AN ASSESSMENT ON THE ROLE OF BICYCLING LANE PROJECT

FOR IMPROVING MOBILITY IN ADDIS ABABA

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Declarations

I Habtamu Yeshitla, Registration Number/I.D. SGS/0109 /2011B_B, do hereby declare that this Thesis work entitled "**AN ASSESSMENT ON THE ROLE OF BICYCLING LANE PROJECT FOR IMPROVING MOBILITY IN ADDIS ABABA"** is my original work and that it has not been submitted partially; or in full, by any other person for an award of a degree in any other university/institution.

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“The fear of the LORD is the beginning of KNOWLEDGE” Proverb 1:7

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Abstract

The raising use of motorized mode and interrelated infrastructure leads to traffic jamming, environment pollution and traffic accidents make a city worse for living. Mitigating these problems make the city mobility improved and Addis Ababa city administration with cooperation of Addis Ababa road transport bureau installed the first bicycle lane project from Lebu to Jemo corridor to improve mobility on that streets, to reduce traffic congestion, to improve public health and to make the city environment friendly. The purpose of the research is to assess the bicycle lane benefit for improving city mobility after the project implementation and this research use bikeability index to assess bikeability of the bicycle lane using measurements which are the bikeability index variables. In order to make the indexes the research create different variables through detail literature review and validated them through field observation, interview with key informants and questionaries to pedestrian and cyclists in Lebu to Jemo bicycle lane. Research finding indicate that the need of functional bicycle infrastructure to enhance the mobility specially related to destination density design, environment design and safety issues in the streets that encourage a rider to use bicycle as transport mode. In addition, the finding show that the non -motorized strategy of Addis Ababa city administration.

Keywords: Bikeability, Bicycle lane, bikeability Index

Contents

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Acronym

AACRA- Addis Ababa City Road Authority

AARTB-Addis Ababa Roads Transport Bureau

AASHTO-American Association of State Highway and Transportation Officials

AATA- Addis Ababa Transport Authority

AATMA-Addis Ababa traffic Management Agency

BRT- bus rapid transit

CSA-Central Statistical Agency

ETB-Ethiopian Birr

ETH-EiABC-Ethiopia-Ethiopian Institute of Architecture Building Construction and City

LRT- light rail transit

NACTO-National Association of city Transportation Officials

NMT- non-motorized transport

SPSS-Statistical Package for the Social Sciences

TOD- transit oriented development

UNEP-United Nation Environment Program

CHAPTER ONE

1. Introduction

1.1 Background of the study

In a global arena urban planning and design have proven to be important field in determining life styles, solving problems and giving new ways of living in the urban environment. High quality of urban life can be realized through good urban environment and this quality of urban environment can be achieved through different mechanism in the urban planning and design, from which creating quality public realm with harmonious built environment is very important among others and take the biggest share. Interims of public realm there is no element of urban environment is more important than street. (Ewing, et al., 2005). Addis Ababa with a population of over 7.8 million is its largest urban Centre. Because of the rapid growth and the limited capacity to manage this growth, Addis Ababa is facing a variety of challenges, including mobility infrastructure provision and management which leads to a serious problem in the transportation system. (Population of 2019, 2019)

Most of the road designers and engineers give a priority for motorized transportation project only for the past years which represent only a few citizens in Addis Ababa city with share 15% -with private transportation and 31% of city transportation(public) but the citizens who live Addis Ababa above 50% is not using motorized transportation in their day-to-day activities which indicate that city road administration ignoring the vital necessity needs for citizens in transportation system. (Addis Ababa City Administration, 2018). Beside these most of the motorized vehicle owner are living in Addis Ababa which have a negative effect on the environment and safety of the citizens because among the entire vehicle imported in Ethiopia are used or aged models which leads to environment pollution, severe roads traffic accidents and economic loss due to their maintenance and spare part needs. (Akloweg et al., 2011).

Refereeing to motorized transportation project the non-motorized transport project which is bicycling lane projects almost neglected in Addis Ababa city. (Addis Ababa City Administration, 2018). Bicycling is crucial to make a city with sustainable development by reducing pollution due to emission from motorized vehicles, to enhance health and physical fitness of the citizens and most importantly to reduce road traffic accidents (UNEP 2016). The general objective of this paper is to assess the role of bicycling lane project for improving mobility in Addis Ababa and to indicate its significance for city designers, planners and administers.

Street is where different types of bicycling like an active travel to work, shop, eat out and engage in other daily activities takes place and bicycling for exercise mostly occur. Quality of life in cities is affected by the negative and positive aspects of street activities and functions. When a part of street which intended to be used only by people riding bicycle is called bicycling lane.

The first bicycling lane was built on Brooklyn's Ocean Parkway in united states of America in 1894, were nearly five-mile stretch of road was designed by Frederick Law Olmsted and Calvert Vaux, the urban planning masterminds behind Central Park and Prospect Park and then Davis

California in 1967 for the preferential use of bicyclist had been designated as a part of an existing roadway meant for vehicles during this time public works employee loaded a marking machine, letter stencils, and big containers of white paint into a city truck and drove over to 8th street (GANNON,2017). But it could not take long to stripe both sides of 8th between a street and sycamore lane which is less than a mile long (GANNON,2017). After this the people living in Davis started a vibrant movement with local supporters named themselves citizens bicycle study group then they summited a formal petition to install a handful of bike lanes. But their proposal was not accepted by engineers, police, planners, and the city council, which had the power to authorize road infrastructure. The road conflict goes hard between the bicycle user and vehicles users when Davis grew rapidly then the new council approved all the bike lanes in the original petition, in July 1967 governor Ronald Reagan signed vehicle code 21207, which leads cities to make bike lanes on local streets into law. After the low went into effect officials in Davis made four lanes, sycamore Lane. 3rd street, 8th street, and J street.

Ethiopia is one of the least urbanized but the most rapidly urbanizing country in sub-Saharan African countries, and Addis Ababa with a population of over 7.8 million is its largest urban Centre. Because of the rapid growth and the limited capacity to manage this growth, Addis Ababa is facing a variety of challenges, including mobility infrastructure provision and management. With car-oriented transport system and other means of transportation where often neglected. In 2015 three bicycle lanes only were constructed at Summit, Ayat and imperial areas of Addis Ababa with total budget of 7.1 million ETB as pilot project for the first time in the history but all of them were not giving a service. By taking into account the lessons learned from these previous cycle lane attempts, the Lebu-Jemo corridor was selected for the demonstration project. This 3 km stretch in the south-west fringe of the city connects the mid-density residential neighborhoods of Lebu to the small and mid-sized industries in Jemo with support of Bloomberg Philanthropies for Global Road Safety with over 1400 bollards and lane markings across the 3 kms (AARTB and CSA,2015; Global Designing Cities Initiative,2020).Therefore, there is an urgent need to encourage environment and people friendly transportation systems that promote active living and new urbanism concept which enhance bicycling lane street design and Urban Design through Emphasis on beauty, aesthetics, human comfort, and creating a sense of place, Special placement of civic uses and sites within community, Human scale architecture & beautiful surroundings to nourish the human spirit.

1.2 Statement of the Problem

In Addis Ababa transportation problem becomes a headache for city administration so that bicycling lane project is receiving more and more attention through time as Planners, designers and developers are realizing that a bicycle lane contributes to a number of positive effects, such as local vibrancy, public health, less noise and emissions, more social trust and urban market creation. In Ethiopia and many other African countries, bicycling lane is largely overlooked by planning strategies that focus on economic acceleration through automobile infrastructure developments. And these Automobile-oriented networks and urban forms have led to important impacts in terms of transportation congestion, air pollution, inactive lifestyle, pedestrian safety, poor pedestrian environment, and other built environment issues. According to Addis Ababa city administration ,2018 walking takes a share of 54% of the transport, public transportation covers

31% of the transportation which are difficult to get because of long waiting timing and overloaded passengers and the remaining 15% cover by private car user. On the other hand, only 35% of the roads have been built with walkways. (ETH-EiABC, 2014). This percentage of modal share indicates lack of bicycling lane since 65% of the roads have been built without walkways or anything. This lack of bicycle lane demonstrates that bike rider has not been considered a priority for the city's planning strategy. A few researches are made in the Addis Ababa related to bicycling which deals on specifically in health and economic benefit of the bicycling in the previous pilot project such as Summit, Ayat and Imperial corridors which indicate the need of more research on different aspect of bicycling. Therefore, it is essential to make an assessment on the role of bicycling lane project in Addis Ababa with current mobility condition to create design solution that will promoting active living and enable pedestrian system to play a major role in creating safe, sustainable, and equitable mobility and that enhance healthy public life, social life and economy in Addis Ababa.

1.2. General objective

The general objective of the research will be to make an assessment on the role of bicycling lane project for improving mobility in Addis Ababa and to suggest for city planners and engineer to come up with design solution which can be a base to install bicycling lane which enhance healthy public life, social life and economy in Addis Ababa.

1.2.1. Specific objective

- To evaluate the strategy for non-motorized transport in Addis Ababa
- To examine the current condition of bicycling lane project in transportation system
- To assess the role of bicycling lane project in transport system in Addis Ababa
- To suggest implementable potential solution to install bicycling lane

1.2.2. Research questions

- Why is non-motorized transport strategy neglected in Addis Ababa?
- What are the design strategies that can be adopted to make car dominated Addis Ababa roads to biking friendly imaginable street?
- What is the existing condition of bicycling lane project in transportation system?
- What is the role of bicycling lane project in the transportation system in Addis Ababa?

1.3. Significance of the Study

This study will be significant for academic purposes and when carried out successfully the study findings will benefit city planners, designers, researchers as well as decision makers acquire valuable information for the issue under study. Moreover, the study will contribute paramount advantages by creating awareness on the aesthetic and recreational value of cycling environment that contributes to a number of positive effects.

1.4. Organization of the thesis

The thesis is structured in five chapters: **Chapter one** states the general context of the study including the general introduction, back ground, problem statement of the study, research objectives, and research questions, significant of the study. **Chapter two** give comprehensive

literature review related to the topics. In **Chapter three** the description of the study area, settlement trend of the city is presented. In **Chapter four** analysis of the role of bicycling lane to improve mobility in Addis Ababa in a detailed manner and its major findings is presented. Finally, recommendation and conclusion of the research is presented in **Chapter five.**

CHAPTER TWO
2. LITERATURE REVIEW

2.1. Introduction

This section is presented from a wider perspective to a narrow perspective in that the researcher presents literature related to the topic. Such literature is actually based on the objectives of the study. Therefore, it's related to different theories, concepts on bicycling.

2.2. Definition bicycling

The concept "bicycle" is the main concept in theory of cycling. The term bicycle is the machine which having two wheels of a like diameter, with the front on used to guide and the rear one used to drive the whole part which contains pedals and a chain (The explanatory dictionary of sports terms, Moscow, 1993). The bicycle is understood as: "a two -wheeled or three-wheeled machine used for riding, powered by pedals" (Bonivel,1935); "a two-wheeled or three machines used for riding, powered by one's legs with the help of transport" (gorsky. D.P. definition,1974); "a two-wheeled machine as means of transport, consisting of a frame, two wheels, handlebars and connecting rods intended to transfer muscular effort from the legs to the wheels with pedaling" (Efremova,2000).

2.3. Definition of bicycling lane

The AASHTO Guide (2019) for the Development of Bicycle Facilities defines a bike lane as "a part of a street which has been labeled by striping, signing, and pavement markings for the better or exclusive use of bicyclists."

Street is where several types of bicycling like an active travel to work, shop, eat out and keep on in other daily activities takes place and bicycling for exercise mostly occur. The negative and positive aspects of street activities and functions can affect the quality of life in the city. When one segment of the streets is intended to be used only by people riding bicycle is called bicycling lane. (AASHTO,2019)

A bicycle lane is a legally reserved driving space for cyclists on the road, visually separating them from traffic. It is suggested when there is a significant number of cyclist's drive along a somewhat busy road. Cycle lanes are an observable, speedy and flexible solution on existing roads, requiring only road markings. A cycle lane can be an option for a cycle track when space is deficient, but only when safety can be adequately guaranteed. (AASHTO,2019)

2.4. Bikeability

"Bike ability" does not have a concise, universal definition. Several scholars state different distinctive definitions for bikeability. Some of them and the main attributes emphasized in through their definitions are listed below in table.

Table 1Definitions of 'Bike ability'

No	Author	Definition	Attribute
1	Wahlgren& Schantz. (2012).	'… whether the route environment is perceived as stimulating or hindering active commuting is an integrative environmental category of potential importance'	Integrative environmental, Active commuting
2	Lowry et al., (2012)	'…an assessment of an entire bikeway network for perceived comfort and convenience and access to important destinations'	Assessment, bikeway network, comfort and convenience, access to important destinations
3	McNeil (2011).	A methodology for assessing a neighborhood's bicycle accessibility.	Bicycle accessibility, Neighborhood.
4	Winters and Cooper, 2008	"The bike ability index is a tool that can support local planner in the decision making to increase the use of bicycle through an expansion of the bicycle network, since it highlights areas more conducive and less conducive for cycling thus, where cycling condition need to be improved".	Decision making, Conducive
5	Krykewycz (n.d)	Making field measurements to create a complete area wide bicycle comfort	field measurements, bicycle comfort

2.5. Bikeability Index

Bikeability Index was used to find the stage of bikeability of bicycle lanes, but without taking into consideration the environment besides the bicycle lane, it is complex to evaluate the bikeability. The "bikeability index" was developed to measure how safe, easy, and desirable it is to bike instead of drive on the City road network.

2.5.1. Variables of the bikeability index

Bikeability indices have been used in several countries. Variables in each index correspond to the same characteristics of a particular city or a region. Therefore, there is a practical insufficiency in applying such indices as universal tools. Depend on the situation there are several variables such as: -

1. **Safety:** when the bicycle lanes designed 'Safety' should be given the first priority. Bicycle infrastructure designs features such as painted bicycle lanes, marking shared zones which indicate how the countries throughout the world use design principles to guarantee the safety of the bicycle lanes. Bikeability map indicate the accidents occurrence on the bicycle lane, reported after implementing the bicycle lane. It shows the adequateness of selecting 'safety' as one of the key variables to evaluate the case. (Chen,2012)
2. **Topography:** It is better to design bicycle lanes in flat ground with low slope, unless the cycling is used for adventure rides (Sandberg, 2015). Steep slopes slowly raise the speed of the bicycles and in oppose it made riders tired. Rider energy consumption will raise with all these facts. When the bicycle lanes are located adjacent to motorways or compact area the negative aftermaths of bicycle riding in steep slopes will become severe.
3. **Environments:** Bicyclist exposure to sunlight directly will make day to day bicycle riders for their work space a severe barrier. Unlike European countries, Asian countries have high temperature. Designing bicycle lanes next to rivers, and shady areas will make cyclist attractive and motivate them to use bicycles rather than along built-up area. Thus, environmental condition has been one of the key facts, where mostly the scholars brought into consideration in designing bicycle lanes.
4. **Mixed land use rate:** Mixed land use denotes the rate between the number of different types of establishment and its corresponding area. This variable is measured the activity group of the area mixed of activity absolutely related to the high bikeability. Mixed of use reduce the distances within the activities. These characters are boosting the bikeability.
5. **Residential Density (RD):** High density housing has been identified in many researches as an opportunity to increase cycling. Accordingly, below equation was used to identify the residential density. (RD) = Number of residences in one sector /Area (in km2) of respective sector. In calculating the RD one GND was considers as one sector. Higher RD levels were considered as a positive while, where the lower RD values considered to be the negatives. (Wang et al., 2016)
6. **Bicycle infrastructure:** Table 2 shows a list of bicycle infrastructure designs features. The research evaluated the existence of such design features along the Lebu to Jemo

bicycle lane. The places having at least 2 of such features were considered as the places with high bikeability level.

Table 2Bicycle infrastructure designs features

Facility	Type of design
Bicycle facilities	Off-street pathways, Multi-use pathways Separated pedestrian and bicycle facilities
Cycle tracks	One-way cycle tracks, Two-way cycle tracks Curb/median protected cycle tracks, Elevated cycle tracks Parking protected cycle tracks, Bollard protected cycle tracks
Bicycle lanes	Painted bicycle lanes, No on-street, Buffered bicycle lanes, Shoulder bikeways, Contraflow bicycle lanes
Shared Use Facilities	Local street bikeways, Shared use lanes
Intersection and Crossing Treatments	Intersection Approaches, mixing zones, turning zones, at intersections, Advance stop lines, Bike boxes, and Two-stage left turn boxes. Median refuges, Traffic circles, Roundabouts, Protected intersections, Intersection crossing markings, Colored pavement markings
Signals	Bicycle activated signals, Signal Timing Leading bicycle intervals Separate signal phase Bicycle specific signal heads, Intersection restrictions

7. **Road Network density:** High road density areas were measured as a positive fact for bikeability and road density are important built environment indicators that affect bicycle-metro trips. (Muhs & Clifton, 2016)
8. **Importance of destination:** Important destinations are bank, school, restaurants grocery stores etc. An assessment of a whole bikeway-network in terms of the ability and perceived comfort and convenience to access such destinations will be considered through this variable. (Krizek, 2003)
9. **Destination density:** availability of destinations for cyclists such as neighborhood commercial, offices, and entertainment land uses. Heterogeneity of land uses it leads to create the destination density. (Forsyth et al., 2007)
10. **Generalized cost:** the monetary cost travel time, physical needs, risk of injury, risk of theft, comfort and personal security are among the factors that impact the generalized costs of cycling. (Rietveld & Daniel., 2004)
11. **Impedance function for the travel time:** Impedance function for the travel time is one of the essential attributes of a trip and affects mode and route choice in different. Travel can be broken down in vehicle time, waiting time, walking time and transfer time (Ortúzar & Willumsen, 2002).

2.6. Bikeability measuring methods

A Numerous method to measure bikeability have been created in the past, and all method revised on the table below to measure bikeability based on the attributes of cycling facilities, combining these into score. Terms commonly used are index, level of services, rating and score.

Table 3Bikeability measuring methods

Method	**References**
Bicycle stress level	Sorton & Walsh (1994)
Road condition Index	Epperson
Interaction Hazard Score	Landis (1994)
Bicycle suitability Rating	Davis (1995)
Bicycle suitability Assessment	Emery and Crump (2003)
Bicycle suitability score	Turner et al (1997)
Bicycle Level of service score	Lowry et al (2012)
Bikeability index	Mesa and Barajas (2013); Krenn et al. (2015)
Bicycle Level of service	Botma (1995); Dixon (1996); Jensen (2007); Petritsch et al, (2007); The highway capacity manual (2011)

2.7. Type of bicycling lane

2.7.1. Sharrows

A combination of the word's "share" and "arrow," sharrows are proposed to serve as a visual reminder that space on the street is meant to be shared by bikes and cars. Sharrows don't offer dedicated space on the street for people biking (meaning cars can still use a lane with sharrows in it); they indicate a general area on the road in which it should be safe for people to bike. (Jsoulliere, 2017)

Figure 1 Sharrows bicycling lane

2.7.2. Striped bike lanes

Striped bike lanes aim to offer a clearer sense of where bicyclists should be on the street by creating a lane for bikes. Typically, these lanes are striped with white paint and are often located on far-right side of the road. They may be painted a separate color to draw more attention and the drivers are not permitted to drive or park in bike lanes of any kind. (Jsoulliere, 2017)

Figure 2 Striped bike lanes

2.7.3. Buffered bike lanes

Buffered bike lanes make a dedicated lane for bikes, with the additional benefit of putting extra space between bicyclists and passing cars, usually with a painted safe guard area of one to two feet. Drivers must drive on the left side of the buffer while driving and can only cross the bike lane when making a turn or entering an adjacent property - after checking to be sure there are no people biking in the lane, of course. (Jsoulliere, 2017)

Figure 3 Buffered bike lanes

2.7.4. Protected bike lanes

This kind of bike lane cost more money than other bike lanes and street markings, protected bike lanes clearly delineate space on the street for bikes and prevent vehicles from infringing on that space. Installing physical barriers such as plastic bollards on street parking or even planters offer the greatest degree of safety for people riding bikes in on street bike lanes. (Jsoulliere, 2017)

Figure 4 Protected bike lanes

2.8. Benefits of cycling

Road traffic noise is a combination of rolling noise and engine noise. The amount of noise is relay on the speed of travel and at lower speed the engine noise dominates. Cycling as a non-motorized mode of transportation eliminates noise coming from engines. This will be very important for public recreation centers, hospitals and schools that are located near roads. It also reduces emission of pollutant gases to the air which are the major causes of cardiovascular diseases and helps to slow down global warming. In addition, cycling help to reduce the fast depletion of non-renewable resources for the next generations.

Bicycle is the third efficient mode in space saving next to metro and walking. (Cycling handbook 2009) It helps in reducing congestion the travel time public buses. It also saves space from parking requirements. The saved spaces from both the road and parking areas can be used for other public services. And beside this the city will not be crowded by cars so that it becomes beautiful and livable which attracts both local and international tourists to create a business in the city.

2.9. Benefits of cycling to the cyclist

Cycling is a physical exercise which help to maintain the rider to fit physically specially those who do not have a chance to do physical exercising they can easily reduce their diabetes and cholesterol level in health manner, which in turns decrease health care expenses. (UN Environment Programme, 2019)

Cycling is the easiest and affordable transportation system for those who cannot use other mode and it is the fast mode of transportation which can avoid waiting and walking stations in

congested cities. Cyclists are having free travel cost and free parking which allow them to save money compared to other mode of transportation. (UN Environment Programme, 2019)

2.10. Barriers for Cycling

Peoples chose other mode of transport because of the following cultural background, cost and affordability, climate, and safety. In some cultures, bicycles are taken as a toy for children to play with. Women are also not allowed to use bicycles in some countries. If safe parking is not available for the user theft becomes common in cities which make them not to take a risk of their own property and discourage to use bicycle for transportation (Prati & Prakash, 2019).

2.11. Best cycling cities in the world

2.11.1.Utrecht, Netherlands

Utrecht is Netherlands' most populous city is definitely bike friendly with nearly 250 miles of committed bike lanes. In its center, up to 50% of all journeys take place in the saddle and local authorities are building a 12,500-space cycle parking facility billed as the world's biggest. Cycling in Utrecht is treated on pair with walking, with helmets and high-visibility garments rarely used, not least because of the protection offered by segregated cycle lanes (Walker, 2018).

2.11.2. Seville, Spain

Seville is the answer to those who say promoting urban bike use is too ambitious and takes decades. The city creates about 50 miles of cycle lanes within a year (there's now about 80 miles) and commissioned a municipal bike rental plan called Sevici. Critics show that Spain has scant tradition of commuter cycling (Walker, 2018).

2.11.3.Montreal, Canada

Montreal, Canada, began constructing bike paths in the 1980s and now has almost 400 miles of them. One survey says almost half the city's adult population rides a bike at least once a week, yet little more than 2% of commutes are made on two wheels (Walker, 2018).

2.11.4.Copenhagen, Denmark

More than half the locals in the Danish capital cycle to work or school, and with an estimated bike population of 650,000 there are slightly more cycles than people. Most of these bicycles are available to rent to tourists, and Copenhagen's compact dimensions and tolerant traffic make it perfect to explore by bike. City leaders are intent not just on increasing bike use further, but exporting the Copenhagen doctrine of a segregated and safe bike infrastructure that feature bike lanes of up to three meters (about 10 feet) in width (Walker, 2018).

2.11.5.Berlin, Germany

Germany has nonetheless been quietly getting an increment on bike use in many of its cities. Berlin is the standout example. About 13% of all trips in the city are made by bike, nearly twice the rate of 20 years ago. In some inner suburbs this hits 20%. Aside from intelligent and reliable public policy designed to enhance bike use, Berlin has a number of inbuilt advantages. Roads are often hugely wide, in part a consequence of the devastation of World War II and grandiose postwar Soviet planning, and the terrain is largely flat (Walker, 2018).

2.11.6.Portland, Oregon

That infrastructure consists of more than 65 miles of bike paths, 30 miles of low-traffic bike boulevards and 175 miles of bike lanes, all of which are used with passion by the 8% of citizens who claim that biking is their primary form of transportation, and 10% who say a bike is their secondary vehicle (Walker, 2018).

2.11.7.Bogota, Colombia

Bogota gain nearly 200 miles of protected bike lanes and, soon, its own bike-rental plan. The best way to try two-wheeled life in Bogota is a weekly Sunday ritual known as Ciclovia that sees 70 miles of streets closed to vehicles and given over to bikes and pedestrians (Walker, 2018).

2.12. Cycling in Addis Ababa

During the past five years, the cycling use has been promoted in Addis Ababa as a new way improving mobility of transport in some of sub-city (Prati & Prakash, 2019). During many years in the past; our cities were transformed in order to facilitate the use of the private vehicle. As a result of this large use and the increasing rate of motorization, which reached currently the total number of vehicles registered in Ethiopia including motor bicycles and the locally assembled are 1,071,345? Over half of the total registered in the country 596,084 is registered in the capital Addis Ababa; our cities suffer nowadays problems of congestion, saturation of public areas, contamination and noise (Federal Ministry of Transport, 2019).

In high-density areas and for short distances, the car is an inefficient and unsustainable mode of transport. Cycling, together with public transport and walking are the main components of sustainable mobility. However, in many cases, public transport cannot satisfy the mobility needs of citizens: too complex and varied. Its timetables, frequencies, routes… do not always fit the mobility needs. Because of these problems, cycling is raising its proportion in modal split, especially for short trips, where its benefits make it one of the best alternatives. (Hernán Gonzalo-Ordena, 2014)

2.13. Transportation in Addis Ababa

Addis Ababa is the capital city of Ethiopia. It is likewise the biggest city in the nation in terms of population, viewed as a city and state. As a developing country Ethiopia is passing through fastest growing economy with increasing population size; the city requires a sustainable transportation model that can meet the increasing mobility needs of the inhabitants. Nowadays to keep up with continuous economic growth Addis Ababa is facing large demand transportation problem with insufficient available transportation services to continue to grow with increasing population size (Institute For Transportation & Development Policy, 2019).

The major modes of transportation in the city are public buses for 119 different lines, white and blue minibus taxis with 12 seats, private buses with 22 to 27 seats. In addition to these there are taxis with 4 seats. Recently the city has got a new tram line (Light rail transit) which runs from East to West and from North to South ends of the city. But there is still a high demand of transportation. Residents of the city are spending a lot of their time waiting for transportation. In

addition to this the city have insufficient level of infrastructure in current city network which lack or road for the available mode of transportation leads to high level of congestion and traffic accidents in the city (Institute For Transportation & Development Policy, 2019).

In Addis Ababa majority trip covered by walking because most the population are youngest student who takes school in public school in short distance away from their home and for the people who take long trip mostly use public transportation either taxi or city bus. Other means of transportation like motor bike and bicycle are being used very small (Institute For Transportation & Development Policy, 2019).

2.14. Infrastructure in Addis Ababa

As a developing city Addis Ababa mostly concentrated on road design which focuses to move vehicle from one location to another. Car-oriented environments are neither safe nor convenient for the non-motorized modes of transport and usually pedestrians and cyclists are victims of accidents in such typical urban environments. At present Addis Ababa road network extends for a total of 5915km, compared with 5365k in 2014. Meanwhile 2616km of the city's roads are surfaced with asphalt, around 44% of the total network (World Highways Report, 2018)

Most of the cars being parked on the side of the road because there are no parking areas which are made for car in the city. Beside this most of them are now occupied a street market and pedestrians pushed to driving lane these leads the roads to serve weak service in addition to intrinsic inadequate capacity of the road.

A city with sustainable transport is one which has a greater proportion of the most sustainable modes of transport-waking, cycling and public transport. The provision of adequate pedestrian facilities and cycle paths at neighborhood and urban streets is an integral part of sustainable transport planning. Cities that are developing walking and cycling infrastructures learn quickly that these modes are more compatible with public transport than with auto city infrastructures. In addition to this the negative impact of automobile dependency have become widely recognized in recent decades, prompting cities across the globe to invest in transportation alternatives with the potential to improve public health, reduce air pollution and carbon emissions, and relieve traffic congestion (Institute For Transportation & Development Policy, 2019).

2.15. Bicycle lane in Addis Ababa

The role bicycling lane or cycling to improve mobility play a vital role in sustainable development a city and Addis Ababa launches its first cycle lane under the safe cycling program. With a rapidly increasing urban population and a current mode share of 70% pedestrians, 26% transit riders, and 4% motorists, Addis Ababa stands a chance to add cycling as a substantial mode share for their citizens and prevent an increase in their private automobile usage. With a view to investing in sustainable and active mobility, the city developed the NMT Strategy and Action Plan for 2018-2023 which lays guidelines to dedicate 30-70% of the roadbed to NMT facilities, based on the contextual conditions. This has provided the city with a framework to rethink their existing streets and reimaging what their new streets could look like. The Safe Cycling Program aims to not only help build safe cycling infrastructure but also communicate

the need and benefits of cycling and help build a cycling culture in Addis Ababa (Addis Ababa City Administration, 2018).

After much deliberation between several sites across the city and taking into account the lessons learned from the previous cycle lane attempts, the Lebu-Jemo corridor was selected for the demonstration project. This 3 km stretch in the south-west fringe of the city connects the mid-density residential neighborhoods of Lebu to the small and mid-sized industries in Jemo. It was implemented in this area with long term objective of expanding them further in the future in Addis Ababa city. Below diagram shows how look like the Lebu-Jemo bicycle lane and its structure (Addis Ababa City Administration, 2018)

Figure 5 Bicycle lane in Addis Ababa

As per the Figure 5, number 2 denotes the bicycle lane which is located in between the motorway and pedestrian way. Although, it was the theoretical demarcation in practice, most of automobile drivers park their vehicles in the bicycle lane and also it being used as station to public transport service too (see Figure 5). This discourages the bicyclists. It forms the main dispute of this research, challenging the existing bicycle lane design parameters. According to the Transport Services of Scotland, (2010) bicycle lanes should have an appropriate design to inspire bicyclists. Accordingly, they encourage the authorities to adhere below five core principles in designing a bicycle lane;

1. Safety - Infrastructure should address safety of bicyclist, particularly at junctions, high slope areas, and high bend areas
2. Directness – Bicycle routes should be as direct as possible, whilst being logical, and avoiding unnecessary obstacles and delays to a journey. Planning routes as part of a network is key.
3. Comfort - Surfaces should be fit for purpose, enable smooth surface riding and should maintain.
4. Coherence - Infrastructure should be easy to understand and follow for all users.
5. Attractiveness – Infrastructure should add to the attractiveness of the public without unnecessary street clutter.

The existence of above five principles is really questionable within Jemo to Lebu bicycle lane, which is the case study of the research. Opposite to the Addis Ababa background, as the researcher mentioned above Netherlands, Denmark and Germany have made bicycling safe, convenient to the rider Safety of non-motorized users including bicyclists are an obligation of other vehicle users. The ways the bicycle lanes are designed are remembering all the vehicle riders about their mutual obligation and discipline in driving.

Figure 6 Using bicycle lane for parking and station

2.16. Conclusion

Bicycle lane is environment friendly infrastructure which built environment supports and encourages cycling by providing for pedestrian comfort and safety, connecting people with varied destinations within a reasonable amount of time and effort, It reduces congestion and therefore reduces the need for more freeways, saves a city money (benefits of congestion reduction, roadway cost savings, vehicle cost savings, parking cost savings, air pollution reduction, energy conservation, and traffic safety improvements) and offering visual interest in journeys throughout the network. An environment which satisfies human need has important role in the social, economic and environmental aspect. Cycling can be affected by both physical and perceptual quality of a built environment, therefore in order promote cycling there should be a critical consideration during road constructions.

CHAPTER THREE

3. Research Methodology

3.1. Introduction and research design

This chapter will introduce the method that will be used in this research, the criteria used for the selection of the case study area, approached that will be apply, type of data and collection techniques, source of data and methods of data analysis.

3.2. Research design

The main purpose of the study is to assess the role of the bicycling lane to improve mobility in Addis Ababa and then suggest potential role bicycling lane for the identified case. The study design includes both quantitative and qualitative type. Since in situations where two strategies might be considered attractive, it is possible to use multiple strategies in a given study. Therefore, descriptive with document analysis is applied.

3.3. Choice of Research Type, Strategy, Method and area selection

For this research the researcher used a descriptive type of research and case study research as research strategy, the main reason lies on the nature of the research objectives, others experience on nearly the same issue, and topic of the study. In order to assess the role of bicycling lane to improve mobility in Addis Ababa the case study method is selected, since it's hard to take depth analysis on the role bicycling lane in Addis Ababa. According to Kothari (2004). Case study is the imperious method in which a given phenomenon can be studied in depth, if the study is done accurately. Pamela Baxter and Susan Jack (2008) had emphasized that case study method has the potential to deal with simple and complex situation, and it also enables to answer the 'how' and 'why' questions of researches. In short, it is a way of study in depth rather than coverage. If this is so, the case study research is holistic and thick or a more inclusive explanation of a phenomenon. In addition, the fewer case communities are, the more a work merits the intended in-depth understanding of the phenomenon (Gerring, 2007). So, this methodology is appropriate to investigate the problems with support of large evidences, it makes it fit with case of study. In addition to this method the researcher conducts a comprehensive literature review to identify variables of bikeability index.

It is well known that, there is one bicycling lane project in Addis Ababa which has been working until now which is the 3km Lebu-Jemo cycle corridor, since there is no other alternative project to get extensive evidence for the research. So, it is expected to select a case study area based on the project launched in the city in order to present the role of bicycling lane to improve mobility in Addis Ababa with support of large evidence.

Figure 7 Case study map (bicycle lane)

3.4. Research Approach

For this research the researcher used both qualitative and quantitative approach which is called triangulation approach. This is mainly because of the nature of the research topic and objectives. Qualitative research approach used to access attitudes, behavior and experiences are more important to understand the perception of the community about the role of bicycling lane to improve mobility in the case study area of Addis Ababa. Quantitative research approach used to analyze numerical data that is going to be collected for this study.

3.5. Sources of Data and Collection Techniques

3.5.1. Data type and source

For this research the researcher uses both qualitative and quantitative data collection method from both primary and secondary source of data. The primary data is collected through direct observation and picture taken from the site (to get data on how bicycling lane used by making site visits to the areas and observe what really is going on there in order to identify suitable bikeability index variable in the case study area among different variables to measure the role of bicycle lane); interviews and discussion with key informants (different governmental office in particular the sectors and departments that are directly responsible and indirectly concerned for cycling issues like (AACRA, sub city urban planning office, police station and, greenery and beautification office), and questionnaires for pedestrian those walking and bicyclist along the selected case area to achieve accurate, reliable, representative information for the study and to

get enough information about the perception, and attitude related to the role of bicycling lane for improvement of mobility of the area. The secondary data is collected from manuals, previous studies, case studies from both local and international, reports, relevant books, Addis Ababa City Road Authority, Addis Ababa Transport Authority and Federal Road Transport Authority.

3.5.2. Data collection method

Observation

One of the best ways of obtaining a data on how urban spaces operate or used is by making site visits to the areas and observe what really is going on there i.e. through observing the relationships between the built environment, activities and spaces. For instance, the Project for Public space (2005) indicates that when you observe a space you learn how it is actually used rather than how you think it is used. In addition, it is also suitable in dealing with subjects where respondents are not capable of giving verbal report of their feelings for one reason or the other (Kothari, 2004). For this study, therefore, a field observation on the selected case study area will be use as one of the primary method of data collection. Accordingly, observation throughout the length of the bicycling lane will be takes place deeply, and pictures of each will be taken.

Interview

According to Mikkelson (2005), key informant interview are interviews aimed at obtaining special knowledge and key informants are respondents, who are assumed to have special knowledge on a given issue. Usually, harmonizing nature information generated from key informants. In other words, they provide unique information that rarely attainable to generate from other respondents so, for this research, semi-structured interviews are used to gather information from key informants such as officials from AACRA, sub city urban planning office, bicyclist and pedestrians. This is helpful to understand and answer the question like what are the notable effects, who is affected and how, what is missing and where, what went wrong and to what extent, is the problem self-expressive or does it generate other problems? And it is the main input for design part.

Questionnaire

Questionnaire is used to collect primary data from pedestrian and biker who use the bicycle lane. Two sets of questionnaires are used for this research i.e. closed ended and open-ended questionnaire. This are helpful to answer and understand the extent of the problem and their perception to walkability of the area. Because it's the main inputs for design part. The entire questionnaires are prepared in English and then translate into Amharic, in order to make the questioner easily understandable for the respondents.

3.6. Sampling techniques

The major purpose of the research is assessment of the role bicycling lane to improve mobility with relate to different situation and indicate that or give insights how much it is important to improve mobility in Addis Ababa. To undertake this study with appropriate technique to improve accuracy of research findings, the researcher is use convenience sampling from non-probability

sampling for the questionnaire data. The first reason for selecting this method is the challenge of identifying and categorizing a highly diversified group of pedestrians and biker passing by with varying numbers and purposes at different hours. This technique is also selected because it's difficult to collect data by using other methods. Because other sampling methods are required more time to make stratified according to age, gender, education and religion. And for the interview-based data purposive or judgmental techniques from non-random sampling method is used to identify key informants.

3.6.1. Sampling Frame

The sampling frame to identify respondents are the pedestrian and bicyclist along the lane which unidentified in number and it handle by population unknown formula.

3.6.2. Sample Size

As stated in data source and collection method because of the nature of the study the major source of data is gathered through expert observation beside to this there are small number of questionnaires for cyclist and pedestrian those cycling and walking along the selected case area to present the assessment of the role bicycling lane to improve mobility of the case study area with additional evidence to the expert observation. Thus 25 cyclist and 40 pedestrians are taken by convenient sampling method. From the category of non-random sampling frames, 8 key informants will be selected.

Table 4key informants

key informants	Number of Interviewee
(Official from AACRA,	2
official from AATA	2
official from AATMA	2
official from Addis Ababa city plan commission.	2

Therefore, total sample size is the summation of all samples from the two sampling frames and contingency (5%) of the sampling units. Thus, n= (0.05*65) +65+ 8= 77. The contingency was intended to reduce the effects of non-willing, non-responds and misses on the desired data sources.

3.7. Methods of data processing and analysis

For the purpose of accomplishing the objectives of the study and to answer the research questions, the researcher will edit, cod, classify and tabulate the collected raw data in order to make it ready for analysis. Information from primary and secondary sources are analyzed by using qualitative and quantitative methods. Data that have quantitative nature such as average,

percentage and a like with relation to socio-economic condition are computed with Microsoft Excel and SPSS (Statistical Package for Social Science) software. On the other hand, in dealing with the qualitative analysis based on the evidence collected from the different sources are analyzed through carefully understanding and interpretations of organized data in order to use it together with the quantitative data. In general, the data collected are analyzed using different parameters developed by researchers through referring other experience from perspective of basic need of pedestrian and bicyclist.

3.8. Validity and Reliability:

Validity concerns the soundness, legitimacy and relevance of a research theory and its investigation (Kitchin and Tate, 2000). Indeed, validity does not carry the same meaning in the qualitative research as it does in quantitative research (Creswell, 2009). However, it does not mean that validity is unimportant factor in qualitative approaches. Instead, it is a vital means which any qualitative researcher should be concerned while conducting study to assure quality. On the other hand, reliability refers to repeatability or consistency of a finding. However, while consistent findings are quite common in physical sciences, they are much rarer in the social sphere. Furthermore, result consistency is unthinkable in qualitative study since human beings by nature are unstatic. Ensuring reliability in qualitative research therefore concerns to whether the findings of a study can be trusted (Tatek, 2008) rather than repeated.

In this case, reliability in qualitative study is different in concept from quantitative research. Therefore, both concepts can be replaced with different words, for instance trustworthiness and accuracy. In fact, whichever word given to the concepts, the ultimate issue is quality. Therefore, in this study, result quality has been achieved on the basis of suggestions given by Creswell.

To bring quality result I attempted to avoid mistakes during transcription, gave due attention on codes, back some description to the participant to check accuracy, clarify the biases if ever I made throughout the study, spent prolonged time in the field to develop an in depth understanding towards the phenomena. Besides, I crosschecked the responses given in different times by informants to show inconsistency. On the other hand, qualities are also affected by ethical and inter subjectivity manifestations.

3.9. Ethical consideration

Whenever research is conducted, the wellbeing of the respondents is a top priority. If not, all of our efforts remain fruitless. Having this in mind, I made reasonable attention to the cultural, economic, social and political dimensions of respondents, which in turn helped me to become careful when I was conducting interview. On the other side, informants were told about the exact purpose of the study in order to avoid reply exaggeration as well as distortion that could be the case if the researcher would deceive.

3.10. Conclusion

According to descriptive study, simple random samplings from probability sampling and purposive or judgmental techniques from non-random sampling method will be used to identify informants. Thus, primary and secondary data sources are used in this research. The data collection tools are; questionnaire, interview, field observation and document analysis.

CHAPTER FOUR

4. Data analysis

4.1. Introduction

The analysis resulting from applications of different measurements developed by different scholars from pedestrian and bicyclist perspective by expert observation of the site, perception of pedestrian, bicyclist and key informant interviewed. In order to address the first objective of this research means assessing existing bike lane condition of the road, to do so that, the researcher conducted detail observation on road front area with the help of pictures and videos and analyzed the pedestrian flow characteristics, furthermore key informant interview, pedestrian and bicyclist survey through questioners also conducted to sport the field observation. So, the presented result and finding was based from all methods.

The analysis is done based on both perceptual and physical major measurements or evaluations related to bicycle lane or bikeability index variables of case study area such as safety, topography, environment condition, mixed land use, bicycle infrastructure, road density, important of destination and destination density. In order to address the first objective of this research means measuring bikeability based on indexes from best experience, the practice from Active Living Research Program was adapted. The adapted measurements indexes presented in the index.

In order to address the second objective of this research means assessing current bicycle lane condition, to do so that, the researcher conducted detail observation from the start of the lane to the end through the help of pictures and videos and furthermore key informant interview and pedestrian and cyclist survey also conducted to sport the field observation. So, the presented result and finding was based from all methods.

In order to support the expert observation weather agreed or disagreed from the users of the road and evaluates the level of bikeability lane small number of questionnaire survey for pedestrians and cyclists were conducted. A sample of the questionnaire survey can be found in Appendix. A total of 32questionnaires have been given to the pedestrians and cyclist collected, from those 2 of them where not finished properly, thus the remaining 30 was taken for the analysis as follow.

4.2. General profile of the respondents

4.2.1 Sex of respondents?

		Frequency	Valid Percent
Valid	Female	18	27.7
	Male	47	72.3
	Total	65	100.0

Table 5 Sex category

Out of 65 pedestrians and cyclist respondents, 18(27.7%) of them were female and 47(72.3%) of them were male.

4.2.2what is your age?

From categories of age the researcher assigned from 18-25 age are 38.5%, from 26-35 are 49.2%, from 36-50 are 10.8% and finally from 51-35 are 1.5% which means the second categories of age is having maximum among the remaining categories and the minimum is the last one

what is your age?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25	25	38.5	38.5	38.5
	26-35	32	49.2	49.2	87.7
	36-50	7	10.8	10.8	98.5
	51-35	1	1.5	1.5	100.0
	Total	65	100.0	100.0	

Table 6 Age category

4.2.3What is your Education?

What is your Education?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	elementary	4	6.2	6.2	6.2
	Secondary	17	26.2	26.2	32.3
	Higher	44	67.7	67.7	100.0
	Total	65	100.0	100.0	

Table 7 education category

Among the whole respondents the major part of education level is about 67.7% having higher education level, 26.2% are in secondary education level and the last one which are about 6.2% are in elementary education level.

4.2.4What is your Occupation?

As shown below in the table the 69.2% of the respondent are employed,24.6% are students which take the second level of the data, 4.6% of the respondent are unemployed and finally 1.5% of the respondents are pensioner.

What is your Occupation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Student	16	24.6	24.6	24.6
	Employed	45	69.2	69.2	93.8
	Unemployed	3	4.6	4.6	98.5
	Pensioner	1	1.5	1.5	100.0
	Total	65	100.0	100.0	

Table 8 occupation category

4.2.5How do you assess your financial situation?

How do you assess your financial situation?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very good	8	12.3	12.3	12.3
	Good	7	10.8	10.8	23.1
	Average	31	47.7	47.7	70.8
	Bad	14	21.5	21.5	92.3
	very bad	5	7.7	7.7	100.0
	Total	65	100.0	100.0	

Table 9 financial category

According the above data shows most of the respondent have average income per month which is 47.7%, the second group of the data are the respondent that having bad income per month are 21.5%, 7.7% of data shows very bad income per month, 10.8% holds good income per month and finally 12.3% belong to the respondents that having very good income per month.

4.3. Do you have a driver's license?

Do you have a driver's license?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	34	52.3	52.3	52.3
	No	31	47.7	47.7	100.0
	Total	65	100.0	100.0	

Table 10 driver's license

Among 65 respondents about 53.35% of the data shows they have driving license and about 47.7% does not have a license.

4.4. Do you have a bike?

The below table that 38.5% of the respondents have a bicycle and the rest does not have a bicycle which is 61.5% from the data.

Do you have a bike?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	25	38.5	38.5	38.5
	No	40	61.5	61.5	100.0
	Total	65	100.0	100.0	

Table 11 having a bike?

4.5. How long is the distance from your home to your work place?

How long is the distance from your home to your work place?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not selected	4	6.2	6.2	6.2
	<=2km	14	21.5	21.5	27.7
	2-5km	20	30.8	30.8	58.5
	5-8km	9	13.8	13.8	72.3
	>=8km	18	27.7	27.7	100.0
	Total	65	100.0	100.0	

Table 12 distance from home to work place

Here the first categories show that the respondent that does not have a job which is 6.2% ,21.5% shows that those who have a job with in 2km, 30.8% of the respondent are 2-5km far from their home to move to work place, 13.8% are wit in 5-8k to go work place from home and the remaining 27.7% are gone the long journey from home to work place.

4.6. How long is the distance from your home to the nearest stop of public transport?

How long is the distance from your home to the nearest stop of public transport?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=200m	18	27.7	27.7	27.7
	200-500m	23	35.4	35.4	63.1
	500-1000 m	19	29.2	29.2	92.3
	>=1000m	5	7.7	7.7	100.0
	Total	65	100.0	100.0	

Table 13distance from home to the public transport station

Here the graphs and the table show 27.7% on survey the respondent can reach the nearest public station with in 200m, 35.4% has to go from 200-500m to get the nearest station, 29.2% are getting the nearest station within 500-1000m and 7.7% of the respondents have to go above 1000m to get the nearest public transport.

4.7. How long is the distance from your home to the nearest bike lane?

How long is the distance from your home to the nearest bike lane?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	<=1km	26	40.0	40.0	40.0
	1-3 km	20	30.8	30.8	70.8
	3-5 km	9	13.8	13.8	84.6
	>=5 km	5	7.7	7.7	92.3
	5	5	7.7	7.7	100.0
	Total	65	100.0	100.0	

Table 14distance from home to nearest bike lane

As shown on the above graph and table 7.7% people does know where the bicycle lane is available or the road segment, 7.7% respondents greater than 5km away from the bicycle lane, 13.8% of near to the bicycle lane with 3-5km, 30.8% are between 1-3km away from the bicycle lane and the remaining respondent are so close to the lane with in 1km.

4.8. Rate your desire to have more bike lanes in the District?

Here it shows how the respondents to see how do they interact to have a bike lane in their area so that among 65 of them three only do not want to have a bike lane represented on the table “no

action" which is 4.6%, 10 respondents have very bad interest to have more bike lanes which is 15.4%, 4 respondents have bad interest level to have it , 24.6% the response show they have average interest to have more bicycle lane which is 16 respondents, 13 respondents have good level of interest to have more bike lane in there district which is 20% and 19 of the respondents have a very good interest to have bicycle lane in there district which is about 29.2%.

Rate your desire to have more bike lanes in the District?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no action	3	4.6	4.6	4.6
	very bad	10	15.4	15.4	20.0
	Bad	4	6.2	6.2	26.2
	Average	16	24.6	24.6	50.8
	Good	13	20.0	20.0	70.8
	very good	19	29.2	29.2	100.0
	Total	65	100.0	100.0	

Table 15desire to have more bike lanes in the District

4.9. How effective was the educational messaging on bike lanes communicated to you?

How effective was the educational messaging on bike lanes communicated to you?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	not available	4	6.2	6.2	6.2
	very bad	12	18.5	18.5	24.6
	Bad	14	21.5	21.5	46.2
	Average	15	23.1	23.1	69.2
	Good	12	18.5	18.5	87.7
	very good	8	12.3	12.3	100.0
	Total	65	100.0	100.0	

Table 16education messaging to the community

Here the graph and table show how the education messaging to the community communicated effective so among the collected data from the respondents 6.2% said that the message delivered to them were not effective about bike lane, 12 of them from 65 respondents has said the education messaging was very bad for them which is 18.5%, 14 people said bad to them which is about 21.5%, 23.1% of the respondents has said that it was averagely effective, 12 respondents

said it was good communicated to them which is 18.5%and finally 8 person from them said it was communicated very good to them which is 12.3%.

4.10. Do you utilize the bike lanes?

		Frequency	Valid Percent
Valid	Yes	26	40.0
	No	39	60.0
	Total	65	100.0

Table 17utilization of bike lane

For this question 26 respondent said that they use the bike lane when they are biking which is 40% among 65 respondents and the remaining said that they never use the bike lane for different reason which is 60%.

14.1. If you said 'yes', what are your main reasons for cycling?

The data bellow shows why the respondent use a bike lane and from the 65 response 7 of them said they use it for travel to and from work, 1 of them said that they use it for shop or run errands,6 of them is use it for leisure or recreation and 12 of them use for fitness or training purpose.

		Frequency	Valid Percent
Valid	not selected	39	60.0
	Travel to and from work	7	10.8
	Shop or run errands	1	1.5
	Leisure or recreation	6	9.2
	Fitness or training	12	18.5
	Total	65	100.0

Table 18reasons for cycling

14.2. If you said 'no or rarely', why not?

Here the data indicate that 7.7% not use the bicycle lane which they do not feel safe cycling on the road, 3.1% of them not used the lane because it is weather dependent, 29.2% which take the major reason that the respondent not used bike lane because the available rotes are inconvenient or it does not meet their needs, 9.2% of the respondent does not have no interest and 9.2% not use the lane because of different reason.

		Frequency	Valid Percent
Valid	not selected	26	40.0
	I don't feel safe cycling on the road.	5	7.7
	It is weather dependent.	2	3.1

	The available routes are inconvenient or don't meet my needs.	19	29.2
	I have a physical or health limitation.	1	1.5
	I have no interest.	6	9.2
	Other	6	9.2
	Total	65	100.0

Table 19 reason for not utilization of bike lane

4.11. How would you rate the following as reasons that you do not BICYCLE more frequently?

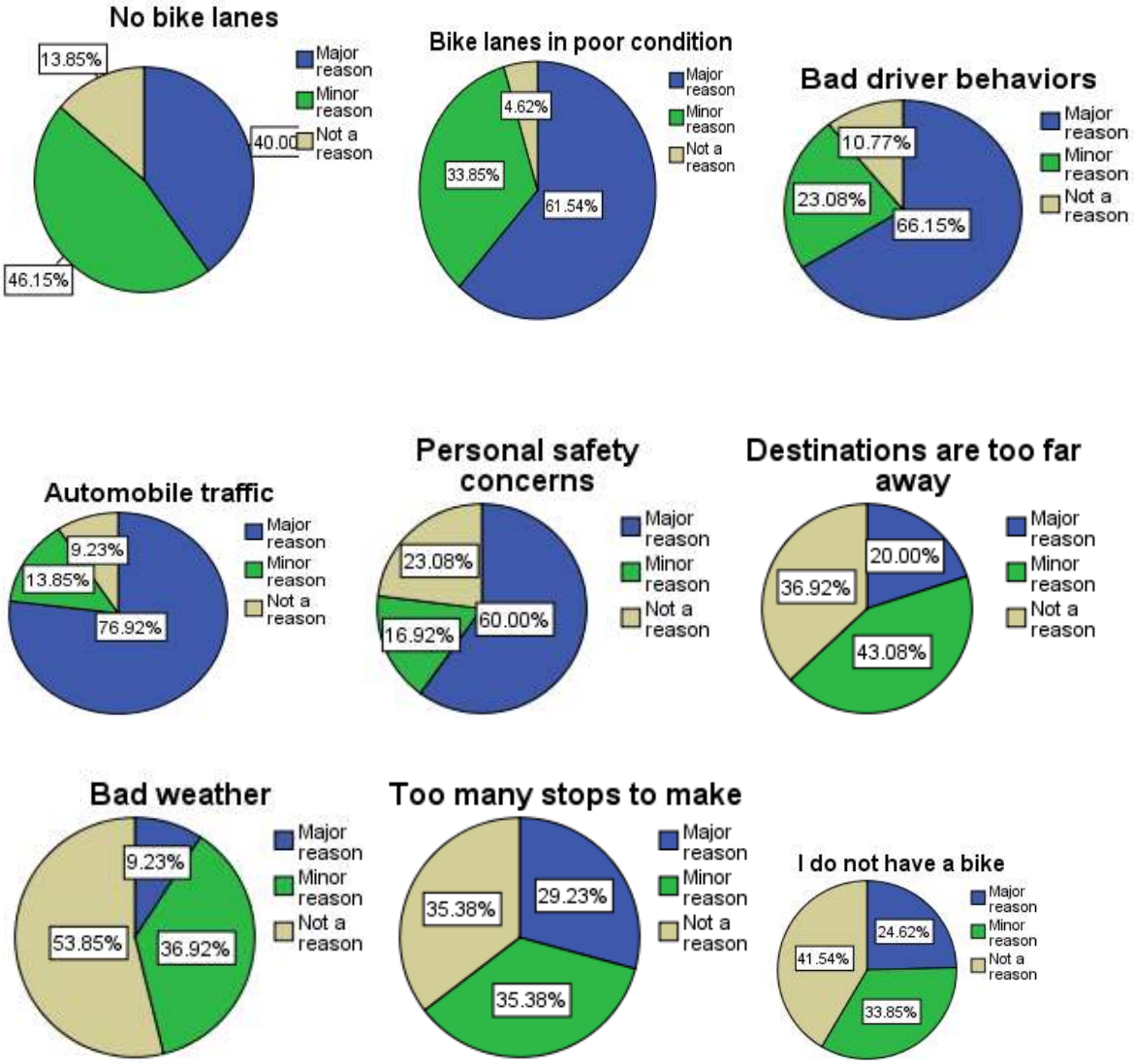


Figure 8 rating for bicycling

a) No bike lane: for mentioned question for 26 of them it was the major reason, for 30 of them it was minor reason and 9 of them it was not a reason that why they did not bike more frequently.
b) Bike lane in poor condition: for 40 of them it was the major reason, for 22 of them it was minor reason and for 3 of them it was not a reason to not bicycling more frequently.
c) Bad driver behavior: for 43 of them it was the major reason, for 15 of them it was minor reason and for 7 of them it was not a reason that why they did not bike more frequently.
d) Automobile traffic: for 50 of them it was the major reason, 9 of them it was a minor reason, and for 6 of them it was not a reason that why they did not bike more frequently.
e) Personal safety concerns: for 39 of them it was their major reason, for 11 of them it was a minor reason and for 15 of them it was not a reason that why they did not bike more frequently.
f) Destination is too far away: for 13 of them it was the major reason, for 28 of them it was the minor reason and for 24 of them it was not a reason that why they did not bike more frequently.
g) Bad weather: for 6 of them it was the major reason, for 24 of them it was the minor reason and for 35 of them it was not a reason that why they did not bike more frequently.
h) Too many stops to make: for 19 of them it was the major reason, for 23 of them it was the minor reason and for 23 of them it was not a reason that why they did not bike more frequently.
i) I don't have a bike: for 16 of them it was the major reason, for 22 of them it was the minor reason and for 27 of them it was not a reason that why they did not bike more frequently.

4.12. If you ride bicycle, how often do you ride?

Here the data explain that 10 of them ride bike daily which represent 15.4% among the 65 respondents, 19 respondents ride bike weekly which take the major portion of the data about 29.2% of the total respondents, the other who drive a bike monthly are 10 which take 15.4% and the remaining 40% they are totally never ride a bike any time which are 26 of them among 65.

If you ride bicycle, how often do you ride?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Daily	10	15.4	15.4	15.4
	Weekly	19	29.2	29.2	44.6
	Monthly	10	15.4	15.4	60.0
	not at all	26	40.0	40.0	100.0
	Total	65	100.0	100.0	

Table 20 frequency to ride bicycle

4.13. Do you know anyone who utilizes the bike lanes?

		Frequency	Valid Percent
Valid	Yes	41	63.1

	No	24	36.9
	Total	65	100.0

Table 21 bike lane being used by others

Among the collected data 41 respondents did know who use a bike lane around the case area which is 63.1% and the rest 24 respondent they did know who use a bike lane which is about 36.9%.

4.14. Do you feel your input was taken into consideration when the decision was made to install bike lanes in your community?

Here the data show that major respondents say that their input was not considered when the bike lane installed which is 81.5% among the total respondents and only 12 of them said that their input was taken when the authority planned to make a bike lane which is 18.5%.

Do you feel your input was taken into consideration when the decision was made to install bike lanes in your community?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	12	18.5	18.5	18.5
	No	53	81.5	81.5	100.0
	Total	65	100.0	100.0	

Table 21your input consideration to install bike lanes in your community?

4.15. Has the installation of bike lanes interfered with your travel pattern?

From 65 response for this question 52.3% of the respondents which is 34 the installation of the bike does meet their travel pattern and around 47.7% of the response indicate that the it does not meet their travel pattern of which is 31 of them among the general response.

Has the installation of bike lanes interfered with your travel pattern?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	34	52.3	52.3	52.3
	No	31	47.7	47.7	100.0
	Total	65	100.0	100.0	

Table 22bike lanes interference with travel pattern

4.16. Do you think the bike lanes currently installed create a safety risk for cyclists?

Do you think the bike lanes currently installed create a safety risk for cyclists?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	41	63.1	63.1	63.1
	no	24	36.9	36.9	100.0
	Total	65	100.0	100.0	

Table 23 safety risk for created by bike lane

Out of 65 response 41 of the response indicate that the bike lane currently installed in the case study area create safety risk for them and 24 of them they said that it does not create a safety risk for the cyclist which is 63.1% and 36.9% respectively.

4.17. In your opinion, do the bike lanes add value to the community?

In your opinion, do the bike lanes add value to the community?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	23	35.4	35.4	35.4
	no	21	32.3	32.3	67.7
	maybe	21	32.3	32.3	100.0
	Total	65	100.0	100.0	

Table 24value added to comminutes

For this question 23 of them said that the bike lane adds a value to the community which represent 35.4%, 21 respondents said that it does not add a value to the community which is about 32.3% among the total and the remaining said that maybe the bike lane add a value to the community which take 32.3%.

4.18. In your opinion, do you think businesses are positively impacted by the bike lanes?

Most of the response for this question about 41.5% show the bike lane has a positive impact on the business which represent the response of 27 respondents, 26 out of 65 said that it does not have a positive impact in business which is 40% and the rest of them said that it maybe have impact on business which is about 18.5% among the total response.

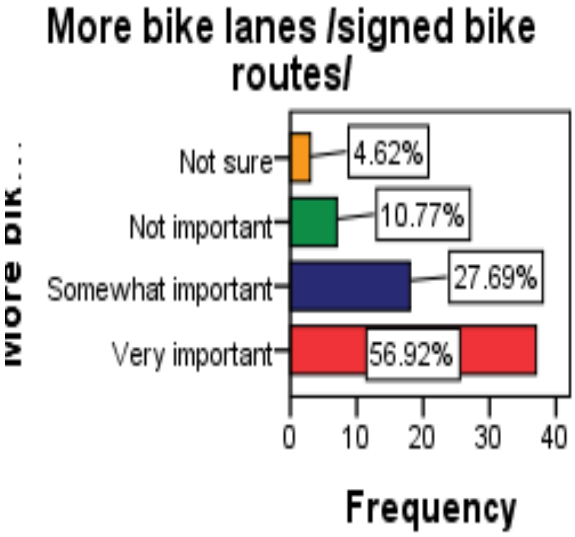
In your opinion, do you think businesses are positively impacted by the bike lanes?

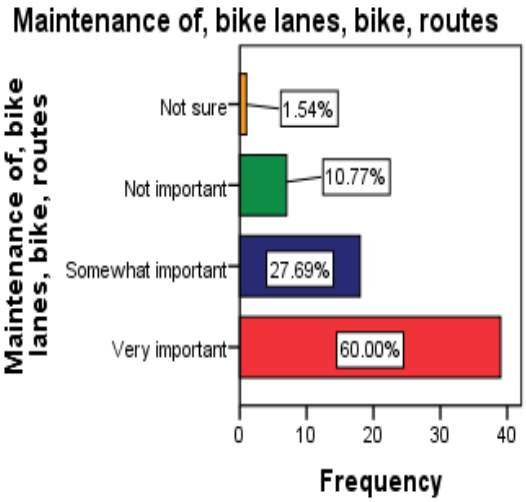
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	yes	27	41.5	41.5	41.5

	no	26	40.0	40.0	81.5
	maybe	12	18.5	18.5	100.0
	Total	65	100.0	100.0	

Table 25 positive impact on business

4.19. How important do you think the following improvements would be in supporting bicycling in the ADDIS ABABA city?





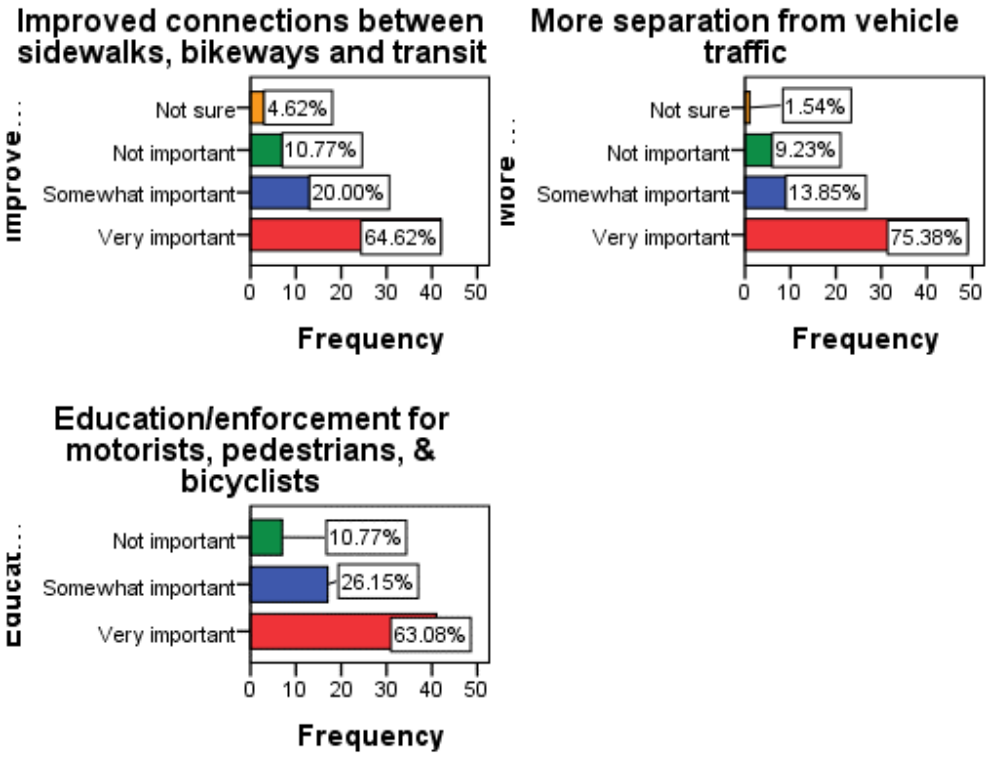


Figure 9 improvement to support biking

a) More bike lane: 37 respondents said that improvement on more bikes is very important to them to support cycling in Addis Ababa, for 18 of them it is somewhat important, for 7 of them it is not important and 3 of them said that they are sure about its important to support biking.
b) For the second question here, most respondent said that maintenance bike lane, bikes are very important which is 39 of them, it somewhat important for 18 of them, 7 of them said that it is not important and the remaining respondents are not sure about its benefit to support biking in Addis Ababa.
c) Here improved connection between sidewalks, bike ways and transit for major respondents is very important for 42 of them, for 13 of them it is somewhat important, for 7 of them it is not important and for 3 of them is not sure about its improvement to support cycling in Addis Ababa.
d) About 49 of the respondents here said that more separation from vehicle traffic is very important for it, 9 of them said that it somewhat important for it, 6 of them said that it is not important for supporting it and only one person is not sure about it to support biking in Addis Ababa.
e) Among 65 of them 41 response show that education or enforcement for motorist, pedestrians and bicyclist is very important to support biking, for 17 of them it is somewhat important for supporting and 7 respondents said that it is not important to support bicycling in Addis Ababa.

2. If I wanted, I would bike for transportation already under current conditions.

The graph and table as shown below 16 respondents strongly agree to use bike in current condition, 18 of them rather agree to use a bike, 6 responses show that they are not decided not to agree or disagree, 6 data show that they are rather disagree and 17 respondents are strongly disagreed to use bicycle in current condition as per the question.

If I wanted, I would bike for transportation already under current conditions.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	16	24.6	24.6	24.6
	Rather agree	18	27.7	27.7	52.3
	Undecided	6	9.2	9.2	61.5
	Rather disagree	8	12.3	12.3	73.8
	Strongly disagree	17	26.2	26.2	100.0
	Total	65	100.0	100.0	

Table 26bike for transportation

4.20. The coordination of bike infrastructure with public transport would encourage me to bike for transport.

The coordination of bike infrastructure with public transport would encourage me to bike for transport.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly agree	18	27.7	27.7	27.7
	Rather agree	25	38.5	38.5	66.2
	Undecided	5	7.7	7.7	73.8
	Rather disagree	9	13.8	13.8	87.7
	Strongly disagree	8	12.3	12.3	100.0
	Total	65	100.0	100.0	

Table 27 bike lane and public transport coordination

The above table and graph show18 responses strongly agree that the coordination of bike infrastructure with public transport would encourage them to use bike for transport, 25 of them rather agree to use bike, 5 of them neither agree nor disagree, 9 respondents rather disagree with that and 8 responses report that they are strongly disagree to use bike for transport.

4.21. City authorities have an influence on what mode of transportation is most willingly used by the residents.

As the data shown below 13 response are strongly agree that the authorities have an influence on the mode of transportation, 16 of them said that they rather agree with it, 8 of

them are neither agree or disagree with it, 6 respondents are rather disagreed with the influence authority on the mode of transportation and 22 of them strongly agree with authority influence on the mode.

		Frequency	Valid Percent
Valid	Strongly agree	13	20.0
	Rather agree	16	24.6
	Undecided	8	12.3
	Rather disagree	6	9.2
	Strongly disagree	22	33.8
	Total	65	100.0

Table 28 authority influence on transport mode

4.22. How do you usually commute?

If, during one travel you use more than one mode of transport, mark all modes that you use.

$commuting Frequencies

		Responses		Percent of Cases
		N	Percent	
mode of transport	usually commute by foot	9	10.8%	13.8%
	usually commute by bus	9	10.8%	13.8%
	usually commute by minibus	46	55.4%	70.8%
	usually commute by train	3	3.6%	4.6%
	usually commute by bike	10	12.0%	15.4%
	usually commute by private car	6	7.2%	9.2%
Total		83	100.0%	127.7%

.

Table 29 commuting frequency

Here the above table 19 show that 9 respondents usually commute by foot which is 10.8% out of 100% from the collected data,9 of them use bus for transport which is 10.8%, the most of the respondents use minibus for transportation us we can see form the data which is about 55.4% or 46 respondents,3 of them usually use train for transport which is 3.6%,10 or 12% from the total

respondents use bike for transport purpose and the rest 7.2% respondents use private car for transport.

4.23. The most pleasant experiences during daily commute:

(choose max. 2 answers)

$daily commute Frequencies

		Responses		Percent of Cases
		N	Percent	
most pleasant experiences	Smooth travel	29	22.3%	44.6%
	Contact with people	21	16.2%	32.3%
	Good well-being	21	16.2%	32.3%
	Observing the environment	12	9.2%	18.5%
	Comfortable mode of transport	22	16.9%	33.8%
	Possibility of listening to music, reading, playing	25	19.2%	38.5%
Total		130	100.0%	200.0%

Table 30 frequency of pleasant experience

The table show that most respondents like have smooth travel in their daily commute which is about 22.3%, 16.2% of them said that they like to contact with people and need to have good well-being, 9.2% said that observing the environment will make their day pleasant, 16.9% respondents said that they need to have comfortable mode of transport to have most pleasant day and the remaining 19.2% said that the day that having a chance or possibility to listen music, reading and playing are the most pleasant day for them.

4.24. The most unpleasant experiences during daily commute:

(choose max. 2 answers)

$daily commute Frequencies

		Responses		Percent of Cases
		N	Percent	
most unpleasant experiences	Traffic jams	49	37.7%	75.4%
	Long time to wait for the next change	21	16.2%	32.3%
	Lack of appropriate infrastructure	18	13.8%	27.7%

	Crowded bus	12	9.2%	18.5%
	Delayed bus	11	8.5%	16.9%
	The danger of an accident	19	14.6%	29.2%
Total		130	100.0%	200.0%

Table 31 frequency of unpleasant experience

As we can see from the data the most unpleasant day for 37.7% of the response is traffic jams during their daily commute, 16.2% of the response show their day become unpleasant when they waiting long time for the next change, 13.8% of the respondents said that lack of appropriate infrastructure when they commuting, 9.2% of the response show because of the crowded bus, delayed bus take the share 8.5% among the collected data's and the last that make their day mostly unpleasant is the danger of an accidents which is about 14.6%.

4.25. What would convince you to bike for transport?

Choose max. 3 answers.

As we can see form the table below for 22.3% respondents said that expanded bike lanes network convince them to use bicycle, 16.9% of them said that they will be convinced when a bike rack or bike parking at destination fulfilled, 13.8% of response show that if there is Additional appliances of bike infrastructures, e.g., pumps at bike lanes will convince them to use bicycle, 10.8% of the response show the will convinced if there is priority on roads for bicyclist, 9.7% of the them said that they will be convinced if there is a bigger number of bicyclist, 6.7% among the respondents said that if there is limited car traffic on roads, about 17.9% said that the possibility of cycling on roads closed for cars, or the opposite direction on one-way roads will convince them which is the second reason selected by the respondents among the rest ones and the remaining 2.1% have said that they will be more convinced if there is shower at the destination.

$bike for transport Frequencies

		Responses		Percent
		N	Percent	of Cases
convince you	Expanded bike lanes network	43	22.1%	66.2%
	Bike racks/ bike parking at the destination	33	16.9%	50.8%
	Additional appliances of bike infrastructures, e.g., pumps at bike lanes	27	13.8%	41.5%
	Priority on roads	21	10.8%	32.3%
	The presence of a bigger number of cyclists	19	9.7%	29.2%

	Limited car traffic on roads	13	6.7%	20.0%
	The possibility of cycling on roads closed for cars, or the opposite direction on one-way roads	35	17.9%	53.8%
	OTHERS	4	2.1%	6.2%
Total		195	100.0%	300.0%

Table 32 idea to use bike for transport

4.26. What discourages you from cycling for transport?

Choose max.3 answers

$bike for transport Frequencies

		Responses		Percent of Cases
		N	Percent	
discourage you	Weak bike lanes network	44	22.6%	67.7%
	Lack of bike racks/ bike parking at the destination point	35	17.9%	53.8%
	Risk of bike theft	27	13.8%	41.5%
	Heavy car traffic	45	23.1%	69.2%
	The distance commuted daily	14	7.2%	21.5%
	TIREDNESS	25	12.8%	38.5%
	OTHERS	5	2.6%	7.7%
Total		195	100.0%	300.0%

Table 33 idea which discourage cycling

As the above table show about 22.6% of the respondents discourage to use bike for transport because of weak bike lane network, 17.9% of them said that because of lack of bike racks/bike parking at the destination point, 13.8% of the said that because the risk of bike theft, among the whole data collected from the respondents heavy car traffic take the major reason which discourage them to use bike for transport and the distance commuted daily; tiredness; other reason like lack of shower at destination take 7.2%, 12.8% and 2.6 respectively.

4.27. Result or Finding

4.27.1.Non-motorized strategy in Addis Ababa

According to the interview made with the Addis Ababa city administration key informant Addis Ababa have a non-motorized strategy starting from 2019 up to 2028. The authority believed that as the city rising quickly it needs an urban environment that is safe, comfortable and inclusive. In addition to this the previous strategy planning has concentrated on the need of private vehicle user without considering the majority city residents who walk, cycle and public transport user. These approach leads to the problems of congestion and road safety which affect the economic development, productivity and public health.

And the city administration planned to investing I sustainable transport system that support to defense climate change, simplify trading and advance the access to education, health and jobs. The city administration with the coordination of Addis Ababa Road Transport Bureau authority for the coming ten years they have a strategy to develop city wide walking and cycling network that make the sustainable mode of transport make safe, suitable and easy to use. The street design will be added with better mobility services and they believed that the more investment made on non-motorized transport will give a number of benefits, particularly for low-income residents because most of the them rely on walking and public transport relative to few personal vehicles in the city and getting more challenges such as insufficient size foot paths, unsafe crossing and badly maintained infrastructure. They are seeking to give a priority for non -motorized transport including walking, cycling and other form of NMT and the use of NMT will give different benefits such as work and educational chances, better public health, minimized emissions of hazardous pollutants and reduction of injuries from traffic accidents.

This NMT strategy depends on the transport policy of Addis Ababa which gives a distinct consideration to non-motorized transport through developing pedestrian and bicycle networks. To make higher quality walking and cycling facilities the strategy considers the city master plan, compact settlements, integrated development of transport and housing, and in order give a care to pedestrian safety it closely related to Addis Ababa Road safety strategy.

4.27.1.1. DESIGN PRINCIPLES FOR WALKING AND CYCLING

To make non-motorized mode of transport feasible and suitable it needs the street space rebalancing and then it will provide to all modes. For creating a high-quality walking

environment, the physical design of streets, the provision of sidewalks, crossings, and other walking infrastructures are important. Accommodating NMT involves two basic techniques:

• **Systematic traffic calming on smaller streets**: to decrease motor vehicle speeds and provide safe places for the mixing of walkers and other modes (shared lanes);

• **Pedestrian and cycle infrastructure that is physically disconnected from motor vehicle traffic on larger streets**, paired with traffic calming or traffic control to facilitate safe crossings. Pedestrian footpaths should deliver clear space for walking, with other elements placed in a strategic manner. These elements include paving, landscape planting, and street lighting, street furniture, public facilities, underground utility access points, and other sidewalk amenities. Similarly, dedicated cycle tracks should be provided isolated from the mixed traffic carriageway. Large streets require signalization or traffic calming at crossings and intersections to enable pedestrians and cyclists to move on the street safely. The Addis Ababa Master Plan, developed by the Addis Ababa City Government Plan Commission, incorporates provisions for NMT, recommending that cross sections for streets in the city center allocate 60 percent of the right-of-way (ROW) to footpaths, cycle tracks, and other NMT facilities.

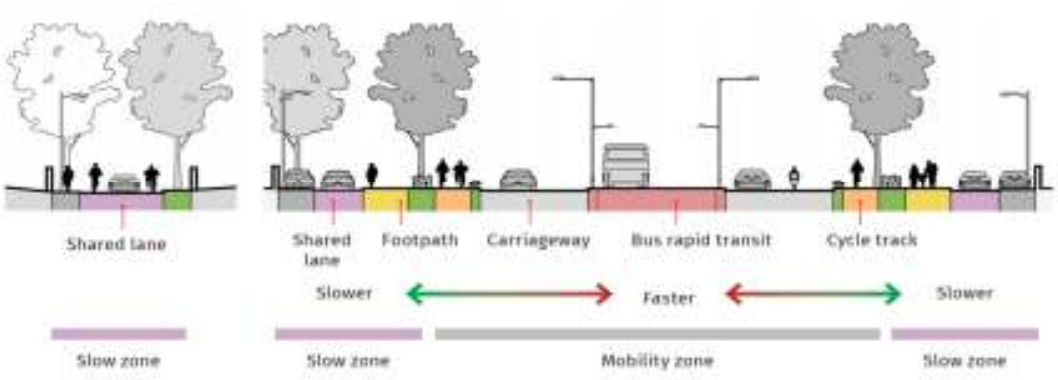


Figure 10 Smaller streets function as shared spaces

Figure-- Smaller streets can function as shared spaces where pedestrians walk together with slow moving vehicles (left). On larger streets with heavy vehicles and faster speeds, separate space for pedestrians and cycles
is needed (right)

4.27.1.2. Vision of Addis Ababa city related to NMT

Addis Ababa will offer safe, effective, and reachable pedestrian and cycling networks to expand access to opportunities and mobility for all residents, foster equitable allocation of street space, and create a dignified walking and cycling environment.

4.27.1.3. Addis Ababa non-motorized strategy intuitive

1. **Pedestrian network:** Addis Ababa administration have a strategy to prepare a footpath that consist of three zones to provide a continuous space for walking which support other activities such as street vending and waiting at bus stops without affecting pedestrian mobility. Frontage zone contain a buffer between street-side activities and the pedestrian zone; the pedestrian zone offers a continuous space for walking which is clear form any obstruction and the furniture zone provide space for trees, furniture, lights, bus stops, signs, benches and etc. This footpath designed to ensure that the pedestrian environment is accessible to persons with disabilities and person with visual impairments.

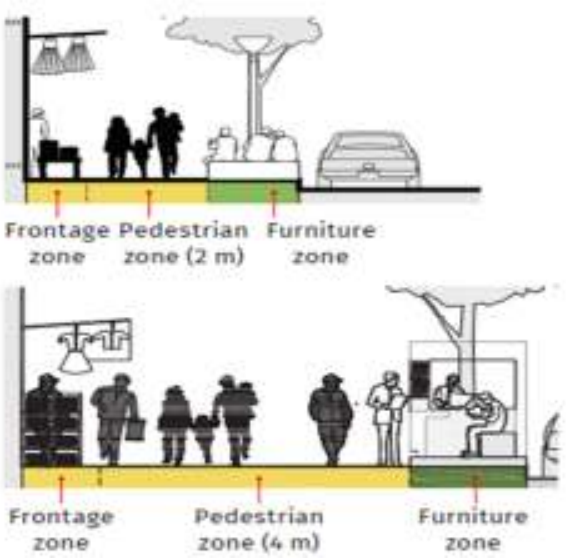


Figure 11 footpath zones

10-year targets of this strategy

- 600 km of new and existing streets incorporate a continuous pedestrian realm with high-quality footpaths, safe at-grade crossings, and adequate street lighting.
- All schools have safe pedestrian access.

2. **pedestrian priority precincts:** this strategy implemented to the area where the demand for pedestrian activity is much greater. These zones must use bollards and other barriers to physically separate vehicles from encroaching on NMT space and should ensure compliance with disability access guidelines and offer acceptable cycle parking. Piazza, Megenagna, Merkato and Churchill South are the most area that having high priority locations for pedestrian precincts.

   10-year targets of this strategy

Pedestrian zones, public spaces, and comprehensive street improvements implemented in Piazza, Megenagna, Merkato, and ChurchillSouth.

3. **Bicycle Network:** as we know bicycle is one mode of sustainable transport which is segregated track is often faster than using a private vehicle for short distance trips. Addis Ababa city is in continent for cyclist because of faster moving traffic and it need physical separation from the carriageway: must have sufficient clear width for cycle movement; a smooth surface material and a buffer between the track carriageways.
   The planned network of the cycle tracks will cover key urban corridors, including arterial roads aiming to get easily surrounding residential areas and to connect high density residential areas to commercial districts. The network also leads to light train transit, bus rapid transit and public transport stations but the implementation phase prioritize roads to rapid corridors: streets with high cycle volumes; within the coverage area of the bicycle sharing system and streets with flat topography.
   10-year target of strategy
   - 200 km of cycle tracks constructed

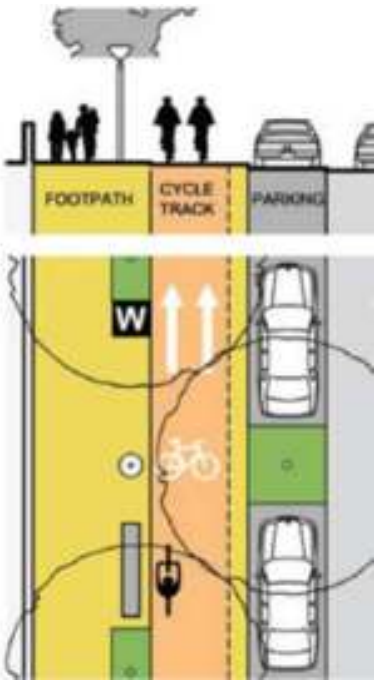


Figure 12 bicycle truck on urban corridor

4. **Greenway Network:** green way is used to describe walkways and cycle paths that utilize an independent ROW. it can offer safe, convenient connectivity to important destinations such as schools, markets. Addis Ababa has the chance to build a network of high- quality greenways because of many rivers that will help to improve mobility for all NMT users. It must be combined in to NMT networks along adjacent streets.
   10-years target of strategy
   - 20 km greenway network implemented
5. **Public Transport Access:** people must have safe access to stations with well-designed crossing which allow the pedestrians to cross busy streets safely and conveniently and it must meet standards such as a raised crosswalk must be provided elevated to the level of the adjacent footpath considering the speed of the motor, at unsignalized crossings the walker should not have to cross more than two lanes of traffic before reaching a walker refuge and speed bump which need to minimize the motor vehicle speeds.
   The placement of bus shelters in the streetscape is the element of public transport access. Most of the installed bus shelters decrease the clear width available on footpaths which lead the walker to walk in the carriageway and the bus station must be sized per local public transport demand.
   10-year target of the strategy

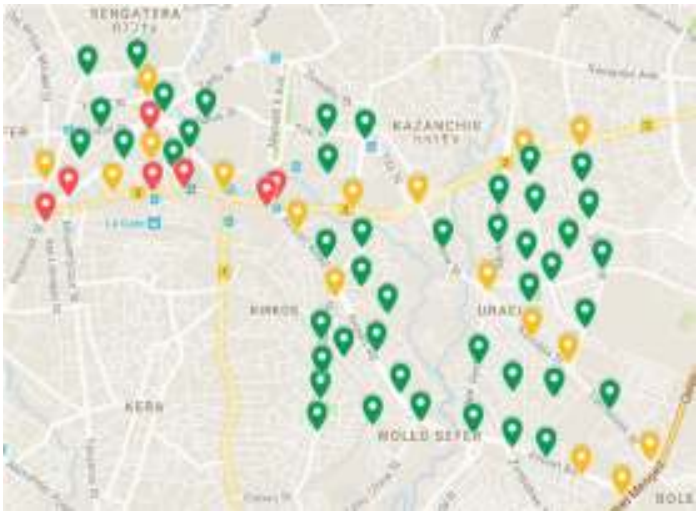
- Safe, at-grade pedestrian crossings with traffic calming or signalization implemented at all BRT and LRT stations.
- High-quality bus shelters installed at all bus stops and integrated the design of footpaths and cycle tracks.
- Bicycle parking provided at BRT and LRT stations.

6. **Intersection improvement:** redesigning the Addis Ababa intersections to keep the pedestrians from accidents and inspire safe driving which is identified in Addis Ababa Safety strategy. The Safety intersection program use the following strategies such decreasing the size of corner radii, adding medians and refuge islands, making direct pedestrian crossing, creating compact intersections and narrowing travel lanes and reclaiming underutilized space. These interventions have effective to decrease the vehicle movement and offering safe space to pedestrians and public perception of the city's streets.

   10- year target of this strategy

   - All intersections on the arterial road network in Addis Ababa are designed for pedestrian and cyclist safety and access.

7. **Bicycle Sharing System:** this will advance the last mile connectivity to public transport and serve short trips in city through a safe, healthy and environmentally friendly means of transport. The sharing system in the beginning will deliver in Mexico, Meskel Square, Bole and Urael/Atlas and as a pilot zone it will be started in a condominium area. The system will start with 500 bicycles and throughout the time reaching up to 10,000 bicycles to serve all of Addis Ababa. The bicycle controlled by information technology system like GPS and their activities controlled by Addis Ababa Roads and Transport Bureau to manage the bicycle sharing system.



10-year target of this strategy

- 10,000 shared bicycles serve short trips and improve last-mile connectivity to public transport.

The bicycle sharing system (red = large stations, yellow = medium stations, green = small stations).

Figure 13bicycle stations

8. **Parking Management**

   The traffic management agency is currently developing a parking management strategy for the city which involves to offering clear, consistent customer information on parking

rules and fee levels. The enforcement related to parking will be IT-based monitoring of enforcement agents so that the government receives regular updates on the number of vehicles checked, payment status and number of enforcement events through the help of GPS.

10-years target of strategy

- 30,000 on-street spaces are managed through an IT-based parking system, generating revenue for sustainable transport.
- Bollards are installed on all footpaths at high risk of parking encroachment

9. **Vendor Management**

   The use of public spaces, parking lanes and furniture zone for organized street vending can help ensure that clear space remains for the movement of pedestrians and cyclists. The city administration will give the license to street venders with standards for stands monitor the vending areas.

   10-years target of strategy

   A comprehensive street vending management system ensures that organized vending complements other road uses.

10. **Street Design Standards:** The Addis Ababa City Roads Authority design manuals consist of several volumes that provide guidance on geometry, drainage, road rehabilitation and other elements of the NMT environment. Geometry design manual such as design speeds, footpath geometry, cycle track geometry and pedestrian crossing; street lighting design manual and bridge design manual.

    10-year target of strategy

    - Revised Geometric Design, Street Lighting Design, and Bridge Design Manuals incorporate best practice standards for walking and cycling design.

11. **Review of building control & planning regulations:** the built environment around the pedestrian routes should be conductive to walking. The building setbacks, the ratio to building height to street width and the articulation and permeability of building – street interface have a high impact on the quality and safety of pedestrian spaces

    10-year target of strategy

    - Condominium projects incorporate compact layouts and improve NMT access to planned public transport corridors.
    - Building control regulations encourage active frontage; reduced set back requirements; ensure that setbacks are publicly accessible; mandate arcades along commercial streets; and mandate a maximum block size of 100 m for all redevelopment projects.
    - Land use policies to encourage transit-oriented development (TOD) within 500 m of existing and planned mass rapid transit corridors. TOD elements will include affordable housing mandates, higher allowed densities, and maximum off-street parking standards.

12. **Communications and Engagement:** to develop public support for the NMT strategy communication and engagement play vital role and participating local residents, business and other stakeholder in planning and design of streets will increase transparency and

sense of ownership of public spaces. These activists will include open streets events, marketing campaigns and cycle trainings.

10-year targets of this strategy

- Regular open streets events offer safe space for walking, cycling, and other forms of recreation.
- Active marketing campaigns transform the image of NMT and drive growing usage of the bicycle sharing system.
- City residents have open access to information regarding ongoing transport projects and participate actively in the planning process at the city and sub-city levels.

4.27.1.4. AACRA design

On One-way lanes have the minimum width for bicycle lane is 1.2m and 1.8m on two -way lanes with absolute minimum widths of 0.9m and 1.5m respectively? The cycle track has slightly different width of 1.5m for one -way lane and 2.4m for two -way movements. The guide discourages the use of median cycle tracks, to determine the implementation of bicycle lane or tracks uses the volume of motor vehicle traffic and their speeds, and recommending the use of protected intersection design with corner islands and advises methods for retrofitting roundabouts to incorporate physically separated spaces for bicycle movement.

4.27.2.Current condition of Lebu to Jemo bicycle lane project

Assessment of bikeability was the main method used to evaluate the condition or the effectiveness. In addition to this there are many methods that has been used to evaluate the bikeability of bicycle lanes and among the different bikeability measuring method which had been reviewed and compiled the researcher found that the bikeability index method best fit for evaluation because it is convenient method which can show the condition of the Lebu to Jemo bicycle lane project. From variables of bikeability index the researcher use nine variables for assessment such as safety, topography, environments, mixed land use rate, road network density, important of destination and destination density.

4.27.2.1. Safety

To get evidenced information about the Lebu-Jemo bicycle lane project related to safety the researcher has interviewed the directorate director of Addis Ababa traffic management agency who is responsible to the issues happening around the district traffic lane and bicycle lane, he told me that only three easy accidents were recorded alongside the bicycle lane but the accident was not related to the bicyclist or pedestrians. One accident was the collision between the vehicle and the median infrastructure of the road and the other two accidents was vehicles to vehicles happened after the bicycle lane project implemented till the interview day.

From the questionnaires the researcher made for pedestrian and bicyclist related to safety 7.7% the sample of response show that they did not feel safe when cycling on the bicycle lane; and they put two major reason why they did not bike, first reason the bike lane in poor condition which demotivate them to ride a bicycle about 61.54% response from the total respondents;

second reason a personal safety concern which is about 60% response of the respondents and 63.08% response said that it create a safety risk for cyclists.
From the field observation the researcher noticed different concern as shown in the figure—such as the bicycle lane is being used by pedestrian as walking side corridor which make the cyclist not feeling free when they are riding; for safety purpose the authority makes the bicycle lane separated from the traffic lane to give some degree of safety through thermoplastic delineators and Bullard's, however the thermoplastic delineators most of them damaged and the Bullard's made from the cement concrete are smashed by vehicles and moved inside the bicycle lane and the road intersection and round about which connect the bicycle lane has no traffic sign related to bicycle lane which can give a sign for motorized vehicle to avoid accidents.

Figure 14 safety risk on bicycle lane

4.27.2.2. Topography

Here we can measure the topography of the bike lane area which has the effect on comfort and attractiveness aspect. The indicator to evaluate the topography of the bicycle lane is slope percentage of the bicycle lanes. Bicyclist will not use the area with high slope because the need to exert more energy to cycle their bicycle. The method to evaluate this variable is the ratio of bicycle lanes with low slop percentage. The ratio is equal to vertical height difference of the bicycle lane divided by the total length of the bicycle lane in the transit-oriented development area.

Percentage slope = vertical height difference /total length of bicycle lane*100

Percentage slope= 13m/3000*100

=0.433%

According to NACTOS the most recommended slope percentage for bicycle lane is below 6% of the slope percentage, but as the result show us the slope percentage for area which the bicycle lane installed is about 0.433% and relative to the recommended percentage it is very small that makes the bicycle lane suitable for bicycling.

Figure 15 elevation deference

4.27.2.3. Environment

As we know environment considered as one variable because it has influences on comfort and the attractiveness. For measuring this variable there are four common indicator such as bicycle lane along water area, bicycle lane along beauty area, bicycle lanes along built-up area and bicycle lanes along green area. In order to measures this the Lebu to Jemo bicycle lane only fulfill one measurement because it is installed in built-up area. The bicycle lane has not gotten any shadow effect from the built-up area because the lane installed form west to east direction that means the bike rider all the time exposed to sun light in the harsh time. The researcher during field observation found out that most of the buildings constructed opposite to the bicycle lane are low rise buildings, so that the bike lane is exposed to south west sun light radiation which is the most harmful radiation released which can affect the bicycle rider harmfully.

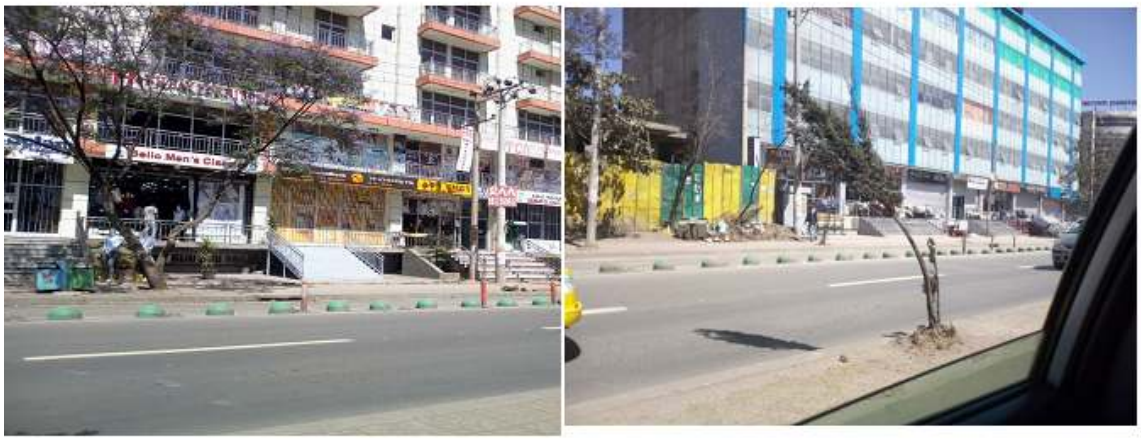


Figure 16 exposed bicycling to sun direction

4.27.2.4. Bicycle infrastructure

There are different design features that the bicycle must meet in design aspect among these features one bicycle should contain at least two design features such as type of the bicycle lane, type the road, road pavement, bicycle facilities, cycle tracks, shared use facilities, intersection and crossing treatments and signals.

The researcher evaluated the availability of these features through detail field observation in case study area, however the Lebu to Jemo bicycle lane was made with the traffic lane which is separated bicycle facility; the lane form the starting point to the end point is Bollard protected

cycle tracks; the type of bike lane being installed in the case study area is a buffered bicycle lane which is a designated buffer space separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane; throughout the length of the bicycle lane there is one roundabouts and five intersection crossing and it contain few bicycle activated signals.

The bicycle lane infrastructure in terms of quality can be measured which is the ratio of the length goof road surface of bicycle lane divided by the total length of bicycle lane, so that the result show that the condition of the road surface is categorized as good quality surface its ratio is one (3*1)/3=1 and the Lebu to Jemo bicycle lane have fulfilled more than two design features from bike infrastructure design aspects.

Figure 17 bicycling infrastructure

4.27.2.5. Mixed land use

The Lebu to Jemo bicycle lane area is composed of different land use residential area with housings area social housings, private, condominium and real estate apartments. This variable can show mixed activity which have a direct relation with a high bikeability because mixed use shortens the distance between the activities that increase bikeability. As shown in the figure-- Jemo is home to the largest government condominium site with 10,064 units of second-generation G+4 condominiums for around 50,000 dwellers.

Totally, from the field observation and survey the researcher discovered that there is a good mix of land uses and dynamic frontages, but this follow was not similar across all case study areas. Around Jemo condominium neighborhood appeared to have a fair number of commercially active frontages, with more than 3 entrances per 100 m and apart from this more of the apartment's frontage changes to commercial activity center such as restaurants, bars, café and shops.

This variable measured the activity group of the area with different activities which are positively related to the high bikeability. Mixed land use decreases the distances within the activities. In general, high level land use mix and diversity indicate the greater access to services and facilities which can be easily covered by cycling. Besides, residents within higher land use mix are reported to have more social engagement and outdoor activities. This reason has increased short-distance travel demand in turn leads to more bicycle usage. These characters indicate that the Lebu to Jemo bicycle lane corridor have high bikeability conditions.

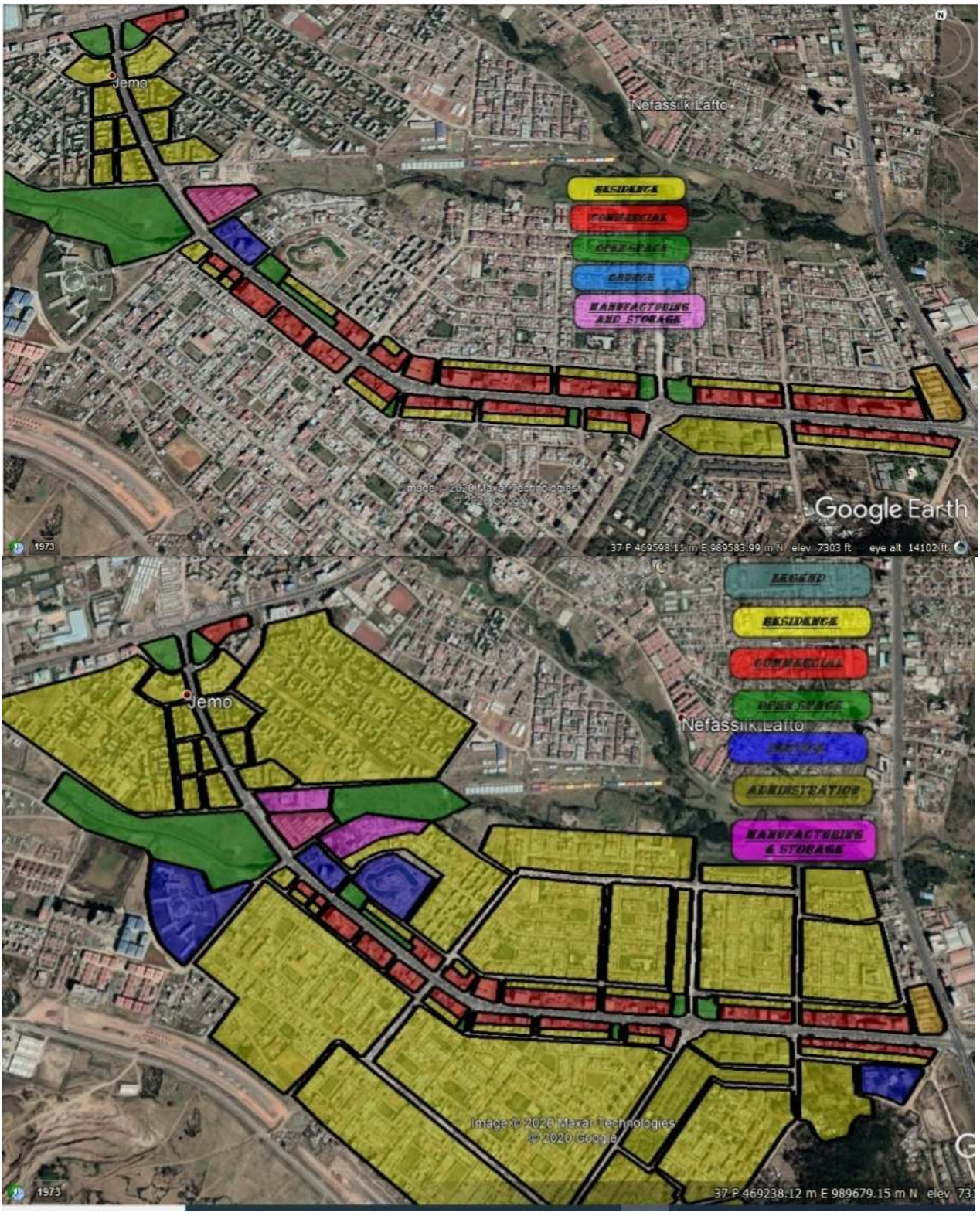


Figure 18 Existing Land use

4.27.2.6. Connectivity

A bike lane with many intersections assumed low connectivity and with less intersection assumed high connectivity. The Lebu to Jemo bicycle lane contain only one roundabout and two intersection without traffic light which means the bike rider can easily utilize the lane without making stop this measurement show that the lane is easy to understand by the whole user. When the shortest path distance the of bike lane divided by straight lane distance of the bike lane give the cycling directness which indicate the level of connectivity a lower number indicate higher connectivity and the lowest value of cycling route directness is 1 that means when the shortest path distance is equal to straight line distance which exactly the same value, we get in the Lebu to Jemo bicycle lane project.

Figure 19 intersection and roundabout

4.27.2.7. Destination density

It reflects the availability of destinations for cyclist's neighborhood commercial, educational, offices, and entertainment land uses which indicate the ability of the person to get destination by cycling. Among this destination commercial, educational and entertainment land use can be easily accessed for Lebu to Jemo bicycle lane user because most of them are alongside the bike lane so that the researcher took three destination response sample such as from work place to home, from home to public transport station and from home to bicycle lane from few respondents through questionnaires. And the result of the response indicates that most of the respondents can reach the public transport station below 1km distance from their home; 70% of the respondent can access the bike lane with in 1km distance and only 21.5% of the respondent

are below 2km distance away from work place to reach and the rest of them should go more than 2km away from home to reach workplace. The distance to the closest facilities is an explicit measure of accessibility. For transit riders who use cycling as a transfer mode, the distance from their home to the transit station is an important factor. The maximum cycling distance between one's home and a transit station range from 1.2 to 3.7 km. generally, the Lebu to Jemo bike lane can be used to get any public transport station for those living around the lane but it can be used only for few peoples to use it as one transport mode because most of the work place are above 2km away from home for most of them and according to their response this bike lane around for 52.3% of the respondents can meet their travel pattern and 47.7% of them does not meet their travel pattern which means totally have low destination density.

4.27.3.The role of bicycle lane

As we know Addis Ababa is a home to 17 percent of Ethiopia's urban population, is at a critical condition in its modern history. The city is moving with rapid population and economic growth. The number of private cars in the city is speedily increasing, which contributes to the bad congestions, loss of the public dominion, environment pollution, and traffic accidents. In order to void harmful impacts created by private motorized mobility and traffic crowding the transport authority believe that the strategic decisions requirements to hold the economy buzzing.

Currently, most residents depend on walking, cycling, and public transport, and there are moderately few private motor vehicles in the city. However, the pedestrians having many troubles related to transportation including inadequately sized footpaths, unsafe crossings, and badly maintained infrastructure. The city transport authority with cooperation of Addis Ababa Road and Transport Bureau (AARTB) is working closely with the Institute for Transportation and Development Policy (ITDP) try to find the way to prioritizes non-motorized transport (NMT). So that among the others non-motorized transport the authority giving the second priority to cycling next to walking which having tedious role in transportation system which bring numerous advantages including improved entrée to jobs and informative chances; better public health due to dynamic lifestyles; less emissions of harmful pollutants and decreasing the load of injuries and horrible traffic accidents.

According to the interview the researcher made with Addis Ababa roads and transport bureau key informants the role of bicycling lane project was focused on air quality and public health developments with the purpose of discovering the possibility of urban cycling and cycle sharing in Addis Ababa. The new project has the role to create "cost-effective movement systems" and "accessibility through improving relationships between people, places and activities." The overall strategy bicycle lane project role is to put a basement to a more accessible, inclusive, sustainable, efficient, healthy, and attractive city.

Key informants from Addis Ababa traffic management agency key who were directly participating on Lebu to Jemo bicycle project said that the role of the bicycle lane project is to provide a community a new mode transportation which minimizes destination time for bicyclist by avoiding traffic congestion.

Regarding to the bicycle lane role, the researcher has asked some respondents thorough questionnaires to see how the community understand the use of bicycle in Lebu to Jemo corridor following the bike lane and around 47 in count or 24.6% of them the respondents said that it is environmentally friendly to use for transportation with 0% emission pollutants to make the city public health assured. Secondly, about 39(20.4%) of the respondent said that bike lane encourage community for biking which means the communities can easily keep their health aspects in good condition because biking is physical exercise. Other role mentioned by the respondents in the third place it creates independency from other traffic condition which makes them feel safe from traffic accidents and there is different role of bike lane cited.

$bike lane role Frequencies

		Responses		Percent of Cases
		N	Percent	
Roles	Direct commute	16	8.4%	24.6%
	Independency	29	15.2%	44.6%
	Time-saving	21	11.0%	32.3%
	Money –saving	27	14.1%	41.5%
	Comfort	8	4.2%	12.3%
	Environmentally friendly	47	24.6%	72.3%
	Good for one's health	39	20.4%	60.0%
	Others	4	2.1%	6.2%
Total		191	100.0%	293.8%

Table 32 bicycling role

Generally, the research made field observation excessively for one month with in consecutive days on peak hour and off-peak hours in each week to understand the clear role of the Lebu to Jemo bicycle lane project and noticed that the lane slightly used in the morning from 12:00 up to 1:00 local time for sport activity. Addis Ababa traffic management agency has a monthly vehicle free day program organized in Sunday after the Lebu to Jemo bicycle lane project launched and every first Sunday of the month from 1:00 to 6:00 the residents park their car to participate in sports. The traffic management agency with cooperation of traffic police designates alternatives routes for vehicle during the events.

To strengthen the finding about the role of the bicycle lane beside the field observation and the researcher asked some like what mode of transport they used during their commute and most of the respondent's response show that in table—the major mode of transport they used is minibus taxi which take the share around 55.4% and 12% of the respondents usually use bicycle to commute to their destination. The reaming respondents use other kind of transport mode such as bus, train, walking, and private car as shown in the table--. From the total respondents 60% of the response in table-- show that they are not using the bike lane and the major reason among different reason about 29.2% is the available routes are inconvenient or don't meet their needs; 18.5% responses show that they the bicycle lane for fitness and training;10.8% of the respondents use the bicycle lane for transport purpose to go home to work and work to home versa.

During the field observation the researcher went the whole time the bicycle lane being used for other purpose which completely miss the role of the bicycle lane identified by-different scholars in the literature reviewed and even the role mentioned by the Addis Ababa city transport authority. The Lebu to Jemo bicycle lane corridor is not being used by cyclists throughout the day because the bicycle lane been blocked by the motorized vehicles which being used for parking purpose: the motor vehicle stop inside the bicycle lane as lay by for dropping off and peaking up travelers: small business being done inside the bike lane: the pedestrians also walk inside the bicycle lane and three wheel motorist use it as station except early morning time from 12:00 to 1:00 and late afternoon from 11:30 to 12:00 o'clock local time.

From interview made with the traffic management agency officers who is responsible for that district related to enforcement when the bicycle lane was being used for other purpose, he told me that there is an enforcement controlled by their line operator to give punishment for those vehicle drivers against the regulation of traffic management agency regulation for vehicle. The field observation indicates that there was weak enforcement related to the bicycle lane because its being used for other purpose as shown below in the figure21.

Figure 20 Existing role of bicycle lane

CHAPTER 5

5. CONCLUSION AND RECOMMENDATION

5.1. Conclusion

The Lebu to Jemo bicycle lane project was assessed through this research as a case study and the research attempted to evaluate the design style and facts related to mobility through a critical field observation, interviewing key informant who is actively participate on this project, questionnaires to the perceptions of the pedestrian and cyclist and a bikeability index. As a mode of transportation which is non-motorized transportation that support major tasks on transport aspects. To improve mobility in Addis Ababa the city administration has implemented a buffered bicycle lane for moving automobile user to bicycles but the research finding show that the installed bicycle lane require more circumstantial studies on important variables, physical design, level of bikeability before the implementation of the project. According the research results shown the bike lane is not meeting the authority needs or the rider's satisfaction because the role of the bicycle lane is miss used for other purpose such as walking space for pedestrian, parking for motor vehicle, for transport station for three-wheel vehicles and used for vending which indicate weak enforcement being conducted on the case study area.

The modal share around the case study area indicates the use of high number of motor vehicles during peak hours which completely show the need of other means of transport to improve the mobility. One of the solution is creating a streets that having a chance to be accessed by other mode of transportation such as safe walking side for pedestrian and a bicycle lane for cyclists which leads Addis Ababa to sustainable transport system but the reality show that the residents still use motor vehicle for transportation rather than other means of transportation in the case study area because the new bicycle lane is not safe for bicyclist due to many constraint such as the bike lane being used for pedestrians as footpaths, the bike lane blocked for vending purpose, the bike lane delineators and bollards miss there place due to bad driving behavior of motorized vehicles.

The Lebu to Jemo bicycle lane project faced several problems regarding to safety issues to improve mobility around that corridor. The first problem is the lane blocked by other motor vehicle for parking service, lay by on the bicycle lane to drop off traveler and use it as transport station which forces bicyclist to use the motor vehicle traffic lanes to escape them and puts the user safety in questions. The second safety problem faced on this bike lane is lack of pedestrian awareness about the bike lane because most of the time they push the walking space inside the bike lane space. Apart from this problem the lane lacks shading effect which can easily convince the pedestrian to use bike as one mode of transportation. The third main problem of this bicycle lane project having low destination density because most of the residents takes a daily commute through other mode of transportation above three kilometers to go work place and to change the mode of transportation for pedestrian and bicyclist from vehicle-oriented transportation to non-motorized transportation which improve the mobility problem in the city the destination density is very critical factor for bicycle lane projects. The fourth problem faced on this bike lane is weak enforcement related to parking issues for whom using the lane as a parking, for those doing

vending on the bike lane space, for those motor vehicle drivers who is against the regulation of traffic management agency related to the Lebu to Jemo bicycle lane project.

Generally the level of bikeability of the Lebu to Jemo bicycle lane project is high except the safety, environment measurement and destination density factors but the other like topography of the lane indicate that it almost negligible; bicycle infrastructure consist of quality design features; it has great mix land use that having a chance to encouraging bicycling and the lane have high connectivity (less intersection indicate high connectivity and more intersection indicate low connectivity) because this bike lane project contain only one roundabout and two intersection throughout the length of the street.

5.2. Recommendation

The research emphasizes the need of reconsideration of some bikeability level of a bicycle lane prior implementing the next project of bicycle lane in the city such as safety issues which consist of installation of bicycle signs at each intersection and roundabout for motor vehicle user to ensure the safety of the bicyclist, awareness creation for the community to use the bike lane only for bicycling activities which increase the number of bicyclist by eliminating safety issues related to pedestrians and strengthen the enforcement in proper manner related to motor vehicle lane user and bicycle lane user which leads the bicyclist to use the lane without fear of traffic accidents and collisions.

Comfort and attractiveness are influenced by the environment criteria so that the bike lane along water area, bike lane along beauty area, bike lane along built up area and bike lane along green area criteria has to be checked because they affect cyclist to choose the routes.

To improve mobility the bicycle lane in Addis Ababa destination density play a vital role in terms of changing the habit of community to use bicycle as one mode of transportation. when there is more route connection throughout the city for the residents working within 1.2-3.7km use the bike lane to go work place using bicycle.

Finally, the implementation of the strategy made with the coordination of Addis Ababa city administration and Addis Ababa Transport Road Bureau Authority such as pedestrian network, pedestrian priority precincts, bicycle network, green way network, public transport access, intersection improvement, bicycle sharing system, parking management, vendor management, street design standards, review of building control & planning regulations and communications and engagement which they are having great effect to improve the mobility in Addis Ababa by offering a wider range to use other mode of transport rather than motor vehicle for transportation.

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Annex1 sample *Questionnaire*

Questionaries for pedestrian and cyclist

1. **What is your Sex?**
   Female
   o Male
2. **What is your Age?**
   o 18-25

o 26-35
o 36-50
o 51-65
o Over 65

3. **What is your Education?**
   o Elementary
   o Secondary
   o Higher
4. **What is your Occupation?**
   o Student
   o Employed
   o Unemployed
   o Housewife
   o Pensioner
5. **How do you assess your financial situation?**
   o Very good
   o Good
   o Average
   o Bad
   o Very bad
6. Do you have a driver's license?
   o Yes
   o No
7. **Do you have an access to a car?**
   o Yes
   o No

8. **Do you have a bike?**
   o Yes
   o No
9. **How long is the distance from your home to your work place?**

o Less than 2km
o 2-5 km
o 5-8 km
o More than 8 km

10. **How long is the distance from your home to the nearest stop of public transport?**
    o Less than 200 m
    o 200-500 m

o500-1000 m
o More than 1 km

11. **How long is the distance from your home to the nearest bike lane**?
    o Less than 1 km
    o 1-3 km
    o 3-5 km
    o More than 5 km
    o I don't know where the nearest bike lane is.
12. **How do you usually commute?** If, during one travel you use more than one mode of transport, mark all modes that you use.
    o on foot
    o by bus
    o by car
    o By train
    o By bike
    o Others: how?
13. **The most pleasant experiences during daily commute:** (choose max. 2 answers)
    o Smooth travel
    o Contact with people
    o Good well-being
    o Observing the environment
    o Comfortable mode of transport
    o Possibility of listening to music, reading, playing
    o Others: which ones?
14. **The most unpleasant experiences during daily commute:** (choose max. 2 answers)
    o Traffic jams
    o Long time to wait for the next change
    o Lack of appropriate infrastructure
    o Crowded bus/ train
    o Delayed bus/ train

o The danger of an accident
o Others: which ones?

15. Do you utilize the bike lanes?

☐ Yes

☑ No

16. If you said 'yes', what are your main reasons for cycling?
- o Travel to and from work
- o Shop or run errands
- o Leisure or recreation
- o Fitness or training
- o Other

17. **If you said 'no or rarely', why not?**
    - o **I don't feel safe cycling on the road.**
    - o **I'm not aware of the routes and amenities available.**
    - o **It is weather dependent.**
    - o **The available routes are inconvenient or don't meet my needs.**
    - o **I have a physical or health limitation.**
    - o **I have no interest.**
    - o **Other**

18. How would you rate the following as reasons that you do not BICYCLE more frequently?

1. **No bicycle parking.**

a. **Major reason**
b. **Minor reason**
c. **Not a reason**

2. **No bike lanes**
    a. **Major reason**
    b. **Minor reason**
    c. **Not a reason**
3. **Bike lanes in poor condition**
    a. **Major reason**
    b. **Minor reason**
    c. **Not a reason**
4. **Unsafe intersections**
    a. **Major reason**
    b. **Minor reason**
    c. **Not a reason**
5. **Bad driver behaviors**
    a. **Major reason**
    b. **Minor reason**
    c. **Not a reason**

6. **Automobile traffic**
   a. Major reason
   b. Minor reason
   c. Not a reason
7. Personal safety concerns
   a. Major reason
   b. Minor reason
   c. Not a reason
8. Destinations are too far away
   a. Major reason
   b. Minor reason
   c. Not a reason
9. Bad weather
   a. Major reason
   b. Minor reason
   c. Not a reason
10. Lack of worksite amenities (eg showers)
    a. Major reason
    b. Minor reason
    c. Not a reason
11. Too many stops to make
    a. Major reason
    b. Minor reason
    c. Not a reason
12. I do not have a bike
    a. Major reason
    b. Minor reason
    c. Not a reason

22. **If so, how often?**
- **Daily**
- **Weekly**
- **Monthly**
- **N/A**

23. **Do you know anyone who utilizes the bike lanes?**
- ☐ **Yes**
- ☐ **No**

24. **Do you feel your input was taken into consideration when the decision was made to install bike lanes in your community?**
- ☐ **Yes**
- ☐ **No**

25. **Has the installation of bike lanes interfered with your travel pattern?**
- ☐ **Yes**
- ☐ **No**

26. **Do you think the bike lanes currently installed create a safety risk for cyclists?**

□ **Yes**

□ **No**

27. **In your opinion, do the bike lanes add value to the community?**

□ **Yes**

□ **No**

□ **Maybe**

28. **In your opinion, do you think businesses are positively impacted by the bike lanes?**

□ **Yes**

□ **No**

□ **Maybe**

29. **Overall, would you like the bike lanes to stay?**

□ **Yes**

□ **No**

30. **What do you think are the biggest advantages of bike lane for use of transportation?**

(choose max. 3 answers)

□ **Direct commute**

□ **Independency**

□ **Time-saving**

□ **Money-saving**

□ **Comfort**

□ **Environmentally friendly**

□ **Good for one's health**

□ **Others: which ones?**

31. **What do you think are the biggest disadvantages of bike lane for use transportation?**

(choose max. 3 answers)

□ **Stressful commute conditions**

□ **Uncomfortable**

□ **Does not secure from rain, sunny wind etc.**

□ **Tiring commute**

□ **Feeling of danger because of the cars**

□ **Others: which ones?**

32.

□	Strongly disagree	Rather disagree	Undecided	Rather agree	Strongly agree
If I wanted, I would bike for transportation already under current conditions.					
The coordination of bike infrastructure with public transport would encourage me to bike for transport.					

Expanded bike infrastructure lowers the number of accidents.					
City authorities have an influence on what mode of transportation is most willingly used by the residents.					

33. What would convince you to bike for transport**?** Choose max. 3 answers.
    - ☐ Expanded bike lanes network
    - ☐ Bike racks/ bike parking at the destination
    - ☐ Additional appliances of bike infrastructures, e.g. pumps at bike lanes
    - ☐ Priority on roads
    - ☐ The presence of a bigger number of cyclists
    - ☐ Limited car traffic on roads
    - ☐ The possibility of cycling on roads closed for cars, or the opposite direction on one-way roads
    - ☐ Shower at destination point (work, school etc)
    - ☐ Others: what?
34. What discourages you from cycling for transport? Choose max. 3 answers.
    - ☐ Weak bike lanes network
    - ☐ Lack of bike racks/ bike parking at the destination point
    - ☐ Risk of bike theft
    - ☐ Heavy car traffic
    - ☐ The distance commuted daily
    - ☐ Tiredness
    - ☐ No shower at destination point
    - ☐ Others: what?
35. How important do you think the following improvements would be in supporting bicycling in the ADDIS ABABA city?

a. More bike lanes /signed bike routes/
    - ☐ Very important
    - ☐ Somewhat important
    - ☐ Not important
    - ☐ Not sure
b. Maintenance of, bike lanes, bike, routes
    - ☐ Very important
    - ☐ Somewhat important
    - ☐ Not important
    - ☐ Not sure
c. Improved connections between sidewalks, bikeways and transit
    - ☐ Very important
    - ☐ Somewhat important
    - ☐ Not important
    - ☐ Not sure

d. Better intersections (pedestrian signals/crosswalks)
   - ☐ Very important
   - ☐ Somewhat important
   - ☐ Not important
   - ☐ Not sure

e. More separation from vehicle traffic
   - ☐ Very important
   - ☐ Somewhat important
   - ☐ Not important
   - ☐ Not sure

f. Education/enforcement for motorists, pedestrians, & bicyclists
   - ☐ Very important
   - ☐ Somewhat important
   - ☐ Not important
   - ☐ Not sure