ADDIS ABABA CYCLE NETWORK PLAN 2023-2032

OCT 2023

ITDP

UN HABITAT
FOR A BETTER URBAN FUTURE

PREPARED BY

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CONTENTS

1. INTRODUCTION

Addis Ababa, home to 5 million people, or 25 percent of Ethiopia's urban population, is among the fastest-growing urban areas in the world (World Population Review, 2021; World Bank, 2015). Urban mobility has become inefficient in Addis Ababa due to insufficient public transport service, poor traffic management, and prioritisation of cars rather than people in the design of streets. The number of private vehicles in the city is rapidly increasing, contributing to worsening congestion, loss of the public realm, air pollution, and traffic fatalities. To tackle these challenges, Addis Ababa needs to invest in efficient, sustainable mobility, including high-quality public transport systems and streets that are safe for active mobility.

Cycling is a sustainable non-motorised mode of transport that can offer low-cost, pollution-free mobility. Cycles occupy minimal street space—only around one-tenth of the space occupied by a car. Cycling on a segregated track is often faster than using a private motor vehicle, particularly for short- to medium-distance trips. In order to encourage more people to cycle and make cycling accessible to women, Addis Ababa needs a complete and interconnected network of safe bicycle routes.

The Addis Ababa Transport Bureau (AATB), in partnership with the Institute for Transportation and Development Policy (ITDP) and United Nations Human Settlements Programme (UN-Habitat), aims to identify and implement a network of coherent, continuous, convenient, direct, safe, attractive, accessible, and comfortable cycle facilities. This study examines the existing cycling environment in Addis Ababa and proposes a phased implementation plan to build out a high-quality cycle network over the short, medium, and long terms. The study aligned with the Addis Ababa Non-Motorised Transport (NMT) Strategy, which calls for a 200 km cycle network. The resulting network of low-stress bikeways will welcome users of all sexes, ages, and abilities.

1.1 BENEFITS OF CYCLING

A well-connected cycle network can encourage a shift from motorised modes to cycling, bringing several benefits to riders and the community as a whole:

- **Equity:** Well-connected cycling infrastructure can improve transport equity by improving access for people who do not have access to motor vehicles.
- **Economic benefits:** Cycling is cheaper than motorised modes, including cars and public transport.
- **Safety:** Providing cycle infrastructure and designing for slower speeds can reduce the risk of fatalities and injuries from crashes.
- **Health benefits:** Physical activity reduces the risk of obesity, heart disease, cancer, and diabetes, contributing to a healthier and happier community.
- **Environmental benefits:** By replacing trips of polluting motor vehicles, cycling can reduce emissions of dangerous local pollutants and greenhouse gases.
- **Quality of life:** Residents of cycle friendly neighbourhoods experience a stronger sense of place, freedom of mobility, and improved social interactions.
- **Gender equity:** As women are affected by time poverty due to inequitable gender-based division of labour, women benefit from cycling by saving time and money.

1.2 ACTIVE MOBILITY POLICIES

Several policies and planning documents support the development of an urban cycle network in Addis Ababa.

1.2.1 ADDIS ABABA NON-MOTORISED TRANSPORT STRATEGY (2019-2028)

Developed by the Transport Programmes Management Office (now Addis Ababa City Administration Transport Bureau), the NMT Strategy aims to provide safe, efficient, and accessible pedestrian and cycling networks to improve access to opportunities, foster equitable allocation of street space, and create a dignified walking and cycling environment. Regarding cycle networks, the Strategy calls for the construction of at least 200 km of cycle tracks covering key urban corridors including arterial roads with a right-of-way (ROW) of 30 m and above. The cycle network will help the strategy to meet its target of increasing the share of cyclists who are women to 50 percent by 2028 by providing equitable, safe, and secure cycle infrastructure. It also recommends the provision of bicycle parking at rapid transit stations and bus terminals to improve last-mile access. It calls for the introduction of a modern bikeshare system.

1.2.2 ADDIS ABABA CITY STRUCTURE PLAN (2017-2027)

The Structure Plan, prepared by the Addis Ababa City Planning Project Office (2016), states that public transport and NMT should be supported as the main mobility modes in Addis Ababa. The plan calls for cycle tracks in most parts of the city, especially within the inner ring road. The Structure Plan stipulates that 50 to 60 percent of the ROW of streets located within the inner ring road should be allocated for NMT. Wider spaces for pedestrians and cyclists are recommended for commercial streets and in market areas. It also suggests providing parking facilities for cycle users at mass rapid transit stations. Regarding public parks, 15 percent of the land area of the parks is reserved for footpaths, cycle tracks, and water features.

1.2.3 ADDIS ABABA TRANSPORT POLICY

The Transport Policy of Addis Ababa cites the absence of sufficient bicycle infrastructure as a critical issue facing the city. It emphasises the need to consider public transport and NMT to meet the mobility needs of the urban inhabitants. The Policy suggests constructing walkways, cycle paths, and bicycle parking, especially at main terminals. The objectives of the policy include the provision of safe, efficient, comfortable, affordable, reliable, and accessible transport services to enable the city to play its pivotal role in the development of the country.

1.2.4 CLIMATE RESILIENT TRANSPORT SECTOR STRATEGY

The Climate Resilient Transport Sector Strategy, developed by the Ministry of Transport, aims to reduce Ethiopia's dependence on imported fuels and cut transport-based carbon emissions significantly by 2030. The Strategy recommends the development of walking and cycling facilities in all urban centres as a means of reducing private motorised vehicle trips and improving public health. It also discusses the relationship between transport and urban form. In sum, the Strategy calls for “an affordable, integrated, safe, responsive and sustainable transport system that enhances the environmental, economic, social and cultural wellbeing of Ethiopia’s population.”

1.2.5 ADDIS ABABA ROAD SAFETY STRATEGY

The Road Safety Strategy, developed by the Traffic Management Agency in 2017, calls for increased attention to safety and convenience for vulnerable road users and envisions Addis Ababa as a city free from road trauma. It stresses the importance of facilitating people to use walking, cycling, and

public transport rather than private motor vehicles. The Strategy recommends providing safe cycling infrastructure to position cycling as an alternative for long walking trips and as a feeder to mass rapid transit systems.

2. PRINCIPLES OF CYCLE NETWORK PLANNING

Cycle facilities must cater for multiple groups of cyclists: not just those who are already riding, but also more cautious users who might be willing to ride in the presence of a well-designed and complete cycle network. In order to serve Addis Ababa residents, especially women, children, people with disabilities, and elderly people, the cycle network should offer safe, coherent, attractive, direct, secure, accessible, and comfortable routes.

The potential users of the cycle network have diverse needs and concerns in terms of personal safety, expertise, income, physical ability, and time availability. Women, men, people with disabilities, the elderly, pregnant women, and caregivers all have distinct expectations and necessities in their travels. Vulnerable groups require security measures and universally accessible infrastructure.

2.1 TYPES OF CYCLISTS AND THEIR NEEDS

Most cyclists in Addis Ababa are young, male, experienced cyclists making utilitarian trips or upper-class recreational cyclists. It is important to provide equitable access to cycling infrastructure for more diverse groups, including women, people of varying income classes, ages, and capabilities. In order to increase cycle ridership for all groups in Addis Ababa, there must be a focus on understanding cyclists' needs and addressing these needs in the planning of the cycle network. Planning should address the needs of vulnerable users, including children, the elderly, people with disabilities, women, and caregivers, who often experience barriers to access in the mobility system. Cycle infrastructure should accommodate different types of non-motorised vehicles, including three-wheeled bikes for transporting goods and kids.

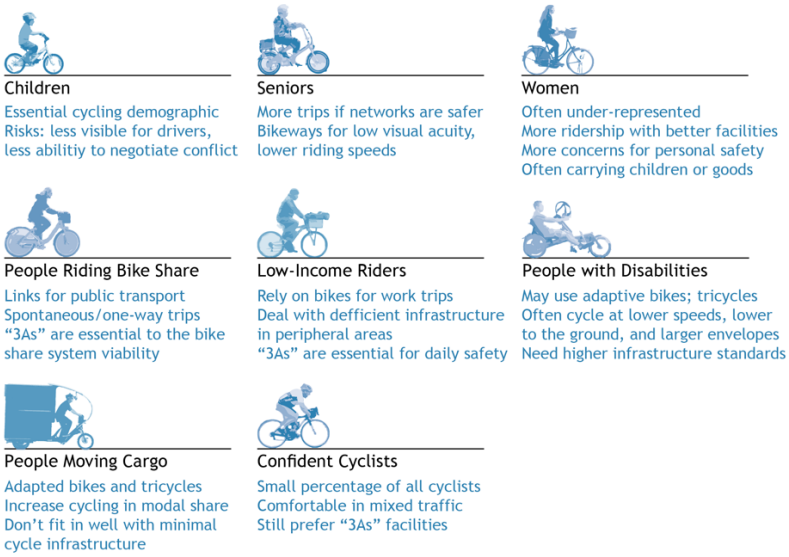

Figure 1. Cycle user groups. (Adapted from NACTO, 2017).

Considering risk-tolerance and comfort with cycling, the public can be classified in four groups (Portland Bureau of Transportation, n.d.):

- **Strong and fearless:** Willing to cycle under any traffic conditions.
- **Enthused and confident:** Comfortable sharing the roadway with automotive traffic, but they prefer to ride in dedicated lanes.

- **Interested but concerned:** Enjoy cycling but are afraid to do so due to the speed of vehicles and the lack of safe cycling infrastructure.
- **Not interested:** May not be willing to cycle regardless of the available infrastructure.

Much needs to be done to improve the infrastructure to attract riders in the categories of interested but concerned and enthused and confident, who are willing to cycle in lower stress environments. The figure below displays cycleway typologies and the extent to which they support usage by all ages and abilities, including "interested but concerned" cyclists (City of Vancouver, 2017). Slow-speed shared streets can be safe for all users if motor vehicle speeds are limited to 15 km/h by design. Protected cycle tracks are the most appropriate choice for major streets in Addis Ababa, while smaller streets can be designed with slow-speed carriageways (≤ 30 km/h) or shared space (≤ 15 km/h). Off-street pathways are encouraged in parks and along waterways.

Figure 2. Suitability of infrastructure for cyclists of all ages and abilities. (Adapted from City of Vancouver, 2017.)

Aside from the creation of high-quality infrastructure, complementary programmes and policies can support new users in taking up cycling. Women need affordable cycles and bikeshare schemes. Bikeshare offers a way for potential users to try out cycling without the need to invest in a cycle. Bikeshare users will be able to check out cycles with a smart card or phone and use the cycle for a short one-way trip, complementing other transport modes. In addition, riding skill training can impart the basics of safe cycling to new cyclists. To reduce the cost of cycles, import tariffs on cycles should be eliminated, as discussed in the national NMT Strategy. Cycle distribution and microfinance initiatives can help low-income users access high-quality cycles.

Women and girls are underrepresented among cyclists in Addis Ababa, which requires attention to these groups' needs. Preventing sexual harassment while moving around the city is important, as is incentivising more women to learn to cycle. The cycle network should be connected to support

multi-purpose trips, which would ease access for caregivers. Strategic actions targeting women cyclists can encourage ridership. Guided cycling tours, targeted survey questionnaires, the provision of affordable cycles, and bikeshare systems can encourage more women to use the cycle network.

2.2 NETWORK PLANNING PRINCIPLES

Cycle network planning should prioritise safety, coherence, directness, attractiveness, accessibility, security, and comfort (National Transport Authority, 2011; National Transport Authority, 2013). A network with these qualities can reduce cyclist stress levels and enhance the appeal of cycling to all users, thereby helping to get more people on bikes.

2.2.1 SAFETY

Cycle routes should be safe, provide personal security, and accommodate cyclists as well as all other road users. Vehicle speeds and volumes influence the cycling experience and cycle ridership. Whenever less experienced cyclists come across “near miss” incidents, stress levels rise. These factors often affect women cyclists more than men.

Cycling close to motor vehicles at 40 km/h is the threshold for discomfort. On smaller streets where motor vehicles and cyclists share the same space, motor vehicle volumes and speeds should be contained for safe and comfortable conditions for cyclists. If vehicle volumes exceed 1,000 vehicles per day (i.e., around 50 vehicles per direction at the peak hour), speeds should be no higher than 30 km/h in the absence of a cycle track. Traffic calming measures, including speed bumps, tabletop crossings, chicanes, and neckdowns, can help reduce vehicle speeds.

As traffic speed and volumes increase, the risk of conflicts and the severity of injuries increase (NACTO, 2014). On streets with speeds over 30 km/h or daily vehicle volumes over 1,000 (average daily traffic, or ADT), separate cycle tracks are needed. In addition, intersection treatments can ensure that cyclists and vehicles can interact safely.

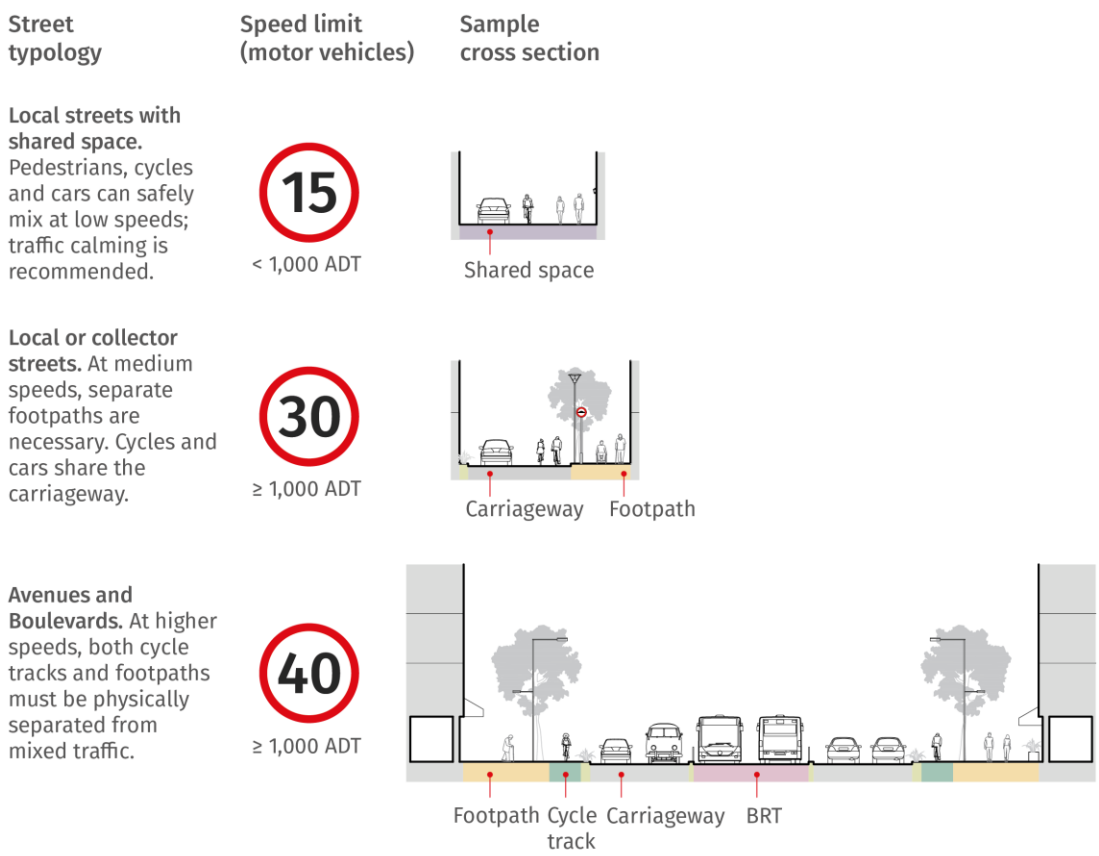

Figure 3. Street typologies and corresponding traffic speeds for safe cycling.

2.2.2 COHERENCE

Cycle routes should link all potential origins and destinations, be logical and continuous, and offer a consistent standard of protection throughout. Cycle facilities should not disappear at intersections or other stressful locations, as those gaps discourage new cyclists and undermine ridership and the success of the network. To be recognisable, cycle facilities should follow consistent standards and designs. They should be easily understandable at intersections. For commuter routes, the infrastructure should be physically separated from cars, and delays from stopping and waiting should be minimal, by reducing the number of crossings along the route.

2.2.3 DIRECTNESS

Cycle routes should be as direct as possible, based on desired lines, to minimise delays or detours. Short cuts should be provided, and signal designs should minimise delay at intersections. Footbridges should be avoided on key cycling routes because they increase travel times and may force cyclists to dismount and walk their bikes over the facility. People will not cycle to key destinations if the cycle facility takes a longer route.

In some cases, large urban blocks may need to be divided into smaller units by creating cut-throughs for pedestrians and cyclists during the redevelopment process. This reduces travel times and makes active mobility an attractive option compared to the use of motorised modes. The cycle network also needs to overcome barriers such as water bodies and rail lines.

2.2.4 ATTRACTIVENESS

Cycling environments should be interesting and pleasant. Attractive routes are particularly helpful for attracting beginners, tourists, and recreational cyclists. Cycle routes should complement their surroundings, enhance public security, look attractive, and generally contribute to an enjoyable cycling experience.

The urban design also plays a role, as streets with active edges, play elements, and organised street vending can become vital public spaces. The design of the NMT network should consider the local context of the street or neighbourhood.

2.2.5 COMFORT AND SECURITY

Cycling infrastructure should be designed, built, and maintained for ease of use and comfort of all users. Cycling routes need gentle slopes, smooth surfaces, sufficient width, and lighting. They should be designed to avoid complicated manoeuvres. Shade and lighting are critical to creating a comfortable environment for riding. Monitoring of public space through CCTV cameras could enhance security for women further.

Cycle routes should be accessible for all users including people with disabilities and shall consider avoiding features that reduce accessibility such as narrow cycle tracks, physical obstacles, barriers, and potholes.

Separate facilities for walking and cycling are crucial, to prevent pedestrians from spilling onto the carriageway or from competing with cyclists for space. The interplay between parking and carriageway width also should be assessed, with priority given to cycle movement.

Figure 4. Network planning principles.

2.3 CYCLE FACILITY DESIGN

The physical conditions of cycle infrastructure impact the ability of the cycle route to appeal to users of all ages and abilities. The quality of pavement surface, junction treatments, lighting conditions, and drainage shall be considered to improve the usability of cycle routes. All streets should be designed by a complete streets approach to cater to the needs of all users and activities, through equitable allocation of roads.[8,9] Larger streets need continuous cycle tracks and safe intersections, while smaller streets require adequate traffic calming facilities to reduce vehicle speeds.

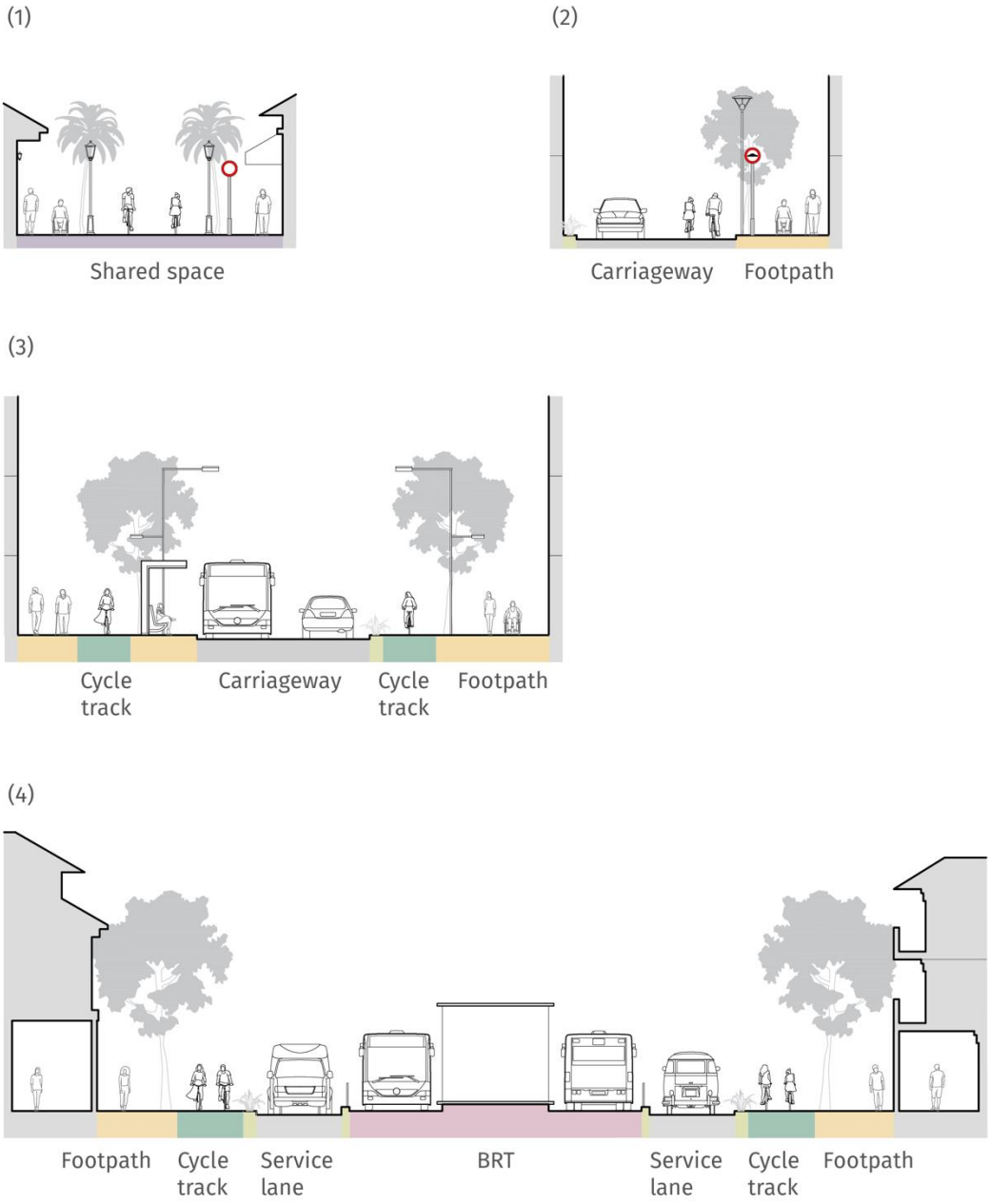

Figure 5. Cycle facility typologies: (1) local street functioning as a shared space for pedestrians, cycles, and vehicles, (2) cycles in a low-speed carriageway, (3) and (4) dedicated cycle tracks protect cyclists. (Source: Ministry of Transport and Logistics, forthcoming.)

2.3.1 CYCLE TRACKS

On Principal Arterial Streets (PAS), Sub-Arterial Streets (SAS), and Collector Streets (CS) need cycle facilities that physically separated from mixed traffic. Design criteria for cycle tracks include (Ministry of Transport and Logistics, forthcoming):

- Width: At least 2.0 m for one-way movement, and 3.0 m for two-way movement.
- Elevation: +150 mm above the carriageway.
- Positioning between the footpath and carriageway.

- Physical separation from the carriageway. Painted lanes and sharrows are not acceptable due to safety risks for cyclists. A buffer of at least 0.5 m should be provided between the cycle track and the carriageway. The buffer should be paved when adjacent to a parking lane.
- Surface material: Smooth: asphalt, or concrete. Paver blocks are to be avoided.
- Central bollards along the cycle track for cyclists to pass on either side.
- Ramps must be provided to accommodate level differences, such as when approaching intersections and bus stops.
- Crossing points for cyclists and pedestrians where there is demand to cross.

Acceptable cycle facility designs are as follows:

- New streets should include raised cycle tracks constructed at the same level as the footpath.
- For existing streets, construct protected bike lanes in the existing carriageway, with physical separation from mixed traffic and the same unidirectional layout on both sides of the street.

The preferred cycle infrastructure layout consists of a duo of segregated, unidirectional cycle tracks on either side of the street. Where space constraints are present, it is acceptable to adopt a bidirectional cycle track on one side of the street.

Table 1. Cycle facilities by street category (MoTL, forthcoming).

Street category	ROW (m)	Cycle track typologies
Principal Arterial Streets (PAS)	31-60	• Unidirectional cycle track on both sides of the street: 2.0 m per direction
Sub-Arterial Streets (SAS)	21-30	• Unidirectional cycle track on both sides of the street (30 m ROW): 2.0 m per direction • Bidirectional cycle track on one side of the street (ROW below 30 m): 3.0 m for two directions
Collector Streets (CS)	15-20	• Bidirectional cycle track on one side of the street: 3.0 m for two directions • Cycles in mixed traffic, with traffic calming measures
Local Streets (LS)	6-14	• Shared space with cycles, pedestrians, and mixed traffic

Figure 6. Visualisation of a unidirectional cycle track along Bole Road.

Figure 7. Visualisation of a unidirectional cycle track along the Ayat-Tor Hailoch LRT corridor.

Figure 8. Visualisation of a bidirectional cycle track on the Piazza to Ras Mekonen corridor.

Figure 9. Visualisation of a bidirectional cycle track on the Getahun Besha corridor.

2.3.2 INTERSECTION DESIGN

Intersections should be built with segregated cycle facilities for safety and comfort for all users. The following principles apply to intersection design:

- Minimise exposure to conflicts.
- Reduce speeds at conflict points.
- Communicate right-of-way priority.

To manage conflicts at intersections, raised pedestrian crossings are to be provided at every intersection and every mid-block crossing where the right-of-way exceeds 20 m. In signalisation, a left-turn phase for motorists must not conflict with the cyclist crossing movements. Where restricting motor vehicles' left turns is desirable, indicative signage should follow. Cycle crossings should be supplemented with green surfacing, admitting dashed patterns to reduce costs.

Figure 10. Dashed green road markings at an intersection. (Source: Women4Climate, 2020)

The ideal intersection layout, a protected intersection, maintains separation to reduce the exposure of pedestrians and cyclists to motor vehicles. The intersection must be sized to shorten pedestrian crossing distances and provide safe refuge spaces for cyclists while accommodating right turns of a design vehicle. A smaller curb radius slows the vehicles turning across the cycle path. Cycle tracks may be raised but must still encourage cyclists to yield to pedestrians. It is important to reduce traffic speeds at conflict points.

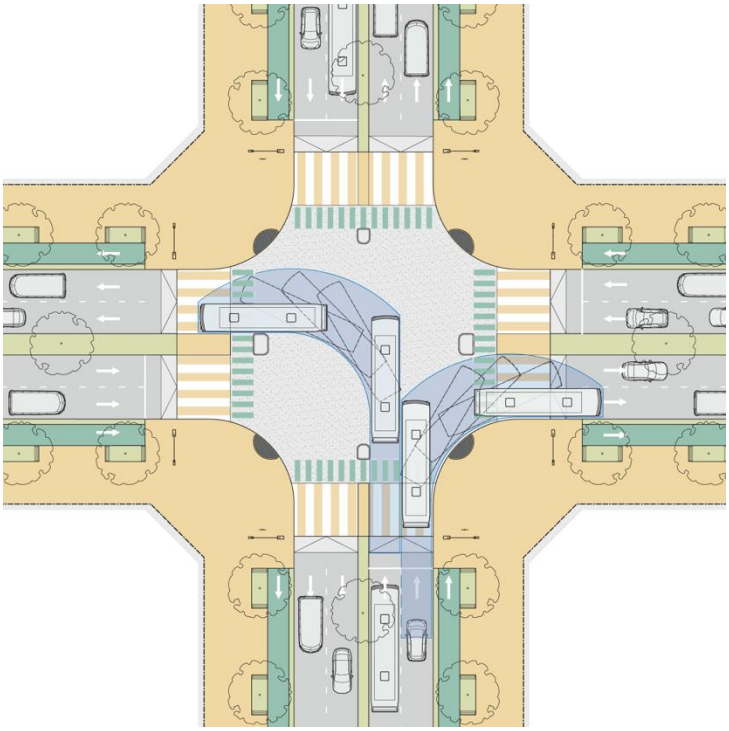

Figure 11. Protected intersection.

As seen below, in (1) the corner refuge island is a physical barrier between cyclists and drivers at the cycle turning points. It also allows for the cyclists in through traffic to pause briefly before crossing, using the forward bicycle queueing area (2). The motorists' yield zone (3) must accompany signage indicating that priority is given to cyclists. As for pedestrian crossings, where two or more lanes are crossed, median islands (4) are obligatory, and for every crossing point, universal access is guaranteed by providing ramps (6), tactile paving, and accessible pedestrian signals (featuring sound signal systems). Where merging areas, crossings, or shared operating spaces are required, they should be designed to minimise exposure (Massachusetts Department of Transportation, 2017).

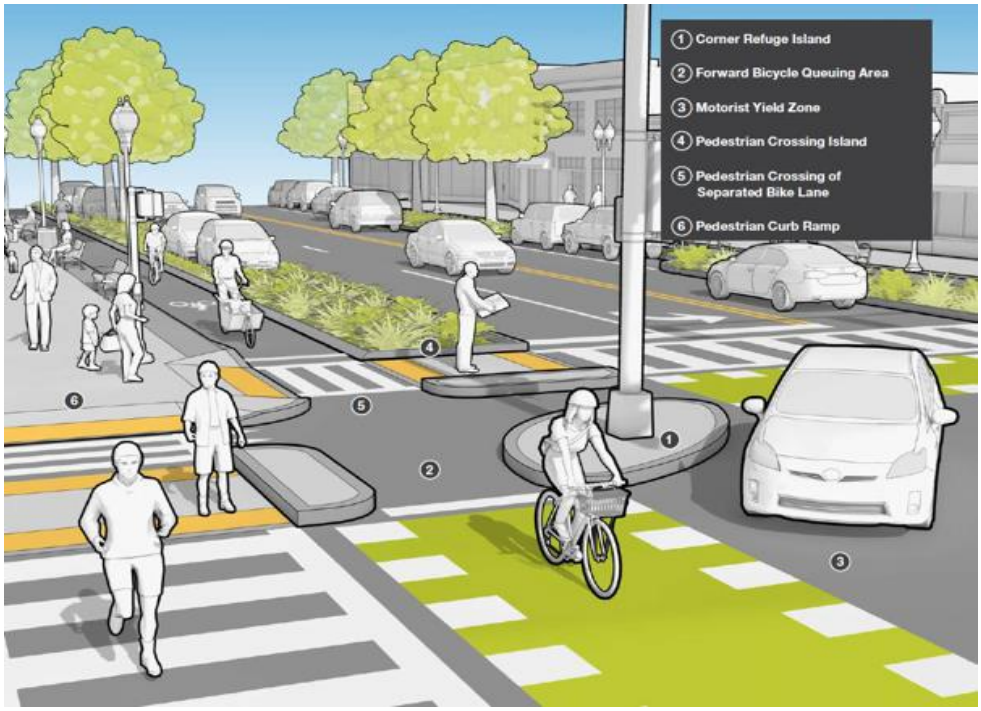

Figure 12. Protected intersection features. (Source: MassDOT, 2015)

2.3.3 SLOW-SPEED CARRIAGEWAYS

Where cycles share the carriageway with motor vehicles, it is imperative to reduce vehicle speeds to ≤ 30 km/h to reduce the stress level for cyclists. Traffic calming measures, such as speed cushions, tabletop crossings, and chicanes, can help ensure that the traffic flow is compatible with the presence of cycles.

2.3.4 SHARED SPACE

Shared space streets are appropriate for historical districts, street markets, and touristic areas. In a shared space, motor vehicles should be guests in the streetscape. The priority is given to active transport modes, pedestrians, and cyclists. Motor vehicle speeds should be 15 km/h or below.

2.3.5 GREENWAYS

Greenways offer dedicated corridors for pedestrians and cyclists alongside waterways or through open spaces, resulting in very low stress levels for cyclists. Greenways can accommodate all gender, ages, and abilities. Parks, old rail rights-of-way, and paths alongside rivers can provide more direct cycle routes. By attracting greater usage, the provision of walking and cycling corridors can make green spaces more social, secure, and safer, especially for women.

Figure 13. Entoto Park walking and cycling path.

3. EXISTING SITUATION ASSESSMENT

Addis Ababa is undergoing a wave of rapid population and economic growth, resulting in increasing travel demand. At present, 54 percent of residents depend on walking, 31 percent use public transport, and only 15 percent travel by personal motor vehicle. Though cycling is not captured in official statistics, cycling is a mode for short-distance trips, primarily among low-income and risk-taking males. Use of cycles for goods delivery is common.

NMT users including cyclists face many challenges, including absence of safe infrastructures, dangerous crossings, inadequate illumination, and poorly maintained infrastructure. Going forward, the city aims to prioritise active mobility in the design and planning of streets. This section reviews ongoing projects to improve the quality of the cycling environment, illustrating good practices that can be scaled up to form a complete cycle network.

3.1 TRAVEL BEHAVIOUR

To examine the potential for uptake of cycling in the bikeshare feasibility study, AATB and ITDP conducted a survey of city residents at ten transport hubs with high pedestrian activity: Mexico, Meskel Square, Megenagna, Ayat, CMC, Bole, Kazanchis, Urael, Leghare, and Akaki/Kality. The sample size was 100 per location.

The graph below shows bicycle ownership results obtained from the survey responses of the bikeshare study. Over 10% of the respondents living in neighbourhoods of eastern and north-eastern Addis Ababa, including Goro, CMC, Arabsa, Yeka Abado, Kotebe, and Tafo, own a bicycle.

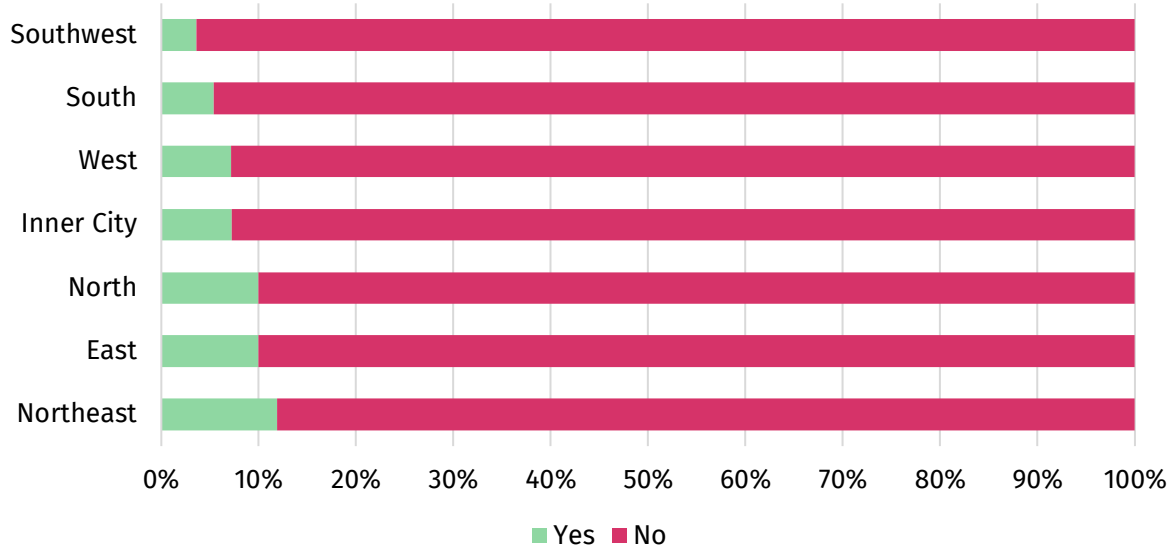

Figure 14. Rate of bicycle ownership.

Eight percent of the surveyed population reported owning a bicycle. By comparison, 25 percent of respondents reported that their households own cars. In terms of gender, 8 percent of the male respondents and 6 percent of the female respondents own a bicycle.

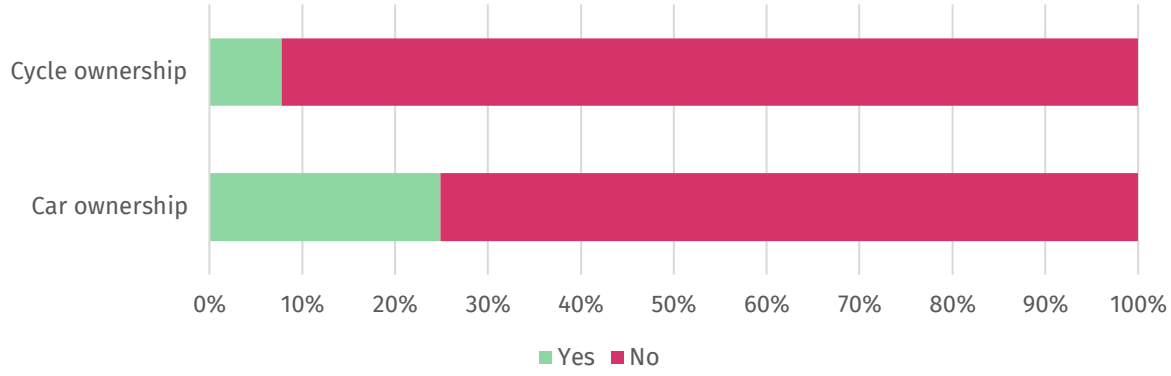

Figure 15. Household bicycle and car ownership.

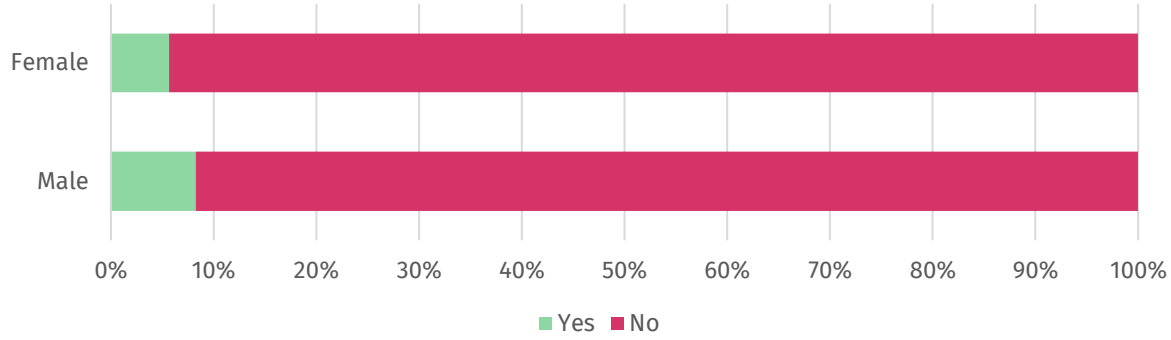

Figure 16. Bicycle ownership by gender.

Considering both male and female respondents, half of the respondents know how to cycle, and among them, 43 percent ride bicycles a few times per year and 7 percent ride a bicycle as a daily trip. The household survey for the Strategic Comprehensive Transport Development Plan (SCTDP) yielded a lower bicycle mode share, indicating that bicycles are used by 3 percent of households as a mode of transport at least once a week.

Only 12 percent of female respondents know how to cycle, with 44 percent of women using a bicycle a few times per year and 4 percent daily. There is also a significant difference in the fraction of respondents who know how to ride a cycle, with 56 percent of males saying that they know how to cycle, compared to 22 percent of women. Among the 5 percent of respondents who know how to cycle but never ride on Addis Ababa streets, 90 percent called for provision of dedicated cycle tracks as a key measure needed to make it easier to ride in the city.

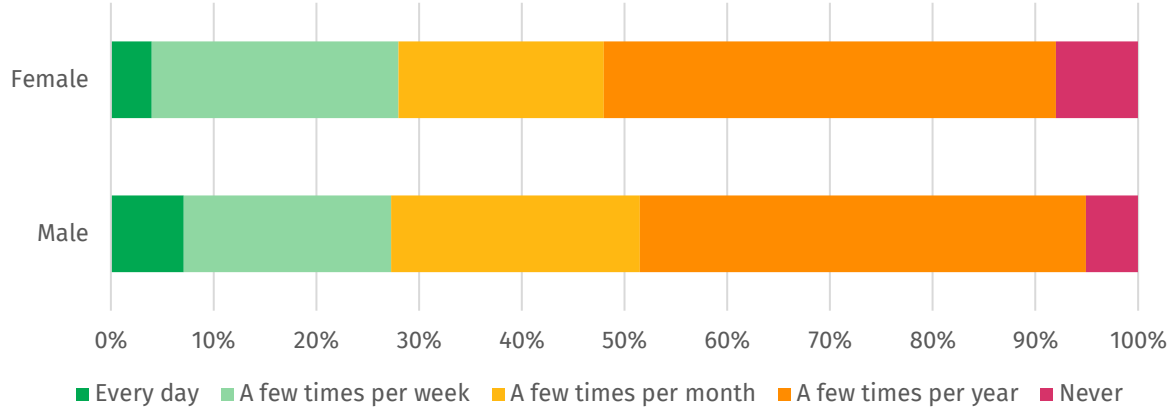

Figure 17. "How often do you cycle?"

Most of the commuters interviewed were traveling to work, with shopping being the next highest trip purpose. Among the women interviewed, a greater fraction were shopping or accompanying others. Women reported a smaller share of work trips than men. Planning of the cycle network should consider the differences in the destinations accessed by women and men and ensure that the system caters to all. For example, network planning can prioritise routes used to access market areas in addition to home-to-work trips.

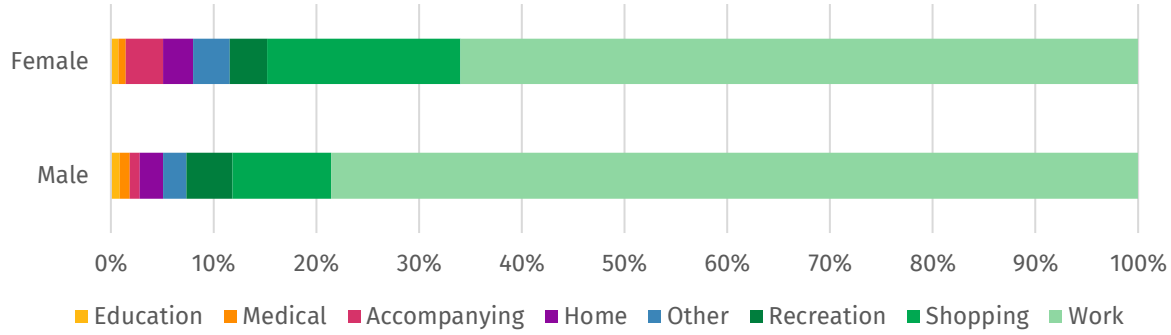

Figure 18. Trip purposes.

Morning peak hour data from traffic surveys in 2019 by AATB indicate the existing volumes of cyclists. Significant numbers of cyclists are present in areas such as Giorgis, Ras Mekonnen Dildiy, Kechene, Coca Mazorya, Bole, Ayat, Yerer Sefera, St Urael Church, British Embassy, and Haile Garment.

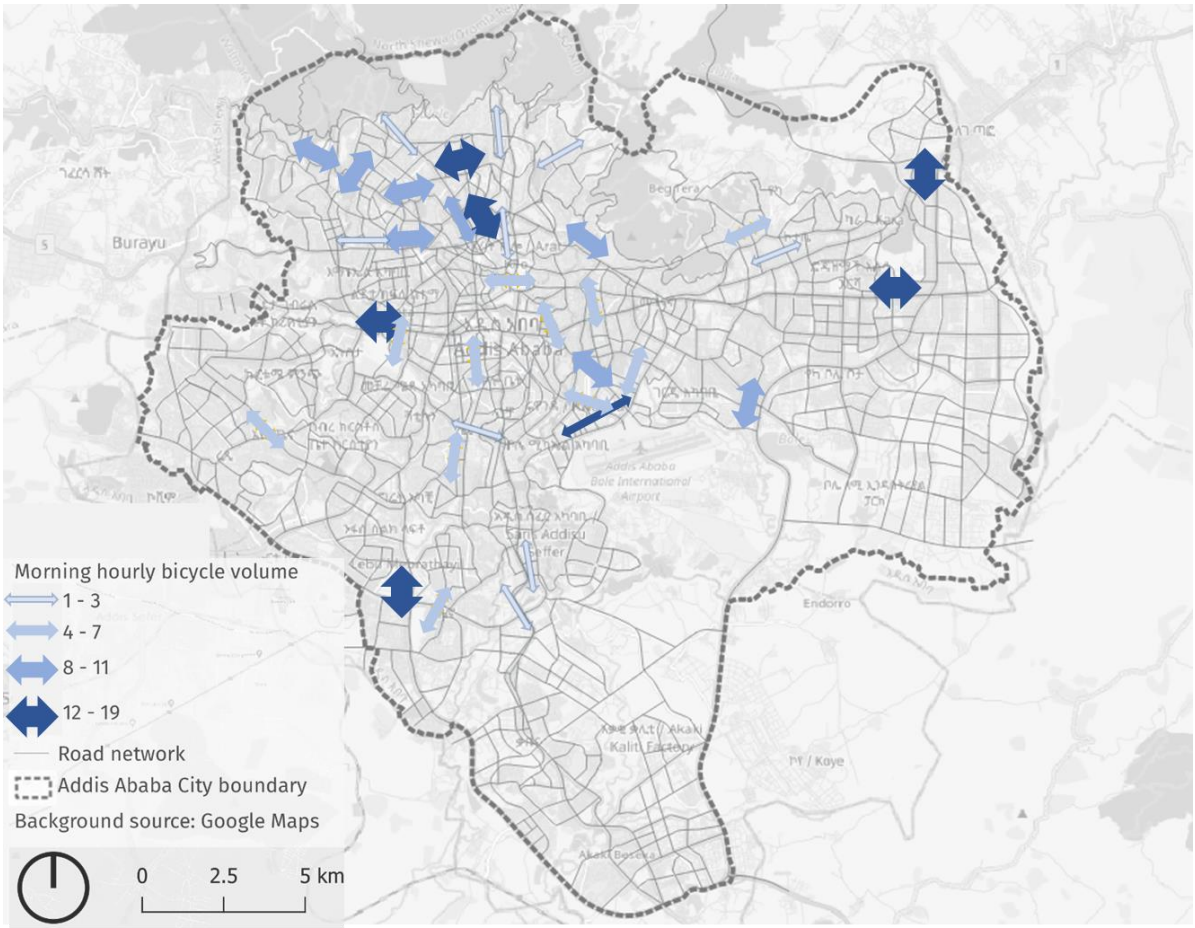

Figure 19. Highest hourly bicycle volume in the morning, both directions.

3.2 SPEED LIMITS

Speed limits are assigned by AATB based on functional classes of the roads as shown below.

Table 2. Assigned speed limit according to functional classification. (Source: AATB)

Classification		Speed / speed in exceptional situations (km/h)
Ring Roads (Urban Expressway)	Central (high-speed) lanes	70
	Outer (frontage) lanes	50
Arterial Streets (Boulevards)	Principal Arterial Streets	50/40
	Sub-Arterial Streets	40/30
Collector Streets	With pedestrian walkway	30
	Without pedestrian walkway	15
Local Streets	With pedestrian walkway	30
	Without pedestrian walkway	15

To reduce the severity of crashes, TMA is reducing speed limits in areas with high pedestrian activity such as dense residential districts, religious places, education centres, market areas, administration areas, transport hubs, and health centres. Furthermore, the speed of corridors along LRT routes is limited to 40 km/h even though these streets fall under the arterial road category since there are high pedestrian flows at stations. On the ring roads, the speed limits were adjusted from 70 km/h to 50 km/h to account for the presence of informal pedestrian crossings, the conflict between local road and frontage road vehicles, the capability of vehicles, locations of the ring roads in built-up areas, and crash history. Further changes in speed limits are warranted to make the corridors safer for pedestrians and cyclists.

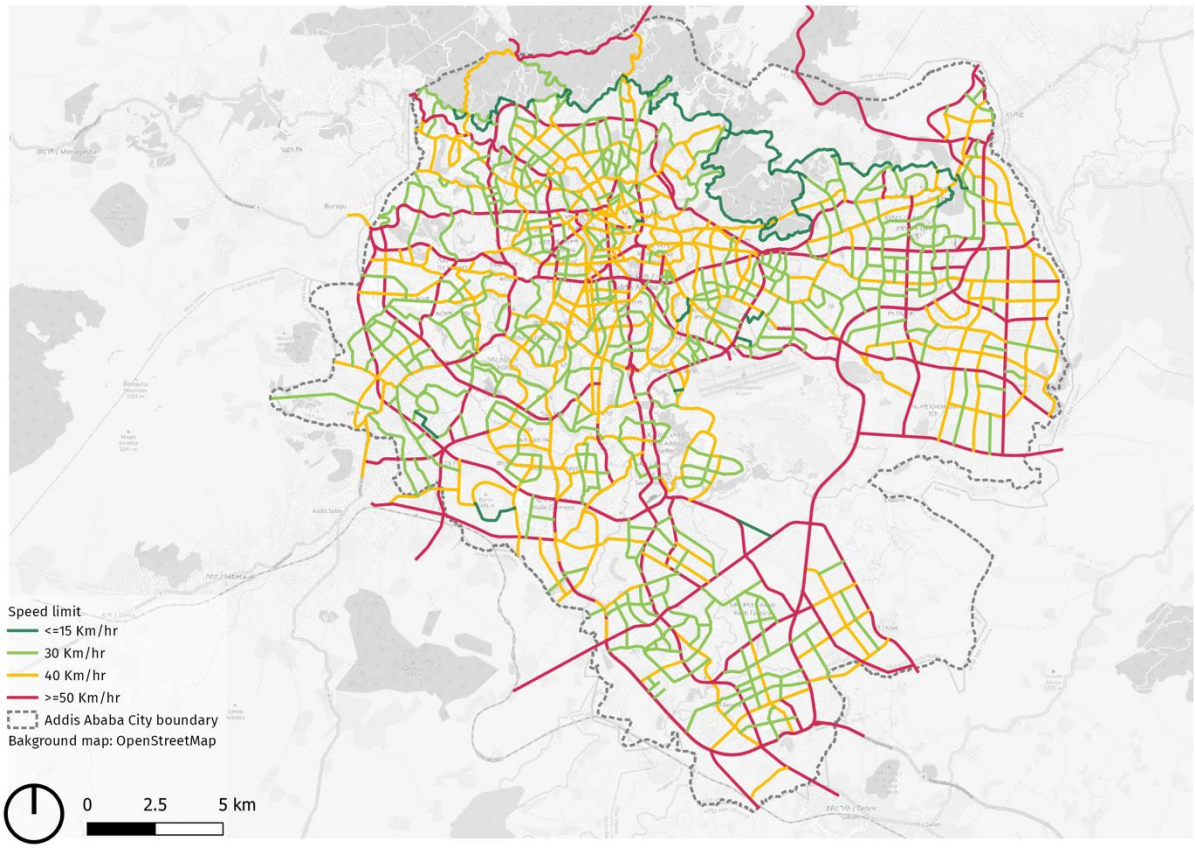

Figure 20. Speed limits in Addis Ababa. (Source: AATB).

3.3 ROAD SAFETY

According to the received traffic fatality data from 2019, 2020, and the first 10 months of 2021, fatal crashes are concentrated on the major roads and sub centres with high pedestrian activity. More than 60 percent of the fatalities are inside the inner ring road. Fatalities are also high on the urban expressway due to the speed of vehicles and lack of formal pedestrian crossings. There is a need to reduce vehicle speed and provide a safer environment for pedestrians and cyclists through intersection redesigns, installation of speed humps, and campaigns related to drunk driving, seat belt use, and other road safety issues.

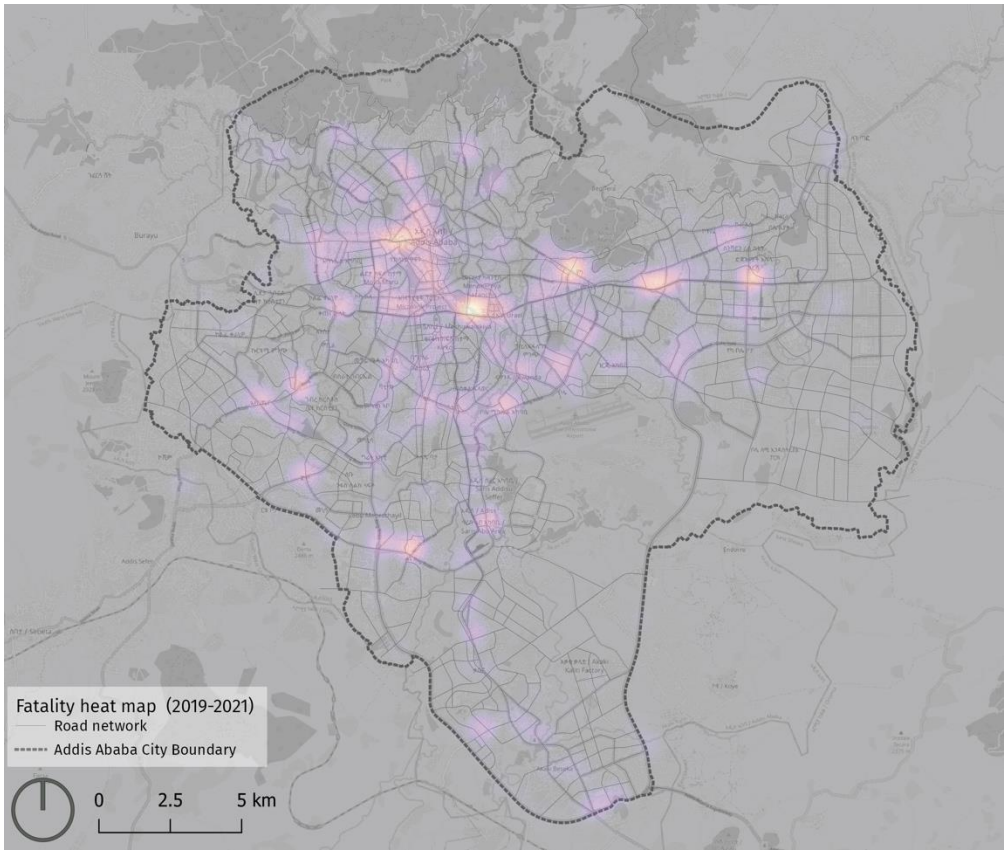

Figure 21. Fatality hot spots in Addis Ababa, 2019-2021.

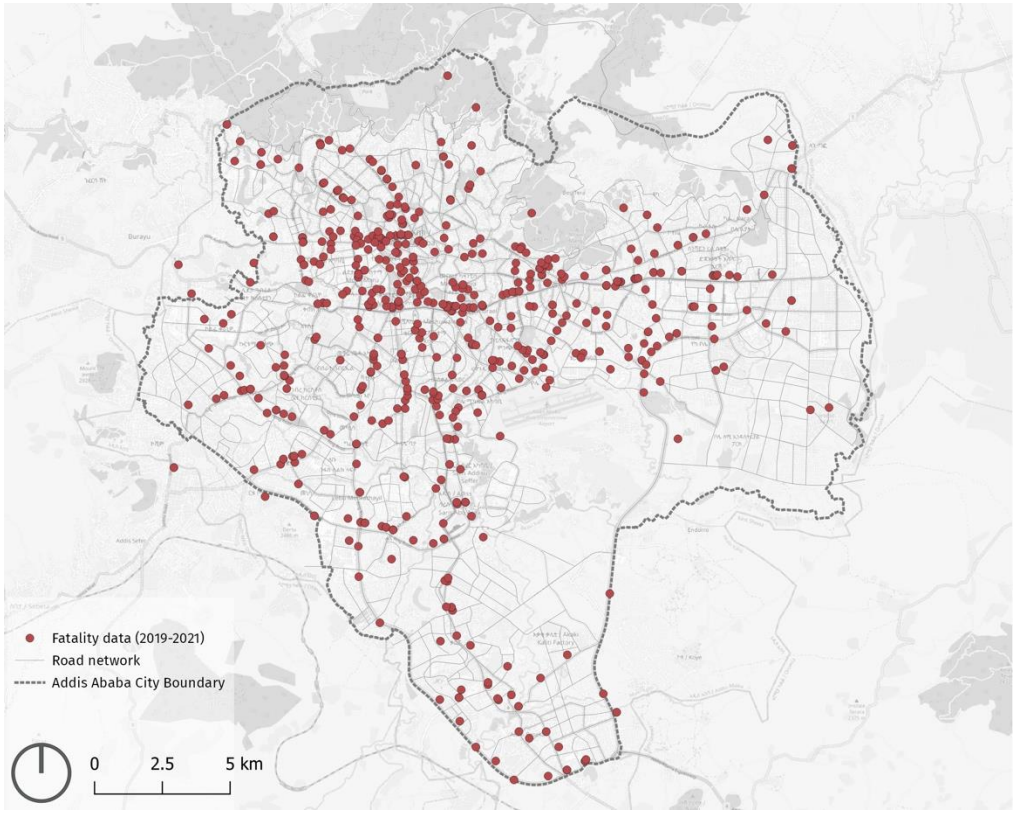

Figure 22. Most fatalities occur in areas within the inner ring road.

3.4 GENDER INCLUSION

Women and girls face specific issues in the Addis Ababa mobility system. Female respondents were asked if they have faced sexual harassment while commuting. Nearly half of women noted that they experience harassment at least a few times per year. There is also a large difference in the fraction of respondents who know how to ride a cycle, with 56 of males saying that they know how to cycle, compared to only 22 percent of women.

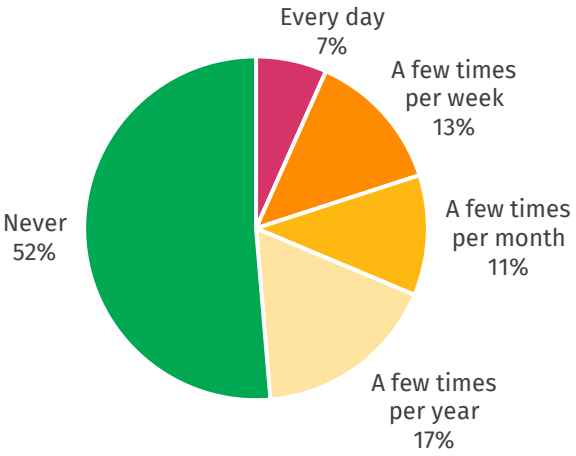

Figure 23. Survey responses: How often do you experience sexual harassment in Addis Ababa?

Survey results indicate that most respondents, especially the women, reported feeling unsafe while cycling in Addis Ababa. Nineteen percent of current cyclists have experienced a crash while cycling in Addis. The introduction of cycle tracks was the top intervention requested by women and men to make it easier to cycle. Women called for provision of information on safe cycling routes and provision of better street-lighting. Women also mentioned the need for greater acceptance of cycling by family and community and a reduction in the risk of sexual harassment.

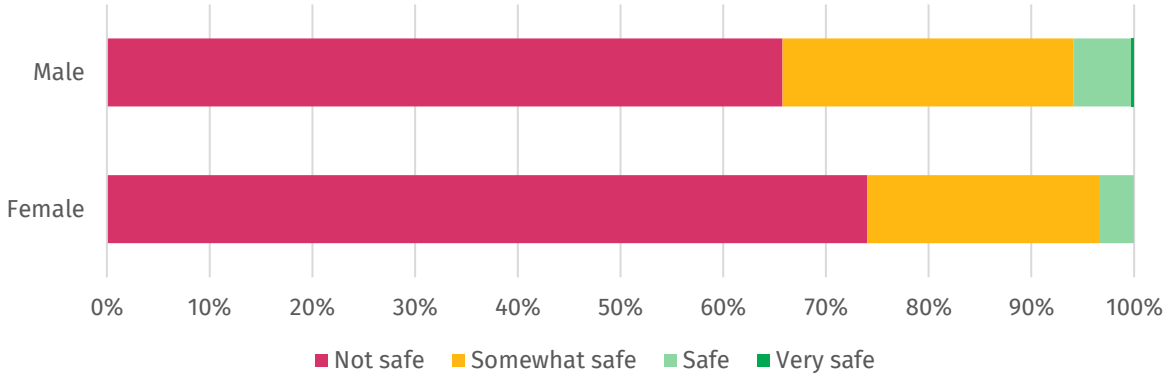

Figure 24. Survey responses: How do you rate safety while cycling in Addis Ababa?

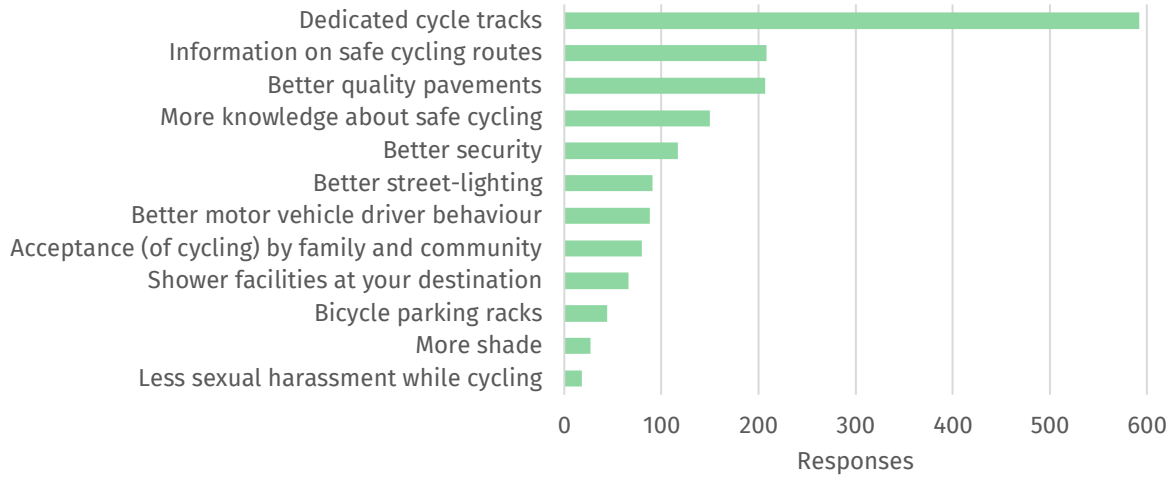

Figure 25. Survey responses: What would make it easier to cycle in Addis Ababa?

These findings suggest that a comprehensive gender inclusion strategy will be needed to attain the Addis Ababa NMT Strategy target of increasing the share of cyclists who are women to 50 percent over ten years:

- Infrastructure that supports cycling: Respondents said that they would consider cycling more often if safer bicycle infrastructure and facilities were available, including cycle tracks, better street lighting, and security features.
- Education and enforcement: Greater emphasis on education is needed to change negative perceptions about cycling and women riding bicycles. In addition, there is a need to educate drivers on how to share the road with cyclists and enforce laws to prevent motorcycles and other vehicles from encroaching on bike lanes. Increasing the number of cycle tracks by its own may not attract female riders. Trainings on cycle riding skills can encourage women to bike.
- Cycling events: Women cycling in groups face less harassment, hence cycling events for women would offer safety in numbers for women who would otherwise not cycle alone. The cycling events should be children or family-friendly to allow women to come along with their families. Cycling events also can function as marketing activities for the bikeshare system.
- Cycle training: There is a need to introduce cycle training grounds in more neighbourhoods. In addition, experienced female cyclists can be enlisted as trainers to support women who are trying out cycling for the first time.
- Women champions: The more women cycle, the more it becomes the norm and encourages other women to join in. Women champions will inspire more women to cycle regardless of their age, fitness level, or ability. All women on cycles should be celebrated as champions: women cycling to the shop, to work, for leisure, or for exercise.
- Affordability of cycles and bikeshare schemes: cost of travel and equipment can be prohibitive to women who rely on public transport. Offering alternatives, such as a bikeshare scheme with discounts and membership benefits, as well as subsidies for cycle purchase, may encourage more women to cycle.

- Access to destinations: In order to encourage women to bike, considering their travel patterns is important. Accordingly, cycle network planning should enable multipurpose trips by connecting various shops, hospitals, schools, and marketplaces.
- Security: Ensuring that the cycle network is well lit can help women feel safer.
- Unisex: A unisex bike is any bike built and designed specifically for all genders. Government needs to subsidies and tax free should be promoted for the unisex bikes.

3.5 PUBLIC TRANSPORT SYSTEM

Public transport accounts for 31 percent of total trips in Addis Ababa. Minibus taxis are the dominant form of public transport, carrying around 80 percent of total public transport demand. Higer midibuses, Anbessa buses, and Sheger buses are other forms of public transport that are affordable compared to minibus taxis and run long-distance trips. Higer midibuses operate on 37 major arterial routes and carry more than 700,000 passengers per day. Anbessa buses operate on 124 routes and carry an average of 309,888 passengers per day. Sheger buses operate on 48 corridors and carry an average of 198,000 passengers per day. The LRT transports over 120,000 passengers per day on the two corridors that operate from Ayat to Torhailoch and from Kality to Menilik II Square.

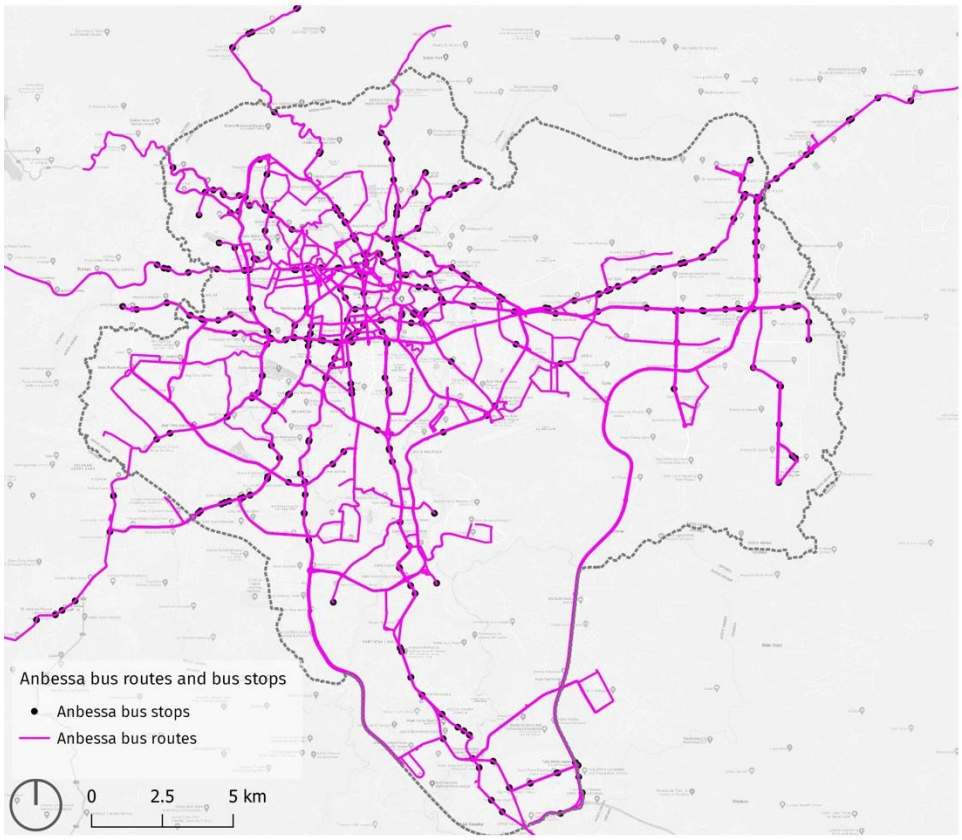

Figure 26. Anbessa bus routes and stops.

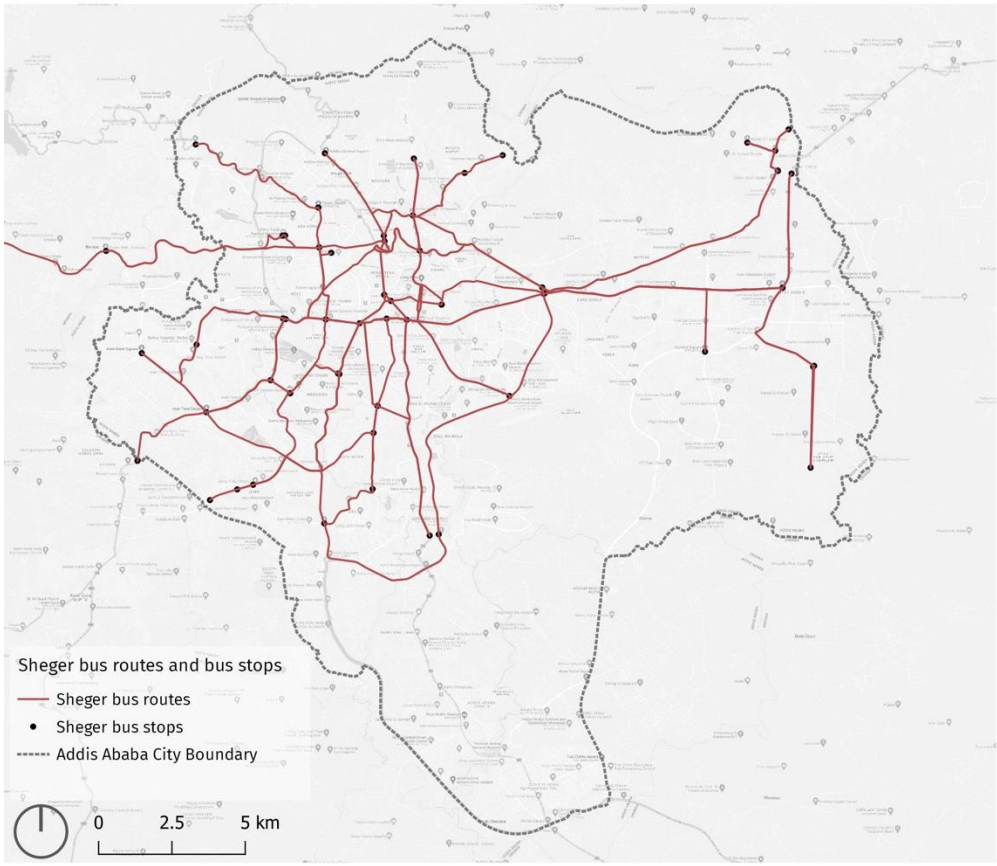

Figure 27. Sheger bus routes and stops.

The city government is trying to increase the number of buses in response to the increased demand for public transport. However, the efficiency of the bus fleet is limited due to congestion. AATB together with TMA, the then Transport Authority, Anbessa, and Sheger enterprises undertook a study to identify dedicated bus lanes and indicate ways to make the identified dedicated bus lanes functional. Although bus lanes have brought some benefits, around 44 percent of bus captains reported that the dedicated bus lanes were not effective, mainly due to parked vehicles, vehicles encroaching on the dedicated bus lane, and pedestrians in the bus lanes. Relevant to the cycle network plan, the dedicated bus lanes have been provided at the kerbside where cyclists also travel, raising the issue of bus-cycle conflicts.

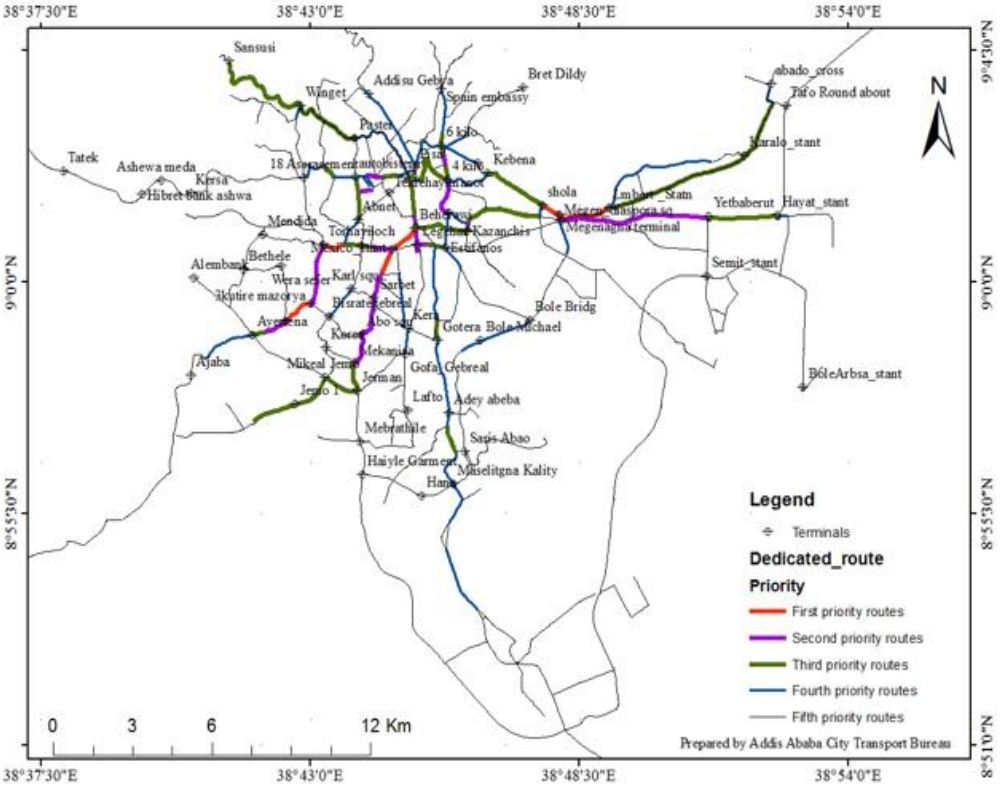

Figure 28. Proposed dedicated bus lane corridors. (Source: AATB)

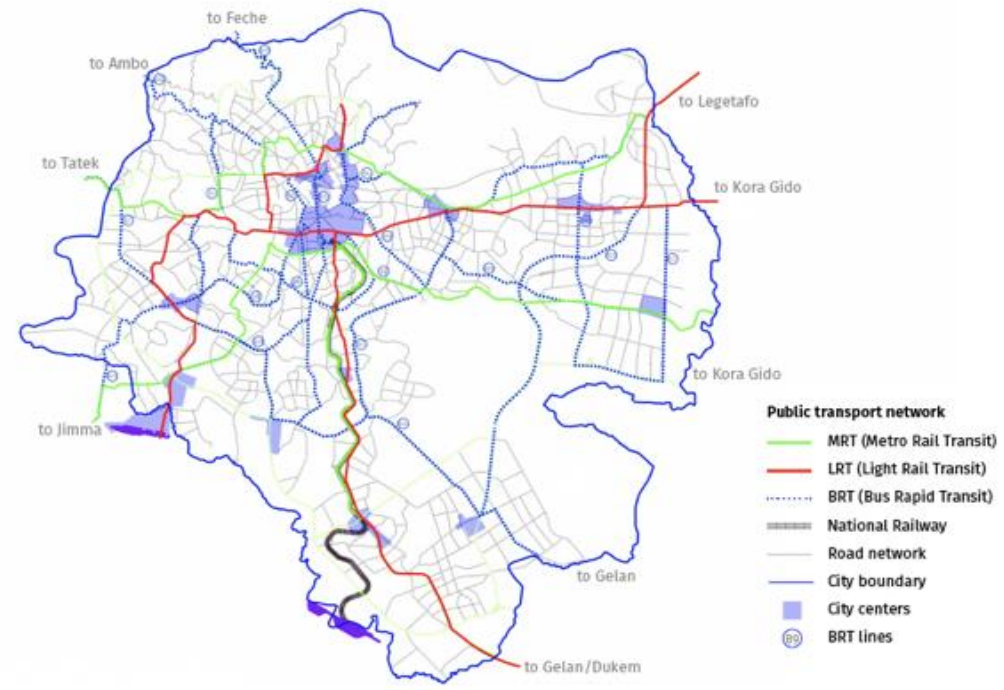

Figure 29. Mass rapid transit corridors proposed in the Structure Plan. (Source: AAPDCo, 2017)

Survey results show that more than half of the respondents walk more than 5 minutes to their final destinations after alighting from public transport, with 31 percent of men and 22 percent of women

reporting walking more than 10 minutes. Bicycles can improve first- and last-mile access, particularly for commuters who walk long distances from public transport stations.

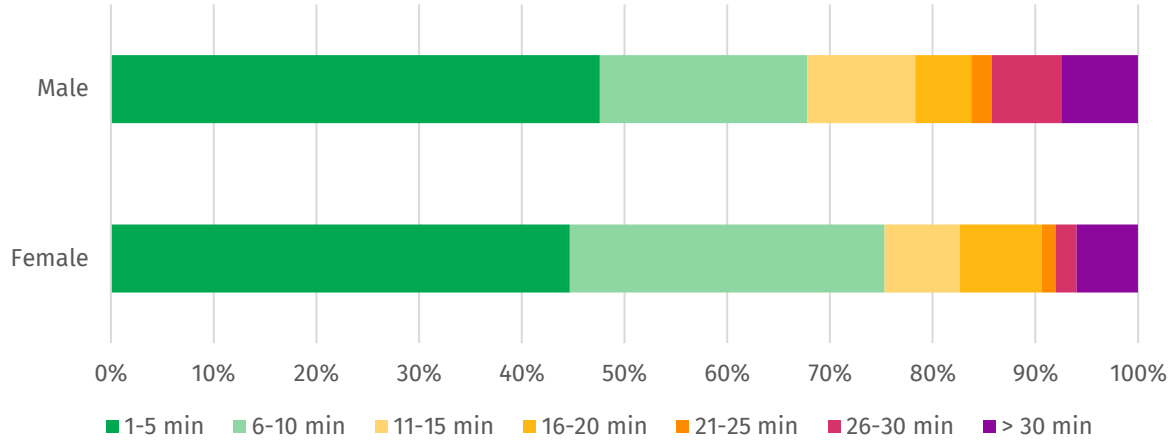

Figure 30. Walking time to destinations for public transport users.

3.6 LAND USE

Land use is a key factor influencing trip patterns. Areas of intense activity, such as market areas, transport hubs, mixed use areas, religious locations, administration offices, education centres, and health centres require convenient access routes within the cycle network. As discussed above, the Structure Plan recommends wide walkways and cycle tracks on business streets and in market areas.[1] The Plan also suggests providing parking facilities for cyclists around mass rapid transit stations.

[1] Addis Ababa Plan and Development Commission, 2017.

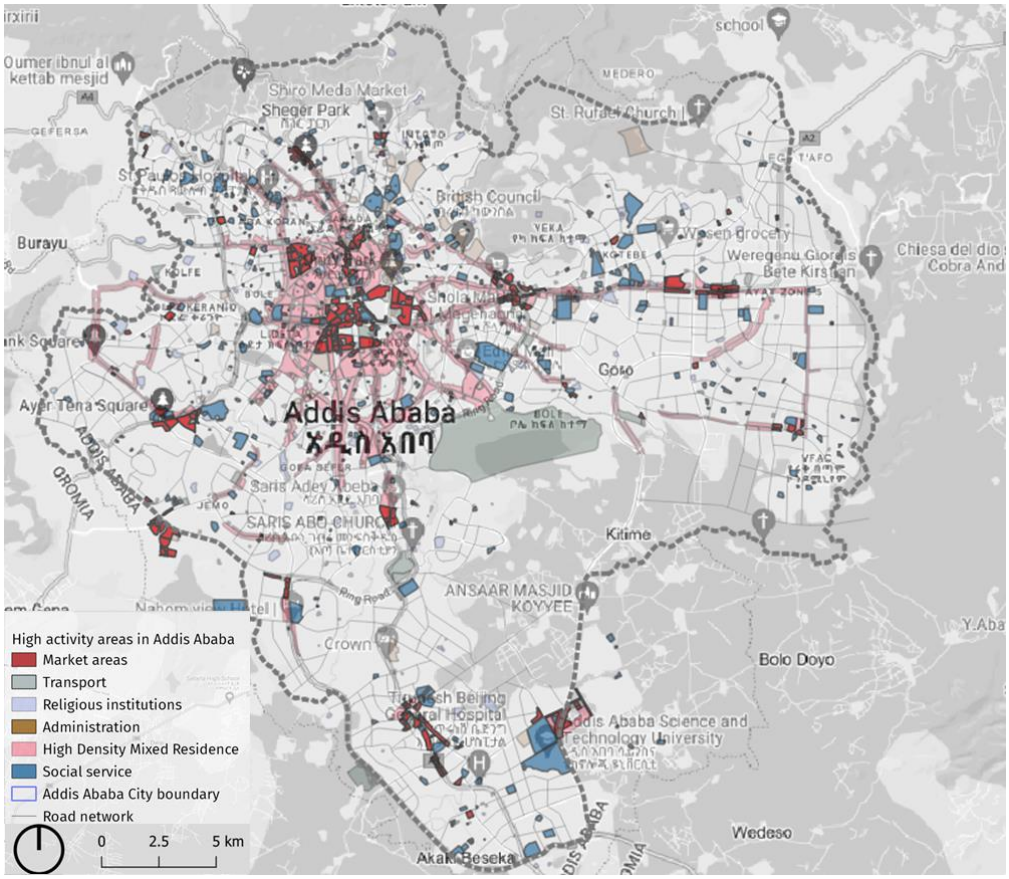

Figure 31. High-intensity land use zones.

3.7 TOPOGRAPHY

The northern parts of Addis Ababa have a higher elevation, with a maximum elevation of 3,044 m above sea level. To the south, the elevation decreases to 2,048 m. The east-west corridors fall in relatively similar elevation categories, as shown in the figure below.

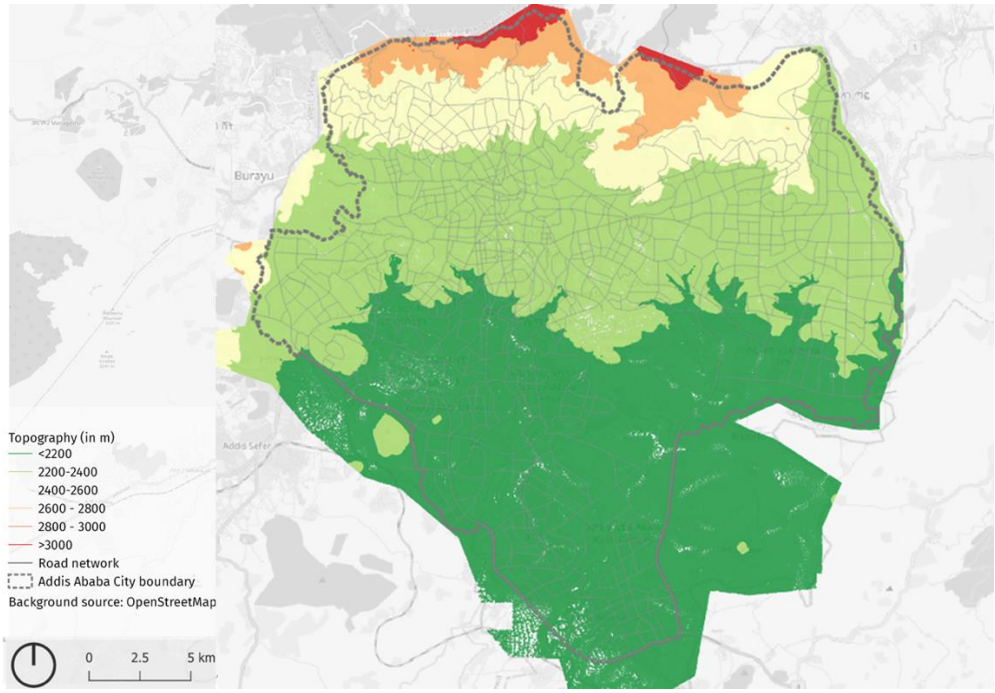

Figure 32. Addis Ababa elevation map.

The Structure Plan proposes to provide dedicated bicycle tracks in zones with gentle slopes. In general, gradients up to 6 percent are acceptable for cyclists, while slopes up to 10 percent are acceptable for very short segments. Larger cycle track widths can improve riding safety on streets with steep gradients. Gradients of 2-3 percent are preferable for longer segments. Out of 1,204 km of analysed street segments, more than 63 percent have gentle slopes of less than 3 percent, while 92 percent are below 6 percent, which is still acceptable for cyclists. Among those streets that have a slope of more than 8 percent slope, 62 percent are collector and special streets. In areas of the city with steeper gradients, e-bikes could help residents tackle the local terrain.

Table 3. Average slope of Addis Ababa streets.

Average slope	Length (km)	Share from the total length of assessed streets (%)
0.0-2.0%	495.6	41.2%
2.1-3.0%	270.6	22.5%
3.1-4.0%	165.8	13.8%
4.1-5.0%	126.3	10.5%
5.1-6.0%	50.4	4.2%
6.1-7.0%	42.9	3.6%
7.1-8.0%	18.8	1.6%
8.1-9.0%	14.9	1.2%
9.1-10.0%	8.0	0.7%
> 10.0%	10.8	0.9%
Sum	1,204.0	100.0%

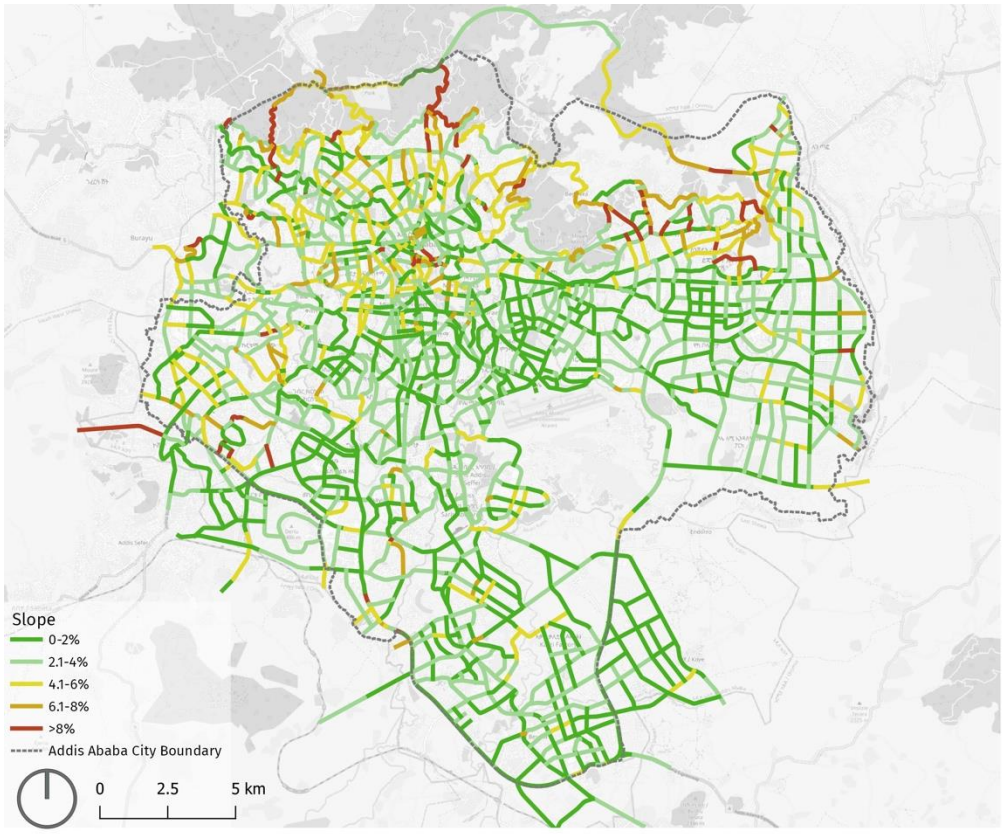

Figure 33. Street slopes.

3.8 LEVEL OF TRAFFIC STRESS

The level of traffic stress (LTS) is a composite measure of the amount of stress felt by cyclists when they interact with traffic. When a street has a moderate or high level of stress, it may be a sign that bicycle infrastructure, such as a dedicated cycle track, is needed for people, especially females and disabled people, to feel comfortable riding. LTS is affected by several variables, including the number of carriageway lanes; intersection designs; the presence of large vehicles; stopping points of public transport vehicles; and other kerbside activities. It is important to account for the changing sources of stress through the day, as traffic volume fluctuates. While the morning and afternoon peaks cause queuing stress, lower volumes off-peak can lead to uncomfortably high car speeds.

The Mineta Transportation Institute (2018) has developed a classification scheme with LTS categories. We have adapted the LTS to characterise the cycling conditions in Addis Ababa, as described in Table 4.

Table 4. Level of Traffic Stress. (Adapted from Mineta Transportation Institute, 2018)

LTS 1	Low-stress environment that demands little attention from cyclists and is attractive for a relaxing bike ride. Suitable for all types of cyclists, including children and novice riders
LTS 2	Presents little traffic stress but demands more attention than might be expected from children. Suitable for “interested but concerned” cyclists.
LTS 3	Involves some interaction with high-speed traffic. Suitable for “enthused and confident” groups.
LTS 4	Requires riding alongside high-speed traffic and making dangerous crossings. Only suitable for “strong and fearless” riders.

To classify the streets of Addis Ababa based on the degree of stress imposed on cyclists, we considered the following factors:

- **Prevailing speed:** The speed of motorised vehicles can affect the level of comfort and safety felt by cyclists. The study considers the speed limit plus 10 km/h as a proxy for the prevailing speed.
- **Number of carriageway lanes:** An increase in the number of motorised carriageway lanes can have a negative impact on cyclists because it encourages higher vehicle speeds. It also impacts the visibility of cyclists at crossings and makes it more difficult for people to cross the road.
- **Presence of cycle track or protected bike lane:** People are more likely to feel comfortable while riding on a street that has a dedicated bicycle track than riding together with the motorised vehicles. On those streets that have bicycle infrastructure in place, bike lane blockages due to on-street parking and vendors are considered on the evaluation since they force cyclists to use the carriageway instead of the bikeway.
- **Properties of streets to be crossed:** A dangerous street crossing can increase the stress level of a cycling corridor. The assessment considers the number of lanes, speed, and availability of a median on each street that intersects with a given block. For the given street, the assessment takes the highest stress level found among the intersecting streets.

After each street centre line is given a score based on the table below, we assigned a numeric stress level.

Table 5. Weight assigned for stress metrics.

Metric	Value	Degree of stress	Weight (in percent)
Prevailing speed	< 25 km/h	0	30
	≤ 40 km/h	20	
	< 60 km/h	75	
	60+ km/h	100	
Carriageway lanes	0	0	15
	2	20	
	4 with median	75	
	4 without median or 6+ with median	100	
Presence of cycle track or protected bike lane	Present, no problems	0	30
	Present, minor problems	35	
	Present, major problems	60	
	Not present	100	
Street to be crossed	< 25 km/h	0	25
	≤ 40 km/h, 1-3 lanes per direction or 4-6 total lanes with 2 m median	20	
	< 60 km/h, 1-4 lanes per direction or 5-6 total lanes with 2 m median	60	
	60+ km/h and/or 6+ total lanes	100	

Physical medians regardless of their size are considered as medians since they are better than painted or unmarked medians. Other than the detailed analysis done for major streets, local streets are assumed to have stress levels of LTS 1, assuming that speeds are generally low (25 km/h or below). Five percent of streets have LTS 2, 38 percent have LTS 3, and 57 percent have LTS 4. These figures indicate that about 95 percent of streets present a high LTS of 3-4, making them usable only for “enthused and confident” and “strong and fearless” cyclists.

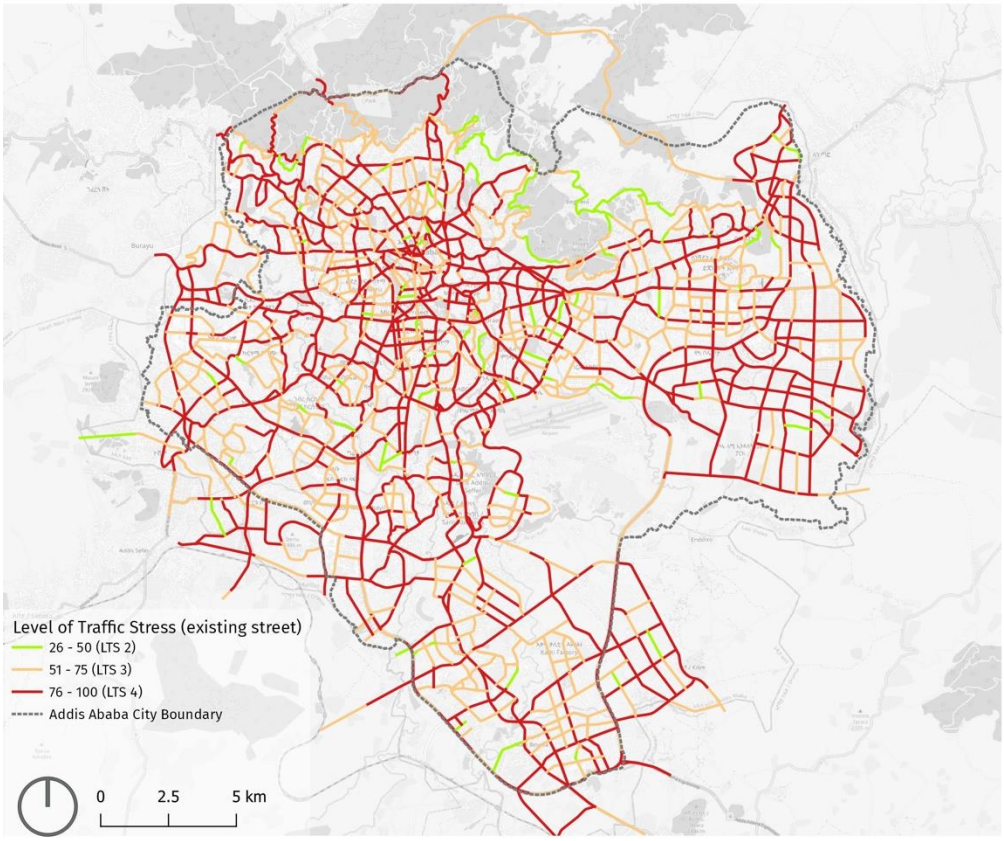

Figure 34. Existing Level of Traffic Stress for cyclists.

3.9 ONGOING STREET IMPROVEMENT AND GREENWAY PROJECTS

Since the launch of the Addis Ababa NMT Strategy in 2019, the city has taken up several initiatives to improve the walking and cycling environment and promote active mobility, as outlined below.

3.9.1 HAILE GARMENT-FURI ROUNDABOUT

The old Transafrica Highway corridor links the Haile garment factory and condominium site with the secondary city centre of Jemo. Recently, open to the public, the corridor is expected to serve as an outer ring road for the city. The total length of the corridor is around 4.5 km, with an ROW of 60 m and wide median for future expansion. The constructed cycle track is unidirectional and is separated from the motor vehicle lane with 0.4 m wide kerbstones.

Figure 35. Haile Garment-Furi roundabout cycle track under construction

3.9.2 LEBU-JEMO PILOT CYCLE CORRIDOR

The Jemo-Lebu cycle track was initially launched with painted buffers and plastic delineators on 16 Feb 2019. The bidirectional cycle track links the secondary city centre of Jemo to Lebu intersection, with a total length of 2.7 km and clear width of 3.0 m for two-way movement on one side of the street. It is a secondary arterial street with a total ROW of 30 m and is located parallel to the Haile Garment-Furi corridor. The protected bike lane occupies space formerly used for on-street parking and is among the streets that host the monthly car-free day event.

Figure 36. Lebu-Jemo pilot bicycle corridor (Photo taken in 2019)

The planning team conducted extensive data collection before and after the inauguration. The number of cyclists increased more than tenfold, suggesting that building safer infrastructure will encourage more people to cycle even on corridors with low existing cycle volumes.

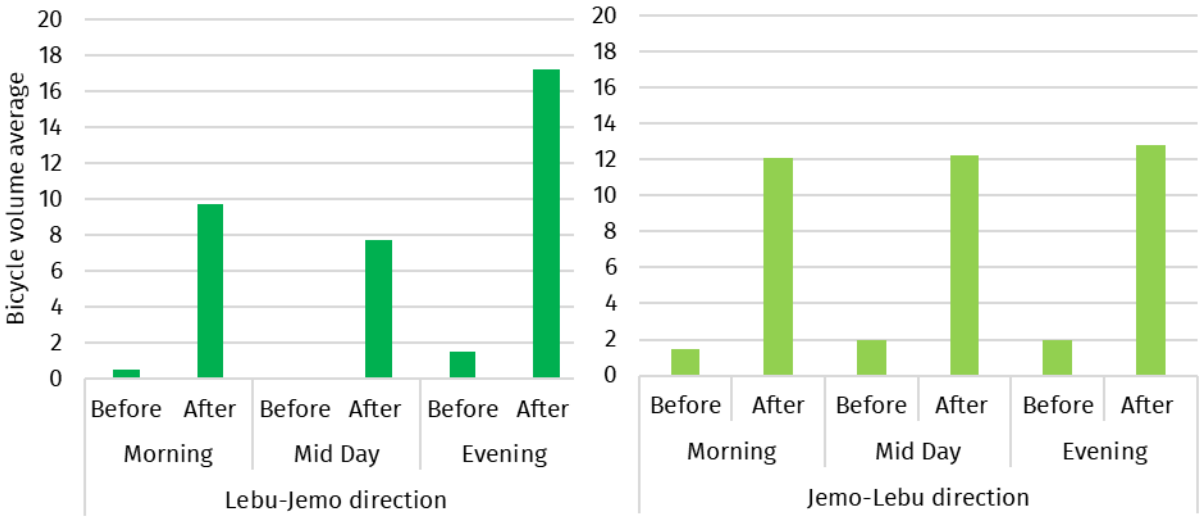

Figure 37. Average bicycle volume per hour per direction before and after implementation on Lebu-Jemo cycle corridor. (Source: AATB)

Ninety-five percent of interview respondents in the area want the cycling corridor to become permanent and 96 percent of cyclists felt some degree of safety while riding on the interim infrastructure. Among the challenges faced are weak enforcement, pushback from business owners along the corridor, encroachment by motor vehicles, and parking issues. AATB together with the Traffic Management Agency have replaced the original plastic delineators with more permanent spherical concrete bollards. Unfortunately, many of the delineators have been removed and the corridor is now occupied by vehicle parking.

Figure 38. The cycle corridor is demolished and used for parking

3.9.3 KALITY-TULU DIMTU

This corridor runs from Kality Drivers and Mechanics Training Centre to Tulu Dimtu, with a length of 10.9 km. The corridor has a ROW of 60 m and a unidirectional cycle track of 1.8 m on each side. The corridor is surrounded by medium and low density mixed residential areas, manufacturing and storage areas, reserved areas for greenery, and commercial places. Currently, the corridor is under construction by the Addis Ababa City Roads Authority.

Figure 39. Kality-Tulu-Dimtu cycle track under construction.

3.9.4 CITY HALL–MESKEL SQUARE PROJECT

The City Hall–Meskel Square Street refurbishment project commences at the City Administration Hall (Mezegaja), situated in Piazza, and extends all the way to Meskel Square through Bherawi Theatre. This corridor, constructed by the City Administration's Mega Project Office, spans a distance of 3 km. It features a spacious walkway, street benches, ample shading, and a bidirectional cycle track on one side of the street.

Figure 40. Mezegaja-Meskel Square street refurbishment project.

3.9.5 WOLLO SEFER-ST. URAEL

This corridor has a length of 1.4 km and has unidirectional bicycle lane running from Wollo Sefer to St. Urael. It has a ROW of 35 m and connects important city locations such as Wollo Sefer, Urael, and Atlas. The cycle lane is only indicated through painted markings and needs physical buffers to prohibit encroachment by parked vehicles and enhance the safety of cyclists.

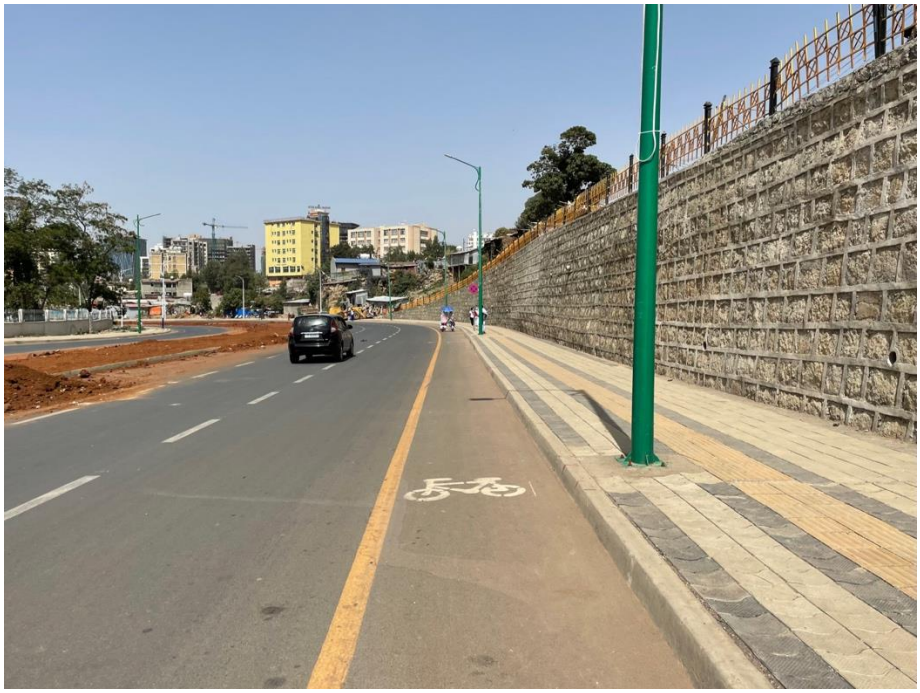

Figure 41. Wollo Sefer-St. Urael cycle lane.

3.9.6 BOLE AIRPORT-GORO PROJECT

The Bole Airport-Goro project runs from Bole Airport to Goro, with a branch toward Roba Bakery. It includes a unidirectional cycle track on each side of the 4 km Bole to Goro road, which has a ROW of 60 m. Adjacent land uses include the airport, industry park, housing, and urban agriculture.

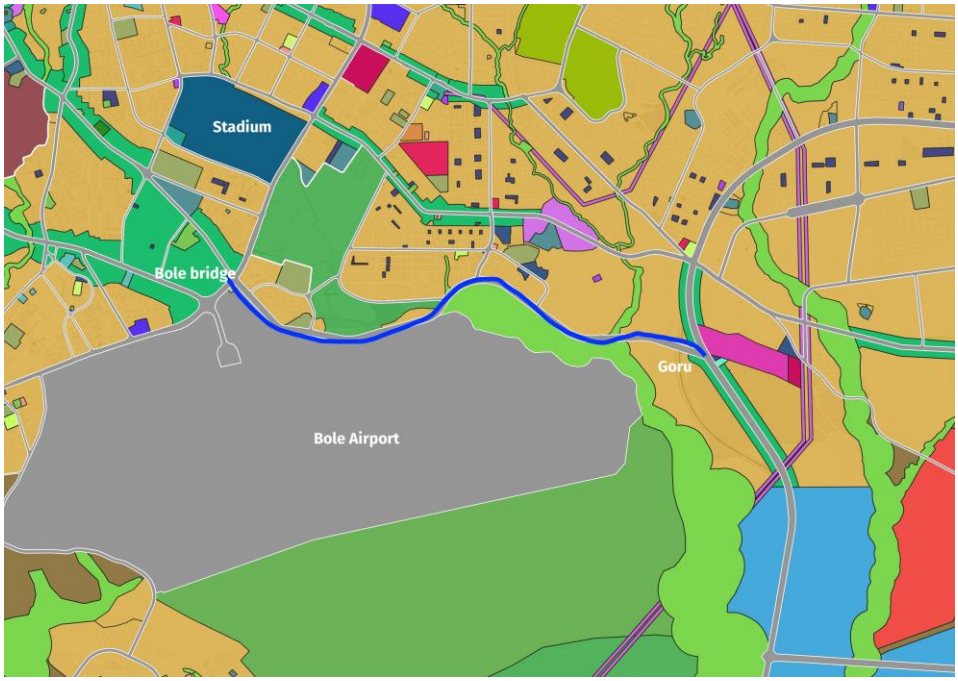

Figure 42. Bole Airport to Goru.

Figure 43. Bole Airport to Goro, under construction.

3.9.7 OTHER STREETS UNDER DESIGN OR IMPLEMENTATION

The Addis Ababa City Roads Authority (AACRA) is working to provide cycle tracks on streets identified in the city's NMT Implementation Plan. Projects at design stage include the 6.1 km Jemo Roundabout-Ambo corridor and the 3 km Semein Hotel-Abebe Bikila Stadium Road. Most of the streets under package 40 lot-2, package 36, package 6, package 39 lot 2, and the ITS project incorporate cycle tracks.

3.9.8 ENTOTO PARK

Entoto Park, which was constructed by the Prime Minister's Office under the Beautifying Sheger project, includes a dedicated walking and cycling corridor. The bikeway and walkway serve leisure riding and sports. People who want to cycle in the park must bring their own bikes to the park. The City Administration aims to introduce a bikeshare system and cycle parking.

Figure 44. Entoto park walking and cycle track.

3.9.9 RIVERSIDE PROJECT

Many rivers in Addis Ababa are highly polluted with sewage and waste. The Riverside Project aims to develop high-quality public spaces, including bicycle paths, along riverbanks; enhance tourism potential; and mitigate flooding risk. The project aims are in line with the Structure Plan, which proposes 15 percent of the land area of parks be reserved for footpaths, cycle tracks, and water features.

The ongoing riverside project covers 11.7 km of the river network and a total area of 437 ha. The project includes three segments, from Meketeya to Anfichober, Afinchober to Ambassador, and Bambis to Peacock Park. It also includes the Sheger Riverside, Dejach Wubie LDP, Piazza Arada LDP, Basha Wubie LDP, and Aroge Kera LDP parks.

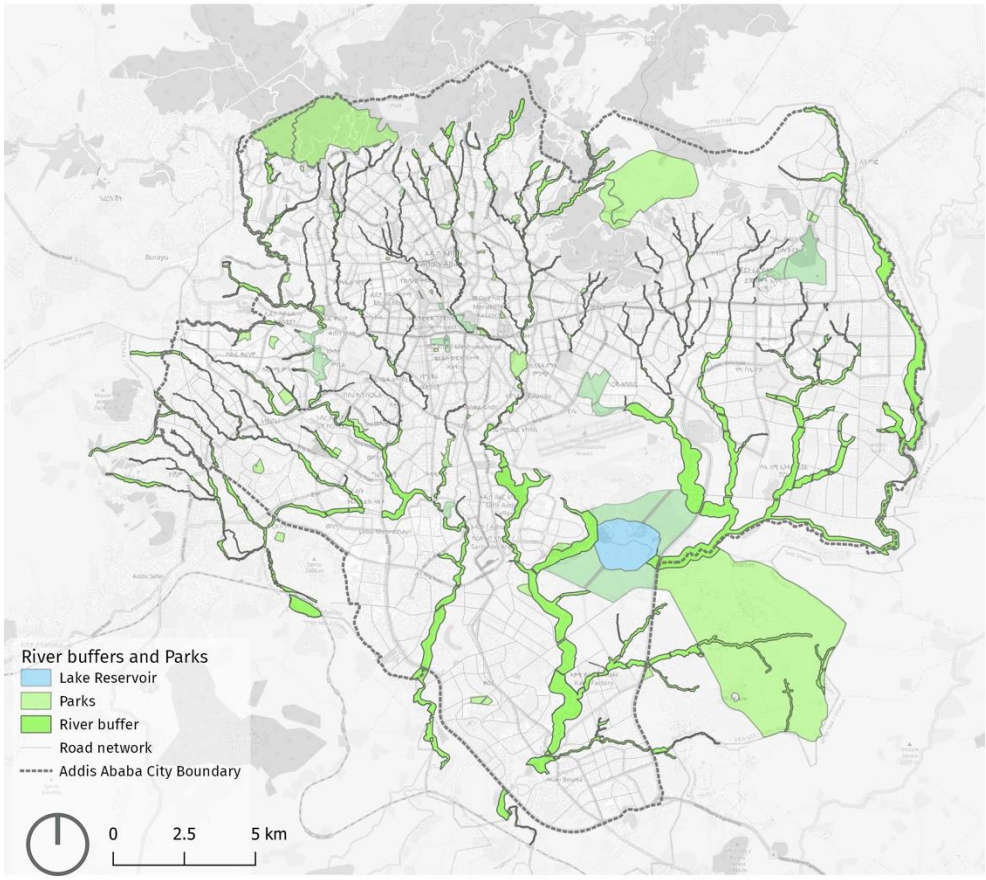

Figure 45. Parks and river buffers.

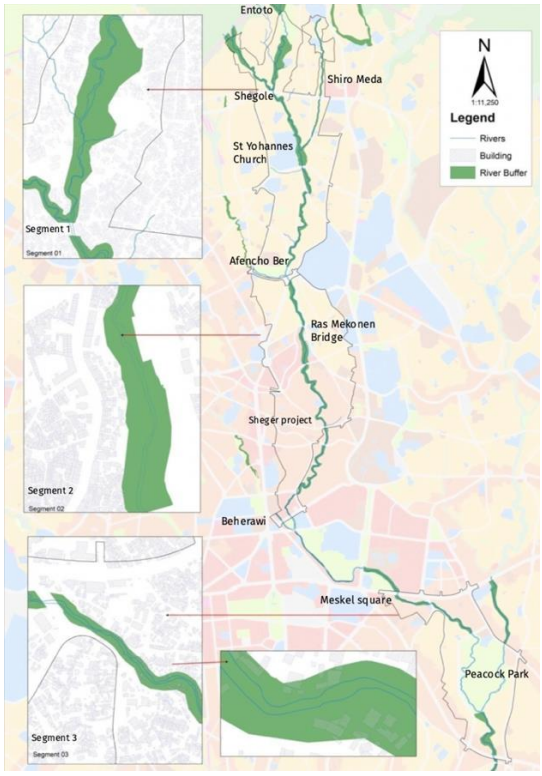

Figure 46. Riverside development local development plan boundary. (Source: AAPDC)

Phase one of the project, which is across from Sheraton Hotel, lies on 27 ha and covers 1.2 km along the river. First Highway, a subsidiary of the state-owned China Communications Construction Company (CCCC), is handling construction of this phase. The second phase of the project lies on 16 ha and spans 10.5 km of the riverside with a total cost of close to ETB 7 billion. Both phases are financed by the Chinese government.

A cycle track could be an integral part of the 1.2 km river corridor. Responsible stakeholders such as AATB, AACRA, and the Mega Project Office must work towards providing a cycle facility on the two sides of the river, which will make the area more attractive and vibrant.

3.9.10 OPEN STREETS EVENTS

The Menged Lesew or Open Streets Day and Walking and Cycling Days aim to encourage the cycling culture in the city. Since its start in December 2018, Menged Lesew has been held monthly with a motto of reclaiming streets for people. Cycling and cycle trainings are among the activities held at these monthly events. Menged Lesew is organised by TMA, and the Walking and Cycling Day event is organised by the Ministry of Transport and Logistics (MOTL) together with AATB.

Figure 47. Car-free event in Addis Ababa.

3.9.11 CYCLE RENTAL PROJECTS

The then Ministry of Transport in coordination with the then Addis Ababa Road and Transport Bureau (AARTB) initiated a project to encourage cycling through the development of designated cycle tracks and a bicycle rental program. The project was conducted as part of a wider long-term strategy focused on air quality and public health improvements. The purpose of the project was to explore the viability of urban cycling and shared bicycles in Addis Ababa. The total project cost was USD 715,000. This included the procurement of electric bicycles, construction of cycle tracks, installation of city benches and cycle racks, setup of micro-enterprise organisations, and planting of green infrastructure.

Since its implementation in 2015, the pilot project has encountered several challenges. As part of the project, cycle tracks were developed at three distinct locations: Imperial, CMC, and Ayat. The cycle tracks vary in level of sophistication. The CMC cycle track is physically segregated. Ayat has one stretch with a bidirectional cycle track and another stretch with unidirectional cycle tracks. At Imperial, the cycle lanes are only demarcated using paint. To complement the cycle tracks, 163 signs, 141 bicycle racks, and 45 benches were installed along the corridor. These facilities were developed at a total cost of USD 220,500.

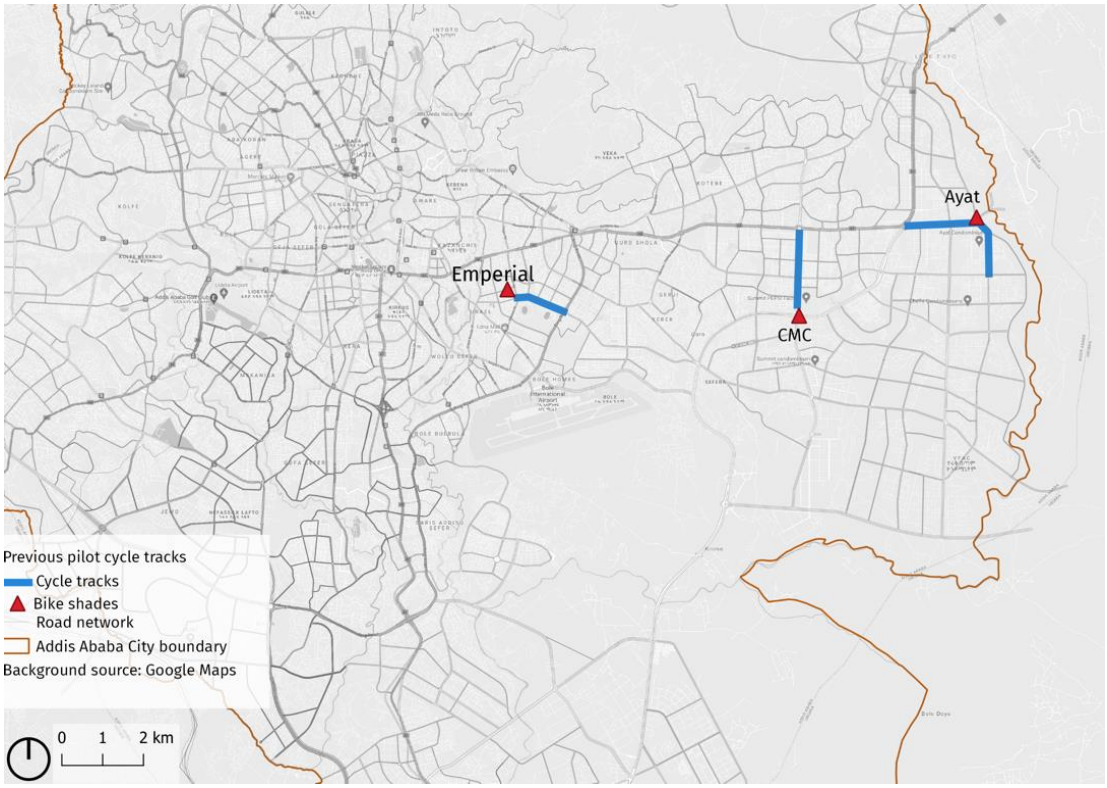

Figure 48. Locations of bicycle facilities and bike sheds.

There are several aspects of the planning and design of the cycle tracks that contribute to poor usage of the facilities. A portion of the cycle track in CMC was built on the outside of the footpath, away from mixed traffic. Generally, cycle tracks should be located between mixed traffic and the footpath. Such an arrangement helps maintain a speed gradient across the cross section and offers access to building frontages for pedestrians. It also minimises conflict points between cyclists and pedestrians at intersections. During the rainy season, the CMC cycle track becomes inundated and therefore unusable. In Ayat, many pedestrians were observed walking on the cycle track because of the poor quality of the walkway running parallel to the cycle track. In addition, there was no street lighting, which increases security risks, especially for women. At Imperial, where the cycle tracks are only demarcated with paint, many cars were observed parked in the cycle lanes. Where it is not blocked by cars, many pedestrians walk in the cycle lane due to the poor quality of the adjacent footpath, similar to the situation in Ayat. Maintenance and enforcement also appear to be poor. Along the segregated cycle track in Ayat, the dumping of construction materials and encroachment from nearby buildings creates a discontinuous cycle track. These factors all reduce the attractiveness and convenience of cycling. We advise the respective stakeholders to rehabilitate these cycle corridors and make them functional.

4. PROPOSED BICYCLE NETWORK

The proposed cycle network is designed to establish connections between various centres, including job hubs, residential areas, shopping districts, and transport facilities, at all levels of the street hierarchy. This comprehensive approach aims to enhance accessibility and opportunities for people of all demographics, with a particular focus on improving conditions for women. Women often engage in multipurpose trips, and it is crucial to provide connectivity to a wide range of activities, allowing them to meet their daily travel needs.

The network's primary objective is to encompass vital urban corridors, especially arterial streets with a minimum ROW of 30 m and two or more lanes of mixed traffic in each direction. By doing so, these streets can become safe and welcoming environments for cyclists of all ages and abilities.

4.1 PRIORITISATION OF CYCLE TRACK DEVELOPMENT

Addis Ababa's bicycle network is one element within the city's overall mobility strategy that aims to enable daily cycling for a wide range of users. Following the mapping of existing conditions and the consultations with user groups in Addis Ababa, the network was developed according to the planning principles outlined in this report.

The implementation plan prioritises cycle corridors based on the following criteria:

- Corridors under planning by implementing agencies.
- Corridors in commercial and business hubs.
- Corridors with possibility of having high cycle ridership.
- Routes within the planned coverage area of the first-phase bikeshare system.
- Streets providing last-mile connectivity to LRT stations, BRT stations, and bus terminals.
- Streets near educational institutions, to improve safety and comfort for school children and college students.
- Streets with relatively flat topography, to achieve uptake early on during implementation. In general, streets with gradients below 6 percent should be prioritised.
- Corridors that fill gaps in the existing network. For instance, Bole Road is a strategic corridor that can link existing cycle tracks on Churchill Avenue and Goro.
- Trunk cycling routes that connect major destinations where jobs, leisure, and education opportunities are concentrated with residential areas.

Members of the cycle community, government officials, and other stakeholders helped identify important corridors meeting the criteria mentioned above.

4.2 IMPLEMENTATION PLAN

The implementation plan comprises short-term projects that can be implemented within 2 years; medium-term projects to be implemented from 3-5 years; and long-term corridors that will be implemented from 6-10 years.

4.2.1 SHORT TERM: YEARS 1-2 (2015-2016 E.C.)

The short-term cycle network plan includes ongoing bicycle projects, the first and second phase bikeshare coverage area, trunk corridors connecting the city centre with peripheral areas, and upgrades to earlier cycle track projects.

Existing cycle track projects being implemented by the City Administration including the following:

- Sheger Riverside Development Project
- Entoto Park development
- Bole Homes to Goro road
- Kality to Tulu Dimtu
- Semein Hotel - Abebe Bikila - traffic Sefer
- Wollo Sefer-Urael
- Bole to Meskel Square

Corridors within the first- and second-phase bikeshare coverage areas include the following:

- Bole -Atlas- Urael- Kazanchis
- Megenagna - Kebena - Arat Kilo-Piassa
- Piassa- Yohannes- Abebe Bikila Stadium
- Megenagna - Signal – Kazanchis
- Lideta Tsebel - Cherkos – Gazebo
- Bole Michael - Olympia
- Coca - Abinet - Autobis tera – Merkato
- Estifanos - Grand palace-Arat Kilo
- Kazanchis - Filwoha – Goma Kuteba
- Megenagna – Stadium
- Grand palace - Tewodros square – Teklehaimanot
- Lideta – Mexico - Leghare - Urael

Previous cycle track projects to be upgraded include:

- Summit to CMC
- 17 health centre to Gerji
- Jemo to Lebu
- Summit to Ayat
- Ayat to Ayat Chefie

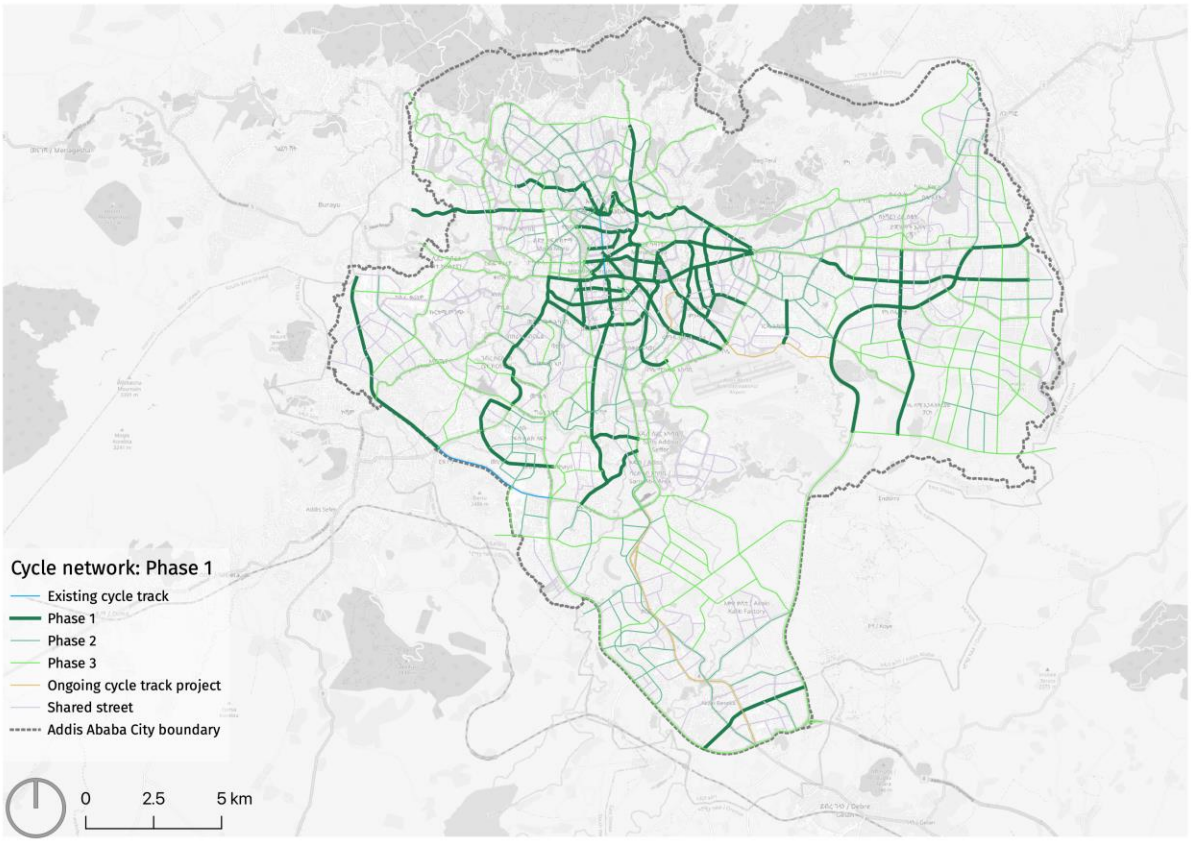

Figure 49. Bicycle network: phase 1.

Table 6. Bicycle network: Corridors that are under construction, design, or planning under phase 1.

Phase	*ROW*	*Street type*	*Intervention*	*Length (km)*
Existing	40	PAS	Bi-directional	2.3
	60	PAS	Uni-directional	4.7
Subtotal				7.0
Ongoing projects	30	SAS	Uni-directional	1.7
	30	CS	Uni-directional	1.0
	40	PAS	Uni-directional	4.4
	50	PAS	Uni-directional	6.7
	60	PAS	Uni-directional	4.4
Subtotal				18.2
Phase 1	20	CS	Bidirectional	5.2
	20	SAS	Bidirectional	3.5
	25	CS	Shared street	0.2
	25	SAS	Bidirectional	18.6
	30	CS	Unidirectional	0.6
	30	PAS	Bidirectional	5.6
	30	PAS	Unidirectional	4.4
	30	SAS	Bidirectional	4.2
	30	SAS	Unidirectional	36.6
	35	SAS	Unidirectional	1.2
	40	PAS	Unidirectional	29.9
	40	Ring Road	Unidirectional	3.1
	40	SAS	Unidirectional	2.7
	50	PAS	Unidirectional	5.0
	60	PAS	Unidirectional	22.2
	90	PAS	Unidirectional	0.9
Subtotal				144.0
Total				169.2

4.2.2 MEDIUM TERM: YEARS 3-5 (2017-2018 E.C.)

The medium-term projects will be implemented from years three to five. This phase will see 30 percent of the cycle network implemented targeting corridors with in the second phase coverage area of the bikeshare system, corridors that are part of the riverside development projects, new connections between the city centre and peripheral areas, and networks within condominium areas.

Cycle infrastructure will be introduced in the following condominium areas:

- Summit Condominium
- Bole Arabesa

- Mikililand Condominium
- Tulu Dimtu, Akaki Kality
- Kilinto
- Jemo
- Ayat Tafo
- Yeka Abado

Medium-term projects will coincide with the third phase of the bikeshare system:

- Megenagna - CMC - Ayat
- Ayer Tena - Alem bank

Additional corridors will be developed along mass rapid transit lines and in secondary city centres:

- Lideta - Sarbet - Jemo Michael - Jemo condominium
- Mexico - Mekanisa - German bridge
- Meri Luke area
- Jemo and Akaki secondary city centres
- Leghare - Kera – Lafto
- Imperial - Gerji – Goro
- Goro - Bole Arabsa
- Sahilte Mihret - CMC – Ayat
- Grand palace-Kebena,
- Georgies-Sidest Kilo
- Shola-Anbessa garage

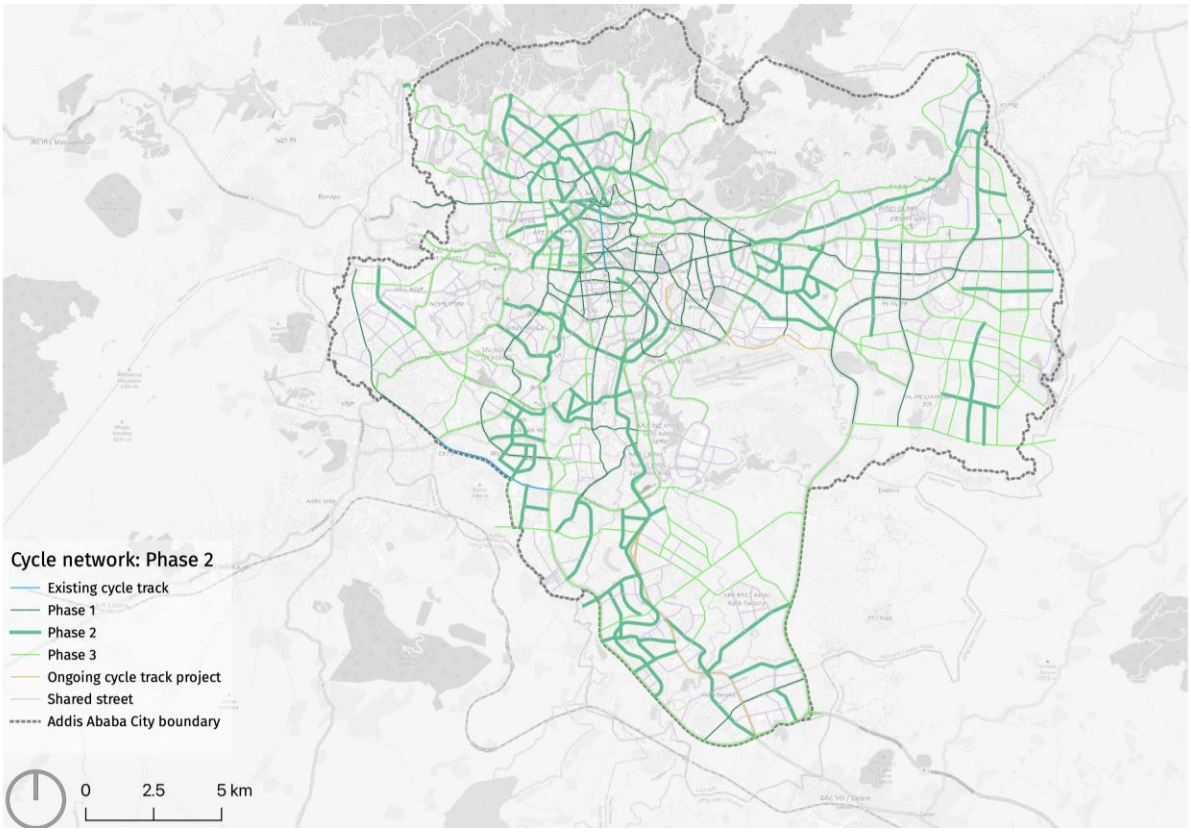

Figure 50. Bicycle network: phase 2.

Table 7. Bicycle network: phase 2 corridors.

ROW	*Street type*	*Intervention*	*Length (km)*
15	CS	Unidirectional	0.5
20	CS	Bidirectional	23.4
20	SAS	Bidirectional	4.3
20	SAS	Shared street	0.4
20	SAS	Unidirectional	0.8
25	CS	Bidirectional	21.2
25	SAS	Bidirectional	17.3
25	SAS	Unidirectional	0.6
30	CS	Unidirectional	3.2
30	PAS	Unidirectional	32.2
30	Railway	Unidirectional	20.4
30	SAS	Bidirectional	0.3
30	SAS	Unidirectional	43.8
40	PAS	Unidirectional	8.9
40	SAS	Unidirectional	6.2
60	PAS	Unidirectional	4.4
Total			187.8

4.2.3 LONG TERM: YEARS 6-10 (2019-2024 E.C.)

In the long term, protected cycling infrastructure shall be provided on all major streets with an ROW of 30 m or more. The local streets under the LDPs shall be designed as shared streets to accommodate cycling, walking, and slow-speed vehicle movement. Cycle tracks shall be incorporated along the mass rapid transit lines. The Addis Ababa City Master Plan proposed 15 BRT corridors to be implemented over ten years. Any BRT corridor with an ROW of more than 35 m shall include cycle tracks. In order to facilitate convenient connections between stations and trip generators, collector and local streets intersecting these mass transport corridors will feature cycle tracks or incorporate safe shared spaces. Moreover, all riverside projects are expected to incorporate cycleways to encourage cycling in these areas.

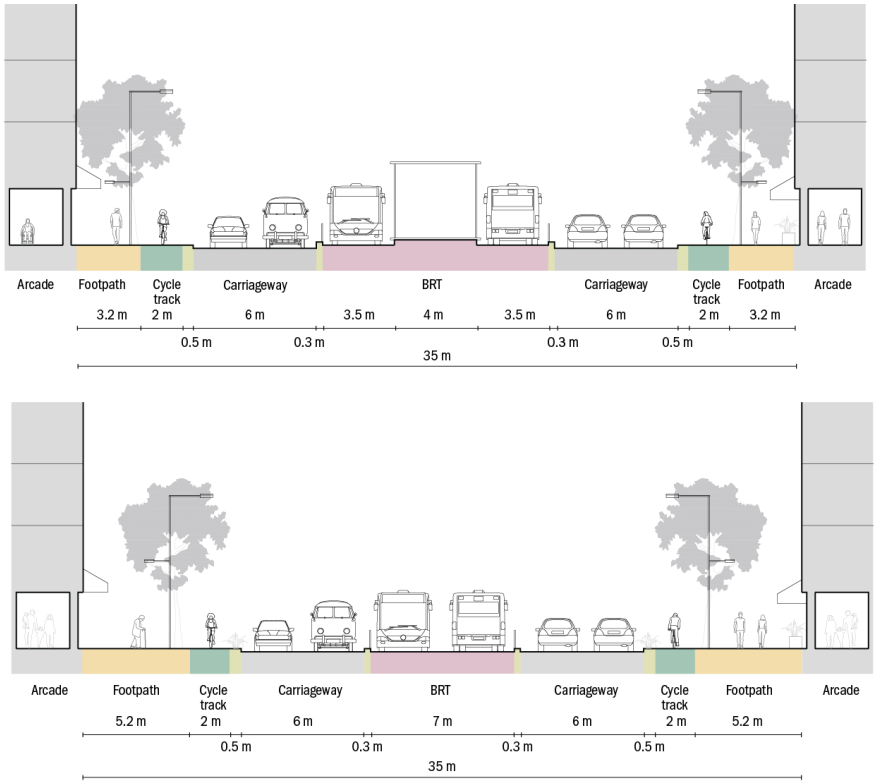

Figure 51. Typical 35 m street with BRT and a cycle track.

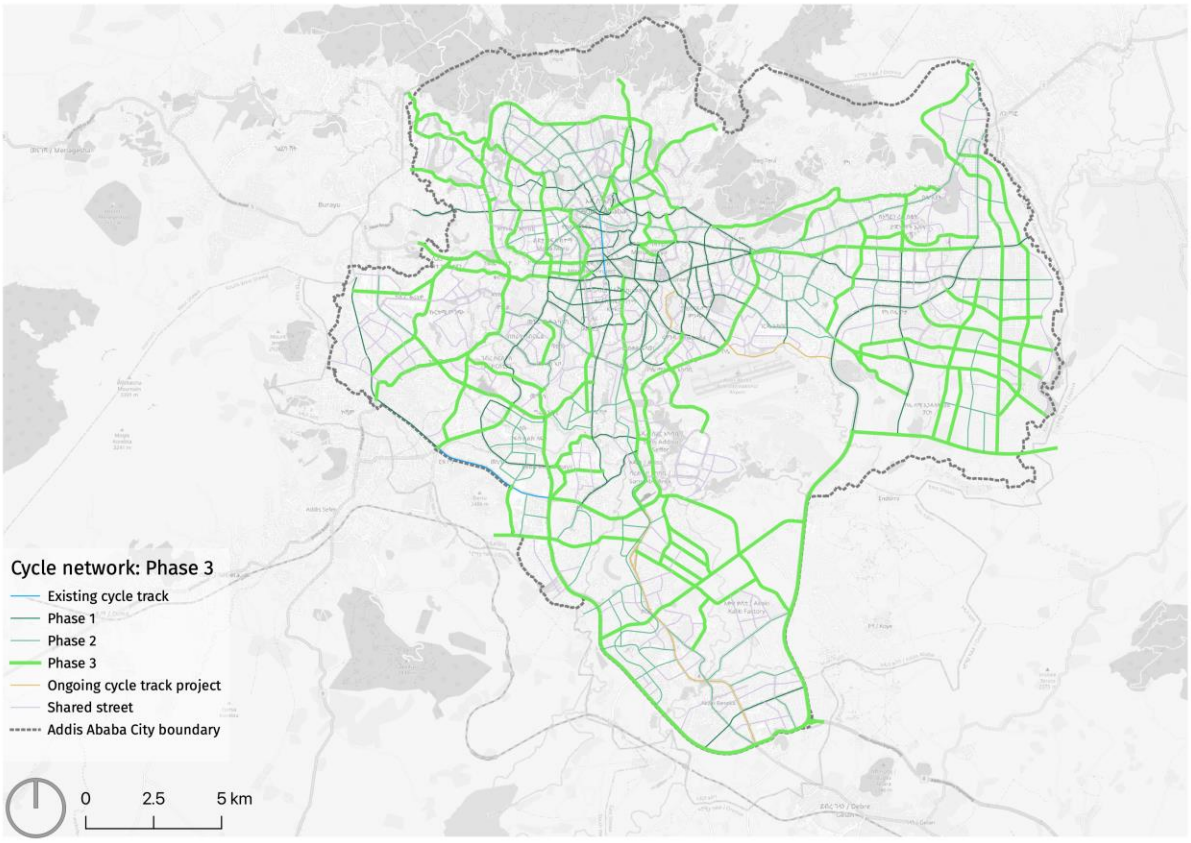

Figure 52. Bicycle network: phase 3.

Table 8. Bicycle network: phase 3 corridors.

ROW	*Street type*	*Intervention*	*Length (km)*
15	CS	Bidirectional	0.4
15	SAS	Bidirectional	0.4
20	CS	Bidirectional	23.4
20	SAS	Bidirectional	15.8
20	SAS	Unidirectional	2.8
25	CS	Bidirectional	8.8
25	PAS	Bidirectional	2.3
25	SAS	Bidirectional	8.8
25	SAS	Unidirectional	2.6
30	CS	Unidirectional	2.1
30	PAS	Unidirectional	38.6
30	SAS	Bidirectional	2.2
30	SAS	Unidirectional	47.6
40	PAS	Unidirectional	58.0
40	Ring Road	Unidirectional	34.2
40	SAS	Bidirectional	1.7
40	SAS	Unidirectional	9.0
50	PAS	Unidirectional	17.2
60	PAS	Unidirectional	39.3
60	Ring Road	Unidirectional	4.6
Total			319.9

4.2.4 SHARED STREETS

On traffic-calmed local and collector streets, cyclists can share space with mixed traffic. Local streets planned by the Addis Ababa City Plan and Development Commission should have a minimum width of 6 m. There are also streets with a ROW of 7 m that are termed special streets. The collector streets in turn have a ROW of 15 to 25 m, with a maximum speed limit of 30 km/h.

There are two possible design typologies for local and collector streets. A shared street is a roadway designed for slow travel speeds where pedestrians, cyclists, and motorists all share the right of way. Vehicles are advised to drive 15 km/h or below, and the roadway may be flush from building line to building line. On streets with separate footpaths for pedestrians, cyclists can travel in the carriageway if vehicle speeds are limited to 30 km/h through physical traffic calming measures. To make the local and collector streets safe for cycling, the primary intervention is to add speed bumps and other traffic calming features that are compatible with cycling.

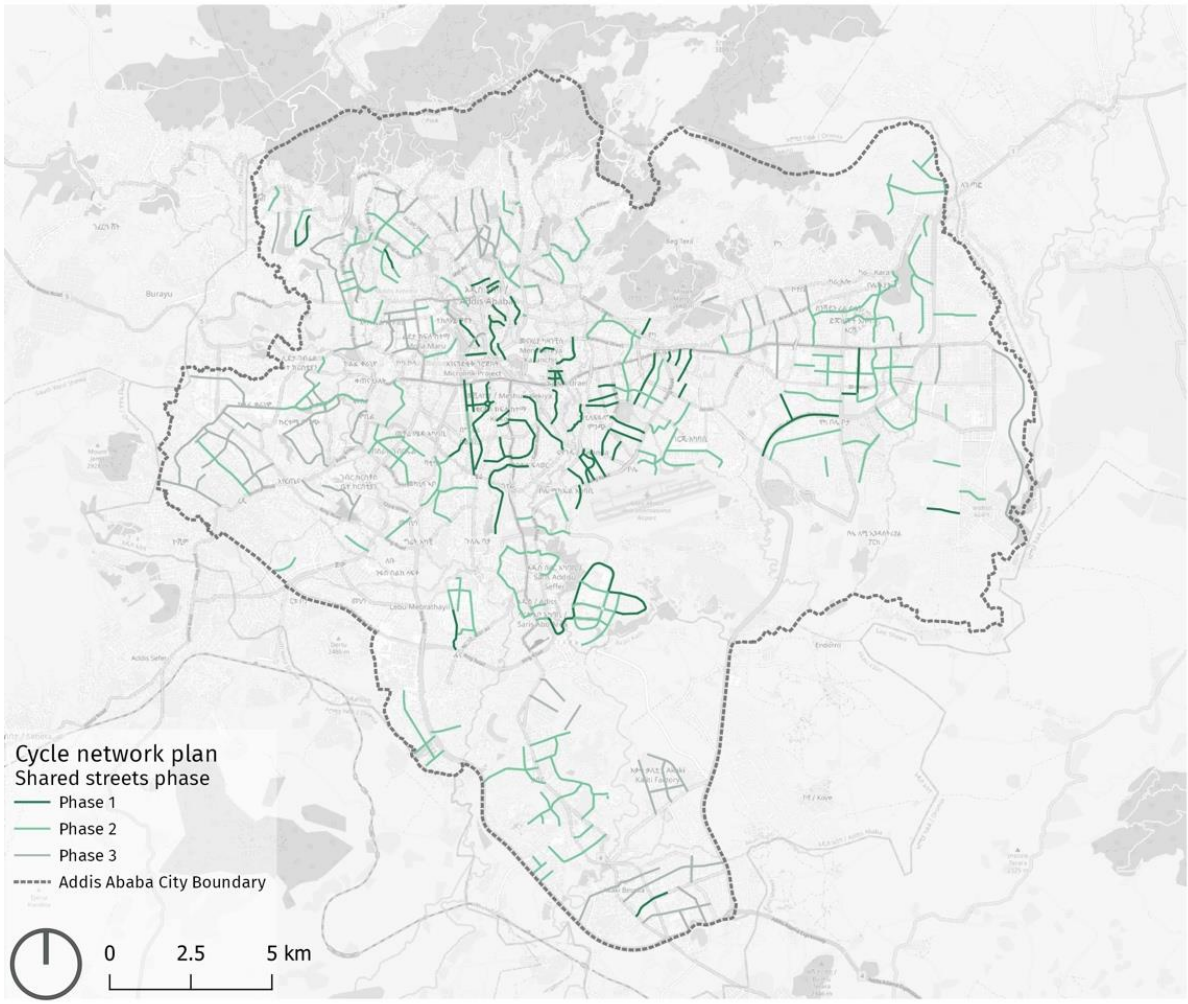

Figure 53. Bicycle network: shared streets.

Table 9. Bicycle network: shared streets.

Phase	*ROW*	*Street type*	*Length (km)*
1	7	Special street	1.1
	15	CS	10.3
	15	SAS	1.6
	20	CS	29.4
	20	SAS	3.5
	25	CS	1.4
	25	PAS	1.0
	25	SAS	0.5
	30	CS	2.7
	30	SAS	6.2
2	7	Special street	2.9
	15	CS	30.3
	15	SAS	0.8
	20	CS	77.3
	20	PAS	1.2
	20	Ring Road	1.0
	20	SAS	14.3
	25	CS	7.4
	25	PAS	0.9
	25	SAS	0.3
	30	CS	5.5
	30	SAS	1.6
	40	CS	0.2
3	15	CS	8.0
	20	CS	62.0
	20	SAS	12.3
	25	CS	0.5
	25	SAS	1.5
	30	CS	0.9
	30	SAS	1.2
Total			288.0

4.2.5 SUMMARY: PHASES 1-3

At the end of phase 3, Addis Ababa will have a cycle network comprising 677 km of dedicated cycle facilities and 288 km of traffic calmed shared streets.

Table 10. Bicycle network: summary.

Phase	*Length (km)*
Existing	7.0
Ongoing projects	18.2
Phase 1	144.0
Phase 2	187.8
Phase 3	319.9
Total	676.8

4.3 LEVEL OF STRESS FOR THE FINAL CYCLE NETWORK

The level of traffic stress was calculated for the planned cycle network to assess the impacts of the planned interventions. For the proposed infrastructure, the following considerations are made to calculate the stress level:

- Prevailing speeds are assumed to be 15 km/h for the special streets and shared streets, 30 km/h for streets with separate footpaths for pedestrians, 40 km/h for most other corridors, while the existing speed limit of 50 km/h is retained for ring roads.
- Cycle facilities are assumed to be present for the corridors that are included in the proposed cycle network.
- Together with the cycle corridors to be constructed, medians are assumed to be present on major streets with four or more carriageway lanes.
- To calculate the numbers of carriageway lanes, for bidirectional cycle tracks, 1 carriageway lane is deducted and for unidirectional cycle tracks, 2 carriageway lanes are deducted.

Based on these assumptions, the level of stress decreases substantially, with 80 percent of the streets having stress levels of LTS 1 and 2. Of the remaining streets, 19 percent have LTS 3, and less than 1 percent, LTS 4. In specific cases, a higher stress level may be accepted if a parallel low-stress corridor is available. For example, a cycle track on the Sheger Riverside Development Project along the Bantyketu river can serve as a safe alternative to parallel road corridors.

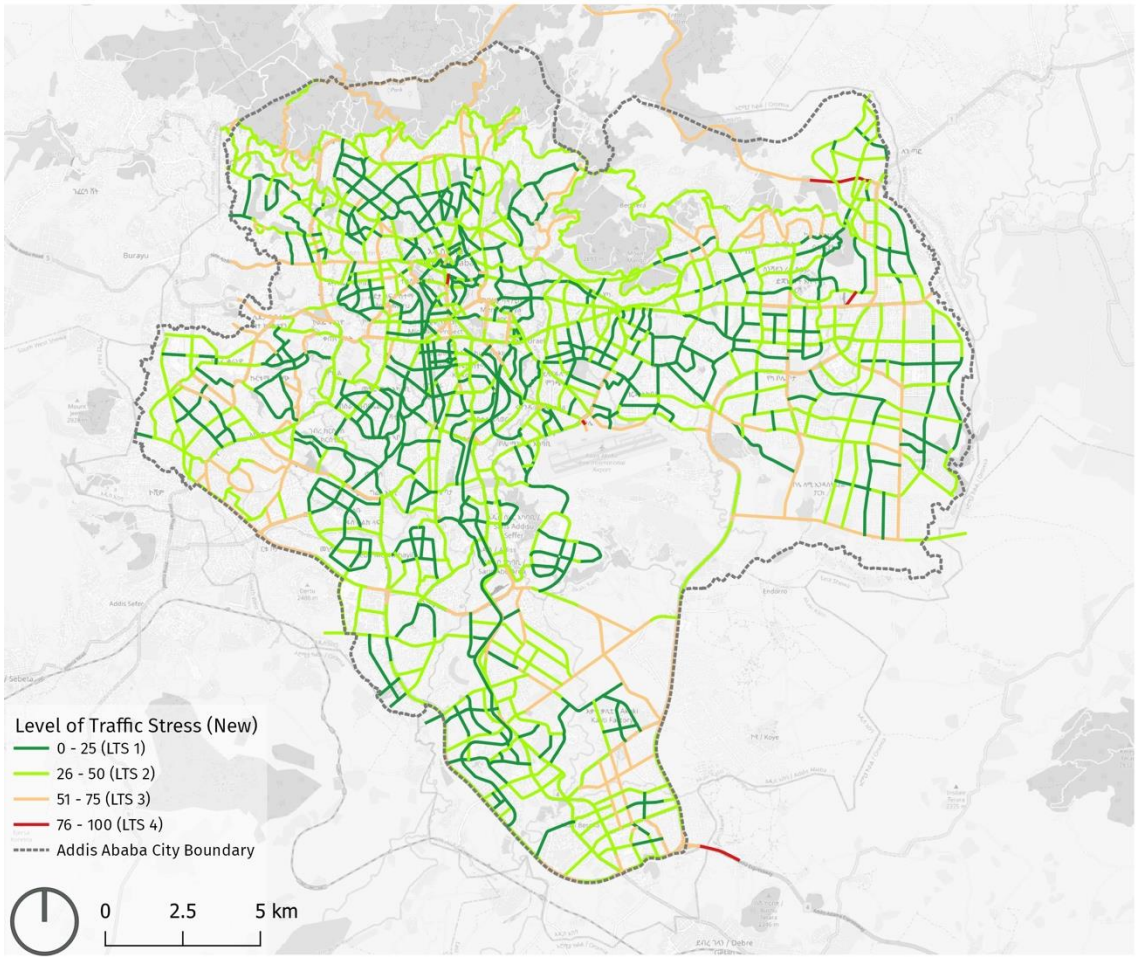

Figure 54. Level of Traffic Stress for cyclists after implementation of the cycle network.

4.4 COMPLEMENTARY ACTIVITIES

Complementing this approach, bicycle programmes have the potential to raise awareness and increase cycle ridership. The city can promote cycling education by expanding learn-to-ride programmes at community centres or other locations, in partnership with civil society groups and schools. It is crucial to find strategies to encourage more women to cycle. Women-only classes or family classes can help bridge gender gaps and create an inclusive cycling environment. Cycle training grounds and cycling instructor workshops can be established at schools to strengthen cycle culture, as recently promoted in the locations of Tibeb Ediget Primary School, Addis Ababa International Stadium, Menelik II Elementary School, and Sarbet.

Supporting policy measures include forming a multi-stakeholder cycling advisory committee or working group. Building control regulations should include minimum cycle parking levels. Complementary facilities include cycling facilities, such as bicycle parking, lockers, showers, and changing areas. Lower taxes on imports of cycles and other products could incentivise cycling.

Financial incentives for commuters and employer benefit schemes to subsidise cycle purchases can serve as a further boost to cycling. Delivering a cycling subsidy strategy requires the appropriate funds and adequate human resources. The City Administration can team up with local employers who can contribute funds and enjoy benefits such as better employee productivity and lower parking costs.

4.5 COST ESTIMATES

The implementation of a safe, connected cycle network in Addis Ababa is expected to cost approximately ETB 10.0 million (USD 242,000) per km of the network, adding up to ETB 6.5 billion (USD 118 million) for phases 1-3 (651.6 km). The table below shows recent construction rates considering different cycle track layouts from two previous projects in Ethiopia. These estimates assume that most cycle facilities on existing corridors will be built as protected bike lanes within the carriageway, making use of existing pavement. On new corridors, cycle facilities should be built as raised cycle tracks.

Table 11. References for cycle facility construction costs.

Location	Cost (ETB/km)	Cycle facility description
Addis Ababa (Jemo-Lebu corridor)	3,720,600	Tactical one-side bidirectional protected bike lane
Bahir Dar (Arba Meter Road corridor)	10,005,000	Permanent, two-side unidirectional protected bike lanes

Table 12. Cycle network implementation costs.

Phase	*Length (km)*	*Cost (ETB)*
1	144.0	1,440,000,000
2	187.8	1,880,000,000
3	319.9	3,200,000,000
Total	651.6	6,520,000,000

4.6 IMPLEMENTING AGENCY RESPONSIBILITIES

The major stakeholders who are responsible for implementing the cycle network are as follows.

Table 13. Stakeholder roles in implementation.

Implementing agency	*Responsibility*
Addis Ababa Transport Bureau	Responsible for developing and overseeing the implementation of this study and providing support for all other stakeholders to successfully implement the study. It will also administer the built cycle infrastructures. The Bureau will seek approval of the prepared cycle network and incorporate the cycle network on other related studies. In addition, the Bureau will be responsible for hiring and managing the bikeshare operator, ensuring cycle tracks are well integrated with the mass transport routes, and providing bicycle racks in places were deemed necessary.
Addis Ababa City Roads Authority	The Authority is responsible for detailed design and construction of high-quality cycle facilities that prioritise pedestrians and cyclists.
Addis Ababa Traffic Management Agency	Responsible for developing high quality cycle tracks on existing roads, managing the traffic enforcement on the constructed cycling infrastructures. The Agency will also organise open street events together with AATB.
Addis Ababa City Plan and Development Commission	Responsible for giving approval of the cycle network plan.

5. APPENDIX

5.1 SECONDARY DATA

The data collected during the existing baseline assessment are listed below.

Table 14. Data sources.

Data type	*Source*
Street alignment and ROW	AACRA
Streets under tender, design, and construction	AACRA, TMA
Land use map	AACMP
Public transport routes and stations	AATB
Crash black spot locations	AATB, BIGRS
User preference questionnaire	ITDP
Video traffic counts	AATB
Greenway corridors	AATB, Riverside and Green Development Office
Speed limits	AATB
Topography	ITDP

5.2 QUESTIONNAIRE SURVEY

- Do you consent to participate in the survey?
- How long did it take to walk to the point where you boarded the first vehicle? [Min]
- Origin of the trip
- Destination of the trip
- Mode used for the trip
- Fare for the segment [ETB]
- How long will it take to walk to your final destination? [Min]
- What is your final destination?
- Purpose of the trip
- Do you know how to cycle? (Yes/No)
- Do you own a cycle? (Yes/No)
- Does your household own a car? (Yes/No)
- How often do you cycle?
- How would you rate road safety (for cycling) in Addis Ababa?
- How would you rate the safety while cycling in Addis Ababa?

- Have you met with an accident while cycling?
- (For women) How often do you experience sexual harassment in Addis Ababa?
- If never, would you face any sexual harassment while cycling in Addis Ababa?
- What would make it easier to cycle in Addis Ababa?
- Where do you stay in Addis Ababa? (Area name)
- Age
- Gender
- Any other comments

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7. ACRONYMS

AACRA	Addis Ababa City Road Authority
AATB	Addis Ababa Transport Bureau
ADT	Average daily traffic
BRT	Bus rapid transit
CRGE	Climate Resilient Green Economy
CS	Collector Street
GBV	Gender-based violence
LDP	Local Development Plan
LRT	Light rail transit
LS	Local Street
LTS	Level of Traffic Stress
MRT	Metro rapid Transit
NACTO	National Association of City Transportation Officials
NMT	Non-motorised transport
PAS	Principal Arterial Street
PWD	Person with disabilities
ROW	Right-of-way
RR	Ring Road
SAS	Sub-Arterial Street
SH	Sexual harassment
TA	Addis Ababa Transport Authority
TMA	Addis Ababa Traffic Management Agency

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