Adama Science and Technology University

May, 2025
Adama, Ethiopia

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APPROVE OF BOARD OF EXAMINERS

I, the advisor of the thesis entitled “**Active Frontage and Its Spatial Correlation with Crime Incidents: In case of Adama Town, Ethiopia**” and developed by **Selamawit Abeje** , hereby certify that the recommendation and suggestions made by the board of examiners are appropriately incorporated into the final version of the thesis.

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We, the undersigned, members of the Board of Examiners of the thesis by **Selamawit Abeje**, have read and evaluated the thesis entitled “**Active Frontage and Its Spatial Correlation with Crime Incidents: In case of Adama Town, Ethiopia**” and examined the candidate during open defense. This is, therefore, to certify that the thesis is accepted for partial fulfillment of the requirement of the degree of Master of Science in Environmental Architecture.

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DECLARATION

I declare that this MSc Thesis entitled “**Active Frontage and Its Spatial Correlation with Crime Incidents: In case of Adama Town, Ethiopia**” is my original work. That is, it has not been submitted for the award of any academic degree, diploma, or certificate in any other university. All sources of materials that are used for this thesis have been duly acknowledged through citation.

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RECOMMENDATION OF ADVISOR

I, the advisor of this thesis, hereby certify that I have read the revised version of the thesis entitled “**Active Frontage and Its Spatial Correlation with Crime Incidents: In case A Case Study of Adama Town, Ethiopia**” prepared under my guidance by Selamawit Abeje submitted in partial fulfillment of the requirements for the degree of Master’s in Environmental Architecture. Therefore, I recommend the submission of revised version of the thesis to the department following the applicable procedures .

Dr.Sieleshi Azagew. (Assistant Prof.PhD)

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Date

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LIST OF ACRONYMS AND ABBREVIATIONS

PAS	Principal arterial street
SAS	Sub-arterial street
CS	Collector street
LS	Local street
ODPM	Office of the Deputy Prime Minister
CPTED	Crime prevention through environmental design
GIS	Geographic Information System
GPS	Ground Position System

ABSTRACT

Active frontage is important for cultivating secure and vibrant urban environments, primarily by enhancing natural surveillance the principle of "eyes on the street" that actively deters crime and instills a pervasive sense of security. This comprehensive study was designed to investigate the existing frontage levels within Adama and elucidate their spatial correlation with various crime incidents. The core objectives included analyzing Adama Town's current active frontage conditions, identifying precise spatial relationships with different crime incidences, and subsequently proposing actionable, context specific design remedies. The research employed a mixed-methods approach, utilizing a deductive framework. Quantitative data on active frontage levels was meticulously collected through extensive field observations across Adama's diverse street types. This data, alongside photographic evidence from walk-along surveys, was digitized and attributed using ArcGIS software, enabling detailed analysis, interpretation, and the systematic mapping and rating of active frontage levels from A to E based on established guidelines. This spatial analysis was complemented by qualitative insights gathered through interviews and crime statistics obtained from local police, providing a holistic understanding of the crime landscape. Key findings indicate a concerning prevalence of dead frontages across Adama, which, are significantly exposed to crime. The study reveals that a high proportion of Adama's street segments exhibit low levels of active frontage, contributing to areas of reduced visibility and social interaction that inadvertently create opportunities for criminal activity. In response to these critical findings, the research proposes innovative design solutions which mitigate inactive frontage levels. These include enhancing new fence designs that increase visibility from inside to outside, thereby promoting natural surveillance. Furthermore, the study recommends strategic street-side landscape designs incorporating various activities to revitalize blind and dead frontages, transforming them into more engaging, secure, and aesthetically pleasing public spaces. This research not only fills a significant gap in localized urban planning knowledge for Adama but also contributes valuable empirical evidence to the broader discourse on crime prevention through environmental design in developing urban contexts.

Key words: *active frontage ,dead frontage , street crime , spatial analysis, urban design*

CHAPTER 1

1. INTRODUCTION

1.1. Background

Urban environments are intricate systems with many interrelated components that affect safety and social behavior. The high rates of homicide, assault, rape, robbery, and other crimes pose a threat to community safety in Africa and other parts of the world. According to a recent UN research, 25% of African urban dwellers had experienced crime within a five-year period (UN-HABITAT, 2007). The existence of interesting, pedestrian-friendly areas that promote communication and community involvement was referred to as "active frontage." Urban studies had taken notice of this idea, especially in light of its possible influence on crime rates.

The concept of active frontage, rooted in the work of (Jacobs, 2009) and further developed by (Gehl, 2006), emphasizes the importance of street life and "eyes on the street" for enhancing urban safety. Active frontages, as defined by the (ODPM, 2004), are characterized by buildings with visible activity, featuring windows, doors, and engaging ground floor uses, as opposed to passive frontages dominated by blank walls, fences, or garages.

According to Heffernan et al. (2014), active frontages are crucial for designing the best public spaces and greatly enhancing the life and vibrancy of metropolitan communities. Active frontages improve the public environment by taking into account heightened interest and activity (Llewelyn Davies et al., 2013). As highlighted (Gehl et al. 2006), well-designed active frontages are essential for the success of public spaces. Successful public spaces, characterized by comfort, sociability, and accessibility, are ultimately valued and enjoyed by their users (Carr et al., 2008). Creating active frontages involves strategies that enhance street life and vitality. This includes mitigating blank walls and maximizing the presence of doors and windows, incorporating narrow buildings to create visual aesthetic, and relating facades with features like bays and

According to international media, police methods have been the mainstay of global governments' efforts to combat crime. Global crime rates, however, kept rising. It's critical to take into account several approaches when addressing antiquated crime-related

problems. The significance of the built environment in lowering crime has been emphasized in recent decades (Newman, 1972). According to Yazdanfar (2013), human needs for safety, motivation, and social interaction can all be met by a well-designed environment.

The relationship between safety and active frontages is rooted in the ideas presented (Jacobs, 1961), who introduced the concept of natural surveillance, often referred to as "eyes on the street." This concept emphasizes the value of creating a built environment that facilitates interaction between buildings and the surrounding spaces they create. The latest national planning guidance focused on safety and security, titled "Safer Places" (ODPM, 2004), enhance for integrating active frontages to enhance street visibility and promote a sense of security. Additionally, features like porches are encouraged to foster a welcoming environment.

Urban safety prioritizes enhancing individual rights, which include people's physical and mental health, in order to combat crime and violence prevention. Because inappropriate urban development conditions can encourage crime and violence, urban safety is a notion that supports crime prevention. Over the past 40 years, a lot of research has been done on how the built environment can lower crime (Newman, 1972). According to (Yazdanfar, 2013), a well-designed environment can satisfy basic human requirements, such as safety as a motivating element, and eventually foster social ties.

Safety has been a fundamental human need throughout history (Cozens, 2008) and remains a main concern in contemporary societies. It can profoundly impact an individual's daily life and actions. A feeling of safety is crucial for effective urban design (Hagerstrand, 1970). In addition to being aesthetically pleasing, environments that encourage safe walking offer defense against crime and the stress that comes with it (Latimer, 2004).

Millions of people's lives are impacted by crime every year. Serious crimes like murder, rape, and theft cause a great deal of terror in communities. This fear, along with the crimes themselves, can limit individuals' freedom to move about and hinder their ability to engage fully and integrate into their communities (National Crime Prevention Council, 2003).

Ethiopia has problems with crime, much as many other countries. Because they are more likely to be victimized and are thought to be carrying valuables, pedestrians are frequently viewed as possible targets. Snatch-and-run thefts, assaults from occupied automobiles, and other minor infractions are common crimes committed against pedestrians. These events

can occur at any time and are more common in places where there are fewer pedestrians. Although it is uncommon under these circumstances, physical violence can happen on occasion. According to the U.S. Embassy (2016), these acts are typically opportunistic rather than planned attacks.

In cities like Adama, Ethiopia, understanding the spatial relationship between active frontages and crime incidents was important for urban planning and public safety. As urbanization accelerated, cities faced challenges related to crime and disorder, making it important to explore how urban design could minimize these problems. This study aimed to contribute to that active frontage and crime basic issues to urban safety and design, offering valuable recommendations for policymakers and urban planners in Adama and similar contexts.

1.2. Statement of the problems

Adama Town's urban landscape includes dead frontages caused by plot orientations in residential districts, as well as long fences enclosing hospitals, colleges, businesses, and administrative buildings. As Street-level frontages are more immediately noticeable than any other building element in Adama Town because of the horizontal nature of the human field of view, which limits street activity and creates a sense of fear. (Svarre & Gehl, 2013). The primary causes of this are improper zoning and rapid development. The spatial distribution of criminal events may be impacted by these design features, which lead to a preponderance of idle frontages and reduced visual permeability. The town's comfort, pleasantness, and aesthetics are also impacted by the level of the frontages. Heffernan (2014).

A major obstacle to evidence-based urban planning and design that aims to improve public safety and inhabitants' quality of life is a lack of localized knowledge. Although it is acknowledged that inactive frontages have a detrimental effect on urban safety and livability, there are few concrete suggestions that are suited to Adama Town's particular situation.

The motivation for this research stemmed from direct observations and experiences as ASTU students over the past seven years, during which crime incidents around university fences were frequently heard and observed. This recurring issue highlighted a critical need to investigate the environmental factors contributing to such vulnerabilities. Furthermore, as architecture students, it became evident that the prevalent design of long, imposing

fences throughout the neighborhood created a distinctly less aesthetically pleasing urban environment, prompting a desire to explore how design interventions could address both security and visual quality concerns.

For urban planners, legislators, and community stakeholders looking to raise the standard of living and strengthen the safety and resilience of urban environments in Adama Town, this knowledge gap is a serious obstacle. No research has explicitly examined the amount of active frontage and its relationship to crime in Adama Town, despite earlier studies mapping the level of active frontage in Addis Ababa city, Ethiopia (Ametu M, 2011), creating safe sidewalks for crime prevention (Berihu M., 2017), and others.

In order to close this gap, the study will first define "active frontage" using the literature on urban design and determine how to assess it. After that, it will investigate current urban development plans and look for information on crime incidences in Adama Town. Additionally, literature on the geographical association between crime and active frontage, especially in comparable contexts, will be reviewed, and possible indicators for evaluating active frontage in Adama Town will be identified. Lastly, it will look into the kinds of frontage design elements that support active frontage in the research region.

1.3. Objective

1.3.1. General Objective

To explore the level of active frontage and the spatial relationship with crime incidents: In the case of Adama town, Ethiopia.

1.3.2. Specific objective

The specific objectives of the study are to:

- Assess the level active frontage within Adama City.
- Analyze the spatial relationship between the level of active frontage and crime incidence in Adama City.
- Explore methods and approaches that minimize the level of dead frontage and related crime incidence.

1.4. Research question

1. What is the level of active frontage within Adama Town ?
2. What is the spatial relationship between active frontage and crime in Adama Town?

3. What methods and approaches can minimize dead frontage and its associated crime incidence?

1.5. Significance of the study

This study is important to the Adama Town community because it attempts to enhance public safety by investigating the connection between crime events and active frontage. offers insightful findings that encourage legislators, urban planners, and other experts in urban development to take into account frontages that improve aesthetics and safety.

The results help guide evidence-based plans for increasing Adama Town's active frontage and boosting urban safety. The study makes a substantial contribution to the expanding corpus of research on the relationship between crime, social dynamics, and the built environment in urban environments.

By examining Adama Town's particular setting, this study not only offers insightful information about the precise role that active frontage plays in influencing crime trends, but it also advances more complex and context-sensitive theories of urban crime.

1.6. Scope of the study

The study is conducted within the current boundary of Adama city which lies in the geographical location of 8°26 '15"N to 8°37 '00"N latitude and 39°12'15"E to 39°19'45"E longitude, 100 km from southeast of Addis Ababa at an average altitude of 1620m above the sea level. Adama is situated in the Eastern Shewa region which is part of the central plateau . this Bole sub-city is where the questionnaire was conducted by specific sampling method .

Thematically, the study focused on identifying the level of active frontage and its correlation with crime incidents in Adama Town. Based on the guidelines Ghel,1994 the Adama frontage level was examined both by land use and street type. From the data analyzed design solutions were also provided for frontages specifically for residence and commercial. Land-scape design which enhances the street side on blind frontages was also included in this research.

1.7. Limitation of the study

The study's limitations include shortage of available data, which have impacted the clarity and comprehensiveness of the findings. As an observational study, the results are subject to a degree of subjectivity. Furthermore, the use of traditional field survey methods for collecting data because of the lack of efficiency of advanced data collection tools such as

satellite maps with 3D. Lack of study related with frontage and crime in Adama was also challenging . Finally, the limited availability of specific crime data from police officers relating areas with low active frontage posed an additional constraint on the analysis.

1.8.Organization of this Research

There are five chapters in the paper. The study is introduced, the problem statement is outlined, the research objectives and questions are defined, the scope and relevance of the research are specified, the constraints of the study are acknowledged, and the report's structure is finally described in the first chapter. The review of pertinent literature is the main topic of the second chapter. The materials and techniques used in the investigation are described in detail in Chapter 3. The observations are discussed and the results are presented in Chapter 4. Chapter 5 wraps up the report by summarizing the main conclusions and providing suggestions derived from the study.

1.9.Operational Definition

Frontage: Building components include elevations, corner treatments, roof lines, doors and windows, materials, and colorful and textured floors. the interface between horizontal and vertical planes includes steps, fences, front gardens, edges, walls, windows, and doors. According to(Gehl et al. , 2006)

Active Frontage: the edge or frontage of a structure or area with doors and windows rather than just walls, fences, and garages. Davies, Llewelyn (2007)

Natural surveillance: Natural surveillance consists of increased visibility of urban places directed at keeping intruders under observation and undesirable behavior under control (Sorensen et al., 2008). Balconies and windows provide good surveillance.

Eyes on the street: could therefore be promoted through mixed land uses, where ‘a substantial quantity of stores and other public places are sprinkled along the sidewalks of a district are used evening and night (Newman’s, 1973).

Activity support: entails both passive and proactive measures to encourage the presence of responsible pedestrian users in a particular location, so enhancing the area's community value and deterring potential offenders who wish to remain anonymous. Joseph (2012)

Defensible Space: involves design changes to the built environment to maximize the natural surveillance of streets provided by people going about their day-to-day activities.(Cozens et al., 2005)

CHAPTER 2

2. LITERATURE REVIEW

2.1. Theoretical Review

2.1.1. Active Frontage

The glossary of "Safer Places" provides the following straightforward definition (Heffernan, E. E., Heffernan, T. W., & Pan, W., 2014). The term "active frontage" describes the area around a building or area that has windows and doors as opposed to empty walls, fences, or garages. (Llewelyn Davies, 2007) listed several characteristics of dynamic frontages in their seminal work "Urban Design Compendium." The term "active frontage" describes the area around a building or area that has windows and doors as opposed to empty walls, fences, or garages. (Llewelyn Davies, 2007) listed several characteristics of dynamic frontages in their seminal work "Urban Design Compendium." views of active internal usage, the vertical rhythm of the buildings, the articulation of building facades, and the frequency of doors and windows. (Heffernan, E. E., Heffernan, T. W., & Pan, W. 2014).

It is characterized by a building's ground floor frontage, which includes a large number of doors and windows, the building's interior usage, and the facade's appearance. These are components of the "Urban Design Compendium" (Llewelyn Davies, 2007) and the book of Gehl (1994), as well as the "Safer Places" concepts (ODPM, 2004).

The Llewelyn Davies definition states that active frontages can boost public interest, life, and vitality; nonetheless, safety is a key justification offered in the majority of the literature for the provision of active frontages (ODPM, 2004; Sparks and Chapman, 1996). (Heffernan, E. E., Pan, W., & Heffernan, T. W., 2014) The concept of safety with respect to active frontages is borrowed from Jacobs's (1961) work.

The idea of improving a physical environment that allows for interaction between buildings and the places they define is known as "natural surveillance." encouraging active frontages' more gregarious and social elements (Alexander, 1977). argued that in order to promote the social life of our towns and cities, a building's facade should be treated as a major component with volume rather than a line on an architectural plan. According to Alexander et al. (1977), the building with an active edge is connected to the town, the social fabric, and the lives of all the people who live nearby and use the building frontage.

The purpose of ground floor facade of a building is significantly different from those of other floors Gehl et al., (2006). They conclude that buildings must interact with both public spaces and the people who use them.

A building's ground level facade serves a very different function than its upper stories. Gehl and associates (2006). They come to the conclusion that structures need to engage with the public and the users of such areas. the edge or frontage of a structure or area with doors and windows rather than just walls, fences, and garages. (Llewelyn Davies, 2007) enumerated several characteristics of dynamic frontages in their seminal work, "Urban Design Compendium": frequency of windows and doors; buildings' vertical rhythm; building facade articulation; and views of active interior usage. The ground floor frontage of a building with numerous doors and windows, details and articulation to the facade, and visible internal uses are the components of the "Safer Places" definition (ODPM, 2004) that are combined with those from the work of Gehl (1994) and the "Urban Design Compendium" (Llewelyn Davies, 2007).

A building's ground level facade serves a very different function than its upper stories. Gehl and associates (2006). They contend that we have "close encounters" with the street level facade in a manner that is different from how we view the other facades. They come to the conclusion that structures need to "learn to make meaningful conversation" with the public and their users.

2.1.2. Criteria to Measure Active Frontage

According to Law et al. (2017), active frontages are quantifiable through various parameters that collectively assess their vibrancy and effectiveness. These attributes include the pedestrian density and number of premises, which indicate human activity, alongside the façade treatment and the quantity of doors and windows, all of which enhance visual permeability and connection to the street. Conversely, the presence of blind or blank walls, as well as the height and material types of fences, are crucial in identifying areas lacking interaction and natural surveillance. Furthermore, the overall street type and quality, coupled with the building's form, material quality, and its function, activity, and intensity of uses, all contribute to determining the continuous presence of people and the overall liveliness of a street frontage.

2.1.3. Advantages of Active Frontage

Because it represents the area where pedestrians and the built environment interact the most, street frontage quality is a crucial component of urban design (Gehl, 1971). Successful public spaces can benefit towns and cities in the long run, and well-designed active frontages help to create them (Heffernan et al., 2014). The more windows and doors facing a street, the more "eyes-on-the streets," which helps to create the impression of a street that is welcoming, safe, and social (Jacobs, 1961; Alexander et al. 1977). According to Jacobs, a strong network of voluntary controls—also referred to as natural monitoring and norms among people themselves—maintains public calm in cities, especially on sidewalks.

This is particularly evident on crowded city streets where there are minimal opportunities for street crime due to pedestrian traffic, street-level stores, and vigilant citizens. Jacobs, 1961. In other words, unlike the cities, which are maintained by the police, the idea of eyes on the street keeps the facade vibrant and secure.

Despite being encouraged in planning guidelines (Llewelyn Davies et al., 2013), active frontage has a significant impact on integrating public spaces. Some of the benefits include: societal benefits, such as improved quality of life; meeting people, whether they are strangers, friends, or acquaintances; economic benefits, such as increased land, property, and rental values; and health benefits, such as improved personal and mental health through social interaction.

2.1.4. Types of active frontage

Active frontage is defined as ground floor buildings with windows and doors rather than blank walls, fences, and garages. The study focuses on the urban planning idea of active vs dead frontage, or the level of frontage from high active frontage to low active frontage (ODPM, 2005). Frontage Classes have been used to define the idea of active frontage (Law et al., 2017).

Active frontage guidelines	
Frontage level A	
Above 15 premises every 100m	There is no blind facades and some passive ones
Above 25 doors and windows	Much depth and relief in the building every 100m surface
High functions level	Best material quality and design
Grade B frontage	
Ten to fifteen premises every 100m	A few passive or blind facades
Above 15 doors and windows	Design variety in every 100m the building surface
A moderate range of functions	Better quality materials and refined details
Grade C frontage	
Six to ten premises every 100m	Few depth and modelling in the building surface
Some range of functions	Common materials and few details
Less than half blind or passive facades	
Grade D frontage	
Three to Five premises every 100m	Flat building surfaces
Little or no range of functions	Few or no details
Predominantly blind or passive facades	
Grade E frontage	
one or two premises every 100m	Flat building surfaces
No range of functions	No details and nothing to look at
Predominantly blind or passive facades	

Table 1: Active frontage level from A to E.

(Source: Llewelyn Davies et al., 2013)

2.1.5. Active frontage versus dead frontage.

Active frontage	Dead frontage
Frequent doors and windows with few blank walls	Longer lengths of blank walls to street
frontages where individuals on the ground levels of buildings and those in the street actively engage visually	frontages diminish activities in the public environment and reduce actual and perceived levels of safety
When buildings' front façades, especially the main door, face and open toward the street, quality is improved.	Change from the inside of the building to the outside. One section of the building frontage can have a lot of glazing, whereas other sections of the façade are mostly empty.
People are invited to shop, work, meet, unwind, and frequently live in frontages.	Frontages not invite people to shop and work
Frontages vary in size and level of use and are generally well-served by public transportation.	Low intensity of uses
Frontages of buildings will be created as important hubs for social and economic activities.	Administrative centers, embassies, social services, big businesses, manufacturing, warehouses, ring roads, and light rail transit all employ building frontage.
frontage with a lots number of pedestrian	Frontage with few or no pedestrian amenity
Frontages feel secure both during the day and at night because people are constantly moving about conducting business there.	Frontage not safe and high crime

Table 2: Active frontage versus dead frontage.

(Source :Ametu M. ,2022)

2.1.6. Methods to be used to change dead frontage in to active frontage

Create Active Frontages. Make street and sidewalk-facing stores and entries appealing and easily accessible to pedestrians. Ensure that the ground floor encourages interaction between building operations and those in the public realm. Views inside a building pique

passersby's interest and highlight its function, whereas views output 'eyes on streets' and add to the feeling of safety. (Ametu M. 2022)

A ground floor with an almost continuous active frontage and through-block links to the building arcade and street, integrated areas for access to the open air through semi-enclosed stairs, balconies, and a rooftop garden, artwork that conveys a sense of the building and contributes to the local culture, and overhangs (canopies, awnings) that are at least six feet from the face of the column or the street are all examples of features that should be included in buildings to create a distinctive entry and encourage interaction between the inside and outside.(Ametu M. 2022)

2.1.7. City design and crime

Jacobs (2006) highlighted aspects of urban planning that she believed could jeopardize public safety. Another significant field of study that transformed the way social scientists and designers approached urban shape and design was the "imageability" of the city, as defined by Lynch (1960).

Although Jacobs (1961), Angel (1968), and Jeffery (1969, 1971) offered additional support, it wasn't until Newman's 'Defensible Space' (1973) that some aspects of urban architecture were generally linked to an increase or decrease in the opportunities for crime. Significantly, Newman's 'Defensible Space' (1973) increased understanding and acceptance of the notion that architectural and environmental design may have an impact on criminal behavior.

2.1.8. Nature of robbery

Robbery is committed against a moving target: an individual. Street robbery is one of the most violent crime categories in the globe, and it causes greater concern among people than property crimes such as burglary or auto crime Hillier, (2005).

The built environment's hazards are the victimization risk element in robberies, according to Alford (2008) and Hillier (2004). Hillier and Alford stress the significance of normalizing basic robbery distributions with the estimated or observed count of people using the space. They analyze risk in terms of how the arrangement of movement in urban space can either increase or decrease the potential danger of becoming a victim of robbery. We may therefore draw the conclusion that the "victim side" of crime-space interactions was of special interest to Hillier and Alford (Hillier, 2004).

2.2. Contextual review

2.2.1. Crime prevention through environmental design

In the 1960s, CPTED (Crime Prevention through Environmental Design) was born in the United States out of worries that urban redevelopment initiatives were eroding social cohesiveness and making communities more susceptible to crime. Architect Oscar Newman's concept of "defensible space," which emphasized the importance of creating environments that naturally deter criminal conduct, was developed by criminologist C. Ray Jeffrey.

Important CPTED principles include promoting a sense of territoriality (visible ownership), controlling access (gates, fences), and improving natural monitoring (clear sightlines). The "broken windows" theory reinforces the idea that abandoned places are conducive to criminal activity, underscoring the importance of maintaining them.

2.2.1.1. Principles of Crime Prevention

a) Natural surveillance

According to Desyllas et al. (2003), the occupants of the surrounding buildings provide surveillance by peering out from windows and building entrances. Many have said that the design should allow for natural surveillance by residents, neighbors, and passersby. Natural surveillance entails increasing the visibility of urban areas to restrict undesirable behavior and monitor invaders (Sorensen et al., 2008). Effective observation is provided by windows and balconies

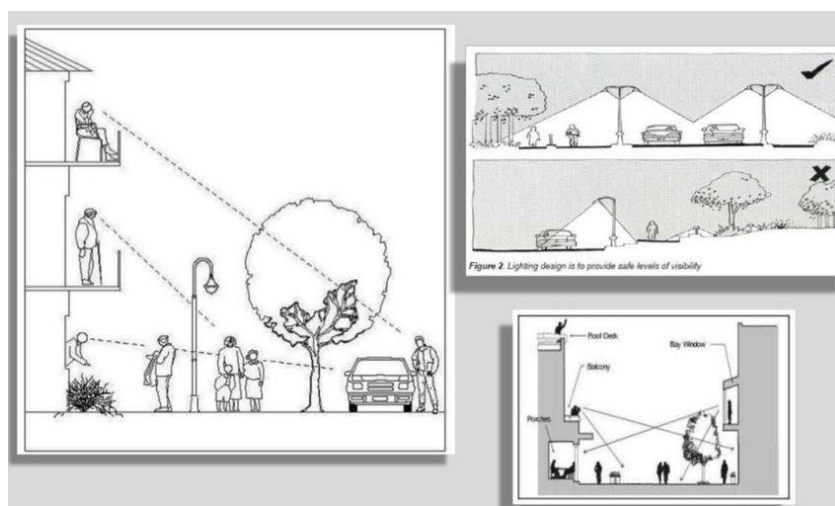


Figure 1:The Social Control of Space through Natural Surveillance by people

Source: (Seminar, 2012)

b) Lighting

Lighting circumstances have an impact on lighting surveillance opportunities. Cozens and associates (2003). In order to lower crime, some American communities implemented significant street lighting programs in the 1960s. According to preliminary findings, these upgrades significantly decreased the amount of crime that was reported. Hartley (2006).

c) Mixed Use Development

A varied mix of land uses on city streets improves natural monitoring by guaranteeing a constant flow of people and informal observation, claim Jacobs (1961) and Angel (1968). People are constantly present on the streets as a result of this, which guarantees that certain activities are completed throughout the majority of the day.

It was shown that a mixed-use neighborhood with more diverse activities in terms of time and space had a lower crime rate (Pettersson, 1997). It is said that zoning regions for certain uses in a methodical manner decreases the number of possible "eyes on the street" (Jacobs, 1961). Furthermore, it's a very recent concept to permit residential buildings atop retail outlets in order to increase street-level activity (Wekerle and Whitzman, 2002).

d) Activity Along Sidewalk

Because individuals are present in buildings that operate late into the night, continuous surveillance is possible. Vogel and Pettinari (2002) assert that while public buildings such as post offices and stations do not provide constant activity and eyes on the street, street-level commercial activity and upper-level residential activities do.

2.2.2. Defensible Space

In order to optimize the natural surveillance of streets given by people going about their daily lives, defensible space entails design modifications to the physical environment. More commonplace methods can also be used, such clearing out bushes in front of houses to allow people to see the street clearly and removing items from convenience store displays that block lines of sight within the establishment. The employment of defensible space strategies to prevent crime in public areas is still quite popular today, despite being harder to measure than security officers and place managers. (Cozens and associates , 2005)

Oscar Newman's suggestion of residential monitoring reduced crime in business zones but not in residential ones. Cozens, P. et al. (2002) examined the perception of crime, fear of

crime, and defensible space in two buildings with the same design but different upkeep levels in order to explore the impact of image on these three concepts. They found that semi-detached, terrace, and detached homes were safe to walk in and reflected favorable perceptions of a defended space.

2.2.3. Environmental Criminology

This analytical technique focuses on the characteristics of crime incidents. For a crime to be committed, the victim, the specific location, and the technical requirements of the crime must all take place simultaneously, claim Brantingham and Brantingham (2001). "... the study of crime, criminality, and victimization as they relate first, to particular places, and second, to the way that individuals and organizations shape their activities by placed-based or spatial factor," in accordance with its definition (Bottoms and Wiles,

In order to obtain the most pertinent and solution-provider results, this study employed those theoretical works as a baseline and case study. These literature evaluations serve as the basis for the methods utilized to assess frontages and their relationship to criminal situations.

2.3. Empirical review

The research of Ametu M. (2022) is the study most closely associated with this title. The frontage level of Addis Ababa City is evaluated. Geographically, Addis Ababa, Ethiopia's administrative hub and most significant commercial and cultural hub, is situated at 9°2'N latitude and 38°45'E longitude in the country's center. and the outcome displays as Land front levels A and B make up 14.4% of the 43,480.5 hectares of Addis Ababa's total geographic coverage. This indicates that just 14.4% of Addis Ababa's land is active frontage; the remaining 85.6% is made up of frontage levels C, D, and E, or dead frontage. (M. Ametu, 2022).

Other some what relevant research with crime and frontages is research by Rabira R. (2016) on Creating Safe Sidewalk for Crime Prevention in case of AMCE area, Addis Ababa. It studied about the existing safety problem around AMCE and provide design solution . the result show, Crime can be reduced where there is a high level of ground floor activity at different times of day and night. The level of activity increases that crime will be observed or challenged. The development of an evening economy is a good way of extending activity and diversifying uses throughout the night and day. In high- and medium-density locations, ground-level pedestrian-inclusive activities should be promoted. (P. Cozens and

others, 2002) By increasing ground-level activity like retail, which could increase the number of eyes on the street, fear crime and crime can be reduced. Places that are continuously occupied and where people are passing by or observing might also lessen the fear of crime (National Crime Prevention Council, 2003).

2.4. Research Gap

There is a substantial gap in the body of knowledge regarding active frontage levels and their spatial relationship to crime events, especially when it comes to Adama Town. Although there have been research on this subject in Addis Ababa, their relevance to Adama is limited because of the basic variations in boundary area, topography, and socioeconomic dynamics. A targeted, specialized study is required due to Adama's distinctive local characteristics, which include particular land use patterns, community interactions, and prevalent crime categories.

Additionally, there is a noticeable study gap in Ethiopia about the relationship between crime and street frontages. Although previous studies discuss environmental design or urban safety in general, there is a dearth of specific attention to the impact of frontage design on crime. This gap is significant because street frontage management and design have a direct impact on territoriality, natural surveillance, and the general vitality and perceived safety of public areas. Urban planners and politicians lack the localized data base necessary to create efficient, context-sensitive solutions for improving safety and livability through better frontage design in the absence of Adama specific research.

This study, therefore, aims to fill this critical gaps by providing a specific, empirical analysis for Adama, contributing valuable ideas to both local urban Design efforts and the broader discourse on crime prevention through environmental design in developing urban contexts.

CHAPTER 3

3. METHDILOGY

3.1. Description of study Area

Adama is a city found in Ethiopia at latitude $8^{\circ}26'15''\text{N}$ to $8^{\circ}37'00''\text{N}$ and longitude $39^{\circ}12'15''\text{E}$ to $39^{\circ}19'45''\text{E}$. it has an elevation that ranges from 1500 m to 1900 m above sea level. It located in East Shoa zone of Oromia regional about 100 km south east of Addis Ababa along the main road to Harar. After the Addis Ababa-Djibouti railway line opened in 1916, the city was established. The Great Rift Valley is to the east, and the foot of an escarpment is to the west. Adama is a reformed city in the region, with a city administration made up of 14 urban and four rural kebeles.

Location map

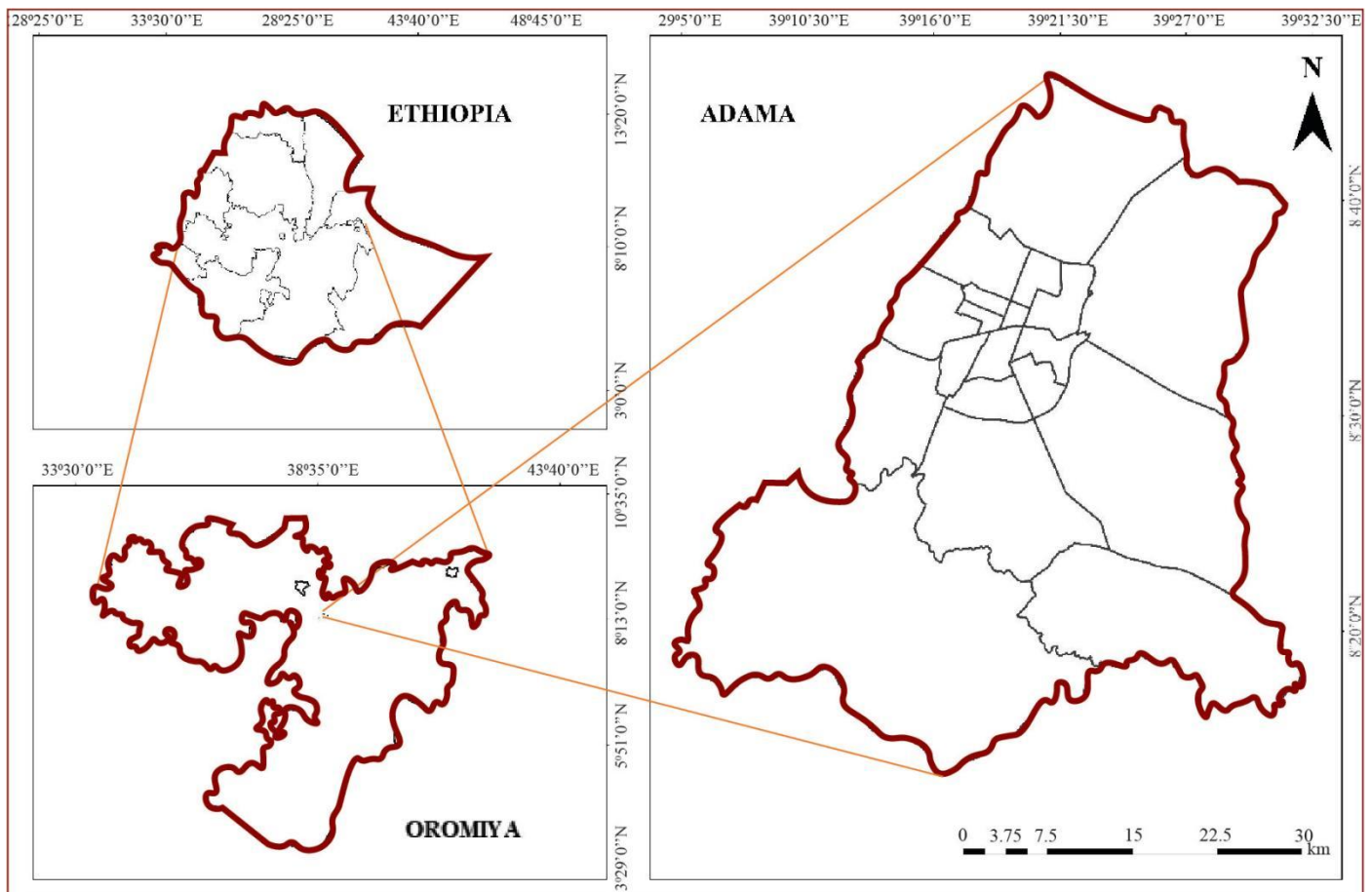


Figure 2: Location map

(Source : Author, 2025)

3.2. Research Approach

The research approach for this study was mixed-methods, combining both quantitative and qualitative methodologies. To assess the level of active frontage, field surveys were conducted across Adama Town, utilizing the city's structure map to ensure representation from a variety of street types, including expressways, principal arterial streets, sub-arterial streets, collector streets, and local streets. Data collection occurred from the median of each street, and further detailed information was gathered at the individual plot or building level.

The level of active frontage was then evaluated and rated using the facade evaluation scale outlined in *The Urban Design Compendium* (Llewelyn Davies Yeang and HCA, 2013). This data, along with photographs captured during walk-along surveys, was subsequently digitized and attributed using Arc GIS software to facilitate analysis, interpretation, mapping, and the categorization of active frontage levels from A to E.

Complementing the spatial analysis of active frontage, crime data was gathered through direct engagement with local authorities. Interviews were conducted to gain insights into the nature and context of crime incidents within Adama Town. Additionally, specific crime rate statistics were obtained directly from the Adama police officers to provide a quantitative measure of criminal activity across the study area. This dual approach, combining the systematic assessment of urban form with empirical crime data, allowed for a comprehensive investigation into the spatial relationship between active frontage and crime incidents within the case of Adama Town, Ethiopia.

3.3. Research Design

The research design for this study serves as the road map, outlining the progression from the study's inception to its conclusion. Following a logical reasoning, this research adopts a conceptual framework that moves from the specific to the general. Specifically, the study involves examining the level of active frontage at various locations within Adama Town and the corresponding crime incidents in those specific areas. By analyzing these localized relationships between active frontage and crime levels at the site level, the research aims to generalize these findings to understand the broader spatial relationship between inactive frontage and crime across Adama Town.

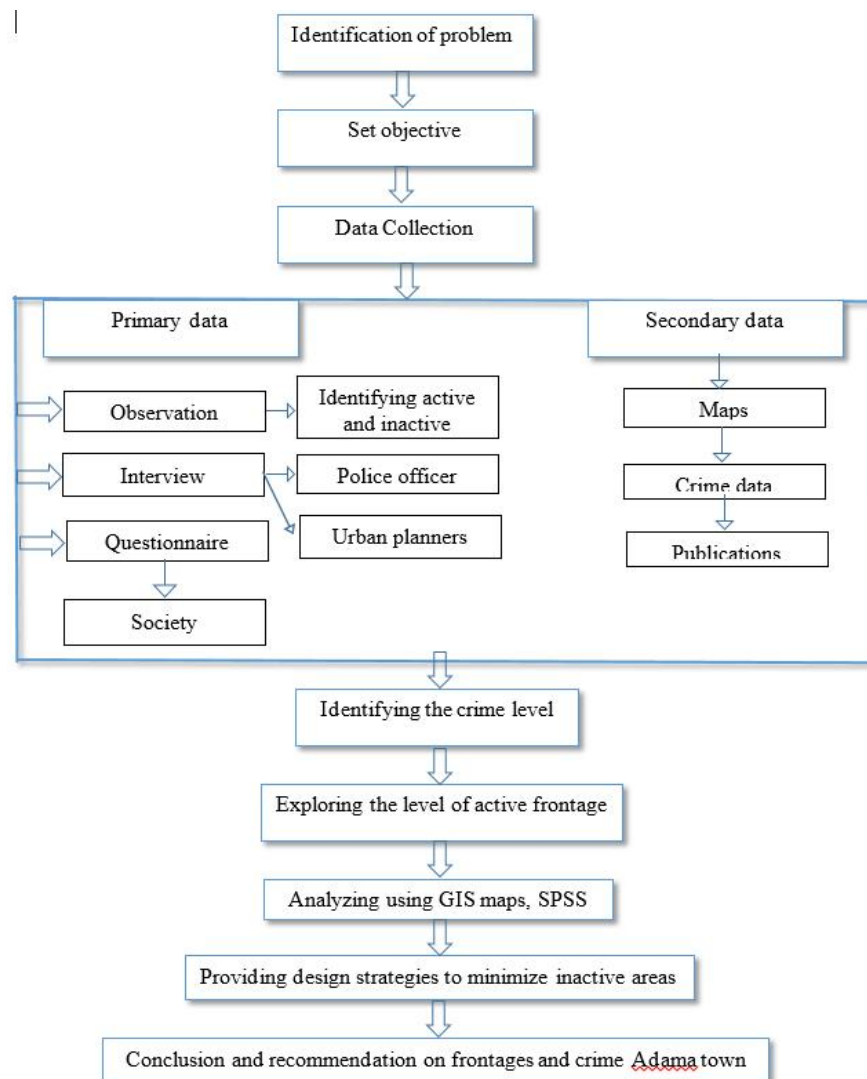


Figure 3: Research design diagram

Source: (Author , 2025)

3.4. Data Sources and Collection Techniques

The research has employed data collected from both primary and secondary sources in order to fulfill the objective of the research. The data collected from the primary sources were from the direct contact with the involved parties achieved through observation and field studies in-depth interviews and self-administered questionnaires. Through the data acquired from the primary sources, the researcher was able to understand and look into the practical conditions of the active frontage level of Adama.

The data are collected from the secondary sources were from a thorough desk review of articles, books, and published research in order to get an insight into our countries and the cities and other countries and their cities' experiences regarding the current study which is concerned with active frontage and their spatial relation with crime incidents. These secondary data were also from different city administration agencies such as the Adama municipality office, the Adama land administration agency, Adama police office and other published articles and journals.

3.4.1. Primary datas

I. Questionnaire

The questionnaire was prepared and organized in a relevant and understandable manner in the language of the local communities and the respondents, primarily being prepared in English and then translated to Amharic and Affan Oromo. The questionnaires included both open-ended and close-ended questions which were supplied to the different respondents, which included the street users and the residents who owned their own plot they were charged with filling the questions with the direct help of the researcher. The questionnaire was mainly concerned with understanding and acquiring the general perception of the respondents in order to fulfill the objectives provided. The questionnaire was then analyzed and presented by the use verbatims method concerning the open-ended questionnaires.

II. Interview

Data was gathered through both structured and unstructured interviews to gain in-depth understanding and diverse perspectives. These interviews targeted officials and experts directly or indirectly involved in crime prevention. Specifically, planners, architects, and police officers were interviewed to collect detailed information requiring further clarification. Tailored interview materials were prepared for experts and officers from

different organizations. Both the in-depth interview and the field survey were shown in an integrated manner in order to better elaborate on the general conditions frontage level and it's relation with crime. The in-depth interview mainly focused on getting insight into the general conditions of the crime in adama city and it's relation with frontage level. The interviewed conducted professionals from adama urban planning team and adama police office selected based on their responsibility and their understanding for the concept of active frontage and relationship with crime incident.

No	Name of organization	Number	Position
1	Adama Administration Office of Urban Planning department	2	Adama urban planning team leader and adama urban planning team member
2	Adama Police officers	3	Head of the Crime Investigation Department and crime investigation police member

Table 3:interviewee's position in their organization

Source:(Author , 2025)

III. Site Observation

This method was particularly important for identifying and documenting active frontage level in adama town and safety problems relevant to the study. Field experience was gained through direct observation of the sites. During the site observation, the frontage level recorded on checklist paper and by camera photos and video.

3.4.2. Secondary data

Secondary data sources such as published and unpublished documents, related research documents, magazines, satellite images, articles, maps, and books are used. In , government policies, guidelines, reports, manuals, photographs and more were sources of secondary data. Adama structure plan were used as base map for all map resulted from analysis.

3.4.2.1. Adama Land-use

Ethiopia and its cities have different plans and maps in place for the country's development. the structural plan is a plan that is valid for about 10 years and guided by the national and regional development plan of the country.

Adama's land use is characterized by a significant increase in built-up areas and a corresponding decrease in bare land and shrubland. This trend is driven by urbanization and economic development, particularly in the Awash Valley. The city's location within the Great Rift Valley also influences land use patterns, with lower areas in the south-central part and higher elevations in the north and south.(A.S. Mohammed Abdul Athick a, K. Shankar, 2019)

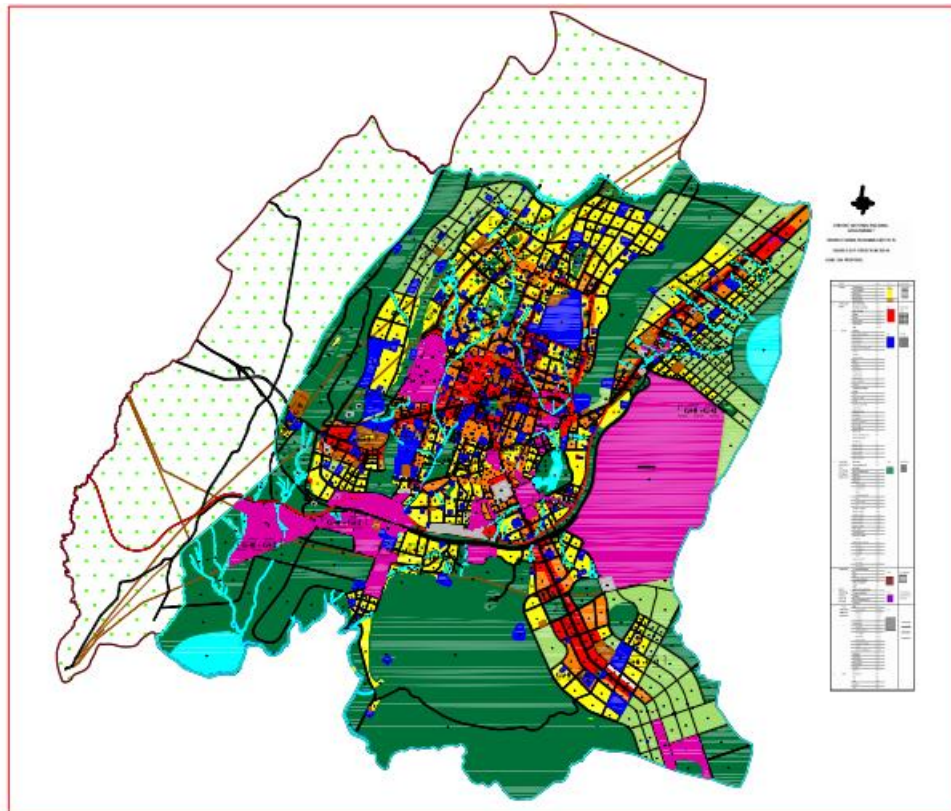


Figure 4: Adama land use map

Source : (Adama Municipality office)

The landuse map of Adama used in the reasearch to analyze the active frontage level of adama by it's land use .

3.4.2.2. Adama Street types

In Adama, there are four main street types: Principal Arterial, sub-arterial, collector street, and local street.

Street type	Amharic name	Characteristics	ROW	Max. vehicle speeds
Principal Arterial Street/ Boulevard	Godana	Dedicated space for public transport (1+1 lanes), Motor vehicle lanes (2+2 lanes), Service lanes (optional), Cycle tracks and Footpaths	35-60 m wider ROWs for cultural and civic purposes	50 km/h
Sub Arterial Street/ Avenue	Melesetegna godana	Dedicated space for public transport (1+1 lanes), or public transport access, Motor vehicle lanes (2+2 lanes), Cycle tracks and Footpaths	25-30 m	40 km/h
Collector Street	Sebsabi Menged	Public transport access (optional), Motor vehicle lanes (1+1 lanes), Cycle tracks or cycles use traffic calmed motor vehicle lanes and Footpath	15-20 m	30 km/h
Local street	Yewesete leweset menged	Footpaths & 1+1 vehicle lanes or shared space Cycles use traffic calmed motor vehicle lanes or shared space	6-12 m	10- 15 km/h

Table 4:Ethiopia urban street design manual

Source : Ethiopian National urban street design manul

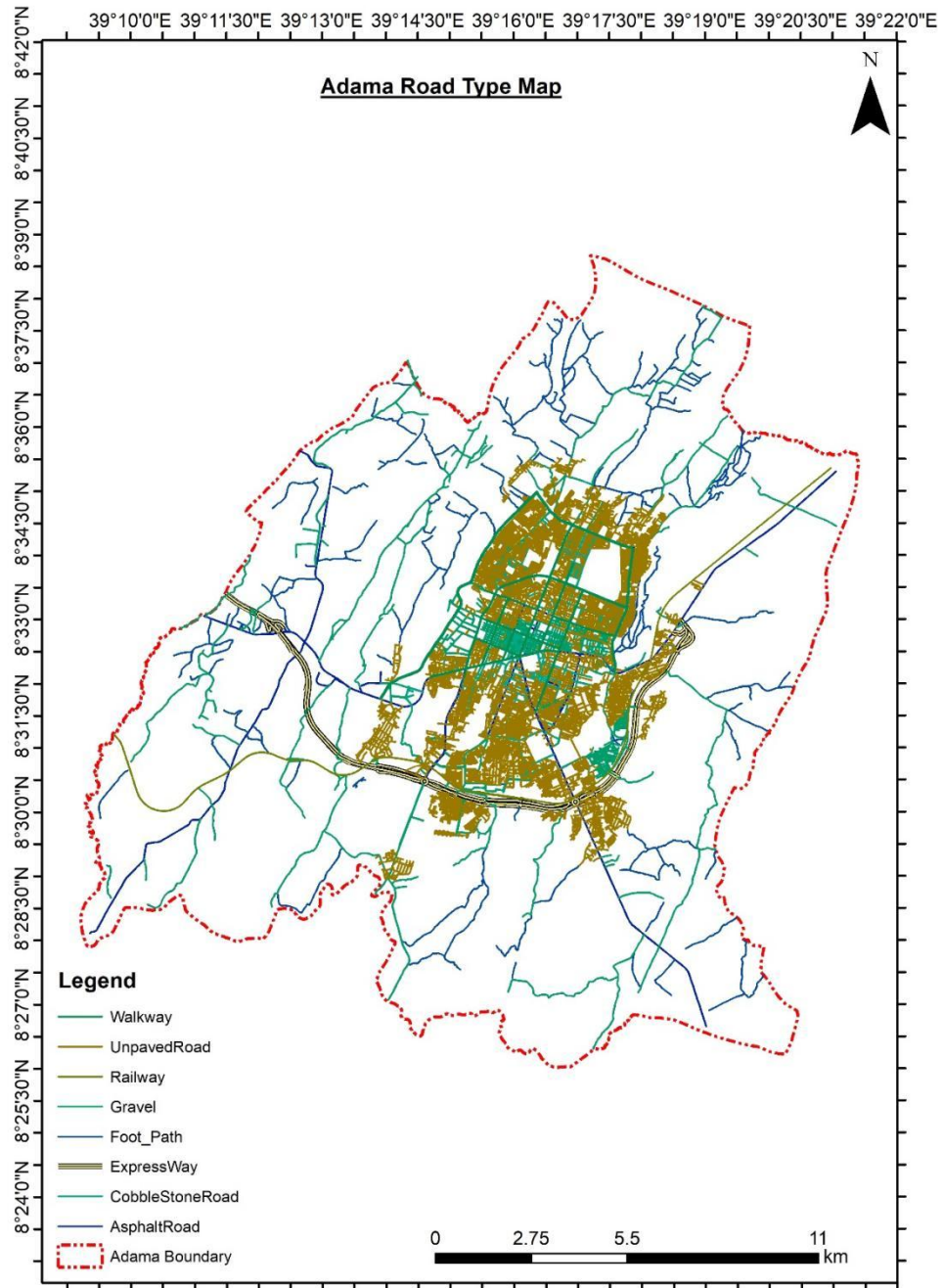


Figure 5: Adama road type map

Source : (adama structure plan map from Adama manuciplity)

This map used to analyze the active frontage level of Adama by Each street type.

No	Specific objective	Data used	Collection method
1	To assess the level and spatial distribution of active frontage within Adama Town.	Active frontage level	Observation by using checklist maps
2	To analyze the spatial relationship between active frontage and crime hotspots in Adama Town.	Crime related data	From Adama Town Police Station, this data will provide detailed information on the location, type, and time of reported crimes within the study area.

Table 5: summary of methods

Source: (Author, 2025)

3.5. Sampling methods

3.5.1. Sampling method for questionnaire

Area selected to to conduct questionnaire is Bole sub-city and it is selected based on researcher observation and crime report result. Form observation it is concluded that it include both residence, commercial and organization fence , in the other way based on the data of crime report it is the second high crime sub-city in adama and high number of robbery crime is happened there . beyond to this robbery is high around bole subcity as compared to others subcity Based on the crime reported . As represented on the chart figure below .

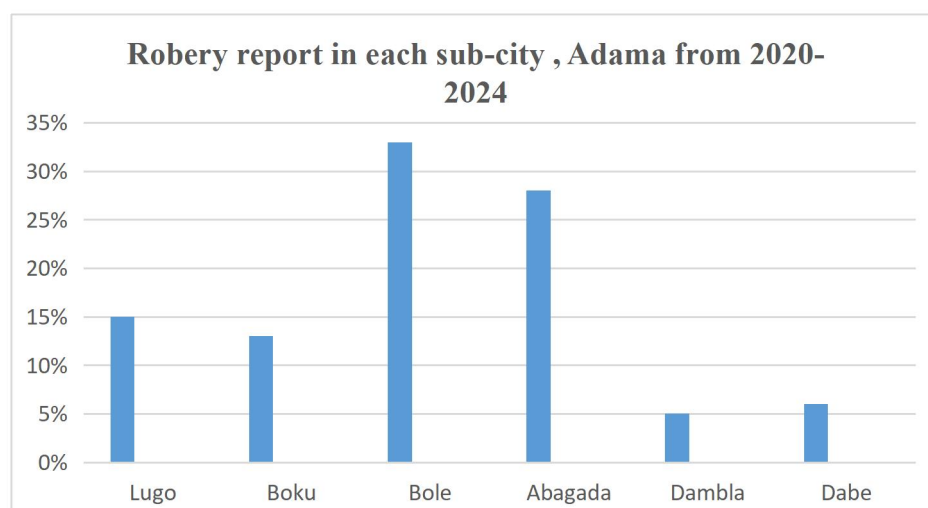


Figure 6: Robbery crime report in Adama

When the provided information analyzed , the chart indicates that the highest number of robbery reports originates from the Bole zone, which is noted as the most tranquil area within Adama, suggesting that the quiet environment may unfortunately facilitate such crimes. This was the reason to select Bole sub-city to conduct questionnaire.

From total population of adama 456,900 the population number for bole subcity is 40144. (Ethiopian Statistics Service data , 2022).To determine the sample population size used Yamane (1967:886) provides a simplified formula to calculate sample sizes. (Israel, Glenn D, 2002). This formula used because of we can't determine the number of street users , and its finite.

$$n = \frac{N}{1 + N(e)^2}$$

Where

N is population size

e level of precision

$$n = 96144 / (1 + (96144 * (0.5)^2))$$

$$n = 398$$

1.5.2. sampling method for interview

The selection criteria were based on (Creswell, 1998) recommendation that allowed 5-25 individuals selected for qualitative research. Therefore, from the Adama urban planning office 2 people and 3 peoples from adama police officer the leader of investigation department and 2 police officer working on crime prevention around bole .The interviewed selected based on their responsibility and their understanding for the concept of active frontage and relationship with crime incident.

1.5.3. sampling method for observation

Given Adama's considerable size, encompassing an area of 29.86 km², a detailed frontage analysis using a 100-meter checklist across the entire town proved impractical within the scope of the study. To address this, the researcher prioritized a comprehensive checklist-based observation and analysis for all Principal Arterial Streets (PAS) and Sub-Arterial Streets (SAS), which typically feature more varied and complex frontage types.

For Collector and Local Streets, predominantly situated within residential zones and exhibiting more uniform plot arrangements, a broader, overall assessment was employed. This approach, while not using the granular checklist for every segment, still allowed for the identification and characterization of the unique patterns and features prevalent in these residential street frontages.

1.6. Data analysis

For the purpose of the field study, in order to acquire the primary data required for the purpose of the research, the researcher employed the use of materials and instruments such as Audio and Video recording Camera phones, google earth, and notebooks.

The data from both the primary sources and secondary sources such as questionnaires, in-depth interviews, and desk reviews were analyzed by the use of ArcGIS 10.8, MS Excel 2016, google earth and SPSS, Revit architecture software version 2024, Lumion, Adobe Illustrator cc 2019 and Adobe Photoshop 2019, and finally MS word 2016.

Materials and Instruments	Purpose of the Materials and instruments
Camera phones	To take photographs, to record audio and video recordings from observation and interview
Google earth pro software	To trece unknownunkown dimension of some roads
ArcGIS 10.8	To create every maps used in the research
SPSS software	For the analysis of the result acquired from the self-administered questionnaire
MS Excel 2016	Was used for the analysis of data
Revit architecture version 2020	To design the new fence design
Lumion	Was used for aesthetical rendering of the designed center
Adobe Illustrator cc 2019	Were used to further integrate and present the different outcomes achieved by the above software's
Adobe Photoshop 2019	
MS word 2016	Was used to forward the final document report.

Table 6: Materials and Instruments

Source: (Author, 2025)

3.8. Ethical consideration

Letters were written to the different organizations for their willingness to share information required by the researcher. The official letters were provided by the institute of Adama Science and Technology University which asks for the respectful compliance of Adama city municipality and other organizations that the researcher might deem important for the gathering of information.

CHAPTER 4

2. RESULT AND DISSCUSION

4.1. Result for first objective

The level of active frontage in adama city discussed by

- Frontage condition resulted from observation
- Land-use,
- Street type and
- details for selected streets (mixed frontage and dead frontage).

4.1.1. Adama Frontage Condition

4.1.1.1. Type I frontage condtion

The general condition of adama active frontage resulted from field survey by photographs and image. Those are suitable for examining street-level frontages in Adama Town. This approach expanded upon established frontage analysis techniques, drawing inspiration from (Gehl's 1994, 2010) frontage evaluation grading scale. **Figure 7-figure 11** shows that, commercial buildings located around Posta, Franko Mebrat, 04, bole and in certain areas of Amade feature continuous storefront windows and frequent, highly visible entrances along the street.



Figure 7: franko fasfood and outdoor dininig **Figure 8** franko ground commercial building



Figure 9: microshops on the street side / market areas around warka



Figure 10: posta commercial building active surrounding commercial building with open frontage around bole



Figure 11 : wangari

4.1.1.2. Type II frontage condition

Figure 11 and figure 12: some fence design in adama with pillars appear to be spaced at regular intervals, providing structural support for the fence and wrought iron panels between the pillars showcase an open design with repeating arched patterns, allowing for a significant degree of visibility through the fence. Those fences have moderate overall height . This design contributes to minimizing dead frontage in Adama town by promoting moderate height and open design strike a balance between security and accessibility, avoiding the imposing and uninviting presence that can contribute to dead frontage. In addition to this the decorative elements add visual interest to the streets-cape, breaking up potential monotony often associated with inactive frontages.



Figure 12: New Adama administration office fence,posta

Source:(Author, 2025)



Figure 13: fence design for residence around bole

Source:(Author, 2025)

4.1.1.3. Type III Frontage condition

In Most of adama residence buildings the solid part of the building serve as fence. They create a visual barrier, preventing pedestrians from seeing into the property and vice versa, thus reducing natural surveillance and the sense of connection. **Figure 13 and figure 14** are examples of such type of frontages .



Figure 14::building wall serve as fence around kebele 10 **Figure 15:** building wall serve as fence around alibirra circle

4.1.1.4. Type IV frontage condition

Fence type which is used in Adama dominantly is a 2.5-meter tall fence, with a wire mesh top. Even if it is less than a solid building, it has a negative impact on the active frontage level of a town. While the wire mesh might offer some limited visual permeability in the upper section, the significant height of 2.5 meters creates a substantial physical and visual barrier at pedestrian level.



Figure 16: : Residence 04 kebele



Figure 17: Residence Bole around

4.1.1.5. Type V frontage condition

Figure 17- Figure 19 : most of Organizations and industry in this town have about 2m and above height and long concrete fence, which significantly hinders the principles of active frontage. Such a solid barrier obstructs views between the street and the property, reducing natural surveillance – a key element in deterring crime. While a fence can act as a physical deterrent to robbery by making access more difficult, a solid concrete wall, especially at that height, also creates blind spots and hiding places for potential offenders, potentially increasing the risk of robbery in the immediate vicinity.



Figure 18: Adama science and technology university fence **Figure 19:** adama general hospital fence

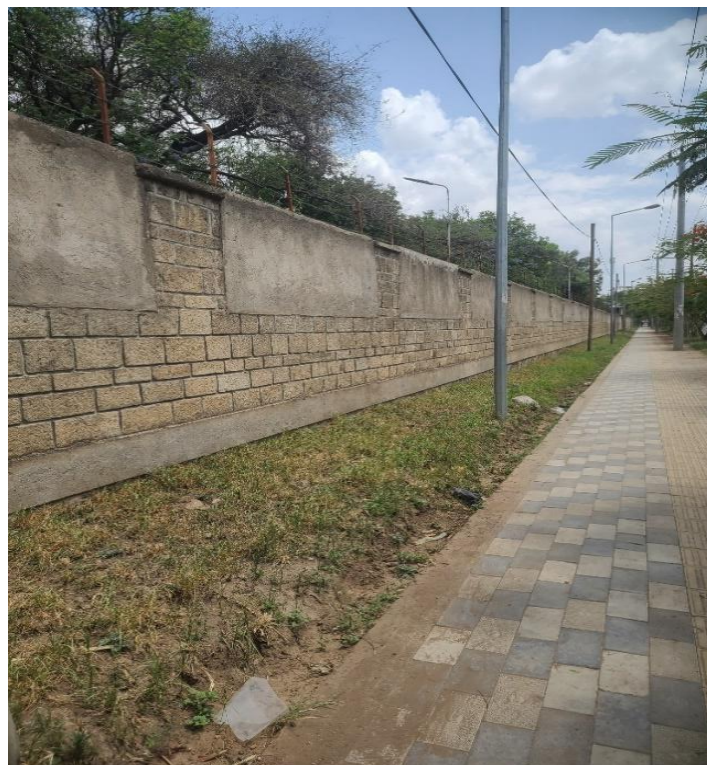


Figure 20:Adama tractory factory fence

4.1.1.6. Type VI frontage condition

There are some Construction sites on frontages they can affect the active frontage level by creating physical barriers like hoardings, limiting pedestrian access, and reducing visual connections between buildings and the street .



Figure 21:frontage under construction around adama tractor factory **Figure 22:** kebele 11

4.1.1.7. Type VII frontage condition

Rare bamboo fences are observed on the road even if it's environmentally preferable material , to have positive impact on active frontage level it should have to be constructed with moderate height .figure 28 and figure 29 those shown below are good examples . are



Figure 23: bamboo fence around harambe university **Figure 24:**goro condominium fence

The existing solution taken by the community to protect their neighborhood safety involves building small shelters and commonly employing security personnel. This approach reflects a community-based effort to enhance security through both physical presence and designated safe points within the neighborhood. The below figures are pictures taken from adama neighborhoods



Figure 25: bole neighborhood security house **Figure 26:** 04 kebele security house

4.1.2. Adama Frontage level map by land use

Adama Town's active frontage level is primarily passive. With 85.07% of the total frontage, frontage level E, or passive frontage, makes up the great bulk of the area. On the other hand, just 14.93% of all active frontage levels (A, B, C, and D) are merged, whereas Front level C holds the biggest share among the active levels at 10.11%.

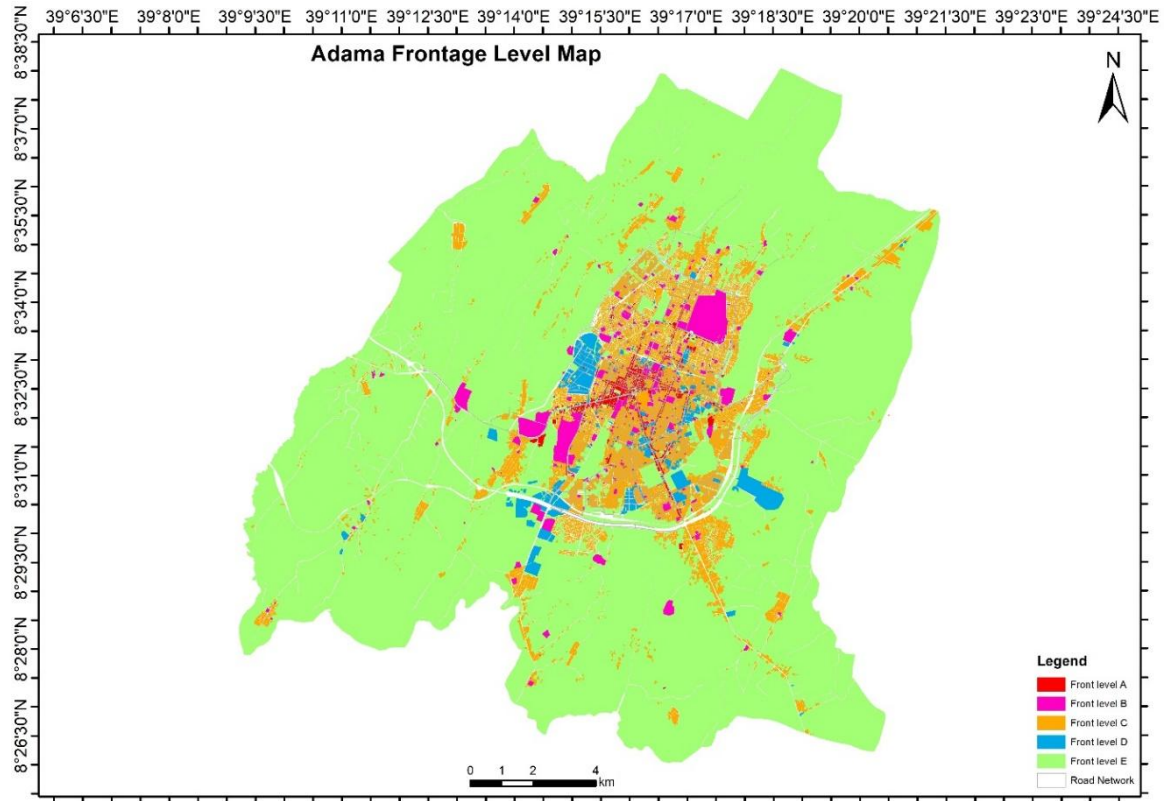


Figure 27: adama active frontage level map

Adama frontage level percentage			
no	Active_frontage	Area	percent
1	Front level A	180.87	0.62%
2	Front level B	675.27	2.32%
3	Front level C	2940.03	10.11%
4	Front level D	545.91	1.88%
5	Front level E	24733.34	85.07%
	Total	29075.42	100.00%

Table 7: Adama Frontage level percentage by Land-use

Active Frontage Classification by Land Use Type

Land Use Type	Active Frontage Level	Description
Commercial (Retail, Markets)	A (Very High)	Transparent facades, frequent entrances, vibrant pedestrian interaction.
Mixed Use (Commercial + Residential/Office)	A (Very High)	Ground floors are highly active (shops, services); upper floors vary.
Institutional (Schools, Clinics, Offices)	B (High)	Entry points, windows, and visibility to the street; activity during the day.
Dense Urban Residential (e.g. Apartments, Townhouses)	C (Medium)	Some doors/windows on the street, but less commercial interaction.
Recreational / Public Open Space	C (Medium)	Visually open, some interaction (paths, benches), but no active building edge.
Low-Density or G+0 Residential	D (Low)	Often fenced or set back from street; limited street-level interaction.
Industrial / Warehousing	D (Low)	Few windows/doors, restricted access; blank or opaque street edges.
Vacant / Underutilized Land	E (Very Low)	No meaningful interaction with the street.
Transport Infrastructure (e.g. Parking, Roads)	E (Very Low)	Little to no pedestrian-scale interaction unless integrated with kiosks, etc.

Table 8: Adama Frontage level by landuse

4.1.3. Adama frontage level by street types

Table 9 : Active frontage level from A to E.

Active frontage guidelines	
Grade A frontage	
More than 15 premises every 100m	No blind facades and few passive ones
More than 25 doors and windows	Much depth and relief in the building every 100m surface
A large range of functions	High quality materials and refined details
Grade B frontage	
10 to 15 premises every 100m	A few blind or passive facades
More than 15 doors and windows	Some depth and modelling in every 100m the building surface
A moderate range of functions	Good quality materials and refined details
Grade C frontage	
6 to 10 premises every 100m	Very little depth and modelling in the building surface
Some range of functions	Standard materials and few details
Less than half blind or passive facades	
Grade D frontage	
3 to 5 premises every 100m	Flat building surfaces
Little or no range of functions	Few or no details
Predominantly blind or passive facades	
Grade E frontage	
1 or 2 premises every 100m	Flat building surfaces
No range of functions	No details and nothing to look at
Predominantly blind or passive facades	

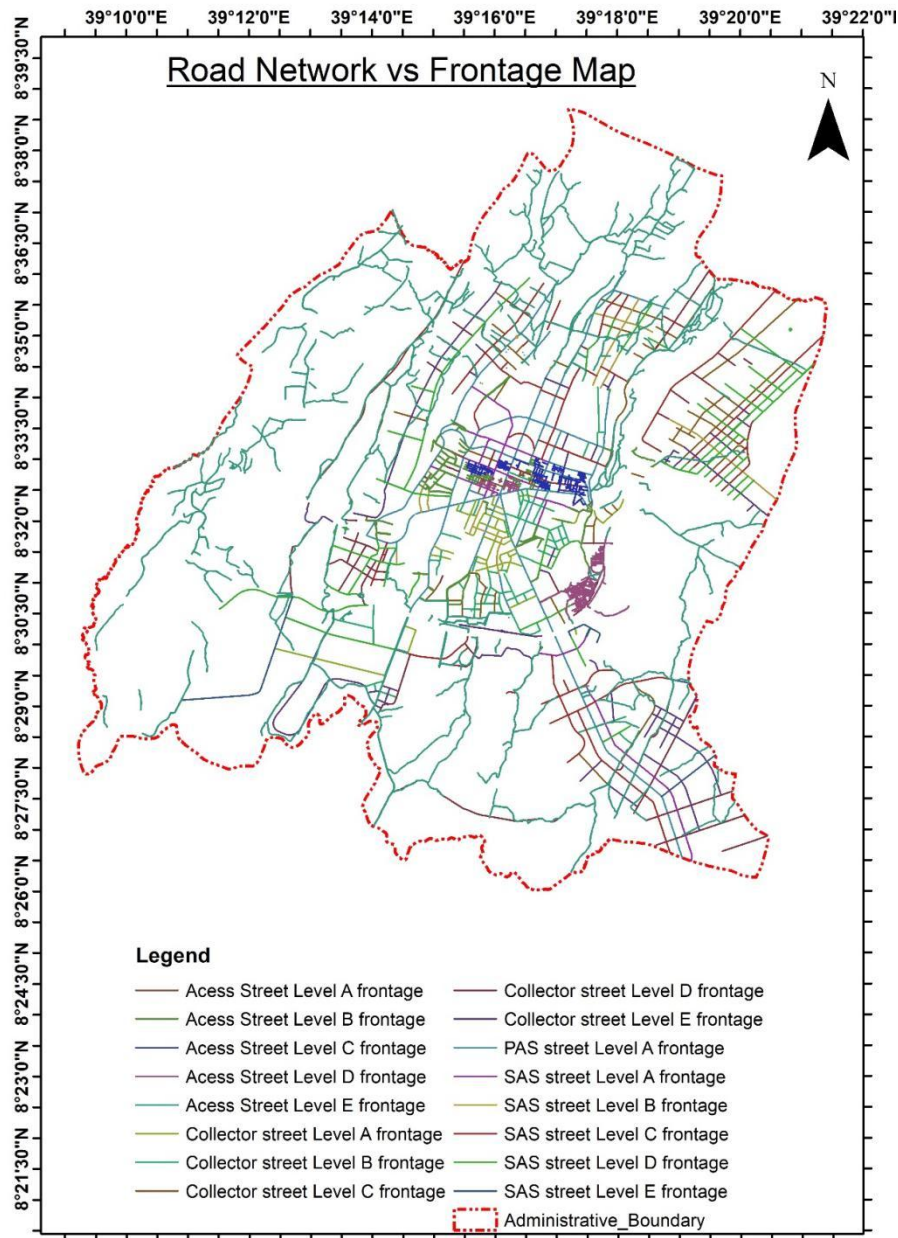


Figure 28: Road Network and frontage map

From the total 1256 km of adama street 10% only which is 129 km only ranked under frontage level A and 55% of the street which is about 680 km is under frontage E. the table below show as the frontage level on each street type.

Road Network Vs Frontage		
Level	Length	Percent
Acess Street Level A frontage	7.26	0.58%
Acess Street Level B frontage	57.78	4.60%
Acess Street Level C frontage	37.65	3.00%
Acess Street Level D frontage	46.38	3.69%
Acess Street Level E frontage	615.29	48.99%
Collector street Level A frontage	22.41	1.78%
Collector street Level B frontage	35.14	2.80%
Collector street Level C frontage	56.85	4.53%
Collector street Level D frontage	48.98	3.90%
Collector street Level E frontage	55.33	4.41%
SAS street Level A frontage	25.03	1.99%
SAS street Level B frontage	19.17	1.53%
SAS street Level C frontage	77.61	6.18%
SAS street Level D frontage	66.63	5.31%
SAS street Level E frontage	9.71	0.77%
PAS street Level A frontage	74.73	5.28%
PAS street Level B frontage	15.61	8.83%
PAS street Level C frontage	19.44	1.00%
PAS street Level D frontage	31.43	1.78%
PAS street Level E frontage	35.53	2.10%
	1255.94	100.00%

Table 10: road network vs frontage

I. Frontage level for Principal Arterial Street

In Adama there is about 176.5 km length Principal arterial street , with active frontages defined as levels A and B, concluded that 43 % of the 90.3 km of these streets feature active frontage. This indicates that a dominant portion of the PAS in Adama have characteristics that encourage pedestrian engagement and visual interaction. However, the remaining 57% of the Principal Arterial Streets fall into non-active frontage categories (C, D, and E). The figure below shows the frontage level on PAS in Adama. Even Most of the PAS both fronts have the same frontage condition in some cases there is one is side frontage level D and the other side is frontage level E.

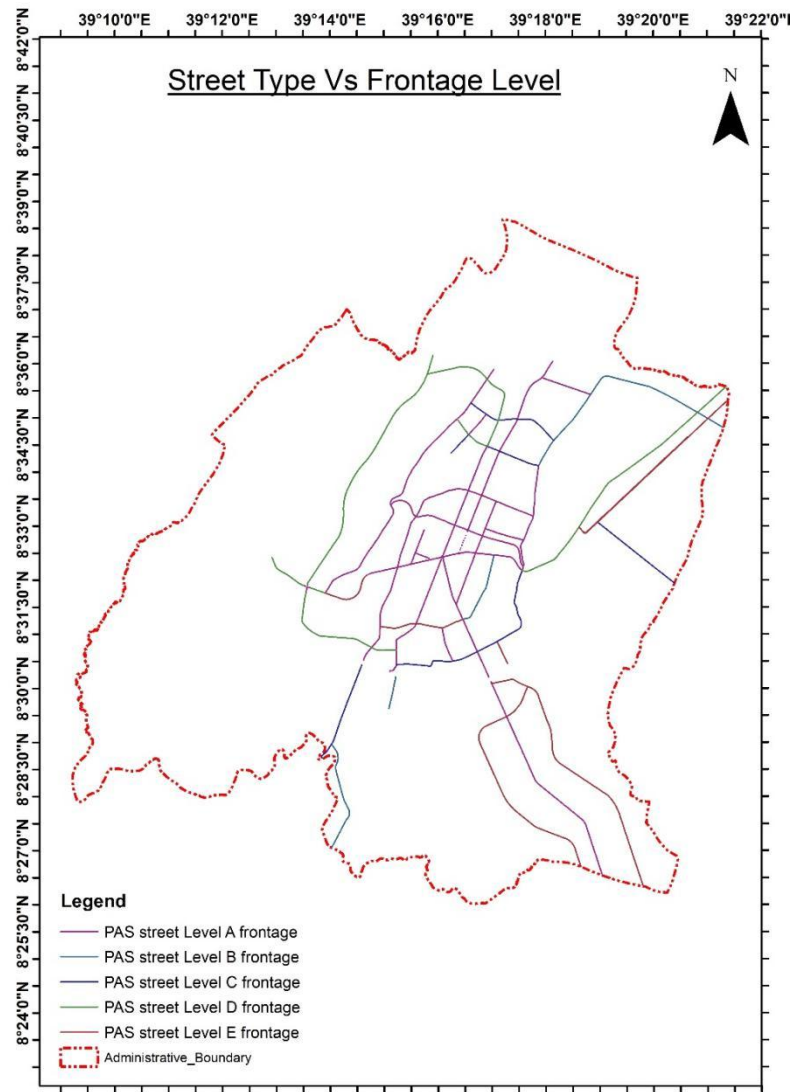


Figure 29: PAS vs frontage map

PAS Street Vs Frontage		
Level	Length(km)	Percent
PAS street Level A frontage	74.73	42.28%
PAS street Level B frontage	15.61	8.83%
PAS street Level C frontage	19.44	11.00%
PAS street Level D frontage	31.43	17.78%
PAS street Level E frontage	35.53	20.10%
Total	176.75	100.00%

Table 11: PAS Vs Frontage

II. Frontage level for Sub-Arterial Street

The total length of subarterial streets in Adama is 198 km. The Sub-Arterial Streets (SAS) frontage level in Adama, Frontage Levels A and B as active, 23.5% of the 44 km of these streets feature active frontages. This indicates a substantial presence of street-level activity and pedestrian engagement along the sub-arterial roads. However, a larger portion, 56.5 %, falls into the non-active categories C, D, E, and Blind frontage.

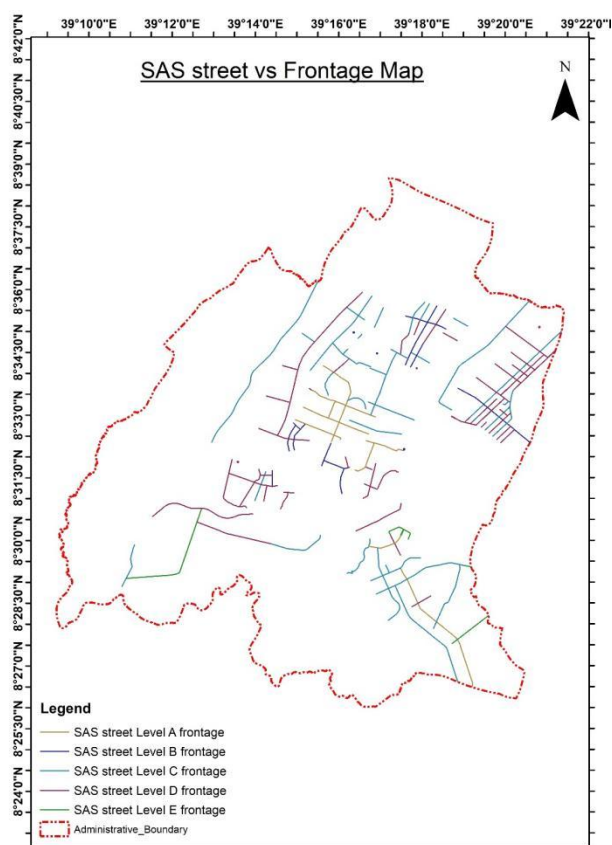


Figure 30: SAS steet vs Frontage Map

SAS Street Vs Frontage		
Level	Length(km)	Percent
SAS street Level A frontage	25.03	12.63%
SAS street Level B frontage	19.17	9.68%
SAS street Level C frontage	77.61	39.17%
SAS street Level D frontage	66.63	33.63%
SAS street Level E frontage	9.71	4.90%
	198.14	100.00%

Table 12: SAS Street VS frontage

Collector streets frontage level

The analysis of Collector Street frontages reveals that Frontage Level A constitutes 10.25% and Frontage Level B constitutes 16.07% of the total length. the total length of the collector streets in adama city is about 218.7 km. The combined active frontages (Levels A and B) account for 26.32% of the total Collector Street length. This indicates that while a quarter of Collector Streets exhibit active characteristics, a significant majority still fall into less active categories. 73.68% of the total length which is 159 km.

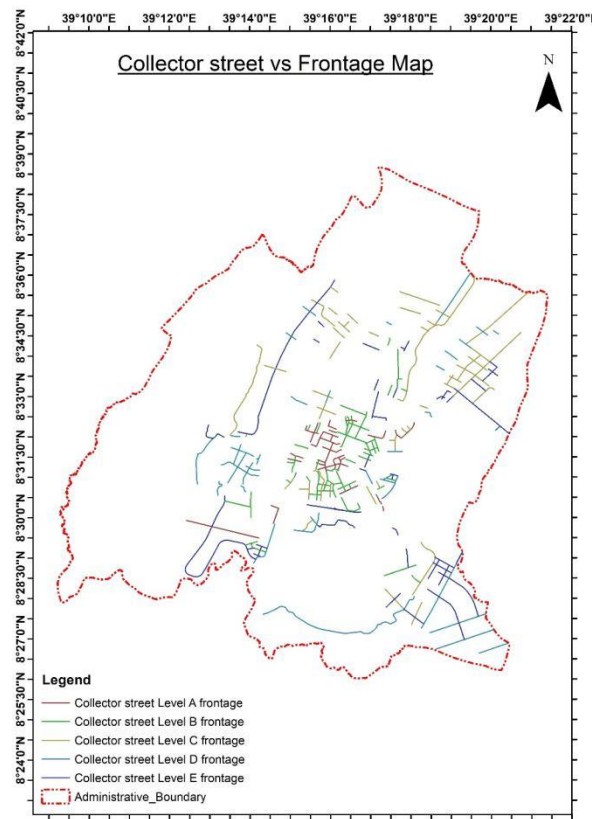


Figure 31: collector street vs frontage map

Collector Street Vs Frontage		
Level	Length(km)	Percent
Collector street Level A frontage	22.41	10.25%
Collector street Level B frontage	35.14	16.07%
Collector street Level C frontage	56.85	25.99%
Collector street Level D frontage	48.98	22.40%
Collector street Level E frontage	55.33	25.30%
Total	218.70	100.00%

Table 13: collector street vs frontage

III. Local street frontage level

The analysis of Local Street frontages indicates that Frontage Level A accounts for 0.95% and Frontage Level B accounts for 7.56% of the total length 764.36 km. Consequently, the combined active frontages (Levels A and B) represent a total of **8.51%** of the entire Local Street length . This highlights that a very small proportion of Local Streets in Adama exhibit active frontage characteristics, with the vast majority falling into less active categories. This suggests that Local Streets, often found in residential areas, have limited interaction and engagement with the public realm at the ground level.

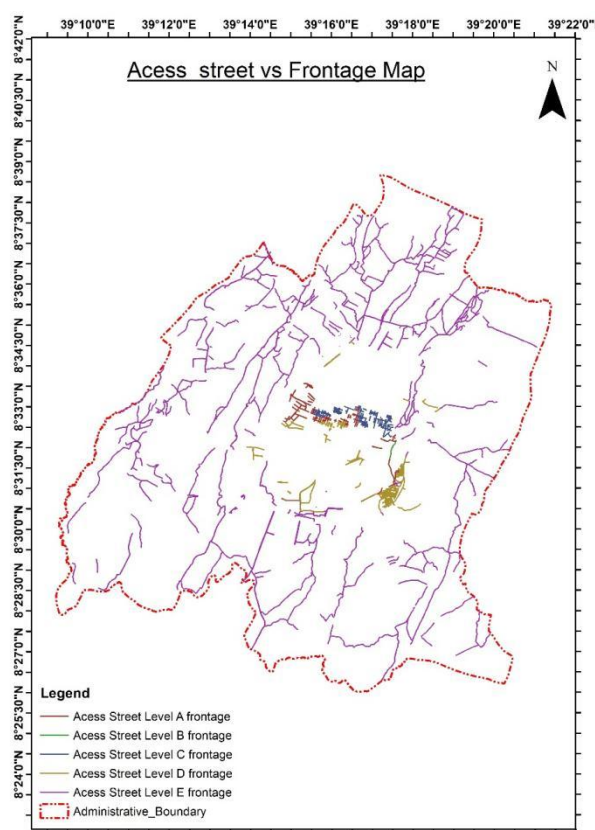


Figure 32:Access street and frontage map

Access/ Local Street Vs Frontage		
Level_	Length(km)	Percent
Access/ Local Street Level A frontage	7.26	0.95%
Access/ Street Level B frontage	57.78	7.56%
Access/ Street Level C frontage	37.65	4.93%
Access/ Street Level D frontage	46.38	6.07%
Access/ Street Level E frontage	615.29	80.50%
Total	764.36	100.00%

Table 14: Access street and frontage map

4.1.4. Details of mixed frontages and blind frontages

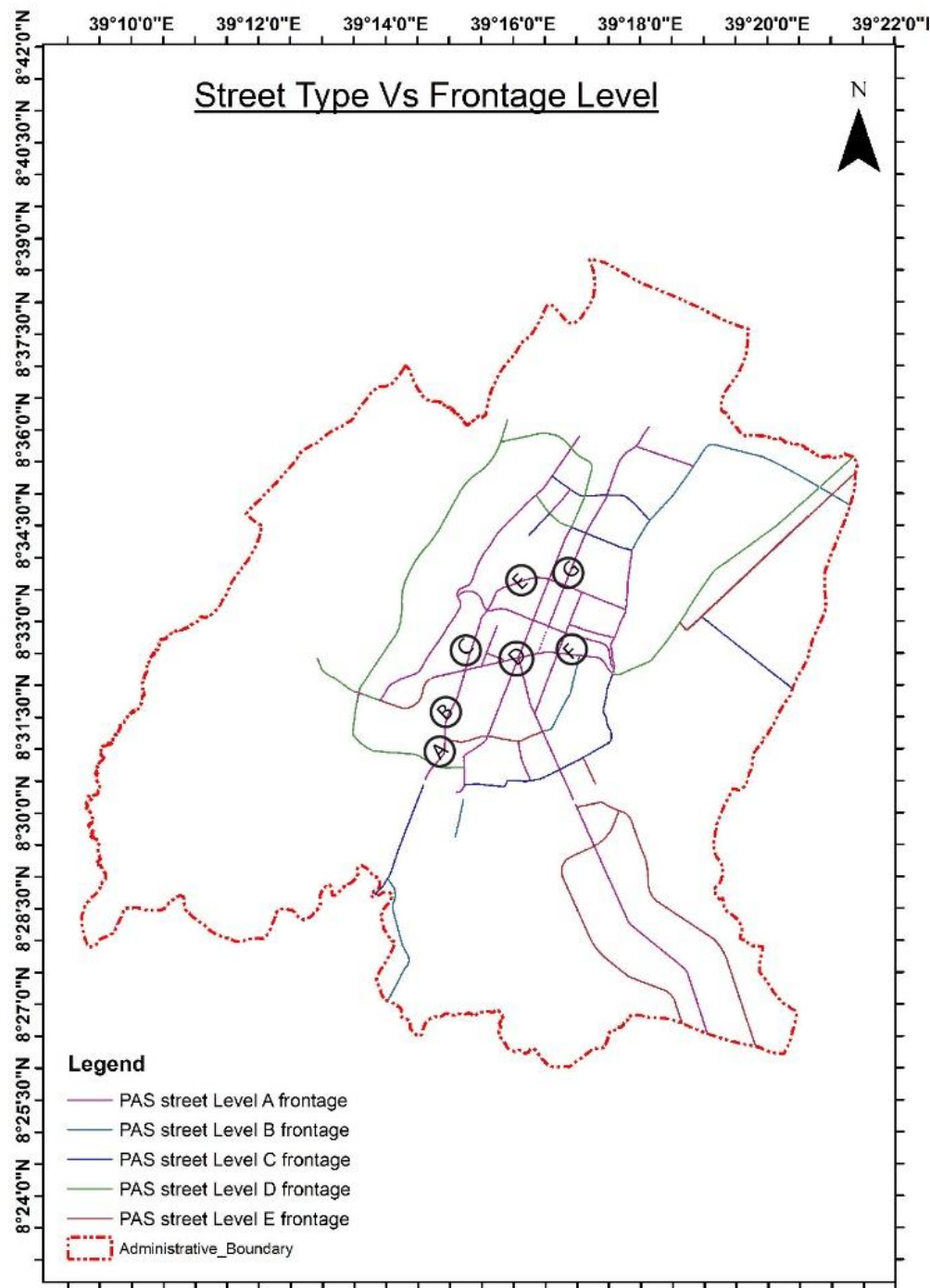


Figure 33: key map for details

❖ **PAS(A) From adama korkoro to military camp fence Egde**

It length is 1.45 km it has about 1km frontage level c and 0.45 frontage level c .

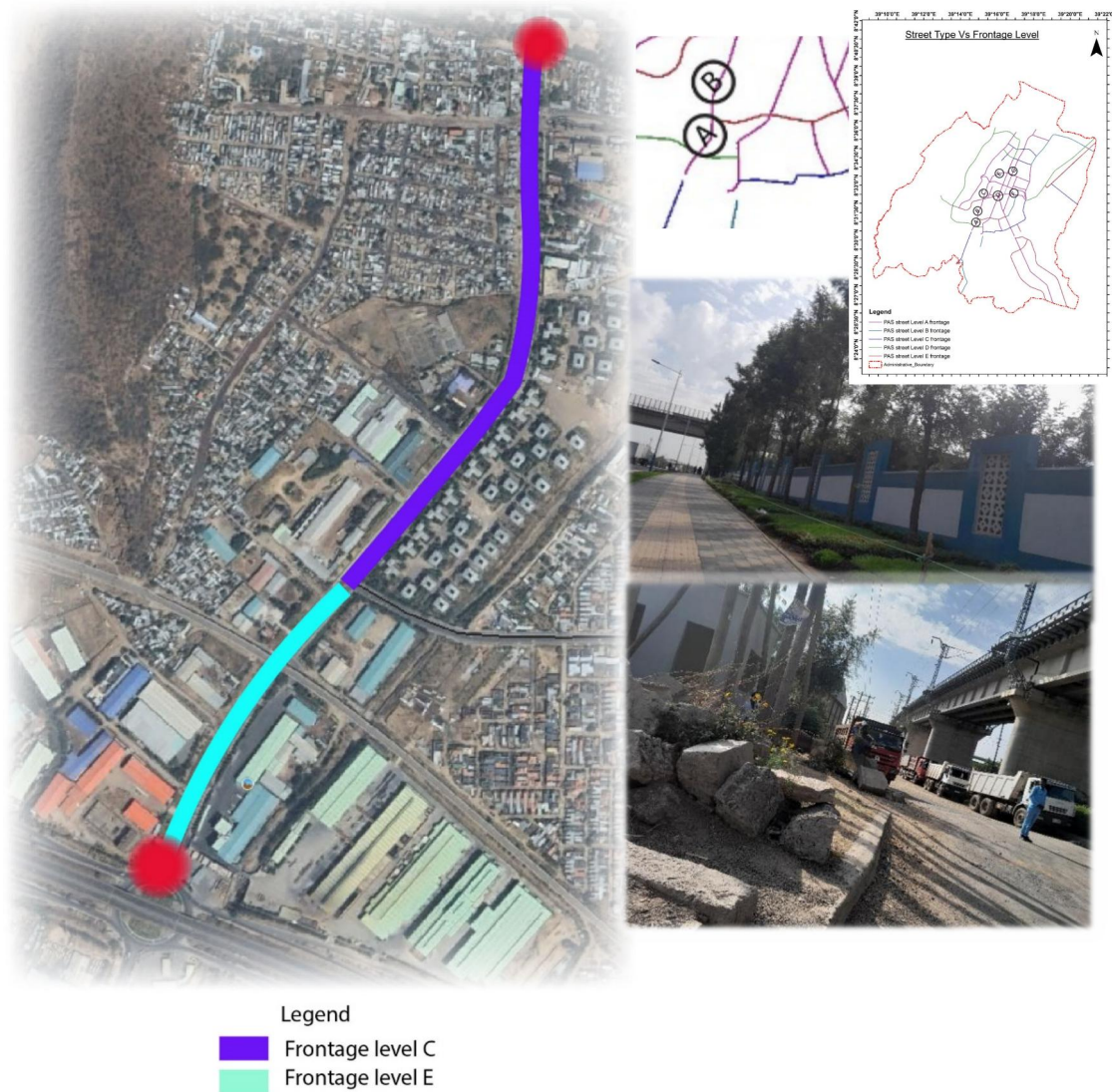


Figure 34 : Street from Adama korkoro to military camp fence edge frontage map and pictures taken from street

On this street there is factory fence with some transparency and condominium fronts. Frontage level E is around the factor .in the condominium frontages there is window and doors and even if it is small number there is also premises such as shops and small cafes .

❖ PAS (B) military camp fence to naflet hotel

This Principal Arterial Street is 1.75 km and it has active frontage level c in one side and it is blind wall in the other side of the street .



Figure 35: Street from military camp fence to Naflet hotel and picture from street

This street has two different frontage level on the sides. The military fence is dead solid concrete with out any door and window in every 100m . but the other side of the building have some premises , window and doors as it is condominium and residence buildings frontages

❖ **PAS (C) tractor factory to jagdish agro-production**

It has about 0.63 km length. This frontage is dead in both side . the reason is it has long fence for factory which solid and in the other side of the street there river , so as it is river side street in needs special development .



Figure 36:Street from tractor factory to jagdish agro-production frontage map and picture from the street

❖ PAS(D) Franko to posta

It's total length is 1km and from this 0.45 km is frontage level B and the other left 0.55 km is frontage level A. as it exist in the center of the town it has good frontage level.

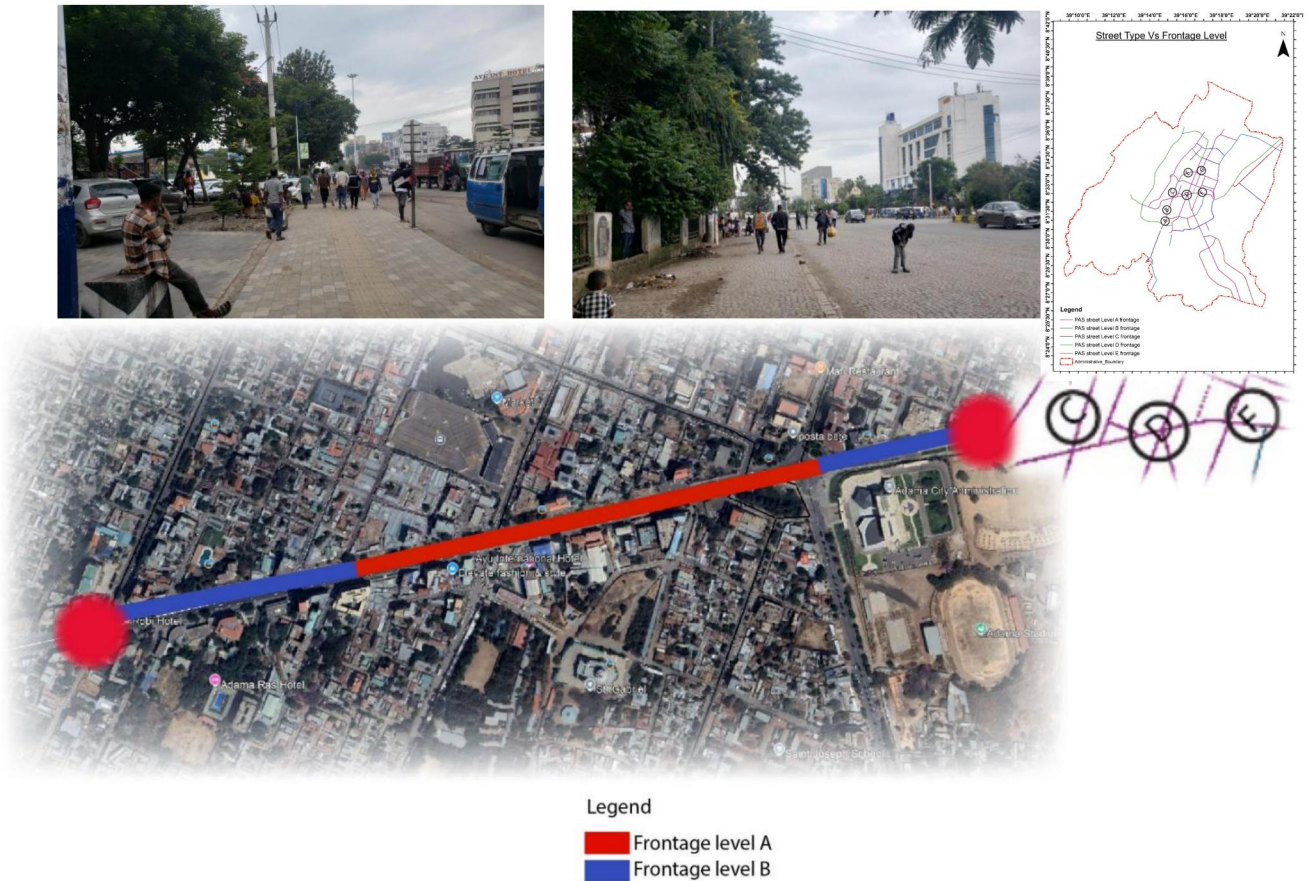


Figure 37: street frontage map for franko to posta

This street locate in the center of the city , hotels and commercial building frontages are mainly located on this street . when the hotels frontages have level B frontage commercial buildings with active grounds have frontage level A , which is can concluded that the this street is active street in general.

❖ **PAS (E) In-front of Holy Saviour Church cemetery**

It is 0.5 km 100% blind frontage with out any premises and doors.



Figure 38: In-front of Holy Saviour Church cemetery and picture from the street

This street have long blind wall with out any window and door for 500m which makes it blind and there is no activity around this street.

❖ **PAS(F) On Amde market to kella street**

it is about 1.12 km and from this 50% of the street is frontage level A which is active. The other left 50% of the street is frontage level D because of it's level difference between the street and the residence frontage.

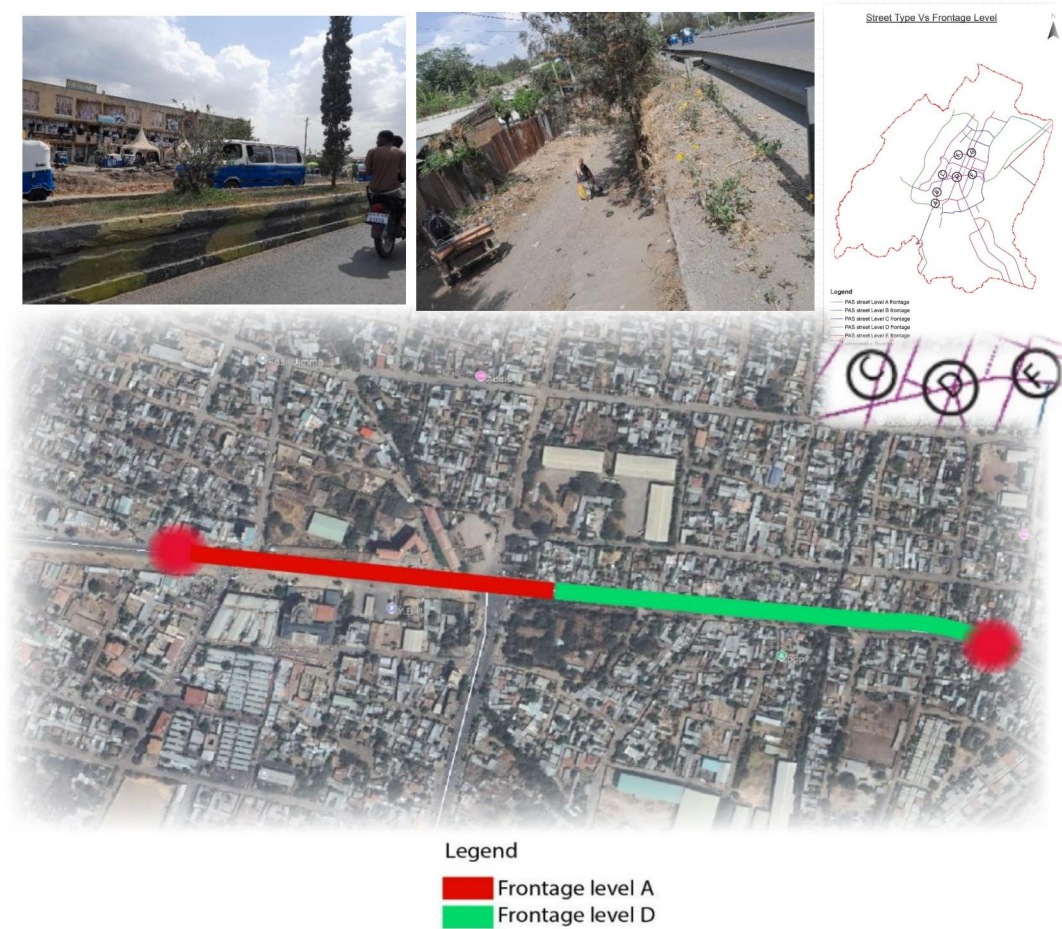


Figure 39: frontage level map Amde market to kella street and pictures from the street .

- ❖ **SAS(G) streets where adama science and technology fence and Adama general hospital fence cross** . this street have long blind fence on the university's fence side which is 1.2 km but on this spot it becomes more blind because of the general hospital also have the same fence type. from the figure below concluded tha blind frontage is 0.6 km total and frontage level C is 0.3 km the the other side active with frontage level B



Figure 40: frontage map for street where adama science and technology fence and Adama general hospital fence cross

4.2. Result for the second objective

The correlation between active frontage level and crime incidents in adama city discussed as below.

4.2.1. Society perception from questionnaire

4.2.1.1. Age and sex

The majority respondents were in between age 26-35 and dominating respondents was found to be males. Where as the 58% of the total respondents were males.

Age	Male	Female	Total	Percentage
18-25	43	27	70	17.5%
26-35	102	82	184	46%
36-45	53	32	85	22%
46-55	19	14	33	8%
56 above	15	11	26	6.5%
Total	232	166	398	100%
Percentage	58%	42%	100%	

Table 15:age and sex

4.2.1.2. Street safety

Respondents were given questions concerning with safety . the question aimed at getting information on whether they are safe in active or in non-active area. According the data obtained 80% of the respondent were feel safe around active streets more than in active areas . the rest of respondents accounted for 20% of the respondents were feel safe around inactive areas more than active areas . the question was where do feel to walk active street or non-active the results are shown on the below table .

	Frequency	Percentage
Active street	318	80%
Non -active street	80	20%

Table 16: where feel safe more

For the question prepared by researcher to know that what peoples think on the crime level whether it less or high around active areas. 75% of respondents answer tha as it's low level crime around active areas. The question was “do you believe that areas with more active frontages experience low level of crime?”

	Frequency	Percentage
Yes	297	75%
No	101	25%
Total	398	100%

Table 17:level of crime perception

Concerning the crime level around dead frontages 44% of the respondents was answered as it is very serious, some what serious was answered by 20% of the respondents . 18% agree on that as it is serious and the left respondents 19% of respondents result is not serious.

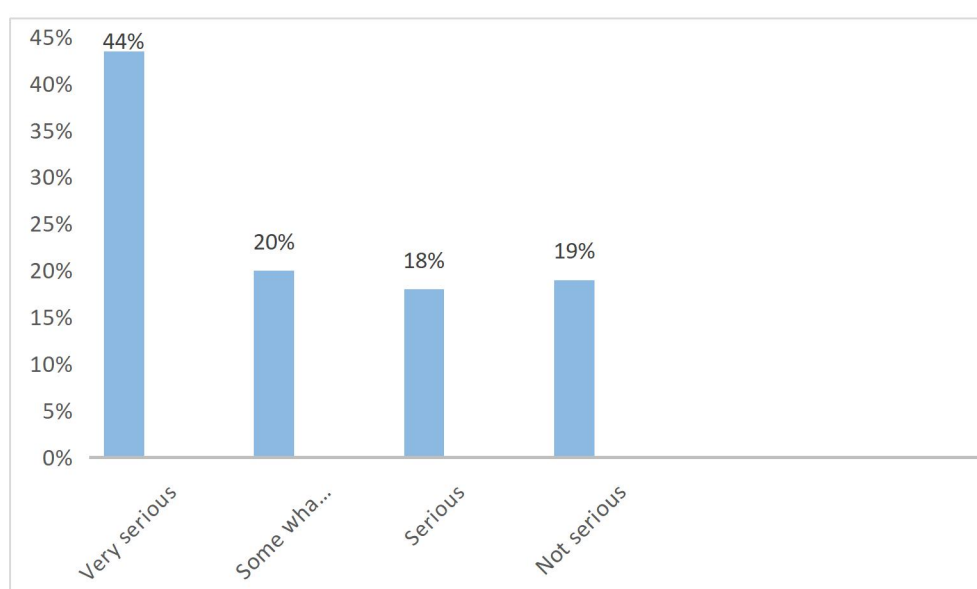


Figure 41: Crime level around dead frontages perception

4.2.2. Adama crime condition

4.2.2.1. Adama crime report

Adama's crime report, based on data obtained from the Adama Police Office, indicates that while not all criminal incidents occurring within the city are officially registered, the available records categorize reported crimes across six distinct zones, revealing variations in the rate of occurrence between these areas, as depicted in the accompanying diagram.

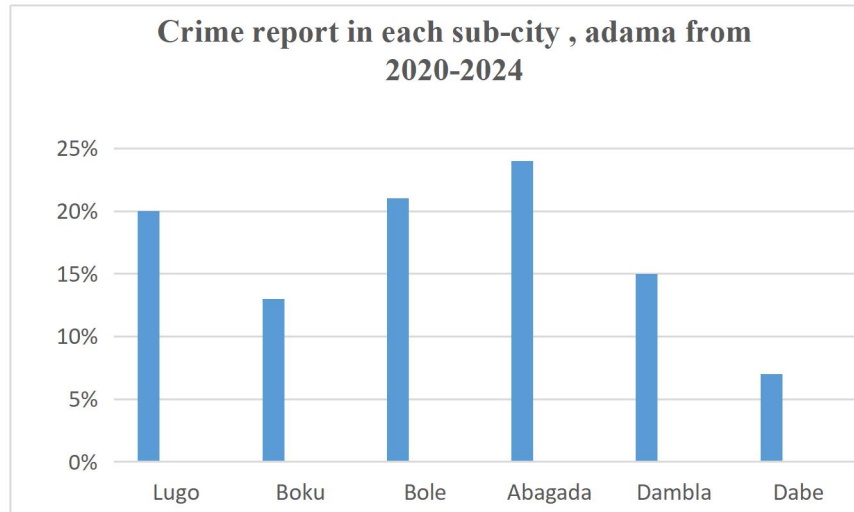


Figure 42: Crime in adama percent chart

Based on the analysis of the crime report chart, the Aba-Gada sub-city exhibits the highest number of crime incidents among the six zones. This is likely due to its central location and high concentration of people, suggesting a correlation between population density and crime rates in this area. Following Aba-Gada, the Bole subcity records the second-highest number of crimes.

Despite not having the same level of activity as Aba-Gada, the prevalence of crime in Bole is potentially linked to its predominantly residential and quiet nature, which may offer greater opportunities for concealment for those intending to commit crime. Despite the highest overall crime rate in Adama being reported around Posta in the Aba-Gada zone, the Bole zone exhibits the second highest crime rate and a particularly high incidence of robbery. This is notable as Bole is characterized by numerous properties with high fences. Interview data collected suggests a potential link between these solid frontages and the elevated crime levels in Bole, implying that such designs might inadvertently contribute to criminal activity in the area.

4.2.2.2. Interview result from police officers

From the interview results with police officers, theft is observed more frequently in busy areas like markets with high pedestrian traffic. However, officers also noted a significant presence of crime in neighborhoods characterized by large fences. These fences, while intended for security, inadvertently offer hiding spots for criminals, both during day and night. The lack of social interaction among residents in these heavily fenced neighborhoods further complicates crime prevention. Police officers suggest that fostering better community engagement and increasing visual connectivity between residents' homes and the street could significantly aid their efforts in maintaining safety.

4.3. Result for third objective

Architectural design plays a crucial role in minimizing dead frontage and its associated crime incidence by fostering "eyes on the street" and promoting a sense of natural surveillance and ownership.

This is primarily achieved through design strategies that maximize transparency and interaction at the street level, such as incorporating large windows and multiple, legible entrances for retail, cafes, or residential lobbies, which allow activities inside to be visible from the public realm. Landscaping, adequate and well-designed lighting, and the avoidance of blind walls or recessed areas create open, well-maintained spaces that feel safer and more inviting, thereby reducing opportunities for crime and encouraging positive social interaction.

4.3.1. Architectural design solution

The questionnaires prepared by researcher concerning with architectural solution, inquired the respondents to share view on whether fence design in Adama city should have to be changed or not. The respondents were involved both street users and owners of the plot. They were asked those questions in order to gain information on the knowledge they had the general relationship with architectural fence design and crime incidents.

The dominant part of respondents 81% of the total respondents agree on changing the fence design of organizations and large institutions for aesthetic and safety case. The same To this, even it is less in percent 65% of respondents agree on transparent and aesthetically better fence for residences. The following table show the respondents answer for organization and residence fence change consequently.

	New fence design for organizations/Institutions		New fence design for residence	
	Frequency	Percentage	Frequency	Percentage
Agree	322	81%	258	65%
Don't agree	76	19%	140	35%
Total	398	100%	398	100%

Table 18: perception for new fence deisgn

4.4. Discussion

After a thorough analysis of Adama's active frontage levels using Gehl's (1994, 2010) developed frontage evaluation grading system and observational checklists, a significant urban design problem was identified. A town like Adama, which aims to be a inclusive and livable urban center, cannot have such low levels of active frontage, therefore this stark difference shows a significant flaw in the town's urban fabric. In order to promote pedestrian activity, foster a feeling of community, and improve a location's overall visual and social appeal, active frontages are important. Their absence usually leads to non-active streetscapes, less social interaction, and low aesthetic for city.

Additionally, the study shows a strong relation between Adama's crime rates and active frontage levels. In particular, robberies are a main problem for both people and their property, and areas with solid and dead frontages are disproportionately vulnerable to crime. The absence of natural supervision in these situations is mostly to blame for this relationship. Dead frontages, which are frequently composed of tall, opaque walls or fences, offer a lot of blind spots and several chances for criminals to hide their activities, approach targets covertly, and make an escape without being spotted. The absence of "eyes on the street"—the unofficial surveillance by businesses, neighbors, and bystanders that bustling frontages inherently promote—deactivates a significant deterrent to criminal activity.

As a result, creating active frontages is essential to improving safety for both residents and pedestrians. Urban design may greatly lower crime prospects and provide a safer, more secure urban environment by increasing transparency, creating visual links between private properties and public places, and supporting lawful activity at the street level. This

emphasizes the pressing need for urban planning strategies and architectural design principles for fences, especially with regard to plot orientation in Adama, to prioritize and actively improve street frontages in order to improve overall urban quality and safety.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The purpose of this study was to examine Adama Town, Ethiopia's degree of active frontage and how it relates to crime incidences spatially. The results show a high correlation between security and urban design. The Bole zone, which is distinguished by a more tranquil residential setting and many high fences, also reports a high number of robberies, whereas areas with high pedestrian activity and commercial presence, like the Aba-Gada zone, have a higher overall crime rate primarily because of increased opportunities for theft. Solid frontages, such as high fences, may unintentionally help thieves by providing hiding spots, even during the day, according to police officer interview results.

This is exacerbated by a lack of community interaction in neighborhoods with extensive fencing, hindering natural surveillance. Despite a general belief in Adama that high fences enhance security, professionals promote for more open and simple fence designs to mitigate the negative impacts of dead frontages on both crime and the aesthetic quality of the town.

5.2. Recommendation

Based on the findings of this study, the following recommendations are proposed to enhance neighborhood safety and promote active frontages in Adama Town

Promote Open Fence Designs: The Adama City Administration, in collaboration with the Oromia Urban Planning Institute, should develop and implement urban design guidelines that encourage the use of visually permeable and shorter fences in residential areas. Incentives or regulations could be introduced to discourage the construction of high, solid concrete fences that limit street visibility and community interaction.(Cozens, 2007)

Enhance Community Engagement: Initiatives that foster social interaction among neighbors should be supported. This can include community events, neighborhood watch programs, and the creation of shared public spaces that encourage residents to connect and look out for each other.

Strategic Urban Planning: Future urban development plans should prioritize the creation of mixed-use areas that promote pedestrian activity throughout the day and night. This can increase natural surveillance and reduce opportunities for crime in quiet or isolated areas.(Ameti M. 2022)

Improve Street Lighting: Investing broadly and well-maintained street lighting, especially in residential areas like Bole, can enhance visibility and deter criminal activity during nighttime.

By implementing these recommendations, Adama Town can strive towards creating safer, more vibrant, and socially connected neighborhoods

5.2.1. Methods and approaches to minimize dead frontage

Rethinking fence design to prioritize visibility offers a powerful strategy for minimizing dead frontage, transforming traditionally uninviting property boundaries into dynamic, engaging interfaces. Instead of opaque barriers that create disconnected streetscapes, new fence designs can leverage materials like perforated metal, glass, or widely spaced slats to allow glimpses into properties, fostering a sense of openness and natural surveillance that deters undesirable activities and enhances public safety. These transparent or semi-transparent structures, potentially integrated with strategic landscaping or public art, not only improve the aesthetic appeal and urban vitality of an area but also encourage greater interaction between private spaces and the public realm, ultimately building stronger community connections and activating previously "dead" zones.

5.2.1.1. Residence fence design

Option 1

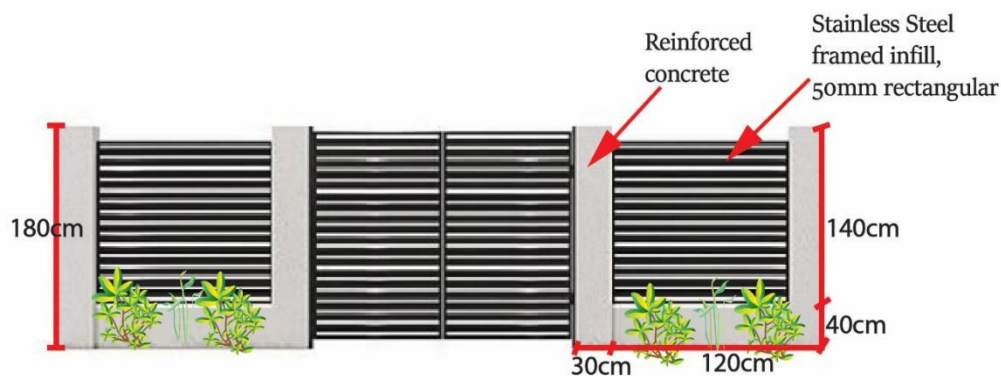




Figure 43:fence design for residence option 1

❖ option 2



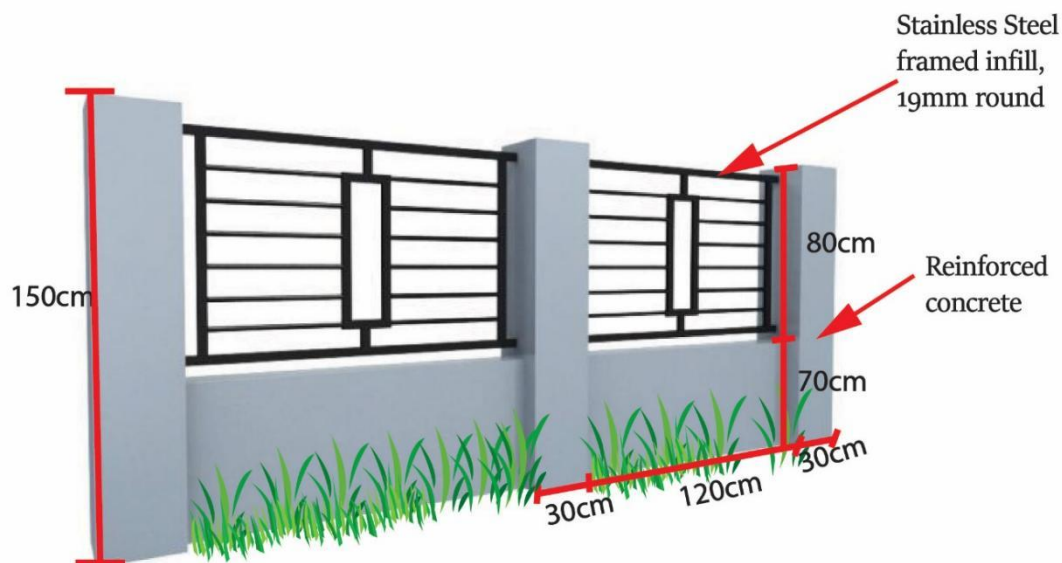
Figure 44: Residence fence design option 2

The comparison of new fence design the existing fence for residences and passed on the pillars of crime prevention through environmental design(CPTED) and aesthetics.

Feature	New fence design for residence	Existing fence design for residence
Natural Surveillance	Create some degree of visual connection between the street and the property, enhancing natural surveillance.	obstructs views, eliminating natural surveillance opportunities between the property and the street.
Activity support	Higher potential for active frontage due to visual permeability and potential for interaction points.	Very low potential for active frontage as it presents a blank, impermeable wall to the street.
Aesthetics	Generally perceived as more aesthetically pleasing and modern, contributing positively to the streetscape.	Can be perceived as stark, imposing, and monotonous, potentially detracting from the street's aesthetic appeal.
Street Safety	Can contribute to street safety by allowing some visibility, making the street feel less isolated.	May negatively impact street safety by creating blind spots and areas where criminal activity can be concealed.
Permeability for Residents	Offers visual permeability, allowing residents to see out and feel connected to the street.	Creates a barrier that isolates residents from the street, limiting visual connection and interaction.

Table 19: Residence fence design comparison

5.2.1.2. organizations and institutions fence design



Comparison of the existing solid concrete fence designs and new proposed fence design for organizations and institutions based on CPTED principles and aesthetics

Comparison for of existing and new fence design		
Feature	Fence design with material stainless steel with concrete pillars and base	Tall concrete Solid Fence
Natural Surveillance	Moderate to High. The slatted design allows for significant visual permeability, enhancing the ability to see and be seen.	Very low. Completely obstructs views between the property and the street, creating blind spots.
Territorial Reinforcement	High. Clearly defines the property boundary, though the visual permeability might slightly lessen the sense of absolute exclusion compared to a solid wall.	High. Clearly defines a strong, impermeable boundary, emphasizing private territory.
Natural Access Control	Moderate to High. The height and physical barrier provide good access control, though the slatted top might be less of a deterrent than a solid wall for determined climbers.	High. The height and solid construction present a significant physical barrier to unauthorized entry.
Aesthetics	Generally perceived as more modern, visually lighter, and potentially more integrated with the urban environment, contributing positively to aesthetics.	Can be perceived as imposing, monotonous, and unwelcoming, potentially detracting from the streetscape.

Table 20: comparison of existing and new fence design for organizations and institutions

5.2.1.3. street-side landscape design for dead frontage



Figure 45: street side landscape with vendor and sitting areas to enhance blind frontage to



active frontages

Figure 46: Street side landscape with entertainment and sitting area

This street-side landscape design effectively transforms dead frontages into active ones by integrating vendor shops and sitting areas. The vendor shops attract people and create activity, while the sitting areas provide space for rest and observation, enhancing natural surveillance. Together, these elements create a more permeable, engaging, and vibrant street edge compared to inactive frontages.

Design solutions in the above ASTM/ American Society for Testing and Materials standard and by studying in the case of Adama city. Those fence design have function mainly on safety and aesthetic. Beside to this as Adama have hot climate it helps to cross wind ventilation and it can minimize the hotness by creating cool climate. In addition to this those fence design encourage to creative and functional residence design rather than repeated fence design as we can observe in the current situation .

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APPENDIX

APPENDIX I

QUESTIONNAIRE FOR SOCIETY

Questionnaire for Analyzing Spatial Relationship Between dead Frontage and Crime .

Instructions for Respondents:

- Please answer all questions honestly based on your experiences and perceptions.

1. What is your age?
 - a. 15-25
 - b. 26-35
 - c. 36-45
 - d. 46-56
 - e. 56 and above
2. What is your gender?
 - a. Female
 - b. Male
3. How long have you lived or worked in Adama Town?
 - a. Below 5
 - b. 5
 - c. 10
 - d. 15
 - e. 20 and above
4. Where do you feel to walk ?
 - A. Active street
 - B. Non-active areas
5. Do you believe that areas with more active frontages experience less crime?
 - a. yes
 - b. no
6. How serious do you think the crime level around non-active streets
 - A. Very serious
 - B. Some what serious
 - C. Serious
 - D. Not serious

7. What is your opinion if institutions and organizations fence changed to short and transparent for safety and aesthetic ?
 - A. It will enhance safety and esthetic
 - B. It doesn't have any impact for safety ,it will enhance aesthetic
 - C. It doesn't have any impact for aesthetic but enhance safety
 - D. I don't have no opinon
8. Do you agree if residential building fence changed to transparent and short height for safety and esthetic as owner
 - A. Yes I agree, it have good impact for city aesthetic and safety
 - B. Partially agree, it have good impact for city aesthetic but not for safety
 - C. I don't agree
 - D. I don't have any idea
9. Do you agree if residential building fence changed to transparent and short height for safety and esthetic as street user
 - A. Yes I agree, it have good impact for city aesthetic and safety
 - B. Partially agree, it have good impact for city aesthetic but not for safety
 - C. I don't agree
 - D. I don't have any idea
10. Is there anything else you'd like to share regarding the relationship between dead frontage and crime areas.

APPENDIX II

Interview professionals in adam administration system

This interview is a research instrument of the study on “This survey is strictly confidential and your answers will only appear as totals combined with those of other respondents for academic purposes only.

1. Can you tell me about the sidewalk safety problems encountered dead frontage in adama city area?

2. What do you think about the main causes of sidewalk safety problems?

3. Are you considering the safety when you papered the LDP?

A. yes B. No

4. If yes , Is there any LDP proposal to protect the crime on sidewalk? How?

5. Are there any guideline/principles of the sub city to protect crime on sidewalk? if yes what

kind of guideline/principles?

6. What do you think is the best approach to solve this problem through planning and design?

7. What future plan does the office has to protect crime on sidewalk?

APPENDIX III

Interview for police officers

This interview is a research instrument of the study on This survey is strictly confidential and your answers will only appear as totals combined with those of other respondents for academic purposes only.

1. What do you think about the sidewalk safety problems encountered dead frontage in adama area?

2. What do you think about the causes of the crime ? Physical features

3. What should be done to solve this problem through physical environment ?

4. How does the policy enforcement to protect crime through planning and design?

5. What are guidelines of physical environment to protect crime on sidewalk?

APPENDIX IV

Active Frontage Checklist for Adama City

This checklist is designed for a quick assessment of street-level building frontages. Use it by observing a 100-meter stretch of street and checking the boxes that apply.

Street Name/Location:

Date:

Time:

Instructions: Walk along a 100-meter stretch of the street and observe the building frontages on one or both sides. Check the boxes that best describe what you see.

1. Number of Premises (Businesses/Services) per 100m:

- More than 25 (Very Active)
- 10 to 25 (Moderately Active)
- 6 to 9 (Somewhat Active)
- 3 to 5 (Low Activity)
- 1 or 2 (Very Low Activity)

2. Number of Doors and Windows per 100m:

- More than 25 (Very Open)
- More than 15 (Open)
- Some doors and windows (Moderate)
- Few doors and windows (Limited)
- No doors and windows (Closed)

3. Variety of Functions (Types of Businesses/Services):

- Large range of functions (e.g., shops, restaurants, services, offices)
- Moderate range of functions
- Some range of functions
- Little or no range of functions
- No functions (residential only or vacant)

4. Building Facade Appearance:

- High quality materials and refined details
- Good quality materials and refined details
- Standard materials and few details

Flat building surfaces (plain, unadorned)
No details and nothing to look at (blank walls)

5. Blind or Passive Facades (Walls with no doors or windows):

No blind facades or very few
A few blind or passive facades
Less than half blind or passive facades
Predominantly blind or passive facades
Entirely blind or passive facades

6. Depth and Relief of Building Surface:

Much depth and relief (e.g., recessed entrances, balconies, ornamentation)
Some depth and modeling
Very little depth and modeling
Flat building surfaces

Overall Assessment (Based on Observations):

- ☐ **Grade A (Very Active):** Lively, engaging street frontage with many activities and visual interest.
- ☐ **Grade B (Moderately Active):** Active frontage with a good level of engagement.
- ☐ **Grade C (Somewhat Active):** Some activity, but may lack vibrancy.
- ☐ **Grade D (Low Activity):** Limited activity and visual appeal.
- ☐ **Grade E (Very Low Activity):** Inactive and visually uninteresting frontage