

# ADDIS ABABA NON-MOTORISED TRANSPORT STRATEGY 2019-2028



**ADDIS ABABA CITY ADMINISTRATION**



**NOVEMBER 2018**



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# FOREWORD

It is our great pleasure to launch the Addis Ababa Non-Motorised Transport (NMT) Strategy. The city of Addis Ababa is growing rapidly and requires an urban environment that is safe, comfortable, and inclusive. For too long, transport planning has focused on the needs of private car users without considering the majority of Addis Ababa residents who walk, cycle, or use public transport. This approach has exacerbated problems of congestion and road safety, both of which affect economic growth, productivity, and public health.



Moving forward, the Addis Ababa City Administration commits to investing in sustainable transport systems that help tackle climate change, facilitate trade, and improve access to education, health, and jobs. Drawing from the Transport Policy of Addis Ababa and Ethiopia's Climate Resilient Transport Sector Strategy, the NMT Strategy outlines a holistic set of measures to expand the use of non-motorised modes. Over the next ten years, we will develop a citywide walking and cycling network that makes sustainable modes safe, convenient, and easy to use. Better street designs will be complemented by innovative mobility services such as bicycle sharing to give more residents access to clean, healthy mobility. Greater investment in non-motorised transport will bring a number of benefits, particularly for low-income residents.

Transformation of our city will only be possible through close collaboration among government departments, civil society, the private sector, and city residents. We call on all stakeholders to redouble their efforts to develop an efficient, green mobility system that serves all residents of Addis Ababa.

Dr Solomon Kidane Zegeye  
Deputy Mayor of Addis Ababa

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# 1. INTRODUCTION

Addis Ababa, home to 17 percent of Ethiopia’s urban population, is at a pivotal moment in its modern history.<sup>1</sup> The city is undergoing a wave of rapid population and economic growth. 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. As the city continues to modernise and motorise, major investments and strategic decisions will be required to keep the economy humming and avoid the negative impacts generated by private motorised mobility and traffic congestion.

At present, most residents depend on walking and public transport, and there are relatively few personal motor vehicles in the city. Nevertheless, pedestrians face many challenges, including inadequately sized footpaths, dangerous crossings, inadequate illumination, and poorly maintained infrastructure. Going forward, the city seeks to prioritise non-motorised transport (NMT), including walking, cycling, and other forms of non-motorised mobility. Greater use of NMT is likely to bring several benefits, including better access to jobs and educational opportunities; improved public health due to active lifestyles; reduced emissions of dangerous pollutants; and a

<sup>1</sup> UN-Habitat. (2017). The State of Addis Ababa 2017: The Addis Ababa We Want. Retrieved from <https://unhabitat.org/books/the-state-of-addis-ababa-2017-the-addis-ababa-we-want/>



Figure 1. The Addis Ababa NMT Strategy aims to develop a comprehensive network of high-quality walking and cycling facilities to address the burgeoning demand for better access in the city.

reduced burden of injuries and fatalities from traffic crashes.

Better walking and cycling facilities also will complement the city's mass rapid transit network, including two existing light rail transit (LRT) corridors and fifteen planned bus rapid transit (BRT) corridors. To guide efforts to improve the walking and cycling environment, the Addis Ababa Road and Transport Bureau (AARTB) has developed a comprehensive NMT Strategy.

The NMT Strategy is consistent with the Transport Policy of Addis Ababa, which calls for giving "special attention to non motorised transport" by expanding pedestrian and bicycle networks.<sup>2</sup> The Strategy also reflects the Addis Ababa City Master Plan, which calls for higher quality walking and cycling facilities. The plan also envisions redevelopment, compact settlements, and integrated development of transport and housing. The NMT Strategy is also closely related to the Addis Ababa Road Safety Strategy, which calls for increased attention to pedestrian safety and convenience.<sup>3</sup>

At the national level, Ethiopia's Climate Resilient Transport Sector Strategy calls for "an affordable, integrated, safe, responsive and sustainable transport system that enhances the environmental, economic, social and cultural well-being of Ethiopia's population."<sup>4</sup> The Strategy calls for an increased mode share for walking and cycling in urban areas. In addition, Ethiopia's Nationally Determined Contribution (NDC) under the United Nations Framework Convention on Climate Change (UNFCCC) calls for a reduction pollution from transport as part of an overall strategy to reduce greenhouse gas emissions.<sup>5</sup> The NMT Strategy, once fully implemented, will help lay the foundations for a more accessible, inclusive, sustainable, efficient, healthy, and attractive city.

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2 Ministry of Transport. (2011, August). Transport Policy of Addis Ababa.

3 Addis Ababa City Administration. (2017). Addis Ababa Road Safety Strategy.

4 Ministry of Transport. (2017). Ethiopia's Climate Resilient Transport Sector Strategy.

5 Federal Democratic Republic of Ethiopia. (2015). Intended Nationally Determined Contribution (INDC) of the Federal Democratic Republic of Ethiopia.

## 2. EMERGING MOBILITY CHALLENGES IN ADDIS ABABA

Ethiopia is undergoing a decade of rapid economic development. The urban share of the population increased from 8.5 percent in 1967 to 17.4 percent in 2012, making Ethiopia among the fastest urbanising countries in sub-Saharan Africa.<sup>6</sup> As with many rapidly developing economies, the hope of new opportunities and better quality of life offered by major cities has fuelled rural-urban migration. As of 2017, the city was home to 3.2 million inhabitants, and is projected to reach 4.7 million by 2030.<sup>7</sup> The city contributes to approximately 8 percent of the national gross domestic product (GDP), with an annual GDP growth rate of around 15 percent.<sup>8</sup>

These unprecedented growth rates have resulted in a rapid expansion of the urban area, which in turn has generated many transport, housing, and infrastructure deficits, as well as alarming environmental degradation. Where the formal economy has failed to absorb growth, the informal economy has thrived, creating a complex economic structure. Unplanned expansion has led to rapid sprawl into the city outskirts, consuming 4-5 sq km of new land per year.<sup>9</sup> Since 1986, the urban footprint

- 6 World Bank. (2016). Project appraisal document on a proposed credit in the amount of SDR 2013 million (US\$ 300 million equivalent) to the Federal Democratic Republic of Ethiopia for a transport systems improvement project. Retrieved from <http://documents.worldbank.org/curated/en/490361467992052159/pdf/PAD1293-PAD-P151819-IDA-R2016-0108-1-Box394887B-OOU-9.pdf>
- 7 UN-Habitat. (2017).
- 8 Ibid.
- 9 Ibid.

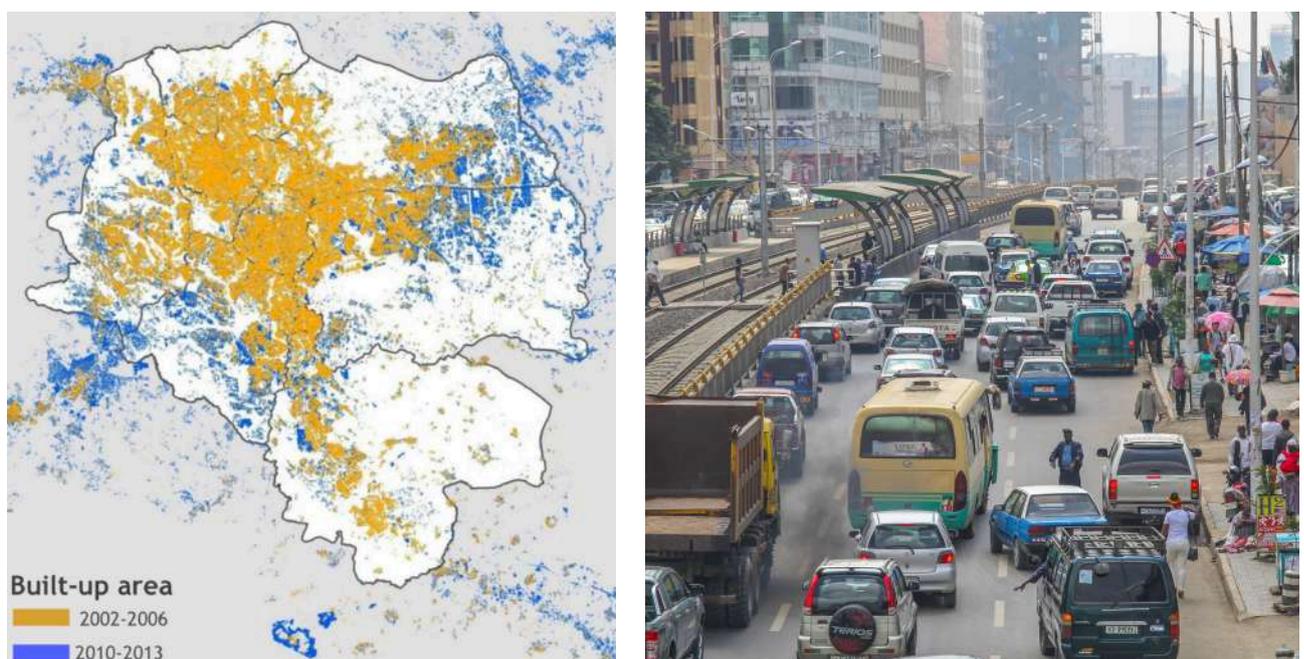


Figure 2. Addis Ababa has experienced rapid outward expansion over the past decade, leading to increased trip distances and reliance on motorised transport.

has quadrupled, resulting in longer distance trips and contributing to other transport challenges.<sup>10</sup>

Walking and public transport are the dominant forms of mobility in Addis Ababa, making up an estimated 85 percent of trips.<sup>11</sup> The fraction of trips made by foot varies widely across the city. For example, in the Addis Ketema sub-city, walking accounts for 78 percent of trips, while in Bole sub-city only 40 percent of trips are by foot.<sup>12</sup> The average length for walking trips is 1.5 km.<sup>13</sup> While not captured in official statistics, cycling is also a mode for short-distance trips, primarily among low-income and risk-taking males. However, cycling is typically perceived as a recreational activity for children, with cycles seen as toys.

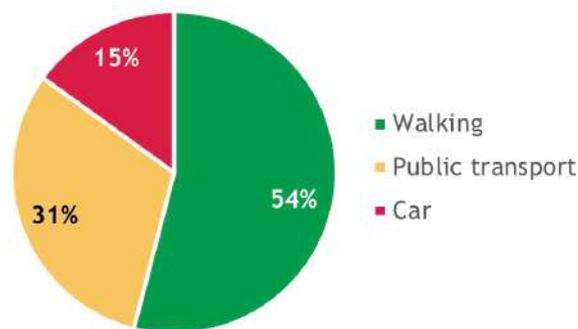


Figure 3. Walking and public transport are the dominant forms of mobility in Addis Ababa.

While the mode share for personal motor vehicles (PMV) is small, accounting for 15 percent, this mode has a disproportionate impact on the city's transport system.<sup>14</sup> Approximately 70 percent of the cars present in the country are registered in Addis Ababa.<sup>15</sup> In spite of high import taxes on cars, the number of vehicles is rapidly increasing, with 110,000 cars imported in 2016, a 50 percent increase over the level of imports during the previous two years.<sup>16</sup> Many of the imported cars are highly-polluting used vehicles. One is quick to observe the negative impacts of an outdated and poorly maintained vehicle fleet. Congestion, localised air-pollution, and noise have become an inescapable part of daily life.

Traffic collisions and fatalities are becoming increasingly common, with 374 fatalities in 2013, increasing to 463 in 2016, of which 80 percent were pedestrians.<sup>17</sup> The high rate of fatalities is due in large part to the fact that just 14 percent of city roads

10 World Bank. (2015). Addis Ababa, Ethiopia: Enhancing Urban Resilience. Retrieved from <http://documents.worldbank.org/curated/en/559781468196153638/pdf/100980-REVISED-WP-PUBLIC-Box394816B-Addis-Ababa-CityStrength-ESpread-S.pdf>

11 World Bank. (2016).

12 Transport Research Laboratory. (2013). Provision for Non-Motorised Transport in Addis Ababa and recommendations for improvements.

13 Ibid.

14 World Bank. (2016).

15 Ministry of Transport. (2011).

16 Import taxes typically increase the vehicle price by 60 to 100 percent, depending on the engine size, year of manufacture, and vehicle price. See Igunza, Emmanuel. (2017, Jan 16). "Why are cars so expensive in Ethiopia?" BBC News. Retrieved from <https://www.bbc.com/news/world-africa-38607986>

17 Addis Ababa City Administration. (2017). Addis Ababa Road Safety Strategy Implementation Plan: Executive Summary.



Figure 4. Despite the dominance of walking in the mode split for Addis Ababa, pedestrian facilities are poor in many parts of the city.

were rated acceptable for pedestrian safety, compounded by the high prevalence of risky driver behaviour, including over-speeding and drunk driving. These trends are exacerbated by a wide range of negative externalities related to physical and mental health, environmental degradation, socio-economic development, and resource use.

Street design in Addis Ababa has taken a car-oriented approach and has prioritised vehicle speed over pedestrian safety. Streets in the city tend to be wide and often lack footpaths, crossings, and traffic calming features. These concerns are particularly acute at intersections. Intersections are where streets and users come together; they are also where the most conflicts and crashes occur. Oversized intersections with large turning radii and long signal cycles contribute to speeding. Lane misalignment causes bottlenecks and unpredictable vehicle movement, while street markings and signage at intersections are inadequate. Good intersection design could dramatically reduce road injuries and fatalities while at the same time improving public transport and vehicle flow and unlocking civic and economic potential. Finally, a lack of dedicated public transport lanes and loading and unloading areas create unsafe conditions for public transport riders and add to congestion.

The trend toward increasing motorisation is especially concerning for children, for whom increasing use of personal motor vehicles consumes safe spaces for play and

travel. There are fewer opportunities for children to engage in physical activity, such as walking or biking to school, because of long travel distances and hazardous streets. In many cases, a child’s personal mobility extends no farther than the edge of a residential neighbourhood or compound. Urgent interventions are needed to address the need for high-quality walking and cycling facilities across Addis Ababa.

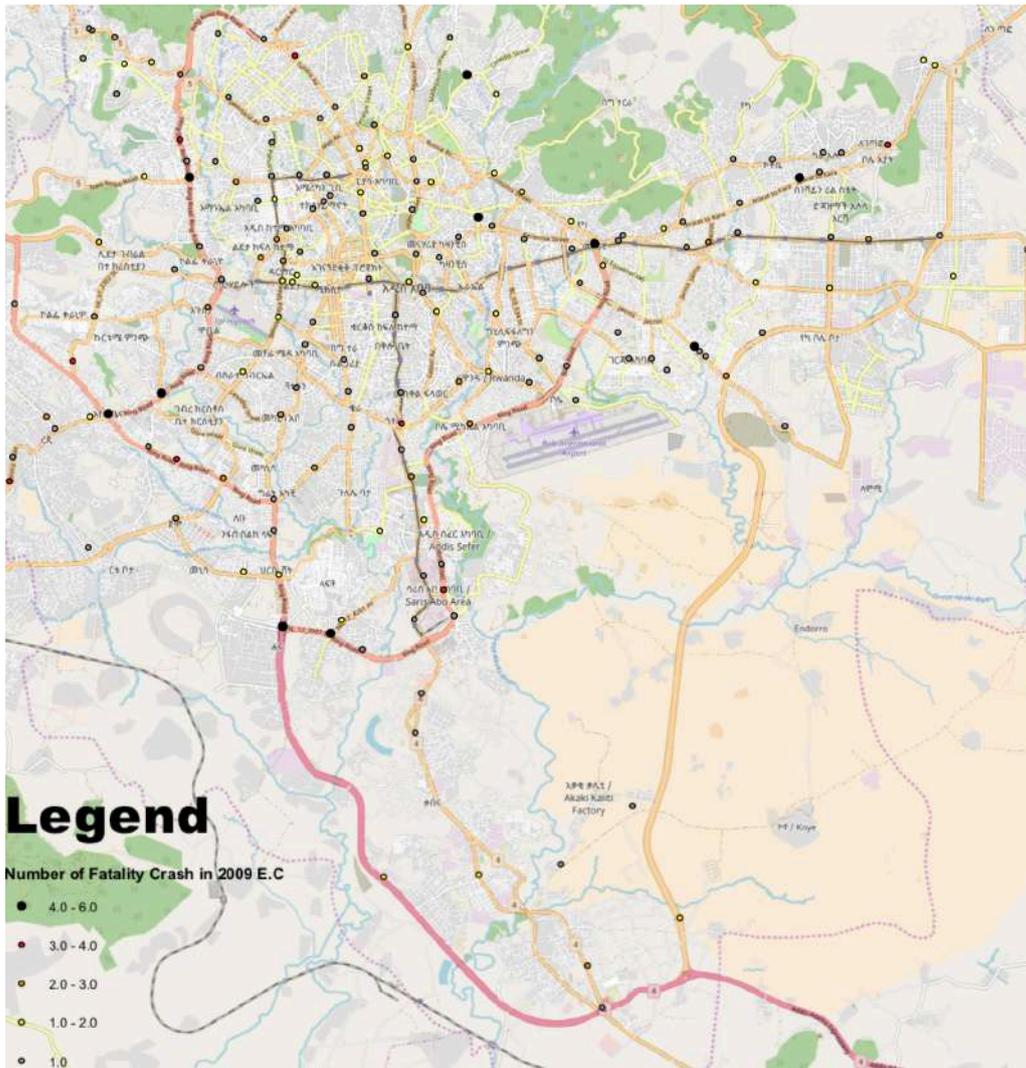


Figure 5. Data on traffic crashes indicate a high number of fatalities, particularly on high-speed corridors such as the ring road.



Figure 6. Transport challenges in Addis Ababa (clockwise from top left): local air pollution; children navigating a wide intersection without refuge islands at Dembel; a street without cycle tracks; a dangerous pedestrian crossing on Bole Rd; and parking encroachments on a footpath in Ayat.

### 3. DESIGN PRINCIPLES FOR WALKING & CYCLING

Making non-motorised modes of transport viable and convenient requires rebalancing street space so that it caters to all modes transport. The physical design of streets and the provision of sidewalks, crossings, and other walking infrastructure is crucial to creating a high-quality walking environment. Accommodating NMT involves two basic techniques:

- **Systematic traffic calming on smaller streets** to reduce motor vehicle speeds and provide safe places for the mixing of pedestrians and other modes (shared lanes); and,
- **Pedestrian and cycle infrastructure that is physically separated from motor vehicle traffic on larger streets**, paired with traffic calming or traffic control to facilitate safe crossings. Pedestrian footpaths should provide clear space for walking, with other elements positioned in a strategic manner. These elements include paving, landscape planting, street lighting, street furniture, public facilities, underground utility access points, and other sidewalk amenities. There are also features that make streets more accessible, including curb ramps, tactile paving, and accessible traffic signs. Similarly, dedicated cycle tracks should be provided, separate from the mixed traffic carriageway. Large streets require signalisation or traffic calming at crossings and intersections to enable pedestrians and cyclists to cross 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 centre allocate 60 percent of the right-of-way (ROW) to footpaths, cycle tracks, and other NMT facilities.

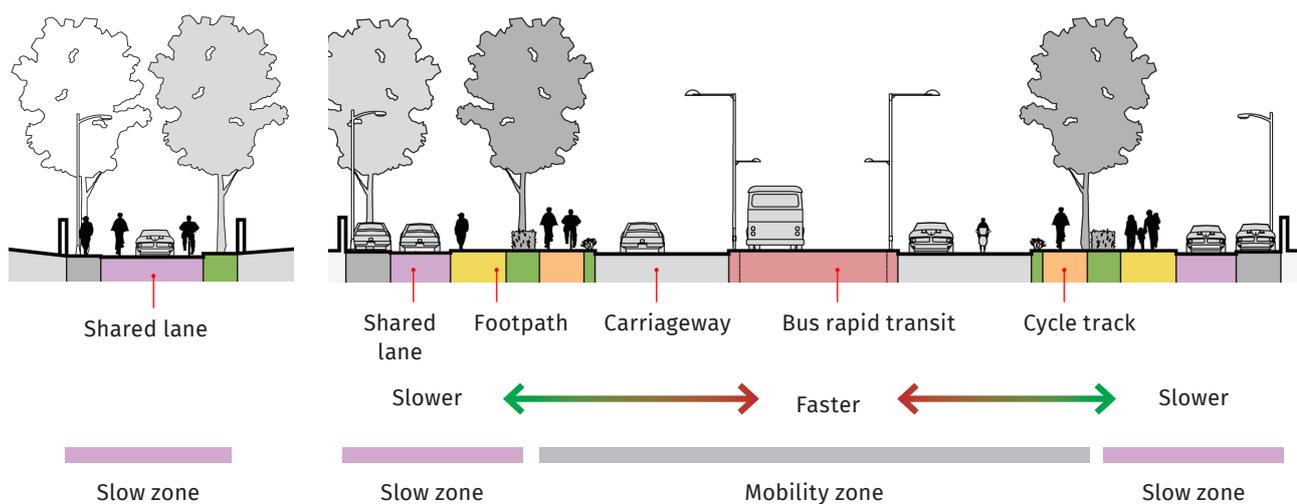


Figure 7. Smaller streets can function as shared spaces where pedestrians walk together with slow-moving vehicles (left). On larger streets with heavy vehicles and faster speeds, separate space for pedestrians and cycles is needed (right).

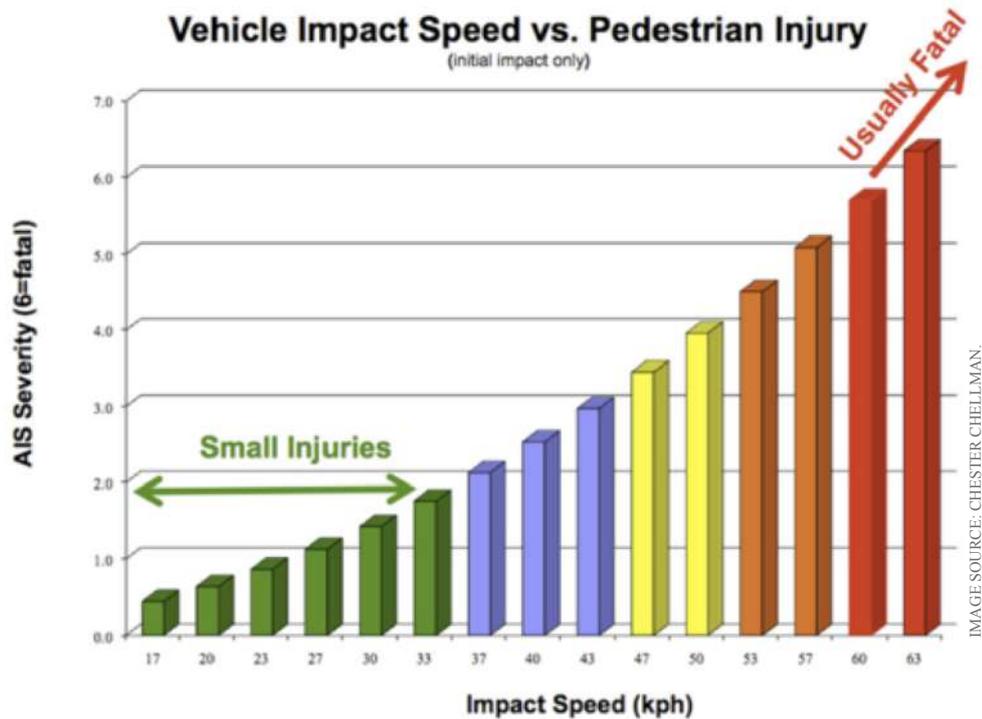


Figure 8. Speed reduction is critical for safe pedestrian environments because the chance of pedestrian death in a collision increases dramatically when vehicle speeds exceed 30 km/h.

Safe street design also aims to encourage moderate vehicle speeds. Street designs that reduce motor vehicle speeds can significantly improve pedestrian safety since the likelihood of pedestrian death in a traffic collision increases dramatically when motor vehicle speeds rise above 30 km/h. A pedestrian has a 90 per cent chance of surviving being hit by a car travelling less than 30 km/h, but only a 50 per cent chance of surviving impacts at 45 km/h.<sup>18</sup>

A high-quality NMT environment recognises city streets not just as spaces for the movement of vehicles but also as inter-connected spaces where people walk, talk, cycle, shop and perform the multitude of functions that are critical to the health of cities. Streets are the most valuable assets in any city and maximising their potential requires a “complete” approach to street planning and design. This can be achieved by applying a set of well-defined principles and standards that target street design, building design, and network design.

<sup>18</sup> WHO (2013). Pedestrian Safety: A Road Safety Manual for Decision-Makers and Practitioners.

## 4. VISION & GOALS

Addis Ababa has adopted the following vision for NMT in the city:

Addis Ababa will provide safe, efficient, and accessible pedestrian and cycling networks to improve access to opportunities and mobility for all residents, foster equitable allocation of street space, and create a dignified walking and cycling environment.

Investment in high-quality NMT facilities is expected to yield numerous benefits, including improved convenience for pedestrians; a reduction in fatalities and injuries from traffic collisions; improved economic vitality; cost savings for the government; improved public health; greater social cohesion; enhanced security in the public realm; foreign exchange savings due to reduced fuel use; and reduced emissions of local air pollution and greenhouse gases.

The following table summarises the key goals that AARTB aims to achieve over the next ten years. Central to achieving these outcomes is a holistic approach to NMT promotion, incorporating a variety of interventions ranging from infrastructure improvements to more effective street management. Besides the NMT initiatives outlined in this Strategy, improved public transport services will form the backbone of the sustainable transport system and are critical to meeting the targets listed below.

**Table 1. Ten-year goals for an improved NMT environment**

| Goal   | Contributing actions  | Targets for 2028  |
|--|---|---|
| Improved road safety   | <ul style="list-style-type: none"> <li>• Safe crossings, redesigned intersections, and dedicated facilities for NMT</li> </ul>  | <ul style="list-style-type: none"> <li>• Fatalities of pedestrians and cyclists are reduced 80 percent below 2018 levels</li> </ul>   |
| Increased mode share of walking, cycling, and public transport | <ul style="list-style-type: none"> <li>• Investments in high-quality walking and cycling facilities</li> <li>• Improved last-mile connectivity to public transport</li> </ul> | <ul style="list-style-type: none"> <li>• Mode share of NMT remains at or above 60% of trips</li> <li>• Public transport constitutes 80% of motorised trips</li> <li>• Women constitute 50% of cyclists</li> </ul> |
| Reduction in the use of personal motor vehicles (PMV)          | <ul style="list-style-type: none"> <li>• Measures to manage vehicle use</li> <li>• Improved attractiveness of sustainable modes</li> </ul>                                    | <ul style="list-style-type: none"> <li>• Vehicle kilometres travelled (VKT) by PMVs are no more than 2018 levels</li> </ul>   |
| Improved air quality   | <ul style="list-style-type: none"> <li>• Investments in high-quality walking and cycling facilities</li> <li>• Measures to manage vehicle use</li> </ul>                      | <ul style="list-style-type: none"> <li>• WHO ambient air quality norms are met 350 days a year</li> <li>• Greenhouse gas emissions follow the targets set in Ethiopia's NDC</li> </ul>                            |

# 5. NMT INITIATIVES

## 5.1. PEDESTRIAN NETWORK

All major streets in Addis Ababa require high-quality footpaths. Well-planned footpaths provide continuous space for walking. They also support other activities such as street vending and waiting at bus stops without compromising pedestrian mobility. The success of a footpath depends on the integration of multiple elements in a coherent design. Footpaths need to be unobstructed, continuous, shaded, and well lit. Footpaths should consist of three zones:

- The **frontage zone** provides a buffer between street-side activities and the pedestrian zone.
- The **pedestrian zone** provides continuous space for walking. The pedestrian zone should be clear of any obstructions, level differences, or other obstacles to pedestrian movement and should have a clear width of at least 2 m. Larger widths are required in areas with high pedestrian volumes.
- The **furniture zone** offers space for trees, furniture, lights, bus stops, signs, benches, public toilets, and private property access ramps.

In addition, footpaths should have a moderate height above the carriageway level and should have a smooth surface. Footpaths and crossings should be designed without abrupt level differences, especially at property entrances and intersections, to ensure that the pedestrian environment is accessible to persons with disabilities. For

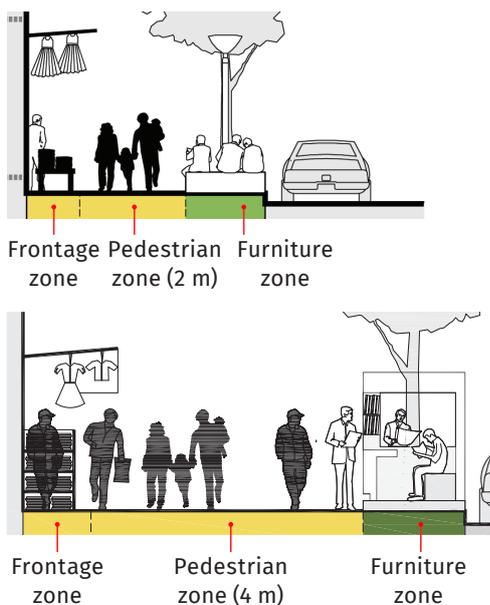


Figure 9. Well-design footpaths have three main zones: the frontage zone, pedestrian zone, and the furniture zone. The width of the pedestrian zone is context-specific and should be at least 2 m.

persons with visual impairments, tactile paving can be installed to indicate locations where vehicles and pedestrians interact.

Crossings and junctions are also essential components of a well-connected street network. When properly designed, crossings and junctions allow pedestrians, cyclists, and other NMT users to cross busy streets safely and conveniently. At points where pedestrians need to cross multiple lanes of traffic, it is important to reduce vehicle speeds to safe levels (e.g., below 15 km/h) or incorporate signals to stop traffic. Refuge islands should be provided whenever pedestrians need to cross more than two traffic lanes at a time. Crossings also require proper signage and road markings.

In many parts of Addis Ababa, barriers have been erected to prevent pedestrians and cyclists from crossing at grade. NMT users are thereby forced to use footbridges. Such facilities are poorly lit, often devoid of users, and potentially unsafe with regard to sexual assault and theft. Footbridges and subways are inconvenient to use and increase barriers to persons with disabilities, people carrying luggage, and parents with strollers. Ramps may be installed to accommodate wheelchairs and bicyclists, but long crossing distances and steep slopes still discourage use. Thus, footbridges should be provided only on high-speed expressways where no access for pedestrians and cyclists is permitted. In other cases, street designs should incorporate safe at-grade crossings that are accessible to all.

Many recently constructed streets in Addis Ababa have basic footpaths, often with generous widths of up to 5 m. However, these streets lack other essential elements of a high-quality walking environment, including safe intersections, mid-block cross-

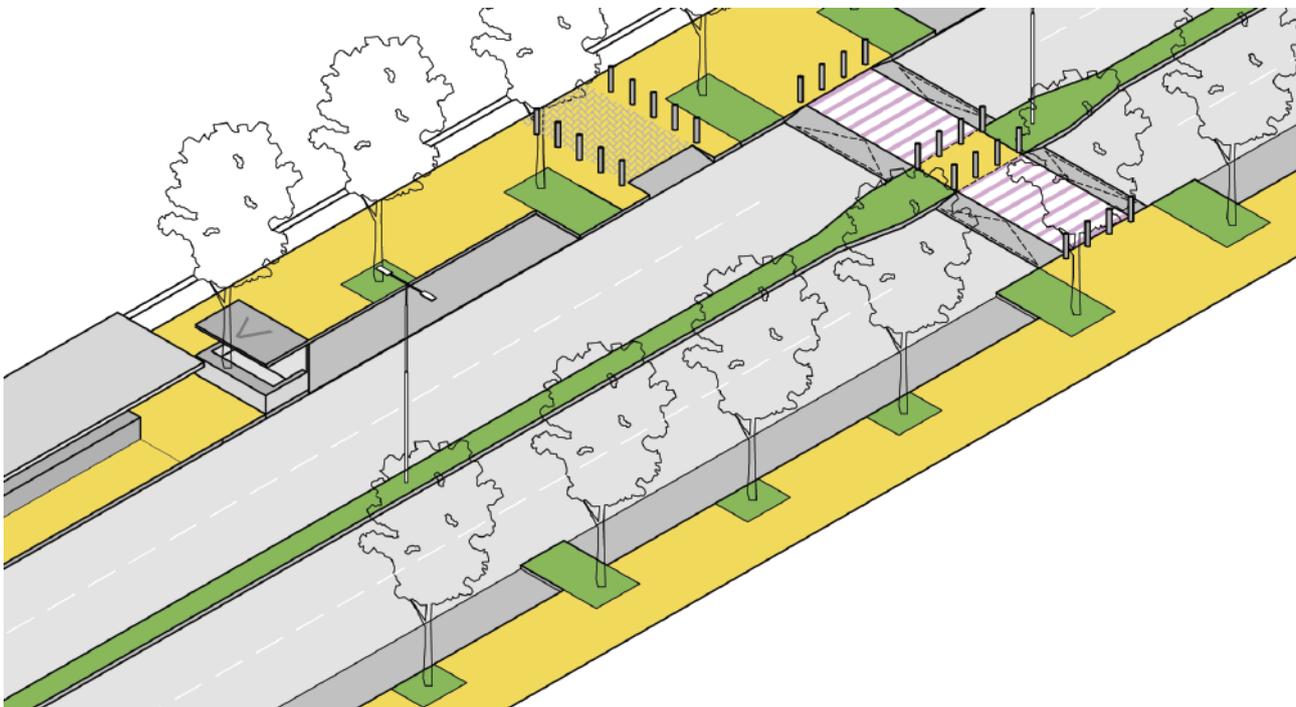


Figure 10. Tabletop crossings that are raised to the level of the footpath reduce vehicle speeds and offer universal access for pedestrians. Bulb-outs into the parking lane reduce the crossing distance.

ings, universal access features, and continuous tree cover. In addition, haphazard arrangement of light poles, utility elements, and vending compromises footpath usability. Street lighting is typically poor, contributing to poor personal security.

Under this initiative, AARTB will develop a continuous and complete pedestrian environment on all streets with high speed differentials and safety risks—typically those with a ROW of 20 m and above. Some narrower streets with high traffic and pedestrian volumes also require dedicated footpaths. On streets without dedicated footpaths, shared space designs with traffic calming are needed to allow pedestrians and vehicles to mix. Implementation phasing will prioritise streets with large volumes of pedestrians and streets in school zones with large numbers of children present. Wide footpaths and safe crossings will be developed on all planned BRT corridors, and existing footpaths on LRT corridors will be improved.

### 10-YEAR TARGETS

- ▶ 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.



Figure 11. Implementation of footpaths and pedestrian crossings will prioritise streets with a ROW of 20 m or above, beginning in locations with high pedestrian volumes, school zones, and rapid transit lines.

## 5.2. PEDESTRIAN PRIORITY PRECINCTS

In areas where the demand for pedestrian activity is the greatest, AARTB can develop pedestrian priority precincts with improved footpaths, pedestrian crossings, and public space. These zones should use bollards and other barriers to physically prevent vehicles from encroaching on NMT space. Pedestrian priority precincts must ensure compliance with disability access guidelines and provide adequate cycle parking. High-priority locations for pedestrian precincts include the following:

- **Piazza**, the old economic heart of Addis Ababa, continues to thrive today. Piazza’s architecture and urban form are a legacy of Italian influence. Street designs have failed to evolve and adapt to the ever-increasing number of pedestrians and vehicles. Piazza is a centre of activity with many restaurants, bars, shops, and small industries. A network of pedestrian-only, shared, and public transport streets can enhance the walking environment. Physical improvements should be complemented with access policies for freight loading.
- **Megenagna**, located east of the city centre, serves as one of Addis Ababa’s biggest intra- and intercity public transport terminals. The area generates exceptionally high pedestrian volumes yet has poor walking facilities. Footpaths should be widened and resurfaced. Large intersection spaces are in urgent need of improved crossings and refuge islands. Parking areas can be re-purposed as pedestrian spaces.
- **Merkato**: Popularly known as the biggest open-air market in Africa, Merkato is a bustling



Figure 12. Better walking facilities can help accommodate the large numbers of pedestrians in busy commercial districts like Piazza.



Figure 13. Wider footpaths and organised vending areas are urgently needed to improve the quality of the walking environment in the Merkato area.

commercial district. The area enjoys connectivity to the existing LRT, the planned B2 BRT corridor, and numerous bus and public taxi stops. The pedestrian environment can be enhanced through improved drainage, wider footpaths, the pedestrianisation of some streets, and proper public transport stops.

- **Churchill South** is a financial and office district characterised by car-oriented streets and a lack of accessible footpaths and safe crossings. Obstructions are frequent, in the form of displaced street paving and poorly located tree pits. The Bloomberg Initiative for Global Road Safety (BIGRS) with support from the Ethiopian Institute of Architecture, Building Construction, and City Development (EiABC) has prepared designs for Churchill Avenue and Urael-Sarbet Street. The vision is for a more people-oriented street network, offering improved walkability, great public spaces, and universal access.

#### 10-YEAR TARGET

- Pedestrian zones, public spaces, and comprehensive street improvements implemented in Piazza, Megenagna, Merkato, and Churchill South.

## 5.3. BICYCLE NETWORK

Cycling is a sustainable non-motorised mode of transport. Cycles offer low-cost, pollution-free mobility and occupy just one tenth of a car space. Cycling in a segregated track is often faster than using a private motor vehicle, particularly for short- to medium-distance trips.

Currently, cyclists witness inconvenience and safety hazards from faster moving traffic. Especially on wider streets, dedicated cycle tracks are needed to create a safe and convenient cycling environment that can attract new users. Cycle tracks can accommodate persons with disabilities who use non-motorised tricycles, non-motorised freight vehicles, and emerging modes such as electric scooters.

Cycle tracks require physical separation from the carriageway—painted lanes and “sharrows” are not sufficient to provide a safe cycling environment. Cycle tracks should have sufficient clear width for cycle movement, a smooth surface material (concrete or asphalt, but not paver blocks), shade from trees, an elevation above the carriageway, smooth transitions where level differences are present, and a buffer between the track and carriageway. Wider cycle tracks are needed to accommodate two-way

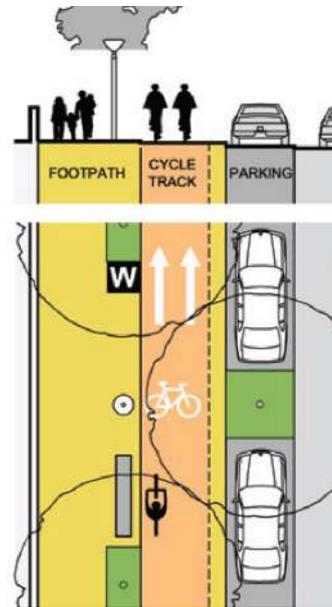


Figure 14. Cycle tracks should be physically separated from traffic lanes and elevated above the carriageway.



Figure 15. Dedicated cycle tracks can improve safety and encourage new users to take up cycling.

movement. Cycle tracks should incorporate proper signage and road markings.

On smaller streets, separate cycle tracks may not be needed. Instead, traffic calming in the form of speed bumps, chicanes, and other elements can help to reduce motor vehicle speeds, making it easier for cyclists and vehicles to travel together.

The planned network of cycle tracks will cover key urban corridors, including arterial roads (generally with a ROW of 30 m and above, with two or more lanes of mixed traffic per direction). These corridors are easily accessible from surrounding residential areas and help connect high density residential areas to commercial districts. The network also will to facilitate first- and last-mile trips to LRT, BRT, and public transport terminals. Implementation phasing will prioritise streets near rapid transit corridors; streets with high cycle volumes, particularly those within the coverage area of the bicycle sharing system; and streets with flat topography.

#### 10-YEAR TARGET

- ▶ 200 km of cycle tracks constructed.



Figure 16. Cycle tracks are needed along streets with heavy vehicle traffic. Implementation will prioritise streets with large cycle volumes, streets near bicycle sharing stations, and streets along rapid transit corridors.

## 5.4. GREENWAY NETWORK

To supplement walking and cycling improvements on city streets, open spaces in the city can be developed as NMT corridors that support commuting as well as recreational uses. The term “greenway” is used to describe walkways and cycle paths that utilise an independent ROW, such as in a park or water body. In this way, greenways can provide safe, convenient connectivity to important destinations, such as schools, colleges, and markets.

The presence of several rivers across Addis Ababa presents the opportunity to build a network of high-quality greenways that improve mobility for all NMT users while creating vibrant public spaces. Waterways can be cleaned through interception sewers and the removal of encroachments. Greenways should incorporate universally accessible walkways and dedicated cycle tracks, both of which should offer ample width for two-way movement and should be integrated into NMT networks along adjacent streets.

### 10-YEAR TARGET

- ▶ 20 km greenway network implemented.



Figure 17. Greenways can offer pedestrian and cycling paths along clean waterways.

## 5.5. PUBLIC TRANSPORT ACCESS

Well-designed crossings allow pedestrians to cross busy streets safely and conveniently. For LRT and BRT lines in Addis Ababa to function well, people must have safe access to stations. At-grade crossings are the preferred mode of access for rapid transit stations. Pedestrian crossings at rapid transit stations must meet the following standards:

- A raised crosswalk should be provided, elevated to the level of the adjacent footpath with a speed table for motor vehicles. The slope for vehicles should be at least 1:15. Since tabletop crossings may alter the flow of storm water, they should incorporate measures to maintain effective drainage.
- At unsignalised crossings, pedestrians should not have to cross more than two lanes of traffic before reaching a pedestrian refuge. On streets with more traffic lanes, signalised crosswalks should be provided.
- Speed bumps in mixed traffic lanes in advance of pedestrian crossings can help reduce motor vehicle speeds further.

Another important element of public transport access is the placement of bus shelters in the streetscape. Recently installed bus shelters sometimes reduce the clear width available on footpaths, forcing pedestrians to walk in the carriageway. In addition, many shelters have been installed at a different level from the surrounding pave-



Figure 18. Safe at-grade pedestrian crossings, such as this speed table crossing in Dar es Salaam, provide easy, convenient access to rapid transit stations.

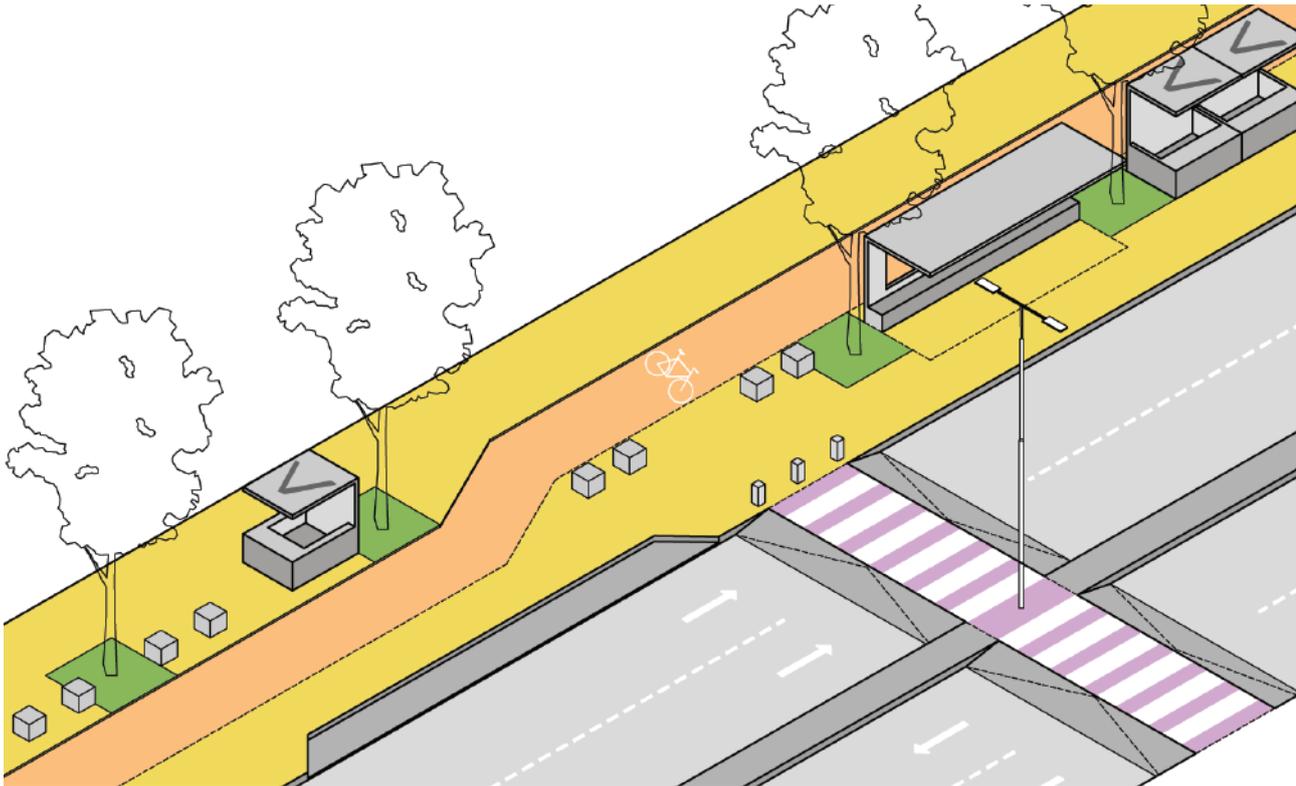


Figure 19. The placement of bus shelters should ensure sufficient clear space behind the shelter for pedestrians and cyclists. Bus stops should be sized per local public transport demand.

ment, making it difficult for persons with disabilities to benefit from the shelters. Well-designed bus stops offer a comfortable, weather-protected, universally accessible waiting area for public transport passengers while leaving ample clear space for pedestrian and bicycle movement behind the shelter.

The provision of bicycle parking at rapid transit stations and bus terminals can further improve last-mile access. At major terminals, parking can be provided within the paid area to improve security.

#### 10-YEAR TARGETS

- ▶ Safe, at-grade pedestrian crossings with traffic calming or signalisation 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.

## 5.6. INTERSECTION IMPROVEMENTS

In 2017, Addis Ababa launched the Safe Intersections Program (SIP), an initiative developed to help reach targets identified in the Addis Ababa Road Safety Strategy and Action Plan by redesigning the city's intersections to protect pedestrians and encourage safe driving. The SIP is using the following design strategies:

- **Tightening corner radii.** Narrowing corner radii reduces vehicle turning speeds as well as pedestrian crossing distances. Minimising the size of a corner radius is critical to creating safe and compact intersections.
- **Adding medians and refuge islands.** Raised centre medians and pedestrian refuge islands can be used to reduce lane width for vehicles, even on relatively narrow streets. They can also be used to organize traffic at intersections or to block access at strategic points.
- **Creating direct pedestrian crossings.** Pedestrian crossings should be aligned as closely as possible with the pedestrian clear path. Inconvenient deviations create an unfriendly pedestrian environment.
- **Narrowing and aligning travel lanes.** Compact intersections encourage predictable vehicle movements and increase visibility for all users. Narrowing travel lanes helps to slow vehicle traffic, while aligning lanes coming in and out of an intersection can help encourage efficient movement of traffic.



Figure 20. Pilot retrofits at Le Gare have demonstrated how reduced turning radii and crossing distances can improve pedestrian safety.

- **Reclaiming underutilised space.** Following the above recommendations enables the reclamation of underutilised space, which can then be re-purposed to create public spaces, provide designated locations for vendors, or add safe public transport stops.

These strategies are being tested on a variety of intersections. Temporary interventions have helped to evaluate changes in street geometry, introducing planners and end users alike to new street designs. The interventions already have proven to be effective at slowing vehicle movement, providing safe spaces for pedestrians, and improving public perception of the city's streets. Lessons from the temporary interventions should be incorporated into design approaches for designing, building, and retrofitting intersections across Addis Ababa.

#### 10-YEAR TARGET

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



IMAGE SOURCE: GLOBAL DESIGNING CITIES INITIATIVE

Figure 21. An intersection retrofit near Anbessa Zoo.

## 5.7. BICYCLE SHARING SYSTEM

Bicycle sharing will improve last-mile connectivity to public transport and serve short trips in central Addis Ababa through a safe, healthy, and environmentally friendly means of transport. To address the challenges encountered during the earlier bicycle rental pilot, the bicycle sharing system will employ the following best practice features:

- A dense network of stations across the coverage area.
- An automated locking system that allows users to check out cycles without the need for staffing at stations.
- IT systems to track where a cycle is picked up, where it is returned, and the user's identity.
- Real-time user information provided through various platforms, including the web, mobile phones, and/or on-site terminals.
- Cycles with specially designed parts and sizes to discourage theft.
- Real-time monitoring of station occupancy rates, used to guide the redistribution of cycles.
- Advertising space on cycles and at stations to generate revenue.
- Pricing structures that incentivise short trips, helping to maximise the number of trips per cycle per day.



Figure 22. Bicycle sharing can improve last-mile connectivity and serve short trips. A user checks out a cycle using a smart phone or RFID-enabled smart card and can return it to any other station.

In its first phase, the bicycle sharing system will serve central areas such as Mexico, Meskel Square, Bole, and Urael/Atlas. An additional pilot zone will be launched in a condominium area. The system will begin with 500 cycles and will be expanded in future phases, eventually reaching upwards of 10,000 cycles and serving all of central Addis Ababa. Stations will be placed at frequent intervals, serving public transport hubs; offices and institutions; healthcare facilities; educational institutions; cultural hubs, and tourist destinations. Close station spacing reduces the distance that a user has to walk to access the bicycle sharing system.

The system will target user groups including commuters who travel by public transport and need a “last mile” option to reach their final destinations; workers and students who need to make short-distance errands during the day; and tourists using the bicycles to explore the city centre. People who already use bicycles will benefit from “safety in numbers” once the system begins to generate a larger number of cycling trips in the city. In addition, bicycle sharing stations can be paired with parking areas for personal cycles. Dedicated bicycle facilities developed in the bicycle sharing coverage area will benefit existing cyclists and new users alike. The project also will provide an employment opportunity to the poor, particularly in the form of the semi-skilled labour in support of system operations.

The registration system will incorporate safeguards to accommodate vulnerable users. While the majority of users may access the system through the website or station terminals, it is important to have a face-to-face platform at a central location where users can subscribe to the system and make payments. Through creative approaches to user registration, payment, and system management, the project will overcome implementation barriers related to purchasing power, credit card/debit card penetration, smartphone penetration, and security.

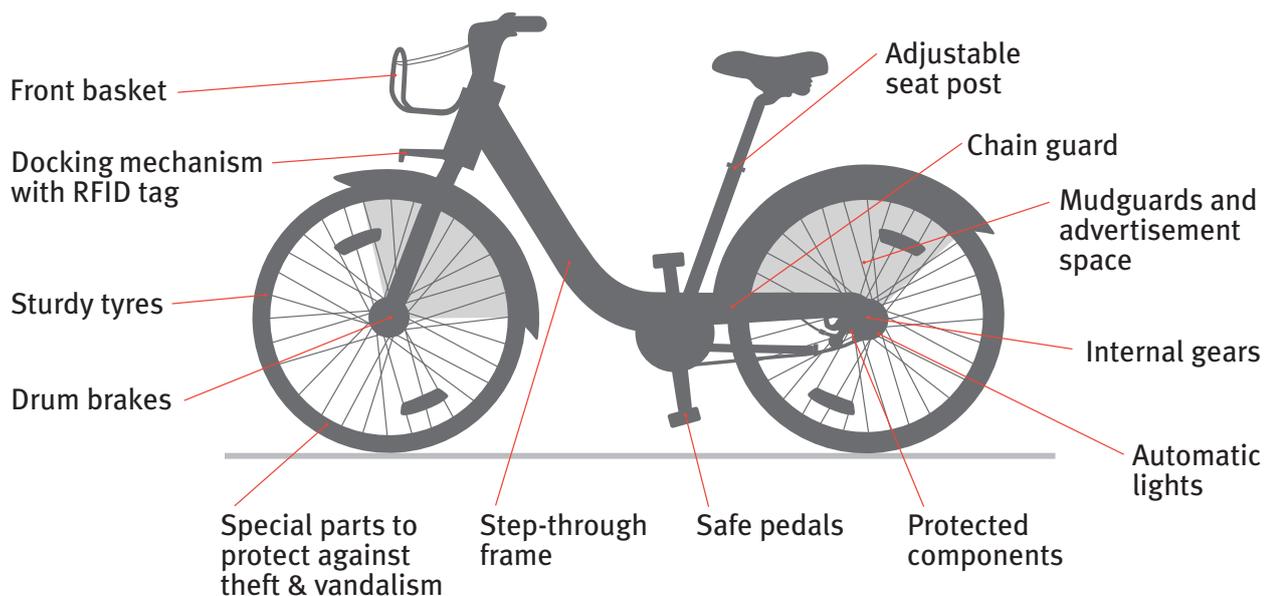


Figure 23. A unique, unisex, robust bicycle design is critical. Such a design increases brand awareness and allows the bicycle to be used by anyone.

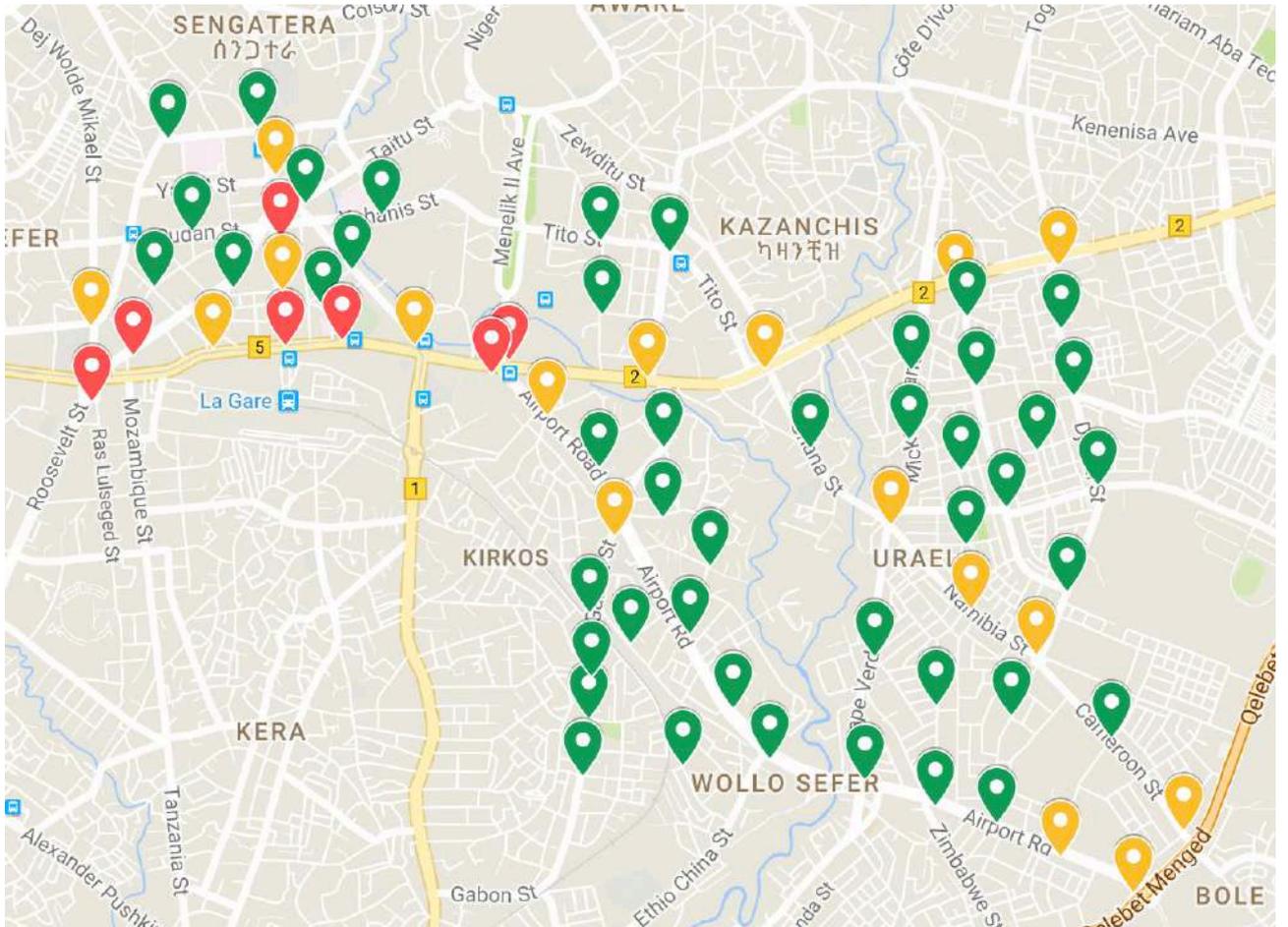


Figure 24. The bicycle sharing system will be launched with 500 cycles and will be expanded in subsequent phases (red = large stations, yellow = medium stations, green = small stations).

Following the completion of preparatory activities, AARTB will contract a private operator to install the system and handle day-to-day operations and maintenance over a six-year period. To ensure long-term sustainability of the project, AARTB will identify full-time staff to manage the bicycle sharing system. The system will be funded through a combination of revenue sources, including advertising, sponsorships, user fees, and the city budget.

The launch of the system will be accompanied by a number of communications and outreach activities aimed at encouraging use of the system, particularly among women, and building a stronger cycling culture in the city.

#### 10-YEAR TARGET

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

## 5.8. PARKING MANAGEMENT

On-street parking should be provided only after adequate provisions have been made for higher priority transport modes, including walking, cycling, and public transport. Where on-street parking is provided, market-based parking fees can help manage demand. In addition, robust parking enforcement mechanisms are needed to ensure that walking and cycling facilities, once built, remain well maintained and free of encroachments. Over time, the rationalisation of on-street parking can help reclaim street space for sustainable modes and manage the use of personal motor vehicles.

Existing parking fees are very low, ranging from ETB 1-6 per hour. At such low levels, parking fees have a minimal impact on parking demand. Payment is manual and the city lacks a formal mechanism for the enforcement of parking rules. As a result, chaotic vehicle parking compromises the mobility function of streets, occupying space that could otherwise facilitate mobility of public transport, pedestrians, and cyclists. Double parking and parking on footpaths are common in busy commercial areas. The city does not receive meaningful compensation for the use of valuable public space by private vehicles.

The Traffic Management Agency (TMA) is currently developing a parking management strategy for the city. Successful implementation of a parking management system will rest on an effective service contract with parking operators. Parking management also involves providing clear, consistent customer information on parking rules and fee levels. Parking fees should be set according to demand, with higher fees in areas with higher parking demand. Revenue gained from parking fees can help fund street improvements such as footpath maintenance and tree planting, helping to establish local buy-in for parking management.

The new management system will incorporate the following elements:

- Hand-held devices that field executives will use to administer parking fees and the enforcement personnel will use to check whether vehicles have paid the requisite parking fees. The devices will be used to issue fines in cases of default.
- Management software will serve as the interface between the field executives, system managers, and the city administration.
- On-street signage, consisting of static signs indicating the parking rules on each stretch of road as well as dynamic message boards alerting drivers about the available capacity in nearby parking facilities.
- Customer centres, a telephone hotline, and a mobile app to offer live information on parking availability and customer service.

Enforcement can be improved through IT-based monitoring of enforcement agents, such that the government receives regular updates on the number of vehicles checked, the payment status, and the number of enforcement events. Individual attendants will be tracked through a GPS-based system, with minimum benchmarks for the number of vehicles to be checked each hour. To have a meaningful impact on parking behaviour, fines for parking in no-parking areas should be increased. Physical measures

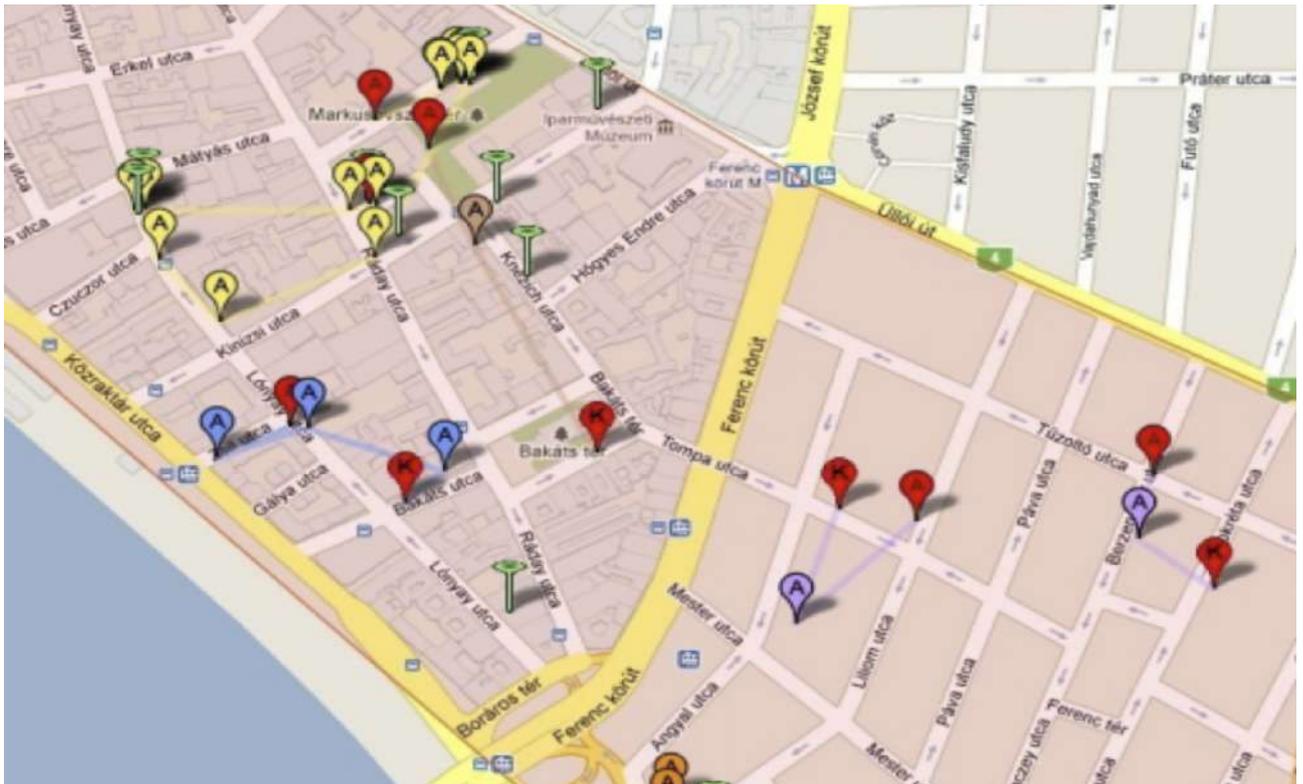


Figure 25. IT-based parking enforcement can improve compliance and prevent revenue leakage. The map shows the real-time locations of parking attendants in Budapest.

are also needed to supplement enforcement activities. In particular, bollards and other physical measures are needed to prevent cars from parking on footpaths and cycle tracks. In commercial areas, car parking spaces can be replaced with bicycle parking.

On-street parking management can complement efforts to manage the overall supply of parking. The restriction and control of parking within developments, especially in areas which are readily accessible by other modes of transport, can help promote more sustainable choices and release land for more productive uses. Minimum off-street parking requirements should be omitted from development control regulations, and parking maximums should be introduced for locations along major public transport corridors. Moving forward, the government will avoid using public resources to create new off-street parking spaces. Park-and-ride facilities will be provided only at terminal rapid transit stations until such station areas are redeveloped with affordable housing and other higher priority land uses.

#### 10-YEAR TARGETS

- ▶ 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.

## 5.9. VENDOR MANAGEMENT

Street vending provides essential goods and services to a wide range of the population. It also makes public space safer by contributing “eyes on the street,” particularly on streets lined with compound walls. If designed properly, vending can be accommodated in the streetscape without interfering with other uses. The furniture zone of the footpath or a bulbout in the parking lane are ideal locations for vending.

The use of parking lanes, furniture zones, and public spaces for organised street vending can help ensure that clear space remains for the movement of pedestrians and cyclists. The city can issue licenses to street vendors, set standards for vending stands, and monitor the upkeep of vending areas. Formalising the relationship between the government and vendors will improve compliance with vending norms and ensure that vending does not interfere with NMT movement.

### 10-YEAR TARGET

- ▶ A comprehensive street vending management system ensures that organised vending complements other road uses.



Figure 26. Street vending provides essential goods and can be enhanced through formal management measures.

## 5.10. STREET DESIGN STANDARDS

The Addis Ababa City Roads Authority (AACRA) Design Manuals comprise several volumes that provide guidance on geometry, drainage, road rehabilitation, and other elements of the NMT environment.<sup>19</sup> During an planned revision of the manuals, attention should be given to updating the following elements to ensure that the manuals reflect best practices:

- **Geometric Design Manual:**
  - Design speeds: The recommended design speeds for arterial, sub-arterial, and collector roads are too fast to ensure safety for pedestrians and cyclists and should be reduced.
  - Footpath geometry: The manual should clarify the zoning system as a framework for footpath design and should recommend a minimum clear width of 2 m on all footpaths.
  - Cycle track geometry: Guidance on cycle track design should be added to the manual.
  - Pedestrian crossings: The Manual should encourage the use of at-grade crossings and incorporate specific guidance on the use of traffic calming and signalisation to improve safety.
  - Intersections: The manual should provide guidance on intersection design elements such as pedestrian crossings, refuge islands, accessibility ramps, corner radii, kerb extensions, and public transport stops/stations.
  - Carriageway design: The revised manual should incorporate nuanced guidance on carriageway lane widths, indicating how narrower lanes can improve safety while accommodating buses and trucks.
  - In many cases, the existing manual presents multiple options, but does not necessarily recommend which is best to implement. The revised manual should provide clear recommendations and minimum design standards to inform the design review process (see section 6.2).
- **Street Lighting Design Manual:** The document should provide information on lighting requirements on pedestrian footpaths.
- **Bridge Design Manual:** The Manual should provide guidance on how to integrate pedestrian or bicycle access when designing bridges.

### 10-YEAR TARGET

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

<sup>19</sup> Addis Ababa City Roads Authority. (2004). Design Manuals, Standard Contract Documents and Specifications.

## 5.11. REVIEW OF BUILDING CONTROL & PLANNING REGULATIONS

The built environment surrounding pedestrian routes must be conducive to walking. Walking is safer and more enjoyable when sidewalks are populated, animated, and lined with useful ground-floor activities such as store fronts and restaurants. In turn, being closer to passing pedestrians and cyclists increases the exposure and vitality of local retail, bringing significant economic benefits.

Architectural design elements such as building setbacks, the ratio of building height to street width, and the articulation and permeability of building-street interface (i.e., the number of doors and windows) have a major impact on the quality and safety of pedestrian spaces. Blank compound walls isolate the street from private uses and contribute to unsafe conditions for pedestrians. Similarly, parking setbacks diminish the connection between pedestrian activity on a footpath and activity inside adjacent buildings. They also increase the risk of parking encroachments on footpaths. Building control regulations for Addis Ababa should be updated to ensure that private developments contribute to the public realm rather than functioning as isolated islands of activity.

Besides active façades, another key to mobility for NMT users is a high ratio of intersection nodes to road links so that streets and pathways are well connected. The maximum recommended block size for people friendly streets is 100 m.<sup>20</sup> Prioritised connectivity creates finer grained networks for walking, including pedestrian-only streets. A fine-grained walking and cycling network helps to reduce trip distances and improves access to public transport.

In Addis Ababa, many traditional neighbourhoods have organic street networks with closely spaced pedestrian access routes. However, connectivity is often lost when these neighbourhoods are redeveloped and informal layouts are amalgamated into large parcels surrounded by compound walls. Moving forward, the redevelopment process should maintain fine-grained street networks, ensuring that parcels are no larger than 100 m on a side after amalgamation. The manual for Local Development Plans (LDPs) should be updated to emphasise the need for fine-grained walking and cycling networks.

Land use policies should encourage transit-oriented development (TOD) within walking distance (i.e., 500 m) of mass rapid transit lines. TOD policies can include affordable housing mandates, incentives for mixed use, and restrictions on off-street parking. All of these principles should be taken into account when preparing layouts and designs for condominium projects.

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<sup>20</sup> Institute for Transportation and Development Policy. (2017). The TOD Standard. Retrieved from <https://www.itdp.org/tod-standard/>



Figure 27. Planning and building control regulations should encourage active façades and mixed land use to create a safer and more attractive pedestrian environment.

#### 10-YEAR TARGETS

- ▶ Condominium projects incorporate compact layouts and improve NMT access to planned public transport corridors.
- ▶ Building control regulations encourage active frontage; reduced setback 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.

## 5.12. COMMUNICATIONS AND ENGAGEMENT

Communications and engagement activities will play a key role in building public support for the NMT Strategy. Effective messaging about NMT and public activities can build enthusiasm for NMT use and can begin to foster a changed culture that accepts walking and cycling as integral modes of transport. In addition, participation of local residents, businesses, and other stakeholders in the planning and design of streets can help improve transparency and foster the community's active use and sense of ownership of public spaces. Communications and outreach activities will include the following:

- **Open streets events** will help introduce the idea of streets as spaces that provide equitable access for all users. During such events, where private motor vehicles are temporarily banned and streets are opened for exclusive access by pedestrians and cyclists. Programmed activities during open streets events can include health and fitness activities, dance classes, bicycle maintenance clinics, inclusive recreation, and arts activities.
- **Marketing campaigns** will raise the profile of walking and cycling, encourage usage of the city's bicycle sharing system, and encourage safe driving among motor vehicle drivers. To reach a diverse audience, such campaigns should make use of multiple channels, including television, radio, print media, and social media.
- **Cycle trainings** can introduce safe cycling techniques and encourage ridership among new users, especially women and youth.



Figure 28. Open streets events re-purpose streets for walking, cycling, and other healthy activities.



Figure 29. A participatory planning process can increase stakeholder buy-in and generate creative input for on-going transport projects.

- **Sustainable commuting days** for AARTB staff will expose city engineers and planners to issues faced by NMT and public transport users and will give an opportunity for Bureau staff to "lead by example."
- **Use of bicycles by city officials**, including the Addis Ababa Police, will help change the image of cycling.
- **Participatory planning activities** will give community members a chance to offer input on plans and designs for NMT projects. AARTB will adopt an open data policy to improve access to information.

#### 10-YEAR TARGETS

- ▶ 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.

## 6. INSTITUTIONAL FRAMEWORK

### 6.1. AGENCY ROLES

A number of agencies have important roles to play in the implementation of the NMT Strategy, as described in the following table.

Table 2. Roles in implementation of the NMT Strategy

| Agency   | Role  |
|--|---|
| Addis Ababa Road and Transport Bureau (AARTB)    | <ul style="list-style-type: none"> <li>• Provide political leadership and general oversight toward implementation of the NMT Strategy.</li> </ul>   |
| Transport Programs Management Office (TPMO)      | <ul style="list-style-type: none"> <li>• Prepare and review plans and designs for transport projects.</li> <li>• Develop and disseminate transport policies and standards.</li> <li>• Host the NMT Cell.</li> <li>• Monitor progress over time and update the NMT Strategy Implementation Plan periodically.</li> </ul> |
| Addis Ababa City Roads Authority (AACRA)         | <ul style="list-style-type: none"> <li>• Design and implement high-quality walking and cycling facilities.</li> </ul>   |
| Beautification Agency                            | <ul style="list-style-type: none"> <li>• Develop and maintain street landscaping.</li> <li>• Maintain storm water facilities.</li> </ul>  |
| Addis Ababa Traffic Management Agency (TMA)      | <ul style="list-style-type: none"> <li>• Regulate traffic operations.</li> <li>• Oversee operations of the on-street parking management system.</li> <li>• Implement traffic calming facilities, including safe intersections, speed bumps, and pedestrian crossings.</li> </ul>  |
| Transport Authority                              | <ul style="list-style-type: none"> <li>• Station installation, user fee determination, and service level monitoring for the bicycle sharing system.</li> </ul>  |
| Rivers and Riversides Development Project Office | <ul style="list-style-type: none"> <li>• Develop greenway corridors with continuous walking and cycling facilities.</li> </ul>  |
| Traffic Police                                   | <ul style="list-style-type: none"> <li>• Control and manage traffic operations.</li> </ul>  |
| Construction Bureau                              | <ul style="list-style-type: none"> <li>• Develop pedestrian friendly building control rules.</li> </ul>   |
| Plan Commission                                  | <ul style="list-style-type: none"> <li>• Develop pedestrian friendly planning regulations.</li> </ul>   |
| Code Enforcement Office                          | <ul style="list-style-type: none"> <li>• Manage street vending.</li> <li>• Prevent encroachments on NMT facilities.</li> </ul>  |
| Construction and Housing Development Bureau      | <ul style="list-style-type: none"> <li>• Develop pedestrian friendly layouts for social housing projects.</li> </ul>  |
| Road Safety Council                              | <ul style="list-style-type: none"> <li>• Coordinate with stakeholders on road safety initiatives related to the walking and cycling environment.</li> </ul>   |
| Sub-cities                                       | <ul style="list-style-type: none"> <li>• Provide input to project plans.</li> <li>• Facilitate community participation.</li> </ul>  |

To help facilitate implementation of the Strategy, an NMT Unit will be formed within TPMO. The NMT Unit will be tasked with the following activities:

- Coordination among agencies responsible for planning, design, management, and maintenance of the NMT environment.
- Review of policies and standards for NMT facilities.
- Facilitation of community participation in the planning process.
- Monitoring and evaluation of the NMT environment and review of progress toward the goals outlined in the NMT Strategy.
- Periodic review and revision of the NMT Strategy and Action Plan.

Through period inter-agency meetings, the NMT Unit can serve as a forum for discussions about multiple issues surrounding walking and cycling initiatives. By bringing stakeholders together on a regular basis, the group will facilitate the sharing of information among implementing agencies.

The NMT Strategy is closely related to the Addis Ababa Road Safety Strategy, recently adopted by the Addis Ababa City Administration. Key elements of the Road Safety Strategy related to NMT include reduced speed limits; good quality footpaths, at-grade crossings, and traffic calming elements; management of pedestrian space to prevent encroachments; NMT improvements in school zones; improved enforcement; and awareness campaigns. Close coordination of the activities planned under the two Strategies through the NMT Unit can help achieve optimal results.

## 6.2. DESIGN REVIEW

In conjunction with the planned revision of the AACRA geometric design guidelines, design review audits will help ensure that projects comply with the new guidelines. The NMT Unit in TPMO will coordinate the design review process. Designs that comply with the street design standards will be approved for implementation. In case of designs that do not comply, project sponsors will be requested to modify the design or provide a justification for the chosen design solution, after which the designs must be submitted to the TPMO Unit for a subsequent review.

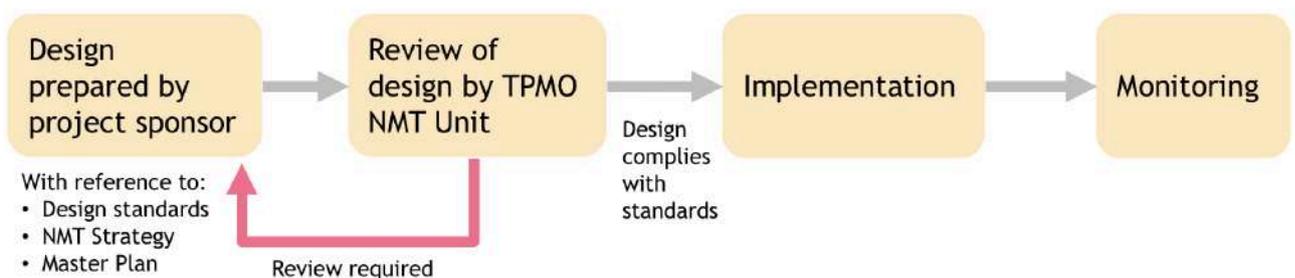


Figure 30. The design review process.

## 6.3. MONITORING AND EVALUATION

To facilitate access to information about the status of the NMT environment, Addis Ababa will conduct regular assessments of the walking and cycling environment. The assessments will cover the following variables:

- **Street environment:** Footpath presence, footpath height, cycle track presence, road width, crossing availability, presence of shade, lighting, landscaping, frontage, etc.
- **User counts, behaviour, and perceptions:** Counts of pedestrians, cyclists, and motor vehicles; observation of pedestrian behaviour; and user surveys.
- **Crash data:** Records on vehicle crashes involving pedestrians, including the location, time of day, and fault vehicle.

This information will be stored in a citywide asset management system built on a Geographic Information Systems (GIS) platform. The database will be used to identify the gaps between existing and desirable walking and cycling facilities and can inform the prioritisation of NMT projects. Data on the physical environment should be supplemented by citywide information on mode shares and travel patterns obtained from periodic household surveys.

## 7. DESIGN CHECKLIST

| Element             | Design criteria  |
|---------------------|--|
| Footpath            | <ul style="list-style-type: none"> <li>• Height of at least 150 mm and no more than 200 mm.</li> <li>• Minimum 2 m clear width in all locations.</li> <li>• Wheelchair kerb ramps have a maximum slope of 1:12.</li> <li>• Bollards installed along the edge of the footpath to prevent driving and parking on the footpath.</li> <li>• At least one set of bollards with spacing of 1,200 mm.</li> <li>• The footpath surface is uniform and non-slippery, with slope of 1:100 to avoid water stagnation.</li> <li>• Tactile warning are strips located at transition points (e.g., mid-block crossings, intersections).</li> </ul> |
| Cycle track         | <ul style="list-style-type: none"> <li>• Physically separated from the carriageway.</li> <li>• Elevated above the carriageway</li> <li>• Clear width <math>\geq</math> 2 m for one-way movement; <math>\geq</math> 2.5 m for two-way movement.</li> </ul>  |
| Property entrances  | <ul style="list-style-type: none"> <li>• The footpath remains at the same level through property entrances.</li> <li>• Bollards are installed on either side of each entrance to prevent driving and parking.</li> <li>• Property access is provided at a discrete location for each plot, with a maximum entrance width of 6 m</li> </ul>   |
| Mid-block crossings | <ul style="list-style-type: none"> <li>• Pedestrian crossings at intervals of 100-150 m.</li> <li>• Crossing are raised to the level of the footpath with ramps for vehicles (minimum slope of 1:15) OR have kerb ramps at each end of the crossing.</li> <li>• Median refuge islands are provided at crossing points, with minimum dimensions of 2 m by 1 m.</li> </ul>   |
| Intersec-<br>tion   | <ul style="list-style-type: none"> <li>• Kerb ramps on all corners of intersections to provide wheelchair access to the footpath.</li> <li>• Median refuge islands with minimum dimensions of 2 m by 1 m on all arms with more than 2 lanes to cross.</li> <li>• Signalisation if any arm has more than 2 lanes to cross.</li> <li>• Pedestrian crossings are located along desire lines.</li> <li>• Turning radii are no more than 5 m.</li> </ul>  |
| Shade               | <ul style="list-style-type: none"> <li>• Tree pits least every 20 m.</li> </ul>  |
| Lighting            | <ul style="list-style-type: none"> <li>• No dark spots on footpath or carriageway.</li> </ul>  |
| On-street parking   | <ul style="list-style-type: none"> <li>• Parking is provided in parallel orientation rather than angled or perpendicular parking.</li> <li>• Car parking bay size is no more than 5.0 m x 2.5 m</li> </ul>   |
| Street vending      | <ul style="list-style-type: none"> <li>• The design includes designated spaces for organised street vending</li> </ul>   |

## 8. DEFINITIONS

**Accessibility:** Facilities offered to people to reach social and economic opportunities, measured in terms of the time, money, comfort, and safety that is associated with reaching such opportunities.

**Average trip length:** The average distance covered by a transport mode for a trip, measured in kilometres.

**Bus rapid transit (BRT):** High quality bus-based mass transit system that delivers fast, comfortable, reliable, and cost-effective urban mobility through the provision of segregated right-of-way infrastructure, rapid and frequent operations, and excellence in marketing and customer service.

**Complete streets:** Streets that are designed for all users, including pedestrians, cyclists, public transport passengers, and personal motor vehicles, including all modes of mobility as well as street vending, trees, street furniture, and other elements.

**Greenway:** A waterway or strip of land with exclusive facilities for cycling and walking.

**Mass rapid transit (MRT):** A high quality public transport system characterized by high capacity, comfort, overall attractiveness, use of technology in passenger information system, and ensuring reliability using dedicated right of way for transit vehicles (i.e., rail tracks or bus lanes).

**Mobility:** Conditions under which an individual is capable to move in the urban environment. **Mode share:** The share of total trips carried out by a particular mode of urban transport, including walking, cycling, bus, paratransit, rail, two-wheeler, or car.

**Non-motorised transport (NMT):** Human-powered transport such as walking and cycling.

**Nationally Determined Contribution (NDC):** National pledges to reduce greenhouse gas emissions per the provisions of the 2015 United Nations Framework Convention on Climate Change Conference of the Parties in Paris.

**On-street parking:** The space occupied by vehicles to park along the edge of the street.

**Paratransit:** Service operated by the private sector on a shared or per seat basis along informally organised routes with intermediate stops. The service may or may not have a predefined fare structure. The term “intermediate public transport (IPT)” means the same but is avoided in this document for consistency. Common paratransit modes include public taxis.

**Public transport (PT):** Shared passenger vehicles that are publically available for multiple users. In this document, the term “public transport” is used to refer to MRT,

paratransit, and formal road-based public transport services.

**Parking management:** Pricing, enforcement, and other mechanisms used to guide parking operations to ensure the efficient use of street space.

**Right-of-way (ROW):** The width of the road, taken from the compound wall/property edge on one side of the road to the compound wall/property edge on the other side of the road.

**School zone:** All streets and greenways within a 200 m radius of a school.

**Sustainable transport modes:** The following modes are categorized as “sustainable modes” of urban transport because when compared with personal motor vehicles, they consume the least amount of road space and fuel per person-km and also entail lower infrastructure costs: walking, cycling, and public transport (including a regular bus service as well as MRT systems).

**Traffic calming:** Traffic calming measures ensure pedestrian and vehicle safety by reducing at least speed and potentially also the volume of motor vehicles. Traffic calming slows down vehicles through vertical displacement, horizontal displacement, real or perceived narrowing of carriageway, material/colour changes that signal conflict points, or the complete closure of a street.

**Vehicle kilometres travelled (VKT):** Vehicle kilometres travelled by all the personal motor vehicles (in a city) in one day.

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