



ADDIS ABABA UNIVERSITY
COLLEGE OF BUSINESS AND ECONOMICS
SCHOOL OF COMMERCE

Assessing the effect of building parking facilities on traffic congestion in selected locations of Addis Ababa: In the case of “Mexico, Megenagna, and Merkato locations”.

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DECLARATION

I hereby declare that the project which is being presented in this study entitled, **Assessing the effect of building parking facilities on traffic congestion in selected locations of Addis Ababa: In the case of “Mexico, Megenagna, and Merkato locations”**. is original work of my own, has not been presented for a degree of any other university and all the resource of materials used for this thesis have been properly acknowledged.

Name: _____

Signature _____

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LETTER OF CERTIFICATE

This is to confirm that Dawit Sisay’s final project work entitled, **Assessing the effect of building parking facilities on traffic congestion in selected locations of Addis Ababa: In the case of “Mexico, Megenagna, and Merkato locations”**. had been completed and presented in partial fulfillment of the Master of Arts in Project Management degree requirement that conforms with university requirements and fulfills acceptable criteria in terms of originality and quality.

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Chair of department

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Acronyms and Abbreviations

AATMA - Addis Ababa Traffic Management Agency

CSA - Central Statistical Agency

FDREMT - Federal Democratic Republic of Ethiopia Ministry of Transport

GDP - Gross Domestic Product

GPS – Ground Positioning System

IT – Information Technology

SPSS- Statistical Software Suite

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Abstract

Ethiopia's capital city, Addis Ababa, is dealing with issues related to transportation, including a deficiency of public transportation, traffic caused by an imbalance between the number of cars in the city and the capacity of on-street parking, and scarcity of parking spaces due to a lack of availability. This study aims to assess the effect of parking facilities within buildings on traffic congestion. Due to heavy reliance on street-side parking study areas Megenagna, Mexico, and Merkato, were selected for the study. A descriptive and exploratory research design with cross-sectional study has been employed by the researcher to collect data from the targets at a single point of time. Primary data was acquired through interviews and questionnaires, where secondary data was collected from traffic management agency, Addis Ababa Building Permit Bureau and related literatures. Expert sampling technique was employed for selecting the interviewee and stratified random sampling was used for selecting the samples for the questionnaire. One hundred sixty-six (166) questionnaires were administered for 41 traffic management higher officers and building permit officials, 69 passengers and 56 drivers and an interview was conducted with the head of traffic management agency. Data analysis was performed using SPSS v27 software and Microsoft Excel. The research indicates a shortage of parking spaces within buildings, primarily due to owners repurposing their buildings without legal repercussions. In order to address these issues, the transport and traffic management bureau should impose strict penalties on building owners who change the permitted use of their properties and there is a need to re-evaluate and increase the total area allocated for parking within buildings

Key Words: *building parking facilities, traffic Congestion, on-street parking.*

CHAPTER ONE

Introduction

The study's background, problem statement, research question, objectives, significance, scope, limitations, definitions of terms are all presented in this chapter.

1.1 Background of the study

Parking plays an important role in the transport system since all vehicles require a storage location when they are not being used. Due to the city's growth, population increase, and economic expansion, there is a growing demand for transportation services to meet the growing needs of people for mobility.

Cities' productivity is greatly impacted by the capacity to transfer people and goods between a variety of origins and destinations in an effective manner. Due to a number of factors that prevent transportation networks from meeting the needs of urban mobility, the most significant transportation issues are frequently associated with metropolitan regions. (Rodrigue et al., 2009).

One of today's most important issues is parking as a component of a larger transportation system. The need to store cars close to destinations presents a difficult design challenge as the global automobile population grows exponentially. In order to ensure the car and driver have a safe and efficient ride, the parking lot or facility must prioritize addressing functional and operational issues. Developing a suitable solution for the site locations involves integrating automotive, engineering, and traffic issues, making it an extremely complex challenge.

Because conventional parking methods need a lot of area, which is required to meet parking standards, they are no longer applicable. Parking solutions need to be as space-efficient as feasible while yet accommodating the largest number of vehicles, given the exponential rise in land costs in cities. Ten to fifteen percent of a person's journey time is spent on end-to-end systems.

This is corroborated by the fact that in many cities and towns, neither central authority is in charge of the road system, public transportation, or parking lots. A planner must integrate their plan with those of other decision-makers and prepare it in greater detail in order to arrive at the best answer. (Litman, 1999)

Most residential and business buildings have parking systems, such as garages, lots, and subterranean vehicle parks. Parking lots at street level may hold a large number of cars in a comparatively small space. Where space is restricted at street level, parking lots with multiple stories or basements are more practical. In both developed and developing countries, parking is a major problem in urban areas. The imbalance between the supply and demand of parking spaces, which many cities are experiencing as a result of the fast increase in automobile ownership, is the main cause of parking issues. This mismatch can be attributed to both poor land use planning and imprecise space need estimates from the initial stages of planning. Lack of parking spots, excessive parking fees, and traffic bottlenecks caused by individuals looking for a place to park are common parking issues.

The main parking issue in Africa is a lack of public parking, which is evident in large cities. Owing to the rapid motorization and urbanization that have occurred, numerous African city governments have reported experiencing this issue. One of the comprehensive land use components related to transportation that can be found in the commercial, industrial, and residential sectors is parking. Parking is related to many other types of travel, like as vacations and shopping trips. As on Step & Mint parking survey estimates, there may be a shortage of up to one million parking spaces in major African cities by 2020.

The city of Addis Ababa's transportation policy was created by the FDREMT in August 2011. Eleven major policy issues and implementation strategies were outlined by the FDRE in order for the city to be competent on a regional, continental, and international scale. These policies also specify that: "car parking facilities shall be built by private, government and public private partnership in the city center and in areas with high traffic volume and land supply shall be given special attention by the city administration." They also include the expansion of transportation infrastructure.

One of the most common transportation issues in sizable urban areas is congestion. Although congestion exists in all cities, it is more prevalent in those with a million or more residents. Traffic congestion is not only large and complex, but it is also strongly linked to motorization and the proliferation of the car, which has increased demand for transportation infrastructure. (The Geography of Transport Systems: Urban Transport Challenges, 2017).

According to IBM research from 2011, over 30% of cars that are circling a city at any given moment are doing so to find parking. Apart from the irritation element, the single biggest social shift impacting the parking industry, according to survey respondents, is the traffic

congestion caused by those cars. Finding a place to park can be difficult in cities all over the world. In densely populated locations, drivers sometimes discover that parking near their destination is either too expensive or unavailable.

Therefore, there are a variety of reasons why cruising for parking may occur, such as the inaccessibility of a private garage, the high cost of public curbside parking compared to private garage parking, or just a driver's inexperience with the area. According to studies, most drivers take between 3.5 and 14 minutes to complete a normal search (Shoup, 2006). In cities, these periods quickly mount up to produce major productivity losses. In Los Angeles, for instance, a single 15-block area serves approximately 8,000 cars daily, resulting in 470–1870 hours of wasted time searching for parking.

1.2 Statement of the Problem

Urbanization and transportation both contribute to Addis Ababa's rapid growth. Additionally, it houses more than 100 embassies from various nations. It also has space for a large number of foreign organizations that support development and aid. The city's rapid growth is a result of its high levels of social, economic, structural, and other change. According to H. Mariam (2017), there are around 800,000 automobiles in Ethiopia, with 70% of those being registered in Addis Abeba (Transport, 2011).

Due to this high growth rate, parking has become integrated component of buildings as well as roadways. Hence, it creates a requirement while planning each infrastructure. Parking facilities have become a fundamental concern. As such, finding parking facilities is the most challenging issue, which causes vehicles to spend more time looking for open places, as seen by real-world situations (Chaniotakis, 2014). The sophisticated transportation system of Addis Ababa; the bustling city is made more complex by the steady stream of automobiles navigating it. It is vital to solve these issues as long as the population grows and the economy prospers. To guarantee efficient transit and improve the general urban experience for both locals and visitors, effective solutions are required.

The goal of this study is to carry out an exhaustive assessment of the existing availability and capacity of parking facilities within buildings at the selected locations of the city. The study aims to ascertain the degree to which these facilities can efficiently decrease the dependence on street-side parking alternatives, which could alleviate traffic jams and improve traffic control in urban settings. Furthermore, the research will investigate how the accessibility of parking facilities influences drivers' preferences for using parking structures of buildings.

1.3 Research Questions

- what are the primary factors contributing to traffic congestion in selected areas of the city?
- What is the current state of parking facilities within buildings in terms of capacity?
- How much are building parking facilities utilized in those locations of Addis Ababa?
- How does the availability of building parking facilities affect the level of congestion in the selected locations?
- Are parking regulations within buildings enforced by relevant authorities?

1.4 Objectives of the Study

1.4.1 General Objective

The overarching goal of the study is to evaluate the effect of parking facilities within buildings on traffic congestion in specified locations in order to spot trends and make suggestions for bettering the traffic flow and easing congestion.

This objective provides a broad perspective on the purpose of the research.

1.4.2 Specific Objectives

- ✚ To analyze the current state of traffic congestion in selected areas of the city and identify the primary factors contributing to it.
- ✚ To assess how much availability of building parking affect the frequency and severity of traffic congestion.
- ✚ To investigate whether there is an enforcement of parking regulations within buildings.
- ✚ To assess effectiveness of building parking facilities in reducing reliance on on-street parking.

1.5 Significance of the study

The study examines the direct relationship between lack of parking spots in urban buildings and the worsening of traffic jams. In addition, it examines the difficulties that current parking systems face and how poor parking infrastructure drives drivers to look for parking on the street, which increases traffic, pollutes the environment, and creates economic inefficiencies. As such, this research is crucial to the development of sustainable and effective urban environments and the research provides insight for urban planners and policy makers. In summary, examining inadequate parking spaces in buildings is crucial for developing dynamic, accessible, and sustainable urban environments. The Addis Ababa City

Administration Construction Permit, the transport authority, and AATMA can utilize the findings of this paper for the formulation of their social and economic policies.

1.6 Scope of the Study

The study areas Megegnagna, Mexico, and Merkato are selected as they are known for their significant transportation challenges and heavy reliance on street-side parking. Even though the targets are limited to the three locations, it is expected to provide an insight on how much parking facilities on buildings contribute to the traffic jams that we are seeing in recent times. The study focuses on how parking facilities on buildings affect traffic congestion and the research requires a thorough examination of the ways in which these facilities affect urban traffic flow and safety. It will evaluate the adequacy of internal parking facilities and their arrangement in relation to road capacity and safety. The study will also assess how these parking structures influence urban traffic flow, providing insights that could inform future urban planning and traffic management strategies.

1.7 Limitations of the study

In the study, the researcher encountered several limitations. Firstly, limited information was acquired due to time constraint. Secondly, the lack of readily accessible secondary data posed a challenge and furthermore the respondents were reluctant to fill the questionnaires; despite these challenges, the researcher mitigated the limitations by taking a representative sample from the larger population, maintaining close communication with those having the necessary data's and by assuring respondents their privacy and using flexible participation methodology's and the study states the findings by remaining impartial and unbiased.

1.8 Definition of Terms

Parking is the act of stopping and disengaging a vehicle and leaving it unoccupied.

(Wikipedia)

Parking space is an area, either paved or unpaved, that is set aside for parking. (Wikipedia)

Parking lot is a cleared area specifically designated for parking vehicles. (Wikipedia)

Traffic refers to the movement of vehicles, pedestrians, ships, or planes along a specific route or within a particular area. (collinsdictionary.com)

Traffic Congestion in the sector of transportation, traffic congestion is defined as slower moving traffic, longer travel times, and more cars in line. (Wikipedia)

<https://en.wikipedia.org>

Parking Demand is the amount of parking that would be needed at a specific location, time, and cost. (Victoria Transport policy institute)

Parking Utilization is the number of parking spots occupied from total parking spaces. (eScribe Meetings).

Building Parking facility is a designated area within a building where cars can be parked to meet the needs of drivers. (Parking Network)

On-street Parking refers to parking cars on the side of public road or street directly along the roadside. (Parking Network)

Off-street Parking refers to Parking spaces that are situated away from streets or public roadways. (Parking Network)

1.9 Organization of the Study

The study is divided into five chapters and is organized as follows. The study's background, problem statement with research questions, aims, scope, and significance are all covered in the first chapter, along with the study's constraints. chapter two provides summary of related literatures on parking facilities, traffic congestion and parking use including the conceptual framework devised for the study. The research strategy, sources, tools, sample strategies, and methods for gathering data for the study are covered in detail in chapter three. Data from primary and secondary sources are presented and analyzed in the fourth chapter of the study. Finally, the fifth chapter synthesizes the findings and proposes recommendations for future researches.

CHAPTER TWO

Review of Related Literature

The purpose of this chapter is to give a general theoretical framework and empirical review about the topic; it also seeks to provide a conceptual framework by using visual representation of the concepts and their inter-relationship in the research study.

2.1 Review of Theories and conceptual studies

2.1.1 Land Use and Traffic Congestion

The link between urban land use and road traffic congestion has been emphasized in many studies (Colonna et al., 2012). In order to address this issue, new, sustainable theories of urban planning have emerged. These theories, in general, take into account a variety of uses and urban activities as a way to lessen congestion. (Kusumastuti & Nicholson, n.d. 2017). Olagunju (2015) discussed how rapid urbanization lacks appropriate land use planning, especially in the vicinity of certain specialized activities like workplaces, residential areas, and recreational facilities in some other areas that are frequently distant from one another, resulting in crisscrossing movements that exacerbate traffic problems. This is from the perspective of land use and road congestion. Many public amenities, like banks, retail centers, and petrol stations, as well as numerous busy places of worship, are positioned in a way that makes them strategically close to junctions, which adds to the congestion caused by traffic. Pre-weekend traffic is more congested than it is on a typical workday, which suggests that traffic control measures should be tightened during this period. (A Tale of a Northwestern Chinese City, n.d.). In conclusion, policy makers and urban planners must understand the connection between land use and traffic congestion. By creating evidence-based policy, we could contribute to the creation of more effective transportation networks and a reduction in traffic.

2.1.2 Traffic Congestion

Slower driving speeds, more extended travel times, and longer vehicle lineups are the hallmarks of the traffic congestion phenomena.

When there are more cars than a road or intersection can accommodate, traffic congestion arises. Vehicles back up, speed drops, and travel time rises as a result. Saturation is the point where traffic demand and road or intersection capacity are equal.

Since traffic volume grows with time, it is possible that an intersection or road's capacity was

inadequate to accommodate the current number of traffic, especially during peak hours, leading to traffic congestion. Road and intersection capacity can be decreased by unfavorable circumstances such as rain, snow, construction, or accidents.

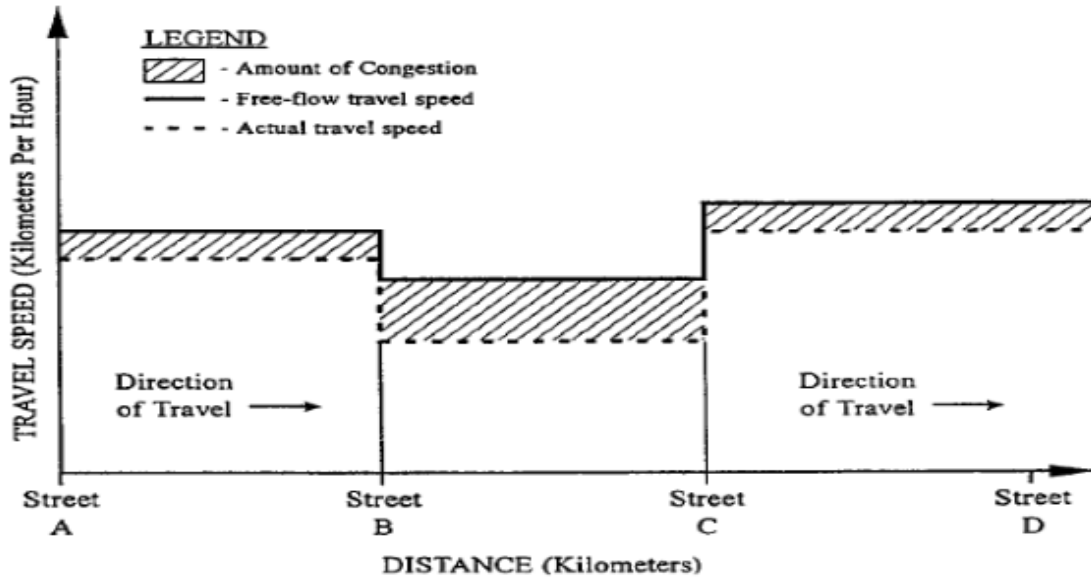


Figure 2. 1 Congestion Distance vs Speed Graph (NCHRP,2019)

According to the above figure, the actual travel rates are far slower than the free flow speed, higher journey times or excess delays are observed. Because of this, the level of congestion varies according on the area. Lomax et al. (1997) suggest that identifying two quantities—congestion and unacceptable congestion—is one approach to solving this issue. Road users are the intended audience for definitions of congestion, and the measures that follow from them should be grounded in notions that they can comprehend.

- ✚ Travel time or delay that exceeds what is typically seen during light or free-flowing travel conditions is referred to as congestion (Figure 1.1)
- ✚ When a trip takes longer than the predetermined amount of time, it is considered unacceptable congestion. Depending on the kind of transportation, the mode of transportation, the destination, and the time of day, the established standard may change.

2.1.3 Types of Congestion

Congestion can take 2 forms that's recurrent congestion and non-recurrent congestion. These categories are determined by the variables that can affect driver behavior, such as the frequency and predictability of traffic jams. Every form of congestion is probably going to have a different cost. Because sufficient amounts of data are inherently sparse, quantifying

non-recurrent congestion costs may be more challenging. One could argue that the costs might have been higher if drivers had not been able to factor in the possibility of traffic when planning their route, or if the costs had not been incurred. Non-recurrent congestion is becoming more common on some routes, such as those with accident black spots.

- I. Recurrent congestion: This is mostly caused by an excessive number of vehicles attempting to use the road simultaneously. They typically occur during weekday morning and afternoon peak hours, when the majority of people leave for work and return home at roughly the same time. Peak times in big cities can be found between 3:30 and 7:00 p.m. and 7:00 to 9:30 a.m. In smaller cities, the peaks could last for just one or two hours. The increasing recurring congestion that happens during off-peak times—that is, on weekends and other non-peak hours—is worth mentioning. This is mostly due to the off-peak travel industry's explosive growth (off-peak travel is rising faster than peak-period travel in some locations).
- II. Non-recurrent congestion: is another major factor contributing to traffic congestion and it's associated with unpredictable or single events, such as work zones, truck spills, accidents, strange or disruptive driving behaviours, infrequent facility maintenance activities (e.g., seasonal street cleaners), inclement weather, and special occasions. It is more challenging to anticipate and manage non-recurrent congestion due to its erratic character.

According to Transport Canada, the effects of non-recurrent congestion are severe since the public, the industries that produce goods, and the economy as a whole depend heavily on the consistency and predictability of travel times. Travel time variability creates expensive uncertainty for commuters and goods haulers in particular who have set delivery deadlines to meet. For the general public, low fluctuation in journey times can be even more significant than trip duration.

2.1.4 Congestion Indicator

Knowing precisely how much and under what operational conditions a particular facility can accommodate is one of the most important requirements in traffic engineering. It is crucial to identify or have indicators of the presence of congestion in the system because, in contrast to other traffic flow metrics, congestion is a relative measure based on feedback from road users about how the transportation system is operating at a particular moment in time. In the case of a multilane roadway, for instance. It has unique qualities of its own. A multilane roadway can be identified by three performance indicators, according to HCM:

- Density in terms of passenger cars per kilometer per lane
- Speed in terms of mean passenger car speed and
- Volume-to-capacity ratio.

The highway's ability to handle traffic flow is demonstrated by each of these metrics. Above all, when a vehicle travels at a slower speed while a queue forms and the average travel time increases, this is a common indicator of the presence of congestion. Compared to traffic volume counts, which are now the foundation for the majority of congestion estimating techniques, these two are more labor-intensive to measure.

2.1.5 Causes of Congestion

Numerous factors can cause traffic congestion, including having too many cars for a given route or crossroads, as well as lane-switching and car-following behaviors that change the capacity of the road on the fly. They are also inextricably linked to other indirect factors, such as patterns of employment and land use, income levels, car ownership trends, investment in infrastructure, and regional economic dynamics, to name a few. However, we can distinguish between two primary and broadly categorical types of causal elements: macro-level factors associated with the overall demand for road use and micro-level factors, such those pertaining to traffic "on the road." in this instance, congestion on the road at both the macro and "micro" levels is "triggered."

2.1.6 Impacts of Congestion

The most obvious effect of traffic congestion on roads is longer travel times. It's not the only expense, though. Both concrete and intangible expenses are incurred by congestion for both our society and individual drivers. For instance, poor mobility has a negative impact on the business sector in addition to wasting time when individuals are stuck in traffic. The business sector has to pay more for inventory and logistics when products or services are not delivered on schedule. When a road fills up, every extra car causes more total delay for other users than it can handle, leading to economically unsustainable traffic numbers. In addition to lengthening travel times and decreasing productivity, congestion also tends to raise fuel consumption, pollution emissions, driver stress, and a lower quality of life.

Queuing, slower moving traffic, and longer travel times are all effects of congestion that have an adverse effect on the economy and the people who live in urban areas.

The European Conference of Ministers claims that in addition to its direct effects, traffic congestion also has a number of indirect ones, including harm to the environment and natural resources, stress, safety, and quality of life, as well as harm to people who use non-vehicular

road space, like sidewalks and road frontage properties. It is crucial that decision-makers give careful consideration to assessment methods that include a review of these effects as well as broader considerations like the ideal urban environment. This study assesses traffic, traffic costs, and traffic's impact on different transportation modes. The expenses associated with traffic congestion have drawn more attention lately.

2.1.7 Parking System

When there is a need for parking, a parking system is crucial. These days, automatic parking systems come in a variety of forms. Their goal is to create a system that works well for managing cars as they enter and exit parking lots.

Parking policies, especially those that allow for on-street parking, affect how urban property is used and add to traffic. As a result of on-street parking, the capacity of the road has decreased. First, the flow of traffic around on-street parking restricts the width of the highway. As a result, vehicles are forced to travel the clogged path, which slows down traffic as a whole.

In addition to decreasing road capacity and traffic flow speed, this also jeopardizes road user safety (Biswas et al., 2017). Second, frequent parking and unparking procedures cause traffic bottlenecks on crowded city streets, resulting in difficult circumstances (Biswas et al., 2017). It is anticipated that unless parking laws are changed, on-street parking problems would grow more prevalent worldwide (Chiguma, 2007). The inability to see the side of the road ahead and the challenge for vehicles to recognize an approaching pedestrian crossing the road are two problems associated with on-street parking.

This parking-related issue in developing countries will become even more problematic if rules are not changed (Pedrah, 2014; Chiguma, 2007; Bulacancial A, Dizon F, Garcia MW, et al., 2013). Parking is another understudied problem in transportation, despite the fact that "automobiles spend over 95% of their time "parked" (Ison S, Rye T, 2006) every day in three unique parking places on average (Cullinane B, Smith D, Green P, 2004). Lawmakers find it difficult to take into account some alternative parking strategies in the absence of sufficient guidelines and research data.

Finding a suitable vehicle parking option is crucial due to the growing automotive population in urban areas. Traditional parking solutions are no longer practicable due to their high area needs and the requirement for a wide space to meet parking requirements. Parking solutions need to be as space-efficient as feasible while yet accommodating the largest number of

vehicles, given the exponential rise in land costs in cities. The average traveler in a large city spends 10 to 15% of their time looking for a parking spot. (Shah et al., n.d.)

For the parking system to work, a working mechanism is needed. Furthermore, in order to notify the user of the availability of a free parking space, a sensor system is required. When developing this system, human and vehicle safety must be taken into account.

The two main teething problems with on-street parking are congestion and interruption of traffic movement. Generally speaking, there are significant effects on the flow of traffic speed, which cause unfavorable delays. This has an impact on the street's ideal or practical capacity (Boro et al., 2015).

Parking lot

The parking lot is the area of a building complex that a user sees first and last. It serves as the entrance for all clients, guests, and staff. Because they provide automobile owners with a location to leave their vehicles while they go about their daily business, parking lots are vital to the urban environment. These structures, which could be built garages, basements, or surface lots, are essential components of our transportation system.

Parking in Basements

The Basement Parking space type refers to parking located below ground floor system within an occupied building. This design incorporates elements into the parking entrance, providing a safe and pleasing appearance. (*Parking Facilities | WBDG - Whole Building Design Guide*, n.d.)

Space Attributes

All parking structures, whether basement, structural, or surface, must allow cars and guests to get to and from their vehicles in a safe and effective manner. As a result, care should be taken to ensure that drivers have the best sight possible at all intersections on the road.

- **Visibility:** Ensuring maximum driver visibility at turning points along the roadway is crucial.
- **Accessible Parking Spaces:** Every parking structure connected to the building needs to have them. Vans should be able to park in at least one out of every six accessible places. These areas ought to be spread out among easily accessible entrances and situated along the most direct path to those entrances.
- **Finishes:** In order to comply with accessibility standards, slip-resistant finishes are necessary.

- **Signage:** In front of parking spaces, the global symbol of accessibility must be erected at least five feet above the ground. Van-accessible locations must be clearly marked.
- **Aesthetics:** Aesthetics influence how people view the building as a whole as well as its residents. Parking garages must to be aesthetically pleasant and simple to find.

Design Considerations

- **Vehicle Weight:** Take into account the weight of any cars that will be kept in the basement.
- **Ceiling Height:** Make sure there is enough ceiling height to allow cars to park comfortably.
- **Slope of Land:** The basement parking area's layout are influenced by the land's slope.

2.1.8 Parking Facilities

Parking facilities can be divided into public parking and private parking.

Public Parking:

- ✓ Everyone in the public is able to drive to and park in public parking, which is overseen by local government bodies.
- ✓ These parking spaces are typically located in public areas such as streets, municipal lots, and designated parking zones.
- ✓ Public parking serves a wide range of users, including residents, visitors, and commuters.

Private Parking:

- ✓ Private parking is owned by a private entity (such as businesses, residential complexes, or institutions).
- ✓ It may be available for use by the public or restricted to specific groups:

Customers: Some private parking areas are exclusively for customers of a particular establishment (e.g shopping malls, restaurants, or theaters).

Employees: Many businesses provide private parking for their employees.

Residents: buildings often have private parking spaces reserved for residents.

- ✓ Private parking can offer additional amenities, security, and convenience but is subject to the rules set by the owner or management.
- ✓ Buildings with parking facilities are form of private parking elements.

2.1.9 Types of Parking

Due to the increase in number of vehicles, the necessity to park them nearby has become a challenge. An appropriate parking solution depends on factors like:

- Type of building project
- Site planning and dimensions
- Land value
- Vehicle types

Parking may take different forms (*Sreyoshi Dhali, 2024*)

2.1.9.1 Underground parking

This is built as a basement or hidden room completely below ground. By creating more room and removing cars from view from the roadway, it permits more active land utilization.

Benefits

Space Optimization: By locating parking underground, valuable surface land is freed up for other uses such as parks, plazas, or commercial spaces.

Aesthetics: Concealing vehicles below ground reduces visual clutter and enhances the overall appearance of the area.

Security: Underground parking provides better security against theft, vandalism, and weather conditions.

Noise Reduction: Vehicles are shielded from street noise, contributing to a quieter environment.

Challenges

Cost: Constructing and maintaining underground parking can be expensive due to excavation, ventilation, and lighting requirements.

Drainage and Ventilation: Proper drainage and ventilation systems are essential to prevent water accumulation and air quality issues.

Accessibility: Ensuring convenient access and egress for vehicles and pedestrians is crucial.

In summary, underground parking optimizes land use, enhances aesthetics, and provides secure storage for vehicles, making it a practical choice for urban environments with limited space.

2.1.9.2 Semi-basement Parking

Semi-basement parking is constructed as a partially covered area or as a semi-basement that is partially below ground level. It requires less excavation, waterproofing, and substructure than underground parking.

Benefits:

Space Utilization: By partially locating parking below ground, valuable surface land remains available for other purposes.

Privacy: Residential and office buildings benefit from increased privacy, as the parking area is not fully visible from the street.

Site Challenges: Semi-basement parking helps address site-related issues, such as dealing with a higher water table.

Challenges:

Accessibility: While it grants privacy, commercial or retail buildings must find solutions to address accessibility challenges.

Design Integration: Designers often incorporate **grilles or landscaping** into the building facade where the semi-basement portion appears above ground level.

2.1.9.3 Undercroft Parking

Undercroft parking refers to utilizing the space below any building situated on a site with inclined topography.

Benefits:

Space Optimization: By utilizing the undercroft, valuable land space is preserved for other purposes.

Aesthetics: Concealing parking below ground maintains a cleaner streetscape.

Privacy: Residents and visitors enjoy privacy, as the parking area is not immediately visible from the street.

Challenges:

Accessibility: Ensuring convenient access for vehicles and pedestrians remains crucial.

Integration with Building Design: Harmonizing undercroft parking with the overall building design is essential.

2.1.9.4 Ground Floor Parking

Ground floor parking refers to parking spaces located directly on the ground level of a building or property.

Benefits:

Simplicity and Cost-Effectiveness: Ground floor parking is straightforward to implement and maintain. It avoids the need for expensive underground structures.

Ease of Access: Vehicles can directly enter and exit without ramps or elevators.

Challenges:

Aesthetics: Ground-level parking can result in **dull and unattractive facades** when visible from the street.

Vehicle Dominance: Large parking areas can dominate the visual landscape, detracting from the overall appeal.

In summary, while ground floor parking offers practicality, thoughtful design interventions are crucial to balance functionality with aesthetics and urban vitality.

2.1.9.5 Surface Floor Parking

These parking arrangements are constructed over an open space without the use of any ground-level enclosed structures. Since it preserves the natural order alongside the constructed environment, it is favored in suburban regions.

Benefits

Cost-Effectiveness: Surface parking tends to be less expensive than above-ground or underground parking structures. It avoids the need for extensive foundations and structural systems.

Energy Reduction: Surface parking can lower energy consumption by producing renewable energy when it is planned with sustainability in mind.

Improved Air and Water Quality: By reducing pollutants, surface parking that is properly designed can help to improve the quality of the air and water.

Traffic Alleviation: Well-organized surface parking layouts help alleviate traffic congestion by efficiently accommodating vehicles.

Challenges

Visual Impact: Large surface parking lots can dominate the landscape, leading to dull and vehicle-dominant facades.

Environmental Impact: If not managed sustainably, surface parking lots can pollute water, contribute to urban heat islands, and disrupt natural landscapes.

Aesthetics: Without thoughtful design, surface parking may lack visual appeal and negatively impact the overall environment.

Accessibility: Ensuring convenient access for both vehicles and pedestrians is essential.

In summary, surface floor parking offers practicality and cost-effectiveness, but integrating it harmoniously with the environment and community requires thoughtful planning and design.

2.1.9.6 Above-Ground Parking

Above-ground parking refers to parking facilities constructed on an elevated platform without any direct connection to the ground level. Because underground parking isn't always an option, above-ground parking is more practical and affordable.

Benefits

Cost-Effectiveness: Since it doesn't require a lot of excavation, it is less expensive to build than underground parking.

Construction Ease: The procedure moves more quickly and causes less disturbance to the neighborhood.

Accessibility: Without ramps or elevators, vehicles can be reached more readily.

Problems.

Challenges

Rising Costs: Building above-ground parking has become more expensive as accessible real estate becomes scarce.

Aesthetic Impact: Because they can dominate the surrounding landscape, large above-ground constructions may need special design solutions to fit in.

2.1.9.7 Multi-story Parking

Multi-storied parking facilities are vertical structures that accommodate parking at multiple levels. Unlike above-ground parking, these facilities are dedicated entirely to parking and are often housed within large buildings.

Benefits

Space Utilization: Multi-storied parking structures optimize land use by accommodating multiple levels of parking within a compact footprint.

Cost-Efficiency: Compared to underground or semi-basement parking, multi-storied options are more economical in terms of construction and maintenance.

Retail and Commercial Synergy: Ground-level retail spaces near multi-storied parking attract longer customer dwell times and enhance the overall urban experience.

Challenges:

Design Complexity: Creating efficient layouts, ramps, and access points across multiple levels requires thoughtful planning.

Visual Integration: Balancing aesthetics with functionality is crucial to avoid creating monolithic structures that dominate the streetscape.

Environmental Impact: Proper ventilation, lighting, and greenery must be considered to mitigate environmental effects.

In summary, multi-storied parking offers space efficiency and adaptability, but successful implementation requires innovative design and consideration of evolving transportation trends.

2.1.9.8 Multi-story Sleeved Parking

These parking spaces are likewise constructed within a massive structure that has several floors designated for parking. On its external face, office, retail, or residential apartments, however, improve the building.

Benefits:

Space optimization: makes effective use of vertical space to fit a large number of parking spots into a small area.

Aesthetic Integration: By hiding parking spots behind more aesthetically pleasing uses, including shop or residential facades, metropolitan areas are made more visually appealing.

Environmental Benefits: It can help with air purification and urban cooling when it is designed with green features.

Challenges:

Complex Design: To guarantee structural integrity and functional design for various functions, meticulous architectural planning is necessary.

Higher Construction Costs: The intricacy of combining several spaces may result in extra expenses.

2.1.9.9 Mechanized Parking

As the name suggests, mechanized parking uses automation technology to park vehicles more efficiently. Mechanized parking is a system that utilizes automation technology to optimize the way vehicles are parked.

Benefits:

Space Efficiency: Mechanized parking optimizes land use, especially in dense urban areas.

Reduced Footprint: Vertical systems require less ground area compared to traditional parking lots.

Enhanced Security: Vehicles are protected from weather, theft, and vandalism.

Challenges:

Initial Investment: Implementing mechanized parking involves higher upfront costs due to specialized equipment.

Maintenance Complexity: Regular maintenance and technical support are essential for smooth operation.

User Adaptation: Users need to be familiar with the automated process and follow guidelines.

2.1.10 Addis Ababa city's strategic plan on the delivery of transportation

The population and economy of the city are expanding quickly. The city's private car population is growing quickly, which exacerbates traffic jams, diminishes public space, pollutes the air, and increases road deaths. Major investments and calculated choices will be needed as the city gets more modern and motorized in order to maintain economic growth and prevent the negative effects of private motorized mobility and traffic congestion.

According to the drafts that have been prepared by transport ministry of Addis Ababa city in order to improve the traffic congestion and coordination of transport services in the city

Here are some of the strong and weak sides that have been identified.

Strong sides that are being implemented

- ♣ New roads and transport infrastructures are being built and expanded.
- ♣ Improvement measures are being undertaken on places that are obstacles to traffic flow by installing pedestrian crossing traffic lights in places where there is a lot of foot traffic and problems for traffic flow.
- ♣ In order to reduce traffic congestion and accidents installation of traffic signals in areas where traffic accidents and pedestrian movements are high;
- ♣ Investigating road safety and flow problems around schools and imposing travel restrictions by installing traffic signs.
- ♣ Planning and participation of the mega project office in the development of parking spaces;
- ♣ The construction and expansion work of railways, depots, terminals, pedestrian and cycle routes, loading and unloading and bus shelters are running away.

Weak sides that need measures

- ♣ Non-implementation of transport infrastructure in accordance with the strategic plan of the structural plan;

- ♣ Failure to provide leadership that takes into account the current situation of the city by having a joint plan with the relevant parties in the sector.
- ♣ Non-standard and inadequate terminals, depots, parking, taxi loading and unloading areas used to facilitate city transport services;
- ♣ Non-motorized transport service lines are built in fragmented manner & are not accessible.
- ♣ To facilitate the flow of traffic and ensure safety

2.1.11 Addis Ababa Parking Strategy

At a rate of 2.1% annually, Addis Ababa's population has been changing extremely quickly (CSA, 2010). For instance, the Addis Ababa Transport Branch Office's 2003–2007 Strategic Plan projects that, as of 2012 E.C., the city's population and human habitation will total 4.5 million. In all communities, transportation is an essential element of economic and social development. The main form of transportation in Ethiopia is the road, which is infamously unreliable and has a number of problems. Users' options for transportation are limited and poor. Addis Ababa's transportation system's dependability is greatly impacted by a number of elements, including organization, environment, infrastructure, technical state, and legislative requirements.

The city's road network, roundabouts, intersections, terminals, and parking areas are basic elements of traffic management, according to Addis Ababa's transport policy from 2011 E.C. Nonetheless, a few of the previously listed aspects of road engineering significantly impact the flow of traffic. Many parts of the city lack amenities, including parking lots, taxi stands, and traffic-calming techniques.

There is a high concentration of motorized vehicles in Addis Ababa. Roughly 80% of all automobiles in the nation are used in urban areas. Dane (n.d.) reports that there are now 202,123 registered automobiles in the capital city. By comparison, the growth from 2006 data, which was 158,252, is 27.27 percent. In 2003, there were 19 paid parking spaces on the street; by 2008, there were 72. Registered parking operator's groups are in charge of overseeing parking spots. The number of jobs associated with parking rose from 207 in 2003 to 1,244 in 2008.

According to the handbook, one of the main infrastructure problems is parking. But given the observed nature of the issues listed in the document, there is an inadequate amount of off-street parking and, on the other hand, an excessive amount of on-street parking. The following are the primary parking-related concerns:

1. Overutilization of Road Space: Parked vehicles occupy a significant portion of road space, leading to congestion and inefficiency.
2. Lack of Off-Street Parking Facilities: The scarcity of designated off-street parking areas exacerbates the problem.
3. Park-and-Ride Facilities: It is essential for sustainable transportation strategy to promote the usage of park-and-ride facilities in combination with mass transit services.

It would be more accurate to characterize the problem as a market failure rather than just a technical one when discussing the infrastructure study and optimization of car parking spaces in Addis Ababa.

2.1.12 Causes of Parking Problems in Buildings

Parking issues in cities and urban areas are a sign of a mismatch between parking supply (the number of spaces enough to accommodate the number of automobiles in need of parking) and parking demand (the number of cars in need of parking spaces).

This gap is due to several reasons

1. Inadequate Parking Space Allocation: One of the main causes of parking issues is a lack of parking spots inside buildings.
2. Badly Designed Parking Facilities: Ineffectively planned parking garages make the problem worse. Parking can be difficult due to things like small lanes, sharp twists, and poor signs.
3. Inadequate Planning During Construction: Shortages occur when parking requirements are not properly planned for during the building design stage.
4. Mixed-Use Developments and Shared Parking: Structures that combine residential and business uses frequently have shared parking areas.
5. Zoning Regulations and Minimum Parking Needs: New developments are frequently subject to minimum parking requirements imposed by zoning rules.
6. Location and Accessibility: Buildings in crowded regions have trouble parking because there isn't enough room.
7. High Demand and Seasonal Variations: Limited parking is available during peak demand times (such as evenings and weekends).
8. Illegal Vehicles and Parking Misuse: Unauthorized parking by visitors or non-staff members may result in fewer spaces becoming available, and vehicles parked improperly or without permits exacerbate the issue.

9. Aging Structures and Retrofit Challenges: It's possible that older structures didn't have enough parking planned when they were first built.
10. Economic Considerations and Cost-Effective Solutions: It's critical to strike a balance between the project's economic feasibility and the expense of adding more parking.

2.1.13 Impacts of Parking Problem in buildings

Parking problems impair urban design. Buildings get farther apart and need more driving when there are more off-street parking spaces available near to or beside each other, which makes walking more difficult.

Furthermore, parking lots create multiple gaps in the façade of buildings, making it very impossible to have aesthetically good, continuous street facades (Manville, M., 2014).

1. Causes Traffic Congestion:

Traffic congestion is a common issue when parking is insufficient and the drivers circling around, searching for available spots, contribute to traffic jams.

2. Inconveniences Customers:

Customer convenience is crucial for successful businesses and Insufficient parking spaces inconvenience visitors.

3. Ruins City's Brand Image:

Disorganized, unprofessional, or unsafe parking lots reflect poorly on business and the negative perceptions affect customer trust and loyalty.

4. Direct Costs to the Business:

Parking shortages have financial implications and businesses may lose customers due to parking issues.

2.1.14 Parking Management

Sufficient accommodations have been made for higher-priority means of transportation, such as walking, cycling, and public transportation, and on-street parking may be made available. Market-based parking fees can help control demand in situations where on-street parking is available. Strong parking enforcement systems are also required to guarantee that, once constructed, walking and bicycling areas are kept up-to-date and clear of encroachments. In the long run, controlling the usage of private motor vehicles and recovering street space for sustainable modes are two benefits of rationalizing on-street parking. The current parking rates, which range from ETB 1-6 per hour, are extremely cheap. Parking costs barely affect the demand for parking at these low levels. The city doesn't have a formal system in place to enforce parking regulations; thus, payment is done manually. In crowded business districts,

parking on sidewalks and in double parking is typical. The use of priceless public space by private automobiles is not adequately compensated for by the city. A parking management plan for the city is presently being developed by the Traffic Management Agency (TMA). An efficient service agreement with parking operators is essential for the successful deployment of a parking management system.

The following components will be included in the new management system:

- ✚ Hand-held devices used by enforcement officers to verify that vehicles have paid the required parking costs and by field executives to administer parking payments. When there is a default, the devices will be used to impose fines.
- ✚ The interaction between field executives, system managers, and the city administration will be provided via management software.
- ✚ Customer service centers, a phone hotline, and a mobile app to provide real-time information on parking availability and customer service.
- ✚ On-street signage, which consists of static signs outlining the parking regulations on each stretch of road as well as dynamic message boards informing drivers about the available capacity in surrounding parking facilities.

Enforcement can be improved by IT-based monitoring of enforcement agents by giving the government regular updates on the quantity of vehicles checked, the status of payments, and the number of enforcement events. A GPS-based system will be used to track each attendant individually, with minimal requirements for the quantity of vehicles to be inspected per hour. The penalties for parking in no-parking zones should be raised in order to significantly alter parking behavior. In addition, physical actions are required to support enforcement efforts. Bollards and other physical barriers are especially necessary to keep automobiles off bike routes and walkways. Bicycle parking can take the place of car parking in commercial areas. Management of on-street parking can support initiatives to control the total amount of available parking. Parking restrictions and management, particularly in developing areas that are easily accessible by other forms of transportation, can encourage more environmentally friendly decisions and free up space for more beneficial uses. Development control regulations should remove the minimum off-street parking requirements and add parking maximums for places along significant public transportation corridors.

2.1.15 Elements of Car parking buildings in Addis Ababa

The following crucial components need to be examined during the building permit provision process for a structure that houses parking.

Separate Entrance and Exit Accesses:

- ✚ Ensuring separate access helps streamline traffic flow and prevents congestion during entry and exit.
- ✚ It is essential to have distinct entrance and exit accesses for a parking building. However, if separate access is not feasible, the minimum width of the combined entrance and exit should be at least 5 meters.

Waiting Space at the Entrance and Exit:

- ✚ The entrance or exit of the parking building should include a designated waiting space for 2-3 cars. This waiting area serves two purposes:
 - Before Entering the Parking Building: Drivers can pause and organize themselves before proceeding into the parking facility.
 - Before Reaching the Main Street: After leaving the parking building, drivers can wait briefly before merging onto the main street.

2.2 Review of Empirical studies

2.2.1 The parking Industry

The results of other relevant empirical studies will be presented in this section of the literature review. This section aims to review the contributions made by other researchers regarding the construction of parking facilities as a traffic-jam-reduction strategy even though much haven't been said.

Inadequate Parking Infrastructure increases the search for traffic as drivers look for available spaces. One potential solution to this issue is to enhance parking accessibility by either building new facilities or making better use of those that already exist. Improved information systems can more effectively direct drivers to open spots; examples of these systems are real-time parking availability apps. Dynamic pricing and other policies that promote parking turnover can also help reduce traffic. In the end, combining these tactics can greatly shorten the amount of time drivers spend looking for parking while also enhancing traffic flow.

(Olorunnimbe, Giwa, Osifodurin,2021)

Parking spots can significantly affect local businesses' bottom lines and property values, according to studies. Parking that is both convenient and plentiful can draw in more consumers, increasing revenue and profitability for surrounding businesses. On the other hand, a scarcity of parking spaces could discourage prospective clients, which would hurt regional business. Additionally, because adequate parking improves accessibility and convenience, property values are typically higher in these types of locations. For this reason,

parking facility strategy is essential to both urban vitality and economic development. (Jun Guo, Hongzhi Guan, Yan Han, and Yunqiang Xue,2023)

Parking that is both convenient and plentiful can draw in more consumers, increasing revenue and profitability for surrounding businesses. On the other hand, a scarcity of parking spaces could discourage prospective clients, which would hurt regional business.

Additionally, because adequate parking improves accessibility and convenience, property values are typically higher in these types of locations. For this reason, parking facility strategy is essential to both urban vitality and economic development. (Zheng, Zeng & Zhang, 2023)

Research has shown that on-street parking can seriously reduce road capacity and cause major delays, especially during peak hours, especially when it is not properly controlled or designed. Traffic safety can be jeopardized by inappropriate parking, which can cause a stop-start situation in the flow of traffic. (Saad Yousif and Purnawan).

2.2.2 Different Articles on parking and traffic congestions

The following articles has been studied extensively. Here are some key findings related to parking systems, parking problems, road capacity and effective management of parking facilities:

Table 1 Different Articles Reviewed

Name of the Researcher	Title of the article	Studies Methods	Final Output of the study
Hua Sha , Rajae Haouari , Mohit Kumar Singh , Evita Papazikou, Mohammed Quddus , Amna Chaudhry , Pete Thomas and Andrew Morris	How can on-street parking regulations affect traffic, safety, and the environment in a cooperative, connected, and automated era?	The study utilized a traffic network model that had been calibrated and validated using AIMSUN Next micro simulation.	Cities can greatly increase mobility, lower emissions, and improve safety by swapping out on-street parking with more effective traffic control methods.

SOFIA SEID AMEDE	Problems associated with on street parking lots in Addis Ababa	using questionnaires and interview	the placement of schools, retail centers, and other locations; the insufficiency of parking spaces; the absence of alternate routes; the growth in the number of automobiles and pedestrians; and the disparity between the quantity of cars and roadways, which results in on-street.
Wengel Yilma	Characteristics and effects of on-street parking in Addis-Ababa a case study on marked box parking facilities in N/silk sub-city	Using field survey	Road capacity is impacted by lane width reduction in traffic lanes and vehicle maneuvering when parking on neighboring lanes.
Semen Bekele Gunjo	Modeling the economic cost of congestion in Addis Ababa City, Ethiopia	Using observation	The results show that the length of the road section, the number of lanes, the volume of traffic, and the income level of the respondents all affect the economic implications of congestion. The study also showed that 74%, 6%, and 20% of the overall cost of congestion can be attributed to travel, vehicle operation, and unreliability, respectively.
Hossam El-Din I. S. Ahmed, Ph.D	Car parking problem in urban areas, causes and solutions	Reviewing the trends	Effective management of parking facilities, encompassing sharing, pricing, parking regulations, and enhancing enforcement, can lead to a rise in efficiency.

2.2.3 Summary and Gap of Literatures

The major findings of the article's reviewed are summarized as the follows: -

- On-street parking and traffic congestion are caused by a lack of parking spots and alternate routes.
- Lane width reduction due to parked cars affects road capacity.
- The economic effects of traffic congestion differ according to the length, volume, and income levels of the road.
- Sharing, charging, enforcing, and regulating parking lots all contribute to efficient parking management.

As far as in study investigation, the articles haven't considered the following areas: -

- The studies don't give insights on how to optimize parking areas specially within buildings.
- The articles haven't considered parking facilities with in buildings.

To summarize the impact of constructing parking facilities on traffic congestion in selected areas of Addis Ababa have been investigated. However, the specific consideration of building-associated parking facilities, which is our primary focus, has not been addressed.”

2.3 Conceptual framework

A conceptual framework for the effect of building parking facilities on traffic congestion was established based on a survey of the literature. It's prepared to illustrate how characteristics of parking facilities influence driver behavior in choosing parking types, which in turn affects traffic congestion and it's illustrated below.

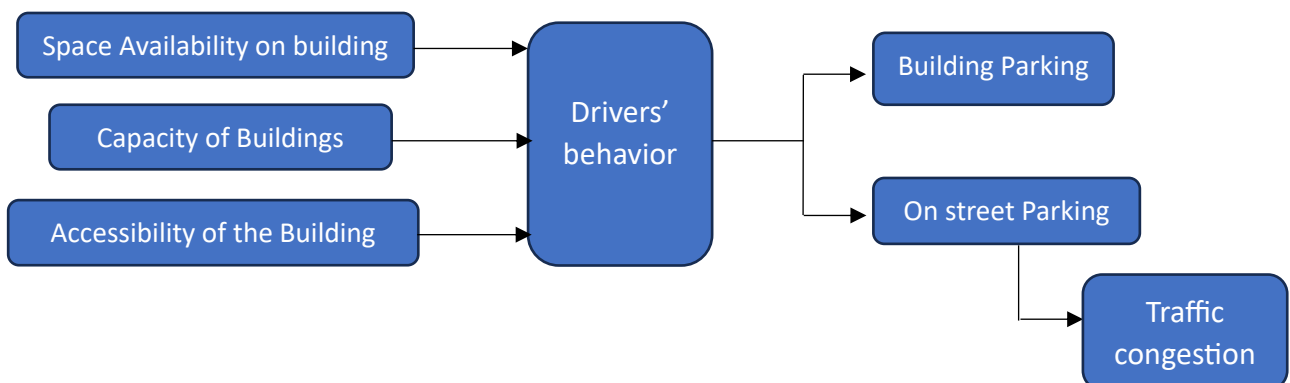


Figure 2.2 Research Conceptual Framework Source Self develop,2024

CHAPTER THREE

Methodology Of the Study

The research process, the choice of the study area, sampling techniques and justification, and the sources of data used in the study are all covered in this chapter, including how the study was carried out with the methods and techniques applied in data collection and the reasons as to why they are to be used according to the research aims and main objectives of the study. The analytical methods that were employed to examine the study's data are also covered.

3.1 Selection of the Study Area

Ethiopia's capital, Addis Ababa, serves as the nation's geographic, political, social, and economic hub. There are bases for the African Union, the Economic Commission for Africa, the Council of the Oriental Orthodox Churches, and many more international organizations. Addis Ababa covers an area of 540 km³ (54000 hectares) and is located at an average elevation of 2500 meters above mean sea level. Addis Ababa has been manifesting to be a fast-growing city in recent decades and contributes about 40% to the national GDP.

Currently, there are 120 Woredas and 11 sub-cities that make up Addis Ababa's administration.

The parameters below are used to select the locations

1. High Commercial Activity

High Commercial Activity is a critical parameter for selecting research locations. This is due to the fact that places with a high volume of commercial activity draw more cars from customers and business owners, which raises the need for parking. An overflow of cars onto the street causes inadequate parking facilities, which exacerbates traffic congestion. Consequently, researching high-traffic areas can yield important information about how well-suited the present parking infrastructure is to the demands of a bustling business district and what can be done to ease traffic. Locations where high commercial activities are widely seen were selected for the study.

2. Prevalence of On-Street Parking

The researcher identified areas with significant traffic congestion and a high prevalence of on-street parking in order to determine the best study locations. In order to fully comprehend the problem, on-street parking was investigated in Addis Ababa's high transportation challenge areas, evaluating parking availability, and the traffic flow. With

their heavy traffic and plenty of on-street parking, the study locations chosen were guaranteed to be representative of Addis Ababa's overall parking and traffic dynamics.

In the end, Mexico, Megenagna, and Merkato were selected as those areas exemplify the challenges faced by Addis Ababa in terms of traffic flow and parking management. The study aims to understand how improved parking facilities within buildings could alleviate city-wide congestion.

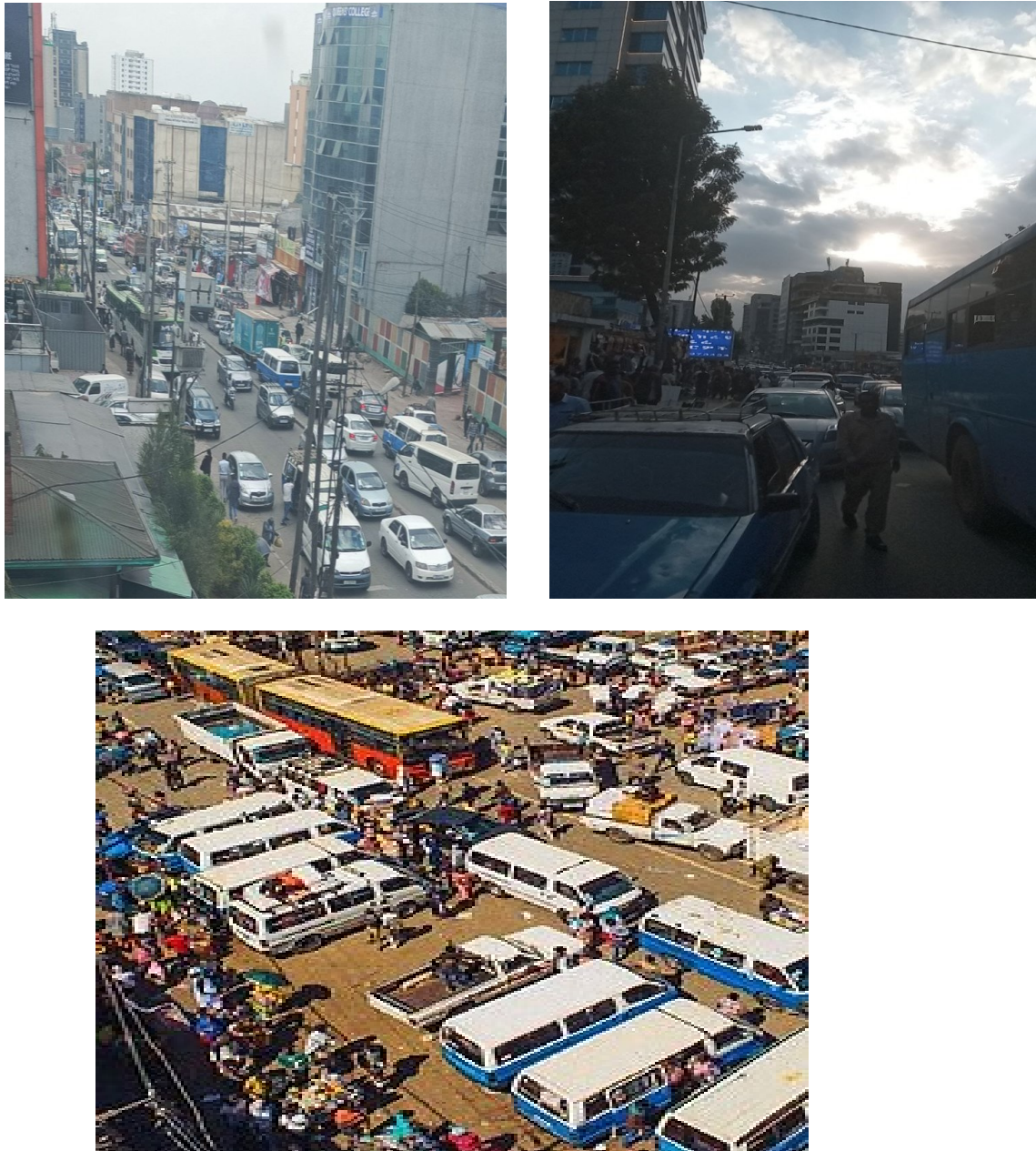


Figure 3.1 On Street Parking and traffic congestion in the selected locations

3.1.1 Characteristics of Each Locations

The selected locations are Merkato, which is located in Nifas Silk City; Mexico, located in Kirkos City; and Megenagna, located in Yeka City.

- **Merkato:** The Hub of Commerce

Is a vibrant market center in the Nifas Silk sub-city. Cars take cover along the curbs from the vivid bustle of vendors and customers. Parking on the street is commonplace, leaving tire stains on the facade of everyday existence.

Parking Facility Gap: Unfortunately, both citizens and visitors to Merkato have difficulties due to the lack of authorized parking spots inside the city's boundaries.

- **Mexico:** The Crossroads of History and Traffic.

A place where ancient architecture and contemporary buzz coexist is cradled in Kirkos Subcity. On-street parking timelessly connects mobility and history.

- **Megenagna:** A Place of Community Guidance

Is an intersection of residences and commerce and is protected by Yeka Sub-city. Here, parked automobiles are accommodated on small roads that quietly reflect the competition for space.

The resolution of this difficulty is necessary to ensure more effective transportation movements across Addis Ababa and to improve urban mobility. By adding more parking places and utilizing the ones that are already there, the city can lower traffic and enhance the quality of life for its residents.

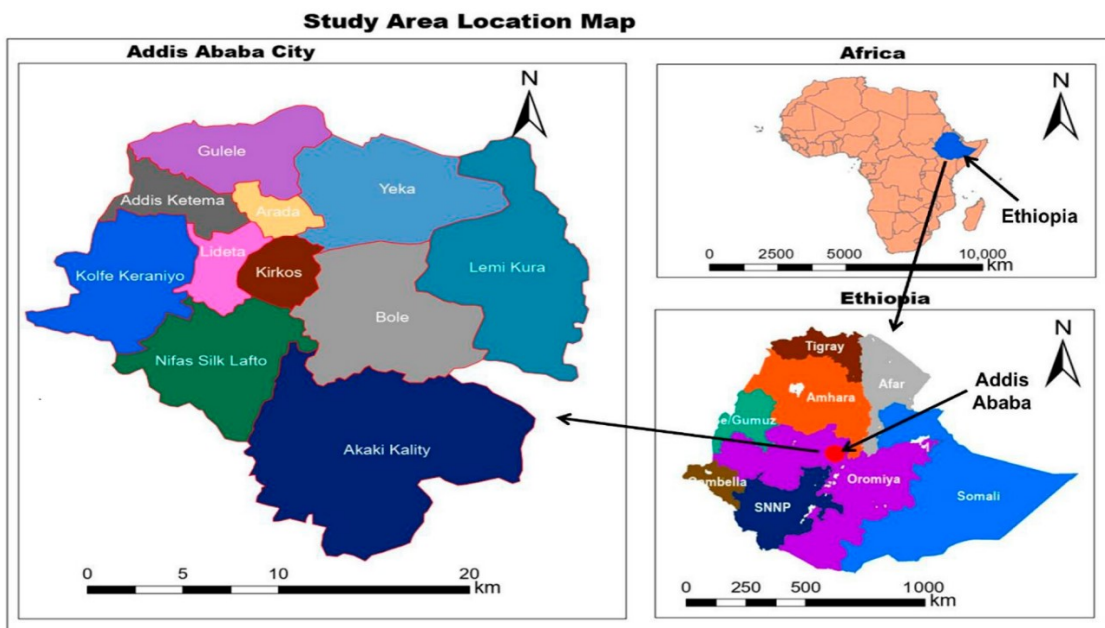


Figure 3.2 Addis Ababa city Map with the Sub-cities

3.2 Research Approach and Research Design

This study utilizes Mixed method approach as it balances the limitations of using a single method by combining qualitative and quantitative research. To provide both depth and breadth of understanding, a concurrent mixed method design is specifically used, in which qualitative and quantitative data are collected concurrently but analyzed separately (Leech & Onwuegbuzie, 2009). With the qualitative data providing context for the numerical findings and vice versa, this approach guarantees that thorough insights are gained and leads to a more robust and nuanced understanding of the research topic.

A research design is a tool that serves as roadmap for carrying out the study's research. In this research, a cross-sectional study design has been employed as the researcher try to collect the data from many individuals at a single point of time. Thus, it enabled qualitative and quantitative data to be collected simultaneously. Because cross-sectional design focuses on what happens or occurs now rather than drawing or following changes at a specific point in time and comparing with the current situation, it is used (Creswell and Clark, 2007).

The study uses an all-encompassing strategy that incorporates both exploratory and descriptive research methods to achieve its goals. The fundamental causes and connections between parking facility within building and traffic congestion are examined using exploratory approaches. Descriptive methods are then applied to systematically characterize these factors and their impacts on traffic flow in specific areas of Addis Ababa.

3.3 Data Type and Source

The study employed both primary and the secondary data types. Building permit officials, experts from the traffic management agency, drivers using roads of the selected locations, and passengers(users) of the road are considered as the primary source of information. While secondary data is collected from unpublished materials from traffic management agency, documents from Addis Ababa Building construction permit. Besides different literatures, journals and research papers related to the topic are considered for the study.

3.4 Data Gathering tools and their design

Different tools have been used for collecting information. Interview and questionnaires were considered as tools for the primary data where secondary data were gathered from traffic management agency and building permit officials.

3.4.1 Designing the Questionnaire

A questionnaire is a type of research tool used to collect data from participants. It consists of a list of questions along with additional prompts.

Three (3) sets of interviews were administered; the first was prepared for drivers using the selected road; the second set of questionnaires was for passengers at the selected locations; and the last set was prepared for building permit officials and traffic management higher officers.

The questionnaire has three sections. The respondent's general information is covered in the first portion; information concerning traffic-related problems in the city is the focus of the second section; and the last section is about building parking facilities in the selected locations of the city.

Both Likert scales and dichotomous forms of questions have been used for the research. The questions were prepared in both English and Amharic versions, as all the respondents might not be literate.

A total of 32 questions were prepared for the passengers, 39 questions for the drivers, and 35 questions for building permit technicians and traffic management higher officers.

The closed-end questions were prepared for a 5-point Likert scale of

1. Not at all significant, slightly significant, moderately significant, very significant, and extremely Significant (Vagias, Wade M. ,2006)
2. Strongly disagree, disagree, neutral, agree, and strongly agree. (Vagias, Wade M. 2006 2006).

The questionnaire was prepared in two forms: manually and using Google Forms.

3.4.2 Designing the Interview

An efficient method for gaining a better sense of the interviewee's thoughts, feelings, or points of view on the topic of discussion is the in-depth interview.

Apart from the previously mentioned significance of an in-depth interview, the interviewee feels at ease responding to the questions because the discussion is one-on-one and there is no room for a group mentality (Milena, 2007). For our research, six in-depth interview questions were prepared, and one official head of a traffic agency was selected for the research who has experience with parking usage and needs in the selected locations.

3.5 Sampling Technique and Sample Size determination

Due to the nature of the research and the intended outcome, both probability and non-probability sampling were used. Type of non-probability sampling known as Expert sampling was utilized for interviewing the head of the traffic Agency as the respondent is selected based on the expertise required for the study and as three questionnaires are prepared for the distinct groups (drivers, passengers and experts of building and traffic agency) and as the targets within these groups are selected randomly the researcher employed stratified random sampling. In this thesis, the researcher tried to have users from the selected locations. Before determining the sample frame, an observation was made to estimate the total number of users in the selected locations. Due to challenges in estimating the exact population size, the researcher opted to sample from each selected location, distributing questionnaires across all chosen sites. Out of the 200-questionnaire distributed 166 responses were obtained. This sample comprised 69 passengers, 56 drivers, and 41 individuals in roles related to traffic management and building regulation, including higher officers and permit officials.

3.6 Data validity and reliability

Concepts like validity and reliability are used to assess the caliber of a research. These ideas are suitable for presenting an amazing research scenario. Validity is the representation of the findings' honesty, whereas reliability is the stability of the findings. (Altheide & Johnson, 1994).

Validity and reliability increase transparency and lessen the chance of introducing researcher bias in qualitative research (Singh, 2014). According to Saunders et al. (2009), a thorough reliability and validity review of secondary data must include an examination of the data gathering methods. These provide an effective means of evaluating results from psychometric instruments (such as symptom scales, questionnaires, education tests, and observer assessments) in clinical practice, research, education, and administration [Cook & Beckman, 2006]. According to Tavakol and Dennick (2011), these concepts are essential to modern research since they increase the accuracy of project appraisal and assessment.

3.7 Ethical consideration

Ethical considerations have been made in order to preserve the data's validity. Before beginning the actual data gathering process, all respondents were informed of the study's goals. They were also told that data providers' concerns, integrity, anonymity, consents, and other human aspects would be kept private and not shared with outside parties.

The responders were shown a letter from the institution requesting their cooperation in order to increase their sense of confidence. They felt free to share their opinions and knowledge about the subject in this way when responding to the questionnaires.

3.8 Data Analysis

Depending on the type of data used, quantitative data analysis approaches have been used to analyze and interpret primary data from the questionnaire (chosen respondents) in the targeted sector, and qualitative methodologies have been used to interpret the interview and the secondary data's that have been collected from traffic management agency and Addis Ababa building permit bureau. The study used descriptive statistical analysis approaches to examine the data collected from the questionnaires. After the data was imported into Excel, it was assessed, exported and examined using SPSS version 27. An evaluation of the existing building parking facilities and traffic management practices was undertaken. These techniques made it easier to report on and assess the practices in this industry. A description of the research findings would be the best evaluation of the real conditions in the sector, which is why the descriptive analysis is necessary to give a better report on what is being done inside the study area.

CHAPTER FOUR

Data Presentation, Interpretation and Analysis

4.1 Introduction

This chapter presents and evaluates the issues related to on-building parking facilities and the congestions encountered in the chosen locations and the data gathered using various data gathering techniques and instruments. The manner in which the data and response questions were presented aligned with the corresponding study topics. In light of it, the responses are presented as follows.

4.2 Analysing Secondary data collected from concerned bodies

4.2.1 Data collected from Addis Ababa City Building Permit and Control Authority

Addis Ababa city building permit and control is an organization that gives permission for the construction of buildings that have above seven (7) stories. This organization ensures compliance with urban development regulations. Data was collected from the organization in order to check whether the buildings given permit from the authority have the required basement facility or not.

As recent data were not available a three (3) year data that is from 2008-2010E.C have been collected from Addis Ababa City Administration Construction Permit and here is the result.

Table 2 Number of buildings given permit from 2008-2010

	2008 (No)	2009(No)	2010(No)
Addis Ketema S/City	22	30	25
Kirkos S/City	125	127	93
Yeka S/City	55	66	66

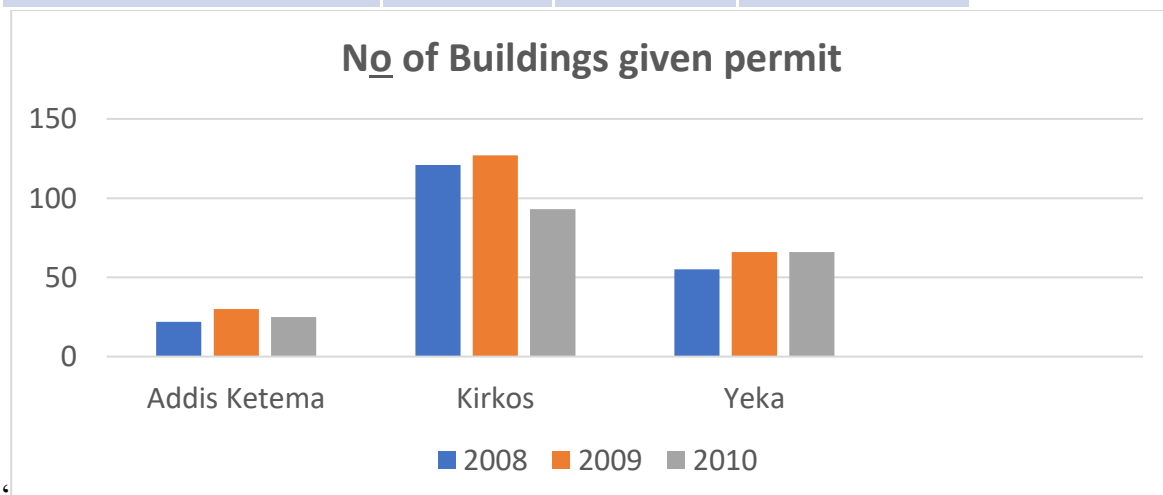


Table 3 Number of buildings with basements from 2008-2010 in the selected S/Cities

	2008 (No)	2009(No)	2010(No)
Addis Ketema S/City	22	28	22
Kirkos S/City	121	124	80
Yeka S/City	48	62	61

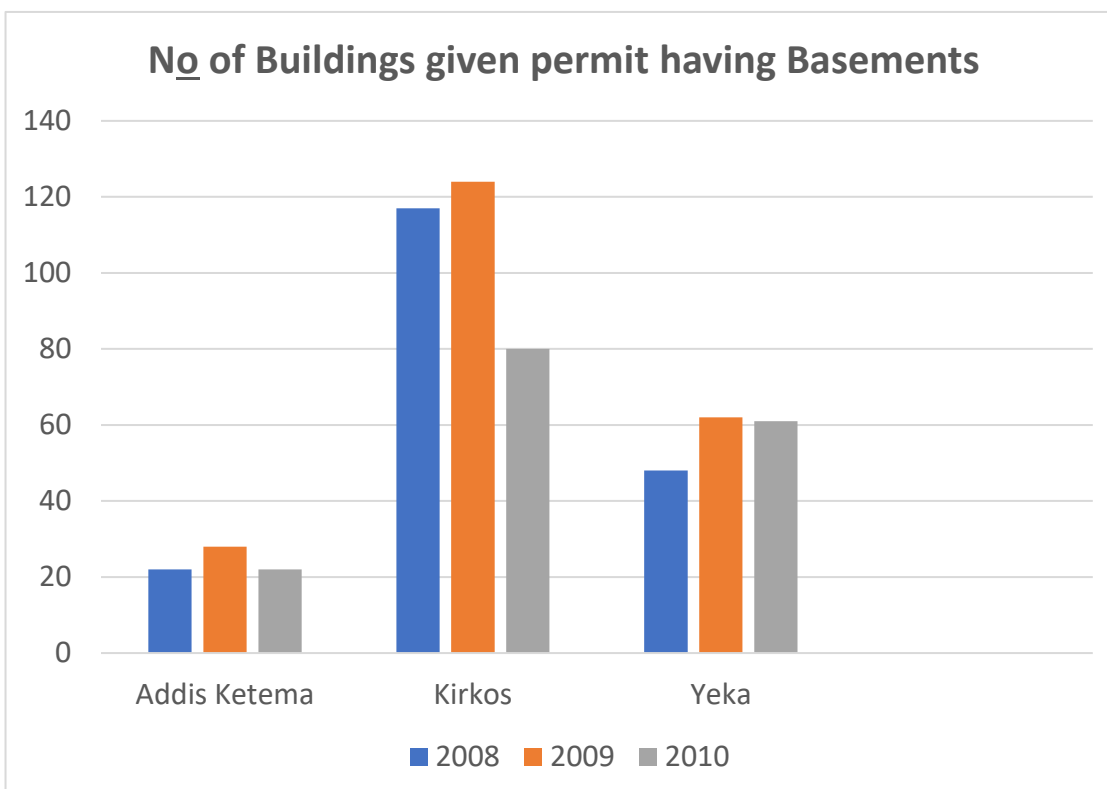
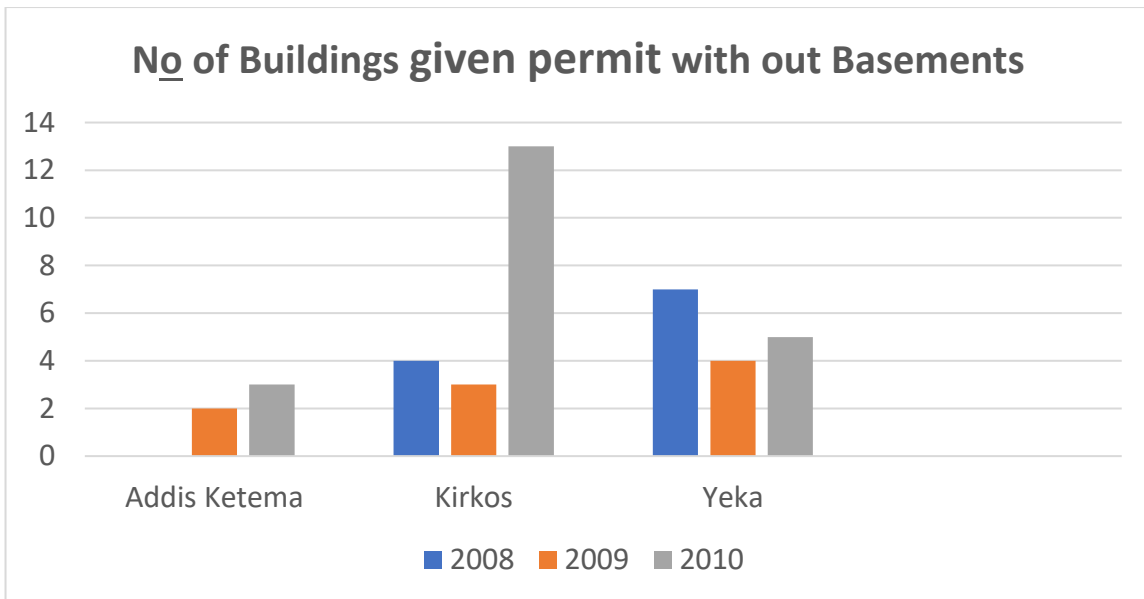
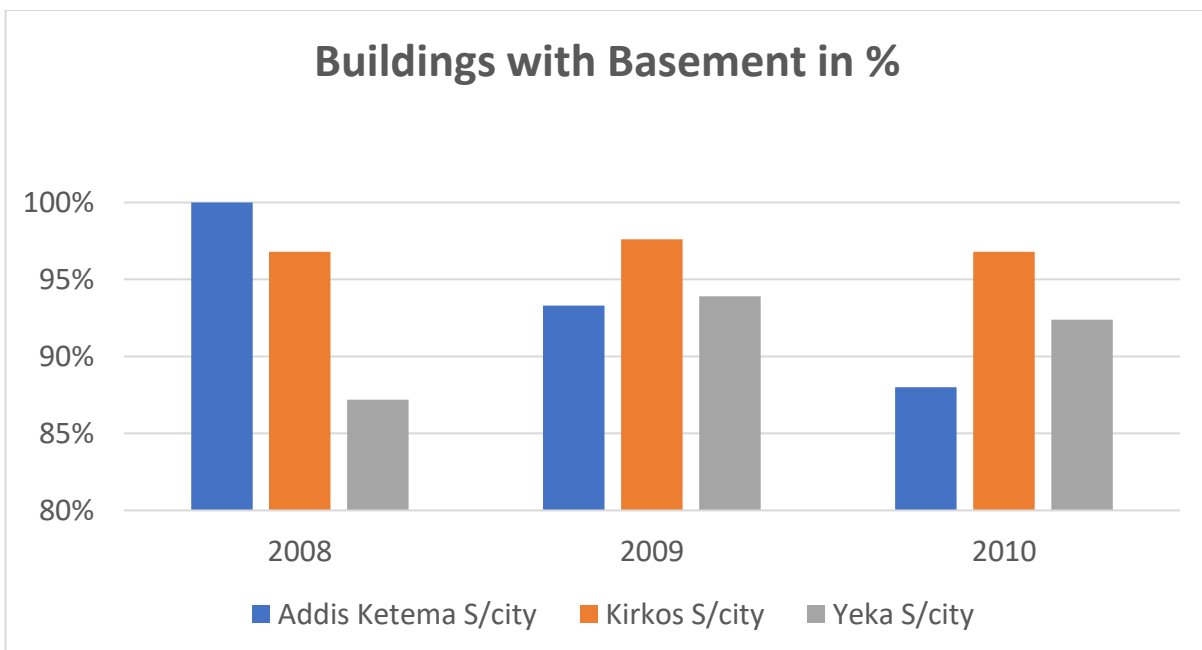


Table 4 Number of buildings with-out basements from 2008-2010 in the selected S/Cities

	2008 (No)	2009(No)	2010(No)
Addis Ketema S/City	-	2	3
Kirkos S/City	4	3	13
Yeka S/City	7	4	5



From the above tables and figures we can say that majority of the buildings that have been given permission for constructing the buildings in the selected sub-cities have a basement facility.



Analyzing the chart, it becomes evident that a substantial majority over 85% of the buildings granted permits are equipped with basement facilities. This finding underscores the significance of basement spaces in the context of building construction and urban planning. These basements serve various purposes, such as storage, parking, utility rooms, or additional living areas.

Parking requirement for individual buildings

Building parking requirement can vary based on the buildings use, size and location.

Generally, planners use different methodologies to determine these requirements.

The table below shows the space requirement that's followed by the building permit officials.

Table 5 Parking space requirement for building

Building Type	Parking Requirement
Rental apartment (flats) and condominium housing	1 car parking space /5 flat
Offices	1 car parking space /150 m ² floor space
Supermarkets, department stores, shops, etc.	1 car parking space /150 m ² floor space
Primary and secondary schools	1 car parking space /2 classrooms
Universities	1 car parking space /5 lecturers
Hospitals	1 car parking space /5 beds
Museums and libraries	1 car parking space /150 m ² floor space
Hotels and motels	1 car parking space /5 beds
Theatres and Cinemas	1 car parking space /10 seats
Stadium	1 car parking space /10 seats
Restaurants, bars, cafes, pastries, etc.	1 car parking space /150 m ² floor space

The information in the table above illustrates the current parking regulations, which stipulate that there must be one parking space for every five rental apartments and one space for every 150 square meters of building area. This criterion implies that there aren't enough parking spaces to accommodate the demand. It is essential to reevaluate and modify the zoning laws in order to alleviate this deficiency. Setting maximum parking limits could be a wise move to guarantee that there is enough parking available.

4.2.2 Data collected from Addis Ababa Traffic Management Agency

Addis Ababa, as a rapidly growing metropolis, faces the dual challenge of urbanization and traffic congestion. To address this, the city's traffic management authorities have been actively conducting inspections on existing buildings to ensure they align with their permitted use.

Purpose of Inspections

The primary objective of these inspections is to verify that buildings are being used in accordance with their intended purpose. This involves assessing whether the actual use matches the zoning regulations and permits granted during construction.

By enforcing compliance, the city aims to enhance safety, optimize land utilization, and maintain the overall urban fabric.

Here below are the results from the inspections undertaken by the bureau

Table 6 Addis Ketema Inspection results

Parking under the building of the Directorate of Road Traffic Infrastructure and Management Office inspection statement from Addis Ketema S/City.							
Partial service							
Building information				A discovery made during the inspection			
No	The name of the building	S/City	Number of vehicles from Building permit	Number of vehicles they can accommodate	Changed quantity	Service used	Explanation
1	3 Blocks	Addis Ketema S/City	56	52	4	Dormitory, office	372 of the permission to use all three buildings
2		Addis Ketema S/City	76	73	3	Guard house	
3		Addis Ketema S/City	92	86	6	Power Box	
4	Building A	Addis Ketema S/City	75	73	2	Tanker storage	It shows 75 on the plan
5	Building B	Addis Ketema S/City	84	82	2	Store	
6	Building C	Addis Ketema S/City	100	86	14	Store, storage for generator, transformer, clothes changer	
7	Building D	Addis Ketema S/City	200	185	15	For shops	The fact that the two basements are fully operational has improved the local traffic flow
8	Building E	Addis Ketema S/City	56	49	7	Generator, water tank	
9	Building F	Addis Ketema S/City	46	44	2	Water tanker	

Upon analyzing the data presented in the table, a notable discrepancy emerges: the number of vehicles specified in the building permit does not align with the current available parking space. This divergence arises primarily due to a shift in the building's purpose or partial utilization of the designated parking area. Consequently, during the inspection, it becomes evident that the parking facilities are not being fully utilized for their intended purpose. Addressing this mismatch is crucial for optimizing urban infrastructure and ensuring efficient use of available resources.

Table 7 Kirkos S/city Inspection results

Parking under the building of the Directorate of Road Traffic Infrastructure and Management Office inspection statement							
Partial service							
Building information				A discovery made during the inspection			
No	The name of the building	Subcity	Number of vehicles from Building permit	Number of vehicles they can accommodate during site visit	Changed quantity	Service used	Explanation
1	Building A	Kirkos S/City	33	27	6	To warehouse	Six cars for another service / warehouse
2	Building B	Kirkos S/City	6	2	4	To warehouse	we do not believe that the space is suitable for parking for two cars only, given the height of the building, we would like to suggest that the building permit be reconsidered.
3	Building C	Kirkos S/City	18	10	8	For office and cafe	Even if the qualification is renewed, the certificate is available at the central branch
4	Building D	Kirkos S/City	7	5	2	For storage	It shows 7 cars and the space can hold only 5 cars. Certificate of qualification has been given for 6 cars. There is no room to add 2 cars.
5	Building E	Kirkos S/City	4	2	2	Garden	The number of cars stated in the certificate of qualification is 4 cars, but it is shown on the plan that it can hold 8 cars. We were there and saw that the place can hold only 6 cars and 2 cars have been converted into a garden.
6	Building F	Kirkos S/City	71	52	19	For storage	Although the plan shows 71 cars, 19 parking spaces have been converted into storage, generators and waste storage.
7	Building G	Kirkos S/City	129	125	4	To warehouse	The parking lot is not available to anyone other than the hotel user
8	Building H	Kirkos S/City	9	5	4	For storage	The parking lot is inconvenient and various items are stored inside.
Completely changed the service							
Building information				A discovery made during the inspection			
No	The name of the building	Subcity	Number of vehicles from Building permit	Number of vehicles they can accommodate during site visit	Changed quantity	Service used	Explanation
1	Building I	Kirkos S/City	14	None	14	For storage	The parking lot has been completely converted for storage
2	Building J	Kirkos S/City	18	None	18	Café	By changing the plan, the basement of the building is completely converted into a cafe, and they are using a place that is not convenient for cars on the side of the road.

The discrepancy between the number of vehicles specified in the building permits and the actual available parking space has led to underutilization of parking facilities. Changes in the buildings' purpose—both partial and complete—have contributed to this mismatch.

Specifically, out of the ten buildings inspected, two have undergone complete transformations, while the remaining eight exhibit partial modifications

Table 8 Yeka S/city Inspection results

Parking under the building of the Directorate of Road Traffic Infrastructure and Management Office inspection statement from Yeka S/City.							
Partial service							
Building information				A discovery made during the inspection			
No	The name of the building	Subcity	Number of vehicles from Building permit	Number of vehicles they can accommodate during site visit	Changed quantity	Service used	Explanation
1	Building A	Yeka S/City	46	46		Unknown	The proposed plan and the situation on the ground are not the same, it lacks important traffic points
2	Building B	Yeka S/City	42	32	10	Storage for construction waste	One of the two basements is in good condition
3	Building C	Yeka S/City	10	8	2	To warehouse	The flooring is good
4	Building D	Yeka S/City	45	27	18	For staff room	Basinet's car park has been completely repurposed. It was not possible to enter and watch for employees and others
5	Building E	Yeka S/City	10	10		Unknown	As the basement plan was not provided, it was not possible to confirm whether or not there is a utility service
6	Building F	Yeka S/City	25	21	4	For office and warehouse	It fulfills important signs and is providing service
7	Building G	Yeka S/City	16	10	6	For office and staff room	It fulfills important signs and is providing service
8	Building H	Yeka S/City	25	21	4	For warehouse rooms	The plan shows three basements with four parking spaces for storage. Ten rooms have been made by reducing some space on basement three.
9	Building I	Yeka S/City	50	30	20	It is not providing service	1 basement is not providing service
10	Building J	Yeka S/City			...		Under-building and above-ground vehicle parking areas are approved by the plan and these areas are being used for their intended purpose. They were told to submit the plan as one of the basements is being used as a supermarket and it is important to check if this is approved by the plan.

Analyzing the data from the table, it becomes evident that the building purposes of structures equipped with parking facilities in Yeka Sub-City have undergone partial modifications

during the inspection period. These changes are significant as they directly impact the overall urban landscape and traffic dynamics.

From the data's collected during our inspections, we can observe that a significant proportion of the buildings equipped with parking facilities in the selected locations have experienced alterations, both partial and complete, over time. These changes may be attributed to various factors, such as urban development, maintenance, or evolving regulations.

1. **Urban Development:** As cities evolve, so do their infrastructure needs. Urban development projects, zoning changes, and shifts in land use can lead to modifications in existing buildings.
2. **Maintenance and Upkeep:** Regular maintenance, repairs, and renovations impact the physical structure of buildings. Parking areas may be expanded, reconfigured, or even relocated during maintenance cycles. Neglected facilities may deteriorate, rendering them unusable for drivers.
3. **Evolving Regulations:** Building codes, safety standards, and environmental regulations change over time. Compliance with these regulations often necessitates adjustments to existing structures. Parking facilities may need upgrades to meet new accessibility requirements or environmental guidelines.

In summary, while the presence of building parking facilities is essential, addressing factors like accessibility, availability, and cost can encourage their utilization. Urban planners and policymakers should consider these dynamics to alleviate traffic congestion and promote efficient parking solutions.

4.3 Analysing Primary data collected from Passenger, Driver, Traffic Officers and Building permit officials of the selected sub-cities

Identification of respondents

In this part, the study provides the details of sex, age, job, educational status and whether the respondents are vehicle owner.

Demographic Characteristics of Respondents

According to the datas most of the respondents are males with age 18-30 that are employed and have an educational background of degree and above and most of them don't have vehicles. The detail is presented in the below table.

Table 9 Demographic information of respondents

Demographic Characteristics		Passenger		Driver		Traffic Officers and Building permit officials	
		Freq	Percent	Freq	Percent	Frequency	Percent
Sex	Male	48	69.6%	37	66.1%	24	58.5%
	Female	21	30.4%	19	33.9%	17	41.5%
	Total	69	100.0%	56	100.0%	41	100.0%
Age	18-30	39	56.5%	31	55.4%	18	43.9%
	31-40	27	39.1%	14	25.0%	17	41.5%
	41-50	3	4.3%	8	14.3%	4	9.8%
	Above 50	-	-	3	5.4%	2	4.9%
	Total	69	100.0%	56	100.0%	41	100.0%
Job	Unemployed	3	4.3%	-	-	-	-
	Employed	56	81.2%	48	85.7%	31	75.6%
	Student	6	8.7%	1	1.8%	4	9.8%
	Private	4	5.8%	7	12.5%	5	12.2%
	Other	-	-	-	-	1	2.4%
	Total	69	100.0%	56	100.0%	41	100.0%
Education Level	Elementary	-	-	-	-	-	-
	High School	1	1.4%	3	5.4%	-	-
	Preparatory	1	1.4%	-	-	-	-
	Diploma	3	4.3%	6	10.7%	1	2.4%
	Degree and above	64	92.8%	47	83.9%	40	97.6%
	Total	69	100.0%	56	100.0%	41	100.0%
Vehicle Owners	No	61	88.4%	10	17.9%	24	58.5%
	Yes	8	11.6%	46	82.1%	17	41.5%
	Total	69	100.0%	56	100.0%	41	100.0%

Part II Analysis of traffic related issues

Q1 What is the major vehicular traffic related problems in the city? Rate the items/indicators from Not at all significant to Extremely significant (1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree).

Table 10 responses from Passengers

Items	Not at all significant		Slightly significant		Moderately significant		Very significant		Extremely Significant	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Traffic accident	4	6%	3	4%	18	26%	16	23%	28	41%
Congestion/jam	1	1%	1	1%	6	9%	17	25%	44	64%
Air pollution	6	9%	8	12%	16	24%	20	29%	18	26%
Noise pollution	8	12%	7	10%	15	22%	23	33%	16	23%
Parking problems	3	4%	-	-	8	12%	20	29%	38	55%
Lack of Public transport	3	4%	2	3%	5	7%	25	36%	34	49%
other factors (increment in transportation fee)	7	14%	8	16%	8	16%	8	16%	19	38%

Source; own survey (2024)

The most crucial issues pertaining to traffic-related issues can now be found by using a relative importance index to rank the issues that are connected to traffic related problems.

$$\text{Relative important index} = \frac{5 N_5 + 4 N_4 + 3N_3 + 2N_2 + 1 N_1}{A * N}$$

N5= number of respondents for Not at all significant

N4= number of respondents for Slightly significant

N3= number of respondents for Moderately significant

N2= number of respondents for Very significant

N1= number of respondents for Extremely Significant

A (highest weight) N (total number of respondents)

Table 11 Importance rank

Issues	Relative important index	Importance rank
Congestion/jam	0.896	1
Parking problems	0.861	2
Lack of Public transport	0.846	3
Traffic accident	0.777	4
Air pollution	0.706	5
Others factors	0.696	6
Noise pollution	0.693	7

The three most important traffic-related issues are parking issues, traffic congestion/jam, and a lack of public transportation, according to data from the Relative Importance Index (RII). They have corresponding RII values of 0.846, 0.861, and 0.896. Resolving these critical issues is necessary in order to solve traffic issues from the viewpoint of the passengers. By concentrating on these important areas, traffic will be better managed and commuters will have a better overall experience.

Table 12 Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Traffic accident	69	4.00	1.00	5.00	3.8841	1.16992
Congestion/jam	69	4.00	1.00	5.00	4.4783	0.83329
Air pollution	68	4.00	1.00	5.00	3.5294	1.25151
Noise pollution	69	4.00	1.00	5.00	3.4638	1.27855
Parking problems	69	4.00	1.00	5.00	4.3043	0.98972
Lack of Public transport	69	4.00	1.00	5.00	4.2319	1.01670
Others	50	4.00	1.00	5.00	3.4800	1.48791
Valid N (listwise)	49					

Source Own Survey (2024)

The mean score for traffic accidents is 3.88, meaning that most respondents (passengers) concur that accidents happen frequently in the chosen areas. The mean score for congestion/jam is 4.48, indicating that most respondents concur that traffic is a common problem in those areas. With a mean score of 3.53, air pollution is clearly regarded as a problem by respondents. Even though noise pollution has the lowest mean score (3.46), most respondents still recognize its occurrence. Finally, passengers generally agree that parking issues are common in those locations, as indicated by the mean score of 4.3 for parking problems. Regarding lack of public transport, the mean score is 4.23, this indicates most of the respondents agreed there is lack of public transport in the selected locations and Regarding others the mean score is 3.48 which shows there are other problems that affect the selected locations moderately.

Table 13 responses from Drivers for Q1

Items	Not at all significant		Slightly significant		Moderately significant		Very significant		Extremely Significant	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
Traffic accident	1	2%	-	-	13	23%	16	29%	26	46%
Congestion/jam	1	2%	-	-	2	3%	15	27%	38	68%
Air pollution	3	5%	9	16%	17	30.5%	17	30.5%	10	18%
Noise pollution	2	3.6%	9	16.1%	16	28.6%	14	25%	15	26.8%
Parking problem	2	3.6%	2	3.6%	2	3.6%	16	28.6%	34	60.7%
Lack of Public transport	1	1.8%	2	3.6%	10	17.9%	12	21.4%	31	55.4%
other factors (increment in transportation fee)	4	12%	1	3%	8	24.2%	11	33.3%	9	27.3%

Source; own survey (2024)

Table 14 Importance rank

Issues	Relative important index	Importance rank
Congestion/jam	0.918	1
Parking problems	0.879	2
Lack of Public transport	0.846	3
Traffic accident	0.836	4
Others factors	0.721	5
Noise pollution	0.711	6
Air Pollution	0.679	7

The three most important traffic-related issues are lack of public transportation, parking issues, and congestion/jam, according to data from the Relative Importance Index (RII). They have corresponding RII values of 0.918, 0.879, and 0.846. Thus, from the driver's point of view, resolving these significant issues is essential to solving traffic-related issues.

Table 15 Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Traffic accident	56	4.00	1.00	5.00	4.1786	0.91666
Congestion/jam	56	4.00	1.00	5.00	4.5893	0.73303
Air pollution	56	4.00	1.00	5.00	3.3929	1.12296
Noise pollution	56	4.00	1.00	5.00	3.5536	1.15868
Parking problems	56	4.00	1.00	5.00	4.3929	0.98495
Lack of Public transport	56	4.00	1.00	5.00	4.2500	0.99544
Others	33	4.00	1.00	5.00	3.6061	1.27327
Valid N (listwise)	33					

Source Own Survey (2024)

With a mean score of 4.17 for traffic accidents, most drivers who responded to the survey agreed that these particular locations are where most traffic accidents occur. With regard to traffic jams, the average score of 4.58 suggests that most drivers who responded to the survey agreed that traffic jams primarily occur in the designated areas. The mean score for air pollution is 3.39, the lowest of all the elements, but most people still agreed that it occurs frequently. With a mean score of 3.55 for noise pollution, the majority of respondents drivers agreed that it is typically observed. The mean score for parking issues was 4.39, indicating that most drivers agreed that parking issues are common in those particular locations. Regarding lack of public transport, the mean score is 4.25, this indicates most of the respondents agreed there is lack of public transport in the selected locations and Regarding others the mean score is 3.6 which shows there are other problems that affect the selected locations moderately.

Table 16 responses from Traffic Officers and Building Permit officials for Q1

Items	Not at all significant		Slightly significant		Moderately significant		Very significant		Extremely Significant	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
Traffic accident	-	-	1	2.4%	6	14.6%	16	39%	18	43.9%
Congestion/jam	-	-	1	2.4%	-	-	7	17.1%	33	80.5%
Air pollution	2	4.9%	6	14.6%	9	22%	13	31.7%	11	26.8%
Noise pollution	-	-	7	17.1%	7	17.1%	16	39%	11	26.8%
Parking problem	1	2.4%	1	2.4%	3	7.3%	9	22%	27	65.9%
Lack of Public transport	1	2.4%	1	2.4%	4	9.8%	14	34.1%	21	51.2%
other factors (increment in transportation fee)	1	2.4%	7	17.1%	-	-	7	17.1%	7	17.1%

Source; own survey (2024)

Table 17 Importance rank

Issues	Relative important index	Importance rank
Congestion/jam	0.951	1
Parking problems	0.893	2
Lack of Public transport	0.859	3
Traffic accident	0.849	4
Noise pollution	0.751	5
Air Pollution	0.722	6
Others factors	0.709	7

With a relative important index (RII) of 0.951, 0.893, and 0.859, respectively, the top three significant related issues of traffic related problems are congestion/jam, parking issues, and a lack of public transportation, according to the aforementioned Relative Important Index data. Therefore, it is crucial to pay close attention to these crucial issues in order to solve traffic-related issues from the perspective of officers and officials.

	N	Range	Minimum	Maximum	Mean	Std. Deviation
Traffic accident	41	3.00	2.00	5.00	4.2439	0.79939
Congestion/jam	41	3.00	2.00	5.00	4.7561	0.58226
Air pollution	41	4.00	1.00	5.00	3.6098	1.18064
Noise pollution	41	3.00	2.00	5.00	3.7561	1.04356
Parking problems	41	4.00	1.00	5.00	4.4634	0.92460
Lack of Public transport	41	4.00	1.00	5.00	4.2927	0.92854
Others	22	4.00	1.00	5.00	3.8636	1.03719
Valid N (listwise)	22					

Source Own Survey (2024)

With a mean score of 4.24 for traffic accidents, the majority of respondents—both officers and officials—agreed that the chosen locations account for the majority of traffic accidents. The mean score for congestion/jam is 4.75, meaning that most respondents—officers and officials—agreed that congestion occurs primarily in those designated areas. The average score for air pollution was 3.61, indicating that most respondents—that is, officers and officials—agreed that air pollution is one of the issues. The majority of respondents agreed that noise pollution was significant in the chosen locations, as indicated by the mean score of 3.75 for this category. With regard to parking issues, the average score was 4.46, indicating that most officials and officers concurred that parking issues are observed widely in those selected locations. Regarding lack of public transport, the mean score is 4.29, this indicates most of the respondents agreed there is lack of public transport in the selected locations and Regarding others the mean score is 3.86 which shows there are other problems that affect the selected locations moderately.

Q2. What are the major causes of congestion in the city? Rate the items/indicators from Not at all significant to Extremely significant (1. Strongly disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly agree).

Table 19 responses from Passengers

Items	Not at all significant		Slightly significant		Moderately significant		Very significant		Extremely Significant	
	Freq	%	Fre	%	Freq	%	Freq	%	Freq	%
Shortage of infrastructure supply	4	6%	-	-	7	10%	18	26%	40	58%
Lack of Building parking facility	1	1%	1	1%	5	7%	27	39%	35	51%
population and economic growth	1	1%	4	6%	17	25%	20	29%	27	39%
Vehicle break downs	5	7%	12	17%	26	38%	17	25%	9	13%
Traffic rule violation	5	7%	9	13%	18	26%	18	26%	19	28%
Unplanned stoppage/ parking	3	4%	4	6%	22	32%	17	25%	23	33%
Poor Signaling	7	10%	9	13%	21	30%	17	25%	15	22%
Lack of investment in transport infrastructure	1	1%	4	6%	7	10%	24	35%	33	48%
Reduction of road space due to road construction	2	3%	3	4%	11	16%	26	38%	27	39%
other factors	7	15%	9	20%	7	15%	8	17%	15	33%

Source; own survey (2024)

Table 20 Importance rank

Issues	Relative important index	Importance rank
Lack of Building parking facility	0.872	1
Shortage of infrastructure supply	0.861	2
Lack of investment in transport infrastructure	0.843	3
Reduction of road space due to road construction and maintenance	0.812	4
population and economic growth	0.797	5
Unplanned stoppage/ parking	0.754	6
Traffic rule violation	0.707	7
Poor Signaling	0.670	8
other factors	0.665	9
Vehicle break downs	0.638	10

We can determine from the previous Relative Important Index data that the top three significant issues relating to the city's congestion are a lack of parking facilities, a shortage of infrastructure, and a lack of investment in transportation infrastructure with Relative important index (RII), 0.872, 0.861 and 0.843 respectively and Poor signaling, others and

vehicle breakdown are the bottom three issues with Relative importance index (RII) 0.67,0.665 and 0.638 respectively. Therefore, it is critical to pay close attention to these crucial issues in order to solve traffic congestion from the perspective of passengers.

Table 21 responses from Drivers for Q2

Items	Not at all significant		Slightly significant		Moderately significant		Very significant		Extremely Significant	
	Freq	%	Fre	%	Freq	%	Fre	%	Freq	%
Shortage of infrastructure supply	-	-	1	1.8%	3	5.4%	13	23.2%	39	69.6%
Lack of Building parking facility	2	3.6%	1	1.8%	5	8.9%	11	19.6%	37	66.1%
population and economic growth,	-	-	2	3.6%	13	23.2%	19	33.9%	22	39.3%
Vehicle break downs	1	1.8%	15	26.8%	16	28.6%	19	33.9%	5	8.9%
Traffic rule violation	3	5.4%	4	7.1%	17	30.4%	17	30.4%	15	26.8%
Unplanned stoppage/ parking,	2	3.6%	11	19.6%	12	21.4%	17	30.4%	14	25%
Poor Signaling	6	10.7%	11	19.6%	17	30.4%	14	25%	8	14.3%
Lack of investment in transport infrastructure	2	3.6%	4	7.1%	10	17.9%	19	33.9%	21	37.5%
Reduction of road space due to road construction and maintenance	1	1.8%	4	7.1%	8	14.3%	20	35.7%	23	41.1%
other factors	3	5.4%	3	5.4%	10	17.9%	8	14.3%	8	14.3%

Source; own survey (2024)

Table 22 Importance rank

Issues	Relative important index	Importance rank
Shortage of infrastructure supply	0.921	1
Lack of Building parking facility	0.886	2
population and economic growth,	0.818	3
Reduction of road space due to road construction and maintenance	0.814	4
Lack of investment in transport infrastructure	0.789	5
Traffic rule violation	0.732	6
Unplanned stoppage/parking	0.707	7
other factors	0.694	8
Vehicle break downs	0.643	9
Poor Signaling	0.625	10

From the above Relative important index data; we can analyze that Shortage of infrastructure supply, Lack of Building parking facility and population and economic growth are the top three important issues related to the congestion in the city with Relative important index (RII), 0.921, 0.886 and 0.818 respectively and others, vehicle breakdown and Poor signaling, are the bottom three issues with Relative importance index (RII) 0.694,0.643 and 0.625 respectively. Therefore, it is critical to pay close attention to these crucial issues in order to solve traffic congestion from the perspective of drivers.

Table 23 responses from Traffic Officers and Building Permit officials for Q2

Items	Not at all significant		Slightly significant		Moderately significant		Very significant		Extremely Significant	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
Shortage of infrastructure supply	-	-	-	-	8	19.5%	8	19.5%	25	61%
Lack of Building parking facility	-	-	2	4.9%	5	12.2%	13	31.7%	21	51.2%
population and economic growth,	2	4.9%	1	2.4%	6	14.6%	14	34.1%	18	43.9%
Vehicle break downs	-	-	7	17.1%	12	29.3%	15	36.6%	7	17.1%
Traffic rule violation	-	-	3	7.2%	9	22%	20	48.8%	9	22%
Unplanned stoppage	-	-	5	12.2%	7	17.1%	18	43.9%	11	26.8%
Poor Signaling	1	2.4%	4	9.8%	18	43.9%	10	24.4%	8	19.5%
Lack of investment in transport infrastructure	-	-	3	7.3%	4	9.8%	13	31.7%	21	51.2%
Reduction of road space due to road construction and maintenance	-	-	1	2.4%	4	9.8%	14	34.1%	22	53.7%
other factors	2	4.9%	4	9.8%	5	12.2%	6	14.6%	6	14.6%

Source; own survey (2024)

Table 24 Importance rank

Issues	Relative important index	Importance rank
Shortage of infrastructure supply	0.883	1
Reduction of road space due to road construction and maintenance	0.878	2
Lack of Building parking facility	0.859	3
Lack of investment in transport infrastructure	0.854	4
population and economic growth	0.820	5
Unplanned stoppage/ parking	0.771	6
Traffic rule violation	0.771	6
Vehicle break downs	0.707	8
Poor Signaling	0.698	9
other factors	0.687	10

From the above Relative Important Index data, we can determine that the top three issues relating to city congestion are shortage of infrastructure supply, reduction of road space due to construction and maintenance, and lack of building parking facilities (RIIs: 0.883, 0.878, and 0.859, respectively), and the bottom three issues are vehicle breakdown, poor signaling, and other issues (RIIs: 0.707, 0.698, and 0.687, respectively).

Parking Related Questions

Table 25 responses from Passengers

Items	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
On street parking results traffic congestion	29	42%	26	38%	4	6%	2	3%	8	12%
There is enough parking situation on the selected locations	6	9%	5	7%	8	12%	24	35%	26	38%
It's difficult to find building parking space in the selected locations	5	7%	7	10%	7	10%	23	33%	27	39%
Lack of parking facility on buildings causes on-street parking	6	9%	7	10%	5	7%	35	51%	16	23%
on-street parking result car accident	66	96%	3	4%	-	-	-	-	-	-

Based on the feedback, most passengers believe that on-street parking does not significantly contribute to traffic congestion. They perceive that there is sufficient parking availability in the selected locations, despite challenges in finding building parking spaces. However, it's important to note that on-street parking, while seemingly convenient, carries a low probability of causing car accidents.

Table 26 Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
On street parking results traffic congestion	69	4.00	1.00	5.00	3.9565	1.22995	1.513
There is enough parking situation on the selected locations	69	4.00	1.00	5.00	2.0435	1.28835	1.660
It's difficult to find parking space in the selected locations	69	4.00	1.00	5.00	3.8551	1.25177	1.567
Lack of parking facility on buildings causes on-street parking	69	4.00	1.00	5.00	3.8696	1.24750	1.556
on-street parking result in car accidents	69	4.00	1.00	5.00	3.6957	1.19194	1.421
Valid N (listwise)	69						

Table 27 responses from Drivers for parking related questions

Items	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
On street parking results traffic congestion	2	3.6%	1	1.8%	3	5.4%	25	44.6%	25	44.6%
There is enough parking situation on the selected locations	18	32.1%	17	30.4%	3	5.4%	8	14.3%	10	17.9%
Buildings with parking facility in those locations utilized for their intended purposes	8	14.3%	21	37.5%	7	12.5%	9	16.1%	11	19.6%
Lack of parking facility on buildings causes on-street parking	2	3.6%	5	8.9%	3	5.4%	20	35.7%	26	46.4%
on-street parking result in car accidents	2	3.6%	9	16.1%	3	5.4%	25	44.6%	17	30.4%
Problems are encountered when parking in Buildings	5	8.9%	11	19.6%	10	17.9%	20	35.7%	10	17.9%

From the feedbacks given; drivers predominantly believe that on-street parking exacerbates traffic congestion. They perceive a lack of sufficient parking facilities in the selected locations. Additionally, they think that buildings equipped with parking spaces are not optimally utilized for their intended purpose. The scarcity of building parking spaces leads to on-street parking, which, despite its convenience, may contribute to car accidents. Furthermore, drivers encounter challenges when attempting to park within buildings

Table 28 Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
On street parking results traffic congestion	56	1.00	5.00	4.2500	0.91949	0.845
There is enough parking situation on the selected locations	56	1.00	5.00	2.5536	1.51261	2.288
It's difficult to find parking space in the selected locations	56	1.00	5.00	2.8929	1.38405	1.916
Lack of parking facility on buildings causes on-street parking	56	1.00	5.00	4.1250	1.09648	1.202
on-street parking result in car accidents	56	1.00	5.00	3.8214	1.14586	1.313
Problems are encountered when parking in Buildings	56	1.00	5.00	3.3393	1.23989	1.537

Table 29 responses from Traffic management officers and Building Permit officials for parking related questions

Items	Strongly disagree		Disagree		Neutral		Agree		Strongly agree	
	Fre	%	Fre	%	Fre	%	Fre	%	Fre	%
There is enough parking situation on the selected locations	18	43.9%	18	43.9%			4	9.8%	1	2.4%
Lack of parking facility on buildings results on-street parking	9	22%			4	9.8%	16	39%	12	29.3%
Buildings with parking facility in the selected locations are being utilized for their purpose	10	24.4%	12	29.3%	6	14.6%	10	24.4%	3	7.3%
Existing parking policies regarding buildings implemented strictly	11	26.8%	14	34.1%	6	14.6%	8	19.5%	2	4.9%
Availability of building parking facility affects the traffic flow	9	22%	5	12.2%	6	14.6%	12	29.3%	9	22%
Congestions are seen on building entrances due to lack of parking	4	9.8%	5	12.2%	3	7.3%	16	39%	13	31.7%
Do you think existing parking regulations on buildings should be amended	3	7.3%	3	7.3%	4	9.8%	17	41.5%	14	34.1%
on-street parking result car accident	4	9.8%	2	4.9%	9	22%	16	39%	10	24.4%

Based on the input from Traffic Management Officers and Building Permit Officials; insufficient parking space in selected locations leads to on-street parking. Buildings with parking facilities are underutilized, and parking policies lack strict enforcement. Availability of parking affects traffic flow, and congestion near building entrances is common due to the scarcity of parking spaces. Officials recommend amending parking regulations, but challenges persist when trying to park within buildings.

Table 30 Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation
There is enough parking situation on the selected locations	41	4.00	1.00	5.00	1.8293	1.02231
Lack of parking facility on buildings results in on-street parking	41	4.00	1.00	5.00	3.5366	1.48488
Buildings with parking facility in the selected locations are being utilized for their purpose	41	4.00	1.00	5.00	2.6098	1.30150
Existing parking policies regarding buildings implemented strictly	41	4.00	1.00	5.00	2.4146	1.22425
Availability of building parking facility affects the traffic flow	41	4.00	1.00	5.00	3.1707	1.48159
Congestions are seen near building entrances due to lack of parking	41	4.00	1.00	5.00	3.7073	1.30851
Do you think existing parking regulations on buildings should be amended	41	4.00	1.00	5.00	3.8780	1.18733
on-street parking result car accidents	41	4.00	1.00	5.00	3.6341	1.19909
Valid N (listwise)	41					

Dichotomous Questions responses

Responses from Passengers

Q1 Are you happy with the current parking situation of the selected locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	67	95.7	95.7	95.7
	Yes	2	4.3	4.3	100.0
	Total	69	100.0	100.0	

Q2 If your answer for the previous question is No, please specify the reason by ticking one or more of the following

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	2	2.9	2.9	2.9
	Lack of sufficient parking space	38	55.1	55.1	58.0
	Inadequate parking options	14	20.3	20.3	78.3
	Inefficient parking configurations	4	5.8	5.8	84.1
	Inconvenient for loading & unloading	3	4.3	4.3	88.4
	Lack of sufficient parking space & Inadequate parking options	1	1.4	1.4	89.9
	Lack of sufficient parking space, Inadequate parking options & Inefficient parking configurations	1	1.4	1.4	91.3
	ALL	6	8.7	8.7	100.0
	Total	69	100.0	100.0	

Q3 What do you think is the level of traffic congestion in the selected locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	9	13.0	13.0	13.0
	Medium	14	20.3	20.3	33.3
	High	21	30.4	30.4	63.8
	Very High	25	36.2	36.2	100.0
	Total	69	100.0	100.0	

Q4 What are the trends and patterns in parking demand in the specified locations over the past two years

		Frequency	Percent	Valid Percent	Cumulative percent
Valid	Decrease	3	4.3	4.3	4.3
	Increase	56	81.2	81.2	85.5
	None	10	14.5	14.5	100.0
	Total	69	100.0	100.0	

Q5 At what time of day you are likely to see traffic congestions in local time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Between 1:00-3:00 am	30	43.5	43.5	43.5
	Between 3:00-6:00 am	5	7.2	7.2	50.7
	Between 6:00-9:00am	6	8.7	8.7	59.4
	Between 9:00-12:00 pm	16	23.2	23.2	82.6
	Between 12:00pm-3:00 pm	5	7.2	7.2	89.9
	Overnight	1	1.4	1.4	91.3
	Between 1:00-3:00 am & Between 9:00-12:00 pm	1	1.4	1.4	92.8
	Between 1:00-3:00 am & Between 12:00-3:00 pm	3	4.3	4.3	97.1
	Between 1:00-3:00 am, Between 9:00-12:00 pm & Between 12:00-3:00 pm	2	2.9	2.9	100.0
	Total	69	100.0	100.0	

Responses from Drivers

Q1, Do you use parking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	3.6	3.6	3.6
	Sometimes	28	50.0	50.0	53.6
	Always	26	46.4	46.4	100.0
	Total	56	100.0	100.0	

Q2 What are the reasons behind your parking

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Work/Business related	43	76.8	76.8	76.8
	Non-work/ non-business	7	12.5	12.5	89.3
	Entertainment	3	5.4	5.4	94.6
	Others	3	5.4	5.4	100.0
	Total	56	100.0	100.0	

Q3 Are you happy with the current parking situation of the selected locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	52	92.9	92.9	92.9
	Yes	4	7.1	7.1	100.0
	Total	56	100.0	100.0	

Q4 If your answer is “No” for question No 1, please specify the reason by selecting from the following

		Frequency	Percent	Valid Percent	Cumulative Percent
	No Need	4	7.1	7.1	7.1
	Lack of sufficient parking space	10	17.9	17.9	25.0
	Inadequate parking options	7	12.5	12.5	37.5
	Inefficient parking configurations	1	1.8	1.8	39.3
	Inconvenient for loading & unloading	2	3.6	3.6	42.9
	Lack of sufficient parking space & Inadequate parking options	4	7.1	7.1	50.0
	Lack of sufficient parking space, Inadequate parking options, Inefficient parking configurations	6	10.7	10.7	60.7
	All	22	39.3	39.3	100.0
	Total	56	100.0	100.0	

Q5 What type of parking do you prefer

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	On-street parking	11	19.6	19.6	19.6
	Off- street parking	7	12.5	12.5	32.1
	Building parking	23	41.1	41.1	73.2
	Smart parking centers	15	26.8	26.8	100.0
	Total	56	100.0	100.0	

Q6 What do you think is the level of traffic congestion in the selected locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Medium	6	10.7	10.7	10.7
	High	17	30.4	30.4	41.1
	Very High	33	58.9	58.9	100.0
	Total	56	100.0	100.0	

Q7 For how long do you use on street parking in the selected locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Up to 30min	17	30.4	30.4	30.4
	30min-1hr	20	35.7	35.7	66.1
	1hr-3hr	10	17.9	17.9	83.9
	More than 3hr	9	16.1	16.1	100.0
	Total	56	100.0	100.0	

Q8 At what time of day are you likely to park in local time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Between 1:00-3:00 am	10	17.9	17.9	17.9
	Between 3:00-6:00 am	13	23.2	23.2	41.1
	Between 6:00-9:00am	5	8.9	8.9	50.0
	Between 9:00-12:00 pm	12	21.4	21.4	71.4
	Between 12:00pm-3:00 pm	1	1.8	1.8	73.2
	Overnight	15	26.8	26.8	100.0
	Total	56	100.0	100.0	

Q9 Is it easy to find parking space in the selected locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	49	87.5	87.5	87.5
	Yes	7	12.5	12.5	100.0
	Total	56	100.0	100.0	

Q10 If your answer is “No”, for the previous question at what times do the problems occur

		Monday-Friday		Saturday		Sunday	
		Frequency	Percent	Frequency	Percent	Frequency	Percent
Valid	No response	7	12.5	7	12.5	7	12.5
	Morning	36	64.3	7	12.5	11	19.6
	Afternoon	9	16.1	36	64.3	19	33.9
	Evening	4	7.1	6	10.7	19	33.9
	Total	56	100.0	56	100.0	56	100.0

Q11 What measures do you take if parking spots are not available

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Waiting	7	12.5	12.5	12.5
	Illegal parking	12	21.4	21.4	33.9
	Searching another parking	37	66.1	66.1	100.0
	Total	56	100.0	100.0	

Q12 Indicate your reasons for using on street parking instead of parking in Buildings

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Lack of building parking facility	35	62.5	62.5	62.5
	Lack of space for parking	19	33.9	33.9	96.4
	Others	2	3.6	3.6	100.0
	Total	56	100.0	100.0	

Responses From Traffic Management Officers and Building Permit officials

Q1 What do you think is the level of traffic congestion in the selected locations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low	1	2.4	2.4	2.4
	Medium	3	7.3	7.3	9.8
	High	14	34.1	34.1	43.9
	Very High	23	56.1	56.1	100.0
	Total	41	100.0	100.0	

Q2 What percentage of building parking spaces are occupied during peak hours

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Up to 25%	1	2.4	2.4	2.4
	25-50%	10	24.4	24.4	26.8
	50-75%	13	31.7	31.7	58.5
	more than75%	17	41.5	41.5	100.0
	Total	41	100.0	100.0	

Q3 When does parking demand exceeds capacity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Working days	36	87.8	87.8	87.8
	Weekends	4	9.8	9.8	97.6
	Holidays	1	2.4	2.4	100.0
	Total	41	100.0	100.0	

Q4 What are the trends and patterns in parking demand in the specified locations over the past two years

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Decrease	1	2.4	2.4	2.4
	None	10	24.4	24.4	26.8
	Increase	30	73.2	73.2	100.0
	Total	41	100.0	100.0	

Q5 At what time of day you are likely to see traffic congestions in local time

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Between 1:00-3:00 am	21	51.2	51.2	51.2
	Between 3:00-6:00 am	3	7.3	7.3	58.5
	Between 6:00-9:00am	1	2.4	2.4	61.0
	Between 9:00-12:00 am	1	2.4	2.4	63.4
	Overnight	15	36.6	36.6	100.0
	Total	41	100.0	100.0	

4.3 Response from the Interview

The interview discussion was made with traffic management official head. The respondent's response to the questions is examined in the following manner.

Table 31 Interview questions with their response

No	Question	Response
Q1	What strategies do you use to reduce traffic congestion in a particular area?	Different types of strategies can be used to reduce traffic congestion these include <ul style="list-style-type: none"> ✓ Prohibition of flow-based vehicle parking and preparing fixed parking facilities ✓ By closing unnecessary bends ✓ If the place is a junction, changing it to a traffic signal ✓ If it is a square, demolish and change it to a signal
Q2	Is there enough Building parking facility in Mexico, Megenagna and Merkato locations? If no what is the reason behind?	Although there are many buildings specially in Mexico and Megenagna, the parking spaces, the basement, are used for other purposes as a result we can say there is no enough building parking facility in the selected locations
Q3	How much does lack of building parking facility affect the traffic	Due to the lack of building parking facilities in the selected locations, the experience of standing on the road is becoming an experience on the main roads of the city. There is a high demand for parking in some

	congestion in the selected locations?	places, and the number of vehicles stopping even in one direction is high. In some places, residents are forced to stand at the gate and as a result, these on-street parking's would result in congestion/jams
Q4	Are buildings being checked for their permitted use? What measures would be taken if the permit have been changed?	Yes, but not to a level that is sufficient and even if it is controlled, it depends on the voluntary nature of the building owners, but since April 1st, a law has been passed to force building parking, so we are preparing to enforce it. If the permitted use of a building is changed, we will take measures against the owners.
Q5	Inorder to reduce on-street parking and improve the utilization of building parking facility what measures should be taken?	Different measures should be taken inorder to reduce on-street parking and to improve building parking facility usage these include <ul style="list-style-type: none"> ✓ The city administration should allow a place for parking ✓ Encourage investors to construct parking facilities in buildings by offering them special incentives. ✓ To make the buildings that's built by the owners used for the permitted use ✓ To strictly control the building usage
Q6	What types of strategy and policy solve the current parking practice in Addis Ababa? Would you please describe how Addis Ababa city implement them?	To address parking issues and relieve traffic congestion, Addis Ababa has been putting numerous tactics and policies into practice. Using a smart parking system, standardizing rules and procedures, creating a master plan for parking places, adjusting parking fees, and other things are a few of them. Smart facilities, modified policies, and uniform procedures all work together to create a city parking ecosystem that is more effective.

According to the perception of the traffic management official head, to mitigate Addis Ababa's traffic congestion, it is critical to address the repurposing of building parking spaces, which has led to a lack of sufficient facilities. One major factor contributing to the congestion on the main thoroughfares is the high demand for parking and the limited supply. It will take a diversified approach to address this issue.

First and foremost, it is essential to construct permanent parking facilities. To guarantee that these efficient service areas have the highest demand, significant consideration of location should go into their construction. Second, the use of traffic management technologies to optimize junctions can significantly improve traffic flow and lessen bottlenecks.

Moreover, the participation of the local administration is crucial in this undertaking. When assigning parking spots, it ought to be proactive in making sure that they are used for the original purpose and aren't put to other uses. Enforcement of regulations and the provision of incentives for appropriate use can accomplish this. In addition to increasing parking availability, encouraging building owners to use parking spaces for their intended purposes will help to lessen traffic congestion.

It is projected that by implementing these changes, Addis Ababa's traffic flow will improve, resulting in a more planned and effective use of the infrastructure in the city.

CHAPTER FIVE

Summary, Conclusions, Recommendations

5.1 Summary of the findings

Based on the discussions in the previous chapter, the major findings of the study are summarized as follows.

Here below are the results obtained from primary and secondary sources in relation to research questions

I. Regarding primary factors contributing to traffic congestion in selected areas of the city.

- ✚ The main factors contributing to congestion within the city include infrastructure shortages, a lack of building parking facilities, and insufficient investment in the transport sector.

II. Regarding Current state of parking facilities within buildings interms of capacity

- ✚ More than 85% of the buildings are granted permits as they are equipped with basement facilities.
- ✚ The current parking requirement show that there must be one parking spot for every 150 square meters of building area.

III. Regarding Utilization of building parking facilities in those locations of Addis Ababa

- ✚ One of the reasons why lack of building parking facilities comes from is changes in permitted use without getting the required acceptance from the building permit which shows they are not being utilized for their purpose.

IV. Regarding the effect of Availability of building parking facilities on the level of congestion in selected locations.

- ✚ More than 75% of building parking spaces are occupied during peak hour worsening the level of congestion in the selected locations.
- ✚ Although drivers favour parking within buildings, the scarcity of such parking spaces forces them to park on the street, consequently narrowing the roadways in the selected locations.

V. Regarding how the enforcement of building parking regulations improve the efficiency of traffic flow.

- ✚ The head of the traffic management office acknowledged that building parking regulations had been laxly enforced. However, recognizing the significant contribution to citywide

congestion, the agency has begun to strictly enforce these regulations on building owners to improve traffic flow efficiency.

5.2 Conclusion

The study's main goal was to determine how parking facilities affect urban traffic congestion. Merkato, Mexico, and Megenagna were the three locations chosen from Addis Ababa City to provide a clear understanding of the subject.

In order to achieve the objectives, data have been collected from different organs, which are building permit officials of the selected locations, experts of the traffic management agency, drivers that use different forms of parking, and passengers using the roads of Megenagna, Mexico, and Merkato.

The purpose of the study was to comprehend how building parking availability affects traffic congestion and how parking rules are enforced within buildings. The findings indicate that while a majority of buildings are equipped with basement facilities, there is a significant lack of utilization due to changes in permitted use without proper approval. This has led to an increased reliance on on-street parking, exacerbating congestion and dissatisfaction among drivers.

Additionally, the study shows that inadequate building parking facilities, a lack of investment in the transportation sector, and a lack of infrastructure are the main causes of traffic congestion. Officials in charge of traffic management and building permits have stated that changes to the current parking laws are necessary to guarantee that buildings are used for their intended purposes.

5.3 Recommendations

Based on basis of the findings of this research work, the following recommendations are suggested to solve the traffic congestions happening due to lack of building parking facilities.

- I. **Enforce Existing Regulations:** strengthen the enforcement of current parking regulations within buildings to ensure that changes in permitted use are approved and that buildings are utilized for their intended purpose.
- II. **Re-Evaluating Building Parking Area Allocations:** there is a need to re-evaluate and increase the total area allocated for parking within buildings.

- III. **Increase Building Parking Facilities:** Encourage the construction of additional building parking facilities in order to accommodate the growing demand and lessen the dependency on street-side parking, which exacerbates traffic congestion.
- IV. **Optimize Parking Configuration:** Redesign parking spaces for efficiency, with adequate space for better configuration to meet drivers' preferences.
- V. **City Administration Involvement:** To effectively address parking issues, the city administration should actively participate in assigning designated parking spaces and encouraging appropriate building use.
- VI. **Invest in Transport Infrastructure:** Make enough investments in the transportation sector, emphasizing the development of new and upgraded infrastructure to reduce traffic.

According to the research, better parking facilities within buildings along with enhanced public transportation can significantly reduce traffic congestion. Adopting these strategies by policymakers is imperative in mitigating the issues arising from inadequate parking in buildings.

To comprehensively address this issue additional studies should be undertaken on topics such as advancements in the parking industry innovations, adapting intelligent transportation systems and Smart parking centers in minimizing congestion problems. Such comprehensive investigations will provide a holistic view of the factors affecting traffic flow and offer insights into potential solutions for urban traffic management.

References

- 8.4 – Urban Transport Challenges | The Geography of Transport Systems. (2017, November 30). <https://transportgeography.org/contents/chapter8/urban-transport-challenges/>
- 9 Distinct Types Of Parking. (n.d.). Retrieved May 28, 2024, from <https://thearchspace.com/9-distinct-types-of-parking/>
- 2012 Rushmoor Borough Council election. (2021). In Wikipedia. https://en.wikipedia.org/w/index.php?title=2012_Rushmoor_Borough_Council_election&oldid=1000716817
- Adane, B. (n.d.). THE FEDERAL DEMOCRATIC REPUBLIC OF ETHIOPIA MINISTRY OF TRANSPORT TRANSPORT POLICY OF ADDIS ABABA ADDIS ABABA. Retrieved April 7, 2024, from https://www.academia.edu/39234345/THE_FEDERAL_DEMOCRATIC_REPUBLIC_OF_ETHIOPIA_MINISTRY_OF_TRANSPORT_TRANSPORT_POLICY_OF_ADDIS_ABABA_ADDIS_ABABA
- Altheide, D. L., & Johnson, J. M. (1994). Criteria for Assessing Interpretive Validity in Qualitative Research. In N. K. Denzin & Y. S. Lincoln (Eds.). *Handbook of Qualitative Research*, pp. 485-499. Thousand Oaks, CA: SAGE.
- Aguinaldo, J. P. (2004). Rethinking Validity in Qualitative Research from a Social Constructionist Perspective: From Is this Valid Research? To What Is this Research Valid for?. *The Qualitative Report*, 9(1), 127-136. <https://doi.org/10.46743/2160-3715/2004.1941>
- Balcombe, R.J., York, I.O., 1993. The future of residential parking. Project Report 22, Transport Research Laboratory
- Biswas, S., Chandra, S., & Ghosh, I. (2017). Effects of On-Street Parking In Urban Context: A Critical Review. *Transportation in Developing Economies*, 3, 1–14. <https://doi.org/10.1007/s40890-017-0040-2>
- Boro, D., Ahmed, M. A., & Goswami, A. (2015). Impact of On-Street Parking on Traffic Flow Characteristics. *Journal of Civil Engineering and Environmental Technology*, 2(7), 555-559.
- Bulactial A, Dizon F, Garcia MW et al (2013) Comparison of on-street parking management in Ermita-Malate Manila and Makati central business district. *Proc East Asia Soc Transp Stud* 9
- Chaniotakis, E. (2014). *Parking Behavioural And Assignment Modelling: Methodology And Application For The Evaluation Of Smart Parking Applications* Master Thesis. Delft University Of Technology.

- Chiguma MLM (2007) Analysis of side friction impact on urban road links; case study Dar-es-salaam. Royal Institute of Technology Stockholm, Sweden
- Colonna, P., Berloco, N., & Circella, G. (2012). The Interaction between Land Use and transport Planning: A Methodological Issue. *Procedia - Social and Behavioral Sciences*, 53, 84–95. <https://doi.org/10.1016/j.sbspro.2012.09.862>
- Cook, D. A., & Beckman, T. J. (2006). Current Concepts in Validity and Reliability for psychometric Instruments: Theory and Application. *The American Journal of Medicine*, 119, 166.e7-166.e16.
- Creswell, J. W., & Clark, V. L. P. (2007). *Designing and conducting mixed methods research*. Sage Publications, Inc.
- Central Statistical Agency (2010) about population growth in Addis Ababa
- Cullinane B, Smith D, Green P (2004) Where, when, and how well people park: a phone survey and field measurements. *UMTRI Rep 2004:18*
- Gomm, R. (2009). *Key concepts in social research methods*. Hampshire, United Kingdom: Palgrave Macmillan.
- H.Mariam, M. K. (2017). Workshop On Promoting Soot-Free Public Transport.
- Ison S, Rye T (2006) Parking. *Transp Policy* 13:445–446. doi:10.1016/j.tranpol.2006.05.0017.
- Kusumastuti, D. & Nicholson, A. (n.d.). ER26 Mixed-Use Urban Planning and development. *Land | Free Full-Text | Land Use Impacts on Traffic Congestion Patterns: A Tale of a Northwestern Chinese City*. (n.d.). Retrieved April 5, 2024, from <https://www.mdpi.com/2073-445X/11/12/2295>
- Leech, N. L., & Onwuegbuzie, A. J. (2009). A typology of mixed methods research designs. *Quality & Quantity: International Journal of Methodology*, 43(2), 265–275.
- Litman, T. (1999). Exploring the Paradigm Shifts Needed To Reconcile Transportation and Sustainability Objectives. *Transportation Research Record*, 1670, 8–12. <https://doi.org/10.3141/1670-02>
- Manville, M. (2014), “Improving Cities Through Parking Policy”, *JOURNEY*.
- Marsden, G. and May, A.D. (2005) ‘Do institutional arrangements make a difference to transport policy and implementation? Lessons from Great Britain’, Forthcoming in *Environment and Planning C: Government and Policy*.
- Msigwa, R. E., & Bwana, K. M. (2013). Parking Challenges Facing Urban Cities in Tanzania: Evidence from Dar es Salaam City. *Journal of Economics and Sustainable Development*, 4(15), 94.

NCHRP (2019). The National Cooperative Highway Research Program, Collaborative Efforts of the Federal Highway Administration. Washington, DC: Transportation Research Board.

Olagunju, K. (2015). Evaluating traffic congestion in developing countries—a case study of Nigeria.

Parking Challenges in Dar es Salaam City, about inadequacy of parking space – Kiunsi 2011, Shoup 2005b, RAC Foundation 2004, Balcombe and York 1993, (Marsden and May 2005).

Parking Facilities | WBDG - Whole Building Design Guide. (n.d.). Retrieved April 2, 2024, from <https://wbdg.org/building-types/parking-facilities>

Peprah C, Oduro CY, Ocloo KA (2014) On-street parking and pedestrian safety in the Kumasi metropolis: issues of culture and attitude. *Dev Ctry Stud* 4:85–95

Rodrigue, J-P; Comtois, & C.; Slack, B. (2009). *The Geography of Transport Systems* (2nd ed.). London: Routledge

Sajeev, A., Vidwans, S., Mallick, C., & Jog, Y. (2015). Understanding Smart and Automated Parking Technology. *International Journal of U- and e- Service, Science and Technology*, 8, 251–262. <https://doi.org/10.14257/ijunesst.2015.8.2.25>

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research Methods for Business Students*, (5th Ed.). Harlow, Pearson Education.

Shah, A., Shah, D., Satpute, A., Shinde, M., & Shinde, S. (n.d.). Literature Review on Parking System. *International Journal of Engineering Research*, 10(10).

Shoup, D. C. (2006). Cruising for parking. *Transport Policy*, 13(6), 479–486. <https://doi.org/10.1016/j.tranpol.2006.05.005>

Singh, A. S. (2014). Conducting Case Study Research in Non-Profit Organizations. *Qualitative Market Research: An International Journal*, 17, 77–84.

Tavakol, M., & Dennick, R. (2011). Making Sense of Cronbach's Alpha. *International journal of Medical Education*, 2, 53-55.

Transport, T. F. (2011). *Transport Policy Of Addis Ababa. The Federal Democratic Republic Of Ethiopia Ministry Of Transport.*

Vagias, Wade M. (2006). "Likert-type scale response anchors. Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. Clemson University

Appendix
ADDIS ABABA UNIVERSITY
SCHOOL OF COMMERCE
DEPARTMENT OF PROJECT MANAGEMENT
QUESTIONNAIRES

Dear respondents,

I am a graduate student at Addis Ababa University School of commerce undertaking a Master's degree in project management I am conducting research on the title "**Assessing the impact of building parking facilities on traffic congestion in selected locations of Addis Ababa: A Case Study of Mexico, Megegnagna, and Merkato locations**". This questionnaire is designed to collect data on the mentioned topic for academic purposes Therefore, I kindly ask you to give me a few minutes of your time to answer the questions. The information you will provide will be treated with the utmost confidentiality and will only be used for academic purposes. Thank you in advance for your cooperation. For any information's you can contact me through davesis012@gmail.com

General Instructions

- You do not need to write your name
- Use tick mark (✓) to answer the questions on the space provided

Personal Information of respondents

1. Gender

Male

Female

2. Age

18-30

31-40

41-50

Above 50

3. Job

Unemployed

Employed

Student

Private

Other

4. Educational level

Elementary High School Preparatory
 Diploma Degree and above

5. Do you have a vehicle?

Yes No

Part II Traffic related questions

Choose the number and mark what you choose in the box

1. What is the major vehicular traffic related problems in the city?

Items	Absolutely significant	Largely	Reasonably significant	To some extent	Not significant
Traffic accident					
Congestion/jam					
Air pollution					
Noise pollution					
Parking problems					
Lack of Public transport					
Others					

2. What are the major causes of congestion in the city?

Items	Absolutely significant	Largely	Reasonably significant	To some extent	Not significant
Shortage of infrastructure supply					
Lack of Building parking facility					
population and economic growth					
Vehicle break downs					
Traffic rule violation					
Unplanned stoppage/ parking					
Poor Signaling					
Lack of investment in transport infrastructure					
Reduction of road space due to road construction and maintenance					
Others. please specify					

Part III Parking related questions to be filled by drivers

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
On street parking results traffic congestion					
There is enough parking situation on the selected locations					
Buildings with parking facility in those locations utilized for their intended purposes					
Lack of parking facility on buildings causes on-street parking					
on-street parking result in car accidents					
Problems are encountered when parking in Buildings					

1. Do you use parking?

Always Sometimes Never

2. What are the reasons behind your parking?

Work/Business related Non-work/ non-business

Entertainment Others

3. Are you happy with the current parking situation of the selected locations?

Yes No

4. If your answer is “No” for question No 3, please specify the reason by ticking one or more of the following

Lack of sufficient parking space Inadequate parking options

Inefficient parking configurations Inconvenient for loading & unloading

5. What type of parking do you prefer

On-street parking Off- street parking

Building parking Smart parking centers

6. What do you think is the level of traffic congestion in the selected locations?

Low Medium

High Very High

7. For how long do you use on street parking in the selected locations?

Up to 30min 30min-1hr

1hr-3hr More than 3hr

8. At what time of day are you likely to park in local time?

Between 1:00-3:00 am Between 3:00-6:00 am

Between 6:00-9:00am Between 9:00-12:00 am

Between 12:00pm-3:00 pm Overnight

9. Is it easy to find parking space in the selected locations?

Yes No

10. If your answer for question No 13 is “Yes”, at what times do these problems occur?

Days	Morning	Afternoon	Evening
Monday-Friday			
Saturday			
Sunday			

11. What measures do you take if parking spots are not available?

Waiting Illegal parking Searching another parking

12. Indicate your reasons for using on street parking instead of parking in Buildings?

Lack of building parking facility Lack of space for parking

Others

Part III Parking related questions to be filled by passengers

Items	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)
On street parking results traffic congestion					
There is enough parking situation on the selected locations					
It's difficult to find parking space in the selected locations					
Lack of parking facility on buildings causes on-street parking					
on-street parking result in car accidents					

Choose your response by checking [√], filling in the blanks.

1. Are you happy with the current parking situation of the selected locations?

Yes No

2. If your answer is “No” for question No 1, please specify the reason by ticking one or more of the following

Lack of sufficient parking space Inadequate parking options

Inefficient parking configurations Inconvenient for loading & unloading

3. What do you think is the level of traffic congestion in the selected locations?

Low Medium

High Very High

4. What are the trends and patterns in parking demand in the specified locations over the past two years?

Increase None Decrease

5. At what time of day you are likely to see traffic congestions in local time?

Between 1:00-3:00 am Between 3:00-6:00 am

Between 6:00-9:00am Between 9:00-12:00 pm

Between 12:00pm-3:00 pm Overnight

Part III Parking related questions to be filled by Building Permit officials of the selected sub-cities and Traffic Management Authority employees.

Items	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
There is enough parking situation on the selected locations					
Lack of parking facility on buildings results in on-street parking					
Buildings with parking facility in the selected locations are being utilized for their purpose					
Existing parking policies regarding buildings implemented strictly					
Availability of building parking facility affects the traffic flow					
Congestions are seen near building entrances due to lack of parking facilities					
Do you think existing parking regulations on buildings should be amended					
on-street parking result in car accidents					

Choose your response by checking [√], filling in the blanks.

1. What do you think is the level of traffic congestion in the selected locations?

Low

Medium

High

Very High

2. What percentage of those parking spaces are occupied during peak hours?

Up to 25%

25-50%

50-75%

more than 75%

3. When does parking demand exceeds capacity?

Working days

Weekends

Holidays

4. What are the trends and patterns in parking demand in the specified locations over the past two years?

Increase

None

Decrease

5. At what time of day you are likely to see traffic congestions in local time?

Between 1:00-3:00 am

Between 3:00-6:00 am

Between 6:00-9:00am

Between 9:00-12:00 am

Between 12:00pm-3:00 pm

Overnight



አዲስ አበባ ዩኒቨርሲቲ
የንግድ ትምህርት ቤት

ውድ ምላሽ ሰጪዎች

በአዲስ አበባ ዩኒቨርሲቲ ንግድ ትምህርት ቤት በፕሮጀክት ማኔጅመንት ሁለተኛ ዲግሪዬን እየሰራሁ ሲሆን “ በህንጻዎች ላይ ያሉ የፓርኪንግ መሰረተ ልማቶች በትራፊክ መጨናነቅ ላይ ያላቸው ተፅዕኖ በተመረጡ የአዲስ አበባ ከተሞች; ሜክሲኮ፣ መገናኛና መርካቶ አካባቢዎች” በሚል ርዕስ ጥናታዊ ስራዬን እየሰራሁ ሲሆን ይህ መጠይቅ በተጠቀሰው ርዕስ ላይ መረጃ ለመሰብሰብ የተነደፈው ለአካዳሚክ ዓላማ ብቻ በመሆኑ ለጥያቄዎች መልስ ለመስጠት ጥቂት ደቂቃዎችን እንድትሰጡኝ በትህትና እጠይቃለሁ። እርስዎ የሚያቀርቡት መረጃ ለጥናታዊ ዓላማ ብቻ የሚቀርብ መሆኑን ለማሳወቅ እወዳለሁ። ለትብብራቹ አስቀድሜ አመሰግናለሁ።

ለማንኛውም መረጃ በ davesis012@gmail.com ሊያገኙኝ ይችላሉ።

አጠቃላይ መመሪያዎች

- ስምዎን መጻፍ አያስፈልግዎትም
- በተሰጠው ቦታ ላይ ያሉትን ጥያቄዎች ለመመለስ ምልክት (✓) ይጠቀሙ

Addis Ababa University Institute of Technology School of Commerce

ይህ መጠይቅ የተዘጋጀው ለድህረምረቃ (MSC) መመሪያ ጽሁፍ “ በህንጻዎች ላይ ያሉ የፓርኪንግ መሰረተ ልማቶች በትራፊክ መጨናነቅ ላይ ያላቸው ተፅዕኖ በተመረጡ የአዲስ አበባ ከተሞች; ሜክሲኮ፣ መገናኛና መርካቶ አካባቢዎች” በሚል ርዕስ ላይ ነው።

ክፍል 1. የግል መረጃዎች

ከተሰጡት አማራጮች መካከል በሚሥማሙት ላይ የ”✓” ምልክት ያስቀምጡ።

1. ጾታ

ወንድ

ሴት

2. ዕድሜ

18-30

31-40

41-50

ከ 50 በላይ

3. የስራ ድርሻ

ሥራ አጥ

ተቀጣሪ

ተማሪ

የግል ስራ

ሌላ

4. የትምህርት ደረጃ

አንደኛ ደረጃ

ሁለተኛ ደረጃ ትምህርት ቤት

መሰናዶ

የዲፕሎማ

ዲግሪ እና ከዚያ በላይ

5. ተሽከርካሪ አለህ/አለሽ

አዎ

አይ

ክፍል II ትራፊክን የተመለከቱ ጥያቄዎች

በተመረጡት ቦታዎች (መርካቶ፣ ሜክሲኮ እንዲሁም መገናኛ) የመኪና ማቆሚያ/ፓርኪንግን የተመለከቱ በተሳፋሪዎች፣

በግንባታ ፍቃድ ባለሙያዎች እንዲሁም በትራፊክ አስተዳደር ድርጅት ሰራተኞች የሚሞሉ ጥያቄዎች ሲሆኑ ቁጥሩን

ይምረጡ እና በሣጥኑ ውስጥ ከተሰጡት አማራጮች መካከል በሚሥሩት ላይ የ”✓” ምልክት ያስቀምጡ።

በከተማው ውስጥ ከተሸከርካሪዎች ጋር የተያያዙ ዋና ዋና ችግሮች ምንድን ናቸው?

	እጅግ በከፍተኛ ሁኔታ (1)	በከፍተኛ ሁኔታ (2)	በመካከለኛ ሁኔታ (3)	በዝቅተኛ ሁኔታ (4)	እጅግ በዝቅተኛ ሁኔታ (5)
የትራፊክ አደጋ					
የትራፊክ መጨናነቅ					
የአየር መበከል					
የድምፅ ብክለት					
የመኪና ማቆሚያ					
የሕዝብ ማመላለሻ እጥረት					
ሌሎች					

በከተማዋ ውስጥ የሚታየው መጨናነቅ ዋና መንስኤዎች ምንድን ናቸው?

	እጅግ በከፍተኛ ሁኔታ (1)	በከፍተኛ ሁኔታ (2)	በመካከለኛ ሁኔታ (3)	በዝቅተኛ ሁኔታ (4)	እጅግ በዝቅተኛ ሁኔታ (5)
የመሠረተ ልማት አቅርቦት እጥረት					
የህንፃ ማቆሚያ ቦታ አለመኖር					
የህዝብ ብዛት እና የኢኮኖሚ እድገት					
የተሸከርካሪ ብልሹዎች					
የትራፊክ ደንብ መጣስ					
ያልታቀደ ማቆሚያ / ማቆሚያ ፣					
ብልሹ የትራፊክ ምልክት ማድረግ					
በትራንስፖርት መሠረተ ልማት ላይ የኢንቨስትመንት እጥረት					
በመንገድ ግንባታ እና ጥገና ምክንያት የመንገድ ቦታ መቀነስ					
ሌሎች ካሉ ይጠቀስ					

ክፍል III በአሽከርካሪዎች የሚሞሉ ጥያቄዎች

በተመረጡት ቦታዎች (መርካቶ፣ሜክሲኮ እንዲሁም መገናኛ) ላይ የሚታዩ የመኪና ማቆሚያ/ፓርኪንግን የተመለከቱ ሲሆኑ ቁጥሩን ይምረጡ እና በሣጥኑ ውስጥ ከተሰጡት አማራጮች መካከል በሚሥሩት ላይ የ”✓” ምልክት ያስቀምጡ።

	በፍጹም አልሰማማም (1)	አልሰማማም (2)	ገለልተኛ (3)	እሰማማለሁ (4)	በጣም እሰማማለሁ (5)
በመንገድ ላይ የሚደረግ የመኪና ፓርኪንግ የትራፊክ መጨናነቅን ያስከትላል					
በተመረጡት አካባቢዎች ላይ በቂ የመኪና ማቆሚያ ቦታ አለ ብለው ያስባሉ					
በተመረጡት አካባቢዎች የሚገኙ የመኪና ማቆሚያ ቦታ ያላቸው ሕንፃዎች ለታለመላቸው ዓላማ ጥቅም ላይ እየዋሉ ነው					
በህንፃዎች ላይ የመኪና ማቆሚያ ቦታ አለመኖሩ በመንገድ ላይ መኪና ማቆምን ያስከትላል					
በመንገድ ላይ ፓርኪንግ የመኪና አደጋን ያስከትላል					
በህንፃዎች ውስጥ የመኪና ማቆሚያ ችግሮች ያጋጥማሉ					

1. የመኪና ማቆሚያ ትጠቀማለህ?

ሁልጊዜ አንዳንድ ጊዜ በጭራሽ

2. ከመኪናዎ ፓርኪንግ በስተጀርባ ያሉት ምክንያቶች ምንድን ናቸው?

ከስራ/ንግድ ጋር የተያያዘ ከስራ ውጪ/ ንግድ ያልሆነ
 መዝናኛ ሌሎች

3. ለጥናቱ በተመረጡት አካባቢዎች አሁን ባለው የመኪና ማቆሚያ ሁኔታ ደስተኛ ነዎት?

በሚገባ በፍጹም

4. ለጥያቄ ቁጥር 3 መልስዎ "በፍጹም" ከሆነ፣ እባክዎን ከሚከተሉት አንዱን ወይም ከዚያ በላይ ምልክት

በማድረግ ምክንያቱን ይግለጹ።

በቂ የመኪና ማቆሚያ ቦታ አለመኖር በቂ ያልሆነ የመኪና ማቆሚያ አማራጮች
 ውጤታማ ያልሆነ የመኪና ማቆሚያ አወቃቀሮች ለመጫን እና ለማውረድ የማይመች በመሆኑ

5. ምን ዓይነት የመኪና ማቆሚያ ይመርጣሉ

የመንገድ ላይ መኪና ማቆሚያ ከመንገድ ውጭ መኪና ማቆሚያ
 የህንጻ ላይ የመኪና ማቆሚያ ዘመናዊ የመኪና ማቆሚያ ማእከላትን መገንባት

6. በተመረጡት አካባቢዎች ላይ የትራፊክ መጨናነቁን እንዴት ይለኩታል

አነስተኛ መካከለኛ
 ከፍተኛ በጣም ከፍተኛ

7. በመንገድ ላይ ፓርኪንግ ምን ያህል ጊዜ ያጠፋሉ

እስከ 30 ደቂቃ 30 ደቂቃ - 1 ሰዓት
 ከ1-3 ሰአት ከ 3 ሰአት በላይ

8. በየትኛው ሰዓት በአካባቢው መኪና ልታቆም ትችላላህ?

ከጠዋቱ 1:00-3:00 ከጠዋቱ 3:00-6:00
 ከጠዋቱ 6:00-9:00 ከ9:00-12:00
 ከምሽቱ 12:00-3:00 ሌሊት

9. በተመረጡት አካባቢዎች ውስጥ የመኪና ማቆሚያ ቦታ ማግኘት ቀላል ነው?

አዎ አይ

10. ለጥያቄ ቁጥር 13 መልስዎ "አይ" ከሆነ ችግሮች የሚከሰቱት በየትኞቹ ጊዜያት ነው?

ቀናት	ጠዋት	ከሰአት	ምሽት
ሰኞ - አርብ			
ቅዳሜ			
እሁድ			

11. የመኪና ማቆሚያ ቦታዎች ከሌሉ ምን እርምጃዎችን ይወስዳሉ?

እጠብቃለሁ በህገወጥ መልኩ አቆማለሁ ሌላ የመኪና ማቆሚያ እፍልጋለሁ

12. በህንጻዎች ውስጥ ፓርክ ከማድረግ ይልቅ በመንገድ ላይ የመኪና ማቆሚያ ለመጠቀም የሚያስችለው ምክንያት ምንድነው?

የህንጻ ማቆሚያ ቦታ እጥረት የመኪና ማቆሚያ ቦታ እጥረት በሌላ ምክንያት

ክፍል III በተሸከርካሪዎች የሚሞሉ ጥያቄዎች

በተመረጡት ቦታዎች (መርከቶ፣መክሲኮ እንዲሁም መገናኛ) ላይ የሚታዩ የመኪና ማቆሚያ/ፓርኪንግን የተመለከቱ ሲሆኑ ቁጥሩን ይምረጡ እና በሣጥኑ ውስጥ ከተሰጡት አማራጮች መካከል በሚሠማሙት ላይ የ”√” ምልክት ያስቀምጡ።

	በፍጹም አልሰማማም (1)	አልሰማማም (2)	ገለልተኛ (3)	እስማማለሁ (4)	በጣም እስማማለሁ (5)
በመንገድ ላይ የሚደረግ የመኪና ፓርኪንግ የትራፊክ መጨናነቅን ያስከትላል					
በተመረጡት አካባቢዎች ላይ በቂ የመኪና ማቆሚያ ቦታ አለብለው ያስባሉ					
በተመረጡት አካባቢዎች ላይ በቂ የህንፃ ማቆሚያ ቦታ ማግኘት ከባድ ነው					
በህንፃዎች ላይ የመኪና ማቆሚያ ቦታ አለመኖሩ በመንገድ ላይ መኪና ማቆምን ያስከትላል					
የመንገድ ላይ ፓርኪንግ የመኪና አደጋን ያስከትላል					

1. በተመረጡት አካባቢዎች አሁን ባለው የመኪና ማቆሚያ ሁኔታ ደስተኛ ነዎት?

በሚገባ በፍጹም

2. ለጥያቄ ቁጥር 1 መልስዎ "በፍጹም" ከሆነ፣ እባክዎን ከሚከተሉት አንዱን ወይም ከዚያ በላይ ምልክት በማድረግ ምክንያቱን ይግለጹ።

በቂ የመኪና ማቆሚያ ቦታ አለመኖር በቂ ያልሆነ የመኪና ማቆሚያ አማራጮች

ውጤታማ ያልሆነ የመኪና ማቆሚያ ውቅርታ ለመጫን እና ለማውረድ ስለማይመች

3. በተመረጡት አካባቢዎች ላይ የትራፊክ መጨናነቅ ደረጃ ምን ይመስልዎታል?

ዝቅተኛ መካከለኛ

ከፍተኛ በጣም ከፍተኛ

4. ባለፉት ሁለት ዓመታት ውስጥ በተጠቀሱት አካባቢዎች ውስጥ የመኪና ማቆሚያ ፍላጎት ምን ይመስላል?

ጨምሯል አልተለወጠም ቀንሷል

5. በአካባቢህ የትራፊክ መጨናነቅ በየትኛው ሰዐት ይበልጥ ይስተዋላል?

ከጠዋቱ 1:00-3:00 ከጠዋቱ 3:00-6:00

ከጠዋቱ 6:00-9:00 ከ9:00-12:00

ከምሽቱ 12:00-3:00 ሌሊት

Interview Questions for Traffic Management Bureau head

1. What strategies do you use to reduce traffic congestion in a particular area? What is the level of congestion in the selected cities?
2. Is there enough Building parking facility in Mexico, Megegnagna and Merkato locations? If no what is the reason behind?
3. How much does lack of building parking facility affect the traffic congestion in the selected locations?
4. Are buildings being checked for their permitted use? What measures would be taken if the permitted use has a parking facility but have been changed?
5. Inorder to reduce on-street parking and improve the utilization of building parking facility what measures should be taken?
6. What types of strategy and policy solve the current parking practice in Addis Ababa? Would you please describe how Addis Ababa city implement them?