WHY INFRASTRUCTURE MATTERS: ACTIVE MOBILITY, PUBLIC TRANSPORT, AND ECONOMIC GROWTH IN AFRICAN CITIES

ITDP

UN environment

UN HABITAT
FOR A BETTER URBAN FUTURE

ITDP Institute for Transportation & Development Policy

UN environment

UN-HABITAT FOR A BETTER URBAN FUTURE

DECEMBER 2022

PREPARED BY

Nour El Deeb, Mariam Sorour, Christopher Kost, Regatu Solomon, Carolyne Mimano, and Emnet Hailu, Institute for Transportation and Development Policy (ITDP)

INFOGRAPHIC DESIGN

Michael Kwasi, UN-Habitat, and Emnet Hailu, ITDP

LAYOUT

Emnet Hailu, Carolyne Mimano, and Christopher Kost, ITDP

ACKNOWLEDGEMENTS

The publication reflects suggestions and contributions from many stakeholders. We would like to express our sincere gratitude to them for offering their time and expertise. Special thanks to Patrin Watanatada (Clean Air Fund), Stefanie Holzwarth (UN-Habitat), Michael Kwasi (UN-Habitat), Sean Cooke (University of Cape Town), Neji Larbi (African Development Bank), and Richard Clarke (FIA Foundation for the Automobile and Society).

TABLE OF CONTENTS


BUSINESS AS USUAL
USD 201 billion cost of transport infrastructure, compared to USD 158 billion under a sustainable scenario
55 km of footpaths, 15 km of cycle tracks, and 9 km of rapid transit per 1 million residents
64% reduction in fuel expenditures
220 million tonnes reduction in annual CO_2 emissions
63% reduction in road crash fatalities
SUSTAINABLE CITY

EXECUTIVE SUMMARY

As Africa urbanises, cities are experiencing growing demand for convenient and efficient mobility. However, urban transport investments in recent decades have focused on the needs of private cars, with little consideration for non-motorised transport (NMT) and public transport—the modes used by most urban Africans. As walking, cycling, and public transport are low-carbon and low-cost modes of transport, investments in these modes help achieve many social, economic, and environmental goals, including improved access to jobs and education; reduction in local pollution; avoidance of fatalities and injuries from traffic crashes and reduced cost of urban infrastructure.

This study explores the benefits that can accrue if cities prioritise active mobility and public transport. It quantifies the benefits of walking, cycling, and public transport in the Africa region, comparing alternate investment scenarios for the 188 largest African cities. Under a Business-as-Usual (BAU) scenario, cities would continue to focus on road expansions, flyovers, and other investments primarily catering to personal car use. In a Sustainable scenario, cities would develop adequate facilities for walking, cycling, and public transport, facilitate compact land use, and adopt measures to manage the use of private motor vehicles.

The analysis indicates that Sustainable scenario would reduce the total cost of infrastructure by USD 43 billion and reduce fuel costs by USD 109 billion compared to BAU. In addition, the Sustainable scenario would reduce road crash fatalities by 63 percent and CO_2 emissions by 220 million tonnes per year compared to the BAU scenario.

To achieve the Sustainable scenario, local and national policies must prioritise sustainable mobility in transport policies and budget plans. Governments need to invest in high-quality pedestrian facilities, citywide cycle networks, bikeshare systems, BRT corridors, and paratransit reform. To support these investments, governments should adopt complementary policies including design standards for urban streets, land use policies to facilitate compact, mixed-use urban development with pedestrian friendly urban design, and travel demand measures such as demand-based parking fees.

Now is the time for African cities to make smart investment decisions that can facilitate economic growth and overall well-being of urban residents for years to come.

1 INTRODUCTION

As Africa continues to urbanise, congestion and pollution have reached a tipping point in many cities. The traditional focus on serving the needs of private cars has proven to be inefficient and costly. Cities that continue to invest and focus on highways and new roads rather than improving walking, cycling, and public transport infrastructure are experiencing worsening traffic, air quality, and safety conditions. Going forward, it is crucial to invest in sustainable, efficient, and equitable means of mobility.

Although a major share of urban residents in Africa walk and cycle, this does not mean that conditions are safe or comfortable for pedestrians and cyclists. Most African cities are not designed to accommodate non-motorised transport (NMT). As a result, walking and cycling levels have been on the decline, as active trips are slowly replaced by motorised modes. Public transport systems are often inefficient, with buses and minibuses stuck in traffic. Vehicle maintenance is poor and crews work without adequate labour standards. The lack of quality public transport further contributes to the image of the private car as a status symbol.

Many cities around the world have shown that street designs that prioritise the movement of people rather than vehicles can enhance efficiency, improve quality of life, and enhance the character of public spaces. African cities have the opportunity to move past investments in car travel and invest in innovative active mobility and public transport solutions. Shared mobility initiatives such as bikeshare have experienced tremendous growth around the globe. African cities such as Cairo, Kigali, and Marrakesh have started bikeshare systems while in Addis Ababa, implementation plans are underway. With the global rise in fuel prices, e-bikes can be a competitive alternative to private cars, because they are faster than mechanical bikes, hence easing cycling over longer distances while keeping costs low. Public transport initiatives are also gaining momentum across the continent. Cities like Dar es Salaam and Johannesburg have implemented BRT, and other cities are in the planning stages.

Walking, cycling, and public transport are critical to achieving the Sustainable Development Goals, which call for improving road safety and access to opportunities (see box below). In August 2020, the UN General Assembly launched the Decade of Action for Road Safety 2021-2030, with the ambitious goal of preventing at least 50 percent of road traffic injuries and deaths by 2030. Investment in NMT facilities will be key to meeting the goal of the Decade of Action. Walking and cycling networks integrated with quality public transport systems are the urban mobility solutions of the future for cities and rural centres: efficient, affordable, and sustainable.

SUSTAINABLE DEVELOPMENT GOALS FOR MOBILITY

SDG 3: Ensure healthy lives and promote well-being for all at all ages. Target 3.6 says, “by 2030, halve global deaths from road traffic accidents.” People who walk and cycle are the most vulnerable to traffic fatalities. Going forward, the design of urban streets needs to prioritise pedestrians and cyclists.

SDG 11: Make cities and human settlements inclusive, safe, resilient and sustainable. Target 11.2 calls for providing “access to safe, affordable, accessible, and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities, and older persons.”

Figure 1. Walkway in Addis Ababa.

Figure 2. Spacious walkways developed under the Kisumu Triangle project in Kisumu, Kenya.

CASE STUDY: ENHANCING THE WALKING ENVIRONMENT IN KISUMU, KENYA

Kisumu, like many cities in Africa, is starting to undergo mobility challenges characterised by increasing car traffic, inefficient public transport, inadequate walking and cycling facilities, and poor parking management. Such challenges contribute to congestion, air, noise pollution, and safety concerns, impacting the city's attractiveness and liveability. Kisumu is a commercial, administrative, and educational hub in Kenya's western region, hosting several centres of higher learning, banks, industries, and other businesses. The city has witnessed a surge in large infrastructure projects by the national government, leading to an urgent need to re-calibrate such investments in order to benefit and be inclusive of all road users.

The city of Kisumu recently launched the Kisumu Sustainable Mobility Plan (KSMP) with technical support from ITDP and UN-Habitat. In Kisumu, 53 percent of daily trips are by foot, 4 percent by bicycle, 13 percent by matatu, 3 percent by tuk tuk, 13 percent by boda boda, 6 percent by motorcycle, and 6 percent by car. Regardless of the high reliance on non-motorised transport, infrastructure designs of most streets are more centred on motorised transport. The 10-year KSMP recognizes the gaps in recent infrastructure projects and offers safe, accessible, and sustainable alternatives.

The City of Kisumu has begun implementing best practice designs that improve safety and enhance the environment for pedestrians and cyclists in line with the Kisumu Sustainable Mobility Plan. Under the World Bank-financed Kenya Urban Support Program, the city launched the KES 241 million Kisumu Triangle, involving the reconstruction of 1.5 km of walkways along Oginga Odinga Street, Ang'awa Avenue, and Jomo Kenyatta Highway. The improved streets are designed to give priority to people through the following elements:

- Wide footpaths with at least 2 m of clear space, raised 150 mm above the carriageway.
- Safe, universally accessible at-grade pedestrian crossings with traffic calming at preferred crossing locations.

- Bollards to prevent vehicles from entering the footpaths.
- Conservation of existing trees and permeable paving blocks around trees to protect tree roots and expand the usable area of the footpath.
- Street lights to enhance safety and security.
- Public toilets.

Construction of the 8 km, KES 659 million second phase of the project is currently underway along Nyerere Road, Ondiek Highway, Gumbi Road, Mosque Road, Achieng' Oneko Rd, Awuor Otieno Road, Omolo Ogar Road, Ang'awa Avenue, and Oginga Odinga Street.

Figure 3. Safe, universally accessible, at-grade pedestrian crossing in Kisumu.

Figure 4. Bollards prevent vehicles from accessing footpaths.


0756 943 406 / 0766 424 205
emjey

2 BENEFITS OF SUSTAINABLE MOBILITY

Walking, cycling, and public transport are critical means of affordable transport, offering access to vital urban services and resources. Greater use of sustainable modes will help reduce demand for travel by personal motor vehicles, thereby addressing the traffic, pollution, equity, and road safety challenges that many African cities face.

2.1. ROAD SAFETY

An estimated 1.35 million people are killed in road crashes annually, and injuries from traffic crashes are currently the ninth leading cause of death globally (WHO, 2018). In addition to the loss of lives and the associated toll on families and communities, there is a significant economic cost of road crashes, estimated to be approximately 3 percent of the GDP in developing countries (WHO, 2013).

Safe road environments can improve access by making all road users feel safe enough to consider walking, cycling, and public transport as viable modes of transport. To improve safety, street designs should encourage moderate vehicle speeds and the provision of high-quality walking and cycling infrastructure. Safety can be achieved through several measures:

- Reducing the total vehicle kilometres travelled in a city reduces exposure of pedestrians and cyclists to motor vehicles. Improved urban planning anchored by efficient public transport, walking, and cycling infrastructure improves accessibility, avoiding the need for long commutes and thereby reducing road fatalities.
- When motor vehicle speeds are reduced to accommodate other modes of transport, pedestrian safety is improved and the risk of death in a traffic collision falls. A pedestrian has a 90 percent chance of surviving being hit by a car travelling less than 30 km/h, but only a 50 percent chance of surviving an impact at 45 km/h.
- Streets and intersections can be redesigned to make pedestrians and cyclists more visible and predictable to drivers. Pedestrian refuge islands, protected cycle tracks, kerb extensions, and signal priority for pedestrians are some key urban street design elements that improve safety. Dedicated cycle tracks that are physically separated from mixed

Figure 5. Raised zebra crossing, a traffic calming measure, contributing to a safe walking and cycling environment in Dar es Salaam.

Figure 6. Pedestrian and cycle facilities along a BRT corridor in Dar es Salaam.

traffic improve safety for cyclists. Protected intersection designs help manage interactions between cyclists and turning vehicles.

- Traffic calming interventions such as narrowed lanes and raised crosswalks can slow vehicle speeds, thereby increasing pedestrian and cyclist safety.
- The design of the street network also can contribute to improving road safety. Short blocks limit vehicle acceleration between intersections, lowering speeds and improving road safety for all users.

CASE STUDY: LE GARE INTERSECTION, ADDIS ABABA

Addis Ababa has transformed several major intersections, making them safer and more attractive for pedestrians. The Transport Programs Management Office (now Addis Ababa Transport Bureau) and Global Designing Cities Initiative (GDCI) led an initiative to transform Le Gare intersection in central Addis Ababa. The team used inexpensive interventions such as planters and paint to expand median refuge islands and walkways, thereby reducing crossing distances and tightening turning radii. After implementation, the intersection saw slower turning speeds and a reduction in fatalities and injuries from traffic crashes (TMPO and NACTO, 2017). The success of the project demonstrates the potential of low-cost and high-impact street transformations to save lives in African cities.

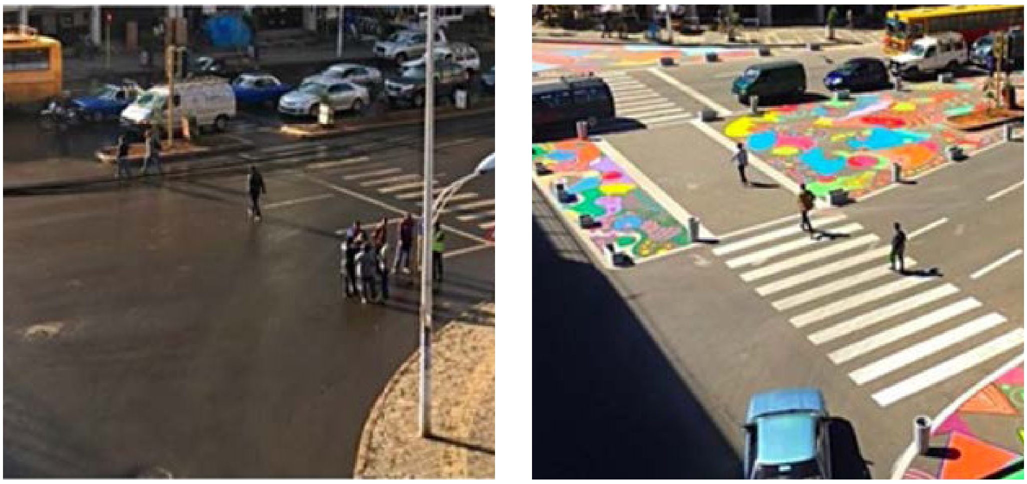


Figure 7. Addis Ababa reduced lane widths and turning radii for motor vehicles in order to improve pedestrian safety. (Images: NACTO/Global Designing Cities Initiative)

2.2. LOWER COST OF INFRASTRUCTURE

Mass rapid transit systems give commuters an alternative to sitting in traffic, while walking and cycling provide seamless last and first mile connectivity options. An efficient and quality public transport system integrated with walking and cycling networks ensures fast and efficient mobility, encouraging a shift from private vehicle use.

BRT is an attractive mass rapid transit option because it allows for a large increase in public transport capacity at relatively moderate costs compared to commuter rail or metro systems. A single BRT lane with articulated buses can carry 13,000 passengers per hour per direction (pphpd), and if passing lanes are added at stations, the capacity increases to 38,000 pphpd. The same lane can carry 800 cars per hour—only 1,200 to 1,600 persons at typical occupancy rates. To expand station catchment areas, BRT corridors should also include cycle parking at all stations and dedicated cycle tracks that are physically separated from mixed traffic.

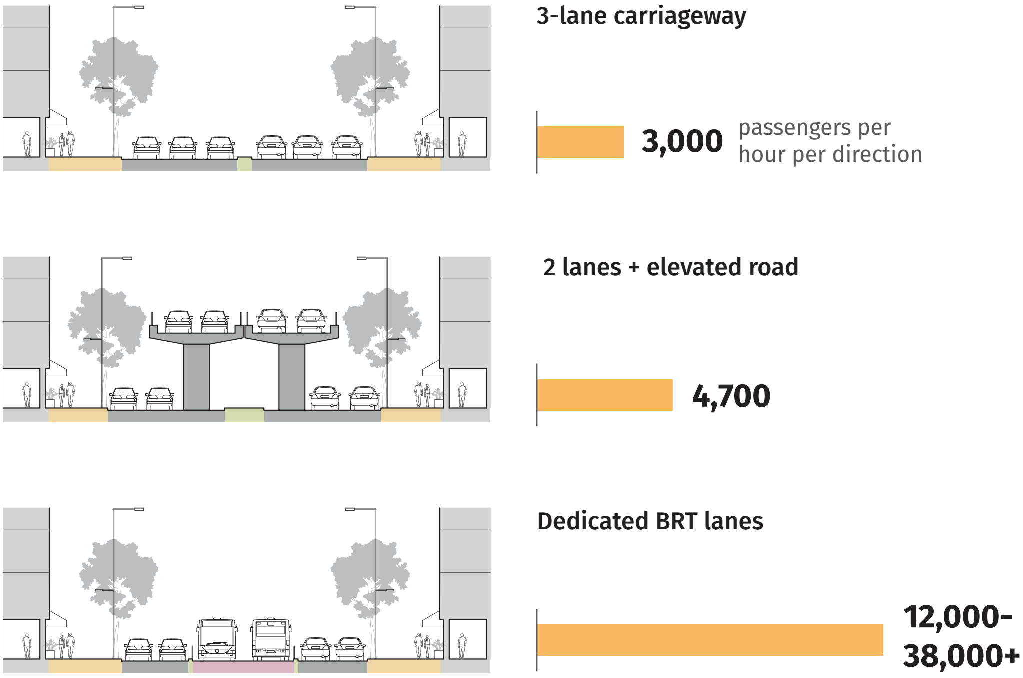


Figure 8. Passenger capacity for different street design scenarios.

2.3. USER SAVINGS

Walking, cycling, and public transport infrastructure improvements enable people to reduce their transport costs, including the cost of vehicle ownership, insurance, operation, maintenance, fuelling, and parking. In addition, walking, cycling, and public transport lower urban traffic congestion, which increases productivity. In Egypt, the estimated direct cost of congestion in the Greater Cairo metropolitan area is EGP 13-14 billion (USD 827–890 million) per year (World Bank, 2013). In Lagos, Nigeria, residents are estimated to lose a collective three billion hours per year to traffic congestion, equivalent to USD 1 billion (Ministry of Economic Planning & Budget, 2013). Prioritising walking, cycling, and public transport in these cities would improve productivity and save on time spent in traffic congestion.

2.4. SOCIAL INCLUSION

Greater investment in active mobility and public transport can expand access to opportunities for women, children, the elderly, and persons with disabilities, who face many obstacles in existing transport systems. People with disabilities benefit directly from investments in universally accessible pedestrian infrastructure, helping to improve their mobility and independence. Inaccessible transport can act as a key barrier for people with disabilities to enter the workforce. A study showed that the employment rate of working-age people with a disability was only 44 percent, compared with 75 percent for people without a disability (WHO and World Bank, 2011). The ability to travel safely and conveniently without a car is particularly important for women. For example, in households with one motor vehicle, that vehicle is often used by the husband (UNCRD, 2018). In addition, harassment and sexual violence deter women from having full access to work opportunities, leisure, culture, and services (ITDP, 2018). As mobility is not neutral with respect to gender, income, race, or disability, governments should take explicit steps to include vulnerable groups in the planning process for public transport and active mobility facilities.

2.5. IMPROVED COMMERCIAL ACTIVITY

Pedestrian elements such as wide footpaths encourage activities like socialising, shopping, and eating. A well-designed public realm helps increase demand for business services. In Kigali, Rwanda, the pedestrianisation of KN 4 Ave in 2015 and the subsequent upgrading of the public space has led to improved safety and social and commercial activity in addition to improved health and environmental benefits.

Figure 9. The Imbuga City Walk on KN 4 Avenue in Kigali. (Image: City of Kigali)

CASE STUDY: LUTHULI AVE, NAIROBI

Luthuli Avenue is a lively commercial street in downtown Nairobi. In 2019, the Nairobi City County government with support from UN-Habitat, C40, and other partners embarked on journey to transform Luthuli Avenue into a traffic-calmed zone. By enhancing the liveability of the street for pedestrians, business owners could witness increased revenues, and the street has attracted food vendors and cafés.

Figure 10. Initial conditions on Luthuli Avenue (left) and the same corridor following the implementation of pedestrian improvements (right). (Images: UN-Habitat)

2.6. IMPROVED INTER-MODALITY

High-quality pedestrian and cycle facilities along with well-connected street networks improve the catchment areas for public transport. Dense, walkable neighbourhoods support the viability of public transport systems: a high number of potential passengers within walking or cycling distance of new infrastructure contributes to a well-used system. The provision of pedestrian and cycling facilities ensures that passengers are able to comfortably and safely access public transport stops.

CASE STUDY: DAR ES SALAAM, TANZANIA

Dar es Salaam is the third fastest-growing city on the African continent. The city implemented the first BRT system in East Africa and is the only city in Africa to win the Sustainable Transport Award (STA). The Dar Rapid Transit (DART) BRT system is 20.9 km long and carries 172,000 passengers per day, providing faster journeys on high-capacity buses. Designs for the first-phase DART corridors prioritised walking and cycling infrastructure improvements. The corridors include continuous cycle tracks, wide footpaths, and at-grade pedestrian crossings. In the Dar es Salaam city centre, Morogoro Rd offers exclusive access for pedestrians, cyclists, and BRT buses.

Figure 11. Integration of BRT with wide footpaths in Dar es Salaam.

2.7. IMPROVED PUBLIC HEALTH

Encouraging walking and cycling as part of everyday commuting is a practical way to improve public health and fitness. There are significant physical and mental health benefits of improved and increased walking and cycling activity, including reduced obesity, diabetes, blood pressure, cardiovascular disease, and cancer, which reduces overall mortality rates. Walking and cycling are also linked to reductions in depression and anxiety and have a positive effect on self-esteem. People who walk and cycle to work are less likely to take sick days, are more productive at work, and enjoy their jobs more.

In addition, walkable communities provide for a more active social life due to increased interactivity. Urban areas in Africa often lack parks, play areas, and spaces where both children and adults can be active. Investing in the design of neighbourhoods to include active mobility infrastructure and public spaces improves happiness and mental health. Vibrant urban experiences also reduce crime, while enhancing a sense of community, which is impossible to achieve in car-oriented urban areas.

3 QUANTIFYING THE BENEFITS OF SUSTAINABLE MOBILITY

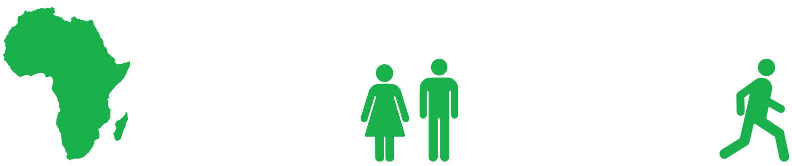
To help cities understand the impacts of policy and investment decisions, ITDP developed the African Cities Investment Model. The model estimates the investments a city or a country would need to make over a 10-year span in order to achieve a sustainable urban mobility system. The tool is scenario-based and creates "what if" scenarios that compare business as usual trends to alternate scenarios. The model uses inputs such as city populations, growth rates, trip rates, and mode splits to generate the outputs, which include fuel consumed, fatalities from traffic crashes, pollution generated, and investment requirements.

This investment model and such scenarios can help policymakers quantify the benefits of investments in walking, cycling, and public transport. The following sections describe the methodology, data, and assumptions used in the study, the "Business-as-Usual (BAU)" and "Sustainable" scenarios, and the results and implications for policy making.

3.1. DATA SOURCES & ASSUMPTIONS

This study uses the 2014 revision of the World Urbanisation Prospects population projections as a foundation for its urban travel projections (UN, 2015). The model includes 188 African cities that will have a combined population of 401 million by 2031.

The model includes estimates of the mode shares for the 188 African cities in the database. The model uses observed values where local mode split data are available, including cities such as Addis Ababa, Cairo, Dar es Salaam, Kampala, Mombasa, and Nairobi (see Figure 14). Where local mode split data are unavailable, the model uses generic assumptions for three population categories: above 5 million, 1 to 5 million, and below 1 million (see Table 1 and Figure 15). The mode shares are interpolated for the population of a given city. Smaller cities are assumed to have higher shares of active mobility and two wheeler use, while large cities have higher public transport use. Although observed mode share patterns vary with local context, the overall trends are consistent with the generic assumptions.



188 largest cities in the African region

Combined population in 2031: 401 million

1.02 billion daily trips (walking, cycling, paratransit, bus, BRT, metro, taxi, car, 2W)

Figure 12. Key figures in the investment model.

3.2. FUTURE SCENARIOS

The African Cities Investment Model includes a baseline scenario representing the situation in 2022 and two future scenarios representing travel patterns in 2031: BAU and Sustainable. For the two future scenarios, the model assumes a uniform increase in daily trips, driven by growing city populations and household incomes. However, the mode shares, trip lengths, and vehicle kilometres associated with those trips vary depending on the scenario characteristics, as described in this section.

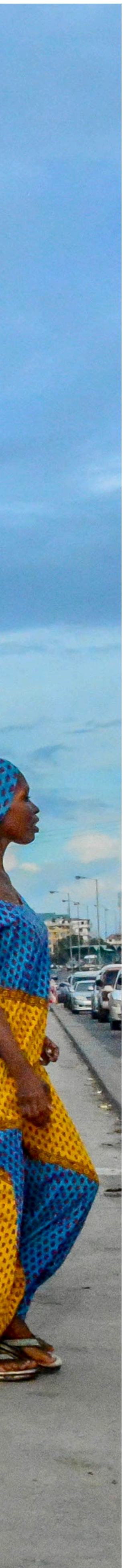


Figure 13. Table top pedestrian crossings facilitating access to a BRT station in Dar es Salaam.

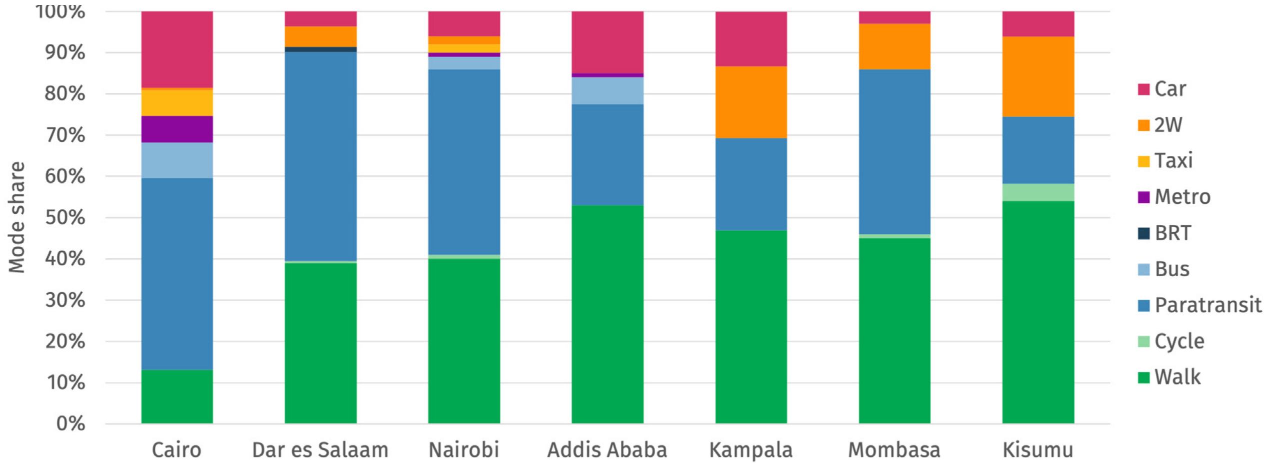


Figure 14. Mode shares for selected African cities.

Table 1. Assumed mode share under the baseline scenario.

Mode	City population categories Above 5,000,000	1,000,000-5,000,000	Below 1 million
Walk	40%	45%	50%
Cycle	1%	2%	4%
Paratransit	45%	35%	25%
Bus	3%	2%	0%
BRT	0%	0%	0%
Metro	1%	0%	0%
Taxi	2%	2%	2%
Car/2W	8%	14%	19%

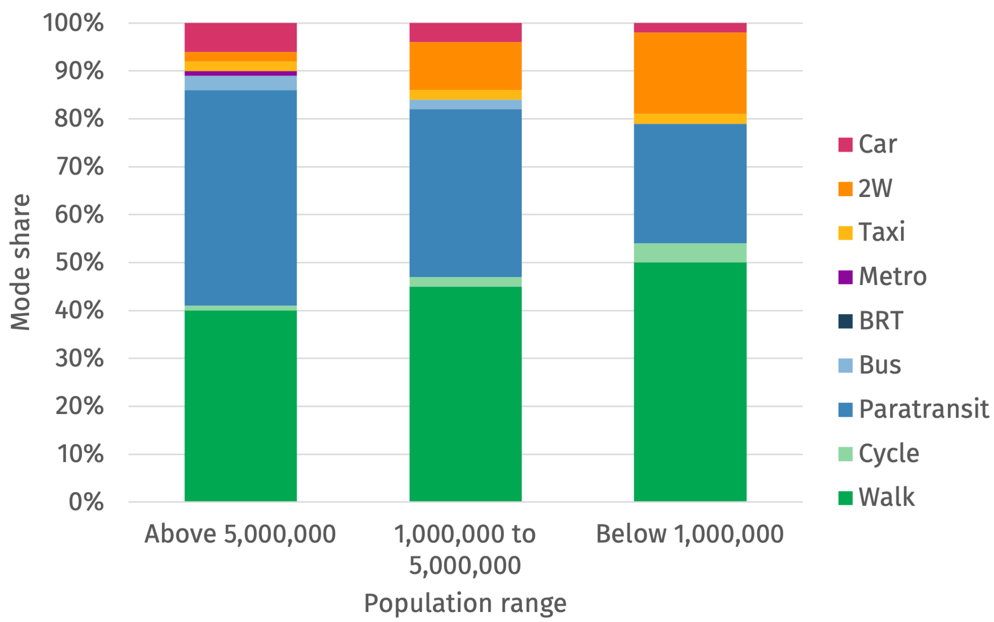


Figure 15. Assumed mode shares per population range for cities where observed mode shares are not available.

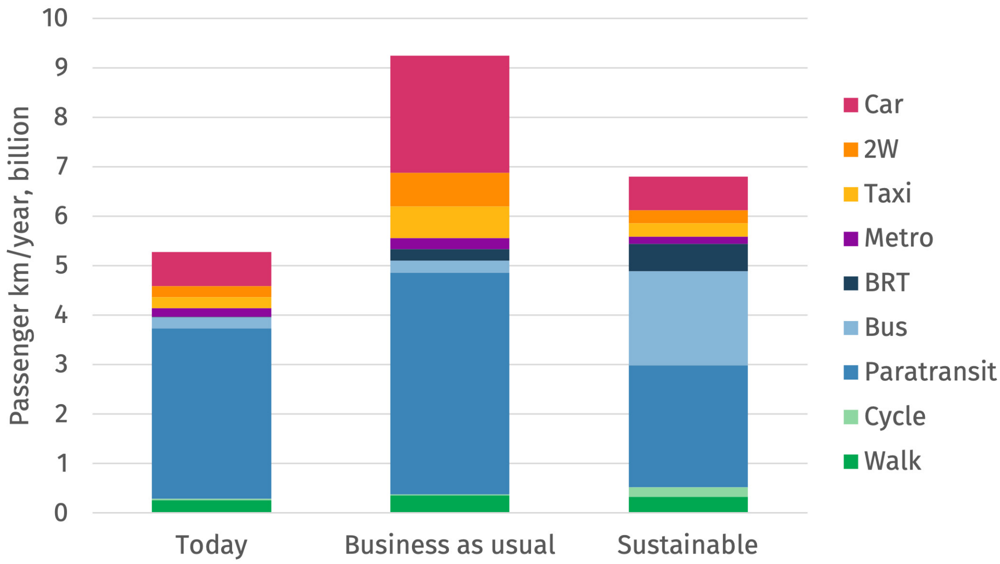


Figure 16. Passenger-km today and under the two future scenarios

3.3. BUSINESS-AS-USUAL SCENARIO

Under the BAU scenario, cities continue to direct investment toward car-centric infrastructure, while public transport, walking, and cycling remain neglected. The BAU scenario builds on recent trends in transport investments around the world, resulting a strong increase in car use as incomes rise. In this scenario, loosely planned cities continue to construct and widen streets to accommodate motor vehicles, with little or no provision for walking and cycling. Growing motor vehicle use and higher speeds create a hostile environment for walking and cycling, causing more people to shift from active mobility to private motorised modes. As growth occurs in the urban periphery at low densities, walking, cycling, and public transport use continue to decline, and dependence on private motor vehicles rises. Cities fail to invest in public transport, resulting in a decline in the mode shares for paratransit as well as improved city bus systems. As walk, cycle, and public transport trip shares fall, private cars and two wheelers absorb the increase in travel demand under the BAU scenario.

3.4. SUSTAINABLE SCENARIO

The Sustainable transport scenario assumes a major departure from the BAU scenario in terms of transport investments and the resulting travel patterns. The overall increase in daily trips remains the same, but cities facilitate a shift to public transport and NMT by improving the provision of high-quality alternatives to private vehicle use. The Sustainable scenario assumes that cities make major investments footpaths, cycle networks, bikeshare systems, expanded bus services with modern vehicles, bus rapid transit (BRT) corridors,

Figure 17. Under the BAU scenario, cities continue to cater for car use (left), while in the sustainable scenario, cities shift investments to active mobility and public transport (right).

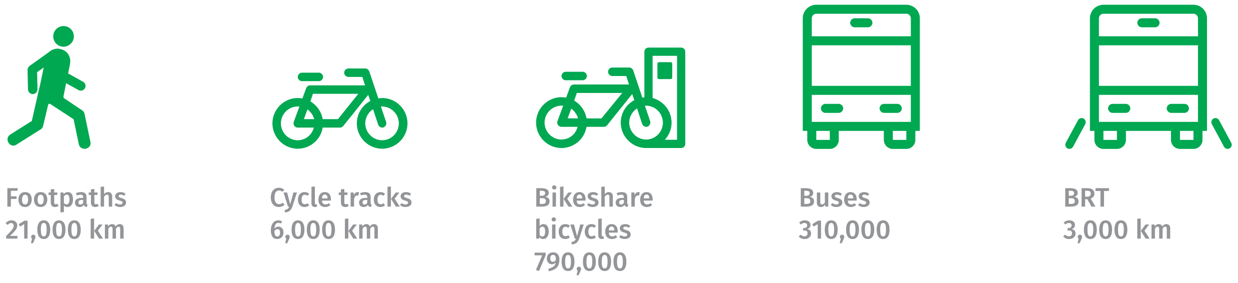


Figure 18. Net infrastructure requirements over 10 years under the Sustainable scenario.

and, in the largest cities, metro systems. The scenario also assumes that cities take steps toward paratransit industry reform and increase the number of buses that operate under regulated public transport systems. On average, for every million urban residents, the Sustainable scenario envisions the construction of 55 km of footpaths, 15 km of cycle tracks, 402 new city buses, and 9 km of mass rapid transit. The Sustainable scenario also assumes the implementation of urban planning interventions that encourage compact mixed-use communities, resulting in shorter trip lengths.

By redirecting investments from car-centric infrastructure such as flyovers and urban highways to sustainable mobility options, cities are able to maintain private vehicle trips at no more than 10 percent above current levels under the Sustainable scenario. Instead of a large increase in private vehicle use, cities accommodate growing travel demand through improved walking, cycling, and public transport facilities.

3.5. RESULTS

3.6. ROAD FATALITIES

Reducing vehicle kilometres travelled and increasing the use of active walking and cycling modes with the requisite infrastructure is likely to reduce the incidence of road crash fatalities and serious injuries. There is a 63 percent reduction in road crash fatalities by 2031 in the Sustainable scenario compared to the BAU scenario.

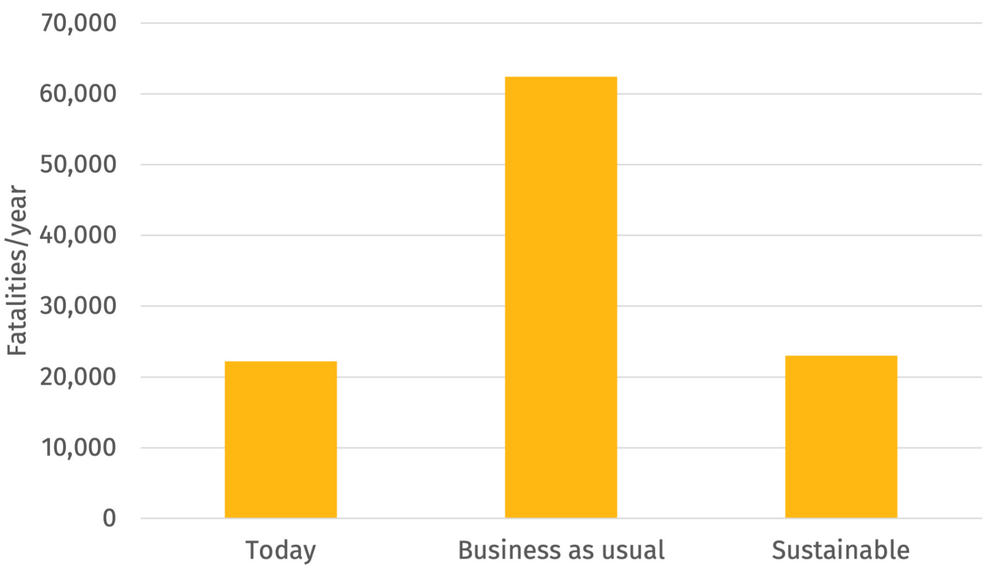


Figure 19. Fatalities per year, by scenario.

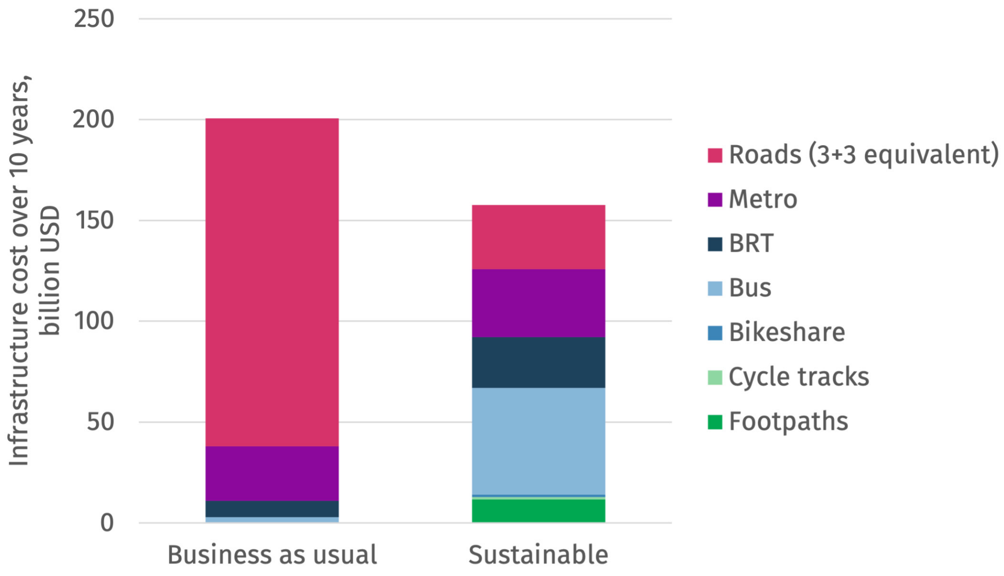


Figure 20. Infrastructure investment over 10 years across all categories, by scenario.

3.7. INFRASTRUCTURE SPENDING

To achieve a sustainable transport scenario by 2031, the net infrastructure requirements include 21,000 km of footpaths, 6,000 km of cycle tracks, 790,000 bikeshare cycles, 310,000 buses, 3,000 km of BRT, and 250 km of metro. ITDP developed cost estimates for these initiatives based on the cost of representative projects in the Africa region. The cost estimates consider the full direct cost of footpaths, cycle tracks, BRT, metro, bus procurement, cycle procurement (for bikeshare systems), and new roads (a function of projected car travel). For example, metro construction cost is estimated at USD 126 million per km, while BRT construction costs are assumed to be USD 8.3 million per km. The total costs also consider the maintenance required for existing and planned infrastructure.

The investment required in the BAU scenario is estimated to be around USD 201 billion, compared to USD 158 billion in the Sustainable scenario. The results indicate that in the BAU scenario, infrastructure costs for roads dominate all other infrastructure costs, at 81 percent. In the Sustainable scenario, the length of required roads drops dramatically to 20 percent of the BAU value. The 21,000 km of footpaths and 6,000 km of cycle tracks needed in 2031 are barely visible since the needed investment, USD 13 billion, is small compared to other costs.

3.8. FUEL SPENDING

Compared to BAU, the Sustainable scenario results in a substantial reduction in fuel costs: USD 109 billion, or a 64 percent reduction in fuel costs. Lower fuel costs will benefit commuters and help countries save valuable foreign exchange.

3.9. CO_2 EMISSIONS

The model derives CO_2 emissions based on the fuel consumption for different modes. Specific fuel types were used in the assessment: road-based modes are dominated by petrol and diesel fuel, while metro systems are assumed to be electrified. If dependence on private motorised modes grows further, CO_2 emissions will continue to rise. In the BAU scenario, CO_2 emissions are projected to increase nearly 86 percent by 2031. The dominance of cars and 2-wheelers is evident, particularly in the BAU scenario: car trips represent only 13 percent of trips but generate 73 percent of CO_2 emissions.

By contrast, the sustainable transport scenario would cut CO_2 emissions by 220 million tonnes per year, or about 63 percent, from 351 million tonnes in the BAU to 131 million tonnes in the Sustainable scenario. There is further greenhouse gas mitigation potential if fuel economy improvements or electrification occur under the Sustainable scenario.

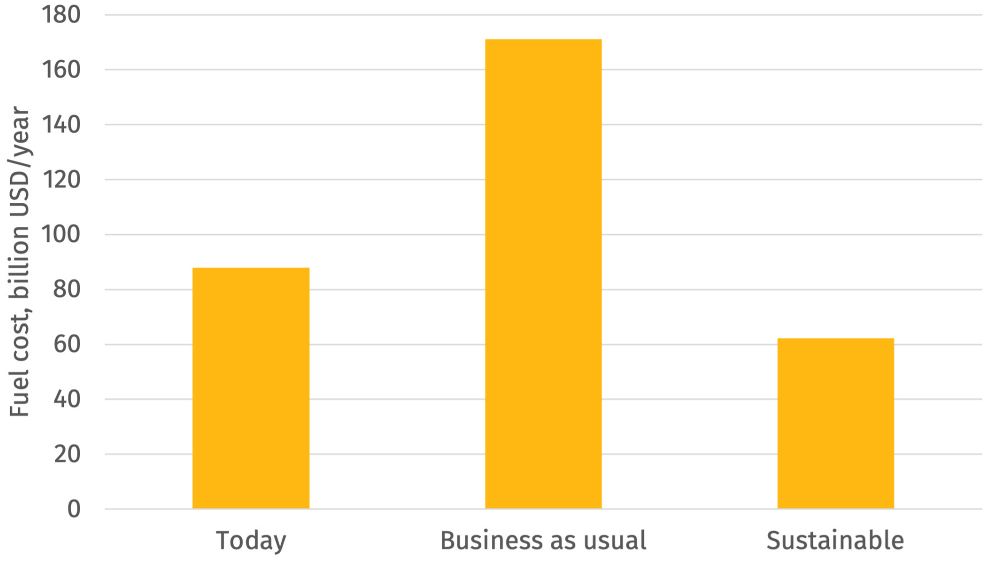


Figure 21. Fuel cost per year, by scenario.

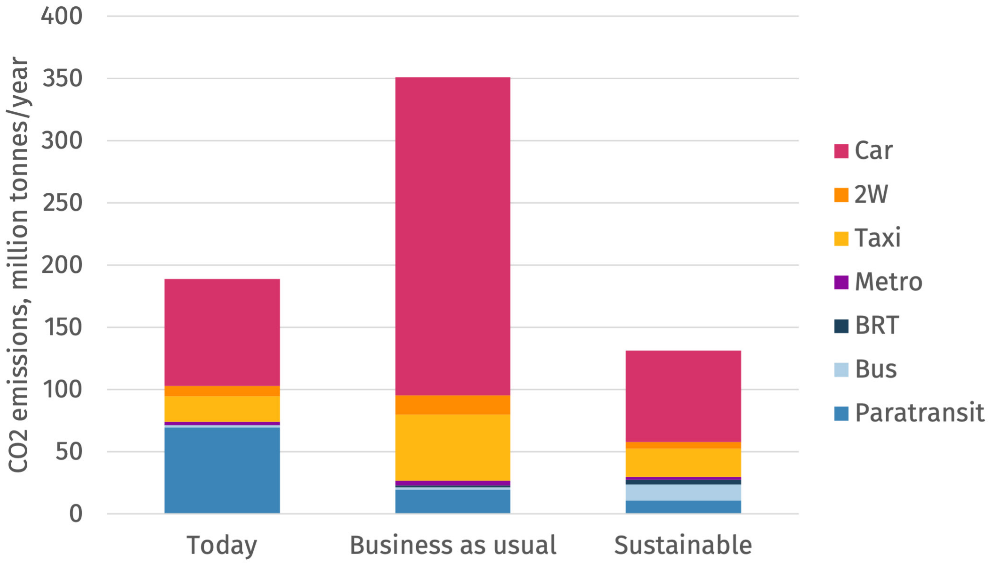


Figure 22. CO2 emissions, by scenario.

3.10. LOCAL POLLUTANT EMISSIONS: NO_X AND PM

This section examines how different scenarios might affect emissions of serious local air pollutants, namely nitrogen oxides (NO_x) and particulate matter (PM). Exposure to these pollutants is associated with increased risk of death from respiratory diseases including lung cancer, chronic obstructive pulmonary disease, and respiratory infections (OECD, 2020). The model results indicate that paratransit vehicles are presently responsible for a large share of NO_x and PM emissions. However, under the BAU scenario, cars generate an increasing share of local pollution, generating over half of PM emissions. The Sustainable scenario results in a 48 reduction in NO_x emissions and a 57 percent reduction in PM emissions compared to BAU.

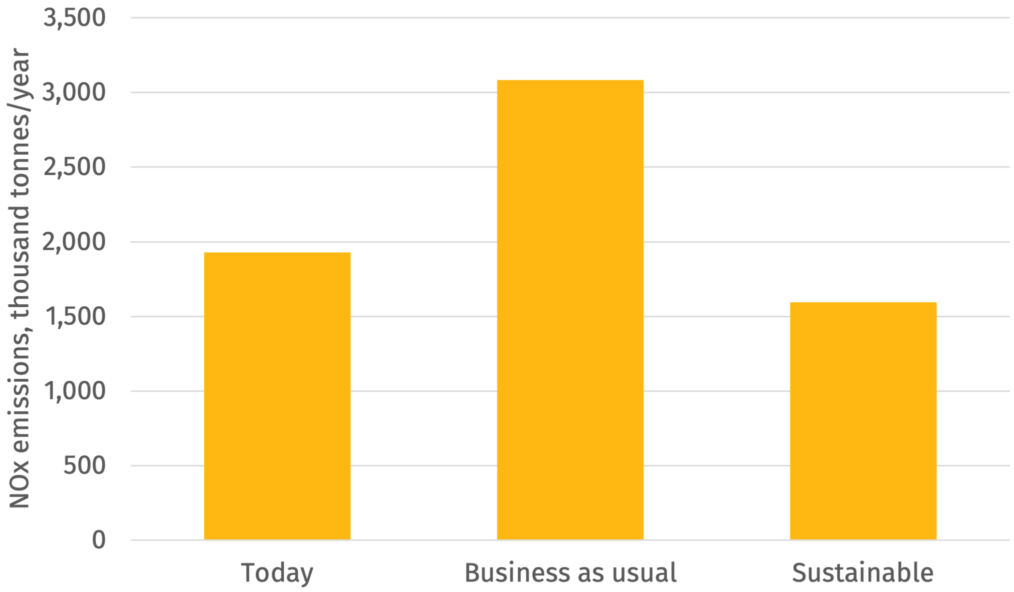


Figure 23. NOx emissions by mode and scenario.

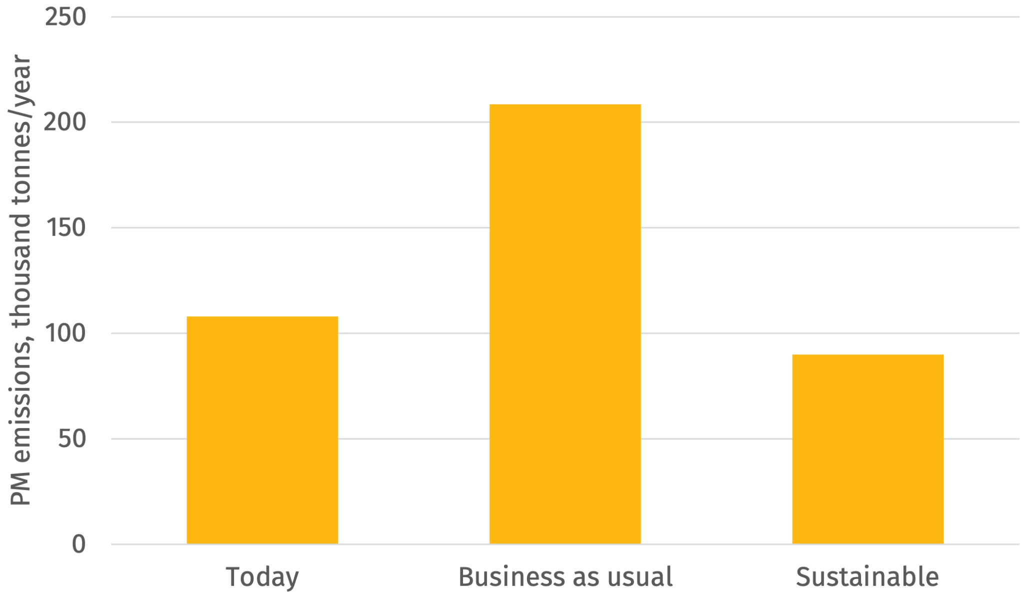


Figure 24. PM emissions by mode and scenario.

4 CONCLUSION

Walking, cycling, and public transport currently play a significant role in mobility systems in African cities, but a lack of quality facilities is contributing to a shift to private vehicles. Greater use of cars and motorcycles has led to growing congestion, rising fatalities from traffic crashes, costlier commutes, and worsening air quality. As demonstrated through the African Cities Investment Model, a Business-as-Usual (BAU) scenario will result in a sharp increase in greenhouse gas emissions, local pollution, fuel expenditures, and expenditures on urban infrastructure. There is a pressing need to act quickly to avoid the BAU scenario.

Under the Sustainable scenario, cities take steps to improve facilities for walking, cycling, and public transport. Results show that the Sustainable scenario would reduce annual CO_2 emissions from urban passenger transport by about 63 percent compared to the BAU scenario. Under the sustainable scenario, cities would save USD 43 billion in avoided urban transport infrastructure spending over the next decade and commuters would enjoy USD 109 billion in avoided fuel costs. Road crash fatalities would fall by 63 percent.

To achieve the ambitious Sustainable scenario, national and local governments need to pursue sustainable mobility investments and policies, including the following:

- Implement high-quality pedestrian infrastructure, including wide walkways and traffic calmed or signalised pedestrian crossings on all major streets.
- Develop citywide networks of physically protected bicycle infrastructure.
- Reduce urban speed limits to 50 km/h to improve safety for NMT users.
- Invest in bikeshare systems to serve short trips and improve last-mile access to public transport.
- Work with the paratransit sector to introduce service contracting, improve labour standards, and roll out electronic fare collection.
- On high-demand public transport corridors, implement BRT systems with dedicated median lanes, level boarding, off-board fare collection, and intersection improvements.
- Coordinate metropolitan-level transport and land-use plans. Adopt zoning policies and building control regulations that promote mixed used neighbourhoods and pedestrian friendly urban design.
- Repeal policies that subsidize additional motor vehicle use, such as fuel subsidies, minimum off-street parking requirements, and free or low-cost on-street parking. Instead, institute demand-based on-street parking fees and congestion charges.
- Avoid using limited funds toward flyovers and urban highways. Existing highways within city areas can be reconfigured as urban streets that are more conducive to the use of sustainable modes.
- Revise laws and enforcement practices to protect people cycling and walking.

High-quality walking, cycling, and public transport paired with measures to manage the use of private vehicles and land use policies that promote compact urban development will result in economic, environmental, and social benefits for African cities. Investing in sustainable mobility will ensure that all urban residents, including the urban poor, have equitable access to opportunities. Now is the time to change the approach to urban mobility planning to achieve a more prosperous future for urban Africa.

Figure 25. A car-free shopping arcade in Aswan, Egypt.


THAILAN
Northern Training Cam
The Working-Phan
increase your
bikeprint
in the world

5 ANNEX

5.1. TRIP CHARACTERISTICS

To determine the number of daily trips per person by mode, trip rates are assumed for the different scenarios as shown in Table 2. Then the total number of trips is calculated based on the mode share and city population. Another critical variable is the trip length, which is generated based on an estimated city diameter. Trip length factors considered for each mode are shown in Table 3, and assumptions for city diameters based on population size were made for the different scenarios.

Table 2. Daily trip rates for the Today, BAU, and Sustainable transport Scenarios according to city populations.

Mode	City population category		
	Above 5,000,000	1,000,000-5,000,000	Below 1,000,000
Today	2.5	2.2	2.0
2031: Business as usual	2.8	2.5	2.3
2031: Sustainable	2.8	2.5	2.3

Table 3. Trip length factor for each model.

Mode	Trip length (km) per km of city diameter
Walk	0.03
Cycle	0.08
Paratransit	0.4
Bus	0.4
BRT	0.5
Metro	0.6
Taxi	0.4
Car	0.4
2W	0.2

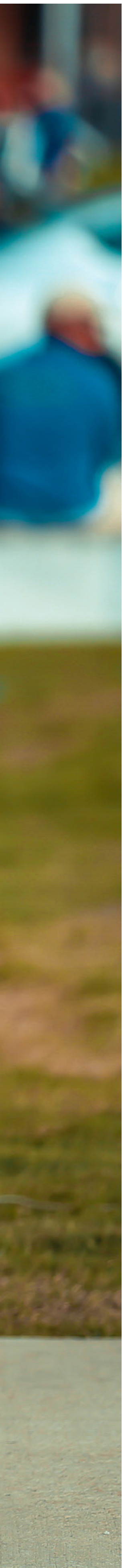


Figure 26. A cyclist using the Cairo bikeshare system.

5.2. EMISSION FACTORS

The model includes PM and NO_x emissions factors for petrol and diesel for cars, motorcycles, and taxis. For public transport, the Euro emission standards factors were considered: Euro I for paratransit and Euro IV for new buses and BRT. For paratransit fuel efficiency, the model relies on factors for Kenyan paratransit vehicles per Mbandi et al (2019).

Table 4. PM and NOx emission factors.

	PM emission Factor (g/km)		NOx emission Factor (g/km)	
	Petrol	Diesel	Petrol	Diesel
Cars	0.008	0.145	0.950	0.450
Motorcycles	0.057	-	0.050	-
Taxi	0.008	0.145	0.950	0.450

Table 5. Emission standards for public transport vehicles.

Standard	PM emission factor (g/km)	NOx emission factor (g/km)
Euro I	0.648	14.4
Euro IV	0.036	6.3

Table 6. Fuel prices.

Fuel	Cost (USD/litre)
Petrol	1.30
Diesel	1.14

6 SOURCES

Addis Ababa City Government Transport Programs Management Office (TPMO) and National Association of City Transportation Officials (NACTO). (2017). Design to Save Lives: Transforming LeGare Intersection in Addis Ababa. Retrieved from https://globaldesigningcities.org/wp-content/uploads/2018/01/le_gare-report.pdf

ITDP. (2018). Women and Children's Access to The City.

Mbandi, Aderiana. (2019). Estimating On-Road Vehicle Fuel Economy in Africa: A Case Study Based on an Urban Transport Survey in Nairobi, Kenya. Energies. 12:1177. Retrieved from https://www.mdpi.com/journal/energies

Ministry of Economic Planning & Budget (2013). The Socio-economic Costs of Traffic Congestion in Lagos. Retrieved from http://mepb.lagosstate.gov.ng/wp-content/uploads/sites/29/2017/01/EIU-Working-Paper-2-Draft-2-Traffic-Congestion.pdf

OECD. (2020). "Air quality", in Environment at a Glance Indicators, OECD Publishing, Paris, https://doi.org/10.1787/80661e2d-en.

United Nations Center for Regional Development (UNCRD). (2018). Mobility and NMT in Sustainable Urban Transport Development Role of City Developers.

United Nations, Department of Economic and Social Affairs, Population Division. (2015). World Urbanization Prospects: The 2014 Revision.

United Nations. (n.d.). SDG Indicators. United Nations. Retrieved from https://unstats.un.org/sdgs/indicators/indicators-list/

World Bank. (2013). Cairo Traffic Congestion Study: Final Report. Retrieved from https://openknowledge.worldbank.org/handle/10986/18735

World Health Organization (WHO). (2013). Pedestrian Safety: A Road Safety Manual for Decision-Makers and Practitioners.

World Health Organization (WHO). (2018). Global Status Report on Road Safety 2018.

World Health Organization (WHO) and World Bank. (2011). World Report on Disability: Summary.

WWW.AFRICA.ITDP.ORG
WWW.UNHABITAT.ORG
WWW.UNEP.ORG

ITDP UN environment UN HABITAT FOR A BETTER URBAN FUTURE