

Sustainable Urban Mobility Plan for the Expanded Kumasi

Synthesis report



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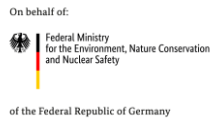
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Abbreviations and acronyms

ADEME	French Environment and Energy Management Agency
AFAWI	Alliance for African Women Initiative
AFD	French Agency for Development
AQI	Air Quality Index
BMU	German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety
BRRl	Building and Road Research Institute
BRT	Bus Rapid Transit
CBD	Central Business District
Cerema	Centre for Studies and Expertise on Risks, Environment, Mobility and Urban Planning
CO ₂ eq	Carbon dioxide equivalent – global warming potential
CODATU	Cooperation for the Development and Improvement of Urban and Peri-urban Transport
COP21	2021 Conference of the Parties
CSIR	Council for Scientific and Industrial Research
CSPG	Cross Sectorial Planning Group
DFR	Department of Feeder Roads
DG INTPA	European Commission's Directorate-General for International Partnerships
DoT	Department of Transport
DUR	Department of Urban Roads
DVLA	Driver and Vehicle Licensing Authority
EBRD	European Bank for Reconstruction and Development
EPA	Environmental Protection Agency
EPAG	Environmental Protection Association of Ghana
FFEM	French Facility for Global Environment
FMD	Floating Mobile Data
GHA	Ghana Highway Authority
GHG	Greenhouse Gas
GIZ	German Society for International Cooperation
GNFS	Ghana National Fire Service
GNPC	Ghana National Petroleum Cooperation
GoG	Government of Ghana
GPRTU	Ghana Private Road Transport Union
GRTCC	Ghana Road Transport Coordinating Council
GSS	Ghana Statistical Service
GUMP	Ghana Urban Management Project
HGV	Heavy Goods Vehicles
IGF	Internally Generated Funds
ITDP	Institute for Transport and Development Policy
JICA	Japanese International Cooperation Agency
KATH	Komfo Anokye Teaching Hospital
KFW	Reconstruction Credit Institute
KMA	Kumasi Metropolitan Area
KNUST	Kwame Nkrumah University of Science and Technology
KTI	Kumasi Technical Institute
KTU	Kumasi Technical University
MAAP	Micro-computer Accident Analysis Package
MLGRD	Ministry of Local Government and Rural Development

MMDA	Municipal and District Assemblies
MoFEP	Ministry of Finance
MoT	Ministry of Transport
MRD	KMA Metro Roads Department
MTE	French Ministry of Ecological Transition
MTTD	Motor Transport and Traffic Directorate
MTTD	Motor Traffic and Transport Department
NDPC	National Development Planning Commission
NGO	Non-Governmental Organisation
NMT	Non-motorised transport
NRSA	National Road Safety Authority
NRTCD	National Road Traffic Crash Database
OBR	Oli Best Road Safety Organisation
PAH	Polycyclic aromatic hydrocarbon
PCU	Passenger car units
PM	Particulate matter
PPP	Public-Private Partnership
QBS	Quality Bus Services
QTS	Quality Trotro Services
RCC	Regional Coordinating Council of Ashanti
RSC	Route Service Contract
SPV	Special Proposal Vehicle
SSNIT	Social Security and National Insurance Trust
SUMP	Sustainable Urban Mobility Plan
TO	Transport Officers
TRECK	Transport Research and Education Centre of Kumasi
TRL	Transport Research Laboratory
TVOC	Total Volatile Organic Compounds concentration
UNICEF	United Nations International Children's Emergency Fund
URD	Urban Roads Department
VOC	Volatile Organic Compounds
VRC	Vehicle Registration Certificate
WHO	World Health Organisation

1. Executive summary

1.1 Background of the SUMP

“Let us take action to reduce carbon emission in our cities and let us be part of the solution”, declared Ghana President, Nana-Akufo-Addo, during the Climate Chance Summit Africa in October 2019. The fight against climate change is one of the priorities of the Ghanaian government. Following this dynamic statement, the Kumasi Metropolitan Assembly applied to MobiliseYourCity partnership in 2019 and expressed interest in the implementation of a Sustainable Urban Mobility Plan (SUMP).

Acknowledging these challenges, the Kumasi SUMP application was favourably considered and approved by the MobiliseYourCity steering committee. Launched at the 2015 Conference of the Parties (COP21) in Paris, the MobiliseYourCity Partnership is a leading global Partnership for sustainable mobility of nearly 100 partners, including 65 city members and 15 country members. The partnership aims at supporting and providing services to at least 100 cities and 20 countries to improve urban mobility for their citizens and decarbonise transport with a target of 50% less urban mobility emissions by 2050.

1.2 Objective and scope

The SUMP includes the entire **Expanded Kumasi area, located in Ghana, Ashanti region**. Figure 1 illustrates the Metropolitan, Municipal and District Assemblies (MMDA) constituting the Expanded Kumasi Area.

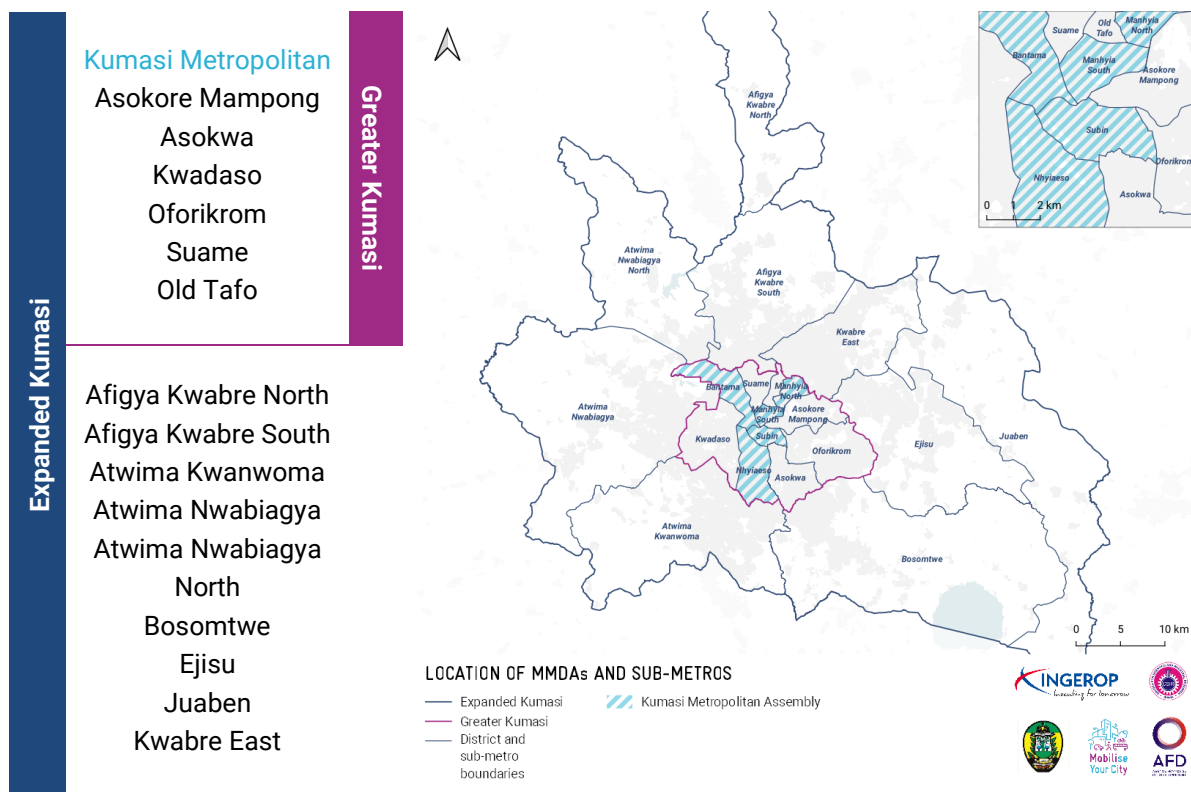


Figure 1: Location of MMDAs and sub-metros

The SUMP time horizon covers the development of mobility in the Expanded Kumasi area **from 2024 to 2040, or approximately 15 years.**

1.3 Methodology

The SUMP is developed following the MYC guidelines. The methodology follows 4 phases:

- **Active inception**
- **Diagnosis**
- **Definition of a vision and strategic objectives**
- **Detailing the selected scenario into an action plan.**

Two cross-cutting missions were also conducted during the development of the SUMP:

- **Participatory process**
- Establishment of a **Mobility observatory.**

The governance framework of the study is as follow:

- **Client/funding agency:** Agence Française de Développement (AFD)
- **Counterpart:** MMDAs of the Expanded Kumasi area, led by KMA
- **Consultant:** INGEROP Group/Building and Road Research Institute (BRR)
- **Taskforce:** core organ for the regular technical follow-up of the project, composed of technical key personnel of MMDAs or local agencies
- **Technical committee:** advisory body to the project, composed of technical key personnel of MMDAs and local key agencies
- **Steering committee:** decision and validation body of the project, composed of the MMDAs Chief Executives and Coordinating Directors, as well as the Regional Minister and the Regional Coordinating Director.

The Technical and Steering Committees met at the critical stages of the SUMP development to validate the orientations and decide on the proposed scenarios and measures.

1.4 Document structure

The present final SUMP document follows the methodology of developing the SUMP:

- Chapter 1: the present Executive summary
- Chapter 2: Process and management structure
- Chapter 3: Status quo analysis
- Chapter 4: Objectives, vision and scenarios
- Chapter 5: Selected scenarios and actions
- Chapter 6: Monitoring and reporting.

1.5 Key results: Diagnosis of mobility in Kumasi

1.5.1 Summary of socio-demography and urban structure

Kumasi metropolis, free of major constraints or boundaries, developed following a classic mono-centric structure.

Built-up areas currently cover over 800km² and 32% of the territory. Expansion is fast, estimated at 4.7% per year, with growth occurring in a concentric manner and along main road arteries.

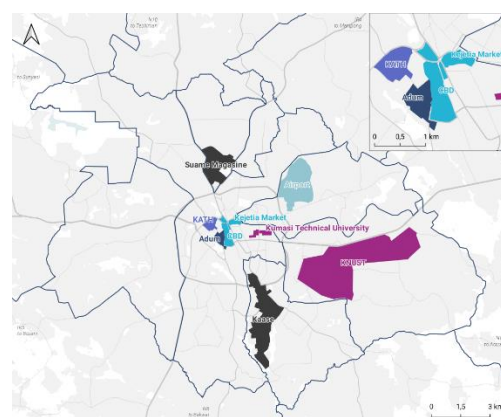
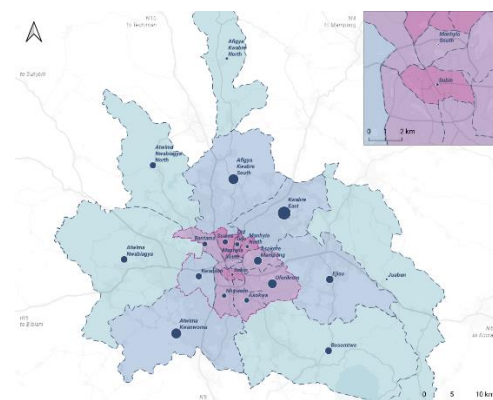
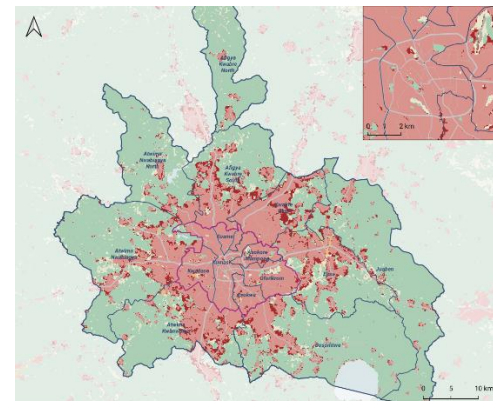
Population currently numbers over 2.9 million inhabitants in Expanded Kumasi, including more than 1.3 million in Greater Kumasi and 444 000 in KMA.

Population densities are the highest near the city centre, being elevated in almost all of Greater Kumasi. The outer MMDAs have a different population profile, with lower densities and larger households.

Education levels, occupations, and socio-professional categories vary largely among the population. The inner ring inhabitants (living in Greater Kumasi, but outside the ring road) show the highest education levels, highest levels of employment, and highest socio-professional categories, reflecting richer areas. Gender disparities are significant in all areas.

Many activities and services are concentrated in the CBD and in the Greater Kumasi. Few services are available in the outer areas, and these concentrate along the main road arteries.

Several strategic planning documents have been developed over the years, but none have been consistently implemented to this day.



1.5.3 Summary of the institutional and financial framework

At the national level, the mobility sector is quite fragmented in Ghana, between infrastructure (Ministry of Roads and Highway, with several different departments and agencies: GHA, DUR, DFR) and transport operations (Ministry of Transport). Although regional road agencies (GHA, DUR, DFR) are present in Kumasi, important decisions, project prioritisation and budget allocations are principally made in the central office in Accra.

The Regional Coordinating Council of Ashanti acts as a link between the districts and the Ministry of Local Government and Rural Development (MLGRD) and is an indispensable partner in larger projects which involve several MMDAs.

At a local level, MMDAs represent the most advanced level of decentralisation. Expanded Kumasi has 16 MMDAs, KMA being the largest and most structured one.

MMDA's Departments of Transport, among other responsibilities, regulate urban transport services and collect fees linked to public transport licences.

MMDA's Departments of Roads (MRD or URD) are responsible for road design, planning and maintenance; except for roads which are the responsibility of the regional office of DUR, DFR or GHA (arterial roads).

Financing for maintenance comes mainly from the Road Fund, a national fund which is currently in financial distress. There are no clear rules for the budget each agency is intitled to.

Financing for new infrastructure projects is more mixed (Government of Ghana Funds, Road Fund, donor funds). It is unpredictable, depending on government priorities decided at the national level. Most new infrastructure projects are carried out by the regional offices, rather than MMDAs.

1.5.4 Summary of mobility patterns

Expanded Kumasi inhabitants have a mobility rate of 75%, with an average of 2.1 travels per day for the mobile population.

Travel patterns are mostly work and school-related, with other purposes being the minority.

Travel times follow a classic distribution with marked peak periods.

Trotro is the main transport mode in terms of number of travels (50%), followed by walking (15%, underestimated as travels shorter than 10min are not included), and private car as a driver (14%).

Public transport users choose this mode mainly due to affordability reasons and lack of alternatives. Levels of satisfaction seem acceptable, except for safety.

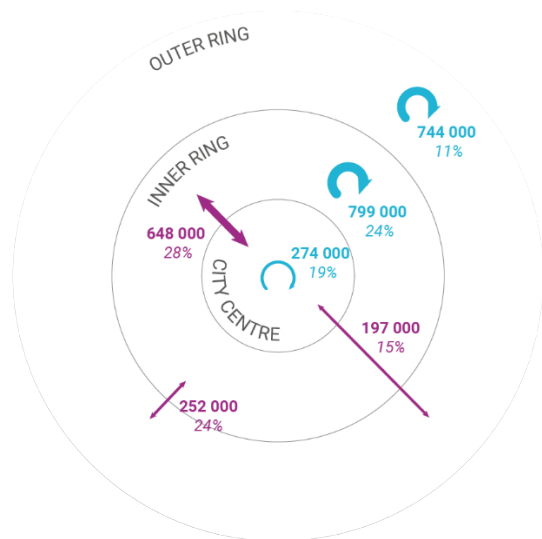
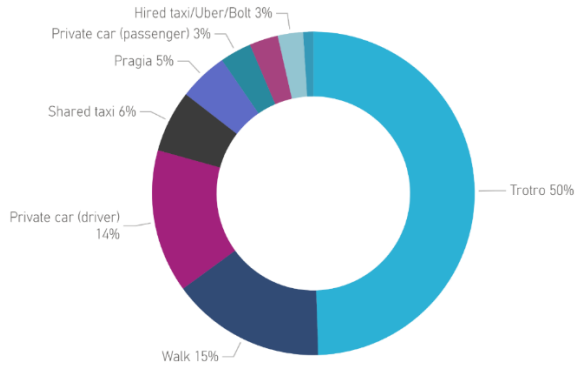
Private car users choose this mode for comfort and travel times. Its modal share is higher in some inner ring sectors, reaching until one quarter of the travels. In general, occupation rates are low.

As in many contexts, women are over-represented among public transport users and pedestrians, and under-represented among private vehicle users. Women are also less mobile.

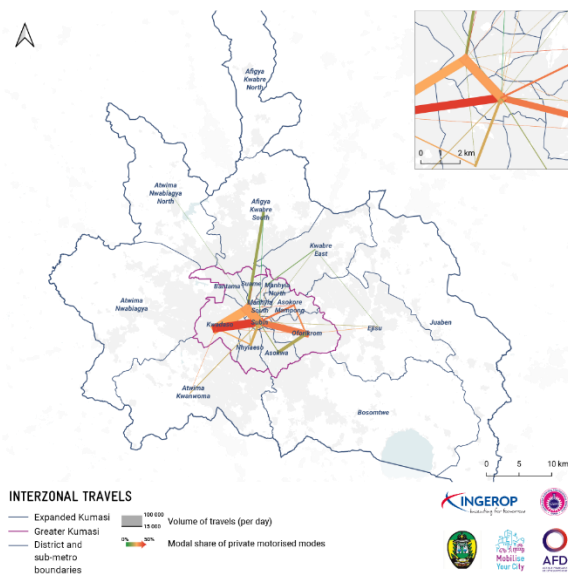
In geographical terms, the main flow of travels is within the inner ring; followed by travels within the outer ring; and travels between inner ring and city centre. An important concentration of flows is observed around the CBD.

Travels of more than 10 minutes inside the city centre are relatively few (concentration of the city centre), as are the travels between the outer ring and the other sectors (long distances and less mobile population).

Public transport use is the highest for inter-zonal travels.



Values in bold are the number of daily travels, values in italic are the private motorised transport modal share



1.5.5 Summary of private and non-motorised transport

The road network is structured in a radial logic, in coherence with the city structure, presenting eight main axes and a ring road surrounding the densely urbanised area.

Although the network shows no real deficits, it lacks alternatives, including in the city centre where several axes converge on the market area (difficulty to by-pass).

Most roads are single carriageway. Many of the main ones are in relatively good maintenance condition. Most lack any infrastructure for pedestrians, and the existing walkways are often occupied. Competition between modes and between usages is high (vendors, public transport stops, parking, etc.) and encroachment is a big issue.

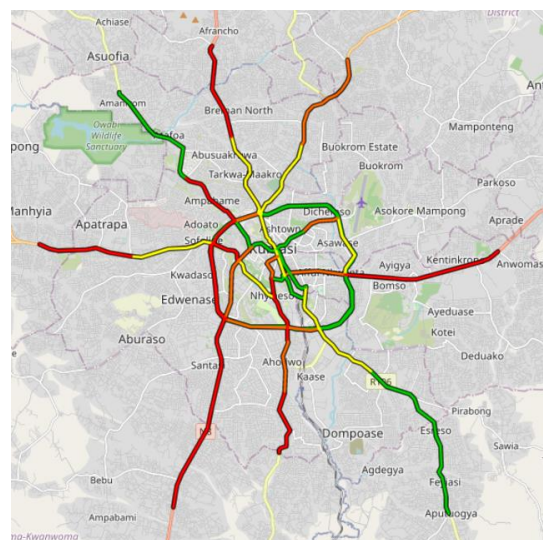
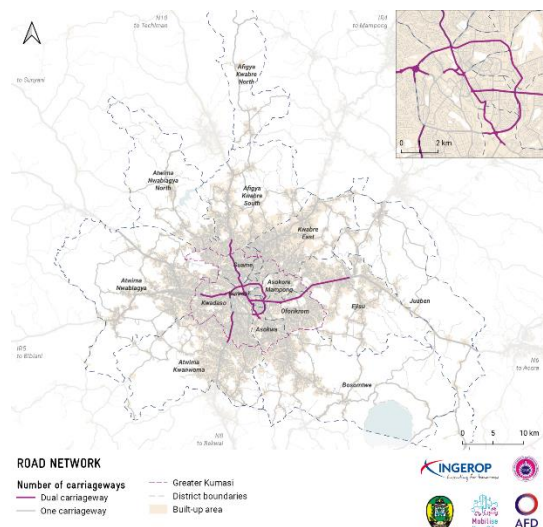
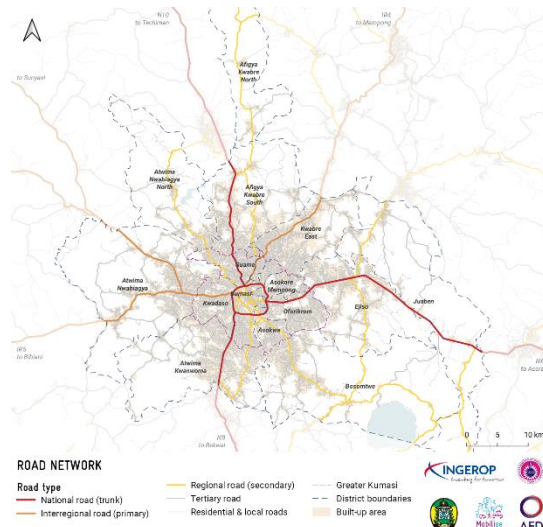
Private car ownership is relatively high in Kumasi, with 25% of households declaring the possession of a private vehicle. Private cars in Kumasi seem relatively recent and in good condition.

Road accidents disproportionately affect pedestrians, with a high concentration of accidents in the evening, due to inadequate pedestrian walkways and lighting. Driver behaviour also plays an important role.

Road trips by private car are relatively short (often under 5km).

Traffic levels are moderate on most roads, but surpass 1500-2000 PCU/hour during peak hour in certain points.

Congestion is the highest during morning peak hour, concentrated in the South-West of the ring road (not dualized) and the arteries leading to it. Travel times during peak hour can almost double. The ring road is solicited all day long. Circulation in the CBD is especially difficult due to encroachment.



1.5.6 Summary of public transport supply and demand

Public transport system is mainly structured around trotros and taxis.

A very important number of routes is identified, with more than 450 trotro and taxi routes in the Expanded Kumasi.

In Greater Kumasi, the coverage of the network is very high. Routes gather towards the CBD.

In Expanded Kumasi, coverage is unequal; presenting mostly the main roads, which converge towards secondary urban centres.

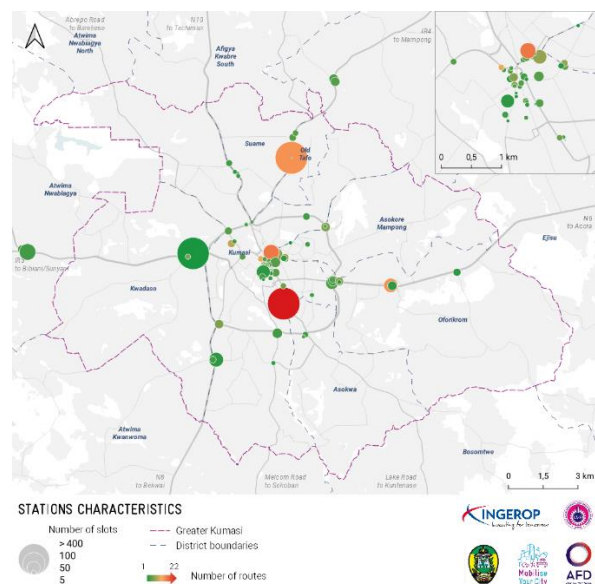
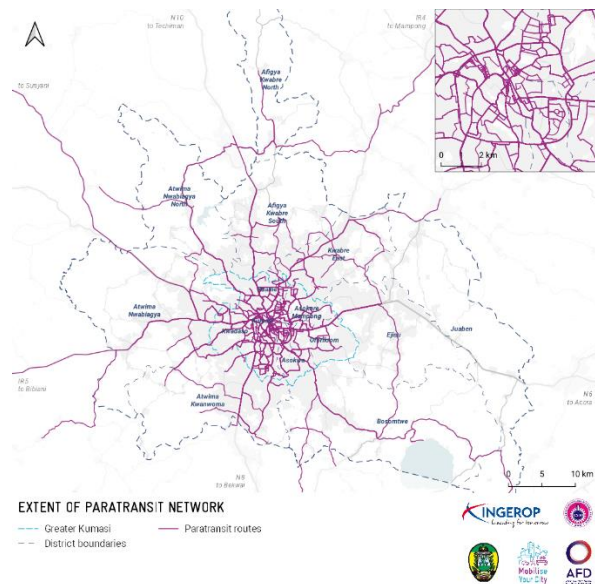
Vehicles operate from stations on a fill-and-go principle. Lack of space for stations is a main issue. Registered trotros compete with illegal vehicles (wa-was), which operate directly on the road. No formalised bus stops exist along the routes.

It is estimated that about 10,000 public transport vehicles operate in the Kumasi Metropolitan Area. Figures are unknown for the other areas.

Frequencies are high, 7 to 15min on peak hours and 15 to 30min off peak; operating times are usually about 5:30 am – 6:30 pm (later on some routes).

Average fares are about 2.7 - 4 GHC for a medium-length ride. Public transport users report paying on average 9 cedis/day for their trotro travels (round trip).

Trotro and taxi vehicles are often old and not in a very good state.



The Adheyee network is a formal bus system operating 10 routes with high-capacity vehicles. This network suffers from low ridership due to an inadequate operating mode.

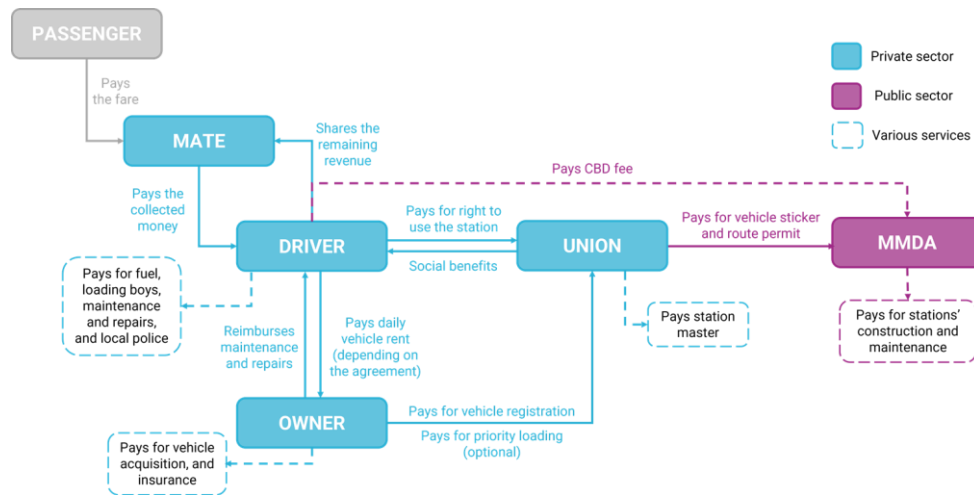
Paratransit is rather highly regulated in the Kumasi area, with various mandatory registrations and authorisations. Routes are authorised by the MMDAs from which they operate.

The system shows flexibility to adapt to new needs, such as enlarging the coverage area and introducing new routes.

Although KMA has developed tools to monitor public transport offer, this practice is today incomplete due to a lack of resources.

All trotros and taxis are supposed to be associated with one of Kumasi’s 24 registered unions. These are central to the organization of the paratransit system, responsible for registration of drivers and vehicles, station management, and route regulation for example.

The driver is a central actor in the daily operation of trotros and taxis. The driver collects fares and does the payments relative to the daily operation (fees to the vehicle owner, mate compensation, fuel refills, etc.).



The paratransit system operates without any public funding. Guidelines for fares are set at the national level, then fares are fixed by the transport unions in consultation with the government. Inflation and fuel price increases are putting a strain on the economic balance of the paratransit system, with some drivers illegally augmenting revenue through “short-short”. A recent unilateral fare increase was implemented by one of the unions.

It is important to mention the existence of wa-was, which are illegal trotros and taxis. It is estimated that about half of the total paratransit offer in Kumasi is ensured by these vehicles, and they are therefore today necessary to provide sufficient transport services for the population. However, the wa-was create difficulties for the legal operators and for the community (unfair competition, illegal occupation, and disruption of public space).

Pragias (motorised tricycles) have also emerged in Kumasi. Their commercial operation is illegal and generates road safety issues.

Although rules and regulations are in place, little enforcement is conducted, for example regarding wawas, pragias, rules for CBD access, and encroachment.

1.5.7 Summary of carbon emission and air quality

Greenhouse Gases (GHG) emissions are one of the most prevalent triggers of climate change. Road transportation accounts for 11.11% of the total GHG emissions in Ghana, with 5.9 MtCO₂eq emitted in 2016.

The annual road transport GHG emissions in Kumasi was estimated at 366 ktCO₂eq/year (well-to-wheel estimation), with an average transport-related GHG emissions per inhabitant of 126 kgCO₂eq/year.

This relatively reasonable figure can be explained by a high reliance on shared vehicles in Kumasi (trotros). However, private vehicle transportation still accounts for a disproportionate amount of GHG emissions in Kumasi.

Air pollution resulting from transportation-related activities contributes to increased risk of morbidity and death. The pollutants of concern to health are nitrogen dioxide, carbon monoxide, black smoke, benzene, PM10 (PM with a diameter of less than 10µm) and PM2.5, polycyclic aromatic hydrocarbons (PAHs) and metals, including lead.

Measures on site analysed air pollution in 3 strategic Kumasi intersections. Kejetia Roundabout has the worst air quality, with the AQI (Air Quality Index), a measure of overall pollution, showing unhealthy conditions for sensitive groups (AQI figures >100) for about 12% of readings during a typical week. Each surveyed site had concentrations higher than WHO recommendations for PM2.5, a condition shared by many cities around the world.

1.6 Key results: Objectives and Vision for mobility in Kumasi

The objectives for mobility in Kumasi, which the SUMP must achieve, were identified on the basis of the diagnosis and with the active participation of stakeholders:

- Improve urban and road safety, NMT conditions
- Enhance the public transport system
- Improve traffic and parking conditions
- Improve sustainability
- Improve the institutional and revenues framework
- Enhance the regulation and enforcement systems
- Educate the public.

The vision for mobility in Kumasi was articulated around **four mottos**:

- A city where it is **safe and pleasant to walk**, offering an **improved urban environment**
- A city offering a **quality public transport** system for every need
- A city where **road use is optimized** through infrastructure and traffic management
- A city offering its local officials the tools to **manage mobility effectively**.

The **very long-term vision developed for the SUMP is highly ambitious**. The proposed measures are detailed in the present report: they include many major infrastructure projects (including 8 BRT projects and an outer ring road), heavy institutional arrangements, and huge investment requirements.

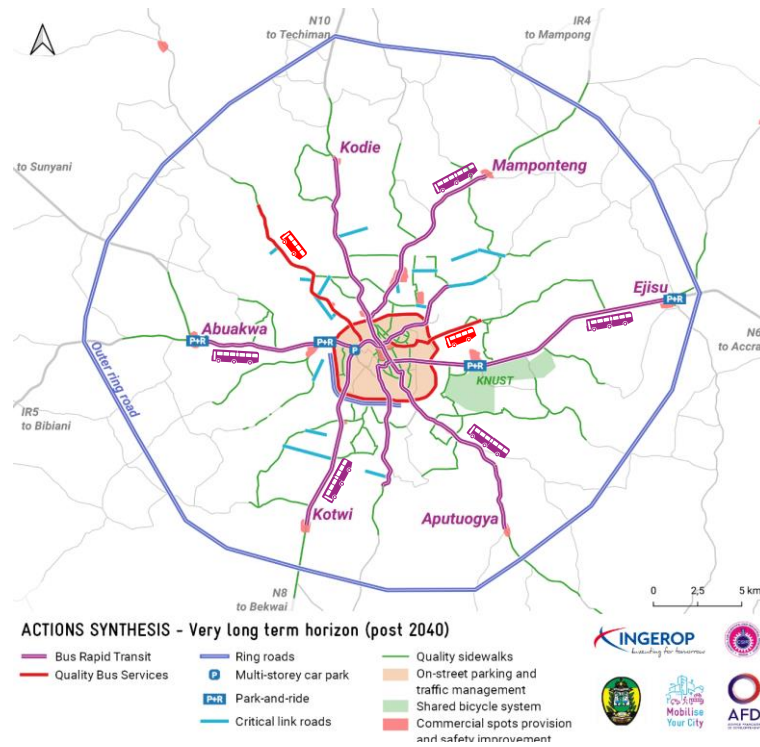


Figure 2: Very long term vision (post SUMP horizon)

1.7 Key results: Selected scenario and action plan

A set of measures gathered into a scenario was selected by steering committee in March 2023. This report refines this scenario into a complete, phased, and funded action plan. It also distributes responsibilities of stakeholders towards these actions, as well as the potential operating mode and simplified business model.

The action plan encompasses six categories to be the most **comprehensive** and **integrated**:

- **Non-motorised transport** improvement
- **Traffic** conditions and **safety** improvement
- **Road network** development
- **Parking** offer management
- **Public transport** enhancement
- **Institutional** arrangements

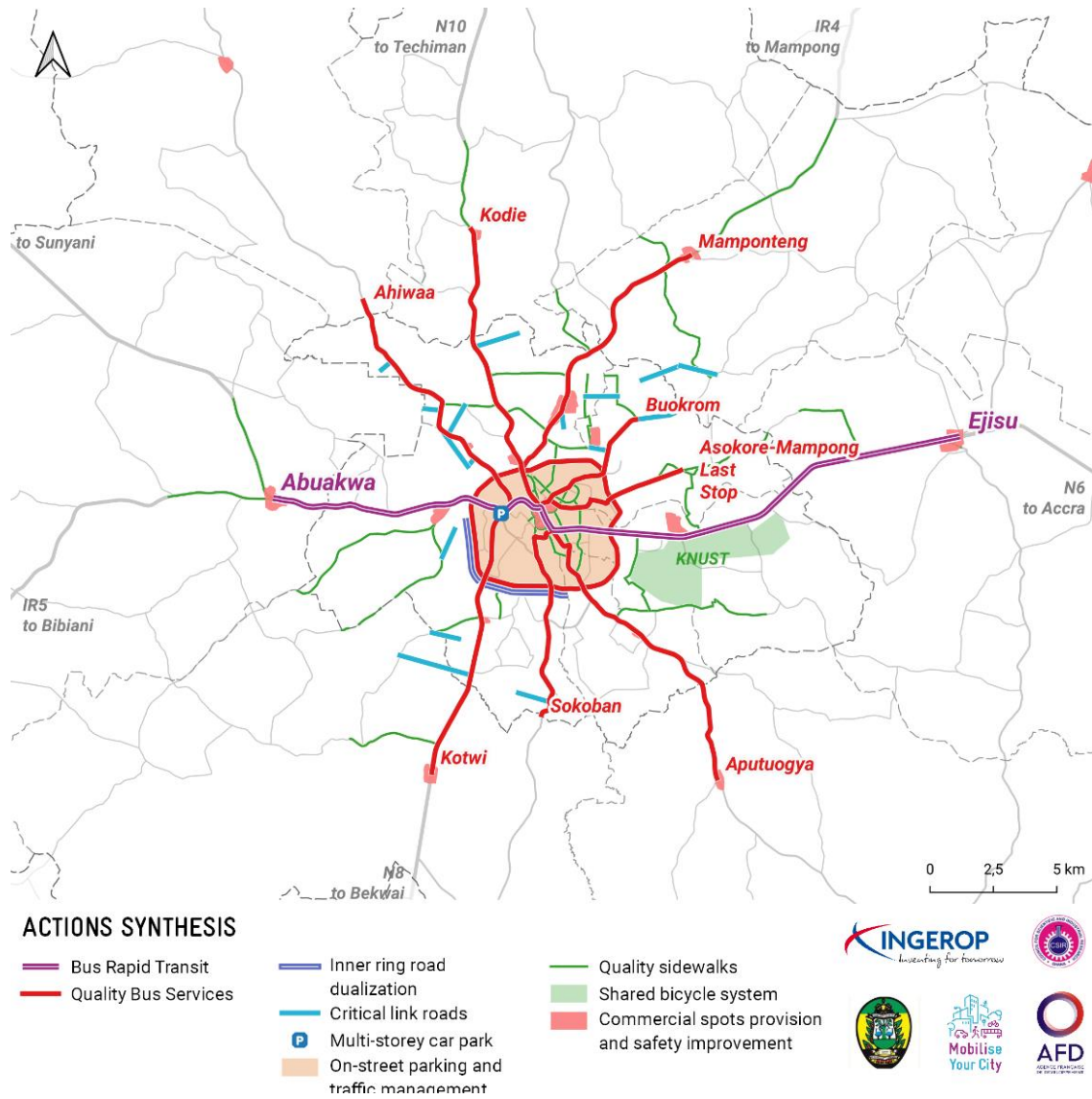


Figure 3: SUMP Action plan

Public transport

The SUMP proposes a **renewed concept** of the **public transport system**, with **three levels of service**: Bus Rapid Transit (BRT), Quality Bus Services (QBS), and Quality Trotro Services (QTS).

- **BRT** corridors will be the **backbone** of the system, on two main urban corridors (Ejsu Road, Sunyani Road).
- **QBS** will offer a schedule-based service with an industrial mode of operation and high-capacity buses on **secondary urban corridors** (Techiman Road, Mampong Road, Bekwai Road, Lake Road, Antoa Road, Asokore-Mampong, Melcom Road, Abrepo Road, Ring Road).
- **QTS** will operate on **all the other routes** and will consist of an enhancement of the existing trotro system with more regulation from public authorities (frequency, operation hours, route, etc.) and modern minibuses.

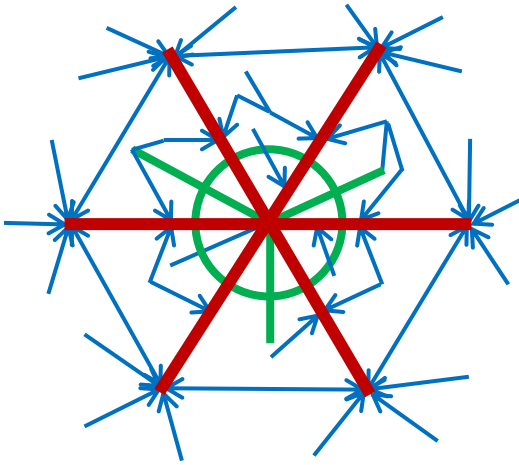


Figure 4: Public transport network hierarchy concept

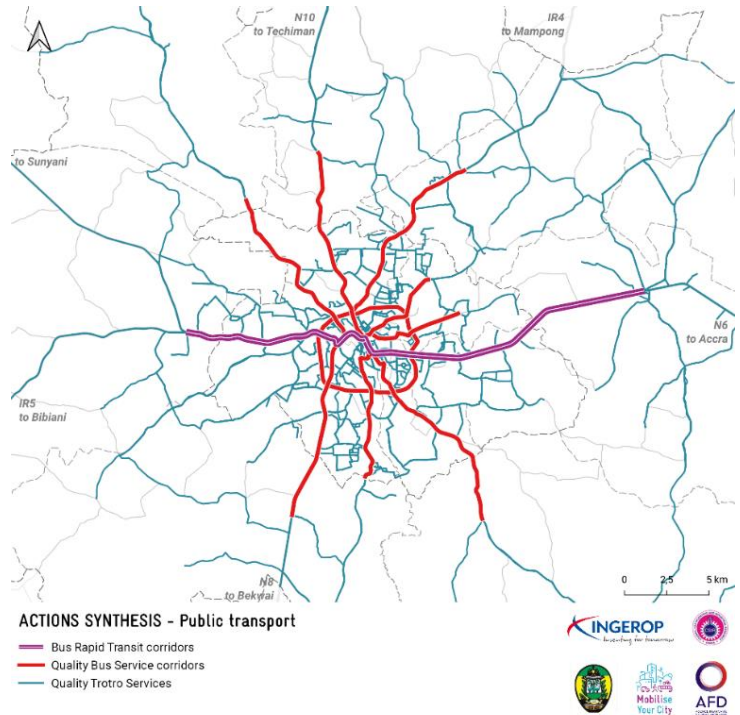


Figure 5: SUMP Action plan : Public transport

Non-motorized transport

Pedestrian mobility related actions in the SUMP mainly encompass the **extensive development of quality sidewalks** (more than 100km), phased up to 2035.

Bicycle mobility is developed by the introduction of an experimentation on KNUST campus: the development of a shared bicycle system. This will enable to promote this mode of transportation, currently under-patronised in the city, and will also be a medium of education and sensitization.

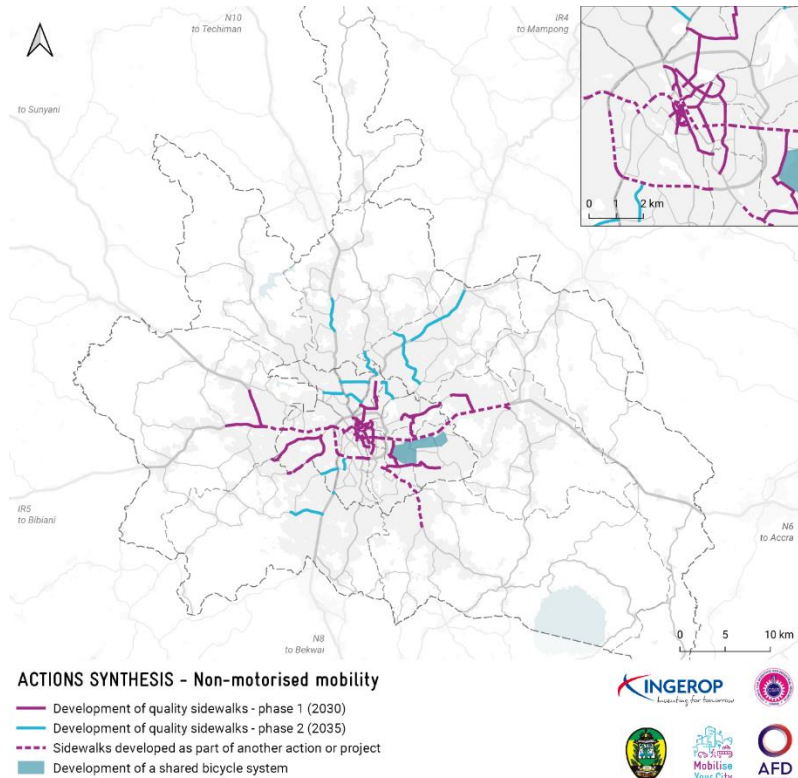


Figure 6: Non-motorized mobility actions synthesis

Traffic management, road network development & parking

Private car mobility, road infrastructure, traffic management, and parking related actions mainly encompass the **full dualization of the inner ring road** and the development of **critical link roads** to communities out of reach of the main road network.

It also includes **traffic management** activities, mainly focusing on the city centre where traffic conditions are bad, with the introduction of a **traffic plan** and the development of a **centralised traffic management system** for traffic lights. A vast program of **urban safety and environment improvement** is implemented, with the development of design guidelines and safety features, the delineation of spots dedicated to street trading (liberating sidewalks and carriageways from encroachment) in all CBDs of the area.

Parking is also organized in the centre of the metropolis, though not in the most central and busy areas of the CBD where the objective is to free the space from on-street parking.

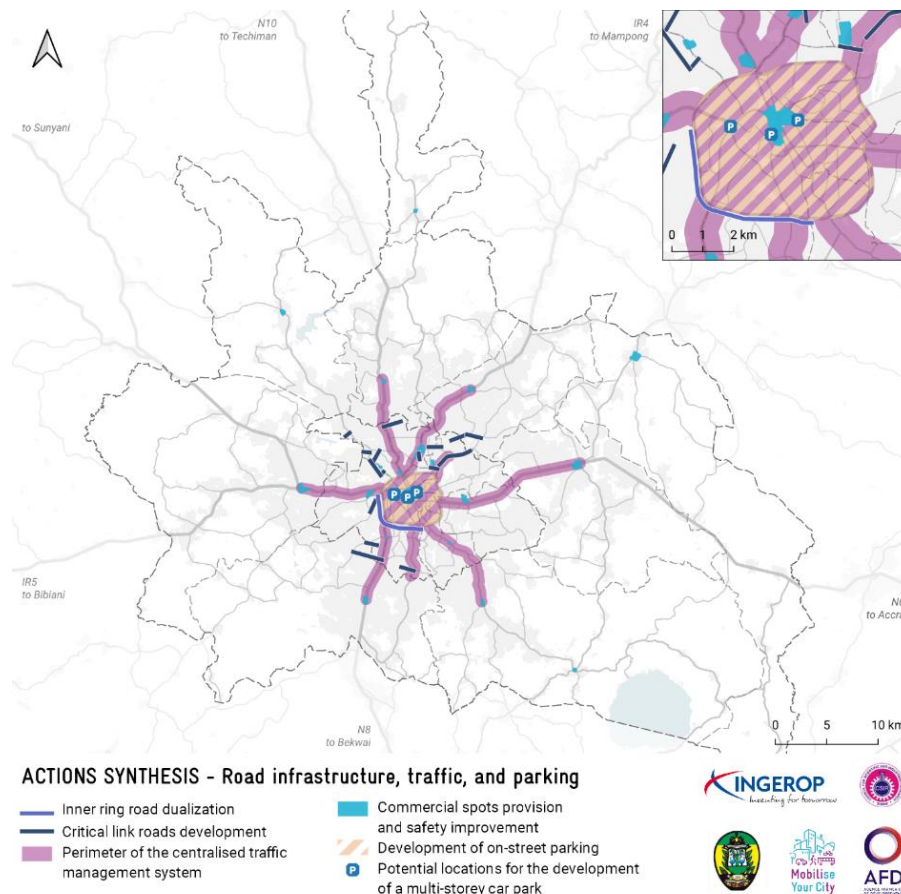


Figure 7: Road infrastructure, traffic, and parking actions synthesis

Institutional arrangements

Other major actions related to the **institutional and regulatory framework** include creation of a **Transport Authority** and various measures regarding regulation, enforcement, and monitoring, such as: Creation of an **Enforcement task force**; Integration and regulation of **pragia**; Development of a **parking fining system**; **Capacity building** for stakeholders and the civil society.

Costing and funding

The action plan of the SUMP is an ambitious program phased from 2024 to 2040. With a **total cost of 997 M\$**, funding is a major stake for its perennity. Some potential **sources of funding** (government funds, private funds, donor loans contracted by the government or private entities) are described for each measure. The plan was approved by the steering committee in October 2023.

Themes are not equal in terms of investment volumes. **Most expenses** go towards three themes: **public transport** enhancement (including development of **BRT**), road network development (development of **critical link roads**, dualization of the **inner ring road**), and NMT improvement (**quality sidewalks** development).

Action plan performance

The SUMP aims to reach an **ambitious performance for mobility in Kumasi** through the different actions, with important improvements in future horizons compared to a “business-as-usual” situation, where none of the aforementioned actions are implemented.

	Business-as-usual 2030	SUMP scenario 2030	Business-as-usual 2040	SUMP scenario 2040
Public transport modal share	67%	71%	52%	57%
Greenhouse gases emissions (per year)	550 ktCO ₂ eq	470 ktCO ₂ eq	890 ktCO ₂ eq	730 ktCO ₂ eq
Average travel time	44 minutes	40 minutes	50 minutes	38 minutes
BRT coverage of the population	0%	6%	0%	6%

The SUMP implementation allows **significant improvements** of the mobility situation in the metropolis: **travel times are improved** and the **modal shift** from public transport towards private cars is **limited** through the years, notably thanks to the implementation of **BRT and QBS systems**, whereas the situation is supposed to worsen by the years in the business-as-usual situation. Consequently, **greenhouse gases emissions** are significantly reduced by the SUMP in future horizons.

2. Process and management structure

2.1 Process overview

2.1.1 Context of developing the SUMP and time horizon

Kumasi Metropolitan Assembly applied to MobiliseYourCity partnership in May 2019 and expressed interest in the implementation of a Sustainable Urban Mobility Plan (SUMP). This submission was approved by the Steering Committee of MYC in August 2019. The SUMP study started in February 2021 and the final Steering Committee took place in October 2023.

The SUMP time horizon **covers the development of mobility in the Expanded Kumasi area from 2024 to 2040, or approximately 15 years**. Several temporal horizons are considered for realization and commissioning of the actions composing the SUMP:

- Quick wins: 2027
- Short term: 2030
- Medium term: 2035
- Long term: 2040.

A vision of a very long term mobility in Kumasi (post-2040 and post-SUMP horizon) was also developed.

2.1.2 SUMP study area

The present study focuses on the Expanded Kumasi area, located in Ghana, Ashanti region. Figure 8 illustrates the Metropolitan, Municipal and District Assemblies (MMDA) constituting the Expanded Kumasi Area. Kumasi Metropolitan Area (KMA) is located at the centre and surrounded by six other MMDAs (Asokore Mampong; Asokwa; Kwadaso; Oforikrom; Suame, and Old Tafo), which together form Greater Kumasi territory. Expanded Kumasi is made up of the Greater Kumasi and ten other MMDAs (Afigya Kwabre North; Afigya Kwabre South; Atwima Kwanwoma; Atwima Nwabiagya; Atwima Nwabiagya; North; Bosomtwe; Ejisu; Juaben, and Kwabre East).

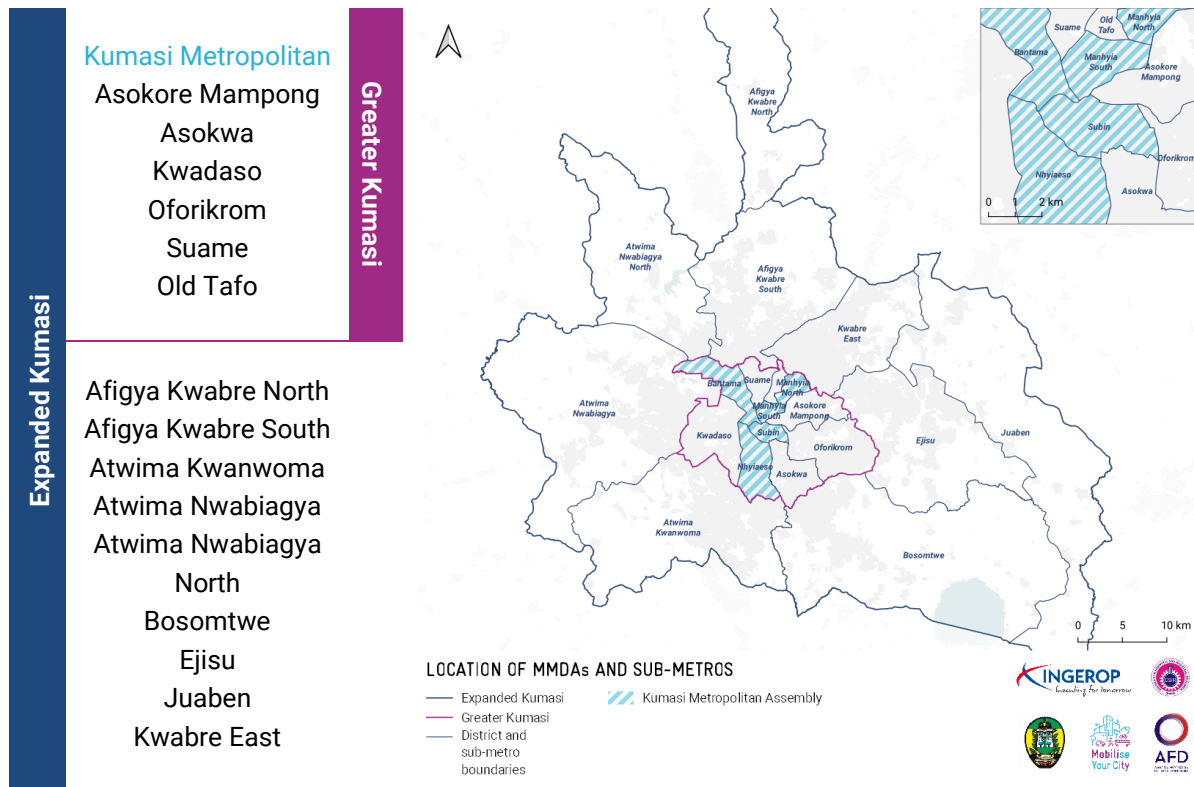


Figure 8: Location of MMDAs and sub-metros

2.1.3 Team and development process

The governance framework of the study is as follow:

- **Client/funding agency:** Agence Française de Développement (AFD)
- **Counterpart:** MMDAs of the Expanded Kumasi area, led by KMA
- **Consultant:** INGEROP Group/Building and Road Research Institute (BRRI)
- **Taskforce:** core organ for the regular technical follow-up of the project, composed of technical key personnel of MMDAs or local agencies
- **Technical committee:** advisory body to the project, composed of technical key personnel of MMDAs and local key agencies
- **Steering committee:** decision and validation body of the project, composed of the MMDAs Chief Executives and Coordinating Directors, as well as the Regional Minister and the Regional Coordinating Director.

The **Regional Coordinating Council of Ashanti** is a deconcentrated administrative body. Its role is to monitor, coordinate and evaluate the performance of the MMDAs in the region, and to act as a link between the districts and the Ministry of Local Government (MLGRD). The RCC played a significant role in chairing the Steering Committee and inviting all MMDA's to the various SUMP-related meetings and activities.

The main Committees took place at the following times:

Committee	Date	Object
MobiliseDays	30 th November 2021	Formal launch of the project Formation of the steering committee
Technical Committee 1	1 st April 2022	Discussion on the ongoing diagnosis (data collection)
Technical committee 2	5 th July 2022	Discussion on the diagnosis
Steering committee 1	8 th July 2022	Validation of the diagnosis
Technical committee 3	28 th March 2023	Discussion on the objectives, vision, and scenarios
Steering committee 2	30 th March 2023	Validation of the objectives and the vision Selection of a scenario
Technical committee 4	10 th October 2023	Discussion on the action plan
Steering committee 3	11 th October 2023	Validation of the action plan and the SUMP

Table 1: Summary of the committees meetings

2.2 Stakeholder involvement

2.2.1 Stakeholder mapping

Stakeholders can be defined as persons or groups that may be involved in the SUMP during implementation or have an influence over its design.

Stakeholder mapping enables a better comprehension of the institutional framework, the inter-relationships between stakeholders and identify possible overlapping responsibilities or informal practices regarding transport mobility. Through this approach, it is possible to understand the roles, responsibilities, degree of autonomy, hierarchical positioning, perimeter limits and control mechanisms of each actor, as well as the decision-making, execution, and control circuits and the financial, investment and operating flows.

By mapping the stakeholders, it is easier to identify the current dysfunctions in mobility governance related to the responsibilities. In addition, this approach can show the financial and human resources available to each actor and identify any shortcomings.

Stakeholders were identified by considering the following:

- Geographical location of the project and the regional and local administrative setting
- Administrative governance structures
- Cultural and traditional factors

The following stakeholder Interest-Influence grid allows us to understand the interest and influence that the different stakeholders identified above may have on the SUMP. Stakeholders were analysed according to:

- The type and level of influence they have on the SUMP. This was rated as:
 - **Low:** the stakeholder cannot influence the execution of the SUMP.
 - **High:** the stakeholder can cause delays or change the way it is implemented).
- The type and level of stakeholder interest in SUMP. This was rated as:
 - **Low:** the stakeholder has no interest in SUMP because it is not involved in the implementation, or because it does not have a direct link with the mobility field.
 - **High:** the stakeholder has a strong interest in SUMP because it is part of the SUMP implementation, or it has a direct link with the mobility field.

Interviews with **key stakeholders** were made on several occasions, both during on-site missions for the abroad team and with the local team. The meetings aimed at meeting various stakeholders, presenting the SUMP process, and gathering some first ideas and information from the partners. The interviews, especially those with the concerned MMDAs, also had as subjects the local mobility context; ongoing and future projects; capacities, and resources of the MMDA; and the expectations towards the SUMP development. These interviews brought precious information for the understanding of the current situation in Kumasi.

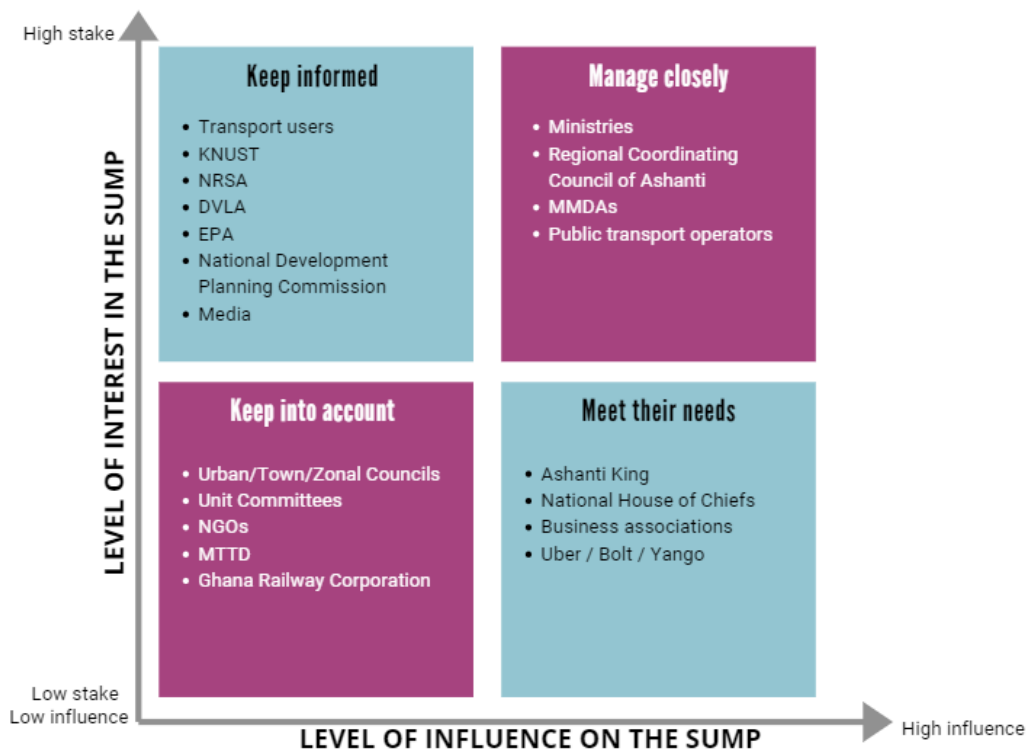


Figure 9: Stakeholder Interest-Influence grid

2.2.2 Stakeholder participation

Participation of all stakeholders was continuous throughout the preparation of the SUMP. The first key event was the MobiliseDays, which kicked off the SUMP process. This event gathered stakeholders from various sectors, from transport operators to local politicians to business associations. The media coverage allowed to raise awareness of the project in the civil society. The event was held on November 30th and December 1st at the Miklin Hotel in Kumasi. The event was co-chaired by H. E. Anne-Sophie AVE, French ambassador to Ghana. The event also inaugurated the steering committee. 94 and 64 participants attended the event on the first and second day respectively.

The steering committee met three other times during the SUMP preparation: at the end of the diagnosis, to validate the key findings; at the end of the scenario phase, to validate the long-term vision of the plan and select a preferred scenario; and at the end of the process, to validate the action plan created from the preferred scenario.

Prior to each steering committee meeting, the technical committee also met, to give insights and technical advice on the contents before the steering committee validation. The technical committee members could also brief their respective steering committee members before the meeting to ensure a smooth and efficient process. The technical committee also met during the diagnosis phase, mainly to present the data collection campaign and the first findings.

Steering committee meeting	Number of participants	Technical committee meeting	Number of participants
MobiliseDays	9 (CEs only)	Data collection	35
Validation of the diagnosis	10	Diagnosis	27
Validation of the vision, selection of a scenario	30	Vision and scenarios	35
Validation of the action plan	23	Action plan	38

Attendance to the steering and technical committees meetings

50 bilateral interviews were conducted during the different components of the SUMP preparation. These interviews aimed at collecting data and information from the various institutional stakeholders, as well as present the project and its process. Extensive valuable information was collected. The interviews were conducted with various institutions, including, the MMDAs, the transport unions, as well as government agencies (DUR, DFR, GHA, EPA, etc.), both in Kumasi at the decentralised level and in Accra at the ministry or central offices level.

The taskforce met regularly as it oversaw the daily follow-up of the process. The scenario building process encompassed a workshop with the taskforce to identify the objectives of the SUMP and first potential measures, followed by also a workshop for each MMDA, held in December 2022 and January 2023.

2.3 Data collection process

In order to complete the existing data and fill the gaps to build a comprehensive diagnosis of the area and its mobility practices, several data collection campaigns were conducted as part of the SUMP preparation. These campaigns were organised following an analysis of the existing and necessary data, and aimed to prevent duplicating already existing data.

The data collection was organised as follows.

Household mobility survey

The household mobility survey was the central component of the data collection. More than 2,000 households (and more than 4,500 persons) were surveyed by trained enumerators. The questionnaire was divided into 4 parts: general structure of the household (demographics, revenues, vehicles owned by the household), sociological information of each person of the household (gender, age, occupation), opinions on mobility (modal choice reasons, perception of safety, perception of new public transport modes), and characteristics of each travel of each person of the household (location, purpose, time, mode, fare, issues). This survey allowed to gather precious information about mobility in Kumasi and was the main base for several parts of the diagnosis. It also enabled to build an origin-destination matrix by mode which was used in the transport demand model.

Focus group discussions

Six focus group discussions were organised on the following topics: paratransit and collective transport, gender issues in mobility, mobility in suburban/rural communities, trading activities and mobility in the CBD, providing transport services to the vulnerable, mobility to and inside the Kwame Nkrumah University of Science and Technology (KNUST). The panels were assembled following state-of-the-art guidelines and depending on the topic of the discussion, and led by a sociologist, Ms Harriet Takyi. Apart from the gender issues group, which was women-only, gender balance was respected in the panels. This groups allowed to gather qualitative information on topics which couldn't precisely be analysed through quantitative data and enabled to complete the vision issued by the household mobility survey.

Cordon line survey

An origin-destination survey was conducted at six points on the main roads entering the metropolis. Origin, destination, and the purpose of the trip were collected. This enabled to complete the origin-destination matrix with exchange and transit traffic. It also focused on freight transport, censusing the weightage and types of goods carried by the vehicles. The survey was coupled with traffic counts.

Public transport terminals survey

Paratransit routes mapping was not available in some MMDAs of the area. Therefore, censusing of the main routes was conducted at strategic stations with the unions and station masters. Censusing was conducted at 20 stations within 7 MMDAs.

Travel times survey

A remote survey of travel times along the main roads of the metropolis was conducted during an entire week. Measures were made every 15 minutes in peak hours and every hour in off-peak hours. Floating Mobile Data were used (GPS location of cell phones which are on-board vehicles). This allowed to quantify congestion and time losses, identify precisely the peak periods and their extent, and identify congested areas.

Air quality survey

Air quality measures were undertaken at strategic congestion spots around the city. The identified areas were Kejetia roundabout, Anloga junction, and Suame roundabout. PM_{2.5}, TVOC, and carbon dioxide were measured, as well as Air Quality Index (AQI). Each spot was surveyed during the peak periods (7am-10am and 4pm-7pm) of an entire week.

Directional traffic counts

Directional traffic counts will serve in future stages of SUMP elaboration. It was proposed to hold directional traffic counts at the same location and time as the air quality measures. One exception is made for Kejetia roundabout, where the level of congestion forbids any representative traffic count. Traffic counts were made during the morning peak period (6am-9am) and evening peak period (4pm-7pm) of one representative day (Tuesday, Wednesday, or Thursday).

3. Status quo analysis

3.1 Institutional, regulatory, and financial framework

Ministry of Roads and Highways

The Ministry of Roads & Highways is responsible for all public roads infrastructure in Ghana and has three main departments and agencies under MRH responsible for the road network in the country namely, the Ghana Highway Authority, the Department of Urban Roads and the Department of Feeder Roads.

The Ministry is responsible for the policy direction of all the three departments and agencies. It also sets the necessary standards for the construction of roads and bridges. Besides that, the Ministry has the Ghana Road Fund, which is responsible for funding road maintenance under it. The discussion below focuses on the various Agencies under the Ministry of Roads and Highways:

- **Ghana Highway Authority (GHA):** responsible for the trunk roads. They are generally classified into National Roads, Inter-Regional Roads and Regional Roads. The Ghana Highway Authority is headed by a Chief Executive with three Deputy Chief Executives under him namely: Deputy Chief Executive Development, Maintenance and Administration. The Authority is represented in all the sixteen regions of Ghana by a Regional Directors. Funds from the Ministry are sent to the head office in Accra who later distribute them to the various regional office depending on the source of funding and the purpose thereof. Most highways pass through urban centres; thus, there is normally an administrative arrangement or agreement in such instances for the Department of Urban Roads to maintain such sections for GHA.
- **Department of Urban Roads (DUR):** responsible for roads within the urban dwellings in the Cities and Major towns within MMDAs. They are generally classified into Major Arterials, Minor Arterials, Collectors, and Local roads. The Department of Urban Roads has a Head Office in Accra with Regional Offices headed by Regional Directors in all the sixteen regions of Ghana. Besides, the Metropolitan and Municipal Assemblies have an Urban Roads Department (URD) also called, in the case of KMA, Metropolitan Roads Department (MRD), responsible for the Access (also called Local) roads. Thus, the National and the Regional Offices are responsible for the Major Arterials, Minor Arterials and Collectors. The Head Office in Accra is responsible for the aggregation of the regional plans and budgets. It also distributes approved budget to the various regional offices, Municipalities and Metropolis. In the District Capitals, the Department of Feeder Roads generally is responsible for these roads but hands over to the Department of urban roads when it becomes urbanised.
- **Department of Feeder Roads (DFR):** responsible for roads that link from rural areas and farm tracks to urban centres and trunk roads. They general classify roads into Inter District, Collectors and Access roads. The Department of Feeder Roads has a Head Office in Accra with Regional Offices headed by Regional Managers in all the sixteen regions of Ghana. Besides, the District Assemblies have Roads Engineers responsible for the Access roads. Thus, the Regional Offices are responsible for Inter District and Collector Roads. The Head Office in Accra is responsible for the aggregation of the regional plans and budgets. It also distributes approved budget to the various regional offices. The regional offices further liaise with the districts to ensure that their needs are incorporated in the regional plans and budgets.

From a general view, most roads in the Greater Kumasi are managed by the DUR, with the local/access roads managed by the MMDA's URD/MRD. In the Expanded assemblies, most roads within the urban

centres are managed by DUR, trunk roads are managed by GHA (except within urban centres where they are managed by DUR), and most rural roads are managed by DFR.

Regional Departments of Ministry of Roads and Highways

The Constitution of Ghana aims at decentralization. Thus, the central institutions have been replicated at the regional level. This decentralization is real at the administrative level. However, political decisions and financing remain at the central office level.

The regional agencies of the GHA, DUR and DFR collaborate with the various Assemblies where they have projects.

Regional Department of Urban Roads

As at regional level, the regional DUR office is responsible for the coordination between projects, the planning, the construction, and the maintenance of roads of the Ashanti Region; and is also responsible for all traffic lights.

The local roads are under the authority of MMDAs (via their Urban Road Department or Metro Road Department). It seems there is not a clear-cut distinction between the roads under the authority of the regional DUR and those under the MMDAs. Definition of a "local road" is done according to road hierarchy, with streets at the MMDA level and arterial and collector roads at the regional DUR level. The DUR can also consider traffic levels on a particular road to decide keep control over it.

In DUR's opinion, their collaboration with the police authorities and the National Road Safety Authority are useful but not developed enough and consequently not sufficient.

The regional DUR is funded through the same channels as the central DUR (Road Fund, consolidated GoG funds and donor funds). The DUR details that the central government funds road development with subventions regarding the respective size of each MMDA road network. However, major infrastructure projects are usually co-funded by outer funding agencies, like the AFD.

Theoretically, the regional DUR should propose a budget for maintenance projects to an independently run Road Fund, and then receive a budget allocation as well as the corresponding funds from the Road Fund to spend within their area.

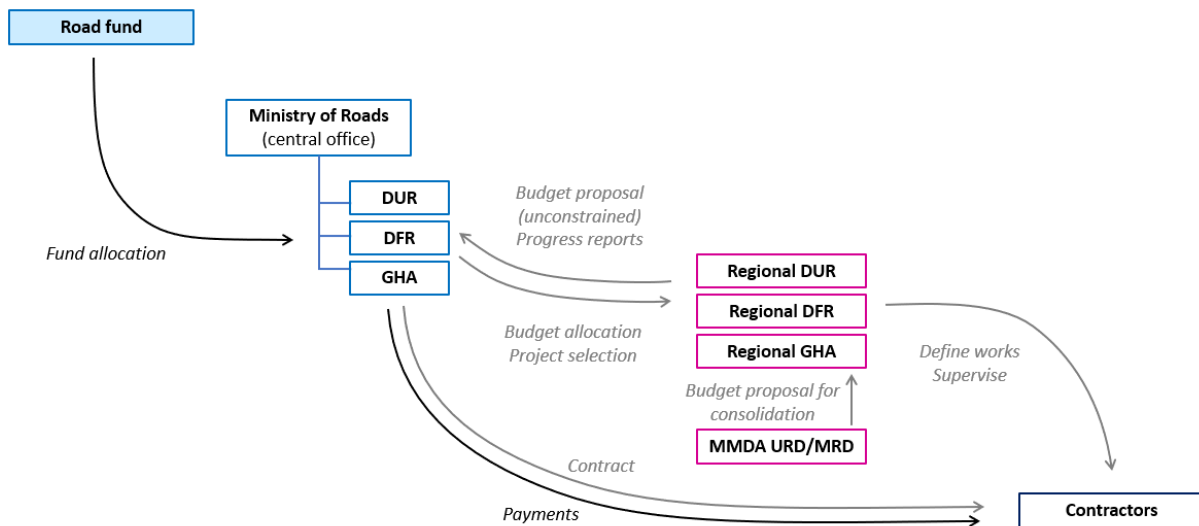
Practically, the DUR submits a budget proposal to the Ministry of Roads and Highways who allocates a budget by type of works (reshaping, pothole fixing, traffic lights, etc.). The regional DUR can then make decisions about prioritizing works within this framework. The regional DUR then implement the measures and projects decided, prepares tender documents after publication by Ministry of Roads and Highways, supervises works and validates invoices which are paid by Ministry (no budget transfers to DUR). Maintenance of traffic lights is carried out through contracts with 2 contractors and are paid as the rest by the central office.

Budget allocations, decided by the central Ministry, depend on the size of the road network, but it does not seem there is a clear-cut rule. For larger projects, the regional DUR can submit projects to the central office. Not much prioritization is done at the regional level, as only the central office of the DUR decides which projects are to be done. Lack of funds means only the most needed or most politically supported

projects are generally chosen. These projects are funded through GoG funds or donor funds (see above – central level).

It seems that due to the importance of works to be done and constraints on budgets, commitments by regional departments often exceed their budget allocations and payments.

The regional DUR can also propose other types of projects. In Kumasi the regional DUR initiated parking fees in 2006, in association with the KMA Metro Roads Department (MRD), in Accra the DUR in cooperation with AFD is implementing a Traffic Control Centre.



Regional DFR

The DFR is not at currently fully decentralized, although current legislation required it to be fully decentralised. The District Level Feeder Roads have now been subsumed under the District Works Department and they are responsible for Access within the Districts. The Regional Offices are responsible for Inter District and Collector Roads.

The regional DFR basically functions the same way as the regional DUR.

Often, a significant part of the national DFR endowment goes to the Ashanti Region.

Regional GHA

The GHA is also not decentralized.

Ministry of Transport (MOT)

The Ministry of Transport is responsible for transport services. The long-term objective of Government's transport policy is to develop modern, integrated, and well-maintained transportation infrastructure for accelerated growth and development. It also seeks to make Ghana the transportation hub of the West African region. The Ministry of Transport is the entity that prepares plans and objectives in that sense, and who facilitate the development of strategies.

It ensures the establishment and operation of planning and budgeting unit in all implementing agencies in the sector. MoT also develops short, medium, and long-term plans and projects for the sector to reach international funding. It provides advice to the ministry's Sector Departments Agencies and companies to enhance better alignment between sector policies, plans and programmes.

In particular, regarding urban transport, the Ministry of Transport is responsible for:

- Regulations regarding public transport (Act 993, L.I.2180, Act 569)
- Determining public transport fares evolutions with other stakeholders (at national level, with GPRTU and GRTCC)

On a general perspective, the Ministry of Roads and Highways is oriented towards road infrastructure (including linear transport infrastructure), whereas the Ministry of Transport is oriented towards transport operations. In the Ministry of Transport's opinion, it is sometimes difficult for them to efficiently work on public transport infrastructure projects: these projects are roads projects, therefore led by the Ministry of Roads and Highways, and the Ministry of Transport has no authority to impose design specifications oriented towards efficient public transport operations.

National Road Safety Authority (NRSA)

The NRSA is the lead public statutory body responsible for road safety management in Ghana. It is under the MoT. Currently, the NRSA provides for an enhanced mandate in addition to the existing mandate of promoting best road safety practices among road users and coordinating road safety activities. The Authority is also mandated to review road designs to ensure compliance to road safety qualifications. The authority is empowered to regulate, ensure implementation and enforcement of road safety standards and procedures. The head office in Accra is responsible of policymaking while the regional office in Kumasi oversees their implementation in the area.

Driver and Vehicle Licensing Authority (DVLA)

The DVLA is a public-sector organisation under the Ministry of Transport. It establishes standards and methods for the training and testing of driving instructors and licenses them. DVLA also inspects, tests and registers motor vehicles. It issues vehicle registration certificates and examination certificates. Registers containing particulars of licensed motor vehicles, driving instructors as well as drivers of motor vehicles are maintained by DVLA. This agency was weaned off government subvention in March 2016.

Ministry of Local Government, Decentralization and Rural Development (MLGRD)

The MLGRD is responsible for implementing decentralisation processes and coordinating interventions between the central and local levels. It oversees the necessary capacity reinforcement of the MMDAs to complete their activities and ensure the effective decentralisation process. It also reviews public policies and evaluates their impact. This institution pays most of the local civil government service staff working for the districts (while the MMDAs are supposed to employ, pay and manage from their own resources the local civil service government staff they need to run the good administration of the district). So, it is estimated that only 30,000 of the 400,000 civil service staff working in MMDAs are employed and managed by local authorities.

Ministry of Finance (MoFEP)

The MoFEP proposes the national budget, which is then approved by Parliament following consideration of local authority budgets. In 2012, the MoFEP introduced the "Composite Budgeting" reform, which aimed to help solve the lack of institutional and financial coordination of planning between the levels of decentralisation. It aims to introduce a global and transparent vision of financial transfers to municipalities, by integrating the budgets of the deconcentrated district departments into the overall budget of the DAs.

The Ministry of Finance has a role in the funding of the transport sector, through:

- The salaries of the local government (including MMDA's departments and national and regional road agencies: Department of Urban Roads, Department of Feeder Roads, Ghana Highways Authority).
- The District Assembly allocation issued from the Common Fund.
- The Consolidated Fund.
- Donor Fund.

Ministry of Railway Development

The Ministry of Railway Development aims to build a modern railway network across Ghana with associated infrastructures. Some projects affecting urban mobility within the Expanded Kumasi are currently being studied:

- The Kumasi-Takoradi interurban train line reconstruction
- The Kumasi Light Rail Transit development

The Ministry was previously a part of the Ministry of Transport but has been independent for five years.

Regional Coordinating Council of Ashanti (RCC)

The Regional Coordinating Council of Ashanti is a deconcentrated administrative body. Its role is to monitor, coordinate and evaluate the performance of the MMDAs in the region, and to act as a link between the districts and the MLGRD. It is a complex entity of decentralisation, which however has limited means.

The Regional Coordinating Council of Ashanti does not have a direct role in deciding or financing transport or infrastructure, as financing comes from the central office. However, the Council can:

- Use its knowledge of the situation at the regional level to push demands to the central office
- Check the spending of MMDAs and make recommendations.

Its coordinating role also makes the RCC an indispensable partner in larger projects which involve several MMDAs.

There is no budget at the regional level, as the budget stays at the national level. The RCC is notified from the central office of the budget allocated to the entities in their jurisdiction. The RCC can push for some projects to move forward according to the knowledge of local needs and public/political pressure but does not have decision powers which are at the national level.

Metropolitan, Municipal & District Assemblies (MMDAs)

Overview

MMDAs are the most advanced level of decentralisation. They are also the dominant political institution at the local level. The different MMDAs are empowered by law with legislative responsibilities to make policies.

Specifically on transportation, Local Government Act, 1993, (Act 462) mandates MMDAs as a regulatory authority to provide leadership for local transport policy and planning, pass common byelaws on passenger transport and facilitate a fair and efficient regulatory environment by providing protection for exclusive use of routes by licensed operators and provide priority for operators using traffic management measures. Therefore, they work as an administrative, coordination and development authority for infrastructure and services. For example, by-laws voted by assemblies can include traffic restrictions (ex. limited times allowed for freight deliveries).

MMDAs are responsible for compliance and enforcement of regulations, in association with the Police (ex: hawking, respecting traffic restriction, unlicensed transport operators, etc).

Department of Transport (DoT)

Within an MMDA, the Department of Transport advises assemblies on transport matters. It plans, regulates, and conducts urban transport services within the metropolis. It also establishes, maintains and controls parks for vehicles. The Department of Transport monitors and evaluates all transport activities and ensures the issuance of permits to transport unions. These licenses give the right to a registered union to legally operate within the assembly. The functions of the Department are:

- Advise the Assembly on matters relating to transport services in the Metropolis
- Plan, regulate and conduct urban transport services within the Metropolis
- Establish, acquire, and maintain a database of all transport operators within the Metropolis
- Provide for the identification of licences vehicles
- Assist in the review of road designs by consultants for designated roads
- Monitor and evaluate all transport activities within the Assembly's jurisdiction.

Metro/Urban Roads Department (MRD/URD)

All Municipal and Metropolitan Assemblies must have a Roads Department, per decentralization laws. The Urban Roads Department (of Metro Roads Department for KMA) is responsible for roads inventory design, planning and maintenance within the constituency of the assembly.

However, the true effectiveness of this Department varies according to the means of each assembly. For example, KMA has a structured department, but some other assemblies don't have the sufficient human resources to actually manage these local roads, letting the regional DUR step in.

Responsibilities of the MRD/URD can include:

- Cleaning of local roads
- Maintenance on local roads

- Development projects such as footbridges, creation of walkways, road signs, terminals, etc.
- Proposal of fees and regulations (ex: parking fees) to the Assembly
- Local traffic management (ex: implementation of a one-way street).

Overall, MMDAs are relatively little involved in road development projects. Involvement is mainly for maintenance of local roads via the URD/DMR. Road/infrastructure projects can include, for example, terminals for public transport, which would be handled with the Department of Transport. In the past, the Ghana Urban Management Project (GUMP) was a pilot project which included terminals. There are no currently on-going road development projects in KMA at MRD level.

MDR/URD unconstrained budgets are proposed every year and consolidated at regional level before submission to the Ministry of Roads and Highways. Budget allocations come from Ministry of Finance as explained above. Functioning is then similar to that of the regional DUR, without actual fund transfers to the MDR/URD level. Funds for the MRD/URD could also come from the assemblies' finances directly. However, the assemblies tend to prioritize other types of projects (such as commercial projects, market spaces) rather than infrastructure projects.

Physical Planning Department

The Physical Planning department is responsible for planning, zoning, follow-up of built-up environment, and delivery of building permits. The department establishes the zonal maps and can make reservation for infrastructure projects for example. However, land belongs to traditional chieftaincies who sometimes sell the land unregarding the department's opinion or zoning.

Paratransit system

The paratransit system analysed in this chapter concerns the trotros and taxis operated within the Expanded Kumasi area. Long distance / intercity services (operated on a similar basis) are not analysed in detail here. Specific emphasis is put on trotros (rather than taxis), since they represent an important modal share and present the most potential to be improved to supply better transport conditions to the population.

Regulation

Regulations regarding paratransit come from guidelines at national and central level (fares, etc.). They are implemented locally by the MMDA's Department of Transport, through their Transport Officers (TO).

Paratransit is quite highly regulated in Kumasi area:

- Unions are registered and regulated
- Vehicles are registered with a union and with the MMDA where their station is located
- Drivers are also registered with a union and with the MMDA where their station is located
- Routes are registered and authorized by the MMDA where the station is located
- All these parameters are combined to get a destination sticker from the MMDA which combines: Union, Vehicle, Driver, Route, Station and Type of service. The sticker needs updating if only one of these parameters changes, for example, if the driver changes.

These principles are the same across the whole greater Kumasi area.

However, there is today a lack of up-to-date tools to monitor these aspects. Even though this is regulated, the MMDAs and unions lack a global view of the situation (regarding drivers and vehicles, there is no information about the totality of the system neither about the respective allocations), meaning that decisions to open a new route or reinforce a route are made qualitatively through information from the field.

Unions

24 unions operate in the greater Kumasi area. These unions cover trotro, taxi, long-distance (intercity) and cargo. Not all these unions operate trotros. They are very unequal in size.

- GRPTU is the largest union operated in Kumasi. GPRTU is a national union with a regional office for the Ashanti region. This regional office is subdivided into branches which report to the GRPTU regional office. These branches are useful to the inner organization of this large union, but the organization in branches is transparent for the MMDA, as vehicles/routes are registered with the MMDA by GRPTU regional office and not the branch.
- 18 unions are associated with GRTCC, which is a national umbrella union. Among others, unions within GRTCC includes GPRTU, Commercial Drivers Association of Ghana, or Progressive Transport Operators Association. GRTCC is funded by fee of 50 GHC/month/union, paid by each union.

These unions are structured with the designation of the roles of Chairman, Vice-Chairman, Trustee, etc.

Unions need to be approved by the MMDA where they operate. In the past, KMA was handling the registrations for the entire area, as its boundaries covered the Expanded Kumasi. However, the assemblies of the Expanded Kumasi have stopped registering new unions because the field is already fragmented. KMA would like to go further and diminish the number of unions, especially consolidating or suppressing some very small unions.

Unions are central to the organisation of the paratransit system in Kumasi, registration and regulation, as almost everything related to organisation go through them:

- Drivers and vehicles must register with unions, which propose registration of drivers, vehicles, and routes to MMDAs. It appeared that some unions ask for a registration fee for the driver, but not all unions.
- Unions manage the stations through the station managers they hire and pay, including defining orders of loading
- Unions cooperate to manage shared stations and/or routes
- Unions do some limited social welfare for drivers: for example, setting up a retirement fund, buying of land for estate houses; depending on the union. These actions are funded with part of the daily fee drivers pay for station use.

Although unions are central to the organisation and registration, unions don't have up-to-date register of drivers and vehicles.

The MMDA/DOT will not intervene in the inner organisation of unions; except if conflicts arise (for example, a driver asking to switch unions) when the DOT will mediate to find a common agreement.

Drivers

Drivers must belong to a union to operate. Drivers can either be a member of a union (only 1 union membership allowed), or just apply for a “shift permit” giving them permission to operate on a route with a union without being a full member. More than 5200 drivers are registered In KMA’s database, which is not completely comprehensive but gives a good estimate. However, it is estimated that another 5000 drivers operate illegally (not registered to any union) in KMA as “wawa” drivers (see dedicated paragraph).

Drivers generally work from 5:30 AM to between 5:00 and 7:00 PM. Drivers generally make around 4 rotations/day on their route (generally 3 to 5 rotations, according to driver working hours and length of route). Some drivers will make extra trips before or after-hours to maximize their revenue as they don’t declare it to the owner of the vehicle. Some owners are equipping their vehicle with GPS trackers and/or demanding vehicles are parked at their home to avoid this.

The drivers are central to the financial aspect of the paratransit system (see specific chapter below). Drivers pay a daily fixed fee to the vehicle owner. Preliminary information estimates this fee around 120 GHC/day for urban routes. If the driver has to pay maintenance, repairs, change of oil, etc; these sums are deducted from this payment, as these expenses are to be paid by the owner. Drivers pay the daily refuelling of the vehicle as well as station use fees.

The unions have no hand in the driver/owner relationship.

Mates

Legally, are supposed to be potential drivers “driver’s mates”, to be able to replace the driver during their long working hours. This is generally not the case and conduct simple conductor tasks. They are most notably in charge of attracting riders and perceiving fares.

Hiring and retainment of mates appears to pose some difficulty with turn-over and dishonest behaviour relating to the fare collection.

Owners

Owners don’t need to register with a union, nor with the MMDAs. However, some owners like to apply to be represented by the union and associated with the union.

Generally, owners buy vehicles with their own funds, without taking out a loan. Owners are often policemen or civil servants. Except in rare cases of multiple ownership, owners are not that involved in daily operation or monitoring. Some GPRTU branches own vehicles, but this seems to be the minority, most owners being private individuals. The owners are responsible for getting twice yearly road-ready certificate (from DVLA) and insurance for the vehicle.

In Kumasi there are no “licence owners” which would be different from drivers or owners, while it can be the case in some other paratransit systems.

Vehicles

Vehicles need to be registered with a union. A payment is made to the union once, at registration with the union.

A vehicles owner entering the system will propose a desired route. The union which the vehicle is registered with will decide which route the vehicle is affected to and propose this to the MMDA for validation and emission of the “destination sticker”.

Vehicles are generally second-handed. They are 15-seat or less minibuses for trotros and regular 5-seat private cars for taxis. Average manufacturing age and years of operation for the complete network are undetermined.

In terms of vehicle structure, some are modified to welcome more seats or even to obstruct some passengers’ boarding. Some of the focus groups identified the fact of raising the doorstep with springs as an alternative. This is the case of those who, for any reason, demand more space to travel or more time to board, such as elderly, pregnant, physically challenged people, or passengers carrying children or goods.

“The drivers add seat to the trotro making the movement in trotro difficult. Some of the walkways of the trotro vehicles are always occupied with stuffs impeding our movement in the vehicle.”

Woman, visually impaired

Organization of services and routes

Routes are set (with minor possible variations) and authorised by the MMDA.

Several unions can register vehicles on the same route and be authorised by the MMDA on this route. It is therefore common for vehicles/drivers belonging to different unions to be operating the same route, and potentially be in competition. This is managed by cooperation and mutual understanding between unions, without intervention by the MMDA (except for occasional conflicts).

New routes (or route extensions) can be proposed by unions or by local authorities. The new route is accepted by MMDA once feasibility has been checked: mainly the possibility to turn around and a place to load passengers. A union will generally implement a trial period for a week to check demand is there.

MMDAs can appeal to an additional union if they estimate an insufficient number of vehicles operate on a route. There does not seem to be a geographical repartition of which routes are registered/operated with which union(s).

Stops are most generally unmarked (except for a few, for example on the Ejisu Road). However, these virtual stops are predetermined and fixed in both drivers and passengers minds. Generally, a trotro will stop only at these virtual stops to deposit passengers, but would pick up a passenger between stops, in an effort to optimize ridership.

It is important to highlight that the registered vehicles are not exclusive. To maximize their profit, illegal trotro and taxi drivers often opt to realize short-distance travels, which means that neither the origin nor the destination are fixed. This is often the case of routes located close to the CBD. From the passenger perspective, the situation leads to the need of adapting their itinerary with more waiting and travelling times, more transfers, or even to forced vehicle exit.

Organisation of stations

Stations are the places at the end of each route where the vehicles load passengers. Some stations are shared between unions. In that case, each union provides a station master, who controls traffic and departures. Vehicles departing a station operate on a fill-and-go principle, meaning the driver waits for the vehicle to be full to go. This system can sometimes lead to long waiting times before the vehicle goes (especially during off-peak hours) and makes it impossible to draw timetables of the routes. They depart in the order determined by the union and its station manager. Loading boys will call out destinations, shouting for passengers. Some vehicle owners will pay a “priority loading” fee to their union, to ensure a quicker departure time, less waiting time and thus more rotations.

An agreement between unions is made to ensure a vehicle arriving at the opposite end, at a station managed by another union, so they may load there; and vice-versa. This practice helps cooperation between unions.

Some private terminals have been created in recent years, but they are reserved for long-distance services. 5 private terminals have opened since 2015.

At night, vehicles are generally parked either at the station; at a gas station; or at the driver’s home.

Synthesis

	Highways	Urban Roads	Feeder Roads	Railways	Local Roads	Tro-tro/taxi routes and fleet	Other PuT routes and fleet	PuT terminals
Coordination/planification	MRH : GHA	MRH : DUR	MRH : DFR	MRD : GRDA	MMDAs: URD	MMDAs: DoT	Adheyee (KMA)	MMDAs: DoT
Funding (construction)	MRH (GoG) Intl cooperation Other private funds	MRH (GoG) Intl cooperation Other private funds	MRH (GoG) Intl cooperation Other private funds	MRD : GRDA	MMDAs: URD	-	-	MMDAs: DoT Intl cooperation
Construction	MRH : GHA	MRH : DUR	MRH : DFR	MRD : GRDA	MMDAs: URD	-	-	MMDAs: DoT
Funding (operation)	MRH (road fund) Ghana Cocoa Board	MRH : DUR	MRH : DFR	MRD : GRDA	MMDAs: URD	Self funded	Self funded Bus provided by MoT	Self funded
Operation	MRH : GHA	MRH : DUR	MRH : DFR	MRD: GRCL	MMDAs: URD	Unions Licensed drivers	Adheyee (KMA)	Unions
Regulation	-	-	-	MRD : GRDA	-	MMDAs: DoT	MMDAs: DoT	MMDAs: DoT
Environmental approval	EPA	EPA	EPA	EPA	-	-	-	EPA
Safety approval	NRSA	NRSA	NRSA	-	-	-	-	-
Enforcement	MTTD	MTTD	MTTD	-	MTTD	MTTD	MTTD	Unions

MRH	Ministry of Roads and Highways		URD	Urban Roads Dept
GHA	Ghana Gighways Authority		EPA	Environment Protection Agency
DUR	Dept of Urban Roads		NRSA	National Road Safety Authority
DFR	Dept of Feeder Roads		MTTD	Motor Traffic & Transport Department
DoT	Dept of Transport		GRDA	Ghana Railways Development Authority
MRD	Ministry of Railways Development		GRCL	Ghana Railway Company Limited

	Government
	Local
	Private/self funded

Figure 10: Stakeholder function matrix

Signalling is not represented but is funded and operated by the Department of Urban Roads. The entity responsible for the road is responsible for the entire cross profile: carriageway (private motorised transport, public transport, and freight), as well as non-motorised transport infrastructure (walkways, bicycle lanes, etc.), drainage, or other design elements.

At the national level, the mobility sector is quite fragmented in Ghana, between infrastructure (Ministry of Roads and Highway, with several different departments and agencies: GHA, DUR, DFR) and transport operations (Ministry of Transport). Although regional road agencies (GHA, DUR, DFR) are present in Kumasi, important decisions, project prioritisation and budget allocations are principally made in the central offices in Accra.

The Regional Coordinating Council of Ashanti acts as a link between the districts and the Ministry of Local Government and Rural Development (MLGRD) and is an indispensable partner in larger projects which involve several MMDAs.

At the local level, MMDAs represent the most advanced level of decentralisation. Expanded Kumasi has 16 MMDAs, KMA being the largest and most structured one. MMDA's Departments of Transport, among other responsibilities, regulate urban transport services and collect fees linked to public transport licences. MMDA's Departments of Roads (MRD or URD) are responsible for road design, planning and maintenance; except for roads which are the responsibility of the regional office of DUR, DFR or GHA.

3.2 Financial framework

3.2.1 Road infrastructure

Funding schemes

Funding and financing of road transportation is done within a complex structure depending on the agency through which the funds flow. The Ministry of Roads and Highways (MRH) and its agencies are generally responsible for a sizable proportion of funds that goes into road infrastructure. The MMDA's do also fund some road projects through sources such as the District Assembly Common Fund, District Development Fund, IGF, etc. However, funds from these sources are used for competing infrastructure projects, and, roads because of their huge investment cost do not end up receiving any funding from these sources in most cases. A few MMDA's do try to use some of above-named sources for the maintenance of their road infrastructure.

The key sources of funding are the Consolidated Fund/Government of Ghana (GoG), Donor Support (loans and Grants) and Road Fund. The consolidated fund is from taxes, levies, fees, etc. that the government collects from its citizenry. This is the primary source of funding for all infrastructure projects including roads. The government also receives money through its multilateral donor support either in the form of loans or grants towards the construction and rehabilitation of roads. The Road Fund is the main source of funding for the maintenance of the road assets. It is the only statutory fund that is clearly focused on roads.

The central government funding and donor funding support through the Ministry of Roads and Highways continues to be the major source of funding for the construction, reconstruction, and rehabilitation of road infrastructure whilst the Road Fund is mainly for the maintenance of the assets. The distribution of funds for roads are generally determined by the central government ministry and its agencies. Similarly, all funds accrued through either tolling, fees and levies for the road fund at the various MMDA's are not used for the maintenance of roads within those MMDA but sent to the Road Fund at the central government level and redistributed based on the Ministry of Roads and Highways request.

Every year, regional departments (regional DUR, regional DFR, regional GHA) propose an unconstrained budget to the Ministry through their Head Office. The Ministry then allots a budget allocation to each department or agency (constrained budget) who subsequently reallocate the funds to their respective regional offices. It must be noted that no fund transfers are done to the regional level: all payments (to contractors, etc.) are made directly by the Ministry at the national level. Thus, the Ministry is the one actually deciding on the project to include in the budget base on the propositions from the regional offices of the departments and agencies. This organisation creates some potential issues in the projects' prioritisation and selection: political influences can take place at the Ministry level and change the selections proposed by the regional agencies.

GOG (Government of Ghana) funds – Consolidated funds

The Ministry of Roads and Highways receives a portion of the Consolidated Fund of the Government of Ghana (GoG) for infrastructure. Most infrastructure projects (such as interchanges, new sections of roads...) are financed through these GOG funds. Which projects are financed is decided at the central level of the Ministry. These funds are also distressed, as commitments exceed actual yearly payments. Consolidated funds are also used as counterpart funds in the case of donor partner funds (see below).

Road Fund

The Road Fund is a fund dedicated to the maintenance of roads. Its sources of revenue include:

- Fuel Levy (main source, currently 70 pesewas per litre)
- Tolls from roads, bridges and ferries (currently suspended)
- Vehicle registration fees.
- Road use fees
- International transit fees

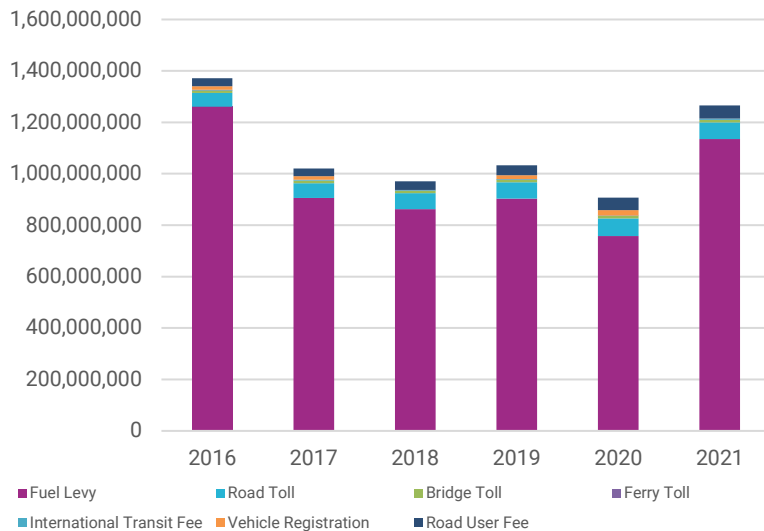


Figure 11: Trend of the different sources of Road Fund Revenue (in ₵)

The Board of the Road Fund is managed at the national level. It is legally supposed to be independent from the central government, but this is not the case as the fund operates through the Ministry of Roads and Highways.

Although the Road fund is theoretically dedicated to maintenance; in practice, it is also used for development, being the main and most reliable source of funding for the mobility and road sector.

The annual theoretical revenue of the Road Fund has been growing, due notably to the increase in fuel prices and consumption. A capping policy (under the Earmarked Funds Capping and Realignment Act, 2017 (Act 947)) has been put into place, limiting the Road Fund’s annual revenue at 850 M₵ nationally for the past 5 years. The road fund is currently in financial distress. Deficit is growing and arrears are today the first spending line of the fund, leaving little space for new projects. Payments are often late.

Donor partner funds

Donor partner funds in the field of infrastructure and mobility can be managed by either the Ministry of Roads and Highways, or by the Ministry of Transport, according to the project. They are designed to address specific needs and a particular project.

Such examples are the Transport Sector Improvement Plan financed by the World Bank (approximately 150 M\$); projects financed by Kreditanstalt für Wiederaufbau (KfW – German Credit Institute for Reconstruction), etc. In the Kumasi area, an Urban Development Grant from the AFD has been used to build footbridges. Ongoing projects include the Kumasi roads and drainage extension (2km, AFD).

Unsolicited proposals & Public-Private Partnerships (PPPs)

New legal dispositions have made possible and favoured funding through unsolicited proposals. A private entity can develop an infrastructure project, either on its own or through a “special proposal vehicle” (SPV) and interest banks in funding the project, which is repaid by the government generally with a delayed payment start. The consolidated GoG funds are then used for these repayments. Four pedestrian bridges should also be built this way in the Kumasi area.

Financial analysis

Routine maintenance projects

None of the Agencies under MRH sends money directly to the MMDAs as previously discussed. However, the Department of Urban Roads typically allocate some of their maintenance budget directly to the MMDA's through their Regional Offices. The following is a discussion on how the Ashanti Regional Office of the Department of Urban Roads distribute Funds to the various MMDA's with special emphasis on the project areas.	MMDA	2022	2021	2020	2019	2018	2017	
	KMA	2.9		2.6	0.9			
	Oforikrom	0.9		0.8	0.32			
	Kwadaso	0.9	No Budgetary Allocation	0.8	0.32	0.53	0.62	
	Old Tafo	0.9		0.8	0.32			
	Asokwa	0.9		0.8	0.32			
	Suame	0.9		0.8	0.32			
	Juaben	0.9		0.8	0.32			
	Atwima Nwabiagya	0.9		0.8	0.32	N/A	N/A	
	Kwabre East	0.9		0.8	0.32			
	Asokore Mampong	1.2			1	0.49	0.32	0.46
	Ejisu	1.1			1	0.45	0.22	0.22
	Total	12.4		-	11	4.4	1.07	1.3

Table 2: Distribution of Minor Maintenance Budget across the Various MMDA in the Expanded Kumasi (M€)
Created from Department of Urban Roads. 2022

Rehabilitation and redevelopment projects

Moreover, the DUR also manages development and rehabilitation projects. These projects are either funded by the Consolidated Fund from the GoG or by a donor partner with a counterpart from the Consolidated Fund.

About 50 rehabilitation/redevelopment projects are ongoing and managed by DUR. These projects are usually asphalt overlay, upgrading, or rehabilitation operations. The sum of these ongoing projects contracts is around 1,500 M€, which rise up to 2,103 M€ when considering the revised contracts. The total length of the concerned network is around 640km. These projects are funded by the Consolidated Fund from the GoG and should not use the road fund. However, sometimes the road fund is used for some of these projects.

Development projects

In addition to these rehabilitation/redevelopment projects, DUR and GHA currently manage two development projects:

- **Kumasi Road and Drainage Extension Project**, funded by AFD and the Government of Ghana, 2.5km long, with China Henan International Cooperation Group as contractor, for an original contract sum of 20,883,927.98€ plus 7,060,566.77 €.
- **Reconstruction of Sunyani Road Phase 2**, funded by the Government of Ghana, 7.5km long, with China Geo Engineering Limited as contractor, for an original contract sum of 254,309,508.22 €.

Local level: MMDAs

The MMDAs are allowed to generate internally as many funds as they desire and use it to cover some expenses of the MMDA. An analysis of the IGF (internally generated funds) related to mobility for the 2019, 2020, 2021, and 2022 composite budgets is hereafter presented for the MMDAs of the Expanded Kumasi.

The MMDAs' budgeted internally generated revenues related to mobility represented around 4.3 MC in 2021, which should be compared to the 11.25 MC allocated by the MRH in 2021 for road routine maintenance in the area.

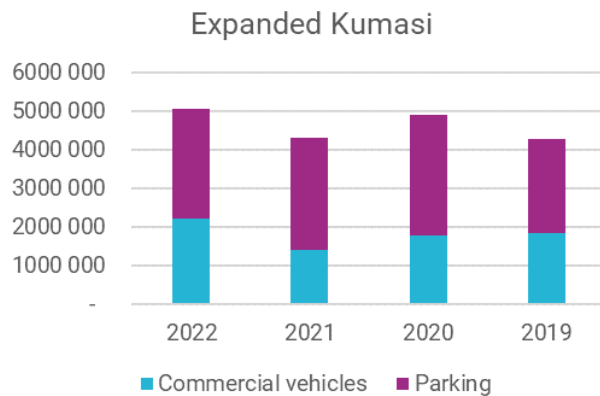


Figure 12: Sum of the budgeted mobility related IGF in the Expanded Kumasi
Created from 2019, 2020, 2021, and 2022 Composite Budgets (Republic of Ghana)

Distribution of revenues and expenditures in KMA

The following figures present the distribution of revenue and the distribution of expenditures for KMA in 2020. Only KMA is presented as its revenue and expenditures are usually ten times more than the other MMDAs. Moreover, the distribution of expenditures was not available for the other MMDAs.

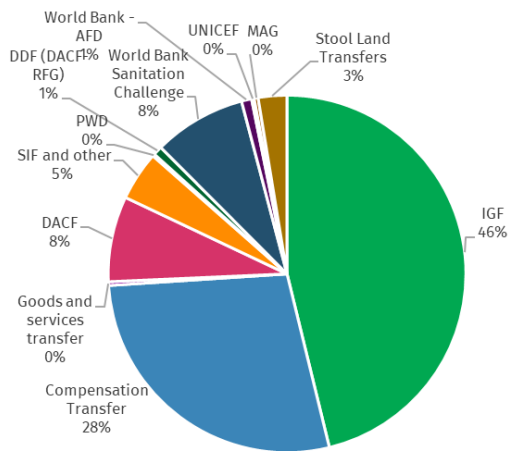


Figure 13: Distribution of revenue sources for KMA for the year 2020
Source: ITDP (2022) from Republic of Ghana (2021)

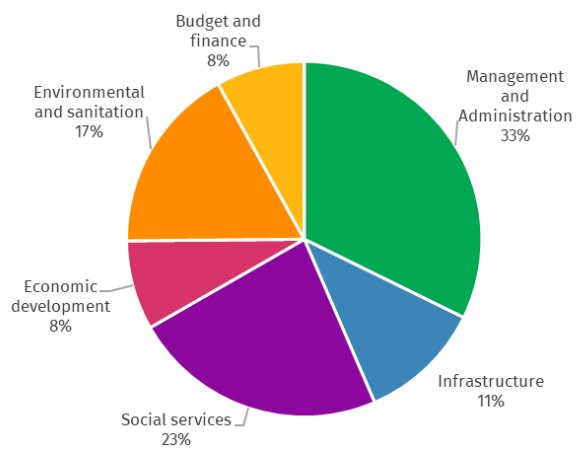


Figure 14: Distribution of expenditures for KMA for the year 2020
Source: ITDP (2022) from Republic of Ghana (2021)

IGF represented 46% of the revenues of KMA in 2020. In the budget, approximately 10% of the IGF originated from mobility activities (commercial vehicles, parking), meaning that around 5% of the overall revenue of KMA comes from mobility activities.

For the other MMDAs of the area, IGF usually accounts for one-third or less of total revenue, making the revenues insufficient and unreliable. It is important to note that civil servants' salaries are directly paid by the MLGRD.

The analysis of the financial data at the MMDA level highlights the fact that major infrastructure projects are not funded by the MMDAs: the road infrastructure budget is managed by the MRH for example. Approximately, one can average that KMA is spending around 5M€ a year in infrastructure, including mobility-related infrastructure (transport terminals for example).

Conclusion

The above discussion shows:

- Very limited amounts controlled by local MMDAs, whether obtained through MRH or through internally generated funds. These are generally limited to routine maintenance and are relatively stable year after year.
- A general lack of funding and financing towards road transport infrastructure by the MMDAs.
- Much larger amounts, controlled by the central government, for rehabilitation projects and development projects. These sums can come from government funds or donor partners.
- A lack of control over these funds from central bank by the regional and local levels. The budgets are decided at the central level and all works contracts, invoices, etc. are handled at the national level. Little visibility is offered to the regional level as these budgets are decided on a yearly basis.
- No operational PPPs at this stage.

To be able to meet the transport infrastructure demand in a sustainable manner, there is the need for institutional rearrangements at the local level coupled with innovating funding and financing methods and mechanisms.

3.2.2 Paratransit system

The paratransit system is entirely private and non-subsidised. However, terminals are built on public land and public authorities are building public terminals (for example Kejetia market terminal). The annual fees paid by the union to the MMDAs to operate (and thus use these terminals) are cheap (200 GHC/route/union) and may not cover the full potential value of the land. There is no VAT or income tax on paratransit.

The driver is at the centre of the paratransit system from a financial point of view. Daily, a trotro driver might, on average:

- Pay vehicle owner: 120 GHC/day
- Pay fuel: 150 GHC/day (in early 2022)
- Pay mate: 50 GHC /day
- Pay loading boys: 1 to 2 GHC/loading, about 10 GHC/day
- Pay use of station (to union): 10 GHC/day
- If in entering the CBD, pay right to enter CBD (to KMA): 2 GHC/day
- And make for himself: approximately 60-100 GHC/day
- Total operation expenditures: approximately 420 GHC/day

For a 4-rotation day with 13-passenger capacity minibuses, this would translate into 104 seats offered and a revenue of about 4 GHC/seat/trip. The actual number of passengers is higher as some seats are occupied by more than one passenger considering the rotation rate of the seats.

The owner will receive a daily fee of 120 GHC/day from driver, and:

- Pays occasional repairs, maintenance
- Pays insurance
- Pays road worthycertificates, registration
- Most often not repay a loan as most vehicles are bought without a loan.

The MMDA receives these fees from unions:

- Destination Sticker: 20 GHC/year/trotro; 15 GHC/year/taxi
- Route: 200 GHC/route/union/year for trotro
- Daily toll to access to CBD: 2 GHC/trotro/day; 1 GHC/taxi/day

MMDAs expenses include regulation of the sector, sometimes construction and development of terminals and stations.

Unions receive these fees from drivers and owners:

2 GHC from the 10 GHC station fare for each driver using the station, once a day.

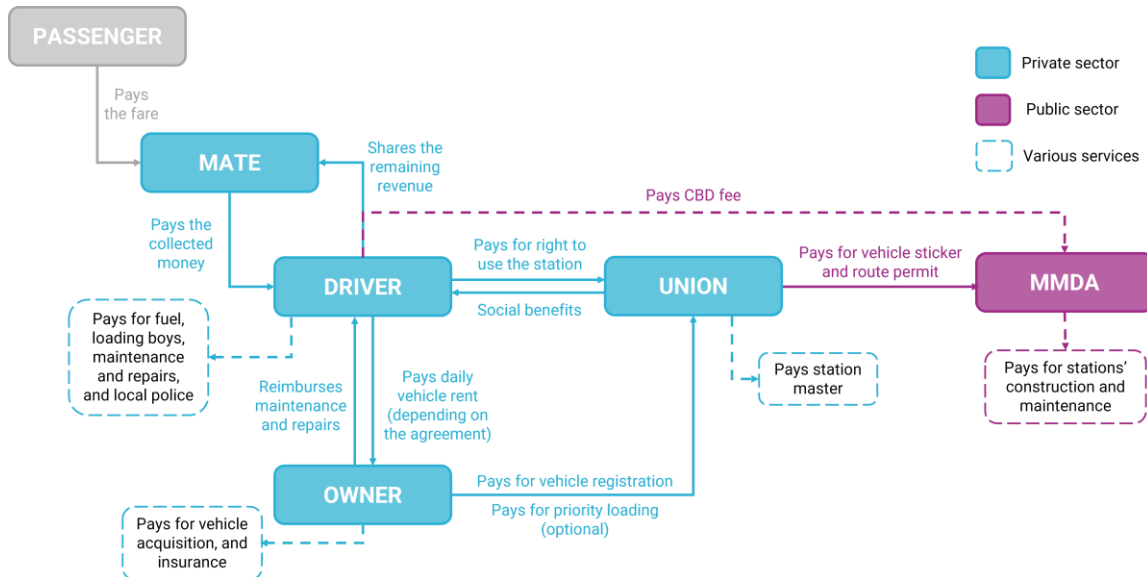


Figure 15: Financial flows of the paratransit system

Fare evolutions are determined by central government (Ministry of Transport), in association with GRTCC and GPRTU. Fixed fares are respected by drivers as passengers are aware of the fares and sometimes even complain on the first days of the fare increments are they are not yet aware of it. In some stations, fare are written on a board.

In early May 2022, GPRTU has unilaterally claimed a 20% increase in transport fares, without any negotiation with the Ministry of Transport and GRTCC. The latter publicly opposed this decision from

GPRTU. This increase was justified from GPRTU by the high increase in fuel and spare part prices as of early 2022.

In KMA, fares vary from 1,40 to 5 GHC according to the route. In each station and for each route, there exists a fare chart fixing fares for partial trips on a route, in a section-type manner. Up to 3-4 sections are commonly found on a route, up to 5-6 for the longest routes.

Drivers and mates prefer riders who do shorter trips, as it increases the total fare perceived per seat and for one trotro trip. Mates are responsible for the checking correct fare is perceived.

Wawa drivers, who often operate on routes similar to official trotro routes, often practice "short-short". "Short-short" consists in segmenting the trips by artificially generated route interruptions, forcing passengers to either disembark or pay anew to continue their journeys. The need to do several transfers is a very sensitive point for the passengers, due the need to wait for another car and to pay once more for the next ride.

"My major challenge when commuting from my home to the CBD has to do with the boarding of two or three cars before I get to the CBD. Passengers can be transported to-and-from the CBD with just one car but drivers resort to transporting in short distance in order to make more sales."

Woman, Kejetia trader

"Sometimes, the trotro I board will be going straight to my destination but drivers intentionally drive on short distance basis in order to gain more profit."

Man, public transport user

"One thing that I have also realized is the increment of the lorry fare by the trotro drivers and their mates when there is an increased demand for their services in the mornings and evenings."

Man, public transport user

"Trotro drivers increase the usual fare prices when the weather condition is bad especially when it is raining."

Man, public transport user

Although this practice is illegal, some trotro drivers engage in it as well.

Some drivers can possibly take profit of the high demand to rise the fares prices, especially during morning and evening peak hours or under unfavorable weather conditions.

The household survey indicates average 4.50 GHC/travel whose main mode is trotro (one-way travel), which may include "short-short" as well as a proportion of combined trotro/collective taxi travels.

However, from the driver point of view, the lack of financial support and fuel price rising lead them to make these decisions.

"The car belongs to my husband, so I help out whenever he needs a mate. The drivers always run the short distances because of the rise in fuel prices. Whenever there is a traffic jam, you run at a loss so it leaves them with no other option than to employ that strategy. By the end of the day, the short distances run help them to get profit after their expenses."

Woman, trotro mate

3.3 Planning framework

3.3.1 Urban development masterplan (2013, JICA)

A masterplan was prepared in 2013 in collaboration with the Japanese International Cooperation Agency (JICA) for the Expanded Kumasi Metropolitan Area (at the time called Greater Kumasi), with the Town and Country Planning Department (under the authority of the Ministry of Environment, Science and Technology) as local counterpart. The plan proposed land-use allocation, infrastructure projects, and a timeframe for implementation.

Outside the “inner city”, the plan proposed the development of suburban centres along major urban corridors (mainly Kumasi-Ejisu and Kumasi-Mampong teng), as well as the development of sub-centres at the intersections between the main arterial roads and the inner ring road. The district capital towns’ role would be reinforced, creating real satellites urban centres. One of the main principles of the plan was to try to decentralise the city, allowing development outside the central business district not to be oriented exclusively on housing. This rebalancing of activities would help to decongest the CBD.

The densely urbanised area would be belted by an outer ring road feeding the suburban centres and newly urbanised area, as well as diverting transit traffic unrelated to Kumasi area outside the city.

The time frame suggested in the masterplan prioritises the development of Kumasi-Ejisu urban corridor, including KNUST, Oforikrom area and Ejisu town. New settlements were to be developed along this corridor, as well as industrial centres. The second corridor which was identified was the Kumasi-Mampong teng corridor along the Mampong Road, accompanied by a capacity increase of the road. The outer ring road was also phased, with a top-priority section identified between Ejisu and Kodie. This new bypass would allow connection of the two new urban corridors and would divert transit traffic, especially freight transit between inland Sahel countries (Burkina Faso, Mali) and the port of Tema, the closest major access to the ocean for these countries.

The plan also proposes the development of satellite markets in the sub centres and suburban centres, which would decrease the pressure on the CBD’s markets such as Kejetia. This principle could rely on the expansion and diversification of already existing markets such as Anloga or Sofoline.

The public transport facet of the plan was mainly based on the development of a new BRT system across the city, upon the inner ring road and the six main arterial roads entering the city (Accra Road, Mampong Road, Techiman Road, Sunyani Road, Bekwai Road, Lake Road). Further studies were conducted specifically on the BRT system, as indicated later.

3.3.2 Kumasi transport plans (2011–2013, World Bank)

A study published in 2013 was prepared in cooperation with the World Bank and the Department of Urban Roads as local counterpart to propose transport plans for the Expanded Kumasi Metropolitan Area (at the time called Greater Kumasi). The study suggested a comprehensive five-year action plan of several transport modes.

The plan had a great focus on road traffic and infrastructure projects, with an important side of the project residing in the development of a transport demand model. On a longer term, the plan proposed

an outer ring road project, which is however different from the JICA masterplan one (closer to the inner ring road). Other road infrastructure projects were proposed, mainly the widening of several single-carriageway roads to dual-carriageway ones.

The following steps were proposed to regulate urban transport operations:

- Stage 1: Registration and rationalisation of all routes in the participating Assemblies.
- Stage 2: Issuing of operating permits (permit Type A¹) to all operators who are identified and recognised at the end of the process in Stage 1.
- Stage 3: Issuing of operating permit Type B² to qualified operators along specified routes that require higher standards of operation.
- Stage 4: Awarding of Route Service Contract (RSC) to operators on high-capacity routes which require much higher operating standards and priority than in stage 3.

It is important to highlight that one of the main objectives of issuing Type B permits is to avoid fill-and-go transport networks, proposing operators to work under a fixed timetable to ensure system reliability and quality of service. Thus, the plan suggested the following actions for a five-year horizon:

- Implement a pilot Type B Large Bus Route delivery on Accra Road.
- Expand Type B network to other corridors.
- On a longer term, develop BRT corridors on main arterial roads. A mass transit system was identified as being necessary to absorb the future demand for public transport, however, its implementation should be preceded by Type B routes operation.

Enhancing the current NMT infrastructure was identified as a priority, especially regarding the removal of obstructing elements from the walkways. For a long-term horizon, the cycle lanes are to be provided along the existing routes to improve cycle ridership:

3.3.3 Other plans and studies

Other plans and studies were recently carried out in the area on some specific topics:

- A feasibility analysis to implement corridors of Bus Rapid Transit was developed in 2020 with the support of AFD and the Department of Urban Roads, including an assessment of the Ayalolo operation challenges met in Accra
- A BRT readiness assessment carried out by the World Bank in 2022, mainly reviewing the BRT feasibility study and assessing the institutional and industrial readiness for BRT operation
- A research project (High Volume Transport – TRANSitions) supported by UKAid focusing on how paratransit in Sub-Saharan Africa could be part of a solution for mass transit in a low carbon emissions perspective, with a case study of Kumasi

¹ Issuing permits is a wide-spread approach to regulate urban transport operation. The permit Type A requires operators to meet standards in terms of corporation, vehicle state, drivers, tax compliance, service quality

² Permit type B is an evolution of permit type A. It presents the following basic characteristics: schedule-based operation, compliance to service standards, route service contract, potentially bus priority and traffic management

3.4 Demographical data and urban development

3.4.1 Urban morphology

Built-up area evolution

Current land use in the Expanded Kumasi is represented in the figure below. Built-up areas cover over 800 km² in 2021, corresponding to 32% of the total area. The built-up areas are mostly continuous, forming a circle expanding along major arteries, with some smaller built-up areas in the outer MMDAs.

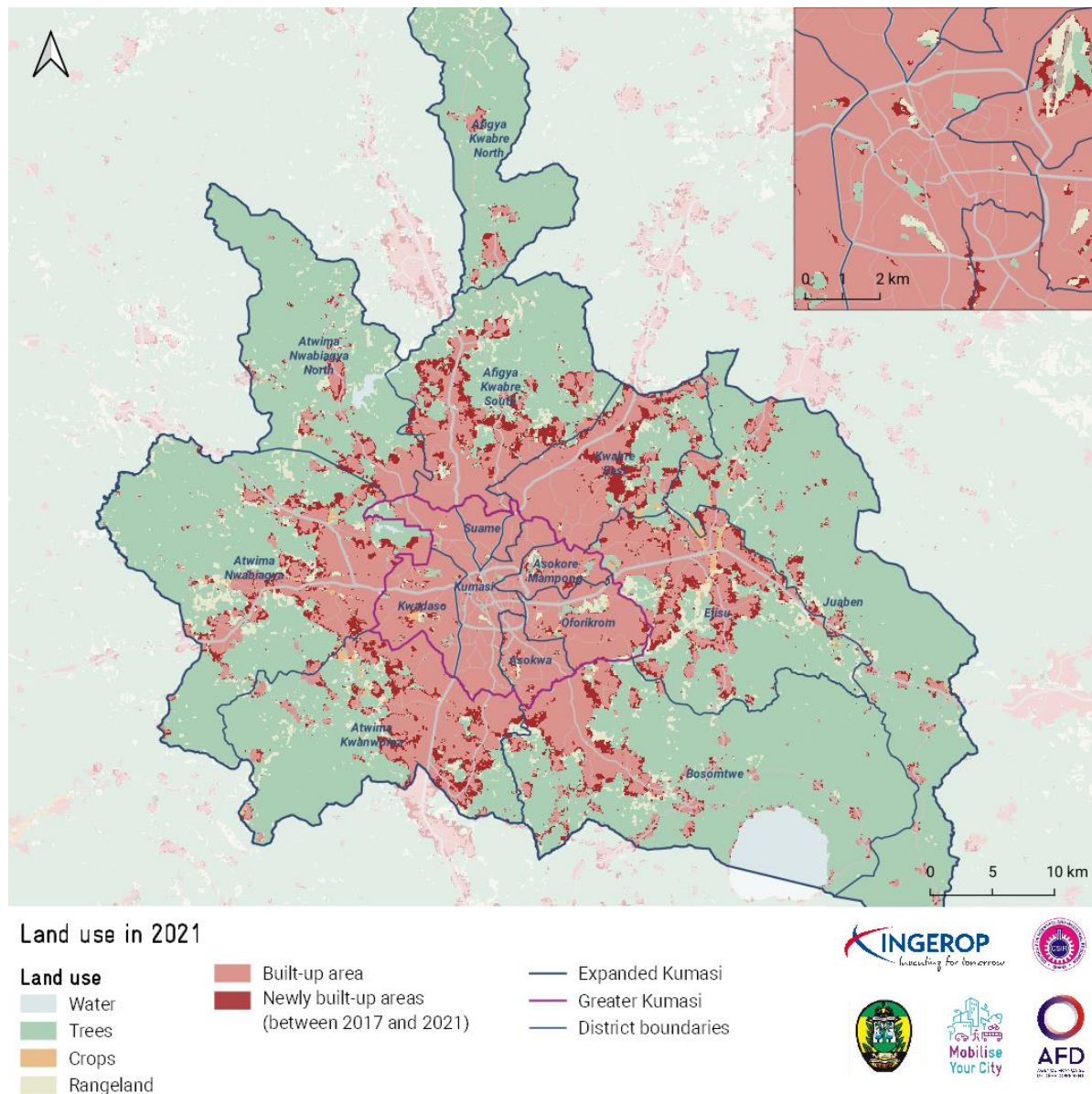
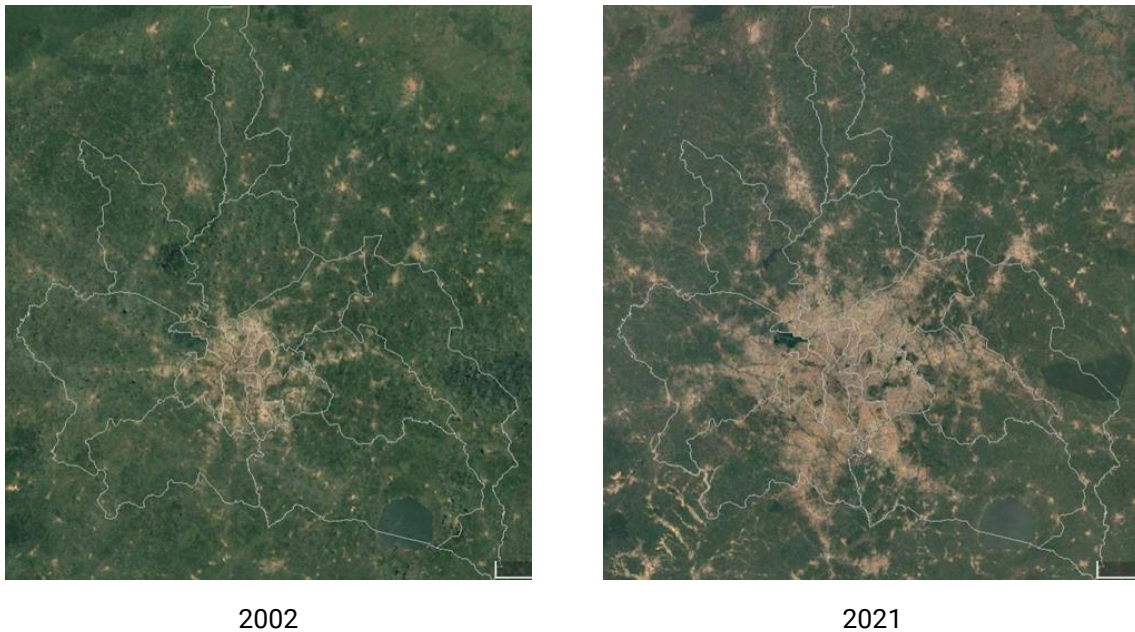


Figure 16: Land use in 2021
 Calculated from ESRI Land Cover 10m[®] in 2017 and 2021

The built-up area still represents only 32% of the total area, demonstrating the diversity of territories in the Expanded Kumasi, both urban but also rural, with large woodlands and a noticeable water body (Lake Bosomtwe).

In the past 20 years, the growth and the sprawl of the metropolis have been momentous. The urbanised area was limited to the Greater Kumasi in 2002, whereas 20 years later, it extends to great parts of the expanded area, sprawling over natural areas.



2002 2021
Figure 17: Satellite imagery of the Expanded Kumasi in 2002 and 2021
Source: Google Earth®

Between 2017 and 2021, the built-up surface increased by 20%, meaning an important yearly sprawl of 4,7%. This sprawl is concentrated in the expanded districts of the area, as the central ones (Greater Kumasi) are already nearly entirely covered by built-up areas.

In this regard, we can classify the districts into 3 dynamics:

- Already urbanised areas, where the built-up surface is stable, forming the Greater Kumasi area
- Urbanising areas, where the sprawl is the most important and fast, in most of the Outer MMDAs
- Not yet urbanised areas, where the built-up area is limited and where the urbanisation is still not so fast, in Afigya-Kwabre North, Atwima-Nwabiagya North, and Juaben

Structure of the metropolis

Kumasi metropolis has a classic hyper-centralised structure, similar to many comparable-sized cities in West Africa. The urban network is centralised around a CBD, which concentrates the major share of the economic activities: trading, shopping, administration, services, offices and job providers, health and education facilities, etc.

Kumasi metropolis does not have any major boundaries or constraints, whether natural (river bodies, topography, etc.) or man-made, and therefore developed along a full symmetrical centralised structure.

From the city centre start all the main transport axis of the city: roads and public transport corridors. In Kumasi, these axes are the eight major entering roads:

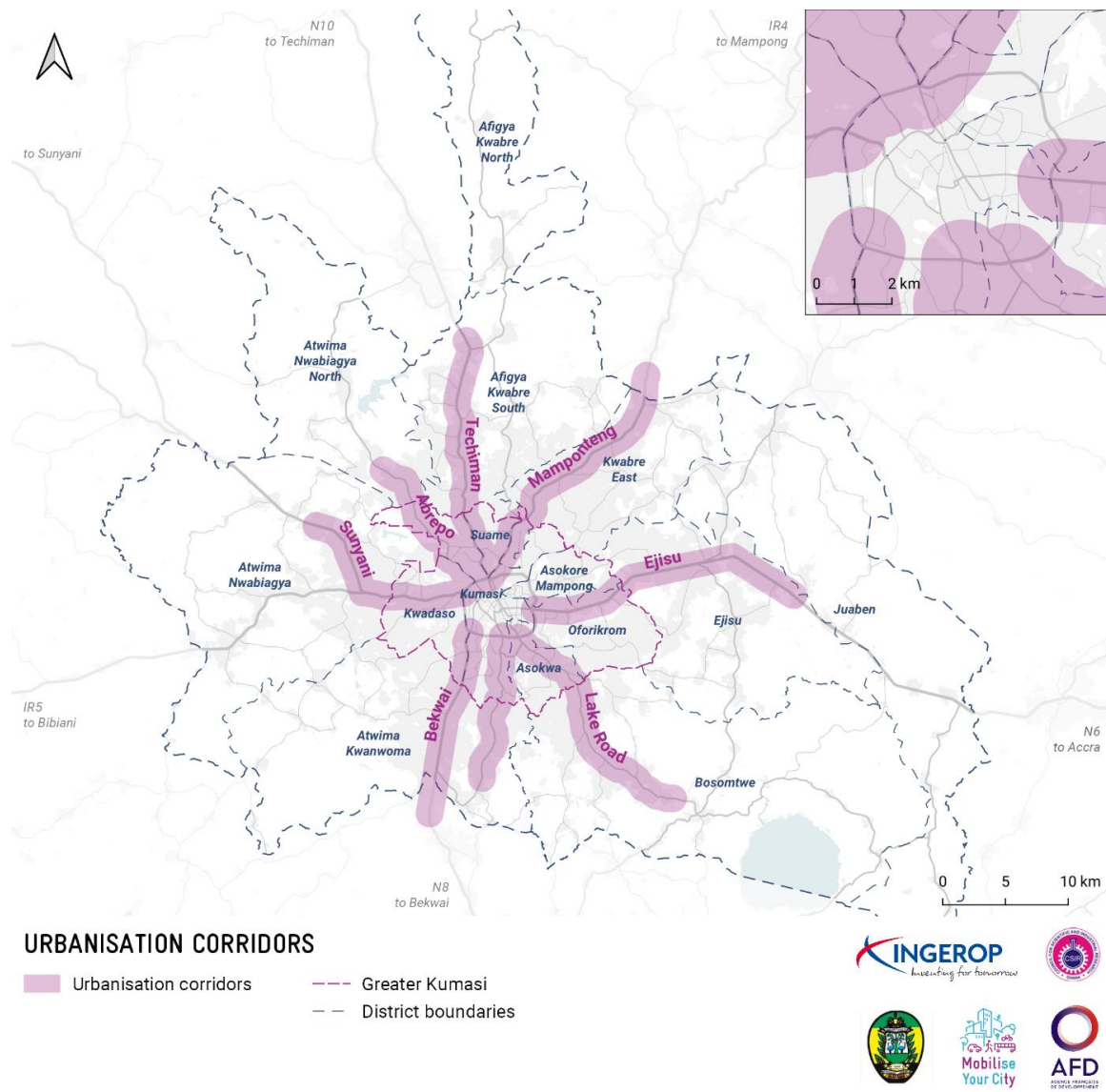


Figure 18: Urbanisation corridors

Urbanisation starts along the corridors and moves away from the CBD. This concentration along the main trunk roads is very visible on the satellite imagery. These areas were the first suburbs to develop, and with time tended to extend the city as settlements along the different corridors joined each other. This mechanism is how Kumasi metropolis sprawled.

Informal settlements created in the past along and between the corridors tend to be formalised with time, and new informal settlements are created in the further suburbs which are developing. This dynamic is still ongoing as of today in Kumasi, even though it is slowing compared to the development period observed these last 20 years.

Secondary urban centres are naturally developed with time, either as new settlements created in the sprawling process, or as ancient, separated villages which are incorporated in the metropolis as the city sprawls (for example Ejisu). However, these secondary centres usually offer fewer services than the CBD and people living in the suburbs still travel on a daily or weekly basis to the city centre, causing important travel demand on the main corridors and commuting congestion to enter the city in the morning and exit it in the evening.

Land use and major traffic generators

Figure 19 identifies the major amenities for the Greater Kumasi region, which are major professional and mobility generators.

In Kumasi city centre, Adum plays the role of Kumasi’s administrative sector, hosting the offices of great civil domains, such as the Centre Assembly, the Kumasi High Court, the Ministry of Trade and Industry, the National Service Secretariat, the Regional Health Directorate, the Immigration Office, Births and Deaths Registry, Social Security and National Insurance Trust (SSNIT), among others. Most offices are concentrated in this area.

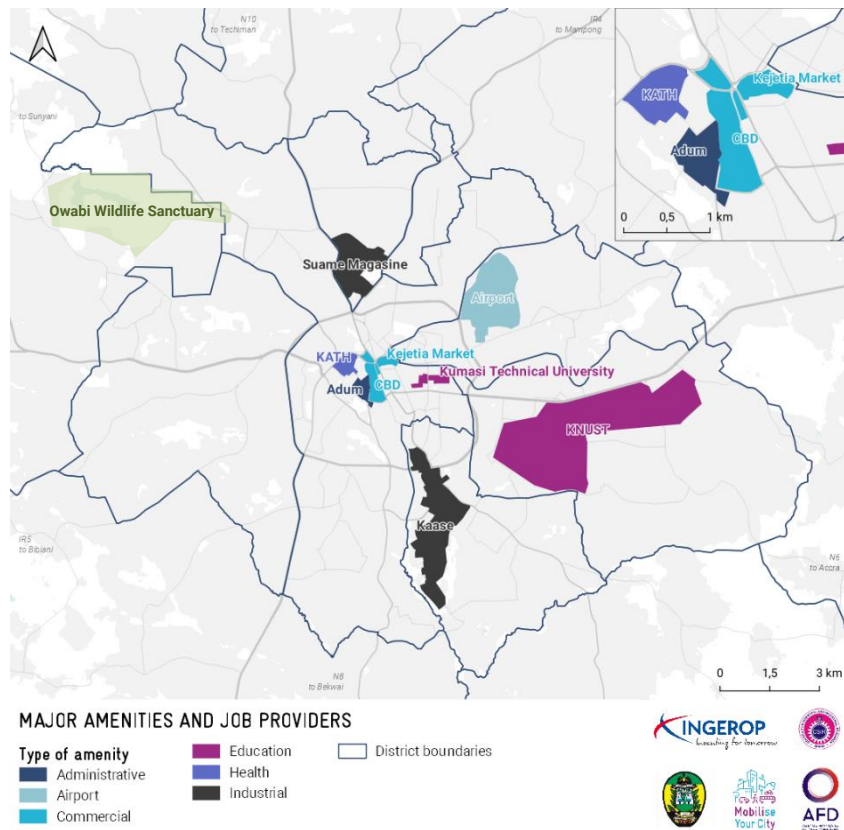


Figure 19: Location of major amenities for Greater Kumasi region

The CBD concentrates most part of services and economic activity in the Expanded Kumasi. It regroups great part of sales and commercial jobs, especially the informal ones. The infrastructure is not necessarily formally organised, and public space is used as a vending spot, where tents or small stands are positioned. Even from further areas, many people travel daily to the CBD for trading activities (both buying and selling).



Figure 20: Pedestrian circulation and commercial activity in Kumasi CBD



Figure 21: Kejetia market
Source: Flow Deutschland Bank

Kejetia market is an ongoing project, led by KMA, to rebuild the old trotro central terminal, which had the capacity of around 1,000 vehicles. The objective was to enhance parking conditions and relocate CBD informal vendors in an organized environment. The first phase of the market was completed in late 2018

and comprises around 8,000 stores and 100 slots for public transport. The second phase, under construction, will welcome around 6,500 stores and 600 trotro slots. Works are expected to be completed until June 2024.

Kwame Nkrumah University of Science and Technology (KNUST) is the second largest university in Ghana, counting a 55,000-student population in 2019 and aimed at welcoming 23 000 new students for 2020. KNUST is organized into six colleges and is equipped with other non-educational amenities, such as the health centre, residential halls/ hostel, and sports facilities. Currently, trotro and other public transport cannot circulate inside the campus, the local transport being ensured by other internal services. Private hired vehicles, unlike private cars, can't reach the core of the campus, where the colleges, the administration buildings, the central classroom block, among others, are located.

Shuttle transport in KNUST Campus

KNUST Campus presents a dedicated transport service, which is offered through "KNUST Campride" shuttles. The use of these shuttles is free for students as the service is funded with the tuition fees of the students. The service covers the main faculties and carries students between the faculties, the commercial area, and the various halls, hostels, and guesthouses. However, one can often see long queues at bus stops in the faculties areas (Central Classroom Block, Examination Complex, etc.). The massive flow of students leaving the buildings at the same time are difficult to absorb for the shuttles which are 12m buses carrying around 100 passengers when full.

"Personally, the availability and access to shuttles is a problem because the number are not enough for the student population. Due to that, there is always a massive struggle for the buses when they arrive to board students to their various destinations. I was even a victim of an attack on me when trying to board a shuttle because the person was also trying to get on board."

Man, student

Out of Kumasi borders, the airport is an important element to mobility dynamics. Kumasi Airport operates on national scale, with over 400,000 passengers handled in 2021, according to the Ghana Airports Company Limited. The airport is the second largest in Ghana in terms of passenger traffic just after Kotoka International Airport in Accra.

Suame Magazine and Kaase are the most important industrial hubs located in the perimeter. Suame is the biggest informal industrial pole in Ghana, specialised in metallurgic enterprises and vehicle repairs services, playing an important role in vehicles and other industrial manufacturing products, requiring small engineering operations. It attracts traders and buyers from all Ghana but also neighbouring countries and is usually considered as the biggest vehicle-repairing site in West Africa, and it is supposed to host around 200 000 workers. A great part of the activity is oriented toward the acquisition of second-hand vehicles from Europe and their reshaping and repairing into functional vehicles supplying West Africa. Kaase is an important industrial hub for the city, gathering among else the slaughterhouses and many wood processing companies, as well as some cocoa processing factories.

Komfo Anokye Teaching Hospital (KATH) is a 1200-bed hospital and a referential of health care on both national and international scales. The institution presents that the hospital takes referrals from 12 out of the 16 administrative regions in Ghana, as well as some visits from Ivory Coast and Eastern Burkina Faso. The concentration of health facilities is clearly imbalanced among the MMDAs, the city centre of Kumasi being the most well-equipped region. Outside the densest areas, care institutions are clearly concentrated along transport axes. This may represent a huge barrier to the rural population, especially in emergency cases, which are deeply dependent on transport offer to reach these destinations.

3.4.2 Socio-demographic characteristics

Population and households

According to the 2021 Ghana Population and Housing Census, the Expanded Kumasi region possesses 2,945,750 inhabitants and 869,500 households in total. Population is distributed as follows:

- KMA: 444,000 inhabitants.
- Inner ring MMDAs: 935,350 inhabitants, excluding the KMA.
- Outer ring MMDAs: 1,566,400 inhabitants, excluding the Greater Kumasi.

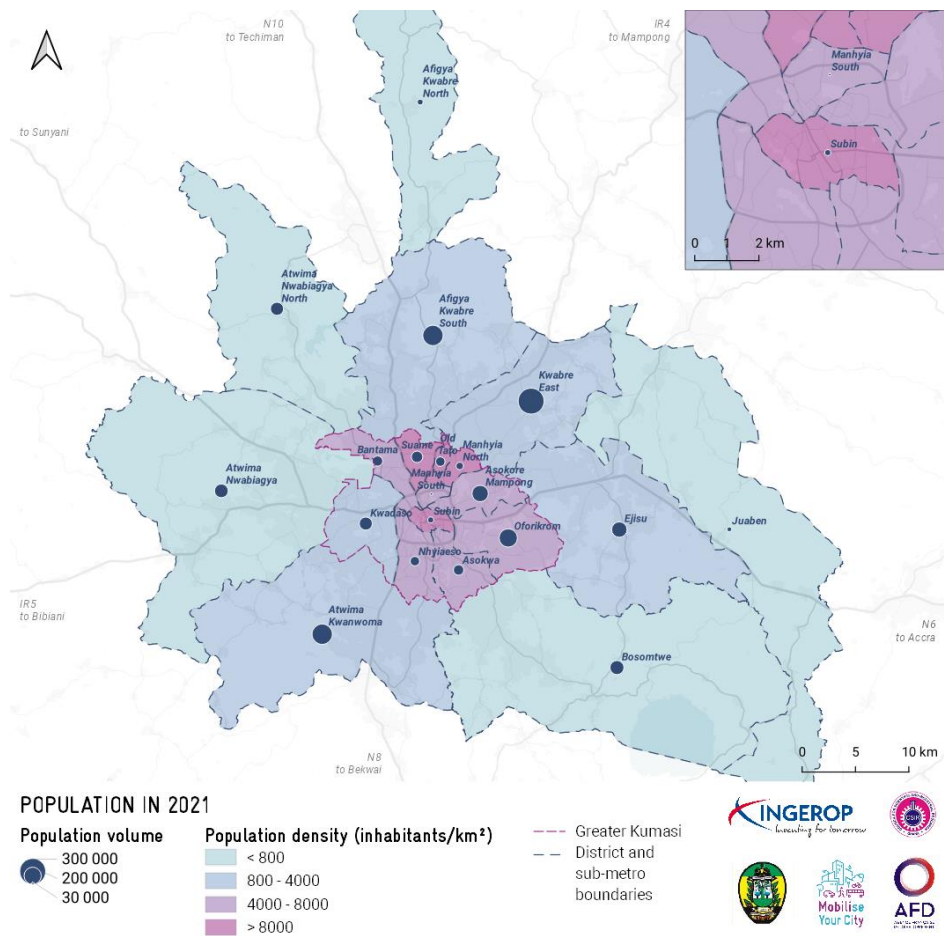


Figure 22: Repartition of population in 2021
 Created from Ghana 2021 Population and Housing Census, Ghana Statistical Services, 2021

As shown in Figure 22, Kwabre East population volume is the greatest, with 296,800 inhabitants, followed by Atwima-Kwanwoma (234,850 inhabitants) and Afigya-Kwabre South (234,650 inhabitants). These are very large MMDAs in the Expanded Kumasi area. In Greater Kumasi, Oforikrom and Asokore-Mampong also house an important population volume.

In general, net population is not proportional to population density. The highest population densities are observed close to the city centre. This indicator only exceeds 8,000 inhabitants/km² in Suame, Subin, Old Tafo, and Manhyia North. The districts of Afigya-Kwabre North, Atwima-Nwabiagya North, Atwima-Nwabiagya, Bosomtwe and Juaben present the lowest population densities, less than 800 inhabitants/km².

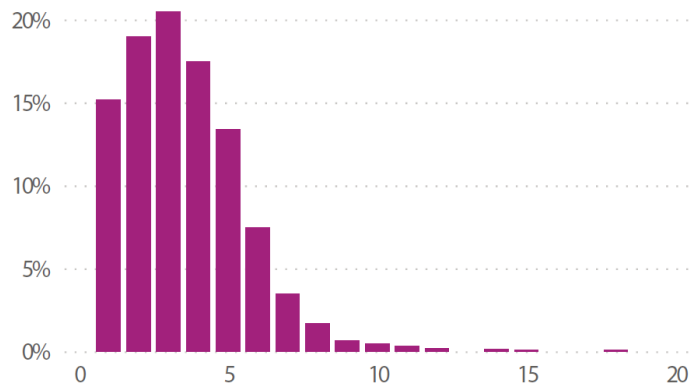


Figure 23: Number of households per size
 Created from 2022 household survey

Concerning the household distribution and composition, the average household size grows in the remote areas. From the 2021 Census, the average household in the Expanded Kumasi is composed by 3 members. The 2022 household survey shows similar results, as shown in Figure 23. Three-member families are the most represented (21%), while the majority is composed of two to four members (57%).

Age pyramid

Ashanti region age repartition is very representative of an emergent country context. The youngest are many, which is illustrated by a larger base.

From a development point of view, Ghana has made great improvements in the past decades, particularly in reducing poverty and boosting economic growth. The Inequality in Ghana Report, published by the United Nations International Children's Emergency Fund (UNICEF) in 2014, presents that even if the gaps between wealth and economically disfavoured population were reduced for net primary school enrolment, immunization rates, sanitation access, and stunting in childhood, gender equality and revenue distribution remain the principal barriers to face.

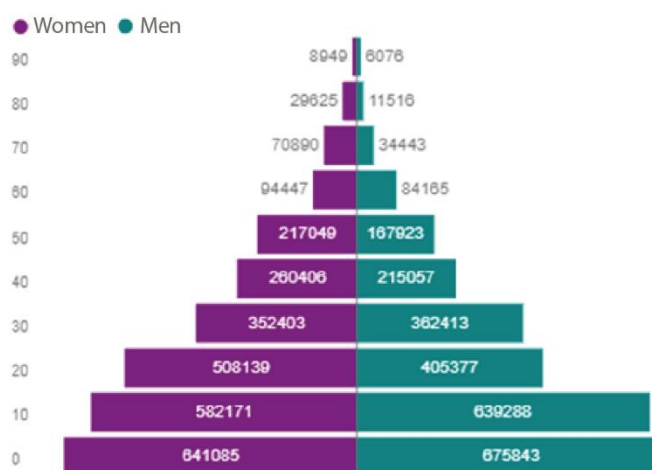


Figure 24: Age pyramid for Ashanti region
Source: GLSS, 2017

Revenue

The Ghana Living Standards Survey (2019) presents information on income in Ghana, based on data collection in 2016-2017. Mean annual household income in Ghana is 33,937 GHC/year, and mean per capita income is 11,694 GHC/year with an average of 3.9 persons/household.

The distribution by quintiles shows a large dispersion of income, for households and even more so for individuals. It is known that social inequality is a major challenge faced in Ghana. The Ghana Living Standards Survey presents that the richest quintile of the Ghanaian population contributes almost half of the country's total income, while the poorest quintile only 5%.

Quintile	Mean annual household income	Mean monthly household income	Mean annual per capita income	Mean monthly per capita income	Mean household size	Share of annual income (%)
Lowest	7,783	649	1,320	110	6.2	2.9
Second	21,817	1,818	3,739	312	5.0	9.9
Third	24,972	2,081	5,792	483	4.3	13.2
Fourth	35,495	2,958	9,433	786	3.4	23.5
Highest	54,371	4,531	24,748	2,062	2.4	50.4
Ghana	33,937	2,828	11,694	975	3.9	100.0

Table 3: Mean annual income in Ghana by quintile (GHC/year)
Source: GLSS, 2019

The mean annual income in the Expanded Kumasi is probably higher, both due to its urban nature and its localization in the Ashanti region. Income for urban areas in Ghana is higher than average, at 44,583 GHC/year/household and 15,344 GHC/year/capita.

Locality	Mean annual household income	Mean annual per capita income	Estimates total annual income (million GHC)	Share of annual income (%)
Urban	46,902	16,373	185,509	76.6
Accra	63,027	23,532	31,338	12.9
Other urban	44,583	15,344	154,170	63.6
Ghana	33,937	11,694	242,271	100.0

Table 4: Mean annual income in Ghana by type of locality (GHC/year)

Source: GLSS, 2019

The household survey gives some information on household revenue as well, although it is notoriously difficult to gather reliable information in this type of survey because of unwillingness to answer and underreporting of total income, especially in a developing economy with a large informal sector. Revenue is a sensitive subject for any survey in the world. Besides being a declarative data, most part of the population possesses multiple revenue resources, often concentrated on a daily basis.

Interviewees were asked to position their household income in one of five monthly revenue categories: <500 GHC; 500 to 1,000 GHC; 1,000 to 2,000 GHC; 2,000 to 5,000; >5,000 GHC. The household survey results show that the Expanded Kumasi population's monthly revenue is mainly divided into three categories: 500 to 1,000 GHC; 1,000 to 2,000 GHC and 2,000 to 5,000, with the poorest and richest part of the interviewed group representing about 5% each (Figure 25).

This question was included in the household survey to differentiate mobility patterns between the richer and poorer households, and not to calculate an average income. However, as an indicator, the household data would place the median household income around 1,500 GHC/month and the mean household income around 2,500 to 3,000 GHC/month. Due to the underreporting bias mentioned above, these numbers do not seem contradictory with the estimate of around 3,700 GHC/month from the GLSS.

The segregated results expose the existent disparities between the city centre and its surroundings.

- The outer ring has the lowest household income, with the biggest population owning up to 1,000 GHC a month and the smallest part owning 2,000 – 5,000 GHC a month. 64% of households have an income between 500 and 2,000 GHC/month.
- The inner ring has the highest household income. 66% of households have an income between 1,000 and 5,000 GHC/month. The inner ring also has the highest proportion of wealthy households and the fewest poor households.
- The city centre presents the most households in the intermediate revenue category between 1,000 and 2,000 GHC a month.

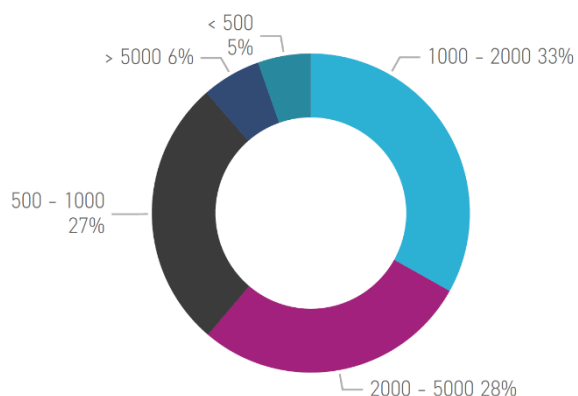


Figure 25: Household revenue (GHC/month)
Created from 2022 household survey

Revenue (GHC/month)	Total (%)	City centre (%)	Inner ring (%)	Outer ring (%)
< 500	5*	3*	3*	7*
500 - 1000	27	28	22	31
1000 - 2000	33	35	32	33
2000 - 5000	28	28	34	24
> 5000	6*	5*	8*	5*

Table 5: Revenue levels for Expanded Kumasi according to the analysis areas

Created from 2022 household survey

*Note: small samples – to be considered with caution

Education

In terms of education level, the household survey presents that the most represented group (37%) attended only basic school, while about one-third attended senior high school (Figure 26). The ones attending tertiary level represent a quarter of the interviewed people. Finally, the level of literacy is high, with just 6% of the sample having never attended school.

As expected, the economic disparities between areas are also reflected in the access to education. On one hand, the patterns for the city centre and inner ring are very similar, which can be related to educational institutions availability since these are more central and urbanized areas. On the other hand, almost half of the sample living in the outer ring attended only basic school, while this proportion is about 30% for the city centre and inner ring regions. Further, the part of inhabitants attaining the tertiary level in more remote areas is the lowest, at about half the rate in the two other areas.

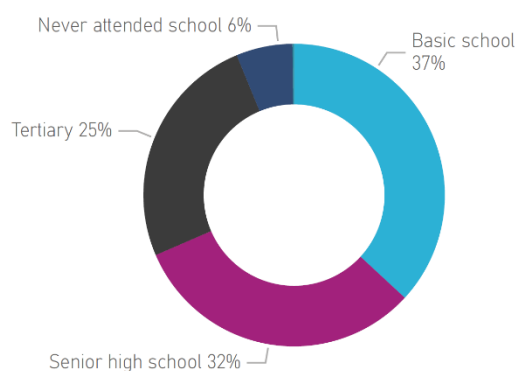


Figure 26: Highest level of education attended
Created from 2022 household survey

Education	Total (%)	City centre (%)	Inner ring (%)	Outer ring (%)
Never attended school	6	5	6	6
Basic school	37	28	30	45
Senior high school	32	34	32	30
Tertiary	25	32	32	18

Table 6: Education levels for Expanded Kumasi according to the analysis areas

Created from 2022 household survey

Regarding gender, education levels disparities between men and women are significant. Regardless of the area, the proportion of women having never attended school or interrupted studies in basic school is more important, while the male sample possesses higher access to senior high school and tertiary levels. Results obtained for the outer ring are outstanding. For these MMDAs, half of the interviewed women attended only basic school, while less than 15% reached the tertiary level. Therefore, not only the geographical location plays an important role in people’s social condition: gender also influences.

Economic activities

The significant presence of basic levels of education reflects in the economic activities' patterns. From Figure 27, self-employees represent more than 40% of the surveyed sample, slightly varying geographically (42% for the city centre, 38% for the inner ring, and 48% for the outer ring). It is worth mentioning that the self-employed category includes part of the informal jobs, mainly related to trading.

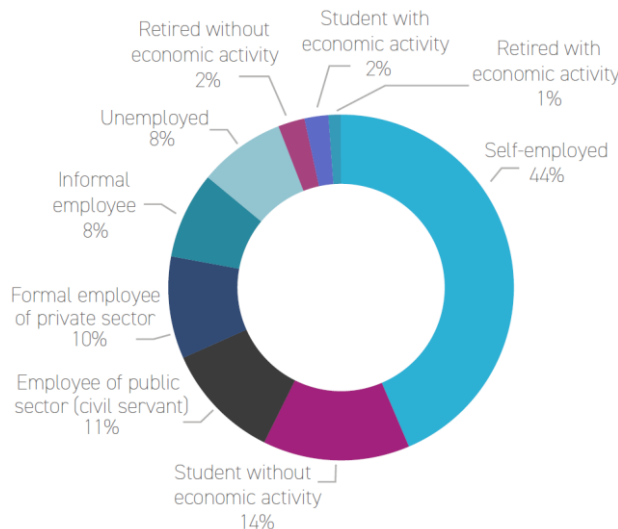


Figure 27: Economic activity categories
Created from 2022 household survey

As expected, gender disparities can also be noticed in the economic activities. Self-employed women are the most represented in the three geographical areas, reaching at least 50% in the city centre and in the outer ring. Men have about twice more access to formal employment than women, which can reflect in their financial independence. It is important to note that, despite the differences, some improvement can be detected. The part of students, either with or without economic activity, is similar in terms of gender, which can potentially switch the current portrait of education access inequity.

Socio-professional categories

Considering the complete perimeter, Figure 28 confirms that the previously identified patterns are also valid for the analysis segregated by socio-professional categories. About one-third of the sample occupy sales and services jobs; Isolating the three study areas, this proportion does not vary. However, managers and professionals rise to almost one-quarter of the surveyed people in the inner ring, to 19% in the city centre and fall to 13% in the outer ring. For the outer ring, agricultural, forestry, and fishery workers represent 8% of the sample, while they represent less than 3% in the centre and the inner ring.

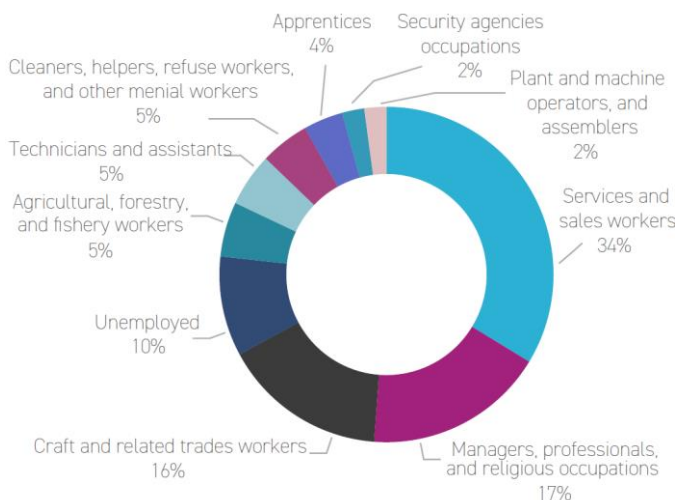


Figure 28: Occupation category
Created from 2022 household survey

From a gendered perspective, women are the ones who are mostly present in sales and services sector, besides being self-employed. Services and sales workers lead the survey, surpassing 40% of the sample in all three perimeters. Unemployment is always more common for women than for men. For male participants, the most representative group in the city centre and inner ring is composed of managers, professionals, and religious occupations (24% and 32%, respectively), while male crafters and traders are more in the outer ring (25%).

3.5 Development trends

This section aims at identifying possible development trends in the Expanded Kumasi territory based on the previous statements and other studies. The BRT projects feasibility study served as the main input for some of the following estimations, proposed by the Building and Road Research Institute (BRRI).

The 2010 Population and Housing Census estimates that, the greater Kumasi area is growing at an annual growth rate of 4.6%. The BRRI report states that this is relatively higher as compared with the 2.8% for Ashanti Region and 2.7% in the case of Ghana. Bosomtwe district (3.5%), the Kumasi metropolis (5.7%) and the Afigya Kwabre district (4.3%) have experienced rapid urbanization within the Greater Kumasi area.

Between 2010 and 2021 census, one can observe an acceleration of the population growth in the outer ring. However, the figures for the Greater Kumasi sub-region (which is now censused as 6 municipal assemblies and 5 sub-metros for KMA) are surprising: the 2010 census recorded more than 2 million people while the 2021 census counted only 1.4 million. It is proposed to take as reference the most recent figures, e.g. from the 2021 census, as the urban density was already high in the 2000s and therefore a 73% increase of the population between 2000 and 2021 seems quite high. Moreover, the population growth rate is likely to be less in the already urbanised area (the Greater Kumasi MMDAs) than in the areas where most of the land is still not built up (outer ring MMDAs).

This finding is consistent with urban sprawl trends observed with satellite imagery. Also, according to Acheampong et al. (2017)³, there has been an increase of 192% of the built-up area between 1986 to 2016 for the Expanded Kumasi area. Cobbinah and Amoako (2012)⁴ noted that nucleated sprawl often occurs at the outskirts of the main cities. The BRRI presents that communities to the southwest of KNUST campus such as Kotei, Deduako, Emena and Apeadu will potentially densify attracting more residential population given the proximity to KNUST and the accompanying economic infrastructure, less traffic, and relatively lower land prices.

The following table present population data for the years of 1984, 2000, 2010, and 2021. The population projections for 2030 and 2040 were based on the analysis of the growth rates calculated from the previous censuses.

Table 7: Population data for the years of 1984, 2000, 2010 and 2021, and population growth expectation for the years of 2030 and 2040.
Calculated from the BRT Projects Feasibility Study (2020), 2010 and 2021 population housing census

³ R. A. Acheampong, Agyemang, F.S.K., and Abdul-Fatawu, M. (2017). Quantifying the spatio-temporal patterns of settlement growth in a metropolitan region of Ghana. *GeoJournal* 82:823–840 DOI 10.1007/s10708-016-9719-x

⁴ Cobbinah, P. B. and Amoako, C. (2012). Urban Sprawl and the Loss of Peri-Urban Land in Kumasi, Ghana. *International Journal of Social and Human Sciences* (6) p 388-397.

MMDA or submetro	1984	2000	Growth 1984-2000	2010	Growth 2000-2010	MMDA or submetro	2021	2030	2040	Retained annual growth forecast	
Source	Census	Census	Calculated	Census (not used)	Calculated		Census	Calculated	Calculated	Calculated	
K.M.A and Asokore-Mampong	487,504	1,170,270	5.6%	2,035,064	5.7%	KMA	Bantama	122,540	157,815	209,039	2.85%
							Nhyiaeso	114,944	148,033	196,081	
							Manhyia North	91,893	118,346	156,759	
							Subin	76,466	98,478	130,442	
							Manhyia South	38,138	49,117	65,059	
							Total KMA	443,981	571,788	757,380	
						Inner Ring	Oforikrom	213,126	274,478	363,568	
							Asokore-Mampong	191,402	246,500	326,510	
							Kwadaso	154,526	199,009	263,604	
							Suame	136,290	175,523	232,495	
							Asokwa	125,642	161,810	214,331	
							OldTafo	114,368	147,291	195,099	
Total Greater Kumasi	1,379,335	1,776,400	2,352,987								
Atwima-Nwabiagya	56,352	127,809	5.3%	149,025	1.5%	Atwima-Nwabiagya	161,893	246,416	392,991	4.78%	
						Atwima-Nwabiagya North	155,025	235,963	376,319		
Ejisu-Juaben	78,783	124,176	2.9%	143,762	1.5%	Ejisu	180,723	238,077	323,386	3.11%	
						Juaben	63,929	84,217	114,395		
Kwabre East	42,044	101,100	5.6%	115,556	1.3%	Kwabre East	296,814	477,468	809,738	5.42%	
Atwima-Kwanmowa	44,437	79,240	3.7%	90,634	1.4%	Atwima-Kwanmowa	234,846	352,093	552,170	4.60%	
Afigya-Kwabre	39,971	89,358	5.2%	136,140	4.3%	Afigya-Kwabre South	234,667	385,621	669,633	5.67%	
						Afigya-Kwabre North	73,330	120,501	209,250		
Bosomtwe	41,283	66,788	3.1%	93,910	3.5%	Bosomtwe	165,180	231,438	336,657	3.82%	
Total Expanded Kumasi	790,374	1,667,741	4.8%	2,764,091	5.2%	Total Expanded Kumasi	2,945,742	4,148,194	6,137,527	4.00%	

3.6 Mobility and transport

3.6.1 Transport infrastructure and transport services supply

Inventory of transport infrastructure and transport services supply

Road network

The network is structured in a radial logic, which is classical for a city free of natural boundaries such as a seaside or noticeable topography. Eight main entering roads enable the access of most of the traffic to the city centre, which is circled by a ring road (completed in 2013). This ring road is inside the densely urbanised area.

Among the eight entering roads, three are national highways: N6 to Accra, N10 to Techiman and Tamale, and N8 to Bekwai and Cape

Coast. These roads support important traffic transiting through the area or in exchange with it. The five other entering roads have a less strategic role on a national scale: IR4 and IR5, of interregional importance, respectively connect the city to Mampong and Sunyani/Bibiani, whereas Lake Road, Melcom Road and Abrepo Road are of local importance (connection between Kumasi and the Expanded Areas). Even though the ring road is complete, these entering roads still connect to each other inside the very centre of the city, at Kejetia roundabout, where the main public transport terminal is located.

The vast majority of roads in the city centre is asphalted, as are the main arterial roads. DUR manages very few non-asphalted roads. The situation is different in other municipalities, where inner local roads and rural roads between smaller communities can be unpaved, especially in the Expanded MMDAs.

On-site observations and local knowledge show that signalised junctions are very few and limited to main arteries in the city centre, the ring road, and along Ejisu Road. Roundabouts are concentrated at the intersections of the ring road and the main arteries, and some can be found within the city centre. Some intersections (especially within the city centre) are regulated with signposts (stop, give way). The vast majority of intersections is not regulated other than with general traffic regulations.

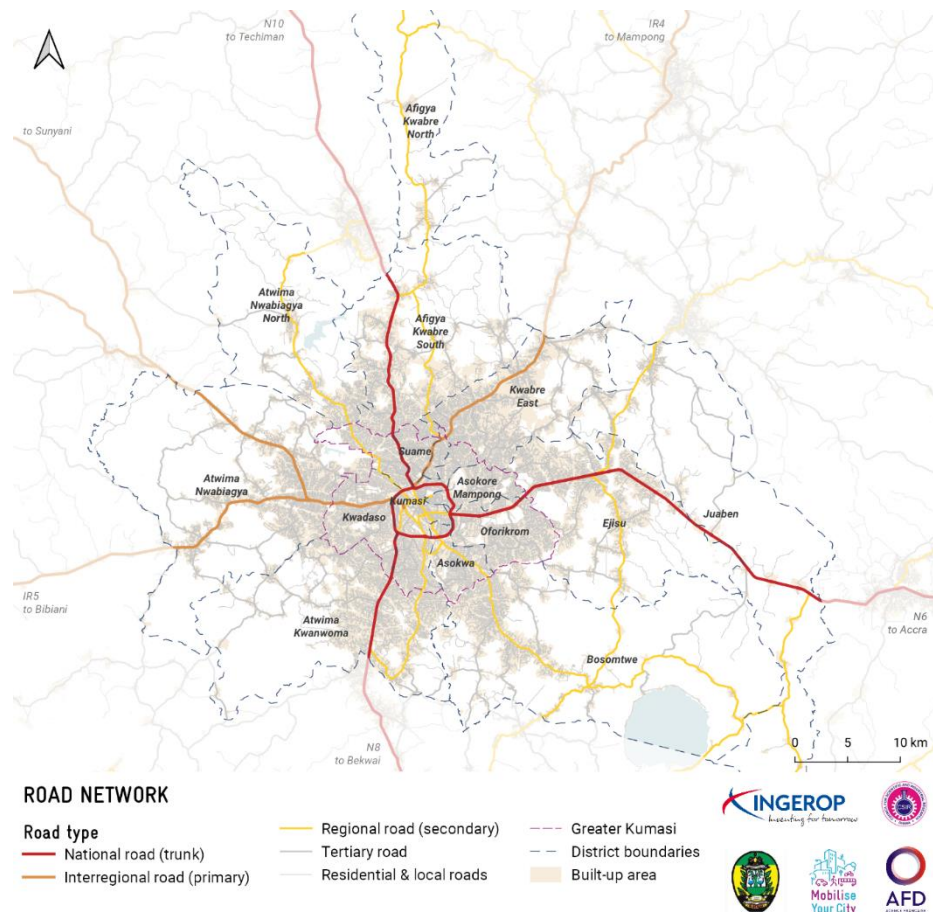


Figure 29/ Expanded Kumasi road network
Created from OpenStreetMap data

Some roads in the area are dualized, mainly the major entering arterial roads. The N6, N8 and N10 are all dualized, the N6 having the longest dual carriageway section (goes through Ejisu). The eastern and northern bypasses are dualized, but the southern and western ones are still on a single carriageway, even though the Department of Urban Roads plans to dualize them. One main itinerary through the city is dualized: the north-south section between Suame roundabout and Lake Road interchange, going through Kejetia and Asafo. Even though dualized, this axis is usually heavily congested due to other factors (market, pedestrian presence, bus and trotro stations, etc.). All dualized sections are 2x2 lanes, except for the Kumasi-Abuakwa stretch on Sunyani Road which is 2x3 lanes.

Future developments of the road network

Currently, in the scale of Expanded Kumasi Region, more than 100km of roadway infrastructure civil works are ongoing or expected to start soon (financially secured), managed and led by the DUR. Most part consist of heavy rehabilitation. DUR is also managing two development projects at the moment: the reconstruction and dualization of Sunyani Road phase 2, and the Kumasi Road and Drainage Extension Project on Lake Road.

Road congestion

Figure 30 presents the traffic volumes for the morning peak hours. In the morning peak, it can be noticed that the most critical traffic volumes are concentrated at Sunyani Road towards the West, outside Kumasi city centre; and in Ejisu Road towards the East, near Kumasi borders (2 000 – 2 500 PCU/hour). Morning peak volumes are greater than the evening ones, which is compatible with previous findings of this report.

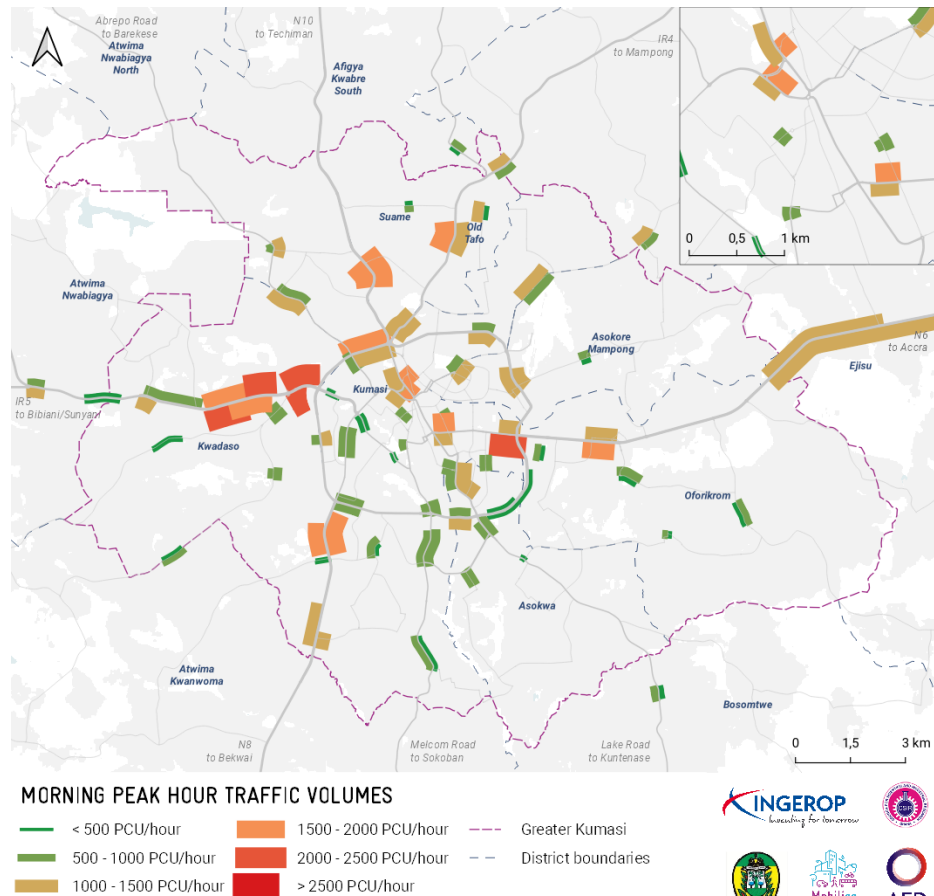


Figure 30: Morning peak hour traffic volumes
 Created from BRT Projects Feasibility Study data (ROM for Department of Urban Roads, 2020)

In the evening peak, Sunyani Road is also the most demanded way. The highest traffic levels are at the intersection of Sunyani and the ring road (> 2 500 PCU/hour). Altogether, except for this point, traffic levels are similar to the morning peaks. Significant traffic volumes (1 500 – 2000 PCU/hour) are also observed in the city centre. The northern part is busier in the morning, while the southern part is busier in the evening peak.

Exchange and transit traffic

Exchange and transit traffic are very limited for private vehicles: less than one percent of the surveyed private cars were in transit throughout the Expanded Kumasi, and around 10% were in exchange (entering the Expanded Kumasi from outside). Moreover, 95% of the sample originated from the Ashanti Region, making the interregional travels very few (around 5%). Therefore, transit through the Expanded Kumasi and exchange with it is not a major stake. Most of the surveyed vehicles were coming from the outer ring and going to the city centre or the inner ring. KMA accounted for 35% of the vehicles as a destination, followed by Suame and Oforikrom with respectively approximately 25% and 15%.

Traffic saturation and demand/offer balance

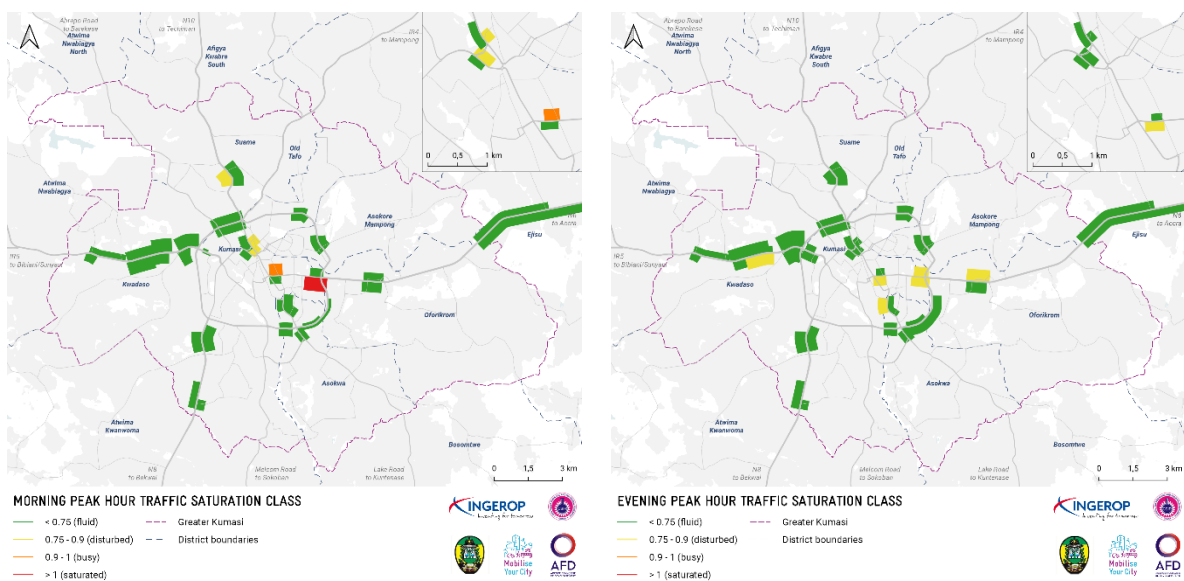


Figure 31: Morning and evening peak hours traffic saturation classes
Created partly from the BRT Projects Feasibility Study (ROM for Department of Urban Roads, 2020)

It appears that, from a theoretical point of view, the roads have enough capacity, with very few traffic blockings. However, the reality is very different and traffic jams are recurrent, as shown in the travel times analysis below. This illustrates the fact that congestion is widely due to behaviour issues: illegal parking, trotros illegally parking and staying on the carriageway, encroachment, etc.

On the main radial arteries outside the city centre, roads capacities are quite high (mainly dual carriageways), with few encroachments and misuse. This allows a rather high flow of traffic towards Kumasi in the morning and from Kumasi in the evening. However, some specific points (Tech Junction, Maakro Market for example) generate a restriction of the road capacity due to the presence of stations and markets, generating encroachment, trading activities alongside the road, illegal parking, and illicit public transport stations on the carriageway. These restrictions trigger traffic jams and queues which can reach quite long stretches during peak hours as the traffic demand is as high as on the other stretches of the artery where the capacity is not restricted.

The situation is less favourable on the ring road, whose capacity seems limited by its more urban characteristics. In the city centre, the situation is very different as traffic levels are much lower but travel times longer, due to an inefficient road usage.

Congestion and travel times

The congestion levels during both peak hours were identified (Figure 32). Chiefly, the main routes are more congested in the morning peak, with an important part of the roadway network saturated or busy. For both peak periods, the South-West part of the network is strongly saturated, which can be explained by an important discontinuity in the road infrastructure: the West-End Hospital Bypass is the only part of the ring road that does not dualize. This characteristic saturates intersections and makes the congestion spread along the connected road arteries.

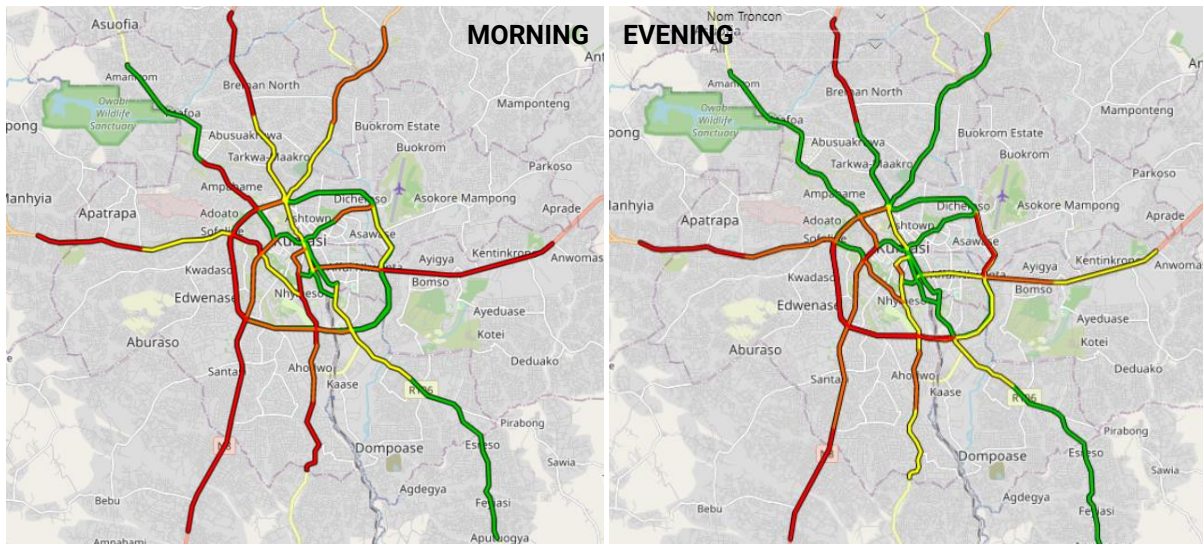
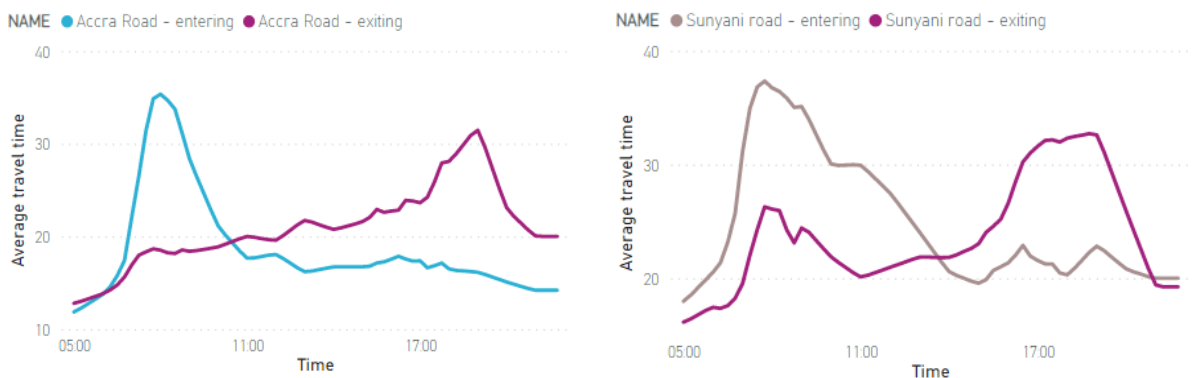


Figure 32: Congestion levels during morning and evening peak periods

Created from 2022 travel time survey, extract of 08:15-08:30 and 16h45-17h time slots on weekdays (Friday excluded)

Green: fluid, yellow: disturbed, orange: busy, red: saturated

Finally, travel times evolution in the main routes was assessed for different times of day. In general, the average travel time during morning peak is greater than the evening one, which is aligned with the previous traffic volumes conclusions. As expected, distinct directions present distinct peaks in most cases, with traffic being more difficult towards city centre in the morning. Exceptions are Cocoa Avenue, where travel times are balanced during all day; and the Ring Road, where both directions are highly demanded during both peak periods. Travel times can double during peak hour for some of the analysed itineraries.



Accra Road: Oduom Roundabout <-> Asafo Interchange, 8.9km

Sunyani Road: Abuakwa <-> Rattray Park junction, 10.9km

Figure 33: Travel times evolution per corridor

Created from 2022 travel times survey

Paratransit offer: trotro and taxi

Structure of the network

The network is very dense with a very important number of routes (350 routes were identified in the ROM study in the Greater Kumasi and more than 100 routes were identified in the 2022 paratransit survey in the outer ring) which is quite typical of paratransit systems worldwide.

In the Greater Kumasi area, coverage of the network is very high. The mapping shows a very centralised network, with numerous routes along the main corridors, many going towards the CBD and in particular Kejetia Market area. In the Expanded Kumasi area, the situation is different. Coverage of the network is mainly limited to larger roads, with large areas which are not serviced. Routes converge towards secondary urban centres.

The routes can be gathered in primary corridors matching the main arterial roads entering the metropolis, which are the backbone of the road network. In the same way, these corridors are the backbone of the paratransit network. Therefore, the latter is organised in a radial logic, converging to the very centre of the city. Few routes are diametric, which implies the vehicles end their route and regulate in the city centre, where the space is very limited. This organisation causes lots of congestion and encroachment issues in the CBD where one can see plenty of trotros, not just boarding and alighting passengers, but also stopping for break times, vehicle regulation and filling. The very structure of the network, combined with the operation mode, is itself causing issues of space occupation and associated congestion issues.

In the recent years, efforts have been made by the transport operators to propose more direct routes from suburban areas to other areas than the CBD. For example, it is now possible to join Ejisu to Santasi without any transfer, where it was previously necessary to transit through Kejetia area and change vehicles. These improvements were made possible by both the increase in drivers and the increase in travel demand. The effect of these changes are faster, easier, and cheaper travels for passengers (who

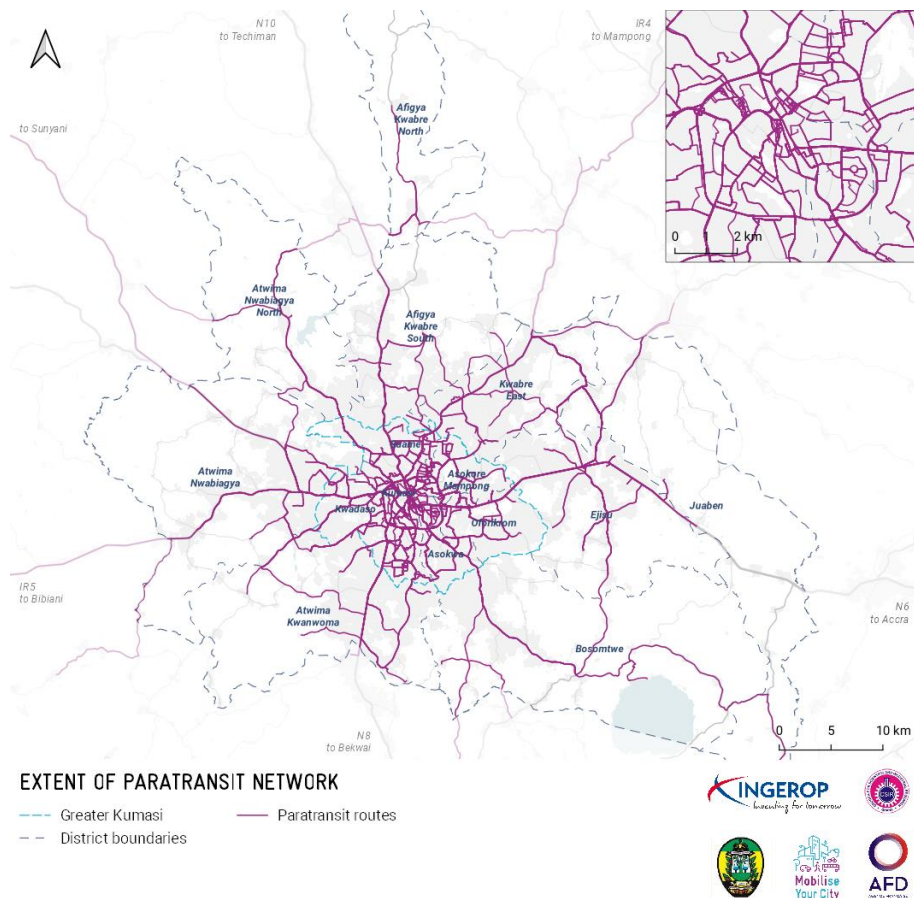


Figure 34: Extent of the paratransit network
 Created from 2022 paratransit survey and BRT feasibility studies (ROM for the Department of Urban Roads, 2020)

are expressively appreciating it), but also the deviation of these passengers from the CBD, helping to limit the saturation growth in Kejetia market area stations.

Terminals and stations

The stations in the Greater Kumasi cover the entire area, with clusters at some key points of the network:

- Kejetia market area, centre of the network and main interchange area, but also entry to the CBD
- Intersections of the main arterial roads (support of the paratransit corridors) with the ring road
- Tech Junction, interchange station for passengers of the Ejisu corridor and entry to KNUST campus
- Maakro, interchange station for passengers of the Techiman corridor and entry to Suame Magazine.



Figure 35: Pictures of Tech Junction station and its surroundings

Numerous markets surround the stations as they generate an important potential for customers. However, the presence of shops, stalls, and hawkers sometimes causes issues in the operations of the station, especially for safety reasons. Some drivers and unions complain that the flow of hawkers crowds the station even more in a space that is usually already busy with vehicles and passengers.

Stations are the most suitable place to board a vehicle. However, due to the absence of formalised bus stops along the routes, a lot of passengers usually wait on the roadside and hail a trotro passing, and in the same way just ask the mate or the driver to stop where they want to alight, making the vehicle stop to let the passenger alight or board. This process leads to congestion issues: as most roads have not been provided with laybys or shoulders, drivers must stop on the carriageway, and due to the placement of the seats in the vehicle the alighting/boarding process can take some time.

“The major challenge from my point-of-view when commuting from our various homes to the CBD is the lack of parking space for trotros. Due to the lack of parking space in the CBD, we are mostly alighted anywhere by the drivers which poses inconveniences and movement challenge for us.”

Man, Kejetia trader

“To add up (...), the lack of parking space for drivers, especially commercial drivers in the CBD has resulted in the boarding and alighting of passengers at any place convenient to them. When such instances happen, KMA officials in the CBD hold drivers and their respective mates accountable for inappropriate parking. As drivers do not want to be arrested by these KMA officials, they board passengers in the middle of the road when driving their cars in a slow motion, which also pose a threat to passengers since they can endanger themselves through injuries when boarding the cars.”

Man, informal market trader

Hours of operation, frequencies, and travel times

The paratransit system generally starts working at sunrise, around 5:30am. Lots of traders travel early to buy goods and open their business in the morning. The frequency of trotros decreases from 6:30pm, when the sun sets. Some operations are still ongoing until 9pm, and then only very few night services exist. Even though the operating hours of shared taxis are the same, taxi drivers tend to propose dropping services during night-time, charging higher fares as they are not sure to find a passenger on their way back.

The frequencies follow the demand due to the fill-and-go operating mode. The average headways are roughly 7-8 minutes for popular routes, 15 minutes for minor routes (during peak hours); 15 minutes for popular routes, 30 minutes for minor routes (during off-peak hours).

Fare structure and ticketing process

Fares for taxis and trotros are set (chapter 3.2.2). They approximately follow these range of prices:

	Short ride (< 5km)	Medium ride (5-10km)	Long ride (10-15km)
Trotro	¢1.40 – ¢2.70	¢2.70 – ¢4.00	¢4.00 – ¢7.00
Taxi	¢ 2.10 - ¢3.50	¢3.50 - ¢5.00	¢5.00 - ¢8.40

Table 8: Fare structure of trotro and shared taxis

The network not being integrated, passengers have to pay separately for each vehicle they ride. The fare is collected by the mate in trotros whereas the taxi drivers collect it themselves. Fares for hired taxi (“dropping” services) must be negotiated between the driver and the passenger before the ride. These fares tend to rise during specific periods (rainstorms, nighttime) or when riding to unusual or unpopular destinations. Following the logic of taxi sharing, the price for a dropping service is usually around four times the price for a seat in a shared taxi.

Fleet

2,567 taxis and 2,274 trotros are registered to the Kumasi Metropolitan Assembly. However, it is estimated that 50% of the drivers and vehicles are operating illegally as “wawas” and therefore are not registered. Thus, the total figures could be estimated around 5,000 taxis and 5,000 trotros, but no comprehensive count is available.

Paratransit offer: pragia

Pragia are initially patronised in northern Ghana, sometimes known as “yellow-yellow”, where the population is of different culture, ethnicity, and religion. However, with time, their success grew upon small-sized towns all across Ghana, where people use it to join the market or the taxi station from their home. The development of pragia in the Expanded Kumasi is particularly strong in several contexts:

- Suburban and remote areas, on the outskirts of the urban area, where people use it to join the main stations or landmarks
- “Zongo” areas in Kumasi and Asokore-Mampong, where a high share of the population is from northern ethnicities
- Kejetia market area, where high levels of congestion encourage to patronise these vehicles which can easily make their way through the traffic thanks to their small size

- Mampong corridor, where the small width of the road encourages to patronise these vehicles which can manoeuvre easily
- Nighttime trips within the city centre, when the offer in trotro and taxi is less



Figure 36: Pragia in the Zongo area (Antoa Road)

In the city, Pragias operate as hired taxis (“dropping” services). However, in some less urbanised areas, Pragias can be found organised in informal unions as those for trotros and taxis, operating as a collective means of transport on set routes with fixed fares. The typical fare for a pragia ride is between 2 and 5 GHC, as the trips are usually very short.

Paratransit demand

Public transport share

The public transport share represents more than half of travels, with a 50% modal share for trotros alone. Figure 38 shows that waiting times usually do not surpass 10min, pragia vehicles being the most effective ones (when available). Waiting time for the Adheyee network are the longest. In general, trotro average travel times are the longest (35min), followed by Adheyee lines (32min), and both shared and hired taxis (29min). Pragia vehicles present the lowest travel durations, which can indicate that these are an option for short distance routes and/or that the vehicles are more adapted to congestion situations, especially due their reduced size.

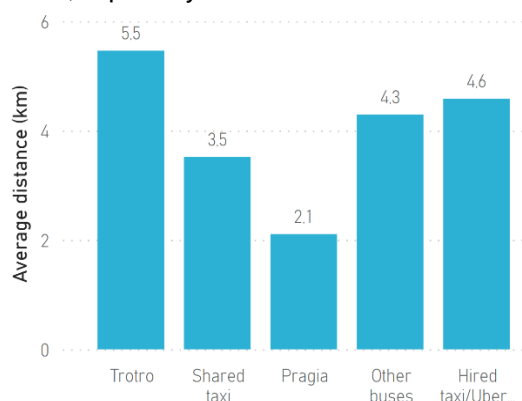


Figure 37: Travelled distance distribution for public transport
Created from Household survey, 2022

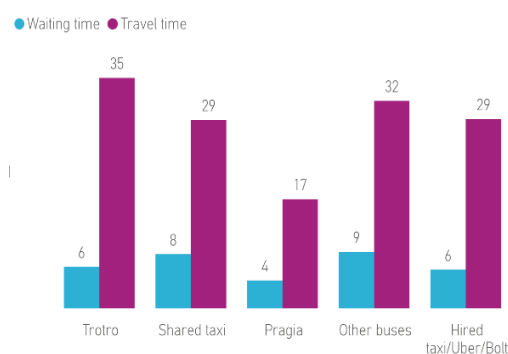


Figure 38: Waiting and travel time for public transport modes
Created from Household survey, 2022

From the average distances, the modal share in pax.km could be determined. Among public transport, 85% of all pax.km are travelled by trotros (Figure 39). For public transport modes, travelled distance is,

on average, inferior to those observed for the private modes. The average length of travels with trotro is 5.5km.

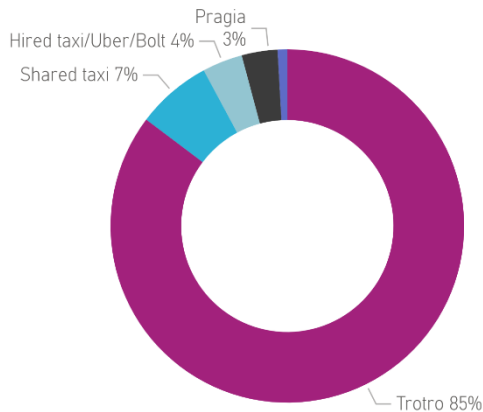


Figure 39: Modal share of public transport (in pax.km, considering the main mode of travel)
Created from Household survey, 2022

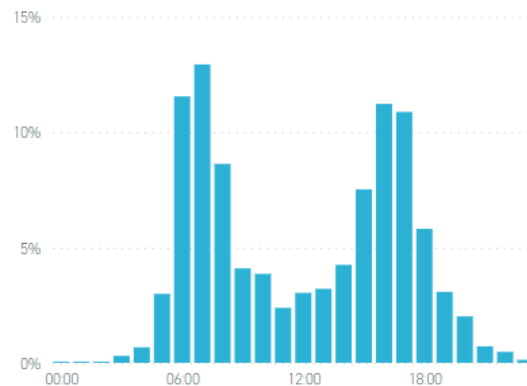


Figure 40: Public transport start time of the travel
Created from Household survey, 2022

Figure 126 shows public transport travels' start time. As expected, two clear peak periods can be identified, corresponding to those previously mentioned (Figure 55). Morning peak is concentrated between 7am and 9am, counting for about 30% of public transport demand, while evening peak is concentrated between 3pm and 7pm, presenting demand levels inferior to those found for the morning peak. The most important demand observed is between 7am and 8am (13% of daily demand) and between 4pm and 5pm (12%).

Paratransit demand volumes

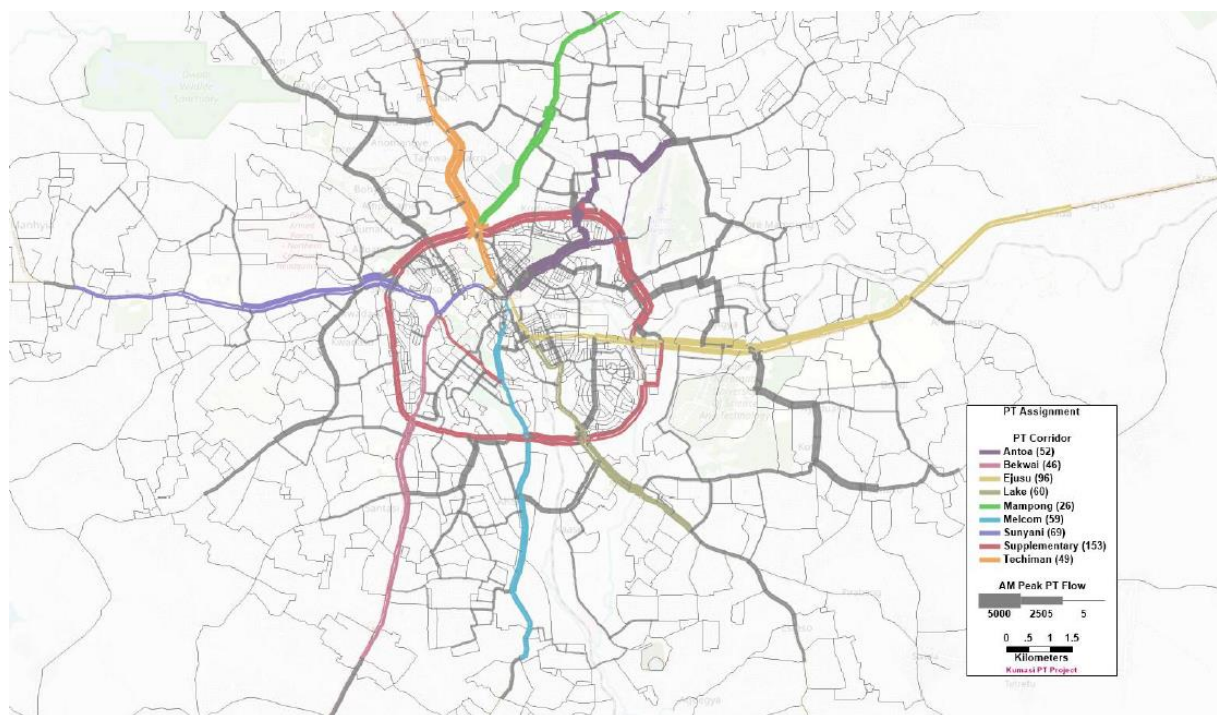


Figure 41: Morning peak hour public transit traffic flows (in passengers per hour per direction)
Source: BRT Projects Feasibility Study (ROM for Department of Urban Roads, 2020)

The volume of demand on the paratransit network shows a high concentration of passengers in the city centre as well as on the main arterial corridors, which is coherent with the concentration of routes.

The Ring Road, Ejisu Road, and Antoa Road support the maximum flows (greater than 3,000 pphpd) while Mampong Road, the Ring Road, Antoa Road and Ejisu Road have the highest average flows (greater than 1,000 pphpd). These figures prove the massive demand in public transit and the opportunity to progressively shift towards a more massive transit system.

The Ring Road shows an imbalance where the eastern and northern bypasses support a greater demand than the southern and western ones. From a general point a view, it seems that a major part of the flow is concentrated along a west-east corridor between Ejisu and Abuakwa. Moreover, the northern entrances of the city (Techiman Road, Mampong Road) are more used by passengers than the southern ones (Lake Road, Melcom Road, Bekwai Road).

The maximum flow of the corridors is usually just before entering the city centre, at the intersection between the corridor and the ring road.

Considering the fill-and-go operating mode of public transport in Kumasi, the offer matches the demand. This was confirmed by the surveys organised as part of the BRT Projects Feasibility Study (ROM for Department of Urban Roads, 2020) which found that 94% and 97% of vehicles leave the origin station completely full in morning and evening peak hours respectively. Interviews with public transport users also confirm that the paratransit transport offer globally satisfies transport demand, with no large unmet demand, even though queuing can punctually happen during peak periods at a few places (Kejetia market for example).

Adheye network

The Expanded Kumasi territory is currently served by 10 bus routes, distributed as shown by Figure 42. An extra line, dedicated to schools, possess 14 buses, and must be hired by the schooling institutions.

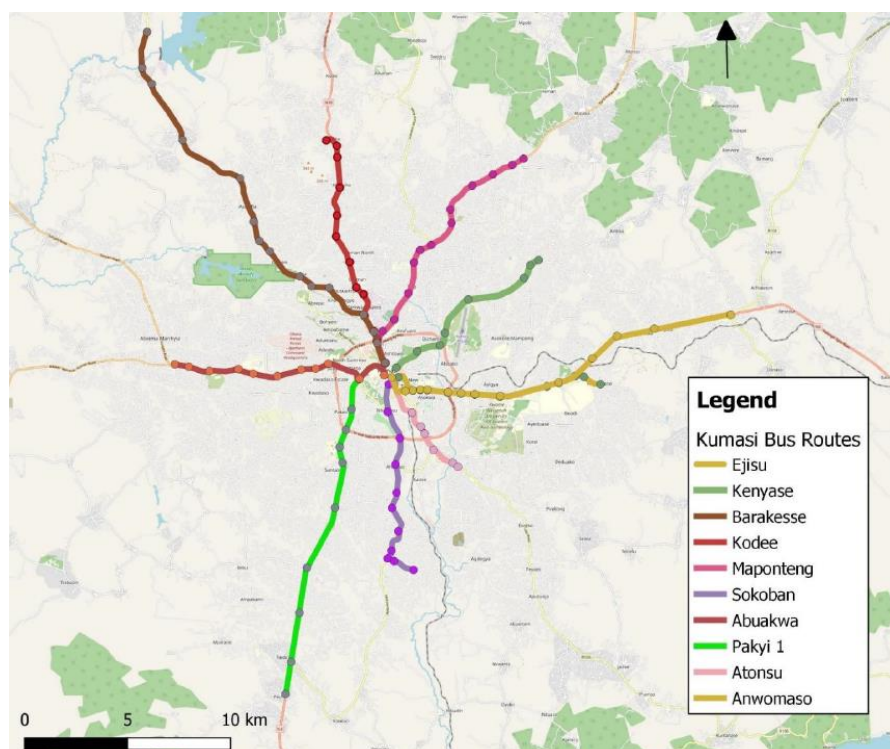


Figure 42: Expanded Kumasi bus corridors
 Source: BRT Projects Feasibility Study (ROM for Department of Urban Roads, 2020)

The bus network is the only formal transport network of the region, and circulates on ordinary road infrastructure, with no dedicated bus lanes nor bus stations. It is operated with modern high-capacity vehicles. Unlike trotro itineraries, the Adheyee lines have pre-defined stops, which are often occupied by the mini vans. Transport offer is strongly limited, totalling two rides a day per route, exclusively in the peak hours. It is estimated that, in average, three hours are required to complete each route, comprising both ways.

The fare is proportional to the travelled distance, varying from 1 to 3 GH¢ maximum. Even though the fares are normally cheaper than the trotro ones, the bus routes are not as attractive for passengers. Besides presenting a limited frequency, the corridors also operate on a fill and go basis and concur with trotro routes, impairing the system's reliability. The large size of the buses means longer waiting times for the bus to fill, and more difficulty to circulate in traffic congestion leading to increased travel times.

In 2017, KMA received a donation from the Ministry of Transport (initially donated by the Swedish Government) of 60 standard buses to enhance public transportation offer. Nowadays, 20 buses are operated by Adheyee, a government owned company, focusing the services in the intra-city. The transport services are the responsibility of KMA, not requiring permits to circulate, and bus drivers are directly hired by Adheyee. Vehicles can welcome 40 seated passenger and 46 standing. On weekends the buses can be rent to perform religious purposes, such as weddings and funerals.

These lines are referred to locally as "BRT lines", although they are not operated as BRTs, and this denomination has brought confusion as to the concept of BRT and a bad image of BRT in Kumasi.

Mobility services

Private hired vehicles (PHV) were introduced in 2017 by Uber, followed in 2019 by Bolt (previously known as Taxify). These vehicles use the same principles as hired taxis, with the exception that the passengers book the ride on an app which also set the fare. The ride is proposed to the driver who can accept or reject it. InDriver is slightly different in the way that the passenger and the driver bargain the fare directly on the app before they both accept the ride.

PHV are specifically patronised by middle-high class youth, who don't have access to a private car but prefer to use an individual transport. Fares are known to be slightly lower than hired taxis which enhances the growing popularity of these services.

PHV are popular within KNUST campus and have become an alternative for those who can afford for it. However, the circulation of PHVs is still restricted and demand other last-mile solutions.

"Speaking of the easy access and usage, the introduction of uber (...) has made transportation on campus or from campus to other destinations become easier (...) and the patronage is very high especially among students. (...) At some point, there is information when one chooses to travel with bolt or uber."

Man, lecturer

"If you have money, then you can opt for bolt or uber. If you don't have money then it is very difficult because you have to walk. With this bolt or uber, they are not allowed to come to the faculty areas so you still have to wait for the shuttle which is very difficult."

Man, student

3.6.2 Mobility demand and traffic

Mobility demand and traffic

Expanded Kumasi inhabitants are mostly mobile, with a 75% mobility rate (at least 1 travel per day), however, this indicates that one-quarter of the population had not travelled on the day before the survey. Most inhabitants (68%) travel twice a day. The average number of daily travels for all interviewees is 1.6. This average raises up to 2.1 travels per day when considering exclusively people who have realised at least one trip.

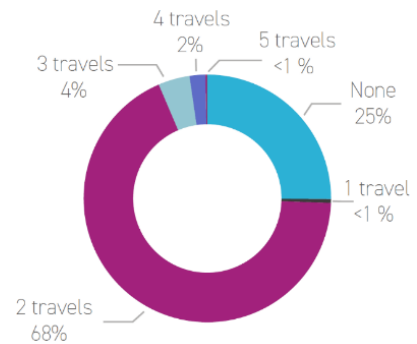


Figure 43: Number of travels repartition
Created from Household survey, 2022

For all the analysis areas, men are more mobile than women, presenting fewer participants who did not realise any travel and more who travel twice a day. Geographically, people living in the outer ring travel less when compared with the other regions, especially women (35% do not leave home or do not perform any travel surpassing 10min). The main difference between areas is in the rate of non-mobile population. Those living in the inner ring are the most mobile, the inner ring male population realising the greatest number of travels (only 14% are non-mobile, 73% travel twice a day, and 7% three times a day). The disparities between city centre and inner ring are not as important as when these two areas are compared separately with the outer ring.

Travel times

Travel start times present a typical distribution, with two clear peak periods identified (6am-9am and 3pm-7pm). The travels for the morning peak hour (7am-8am) represent about 15% of total daily travel, while travels for the evening peak hour are slightly superior to 10% (for two intervals, 4pm to 5pm and 5pm-6pm). It is usual across cities to find a morning peak which is higher in intensity but shorter in duration than the evening peak period.

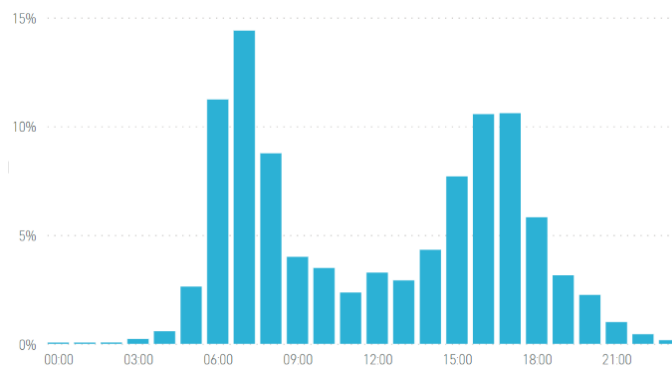


Figure 44: Start time of the travel
Created from Household survey, 2022

This pattern is maintained with almost no variation when isolating city centre, inner ring, and outer ring.

Travel purposes

In the household survey, the travel purpose was identified through the activity performed both at the journey origin and destination. Departures and returns to home are not represented in the following illustrations and analyses. Figure 45 presents the activities at the destination of the travel. Professional mobility is the most present in the sample and represents more than half of all trips, followed by schooling purposes, with 13%. In general, travel purposes are homogeneous for

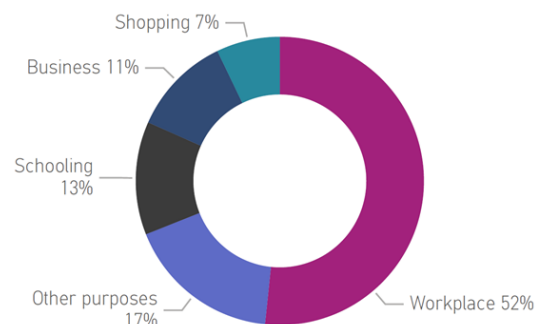


Figure 45: Activity at the destination of the travel (not comprising departure from home)
Created from Household survey, 2022

the three spatial scales, except the “working” trip purpose for people living in the city centre, which is more present than in the other cases.

Modal splits

In general, travels realised in public transport are dominant in the Expanded Kumasi area, with a 63% modal share for the number of travels; followed by private transport (20%), and NMT (16%). These modal shares vary according to the geographical location of the household. Public transport represents 59% of modal shares for people living in the inner ring, 65% in the city centre, and 67% in the outer ring. Private motorised transport is present especially in the inner ring, representing 30%, which is around two times the results found for the city centre and outer ring. Non-motorised transport (NMT) represents almost 20% of all travels in the city centre and in the outer ring, and only 11% in the inner ring.

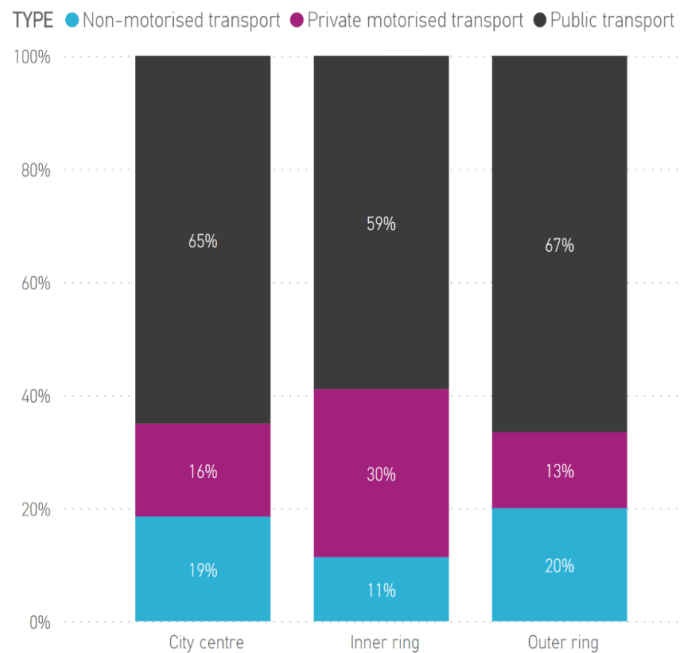


Figure 46: Modal share in number of travels according to the area Created from Household survey, 2022

These geographical variations are consistent with car ownership and revenues in the different areas, NMT being associated with poorer populations and private motorised transport with richer ones.

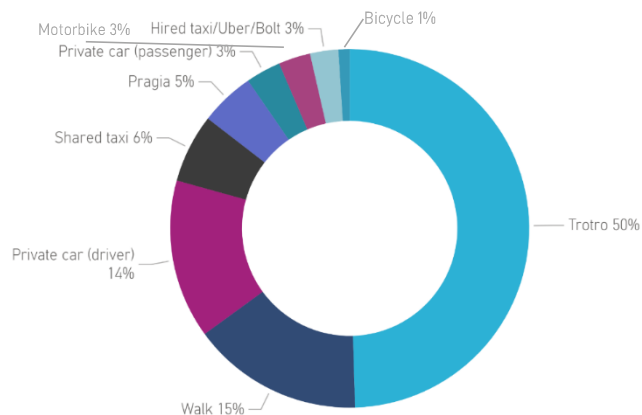


Figure 47: Modal share (in number of travels) Created from Household survey, 2022

If we consider the number of travels, trotro is the most used means of transportation for all analysed areas. The adherence to the public transport system is extremely relevant for the Expanded Kumasi region. Trotro system is followed by trips made by walking (15%) and by private car drivers (14%).

From a gendered approach, international patterns for women's mobility are also identified in this study. Women are more likely to travel on trotros or by foot, while men are more motorised, with the proportions of male drivers being two to three times bigger than those found for women. Further, the household survey points that motorcycles and bicycles, even if a minority, are exclusively used by men. Besides lacking proper infrastructure for cycling, this mode of transport is socially associated with the poorest solution among the existent ones, which leads to reduced modal shares.

Even if women are frequent public transport passengers, it was found that gender gaps also influence the way that the service is offered. People travelling with goods or children can be refused by many

drivers before they can get a vehicle to their destination. From the previous results and based on the social patterns that relates women to caring activities, female passengers are the ones that struggle the most with this situation.

“Women with children and stuff are mostly ignored by drivers. They see us to be a waste of their time, so they always prefer picking up people with no children or many stuff.”
Woman, public transport user

In terms of spatial particularities, city centre and outer ring results are very similar. Inner ring patterns differ from the other for presenting elevated private car drives and reduced trotros and walking shares. Men living in the inner ring present the largest individual and motorised modal shares (29% versus 15% for men in other areas) and the smallest trotros (39% versus 50%) and walking (8% versus 16%) shares.

The low number of private car passengers compared to private car drivers points to a low average occupancy of private cars.

Trotro is the most used mean of transport in pax.km when considering the main mode to go from a specific origin to destination, reaching more than 59% of the sample. Therefore, it is important to highlight that this is the main public transport means for all Expanded Kumasi, while shared taxis (5%) and pragia (2%) are in the minority.

From the segregated analysis, its representativeness rises in city centre and in the outer ring for both genders, while lowers in the inner ring. Walking is the second most important transport mode in number of travels, however, when considering the travelled distance, the share of walking naturally declines. Conversely, the share of private car drivers places second when considering passenger distances travelled.

Figure 49 presents the modal shares in veh.km. When considering vehicle capacity, modal share shifts substantially. For the totality of the sample, private car represents about 55% of the sample, while the share of trotros decreases to less than 20%.

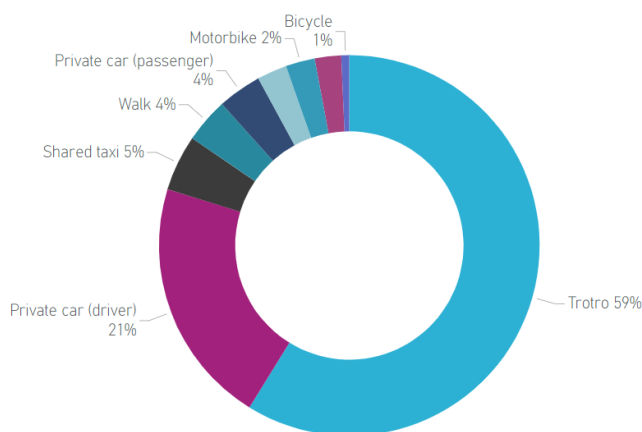


Figure 48: Modal share (in pax.km)
 Created from Household survey, 2022

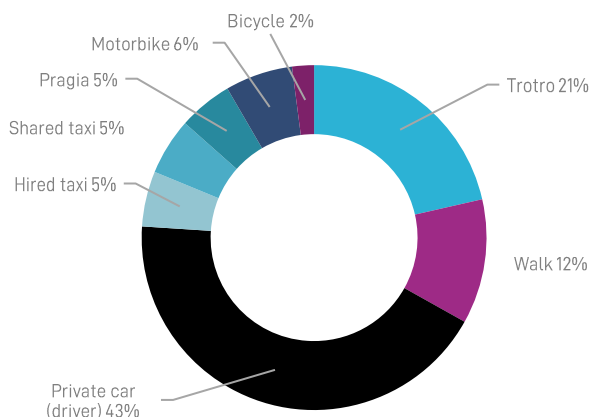
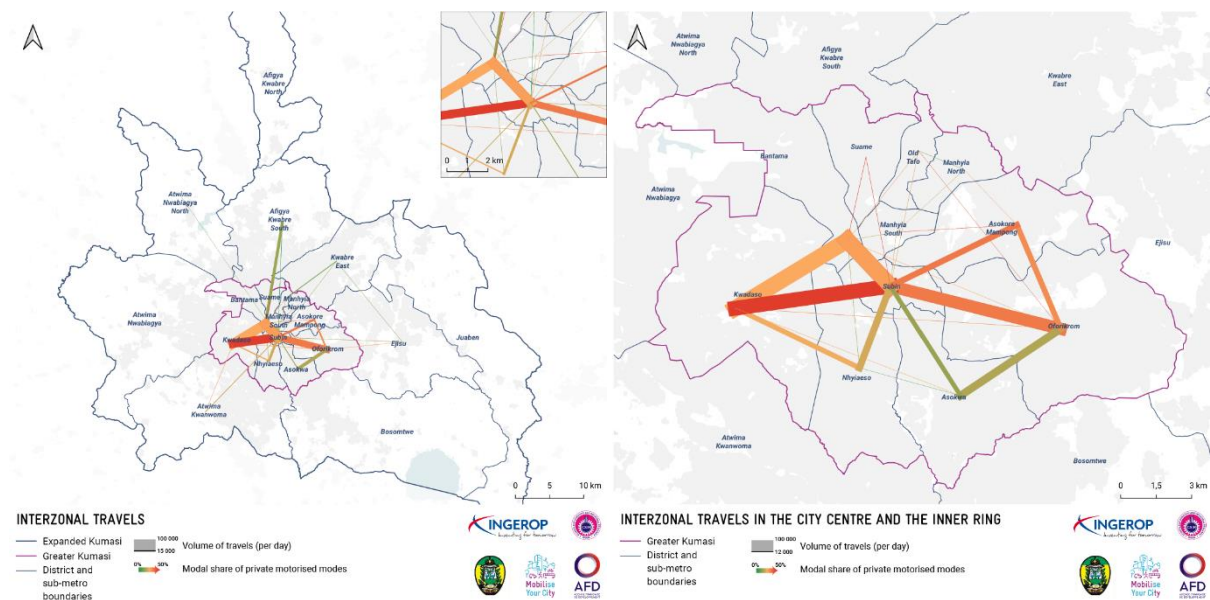


Figure 49: Modal share (in veh.km) travels
 Created from Household survey, 2022

Geographical distribution

These figures confirm mobility patterns which are very linked to work and schooling. For example, few “workplace to shopping” trips are identified (three travels a day, with an intermediary stop between home and the main purpose), and few trips for shopping reason overall. This could be explained by the concentration of activities in the city centre (persons already in the centre for work taking advantage of this to shop); and by short-distance trips (walking or under 10min, not considered by the Household survey).



**Figure 50: Volumes and modal share of interzonal travels in the Expanded and Greater Kumasi
Created from 2022 household survey**

One can clearly see an important polarity around the CBD: many trips are observed towards the Bantama and Subin sub-metros, which house the Kejetia and Adum communities and major facilities such as the central market or Komfo Anokye Teaching Hospital. Most of the zones show a polarised flow towards one of these two areas, making it the central hub of the metropolis. Major flows are also seen between those two sub-metros. Despite the proximity of these areas, the modal share of non-motorised transport is very low (2%), however, people were surveyed only for their travels which took over 10 minutes, which explains that the very short trips within the CBD, usually through walking, are not represented in these volumes.

Kwadaso and Oforikrom are important travel emitters and receptors, which can be explained by their densely populated areas, and the presence of major equipment like KNUST. Asokore-Mampong, Asokwa, and Nhyiaeso are secondary emitters, with flows oriented either towards Subin or to the area next to theirs.

General travel patterns

The main flow is the travels within the inner ring. This can easily be explained by both a high density of population and the location of some major traffic generators (KNUST, Suame Magazine, Kaase Industrial Area, workplaces areas, etc.). In comparison, the city centre gathers a lot of services, jobs, etc. but doesn't have as much population due to its limited spatial extent.

The important internal flow in the outer ring can be explained by very high volumes of population (due to its very large spatial extent) and the need for these inhabitants to stay relatively close to their home for their daily activities (errands, basic services, some jobs, etc.).

In regard of their population, the rate of intrazonal travel per inhabitant is higher in the inner ring, due to the presence of more services and workplaces in comparison with the outer ring.

Interzonal travels are the most important between the inner ring and the city centre, by far. This translates the important link between these areas, both because the inner ring is very populous and therefore generates lots of traffic, and because the city centre remains the most attractive area in terms of services and therefore attracts numerous people living in the inner ring, which is close to the city centre.

Travels between the outer ring and the city centre are few, probably because of the long distance to travel which makes people try to find alternative services closer to their home, mostly inside the outer ring.

Modal shares follow two logics:

- For interzonal travels, we observe an important share of public transport (70 to 85%), very few travels with non-motorised transport (inadequate regarding the distance), and a limited share of private motorised transport (15 to 28%).
- For intrazonal travels, we observe a smaller share of public transport (55 to 58%), an important share of non-motorised transport (19 to 32%), adequate with the distance, and slightly smaller share of private motorised transport (11 to 24%).

These modal shares also depict the socio-economical context of households regarding their location:

- In the inner ring, households with middle to high income are more present, having a higher motorisation rate and therefore using private motorised transport more
- In the city centre, households are more heterogenous, with a lower motorisation rate due to a large number of low-income households
- In the outer ring, low-income households are the most present, with a very low motorisation rate and preferring non-motorised transport to public transport probably for affordability reasons.

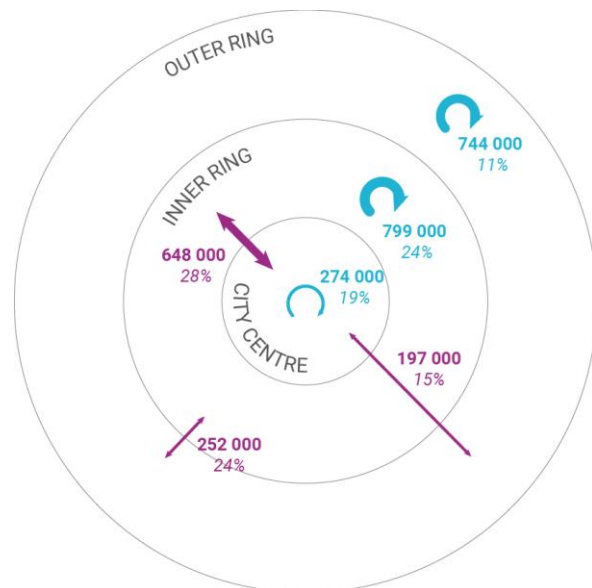


Figure 51: Structure of travels between the urban layers
Created from 2022 household survey
Percentages are the modal shares of private transport

3.6.3 Active mobility

Infrastructure

Infrastructure adapted to NMT and particularly walking is extremely rare or even non-existing in most parts of the Expanded Kumasi perimeter. Typical road cross sections often do not possess sidewalks, nor separate lanes dedicated to pedestrians, forcing them to share the carriageway with other vehicles.

For the sections that present at least a clear sidewalk, these are frequently occupied by vending tents and stands, especially in city centre and around the Kejetia Market. Besides being occupied, the infrastructure state is often precarious.

Figure 52 illustrate the lack of space availability to circulate near commercial spots, due to vending structure installations. Pedestrians, trotros and other motorised vehicles coexist on the carriageway, reducing NMT safety and comfort. The situation is even more precarious for cycling: no dedicated lanes for bicycle circulation were identified.



Figure 52: Lack of NMT infrastructure around Kejetia Market

“The movement pattern especially walking has changed. Pedestrian pathways have been turned into business center where traders, hawkers and shop with extensions engage their businesses. Due to the congestion on the pathways, pedestrian now walk on the road which is meant for cars to transport on and this further causes the traffic congestions since half of these narrowed roads are occupied by pedestrians. I think the enforcement of the law will help to avoid all these congestions and make pedestrian walk comfortable on the pathways.”

Woman, informal market trader

When interviewed, street hawkers and traders point that they have noticed a negative evolution of the situation of CBD public space occupation. Among others, the difficulty to circulate and the lack of well-conceived market infrastructures appear as the main barriers to enhance traffic conditions around the Kejetia market.

Intense congestion hampers trotro and taxis circulation, reducing public transport reliability. In fact, this portrait leads pedestrians to frequently adapt their travels, who find themselves obliged to walk more.

Formalised pedestrian crossings are mostly inexistant, except at very few signalised junctions. People have to cross the road at any point, which endangers them. Drainage usually consists of an open deep gutter on the edge of the carriage. When covered by concrete slabs, this drain is able to absorb the heavy rainfalls while securing walking. However, these gutters are usually not covered, which endangers pedestrians who can trip easily, especially during night-time.

Common spaces lack of adequate lightning conditions, which hinders the experience of pedestrians, especially women travelling during night-time. It can be also added that in rainy days, wild animals circulation can also expose local population to dangerous situations. The precarious condition of public space maintenance is one of the main factors that contribute to the production of the insecurity feeling.

“The bushy surroundings and the unavailability of streetlights on our roads always pose threats to me as a lady. We are always exposed to bad guys who put our lives in danger. When the bushy areas are cleared and there are provisions of streetlights, I believe we will be safe as ladies.

Woman, public transport user

For the central business, I think individuals should just be careful. Also, street lights can also be provided to ensure safety. Security personnel should be at vantage points or places where robbery cases have been recorded.

Man, student

Modal share and demand

Even if currently the Expanded Kumasi perimeter suffers from a lack of NMT infrastructure, walking represents an important part of the identified travels. The household survey identifies 17% of pax.km total is made by walking; this modal share for walking is however an under-counting as travels under 10 minutes were not included.

The household survey identifies cycling is a rare mode of transportation, representing only 1%. Besides infrastructure availability, this finding might be due to other subjective factors, such as the discomfort caused by the hot Ghanaian climate and the social image attributed to the bicycles, considered as a mode for the non-wealthy population.

Walking is often seen as an alternative to the lack of appropriate public transport supply. Some of the focus groups identified that since there is no ensured schedule, and transport fares can be abusive, walking until the destination is seen as the solution in order to save time. Therefore, the lack of non-motorised infrastructure is a primary barrier to the Expanded Kumasi population.

“I walk for 30 minutes while I hold the food. I walk to church in the evenings too. This is because there are no cars available to board. In order not to waste time, I walk. Also, the lorry fares are outrageous when there are many people along the road.”

Woman, walking as the main transport mode

3.7 Accessibility

The accessibility to public transport (considering a 500m access distance to routes with at least a 20-minutes headway in peak periods) is good in the city centre and the inner ring, but is limited in the outer rings, especially for people living far from the main road corridors. Figure 53 compares the coverage of the paratransit network to the extent of the urbanised area. One can clearly see that most of the built-up areas which are not serviced by public transport are located in the outer ring. Oforikrom is the only MMDA within the

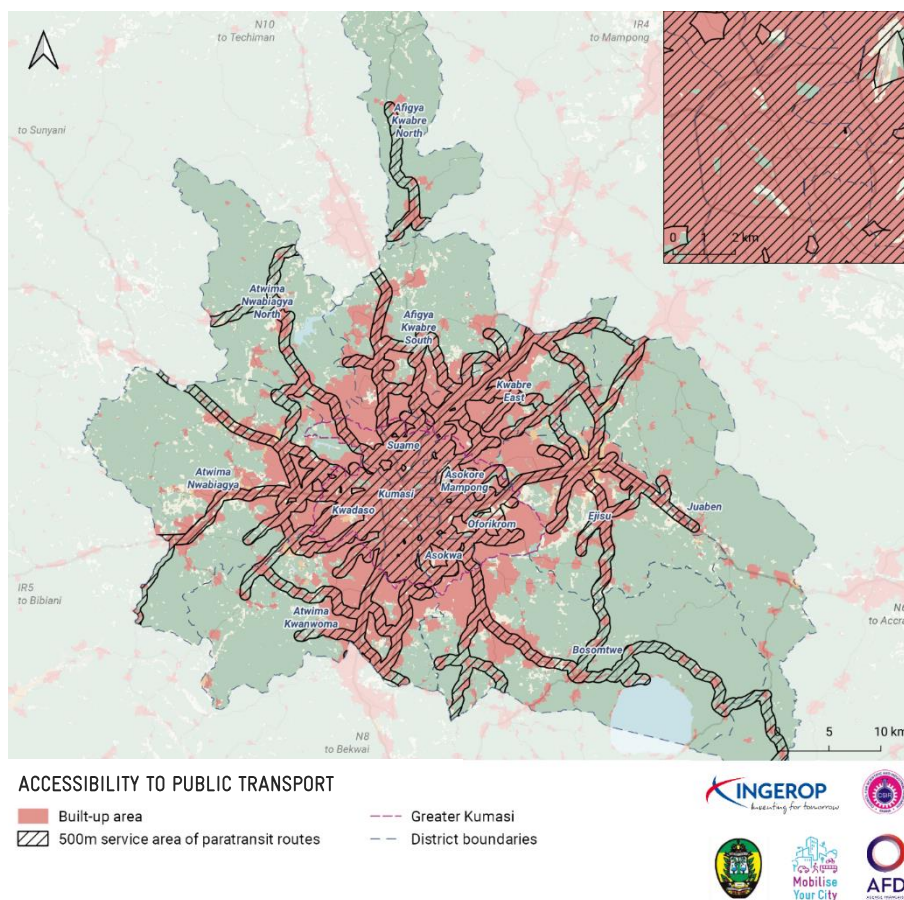


Figure 53: 500m accessibility to the public transport network
 Created from paratransit survey (2022), BRT Projects Feasibility Study (ROM for Department of Urban Roads, 2020), and ESRI Land Cover 10m 2021

Greater Kumasi to have a relatively low coverage rate (56% of the built-up area), where communities in the outskirts of the urbanised area (further than Kotei community for example) can be more than one kilometre away from the nearest public transport regular route. This phenomenon can be explained by the barrier effect of KNUST campus, where trotros and taxis are not allowed to travel on some roads.

Sub-metro or MMDA	Total urban area (km ²)	Covered urban area (km ²)	% of coverage	Total population	Covered population	Non-covered population
KMA	65,210	56,199	86%	443,900	384,300	59,700
Inner ring	149,925	109,701	73%	935,300	723,900	211,400
Outer ring	604,830	302,351	50%	1,566,300	789,600	776,700
TOTAL	819,965	468,251	57%	2,945,500	1,897,800	1,047,800

Table 9: Covered area and population by MMDA

Created from paratransit survey (2022), BRT Projects Feasibility Study (ROM for Department of Urban Roads, 2020), ESRI Land Cover 10m 2021, and 2021 Population and Housing Census (Ghana Statistical Services)

Table 9: Covered area and population by MMDA summarises the coverage by area regarding their respective population. It confirms the analyses from Figure 53 and shows that the coverage rate ranges from 86% within KMA to 50% in the expanded areas. Bosomtwe has the lowest coverage rate, with only 38% of its built-up area being serviced by frequent public transport. Indeed, paratransit routes are concentrated on Lake Road corridor and few lines are serving communities around and new sites.

3.8 Road safety

3.8.1 General pattern in crashes

During the five years period 2016–2020, a total of 5,696 road traffic crashes occurred within the study area resulting in 7,347 casualties. Generally, road traffic crashes and their associated casualties in the Greater Kumasi Area increased over the period under review as shown in Table 10. The number of crashes and their resulting casualties could have been higher if under-reporting was accounted for.

In all the crashes reported, 13% involved one or more individuals being killed in the crash (fatal), 34% involved at least one person being hospitalized for more than 24-hours and 23% involved at least a person being treated and discharged. In 30% of the crashes, no persons were killed nor injured but properties were damaged. Fatalities, serious and slight injuries constituted 11%, 45% and 44%, respectively as shown in Table 10. For the Expanded Kumasi, the rates are of 70 casualties per 100 000 inhabitants and 7.8 fatalities per 100 000 inhabitants.

Year	Crashes				Total	Casualties			Total
	Fatal	Hospitalized	Not Hospitalised	Damage Only		Fatalities	Seriously Injured	Slightly Injured	
2016	147	286	176	256	865	158	432	448	1,038
2017	139	291	201	255	886	146	527	525	1,198
2018	110	352	247	307	1,016	126	621	701	1,448
2019	141	495	285	393	1,314	155	884	671	1,710
2020	184	518	400	513	1,615	218	866	869	1,953
Total	721	1,942	1,309	1,724	5,696	803	3,330	3,214	7,347

Table 10: Distribution of crashes by year from 2016-2020 in the Greater Kumasi area

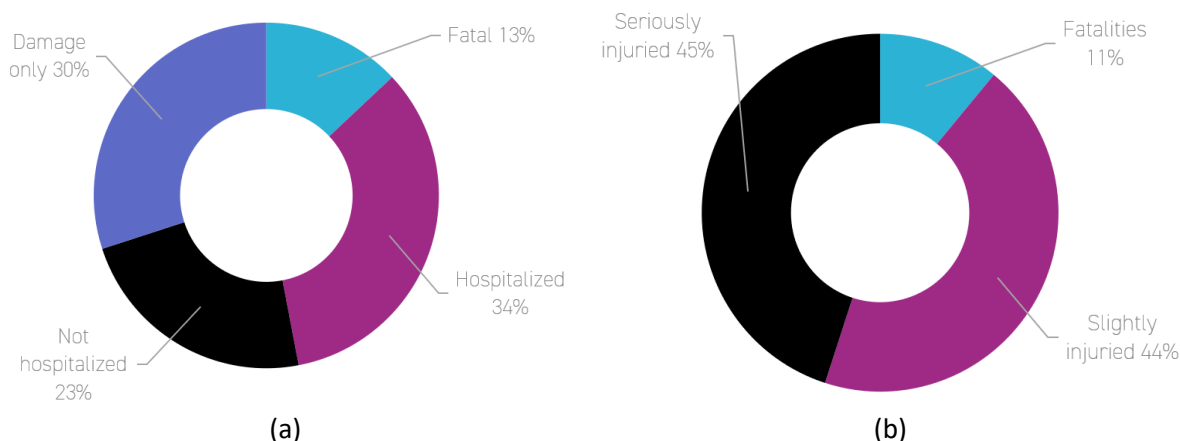


Figure 54: Proportion of severity of crashes (a) and casualties (b)

3.8.2 Road users at risk

From Figure 55, the pattern of fatalities revealed that the road user type with the highest share of casualties is pedestrians. Pedestrians alone constituted a little over one-half (52%) of all road traffic casualties in the Greater Kumasi Area. Motorcyclists (17%), bus/minibus occupants (12%) and Car occupants (9%) followed in that order.

The existing situation of inadequate pedestrian facilities coupled with the activities of street hawkers have compelled pedestrians to use the road space with motorized vehicles which may be a contributory factor to the high incidence of pedestrian crashes in urban centres whereas vehicles moving at high speeds on highways passing through non-urban centres may also have accounted for a high incidence of fatalities in the non-urban centres.

"(...) the pavement which is meant for passengers or people are sometimes used by motorized tricycle. So when we are not prompted by the sound of an approaching motorized tricycle, we end up being a victim."
Woman, visually impaired

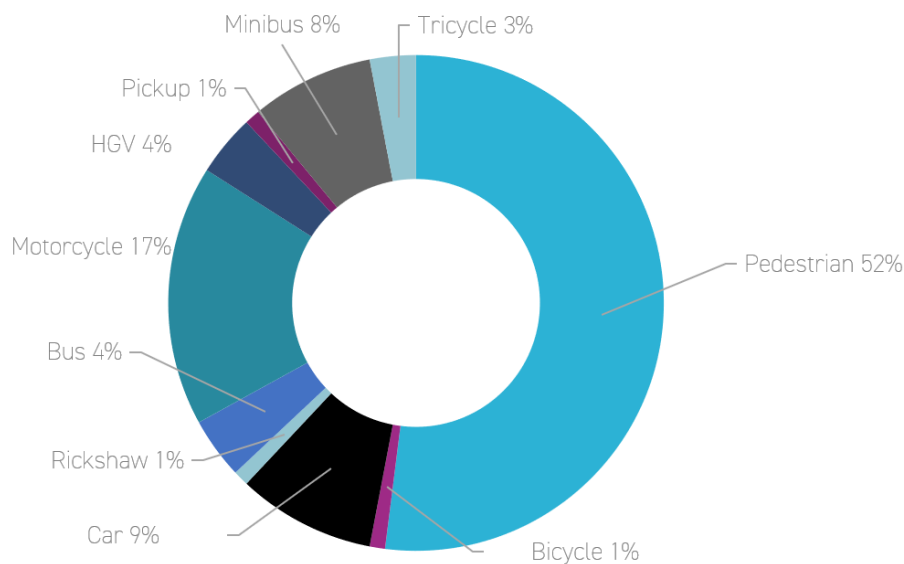


Figure 55: Proportion of fatalities by road user type

3.8.3 Time and location of crashes

From the data available, 794 of the pedestrian crashes representing 39% occurred at nighttime (between 18h – 06h). On the contrary, pedestrian fatalities were high during the hours of the night resulting in 53% of all pedestrian fatalities (Figure 56). The provision of functional streetlights throughout the night will greatly reduce crashes associated with night-time conspicuity problems.

Over three-quarters (77%) of all crashes occurred on straight sections outside junctions and 23% occurred at junctions.

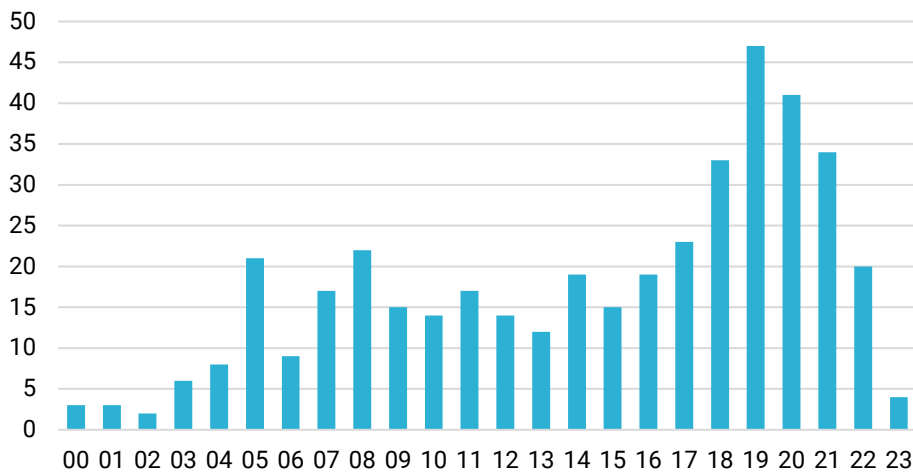
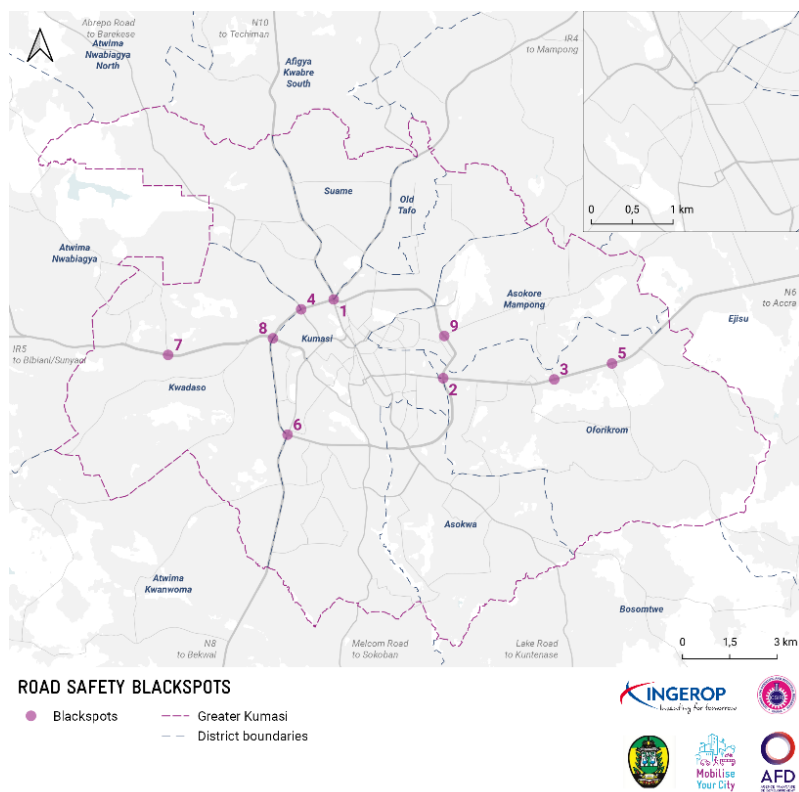


Figure 56: Pedestrian fatalities with the time of day in the Greater Kumasi area

3.8.4 Investigation into some locations with high frequency of crashes

The locations listed below recorded high frequencies of crashes:

1. Suame roundabout
2. Anloga junction
3. KNUST roundabout
4. Abrepo junction
5. Boadi roundabout
6. Santasi roundabout
7. Sofoline traffic light
8. Sofoline interchange
9. Aboabo traffic light
10. Ejisu roundabout (beyond the map boundaries)



A further investigation of the selected high-frequency Kwadaso crash locations revealed the following:

- The Anloga junction location requires attention as more fatal crashes occurred at the site. A further investigation at the site revealed that 40.8% and 26.5% of crashes were rear-end and vehicular-pedestrian collisions, respectively.
- Suame roundabout recorded the highest incidents of crashes though most of the crashes were property damage only. The high incidents of rear-end and side swipe collisions at Suame roundabout may be a result of traffic conflicts which are not well managed.

3.9 Urban freight

3.9.1 Volumes of traffic

An analysis of the current freight traffic situation has been made on the six main corridors of the area. The traffic levels range from 100 to 500 vehicles (during three hours) between Mampondeng and Ejisu corridors. Locations show differentiated shares of truck types, with Ejisu, Afrancho, and Anwiankwanta corridors (respectively roads N6, N10, and N8) showing important shares of Heavy Goods Vehicles (HGV) like trailers, whereas more than half of the traffic counted on each of the other locations was composed of light trucks, surpassing three quarters for Mampondeng corridor.

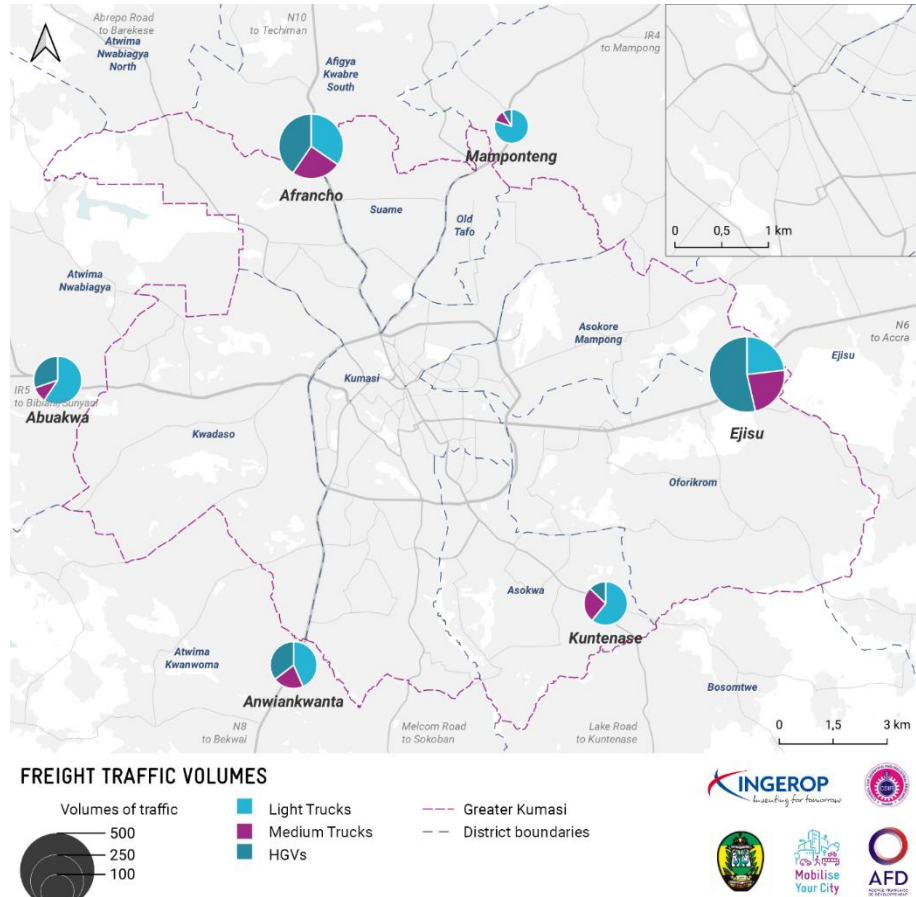


Figure 57: Volumes of freight traffic during morning peak period
Created from cordon line survey, 2022

3.9.2 Travel patterns

About two thirds of the trucks surveyed were coming from out of the Expanded Kumasi perimeter, and two thirds had the Greater Kumasi (KMA + inner ring) as destination. This highlights the important attractivity of the central areas of the metropolis, and shows that transit traffic (vehicles coming from outside and going outside the expanded Kumasi) is likely to be limited (less than a third of the vehicles surveyed entering the cordon were crossing it and had their destination outside it).

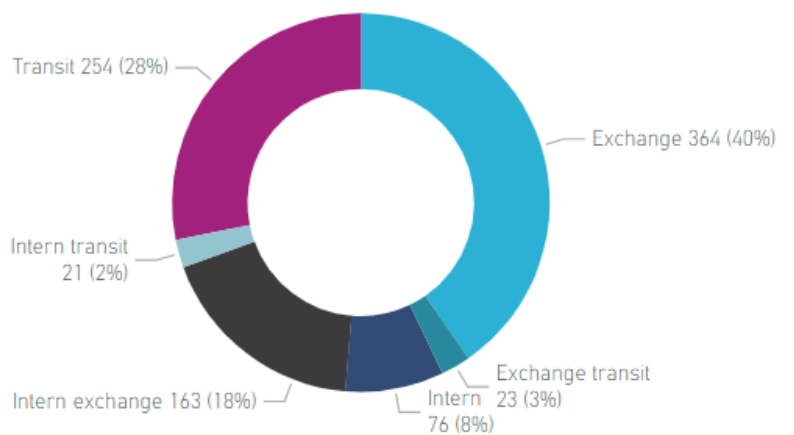


Figure 58: Volume of trucks during morning peak period by type
Created from cordon line survey, 2022

Therefore, the patterns *transit*, *exchange transit*, and *intern transit* do not have any reason to enter the inner ring and the city centre. These vehicles accounted for a third of the total trucks (around 300 trucks during the three-hour morning peak period).

40% of the trucks entering the inner ring are actually going to a destination in the inner ring or the city centre. These trucks cannot be diverted from the roads they take as they have to enter the city. This shows the important needs of the city centre in matters of deliveries and supplies, among others related to the various markets.

3.9.3 Conditions in the Central Business District

The traffic conditions in the CBD of Kumasi (mainly Adum and Kejetia areas) are, as stated in chapter 3.6.1, worse than in the other areas of the Expanded Kumasi. Though the traffic levels are still moderate, the conflicts of usage are very important: important pedestrian flows, over-concentration of trotro and taxi stations with inadequate road space, encroachment of traders on the carriage, presence of hawkers, illicit parking in front of shops, and deliveries of goods on the carriage at any time of the day. The latter has been highlighted by several stakeholders as well as during the focus groups held.

"(...) traffic congestion in the CBD is caused by the big trucks that offload goods to the various shops and wholesales. Such activity is mostly done during week days which I think contribute to the traffic congestion because people mostly come to the CBD during the same week days. I therefore suggest that the offloading of goods by the huge trucks should be during weekends to reduce the traffic congestion."

Woman, informal market trader

Yet, a regulation has been put in place by KMA stipulating that cargo vehicles are not allowed to enter the CBD between 9am and 5pm. This regulation is however not enforced and lots of deliveries still take place during these times, which are also the busiest for trading and other commercial activities.

These congestion issues bother pedestrians and endanger them: as they cannot walk on a walkway encroached by shops, they have to walk on the carriage where offloading of goods is taking place as well as dense vehicular traffic (see chapter 3.6.3).

3.10 Social aspects of mobility

3.10.1 Transport poverty

The diagnosis identified that **affordability** was a key modal choice criteria. 40% of public transport users indicated that they chose to use public transport mainly for affordability reasons, and 30% because they hadn't any alternative (mostly because they can't have access to a private vehicle). Therefore, affordability must be considered carefully when proposing actions.

The enhancement of the public transport system and the introduction of formalised modes will help tackle affordability issues compared to the business-as-usual situation. Indeed, if nothing is done and the **system continues as it is today**:

- **Congestion** will increase due to **higher mobility demand** (strong population growth, especially in periurban areas, while the city remains hyper-centralised)
- **Congestion** will also increase as standards of living are improving and more people have access to **private cars**: if the image of the public transport system is not changed, people who can will shift towards private cars
- As a result, **travel times** for both private cars and public transport will increase
- **Fuel prices** are likely to continue to rise up considering the current economic context
- Therefore, the current business model of the public transport system risks to collapse: longer travel times and more expensive fuel mean **more expenses for the operators**, who will either **reduce the drivers' income** (and risk of losing the necessary workforce to operate the system), or **increase passenger fares**
- If the public transport offer reduces due to lower salaries for drivers, the system will be triggered and people will shift towards **low-capacity vehicles** such as praga or motorcycle taxi, which are highly unregulated and tend to be **more expensive** for passengers at the end of the day

In conclusion, in the business-as-usual scenario, it is very likely that either **passengers fares** for trotro and taxi will **increase massively**, or that people will have to **patronise** more low-occupancy, **more expensive**, vehicles. **In both cases, mobility will become less and less affordable.**

3.10.2 Gender and mobility



Despite Ghana's great improvements in promoting economical development, gender disparities remain as one of the main challenges to be addressed. Within the scope of this diagnosis report, key points of socio-economic characteristics and mobility practices were assessed. Additional information provided by the gender focus group is also presented. This box aims at compiling the main findings regarding gender gaps that should be carefully considered during the next phases of the Expanded Kumasi SUMP.

Education

- Women have less access to formal education than men
- Women living in the outer ring present the greatest part of those who have not attended school and the smallest that reached the tertiary level

	<ul style="list-style-type: none"> Men possess higher access to senior high school and tertiary education.
Economic activities	<ul style="list-style-type: none"> Men have about twice more access to formal employment jobs than women Self-employed women are the most represented in the three geographical areas, which can reflect in their financial independence Gender balance was noticed in the students' category.
Socioprofessional categories	<ul style="list-style-type: none"> For all analysed areas, women are more likely to be unemployed or to be working in the services and sales sector Most men living in the city-centre and in the inner ring work as managers, professionals, and religious leaders Men living in the outer ring work as crafters and traders.
General mobility patterns	<ul style="list-style-type: none"> Men are more mobile than women Men who live in the inner ring are the most mobile, while women living in the outer ring are the least mobile
Modal shares	<ul style="list-style-type: none"> Women are more likely to travel on trotros or by foot Men realise more motorised travels than women Men living in the inner ring present the largest individual and motorised modal shares, and the smallest trotros and walking shares. Motorcycles and bicycles, even if a minority, are almost exclusively used by men In general, trotro is the most used mean of transport in pax.km for both genders, especially in the city-centre and in the outer ring
Public transport choice	<ul style="list-style-type: none"> Affordability is the main factor that leads to public transport use, for both genders Trotro structure is often restraining, especially regarding the door-step height and the number of available seats Pregnant women, disabled people, users carrying children and goods are the ones with most difficulties to access public transport vehicles
Private car choice	<ul style="list-style-type: none"> Convenience and travel time are the main factors that lead to private car use, for both genders
Passenger opinion	<ul style="list-style-type: none"> One-quarter of the surveyed people were victims of assault in public transport For victims, women suffer more from this kind of violence and feel less safe in public transport For non-victims, the feeling of insecurity is higher in the outer ring, for both genders For those feeling unsafe, the driver's behaviour is mostly the reason for this sensation, followed by vehicle conditions Female passengers are likely to avoid taking a trotro or a shared taxi if they do not know who the driver is Women are afraid of travelling by nighttime, however, since people leave home very early (3am-4am), the feeling of insecurity attenuates Stations conditions are not perceived as an important factor for unsafety feelings in general, since the concept of station is not that widespread Solutions such as public space lightning and cleaning were noted as priorities

3.11 Environment

3.11.1 Greenhouse gas emissions

Road transportation accounts for 11.11% of the total GHG emissions in Ghana, with 5.9 MtCO₂eq emitted in 2016⁵. Transportation is one of the great levies towards tackling climate change. Therefore, an estimation of the transport-related emissions in Kumasi was realised as part of the SUMP. This estimation is based on the household survey data and reference values for Ghana regarding fuel consumption issued from the scientific literature. The total emission by mode of transport in the Expanded Kumasi area is presented in Figure 59.

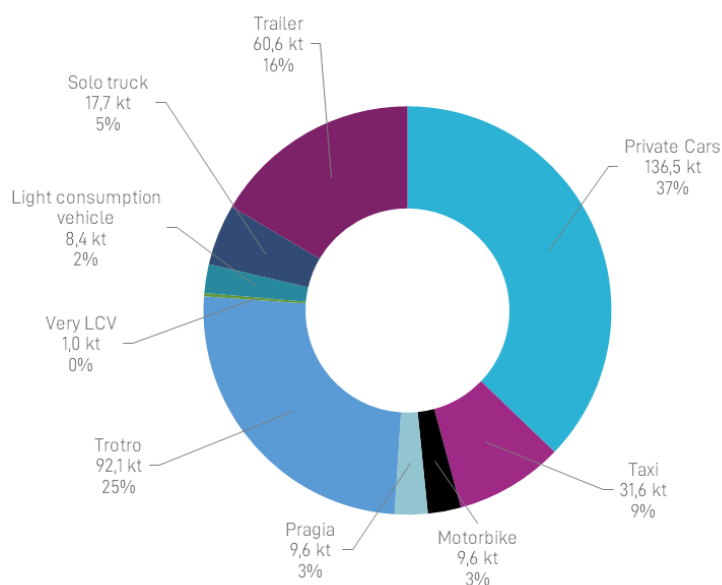


Figure 59: Repartition of GHG emissions (in kilotons of CO₂ equivalent per year)

Mode	Total GHG emission (ktCO ₂ eq/year)	Passengers.kilometers (Milions pax.km/year)	Emission efficiency (gCO ₂ eq/pax.km)
Private Car	138	1,036	133
Taxi	32	301	106
Motorbike	10	103	97
Pragia	10	93	108
Troto	93	2,437	38
TOTAL	283	3,970	71

Table 11: Passenger transport efficiency in terms of GHG emissions

Around 40% of the entire GHG emissions come from private cars. This proportion goes up to around 50% when considering only passenger-transport-related emissions, while private cars only account for 26% of the passenger.kilometers travelled. Indeed, the average emission per passenger.kilometer

⁵ Ghana's Fourth National Greenhouse Gas Inventory Report, Environmental Protection Agency, 2019

travelled by private car is 131 gCO₂eq/pax.km, more than three times higher than the trotro emission rate of 38 gCO₂eq/pax.km.

Freight related emissions are responsible for around 20% of the total transport related emissions.

With a total of 369 ktCO₂eq/year (well-to-wheel estimation), the average transport-related (including freight) GHG emissions per inhabitant is 126 kgCO₂eq/year in the Expanded Kumasi area.

This figure can seem relatively low compared to other similar contexts like Yaoundé (241 kgCO₂eq/year) and Douala (169 kgCO₂eq/year). This can be explained by several factors and uncertainties. Uncertainties include the fleet composition (gasoline/diesel/LPG motorisation), and uncertainties in the GHG emission factors per litre of fuel. Local factors which could explain a lower emission rate per inhabitant could also include a high reliance on shared vehicles (such as trotros) rather than individual vehicles (such as moto-taxis) in Kumasi, as well as the large study area including rural areas with low mobility rates.

3.11.2 Local air pollution

PM is a common evocative indicator for air pollution and it affects majority of people than any other pollutant⁶. The main components of PM are sulphates, sodium chloride, ammonia, nitrates, black carbon, mineral dust and water and involves a complex mixture of solid and liquid particles of organic and inorganic materials suspended in the air⁷. While particles with a diameter of 10 microns or less, (\leq PM₁₀) can enter and lodge deep inside the lungs, the more seriously health-damaging particles are those with a diameter of 2.5 microns or less, (\leq PM_{2.5}). PM_{2.5} can penetrate the lung barrier and move into the blood system (ibid).

According to the WHO, there is a close, quantifiable relationship between exposure to high levels of small particulates (PM₁₀ and PM_{2.5}) and increased mortality or morbidity, daily and over a long time. On the other hand, when the levels of small and fine particulates decrease, related mortality also reduces – provided other factors remain constant (WHO, 2018). This permits policy-makers to forecast the improvements in the health of the population if the levels of particulate air pollution is reduced⁸. Small particulate pollution impacts human health even at very low concentrations – even though, no threshold below which no damage to health is observed has been identified. These therefore necessitated the WHO (2005) guideline limits which seek to achieve the lowest concentrations of PM possible (ibid).

The WHO (2021) air quality guideline recommends PM_{2.5} 24-hour mean of 15µg/m³, while Ghana Environmental Protection Agency (EPA) ambient air quality standards (2016), however, recommends a 24-hour time weighted average of 35µg/m³.

From the collected data, Kejetia was the most polluted of the three sites, with 13 periods out of 14 with a PM_{2.5} concentration higher or equal than 15µg/m³ and seven with a concentration higher than 35µg/m³, and an average concentration of 43µg/m³. Sundays are less polluted than the other weekdays as traffic is usually lower, but the other weekdays are quite homogenous (Saturday included).

⁶ Remy, S., et. al. (2011). Health impact of urban air pollution in Belgium. *Air Quality, Atmosphere & Health*. 4(3-4),

⁷ World Health Organization (WHO), 2018. Ambient (outdoor) air pollution.

⁸ World Health Organization (WHO), 2020. Air Quality Guidelines for Europe. 2nd Edition. WHO Regional Publications, European Series. No. 91

Day of the week	Kejetia Roundabout ($\mu\text{g}/\text{m}^3$)	Anloga Junction ($\mu\text{g}/\text{m}^3$)	Suame Roundabout ($\mu\text{g}/\text{m}^3$)	Average
Monday	65	21	39	42
Tuesday	47	33	41	41
Wednesday	34	37	34	35
Thursday	42	23	29	32
Friday	47	27	32	35
Saturday	38	45	38	41
Sunday	24	20	22	22
Average	43	29	34	35

Table 12: Average PM_{2.5} concentration ($\mu\text{g}/\text{m}^3$) by weekday and location
Created from 2022 air quality survey

From the collected data, each site had concentrations higher than WHO recommendations. This condition, shared by many cities around the world, raises important questions about the sustainability of living in such areas as this exposition to pollutants has a proven important impact on human health and life expectancy.

Besides being a transport-related factor, PM_{2.5} concentration also varies according to meteorological conditions. Data collected in a station located at Abrepo county hospital between May 2021 and May 2022 present that there is, in effect, a significant changing in PM presence for each period of the year, especially during the months of January and February, as illustrated by the figure below. This can be explained by natural phenomenon such as the Harmattan, which occurs in West Africa between the end of November and the middle of March. The Harmattan is defined as a cool dry wind that usually transports great amounts of Sahara sand from north-east to south-west, impacting on visibility and impacting human health as pollutants are less easily evacuated from the ground air.

Therefore, it is important to highlight that air quality does not depend exclusively on traffic flow and transport related emissions. Also, the period of data collection for the three strategical points is optimal in terms of Harmattan impact reduction.

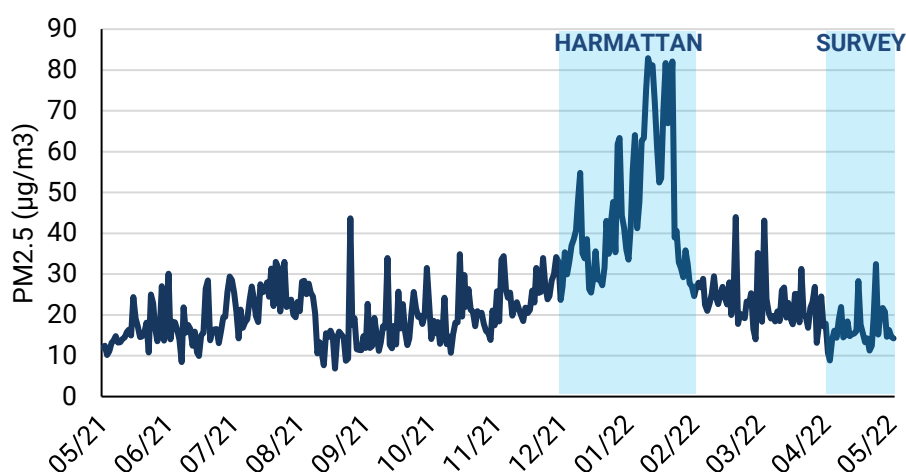


Figure 60: PM_{2.5} concentration ($\mu\text{g}/\text{m}^3$) according to the period of the year (may 2021 -may 2022)
Source: Purple Air open data

3.12 New solutions for mobility and transport

3.12.1 Tools for monitoring: the Transinfomap web app

Until recently, registration of vehicles, drivers and routes used to be done on paper: operators would bring in a list of vehicles to the MMDA.

The “Transinfo map” tool developed by KMA aims to digitalize and professionalise these procedures and allow monitoring. This tool started as Excel spreadsheets in 2015, evolved into an Access database, and is now a web app developed with the support of the Ghana Investment Fund for Electronic Communications (GIFEC, under the Ministry of Communications). The web app is currently hosted on GIFEC servers but after initial development by the GIFEC IT team, no further or continuing development is done by GIFEC.

The tool monitors and registers: vehicles (with vehicle numbers), drivers (with contact information), owners (idem), unions (including contact of key representatives), routes, “stations”. The tool defines a « station » as the combination of a Route (Origin + Destination + if needed, major intermediary stops) + Type of Service (trotro, taxi) + Union. If 2 unions share a route, 2 “stations” for this same route and service are therefore in the system. These “stations” serve as the basis for the emission of the “destination stickers” emitted by the MMDA for each vehicle. These stickers are today developed directly with this Transinfomap tool.

The tool allows to know which driver drives each vehicle, which vehicles and unions operate on a given route, etc.

A complementary phone App (Android), “KMA operators”, has been developed for use by the unions. Through this app, unions can request an update directly, for example in the case of a new driver. This phone app also gives each union access to the vehicles and drivers associated with it. A trotro union interviewed on the subject confirms access to this tool and its usefulness for the union, as the union does not have a census of number of its drivers and vehicles.

This tool was initially developed by KMA in the KMA perimeter. It was completed in early 2021 and up-to-date at that time. However, it has not been updated since and frequent evolutions are to be noted.

KMA has given this tool to all other MMDAs and provided capacity building to use it, but adoption by other MMDAs is not complete at this stage. The objective is that this tool be used for all the Expanded Kumasi area.

Ideas from KMA for further development include mapping (station, routes, GIS-type interface) and links with other functions such as DVLA registration. There are no practical plans for implementing these ideas from lack of available resources.

3.13 Baseline

Current situation: major stakes

The main stakes identified in the diagnosis of the current situation in Kumasi were the following:

- **Urban structure and development:** a classic mono-centric city structure with fast concentric expansion along main arteries; significant disparities among the population; and relatively low urban planning
- **Institutional, regulatory, and financial framework:** a fragmented mobility sector where most decisions are made in Accra and funding is inadequate and uncertain
- **Mobility patterns and expected trends:** a high reliance on trotros; a dominance of work and school related travels; many trips towards the city centre
- **Private and Non-motorised transport (NMT):** a relatively good radial road network with moderate traffic levels; but difficult traffic conditions in the CBD; and unsafe and uncomfortable conditions for pedestrians
- **Public transport:** an important paratransit network (trotros and taxis) servicing the population satisfactorily today; with partial regulation and monitoring; suffering from mounting operating difficulties at terminals (inadequate space), low quality vehicles, rising prices, and competition from illegal wawas.
- **Carbon emissions and air quality:** role of the transport sector in carbon emissions; poor air quality.

SWOT analysis

The following SWOT matrix was built considering these analyses and the inputs of the technical committee.

STRENGTHS

- Transport offer which answers to most mobility needs, no huge unmet travel demand (at least in the city centre)
- Rather simple to get around for passengers, few transfers are necessary
- Rather affordable travel for passengers
- Paratransit system working without any public funds
- Partial regulation and monitoring of the paratransit system
- Relatively complete and logical road network (grid, hierarchy)
- Relatively good quality roads where most urgent maintenance works are done
- Moderate traffic levels, no real reason for congestion today

WEAKNESSES

- Different authorities responsible for different aspects of mobility
- Most decisions made in Accra
- Inadequate funding and poor financial visibility in the future
- Planning and monitoring of transport offer are incomplete
- Lack of coordination between transport and urban planning
- Conflicts between modes & usage of public space, especially in the CBD (vendors, parking, trotro stops...).
- Poor road safety measures & low quality of service for pedestrians leading to low attractiveness of NMT modes
- Bad air quality near roads
- Low attractiveness of Adheyee network
- Road network without alternatives
- Difficult traffic conditions in the city centre around Kejetia market
- No consistent enforcement of regulations

OPPORTUNITIES

- Existence of DOTs and partial monitoring of transport offer within MMDAs
- Existence of transport unions structuring the paratransit system
- Rather “simple” mono-centric and radial city structure, without boundaries or constraints
- Acceptance of public transport by the population and interest in higher-quality transport offer
- Still reasonable traffic and car ownership levels, permitting to influence mobility habits while it is not too late
- Interest in Kumasi from investors

THREATS

- Inadequate space and pressure on land use for public transport terminals
- Risk to the economic model of trotros and affordability, as prices and congestion rise
- Competition and development of wa-was, pragias
- Fast unplanned growth of the metropolis (population, land use, motorization)
- Potential difficult negotiations with public transport stakeholders
- Potential low political support
- Lack of a mobility authority to take charge of transversal projects
- Inadequate funding

4. Objectives, vision, and scenarios

4.1 Objectives and vision for mobility

4.1.1 Objectives for mobility

A workshop with the taskforce was organised in order to collectively identify the objectives of the SUMP regarding the conclusions from the diagnosis. The objectives identified by the taskforce members were grouped into categories and collectively formalised as structured objectives and sub-objectives.

The objectives and sub-objectives adopted for mobility in Kumasi are the following:

- Improve **urban safety, pedestrian and non-motorised transport** conditions and **road safety**
- Enhance the **public transport system**
 - Efficiency of the existing system
 - Improvement of accessibility
 - Massification of the transport system
 - Improvement of security onboard and at terminals
 - Improvement of intermodality
- Improve the **institutional framework and revenues**
- Improve **traffic and parking conditions**, especially in the CBD
- Enhance the **regulation and enforcement** systems
- Improve **sustainability** of transport and its externalities on the **quality of life**
- **Educate** the public about mobility issues.

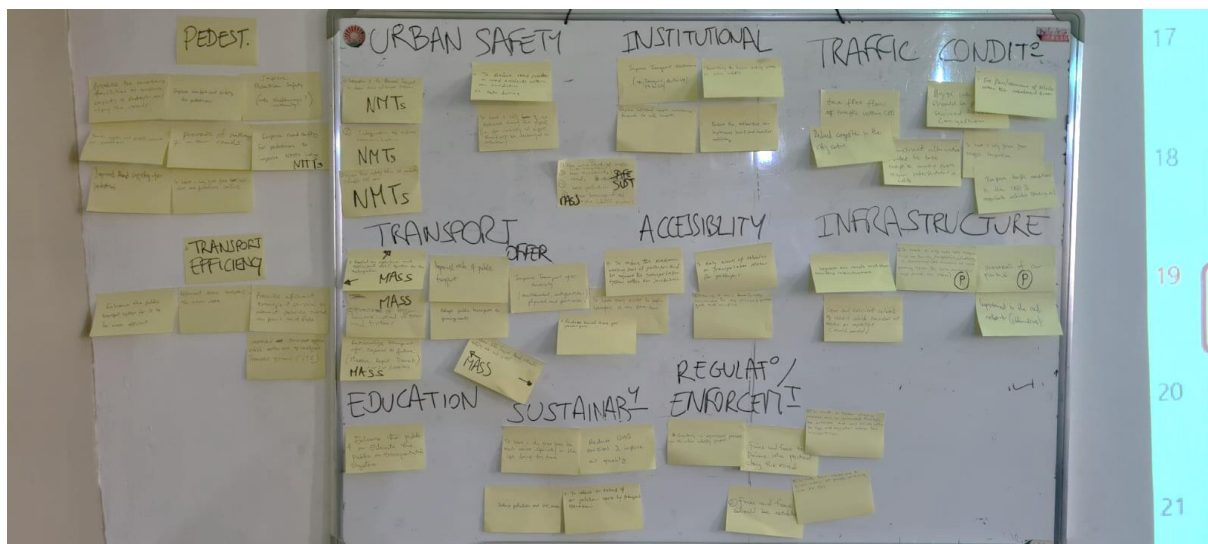


Figure 61: Picture of the objectives' identification workshop

4.1.2 The four mottos

Following the diagnosis; the analysis of the possible trends for mobility in Kumasi and of the business-as-usual scenario; the understanding of the different stakeholders' objectives and vision; the following four mottos were developed to answer the question:

WHAT DO WE HOPE FOR MOBILITY IN KUMASI?

A city offering a
quality public
transport system for
every need

A city where it is safe and
pleasant to walk, offering
an improved urban
environment

A city where road use is
optimized through
infrastructure and traffic
management

A city offering its
local officials the
tools to manage
mobility effectively

4.1.3 Vision for a quality public transport system

General vision

A city offering a quality public transport system for every need

Massification to absorb transport demand without congestion

Clean vehicles, safe, fully accessible to all

Professionalisation of trotro services, offering better quality of service for customers but also better work conditions

The public transport system must be enhanced to be able to answer future needs: the cumulation of population (and mobility demand) increase, private car possession and use, and the volatile economic context challenges the sustainability of the current system.

This enhancement will result in profound changes but will consider the needs of all stakeholders of the mobility systems, passengers as well as service providers.

This enhancement will also tackle issues identified in the diagnosis, such as the unsafety feeling of passengers mostly due to the conditions of the vehicles and the behaviour of some drivers, or the issue of illegal operators (wawas) resulting in illicit parking of the vehicles and creating congestion.

Structure of demand

The existing network is radial and monocentric (most routes converging to Kejetia and Adum), with most of the demand concentrated along six urban corridors and main road entering the city:

- Accra Road (N6)
- Lake Road
- Bekwai Road (N8)
- Sunyani Road
- Techiman Road (N10)
- Mampong Road

Secondary demand corridors are also radial and monocentric:

- Antoa Road
- Asokore-Mampong Road
- Melcom Road
- Abrepo Road

Lastly, the ring road shows high flows of passengers as some routes are now using the bypasses to avoid the city centre and offer suburb-to-suburb itineraries. This demand is however much more limited than on the radial corridors.

The following illustrations are extracted from the Household survey presented in the diagnosis report and show the structure of travel demand in Kumasi.

One can see that the travel demand is widely concentrated along radial axis, whereas orbital and diametral demand is much lower. An orbital demand between the areas of the inner ring exists, but is less than all the radial demand lines between the outer ring areas and their closest inner ring area and the CBD, and between the inner ring areas and the CBD. This travel demand dynamic is logical with the city structure and the road network hierarchy (upon which the public transport network is organised): main arterial roads and main public transport routes are entering the city and distributing passengers from the outer areas to the next inner ring area and the CBD.

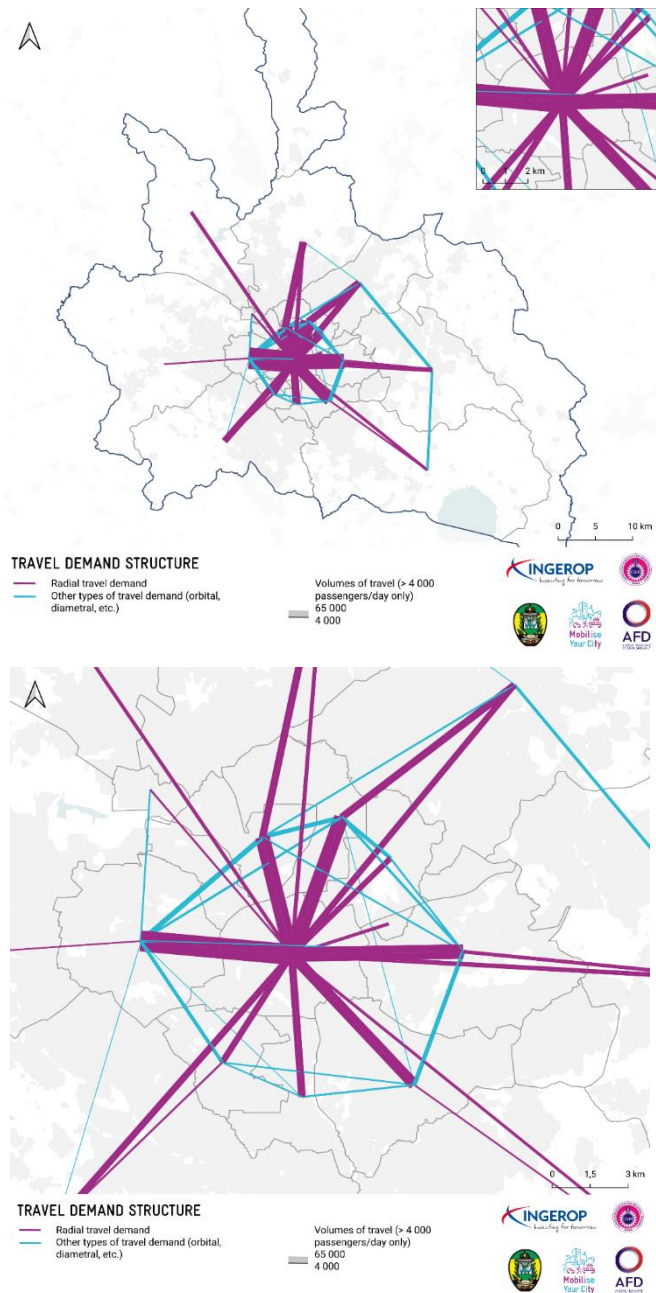


Figure 62: Schematic diagrams of travel demand by type for the baseline (2022)
Created from the 2022 household survey

Hierarchisation of the public transport network

As seen in the Diagnosis and the Business-as-usual scenario, massification of public transport is inevitable to answer the growing transport needs in Kumasi.

In accordance with the analysis of the structure of demand, the following public transport concept is proposed.

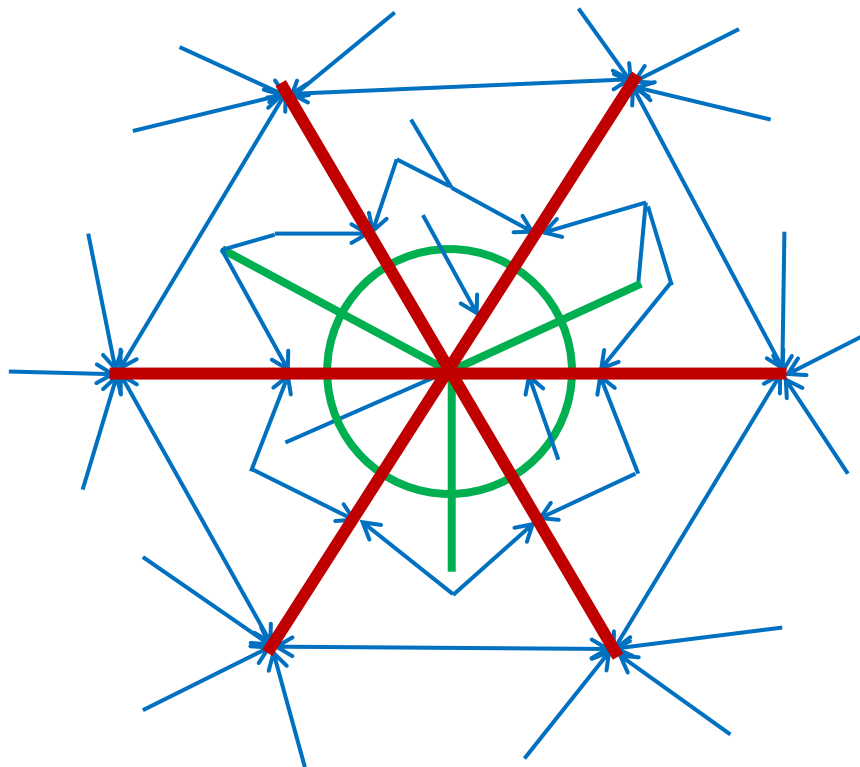


Figure 63: Public transport network hierarchy concept

Level 1: Bus Rapid Transit (BRT)

Mass transit system with Bus Rapid Transit corridors operating at high-speed and high-capacity (high frequency, articulated or bi-articulated buses carrying more than 100 passengers each), backbone of the network. Located on the very-high-demand corridors (most-demand radial roads).

Level 2: Quality Bus Services (QBS)

New high-capacity (~100 passengers) buses with punctual infrastructure (terminus, stops, depots, etc.) and schedule-based high-quality operation. Located on the high-demand corridors (secondary-demand roads, ring road linking the inner ring areas).

Level 3: Quality Trotro Services (QTS)

Enhanced existing trotro system with renewed minibuses and enhanced regulation by public authorities. Located on all other routes, including services feeding Bus Rapid Transit and Quality Bus Services corridors.

Choice of public transport modes

The diagram below represents the pertinence of various urban transport modes in relation to distance and capacity.

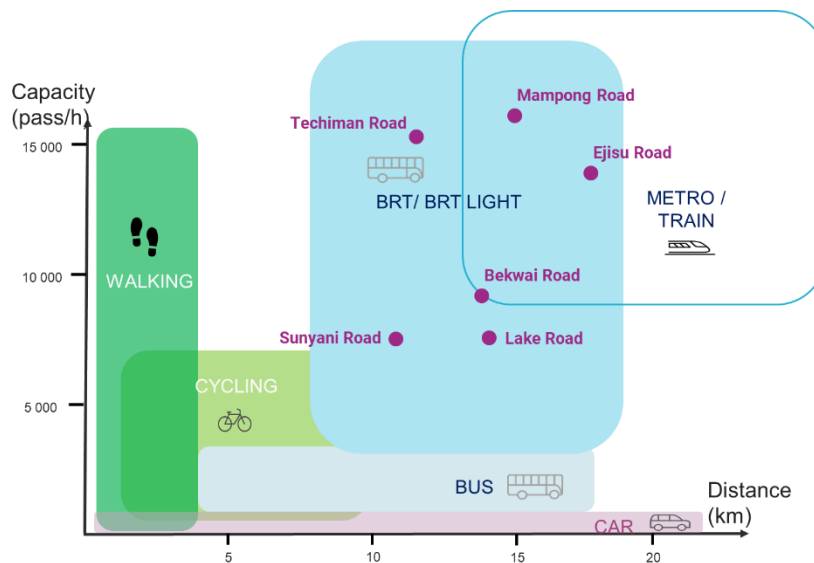


Figure 64: Pertinence of modes considering capacity and distance

The previous diagram presents the estimated maximum potential ridership of a BRT system on the highest-demand corridors for the horizon 2040, compared with the range of pertinence of transport modes. One can see that all the urban corridors identified as main demand corridors are within range of **BRT or BRT Light systems** for the long-term horizon. BRT and/or Quality Bus Services are proposed on all these corridors.

For the mass transit corridors, a light-rail (tram) system was not favoured compared to BRT for several reasons:

- A lesser transport capacity and lesser evolutivity, in a context of fast-changing transport demand
- A higher investment cost, in a context of high financial constraints for public transport
- More complex maintenance than BRT, in a context without a structured, industrialized public transport operation today
- Less experience and feedback for tram in Africa and developing countries generally, leading to more risks regarding costs, implementation and timelines, operation.

If the BRT and QBS systems will cover a great part of the demand, the network can't function without the existing system: trotros and taxis. Travel demand will highly increase in the coming years and high-capacity vehicles aren't adapted to all types of urban contexts and demand types. Therefore, BRT and QBS won't be enough, and **need to rely on the trotro and taxi system**.

It is estimated that at least the same number of trotro vehicles as today will be necessary to cover the demand increase: no loss of jobs on the trotro system is expected.

Though offering a highly valuable service, some aspects of trotro operation are not sustainable (land use requirements and occupation of public space, business model in a context of growing congestion and price increases, etc.) and new expectations are developing from the users and the regulating authorities. This leads to a need to enhance the system by:

- Improving the regulation tools for the public authorities
- Giving more incentive to the illegal operators (wawas) to join the legal system
- Renewing an ageing vehicle fleet, which can be hazardous and polluting
- Improving road safety and passenger safety
- Improving the driver's working conditions in an unfavourable and uncertain economic context.

4.1.4 Vision for non-motorised transport and urban environment

General vision

**A city where it is safe and pleasant to walk,
offering an improved urban environment**

**Quality
infrastructure for
pedestrians**

**Improved road safety
particularly for the most
vulnerable users**

**A dedicated space
to accommodate
every urban function**

**A more sustainable
city, limiting
transport-related GHG
emissions**

**Better air quality and a
better urban
environment**

Infrastructure adapted to NMT and particularly walking is extremely rare or even non-existing in most parts of the Expanded Kumasi. For the sections that present at least a clear sidewalk, these are frequently occupied by vending tents and stands, especially in city centre and around the Kejetia Market. Besides being occupied, the infrastructure state is often precarious.

Vending structure installations leads to a lack of space availability to circulate near commercial spots. Pedestrians, trotros and other motorised vehicles coexist on the carriageway, reducing NMT safety and comfort. The situation is even more precarious for cycling: no dedicated lanes for bicycle circulation were identified.

"The movement pattern especially walking has changed. Pedestrian pathways have been turned into business center where traders, hawkers and shop with extensions engage their businesses. Due to the congestion on the pathways, pedestrian now walk on the road which is meant for cars to transport on and this further causes the traffic congestions since half of these narrowed roads are occupied by pedestrians. I think the enforcement of the law will help to avoid all these congestions and make pedestrian walk comfortable on the pathways."

Woman, informal market trader

Road safety is also a major issue regarding non-motorised transport. It is accounted that pedestrians constituted over one half of all traffic casualties in the area. The existing situation of inadequate pedestrian facilities coupled with the activities of street hawkers have compelled pedestrians to use the road space with motorized vehicles which may be a contributory factor to the high incidence of

pedestrian accidents in urban centres whereas vehicles moving at high speeds on highways passing through non-urban centres may also have accounted for a high incidence of fatalities in the non-urban centres. Most of these fatalities occurred during night-time, mostly due to the inexistence of functional street lighting along many roads. Women feel especially unsafe during night-time due to the poor visibility.

Kumasi, nationwide known as “The Garden City”, somehow lost some of its magnificence when road space was increased to accommodate more motorised traffic, with many trees cut down and some parks and gardens converted to parking lots. Ashantis care about the beauty of their city and some of the inhabitants expressed regrets about how it lost some of it.

Synthesis

All these observations lead to an ambitious vision for non-motorised transport and the urban environment:

- **Massive development of quality pedestrian infrastructure:** sidewalks with drainage systems and street lighting, at least within the busiest areas (Kejetia, Adum), along the main radial roads, and in all urban centres. This will widely help with the improvement of road safety for pedestrians and will continue to promote walking, a clean and healthy transport mode.
- **Traffic taming and road safety improvement:** development of “safety by design” road infrastructure to reduce road safety casualties. This can go through efficient speed bumps, clear signage of dangers and speed limits, etc.
- **Development of the cycling culture:** the idea is to develop cycling culture and analyse the population’s openness to this mode through experimentations before implementing infrastructure. This could take place with bicycle-responsive categories of population like the youth, who are often not motorised and have a low purchasing power. Kwame Nkrumah University of Science and Technology is ideally adapted for this kind of experimentation. The opportunity for future bicycle infrastructure should also be taken into consideration when planning, with the need to include it in the design guidelines. It can also be a part of major projects (such as BRT projects) or be a specific measure in itself, if the experiment turns out to be successful.
- **Better distribution of urban space and improvement of the living environment:** development of “complete streets”, catering space for everyone: pedestrians, bicycles, traders, public transport, private cars, deliveries, etc. This better distribution will also lead to the provision of more green spaces and trees. This will mostly go through the creation of specific urban guidelines, the provision of quality space for street traders.

4.1.5 Vision for road use optimisation

General vision

**A city where road use is optimized
through infrastructure and traffic management**

**Road infrastructure to
divert transit traffic from
the metropolis' centre**

**Traffic conditions and
parking improvement
projects in the CBD**

**Limiting conflicts
between modes and
functions**

Structure of the road network

The road network in Kumasi is structured in a radial logic, which is classical for a city free of natural boundaries such as a seaside or noticeable topography. Eight main radial roads enable the access of most of the traffic to the city centre, which is circled by a ring road. This ring road is inside the densely urbanised area.

Among the eight radial roads, three are national highways: N6 to Accra, N10 to Techiman and Tamale, and N8 to Bekwai and Cape Coast. These roads support important traffic transiting through the area or in exchange with it. The five other entering roads have a less strategic role on a national scale: IR4 and IR5, of interregional importance, respectively connect the city to Mampong and Sunyani/Bibiani, whereas Lake Road, Melcom Road and Abrepo Road are of local importance (connection between Kumasi and the Expanded Areas).

Even though the ring road is complete, these radial roads still connect to each other inside the very centre of the city, at Kejetia roundabout, where the main public transport terminal is located. The structure of the road network is very efficient and logical, with a good hierarchy system and no major missing arterial road. Some of the main radial roads are dualized, and their shape is usually satisfactory, with the Department of Urban Roads carrying efficient maintenance.

This leads to a satisfactory road network structure, not needing a full reshaping. However, traffic conditions can still be bad, even in areas where traffic should be flowing when looking at the road capacity and the transport demand. Most of the traffic is caused by misuses: encroachment of street vendors on the sidewalks making the pedestrians walk of the carriageway, illicit parking and waiting of public transport vehicles on the carriageway, etc.

Moreover, some local issues exist: several communities are remote from the main arterial roads. As these links are missing, few public transport routes access these areas, making the inhabitants walk for long distances to board a vehicle. All this impedes with an easy and efficient mobility for the inhabitants of these communities.

Therefore, the vision for the structure of the road network is to rely on the existing network with minor adjustments:

- Finalization of dualization of the inner ring road.
- Creation of critical link roads to access more remote communities and link them to the existing road network.
- In the very long term, when urbanisation reaches the outer edges of the metropolis, creation of an Outer ring road.

Synthesis

The vision for the road network and traffic conditions consists of an enhancement of the current situation, mostly based on the existing infrastructure, and putting attention on optimisation measures:

- **A city centre where traffic flows are freer thanks to a better regulation and management of the traffic:** with the reliance on more high-occupancy public transport vehicles and the enhancement of trotro operations (see chapter 4.1.3), the public transport needs for public space in the city centre will be decreased. Moreover, the development of more regulated areas for street trading activities (see chapter 1.1) will reduce the encroachment on the roads and help decongest the city centre. Then, the development of a traffic plan, with one-way streets and improved junctions, will help to direct the flows more efficiently and reduce the traffic at some specifically difficult spots.
- **A better management of traffic through technology:** intelligent transport systems (ITS) such as centralised traffic management features will be developed to enhance the regulation of traffic flows, especially when incidents happen
- **Development of local infrastructure to access remote communities:** communities which are out of reach from the main road network will be provided with links roads which are missing today
- **Diversion of traffic from the city centre:** bypasses will be developed at different scales, to help divert some transit traffic from the city centre and allow easy travels between the inner ring areas, where orbital demand is higher than in other areas even if still lower than radial demand
- **Management and development of the parking offer:** parking spaces will be developed close to the city centre, but not within it. The objective of this is to limit illicit parking which can be observed today and is impeding with vehicular movement, as barely any formal parking offer is existing today. However, this development should be limited, in order not to give incentive to use private cars. This is also why parking should be developed outside the busiest areas of the city centre.

4.1.6 Vision for mobility management efficiency

General vision

A city offering its local officials the tools to manage mobility effectively



Synthesis

The last scope of the vision of mobility in Kumasi regards institutional and regulatory aspects. This is key to the good implementation of the plan and the attainment of the ambitious objectives.

The vision is articulated around several concepts:

- **More independence of the local authorities in the mobility planning and regulation:** the creation of a Transport Authority is usually a key to achieve this, but it requires a legal basis. This kind of institution can feature other interesting functions, such as the enforcement of mobility-related by-laws, the contractualization with and monitoring of public transport operators, and is also key in the implementation of wide cross-cutting projects such as Bus Rapid Transit
- **Improvement of the enforcement:** fair and efficient enforcement is essential to the good application of regulations by the passengers, operators, drivers, traders, etc.
- **Legalisation and regulation of some transport activities:** praga are illegally operating, but could be legalized (upon national decision) and integrated through the transport system, which will allow to regulate them and ban this system from the dense areas where it is not adapted to satisfy the travel demand effectively.
- **Development of monitoring and reporting frameworks to enhance planning processes and decision-making**
- **Education and capacity building:** both the civil society and mobility stakeholders should carry on their education about mobility issues.

4.1.7 Very long-term vision for mobility in Kumasi

In application of the vision detailed above, the very long-term vision for mobility in Kumasi is presented on the map below.

This very long-term vision (post 2040 – post SUMP horizon) is developed without considering budget or feasibility constraints. This is the general target we want to achieve -at least partly- through the SUMP.

The SUMP scenarios and action plan will transform this vision to a feasible plan by phasing some actions.

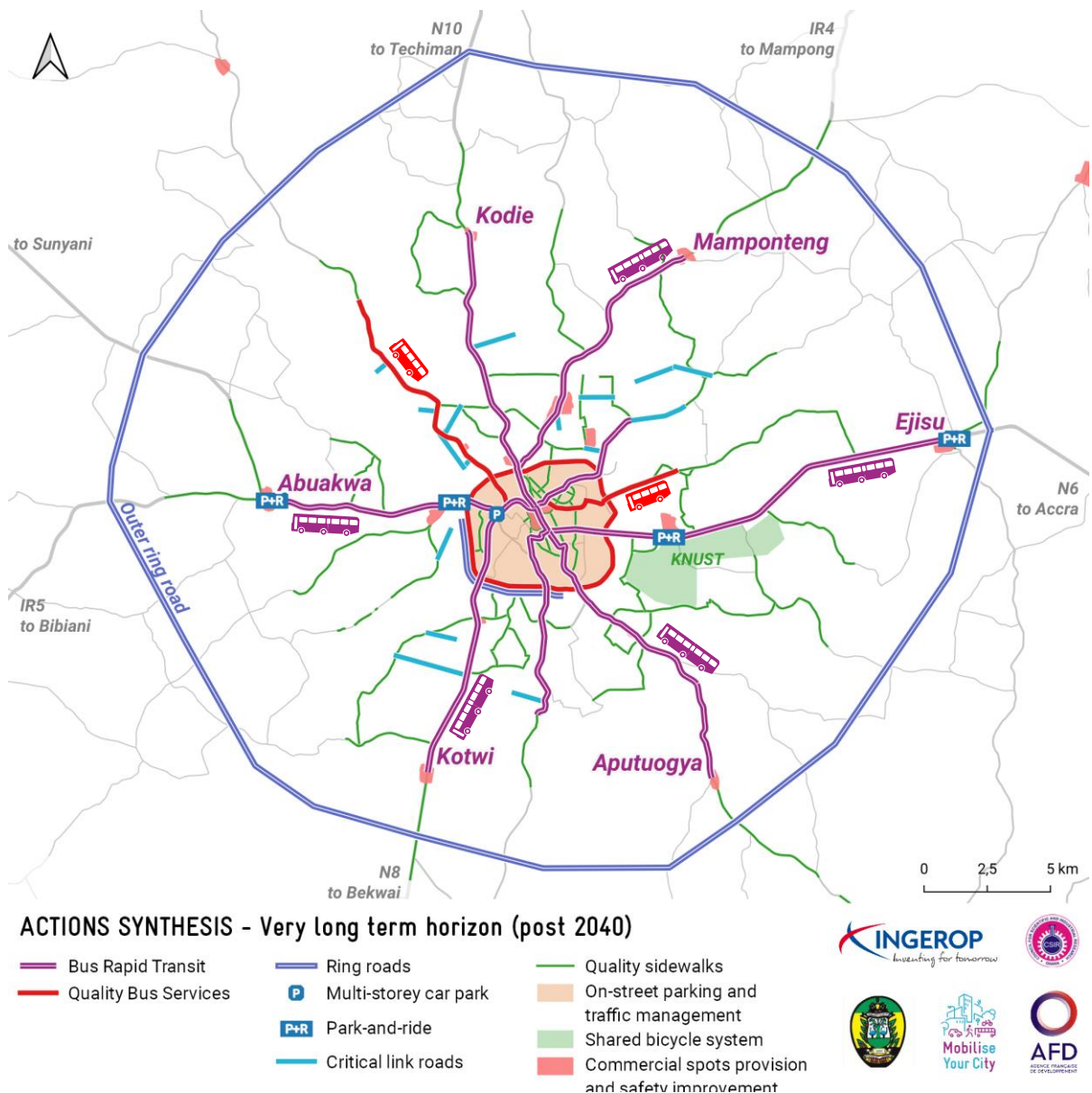


Figure 65: Map of the very-long-term vision for mobility in Kumasi

4.2 Presentation of mobility scenarios

4.2.1 Business-as-usual scenario

The diagnosis identified possible consequences for mobility in Kumasi if trends are allowed to develop and no mobility plan is implemented. These possible trends and consequences identified during the Diagnosis and reminded below, were then refined and quantified to form the Business-as-usual scenario.

Possible trends and consequences

The stakes identified in the diagnosis, combined with the macro-economic forecasts and trends observed in comparable contexts led to identify the following probable trends.

Population growth is strong. This in turn will increase housing demand and urban growth. It can be expected the land use sprawl will continue mainly in a concentric manner and spread along roadway infrastructure. Planning initiatives in the past have not managed to successfully develop attractive secondary urban centres (markets, etc.) meaning the city is likely to remain concentrated and centralized. Pressure on land use can also be expected to increase in the already urbanized areas, especially in the city centre.

As revenues, education levels, etc. are also rising in an emerging economy, it can also be expected that **car ownership rates** will rise, as well as **mobility rates**, as is seen elsewhere in the world. In particular, as the gender gap between men and women gradually decreases, women's mobility and private car use will increase as well.

Lastly, a cycle of inflation is under way in Ghana leading to **price increases**, especially in fuel. However, funds dedicated to transport do not seem to be increasing.

If these trends are allowed to develop, some possible consequences for mobility can be expected:

- Population growth, mobility increases, and private car ownership increases will lead to **more congestion and higher travel times**
- There will be more **competition for urban space** and city centre saturation
- There will be **less and less space for public transport** stations and terminals because of pressure on land for other more lucrative uses
- Increases in traffic (quantity, private vehicle shares and length of trips due to urban sprawl) will lead to **air quality decreases; GHG emissions increase; road accidents increase**
- **Congestion** will increase in the city centre because of the lack of alternatives
- The **economic model of the trotros and taxis will suffer** under the combined effect of rising travel times (less productivity) and rising prices
- Maintaining the current operating model of trotros and taxis will also be made difficult by the pressure on stations and terminals, it will be difficult to add routes or keep as many routes in the CBD

- **Smaller vehicles like Pragias or motorcycles** risk proliferating to take of less operating costs and their better capacity to manoeuvre through congestion. The current public transport system might not be able to **keep up with the rising travel demand**, potentially hindering economic growth.

Urban development and socio-economic context

Urban development and population growth

Forecasted growth is mainly located in outer areas, rather than in the city centre. Indeed, the city centre and the inner ring are already densely built-up areas, whereas urban sprawl can only occur in the outer ring areas, where the outskirts of the city currently are.

Population in 2021 was just under 3 million inhabitants. By 2030, the total population of the metropolis should reach **4 million inhabitants**, and if growth continues as predicted, it should **reach 6 million by 2040, twice the 2021 population**.

Macro-economic conditions and value of time

User's mobility choices (most notably between private car use) are also determined by user's revenue and value of time. This is closely related to revenue and GDP per capita. Gross domestic product (GDP) per capita is necessary to forecast the value of time. GDP data for current and projected horizons is issued from the International Monetary Fund (IMF) which collects past data and forecasts evolutions to a five-year horizon for Ghana.

For years between 2028 and 2030, a mean annual growth rate of 4% is considered. For years between 2030 and 2040, a mean annual growth rate of 3% is considered to reflect the uncertainty of the macro-economic situation evolution.

Transport projects and maintenance

Transport development projects

Some mobility-related projects are currently being discussed in the Expanded Kumasi area, independently from the SUMP.

As none of these projects are yet operational (no funding secured, no completion date announced, no feasibility studies complete), **we do not include these projects in the Business as usual scenario**, but include them in the various SUMP scenarios.

Kumasi Urban Mobility and Accessibility Project (KUMAP)

Managed by the Ministry of Roads and Highways through the Department of Urban roads with assistance from the World Bank and inclusion of various local stakeholders, this project mainly focuses

on the implementation of two BRT corridors: Kejetia-Ejisu (Ejisu Road) and Kejetia-Abuakwa (Sunyani Road).

At this day the project is still at a planning stage; no feasibility studies have been conducted yet. The procurement process is ongoing for several studies (from feasibility studies to detailed design), but no completion date has been announced. To our knowledge, funding is not yet secured. Therefore, it is proposed not to include this project in the business-as-usual scenario.

Dualization of the inner ring road

The Department of Urban Roads wants to dualize the final stretch of the inner ring road (Lake Road interchange – Sofoline interchange) to help decrease congestion in this quadrant of the city. The project has been discussed for a long time, however, as of today, no funding has been secured and no completion date has been announced. Therefore, it is proposed not to include this project in the business-as-usual scenario.

Development of the outer ring road

The Department of Urban Roads considers developing an outer ring road, which was preconised by the 2013 Masterplan. Like the inner ring road, the project has been discussed for a long time, but, as of today, no funding has been secured, no route has been chosen, and no completion date has been announced. Therefore, as the inner ring road, it is proposed not to include this project in the business-as-usual scenario.

Maintenance and reconstruction

The Department of Urban Roads is in charge of the maintenance of most roads in the area. Most of the current DUR budget is dedicated to these works, which are critical to the well-functioning of the road network. Some of these are minor rehabilitation or asphaltic overlaying, but some others are heavy maintenance, redevelopment of reconstruction works.

These works will be carried out by the DUR independently from the SUMP and will still be necessary when the SUMP actions are implemented. **Therefore, these maintenance and reconstruction works are included in the business-as-usual scenario.**

Forecasted mobility characteristics

Motorisation rate

The Vehicle Inventory Report (Ghana Environmental Protection Agency, 2016) forecasted the following vehicle population for the entire country:

- 2020: 1,729,000 vehicles, meaning a motorisation rate of 5.37%
- 2030: 3,356,000 vehicles, meaning a motorisation rate of 8.65%
- 2040: 5,404,000 vehicles, meaning a motorisation rate of 11.85%
- 2050: 7,871,000 vehicles, meaning a motorisation rate of 15.07%

Therefore, the forecasted annual growth rate is 4% between 2020 and 2040. However, the motorisation rate was 5.37% in 2020 for the entire country, while it was estimated around 25% for the Expanded

Kumasi area for the year 2022 (household survey, 2022). Thus, considering the important advance of the area in terms of motorisation rate compared to the rest of the country, **a mean yearly motorisation growth rate of 2.5% is considered between 2022 and 2040**. This would lead to a motorisation rate of **30% in 2030 and 39% in 2040**.

A gradual shift towards cleaner vehicles is taken into account, following the decreases in fuel consumption observed in Europe the past years, as most vehicles in Kumasi are second-hand vehicles from Europe.

These hypotheses are identical between the BAU scenario and the SUMP scenarios.

Mobility rates

Mobility rates (number of travels per inhabitant per day) are supposed stable between the current situation and the future situation (Business as usual as well as SUMP scenarios).

Mobility rates increase proportionally to population increase, for each horizon. **In 2040, total daily travels will thus increase to 5.4 million**, almost doubling the daily 2.9 million travels today.

This hypothesis is identical between the BAU scenario and the SUMP scenarios.

Mobility indicators for the Business-as-usual scenario

Impact of all the evolutions presented above (population growth, motorization growth, value of time...) are introduced in the transport demand model developed for the SUMP (see annex: Transport demand modelling report). The transport demand model provides quantitative indicators on mobility for the BAU scenario.

The main findings are summarised below for the 2040 horizon:

Key indicators	Unit	Today (2022)	Business-as-usual (2040)
Average travel time	Minutes	34	42
Average transport cost	GHC	4.3	6.1
Private car use	Passengers. Kilometres per day	3,262,000	13,537,000
Public transport modal share	%	76%	52%
Total vehicular use	Vehicles. Kilometres per day	4,445,000	11,798,000
Total travels	Travels per day	2,922,000	5,400,000
GHG emissions	ktCO ₂ equivalent	370	890
Population	Million inhabitants	3.1	6.2

Table 13: Key performance indicators for the business-as-usual scenario

Private transport modal share and vehicle.kilometers

Considering the growth of travel demand, the growing motorisation rate, and the macro-economic conditions (growth of the GDP per capita, increasing values of time and propension to pay more for faster and more comfortable modes such as private cars), the use of private cars will drastically increase and will cause severe threats to the well-functioning of the metropolis' mobility system.

The private car modal share should reach 48% by 2040, twice the 2022 one. Thus, the number of kilometres travelled by private cars will increase from around 2 million vehicle.kilometres in 2022 to 9 million vehicle.kilometres in 2040, **multiplying private car traffic by more than four.**

Public transport modal share and vehicle.kilometers

Also considering that the demand for public transport will increase (at a slower pace than private car, as a modal shift will happen from current public transport users towards private cars), the number of kilometres travelled by public transport vehicles will also increase. From 4 million vehicle.kilometres a day in 2022, the cumulated distance travelled by vehicles should reach around 12 million vehicle.kilometres a day for the year 2040.

In the BAU scenario, these distances are all travelled by Trotro and taxis (rather than higher-capacity vehicles). **Trotro and taxi offer would need to be tripled**, which would lead to congestion.

Travel times

Even though private car travels are on average faster than public transport travels, increased vehicular use leads to congestion and longer travel times. The average travel time is estimated to increase to 42 minutes, to be compared to 34 minutes today (+25%).

Travel costs

This shift towards private transport will result in an **increase in average travel costs** for mobility in Kumasi, decreasing general transport affordability and increasing the share of revenue spent on transport.

GHG emissions

The combination of **increased daily travel demand** (due to urbanization and population growth) and **shift towards private vehicle use** (due to growing motorization rates, increasing revenues and value of time, and lack of an attractive public transport offer in the BAU scenario) **results in a drastic increase in GHG emissions.**

Emissions in the BAU scenario are estimated at 890 ktCO₂eq, up from 370 ktCO₂eq in 2021 (+140% increase).

4.2.2 Alternative sustainability scenarios

Following the diagnosis and identification of objectives for mobility in Kumasi, measures which can help attain the objectives and vision above were proposed.

All the measures presented after are interesting to improve mobility in Kumasi. The sum of all these measures constitutes a very-long-term vision for urban mobility in Kumasi, at a very-long-term, post-SUMP horizon. These measures were identified with the task force and discussed individually with each one of the 16 MMDAs. The following table presents all the measures of this very-long-term vision.

However, the Sustainable Urban Mobility Plan for the Expanded Kumasi will include only the measures for the 2040 horizon, approved by the Steering Committee and operationally viable (financing, timeframe, construction delays, etc.) at this horizon. The next phase of the process will consist of prioritize the selected measures over the SUMP timeframe (up to 2040).

Two coherent SUMP scenarios were established for the SUMP timeframe (up to 2040), each including part of the measures proposed in the very-long-term vision:

- **Scenario A: Focus on public transport** prioritises developing the public transport system
- **Scenario B: Focus on infrastructure and non-motorised transport** prioritises developing road infrastructure and non-motorised transport infrastructure

Scenario A: focus on public transport

Scenario A, focusing mainly on public transport, is dominated by the massification of the transport system. It proposes to develop eight Bus Rapid Transit corridors, on all urban corridors:

- Kejetia-Ejisu (Accra Road)
- Kejetia-Abuakwa (Sunyani Road)
- Kejetia-Kodie (Techiman Road)
- Kejetia-Kotwi (Bekwai Road)
- Kejetia-Mampong (Mampong Road)
- Kejetia-Aputuogya (Lake Road)
- Kejetia-Buokrom (Antoa Road)
- Kejetia-Sokoban (Melcom Road)

BRT includes very high-capacity buses, and massive infrastructure with the complete renovation of the right-of-way including a dedicated busway and stations. It also provides maintenance infrastructure and Intelligent Transportation Systems (ITS) features.

The implementation of Quality Bus Services is also included on routes feeding the BRT corridors, as well as on the other most demanded routes of the metropolis. QBS encompasses the provision of new high capacity rolling stock, provision of bus stops, improvement of 35 existing stations along the routes, and the development of three new public transport terminals in the city centre (in Adum and Kejetia areas).

The operating mode of Quality Bus Services will be declined in the next step of the process, either as a whole new mode, as an enhancement of the existing trotro operation, or a mix of both depending on the routes.

The development of BRT will allow the development of quality sidewalks and more generally non-motorized transport infrastructure along the corridors. Moreover, scenario A includes a program of quality sidewalks development along other roads, covering 100km, mostly covering the city centre and a few other areas outside the city centre.

Bicycle development is not a priority of the scenario, as its use is very limited in the area. Although, this scenario includes an experimentation of a shared bicycle system on KNUST campus. It aims to check the potential interest of citizens towards bicycle mobility through a modern and attractive system answering specific mobility needs (students' movement) in an area with limited traffic and quality road infrastructure.

Scenario A also aims at better managing the traffic flows, through several actions. First, dedicated spaces for commercial activities will be developed along the roads to try to accommodate and better regulate street trading activities. This will be implemented in all the CBDs of the area. Traffic issues in the city centre will be tackled through the development of a traffic plan in Kejetia and Adum areas and the improvement of 25 strategic junctions. These junctions will be located either in the city centre or along the eight BRT corridors. Road safety will also be enhanced through a vast program of signage, marking, and traffic taming measures (speed tables, limited speed areas, etc.).

Road infrastructure is not a priority of this scenario. However, the dualization of the last single-carriageway stretch of the inner ring road (Lake Road interchange – Sofoline interchange, 6km) is included to form a full dual-carriageway ring road and tackle traffic issues in the southeast quadrant of the city.

Parking issues will also be partially tackled with the development of on-street parking within the ring road (KMA CBD), but outside the busiest areas of the city centre (Kejetia and Adum areas), where KMA wants to ban on-street parking. This will provide around 2,000 parking spots.

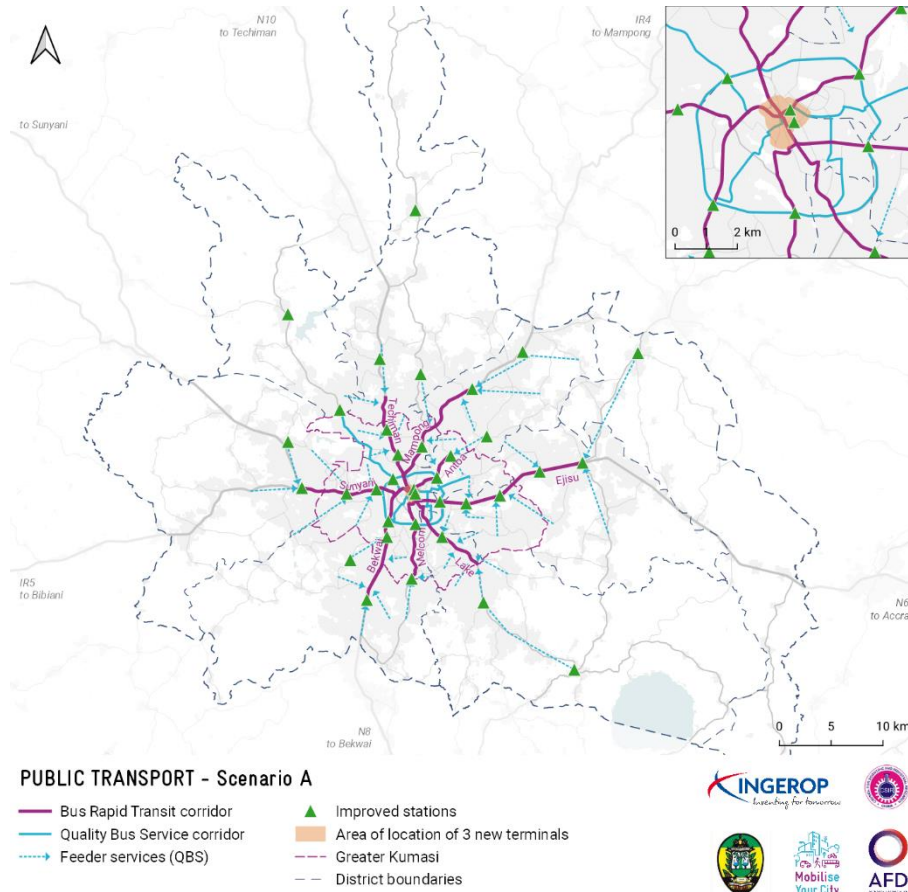


Figure 66: Public transport measures - scenario A

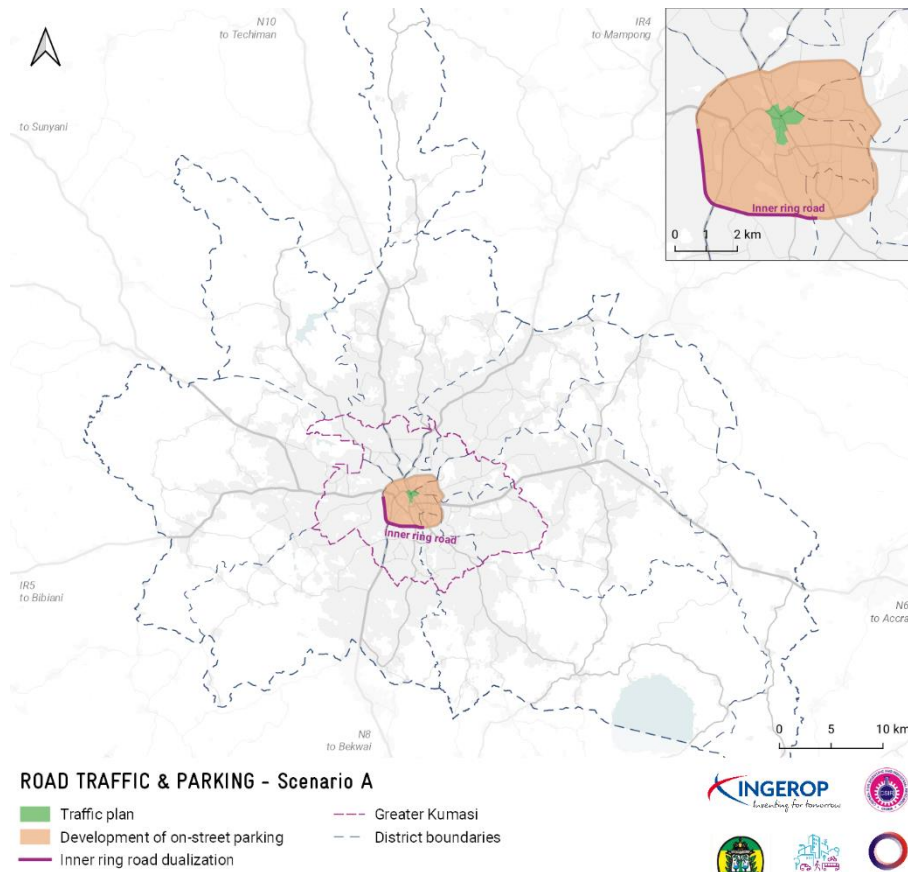


Figure 67: Road infrastructure, traffic management, and parking measures - scenario A

Scenario B: focus on non-motorised transport and infrastructure

Scenario B, focusing on NMT, includes the development of quality sidewalks within the city centre, as well as along the four BRT corridors which will be implemented. Similarly, quality sidewalks development is also included outside the city centre, in other MMDA's CBD and main intensity areas. This program will focus on paved roads, where road traffic is significant, as are pedestrian flows.

Similarly, this scenario also includes the experimentation of a shared bicycle system on KNUST campus, as scenario A, but also the massive development of bicycle infrastructure, covering the eight main urban corridors (around 100km). This ambitious plan will try to develop a cycling culture in the city.

The other focus of this scenario being road infrastructure, extensive developments are planned. First, the last single-carriageway stretch of the inner ring road will be dualized, as in scenario A. Moreover, the ambitious project of outer ring road, which as been discussed for many years, will be developed, belting the outer areas in the city by a quality road infrastructure of around 100km. The priority section of this project is the northeast quadrant, between Ejisu and Kodie, to link N6 and N10 and allow the bypassing of the city for vehicles transiting between the north and south of the country.

The scenario also includes traffic taming measures. First, the development of commercial spots in the CBDs of all MMDAs is implemented, as well as the road safety enhancement program, identically as in scenario A. Similarly, the traffic plan in Adum and Kejetia areas will also be implemented identically as in scenario A. However, whereas scenario A encompassed the improvement of 25 strategic junctions, scenario B will cover 40 junctions, making it possible to cover all the main junctions of KMA CBD and all the main junctions of the eight urban corridors. This scenario also includes the development of a traffic management centre, which will cover all the 40 renewed junctions (potentially signalised), the traffic lights of the BRT corridors, and all the existing signalised junctions.

Parking is also one of the focuses of this scenario. Thus, it will encompass the development of around 2,000 on-street parking spots in KMA CBD (but outside Kejetia and Adum areas), as in scenario A. Furthermore, a new 300-spots high-end multi-storey car park will be developed in KMA CBD, not in the inner core of the city (Kejetia ,Adum), but close to it, to provide parking for people travelling to the city centre without encouraging more traffic in it (three locations were identified by KMA). Four park-and-ride facilities will also be developed along the Ejisu-Kejetia and Abuakwa-Kejetia BRT corridors to improve intermodality between private and public transport.

Lastly, public transport is not the focus of this scenario, but is still one important component. The development of four BRT corridors is included, on selected corridors:

- Kejetia-Ejisu (Accra Road)
- Kejetia-Mampong (Mampong Road)
- Kejetia-Abuakwa (Sunyani Road)
- Kejetia-Aputuogya (Lake Road)

Quality Bus Services will be implemented as feeder routes to these corridors, but also on four more corridors which were implemented as BRT in scenario A:

- Kejetia-Kodie (Techiman Road)
- Kejetia-Buokrom (Antoa Road)
- Kejetia-Kotwi (Bekwai Road)
- Kejetia-Sokoban (Melcom Road)

As in scenario A, stations will be improved along the QBS routes. However, the extent of this measure is more limited with an objective of 20 renewed stations (at least one per MMDA and several key stations in KMA).



PUBLIC TRANSPORT - Scenario B

- Bus Rapid Transit corridor
- Quality Bus Service corridor
- ⋯ Feeder services (QBS)
- ▲ Improved stations
- Greater Kumasi
- - - District boundaries



Figure 68: Public transport measures - scenario B



ROAD TRAFFIC & PARKING - Scenario B

- Traffic plan
- Development of on-street parking
- Inner ring road dualization
- Outer ring road development
- P Potential multi-storey car park
- P+R Park-and-ride
- Centralised traffic management system
- Greater Kumasi
- - - District boundaries



Figure 69: Road infrastructure, traffic management, and parking measures - scenario B

4.2.3 Traffic forecasts, assessment of the scenarios, and multicriteria analysis

To assess the scenarios and analyse how each scenario achieves the objectives of the SUMP in a quantified way, a transport demand was forecasted for each scenario, and compared to a “business as usual” scenario (no supplementary measure compared to today’s situation).

Costing of the scenarios

The following table and graphs present the costing of the three scenarios, detailed by category of measure. Costing is presented in Ghana Cedis and US Dollars, both in the economic value of April 2022.

CATEGORY	SCENARIO A		SCENARIO B	
	(M ₵)	(M \$)	(M ₵)	(M \$)
NMTs, ROAD NETWORK, PARKING	1,117	186	4,676	779
Pedestrian conditions improvement	850	142	1,516	253
Bicycle development	2	0	80	13
Traffic and road safety improvement	137	23	157	26
Road infrastructure development	129	22	2,924	487
Parking conditions improvement	2	0	45	8
PUBLIC TRANSPORT	10,868	1,811	6,060	1,010
BRT system development	9,180	1,530	5,100	850
Trotro system enhancement	1,688	281	960	160
INSTITUTIONAL ARRANGEMENTS	37	6	37	6
Institutional framework enhancement	25	4	25	4
Regulation and enforcement enhancement	12	2	12	2
TOTAL	12,023	2,004	10,795	1,799

Table 14: Costing of the scenarios

In all scenarios, the BRT projects represent the main expense, varying between 55% and 90% of the total investment. However, these BRT projects will have an impact on several modes and not public transport only, as the entire layout of the right-of-way will be rebuilt. Quite logically, **scenario A is the most expensive as it plans the construction of eight BRT corridors, reaching 12bn₵**, with BRT projects accounting for 90% of the investment cost. **The investment is slightly lower for scenario B, just under 11 bn₵**. Even if less focused on public transport, BRT projects still represent around 55% of the total investment. The economy made with four less BRT routes is mostly compensated with the construction of the outer ring road, accounting for more than 25% of the total investment cost.

The current funding for mobility in the Expanded Kumasi is estimated around 94 MUS\$ per year in 2022, with most of this funding is dedicated to road maintenance by the DUR, which therefore will also be necessary during the SUMP implementation. **Both scenarios therefore present a funding challenge**, as they would all necessitate about twice the amounts currently dedicated to mobility in Kumasi.

Key indicators

The results from the model allow to analyse the key indicators presented below:

- **Average travel time:** in minutes, represent the time on average spent by a passenger for one travel, excluding non-motorised transport travels.
- **Average transport cost:** in GH¢₂₀₂₂, represents the money on average spent by a passenger for one travel, including private cars (fuel and daily maintenance cost).
- **Affordability index:** in %, represents the share of the mean cost of two travels compared to the daily income (income is considered constant throughout the years, as transport costs are expressed in constant prices of 2022).
- **Private car use:** in passengers.kilometres per day, represents the total distance travelled by passengers in a private car per day.
- **Public transport modal share:** in percentage, represents the share of travels made with public transport as the main mode among the total number of travels with a motorised mode of transport.
- **Total vehicular use:** in vehicles.kilometres per day, represents the cumulated number of kilometres travelled by vehicles of all types per day.
- **Total travels:** total number of travels within the metropolis per day.
- **Greenhouse Gases (GHG) emissions:** in kilotons of equivalent CO₂ (ktCO₂eq), represents the total emission of greenhouse gases from transport activities. Unlike other indicators, it includes freight transport, accounting for around 20% of the total GHG emissions.
- **Population:** in inhabitants, total population of the metropolis
- **BRT coverage:** share of the population having access to a BRT route less than 800m far from their homeplace

Key indicators (2040)	Baseline (2022)	Business-as-usual	Scenario A	Scenario B
Average travel time	41 minutes	50 minutes	39 minutes	41 minutes
Average transport cost	4.3 GHS	6.1 GHS	4.7 GHS	5.3 GHS
Affordability index	15%	22%	17%	19%
Private car use (daily passengers.kilometres)	3,262,000	13,537,000	5,901,000	9,286,000
Public transport modal share	76%	52%	71%	61%
Daily vehicular use (vehicles.kilometres)	4,445,000	11,798,000	5,875,000	8,379,000
Total travels per day	2,922,000	5,400,000	5,400,000	5,400,000
GHG emissions (ktCO ₂ eq)	370	890	530	670
Population	3.1 million	6.2 million	6.2 million	6.2 million
BRT coverage	0%	0%	22%	12%

Figure 70: Key Performance Indicators for each scenario

The evolution between “Today” and “Business as usual” show the consequences if the current trends are allowed to develop: If current trends are allowed to develop, private car use will increase, average travel times will increase (congestion), average costs will increase, GHG emissions and air pollution will increase.

All scenarios allow a significant betterment of the mobility system compared to the business-as-usual (BAU) scenario.

The impact is the highest with scenario A. Thanks to the massive development of BRT systems in this scenario, a modal shift is triggered from private cars to public transport, allowing to reduce the number of kilometres travelled by passengers in private cars by 56% compared to the BAU scenario. Moreover, many public transport passengers shift from trotro or taxi to BRT, decreasing the reliance on low-occupancy vehicles and reducing the total number of kilometres travelled by public transport vehicles, as BRT vehicles have a higher capacity. In total, the kilometres travelled by vehicles is cut down by 50%.

This impact is lower for scenario B where the kilometres travelled by private car passengers are reduced by 31%, and less low-occupancy vehicles are replaced by BRT vehicles, making the total kilometres travelled by vehicles reduced by 29%. The outer ring road in scenario B tends to improve the attractiveness of private car use in periurban areas, therefore limit the modal shift from private cars to public transport, increasing the total number of kilometres travelled by vehicles.

As road traffic decreases, **travel conditions** improve. All scenarios significantly reduce private car usage compared to the BAU situation. Therefore, travel times similarly decrease, and all scenarios offer a noticeable improvement. This impact is moderated by a higher use of private cars, which even though generates congestion and reduces the speed of all modes, offer attractive travel times as they don't require the use of a feeding or access mode nor a waiting time.

Finally, as a consequence of the decrease of private car use and the decrease of kilometres travelled by low-occupancy vehicles, the total amount of **GHG emissions** related to mobility is cut down by 40% for scenario A and 25% for scenario B, saving respectively 360 and 220 kilotons of CO₂equivalent each year.

Analysis of modal shares

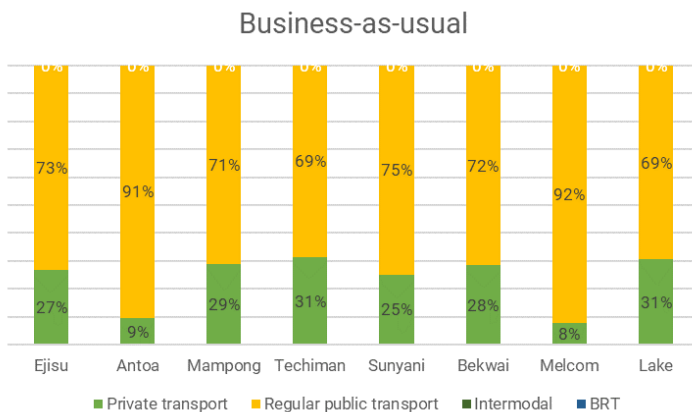
The figures in the next pages show the detail of modal shares in number of travels and in passengers.kilometres, (cumulated distance travelled by the passengers), as well as the modal shares by urban corridor in number of travels.

Logically, **scenario A** with eight BRT corridors is the most impactful on the modal shares: 25% of passengers and 39% of passengers.kilometres use BRT as their main mode of transport, raising the total **public transport modal** share to 59% and 72% respectively, showing respectively a **+16% and +25% gain** of the public transport modal share compared to the business-as-usual scenario.

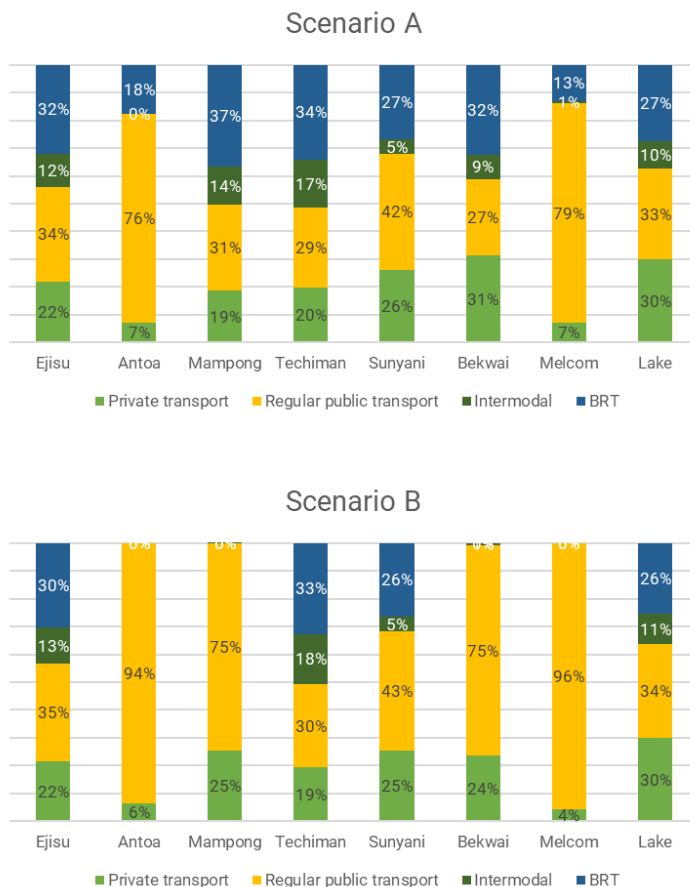
Scenario B has less impact with a gain of **+8%** in the modal share in number of travels and a gain of **+14%** in the modal share in passengers.kilometres, as it only considers four implemented BRT corridors and also provides an attractive outer ring road for private car users, slowing down the decrease in modal share for some private car users.



Figure 71: Modal shares in number of travels (left) and passengers.kilometres (right) by scenario



The modal shares by **corridor** are relatively **homogenous**, with a share of around 30% of travels from/to/within the corridor made by BRT when implemented. Antoa and Melcom corridors are an exception, mostly because of their proximity to other corridors and their limited length.



Indeed, the BRT is advantageous for longer distances, where the time gain induced by the high speed of the BRT is worth the potential feeding service to access the BRT. For shorter travels, the time gain is less as the travelled distance is less, and sometimes is not worth the use of a feeding service. This makes BRT less advantageous in these cases.

Figure 72: Modal shares (in number of travels) for each urban corridor by scenario

Feasibility constraints and potential impacts of the scenarios

Institutional feasibility

For both scenarios, heavy institutional arrangements must be implemented prior to the **BRT implementation**. Complexity increases for the hybrid scenario and even more for scenario A as respectively six or eight BRT corridors will be built in 15-20 years, meaning the arrangements will have to be conducted at a high pace and start very soon, as well as the negotiations with the operators (current and future ones).

The introduction of many contractualized **Quality Bus Services (QBS)** will also necessitate much discussion and negotiations with the current operators, as well as a legal basis to provide the local governments the necessary tools to manage and lead transport operators. Complexity increases with the number of BRT corridors as feeder QBS will have to be implemented in the same timeframe as the BRT corridors. Therefore, scenario B allows for a slower process, whereas scenario A require a higher pace in the institutional arrangements.

The formation of a **transport authority**, which is closely linked to the implementation of BRT projects and QBS, is included in all scenarios. It will follow the launch of the first BRT or QBS project, therefore is

more urgent for scenario A compared to scenario B. At a first stage, the transport authority perimeter could only include the MMDAs concerned by the first BRT and QBS projects to be implemented, and gradually expand.

Social and environmental impacts

The construction of **BRTs** presents a risk of **eviction and land acquisition** if the right-of-way is not wide enough to accommodate all functions needed, for example around stations. The level of potential impact increases as the number of BRT routes grow, therefore is highest for scenario A and lowest for scenario B.

Moreover, the construction of **new terminals** in the city centre (included in scenario A) can also trigger a risk of eviction, as the area is densely built-up. However, these impacts will be more limited, as they will be punctual and not linear. Similarly, the construction of **parking facilities** in the city centre (included in scenario B) can also lead to land acquisition in dense areas but is limited.

The construction of the **outer ring road** in scenario B will lead to massive land acquisition and evictions as the road will be on a new route. If most acquisition will be done on open land (forests, agriculture fields, etc.), some parts of the road will have to go through urban areas, especially around intersections with the main arterial roads, and will probably lead to building demolitions. This, at the end of the day, raises the level of potential eviction of scenario B higher than scenario A.

Social concerns are also raised regarding impact on **paratransit actors** (drivers, mates, station masters, union members, vehicle owners, etc.). They will be impacted by the implementation of BRT and QBS projects, which will trigger major changes in the transport operation businesses. The institutional framework and business model of both BRT and QBS will have to consider the current actors of the paratransit system, to meet their needs. If not, the leverage of current operators can hinder the success of BRT and QBS projects. In some cities, schemes were successfully implemented to industrialise the operation of paratransit and turn it into formal public transport and sometimes Quality Bus Services, for example in Dakar with the creation of "AFTU" (*Association de Financement des Transports Urbains*). The potential impact is higher as the quantity of BRT routes and QBS projects expand, therefore is less for scenario B, higher for scenario A.

Similarly, **street vendors** are also likely to have their activity impacted by the SUMP's projects. It will be the case in streets where sidewalks are renewed and cleared of vendors. The creation of dedicated delineated spots for commercial activities intends to propose an attractive relocation solution for these vendors, as well as market projects not included in the SUMP (for example Kejetia Market phase 2, Aputuogya Market). Deeper social impact studies will have to be carried out on these topics to ensure the impacted vendors are satisfied with the relocation options, as their leverage can hinder the political will of some actions included in the SUMP.

Scenario B also raises **environmental concerns** as the construction of the outer ring road can have an impact on Owabi Wildlife Sanctuary, in Atwima-Nwabiagya Municipal. The impact will depend on the exact route of the road during the feasibility studies phase if scenario B is selected, but the concern was raised in the 2013 Comprehensive Urban Development Plan (JICA).

Multicriteria analysis and synthesis

As presented earlier, the objectives of the SUMP are the following:

- Improve **urban safety, pedestrian and non-motorised transport** conditions and **road safety**
- Enhance the **public transport system**
- Improve the **institutional framework and revenues**
- Improve **traffic and parking conditions**, especially in the CBD
- Enhance the **regulation and enforcement** systems
- Improve **sustainability** of transport and its externalities on the **quality of life**
- **Educate** the public about mobility issues

Each scenario was assessed to analyse how it can answer to each one of the objectives. The objectives were, when adequate, divided into sub-criterion to provide a more precise analysis of the assessment. The other criterion are feasibility constraints: technical issues, institutional issues, and economic feasibility. The following table presents the detailed multicriteria analysis, summarising the previously detailed criterion (reach of objectives, feasibility constraints, costing).

The multicriteria analysis detailed in the next pages show that both scenarios bring significant advantages and achieve all the objectives set for mobility in Kumasi.

Scenario A (Focus on public transport) is the strongest for criteria relating to public transport and to Sustainability, thanks to an important modal shift towards public transport and towards cleaner, larger capacity buses. It is however the most expensive. Scenario B (Focus on infrastructure and NMT) is the strongest for criteria relating to urban and road safety and NMT conditions. It is less expensive.

Table 15: Multicriteria analysis of the scenarios

	Scenario A "Focus on Public Transport"	Scenario B "Focus on Infrastructure & NMT"
Improve urban and road safety, NMT conditions	+ +	+ + +
Pedestrian safety and comfort improvement	+ + +100km renewed sidewalks	+ + + +200km renewed sidewalks
Commercial activities regulation	+ +	+ +
Bicycle use development	=	+ +90km bicycle infrastructure
Traffic taming	+ + -50% veh.km	+ -29% veh.km
Road safety	+ +	+ +

	Scenario A "Focus on Public Transport"	Scenario B "Focus on Infrastructure & NMT"
Enhance the public transport system	+ + +	+ +
Existing system efficiency improvement	+ +	+
Improvement of the accessibility	+ + + 11 minutes gain	+ + 9 minutes gain
Massification of the transport system	+ + + 26% modal share BRT	+ + 15% modal share BRT
Improvement of security onboard and at terminals	+ + +300 trotros renewed	+ +210 trotros renewed
Improvement of intermodality	+	+
Improve traffic and parking conditions	+ +	+ +
Improve traffic conditions in KMA CBD	+ +	+ +
Improve traffic conditions in main corridors	+ + 25 junctions improved	+ + 40 junctions improved
Divert transit traffic from the centre of the metropolis	+	+ +
Reduce illegal and unmonitored parking	+ +2000 parking spots	+ + +2300 parking spots
Improve sustainability	+ + +	+ +
Reduce GHG emissions	+ + + -40% GHG emissions	+ + -25% GHG emissions
Reduce air and noise pollution	+ +	+ +
Improve the institutional and revenues framework	+ +	+ +
Enhance the regulation and enforcement systems	+ +	+ +
Educate the public	+	+
Main impacts		
Environmental and social impacts	! !	! !
Economic feasibility	! !	!
Institutional feasibility	! !	! !

5. Selected scenario and actions

5.1 Selected scenario

A technical committee meeting presenting both scenarios and their assessment was held on March 28th, 2023. The technical committee advised to select a hybrid scenario, combining the best of both scenarios and making it more cost-effective.

The steering committee met on March 30th, 2023, to discuss and select a scenario. Upon recommendation of the technical committee, **the steering committee, chaired by the Honourable Simon Osei-Mensah, Regional Minister of the Ashanti Region, chose a hybrid scenario**, mixing both scenarios A and B. This scenario comprised heavy public transport infrastructure, including the extensive development of the existing system (massification of the transit with BRTs and QBS, renovation of trotro stations, new terminals in the CBD, etc.), as well as the development of several traffic management and parking features (multi-storey car park in the CBD, centralised traffic management system) and road infrastructure (inner ring road dualization, development of critical link roads).

During the last phase of the preparation of the plan, this scenario was refined with the stakeholders and the technical and steering committees considering implementation and financial constraints. In particular, the technical and steering committee meetings held in October 2023 stressed the need for the SUMP action plan to be realistic operationally and financially and decided to reduce the scope of certain actions.

This iterative process **led to the final scenario which is presented in the following chapter.**

5.1.1 Overview

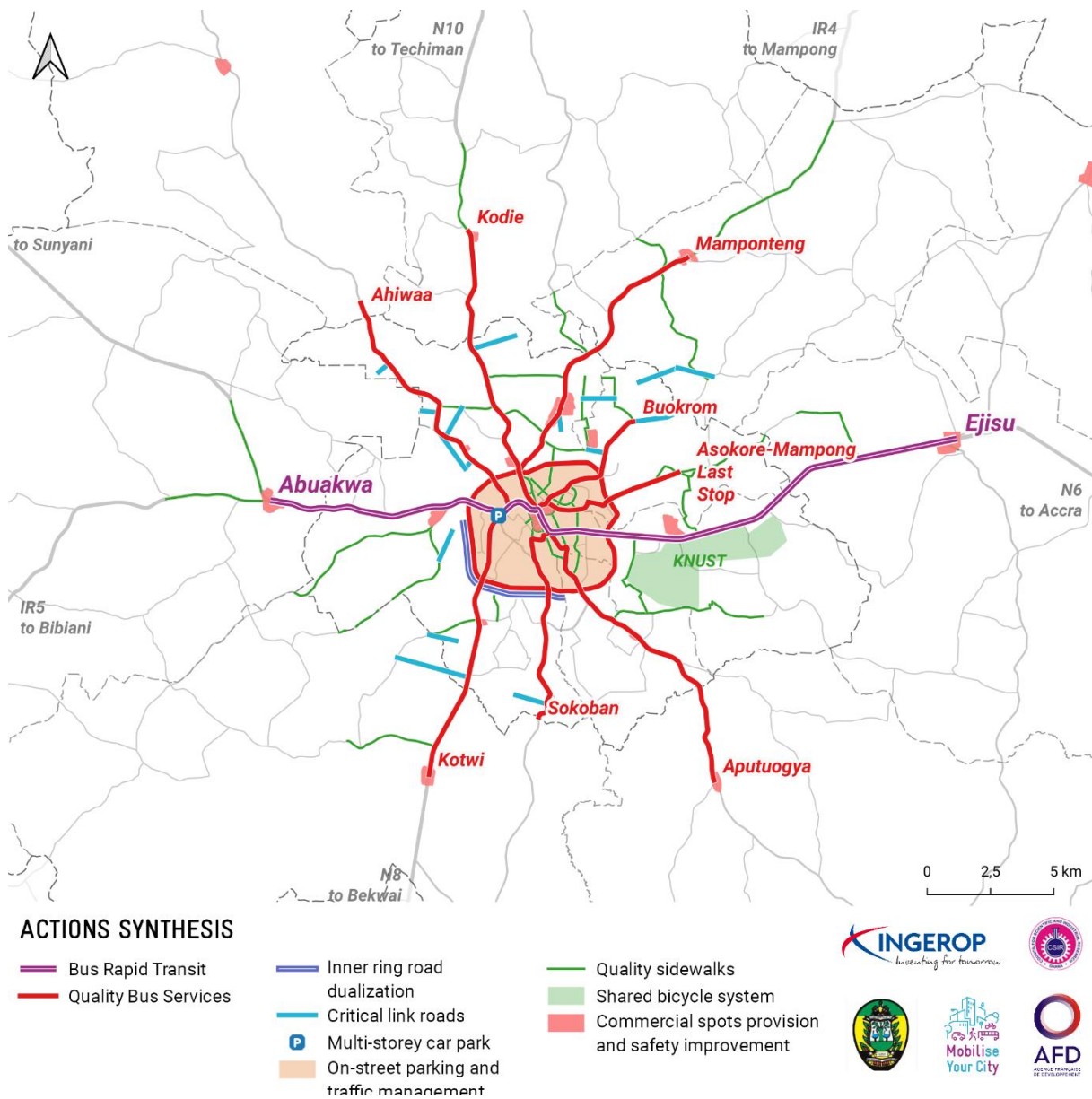


Figure 73: Synthesis map of the SUMP

By 2040, all actions included in the SUMP will be implemented. This will mainly cover the creation of a hierarchised transport network (with 3 levels of service), the extensive development of non-motorised transport infrastructure, local road infrastructure developments, and other mobility management actions.

5.2 Selected measures

5.2.1 Pedestrian mobility

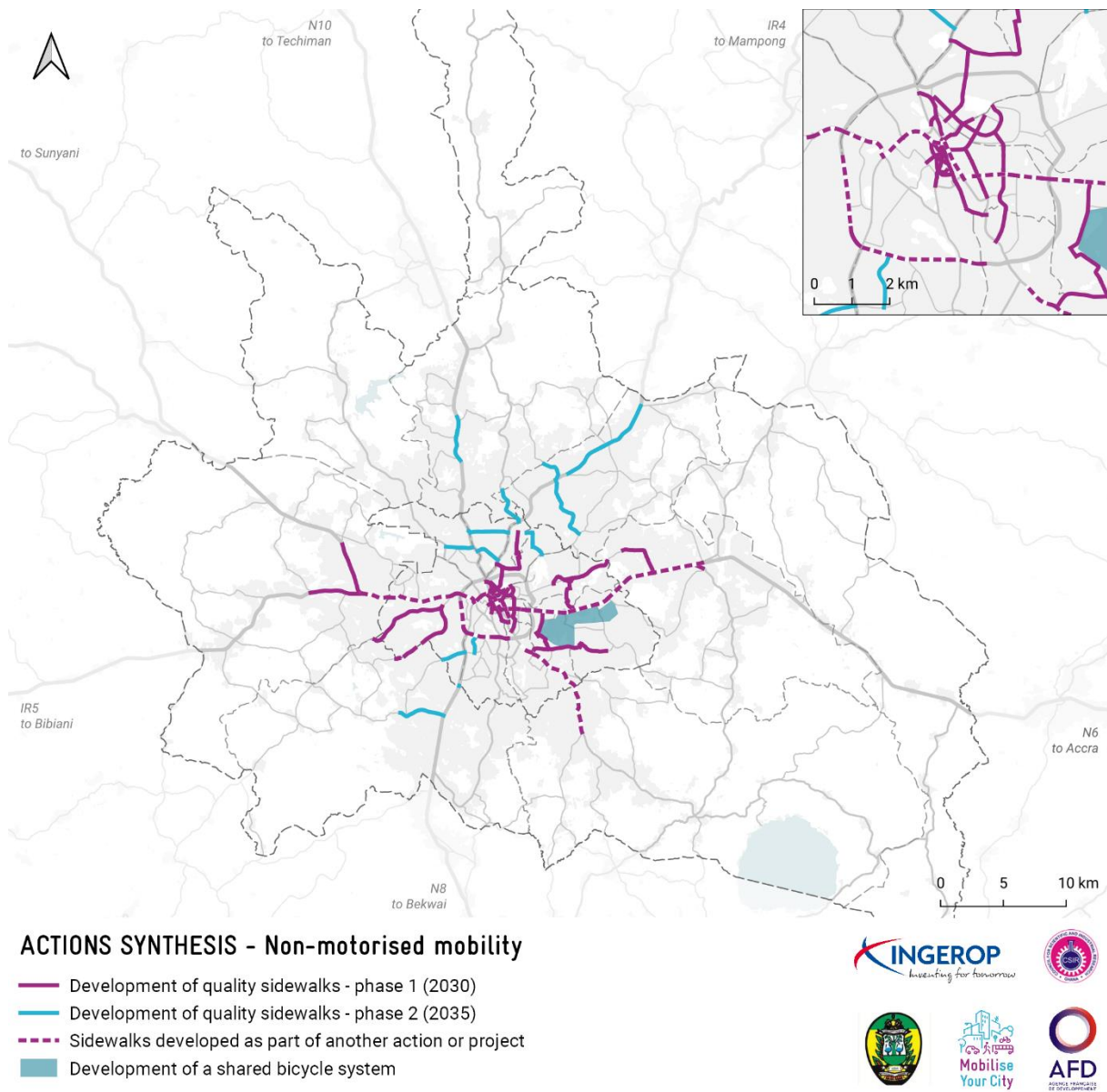


Figure 74: Pedestrian mobility actions synthesis

Pedestrian mobility related actions in the SUMP mainly encompass the **extensive development of quality sidewalks** (more than 100km), phased up to 2035.

Bicycle mobility is developed by the introduction of an experimentation on KNUST campus: the development of a shared bicycle system. This will enable to promote this mode of transportation, currently under-patronised in the city, and will also be a medium of education and sensitization.

N°	Action	Contents	Horizon	CAPEX	OPEX	Stakeholders
1.1	Quality sidewalks	<p>Development of quality sidewalks over 100km of road, including drainage, lighting, and asphaltting works on the carriageway if necessary.</p> <p>Located on selected roads, with a focus on Adum and Kejetia areas.</p> <p>Funding covers studies and all construction works.</p>	<p>Short term</p> <p>Medium term</p>	<p>720 M€</p> <p>(120 M\$)</p>	-	<p>DUR</p> <p>MMDAs' URDs</p>
2.1	Shared bicycle system	<p>Experimentation of a shared bicycle system on KNUST campus (free floating or dock-based). The system will cover all campus and key entry points/public transport terminals (Tech Junction for example).</p> <p>Funding covers studies (the provision of bicycles will be funded through a PPP with the system operator).</p>	Short term	<p>2 M€</p> <p>(0.3 M\$)</p>	Privately managed, not estimated	<p>Oforikrom MA</p> <p>KNUST</p>

Table 16: Synthesis of actions related to non-motorised transport

5.2.2 Road infrastructure, traffic management, parking offer

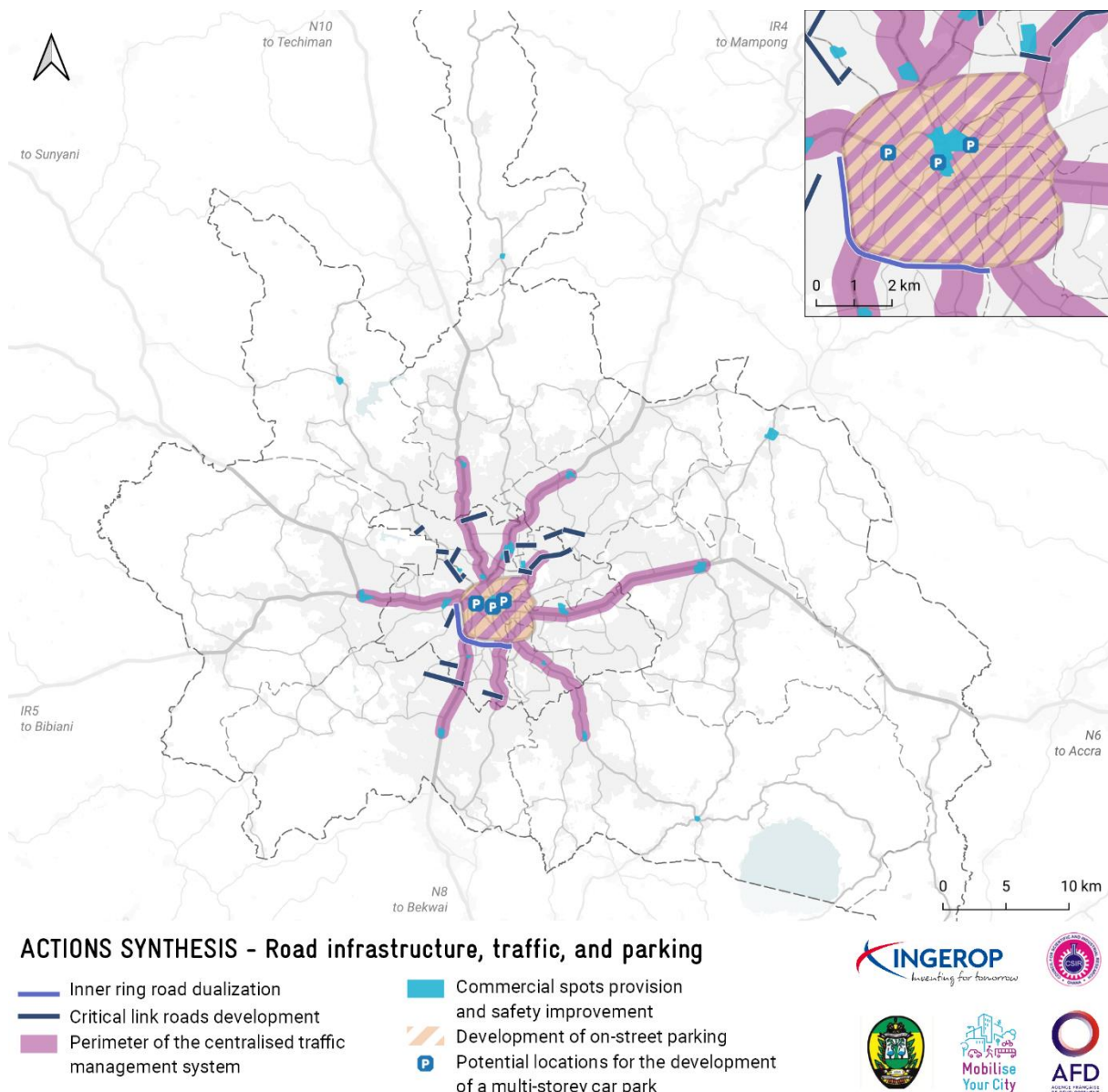


Figure 75: Road infrastructure, traffic, and parking actions synthesis

Private car mobility, road infrastructure, traffic management, and parking related actions mainly encompass the **full dualization of the inner ring road** and the development of **critical link roads** to communities out of reach of the main road network.

It also includes **traffic management** activities, mainly focusing on the city centre where traffic conditions are bad, with the introduction of a **traffic plan** and the development of a **centralised traffic management system** for traffic lights. A vast program of **urban safety and environment improvement** is implemented, with the development of design guidelines and safety features, the delineation of spots dedicated to street trading (liberating sidewalks and carriageways from encroachment) in all CBDs of the area.

Parking is also organized in the centre of the metropolis, though not in the most central and busy areas of the CBD where the objective is to free the space from on-street parking.

N°	Action	Contents	Horizon	CAPEX	OPEX	Stakeholders
2.1	Urban safety and environment improvement	<p>Implementation of a vast program of safety and road space sharing, starting by the development of street design guidelines, which will be based on the concept of “complete streets” putting back non-motorised transport as most privileged users on the road space.</p> <p>Development of regulated spots for street trading, with clear delineation to prevent encroachment.</p> <p>Reinforcement of road safety measures (pedestrian crossings, speed tables, signage of limited speed areas, etc.).</p> <p>Funding covers all construction works and studies.</p>	Short term	76 M€ (13 M\$)	-	DUR MMDAs’ URD NRSA
2.2	Traffic management in the city centre	<p>Implementation of a traffic plan for Kejetia and Adum areas, with consideration of public transport needs, commercial intensity, and sidewalks extensions.</p> <p>Improvement of 20 junctions in the city centre with development or renewal of traffic lights.</p> <p>Funding includes all construction works and studies.</p>	Short term	25 M€ (4 M\$)	200 k\$ annually	KMA MRD DUR
2.3	Centralised traffic management centre	<p>Development of a centralised traffic management centre operating on all traffic lights of the area.</p> <p>Funding includes all construction works, systems, and studies</p>	Medium term	7 M€ (1 M\$)	50 k\$ annually	DUR
3.1	Inner ring road dualization	<p>Dualization of the last single-carriageway stretch of the inner ring road (Lake Road interchange-Sofoline interchange, 6km), with provision of quality sidewalks, drainage, lighting, and public transport features (stops).</p> <p>Funding includes all construction works and studies.</p>	Short term	129 M€ (22 M\$)	60 k\$ annually	DUR
3.2	Development of critical link roads	<p>Construction of 16 critical link roads between communities remote from the main road network (22km in total): single carriageways, with provision of basic sidewalks and efficient drainage.</p> <p>Funding includes all construction works and studies.</p>	Short term Medium term	558 M€ (93 M\$)	220 k\$ annually	DUR

N°	Action	Contents	Horizon	CAPEX	OPEX	Stakeholders
4.1	Development of on-street parking	Marking of 2,000 parking spots in KMA CBD, but outside Kejetia and Adum areas where on-street parking will be banned by KMA. Parking can either be free or charged. Funding includes marking of spots and location studies.	Short term	4 M€ (0.6 M\$)	-	KMA MRD DUR
4.2	Development of a multi-storey car park	Development of a high-rise multi-storey car park in KMA CBD, but not in Adum and Kejetia areas. Parking will be charged to generate revenue to the operator. Funding includes the studies (construction works will be funded by the operator through a PPP).	Medium term	2 M€ (0.3 M\$)	To be defined as part of the PPP	KMA planning unit

Table 17: Synthesis of actions related to non-motorised transport

5.2.3 Public transport

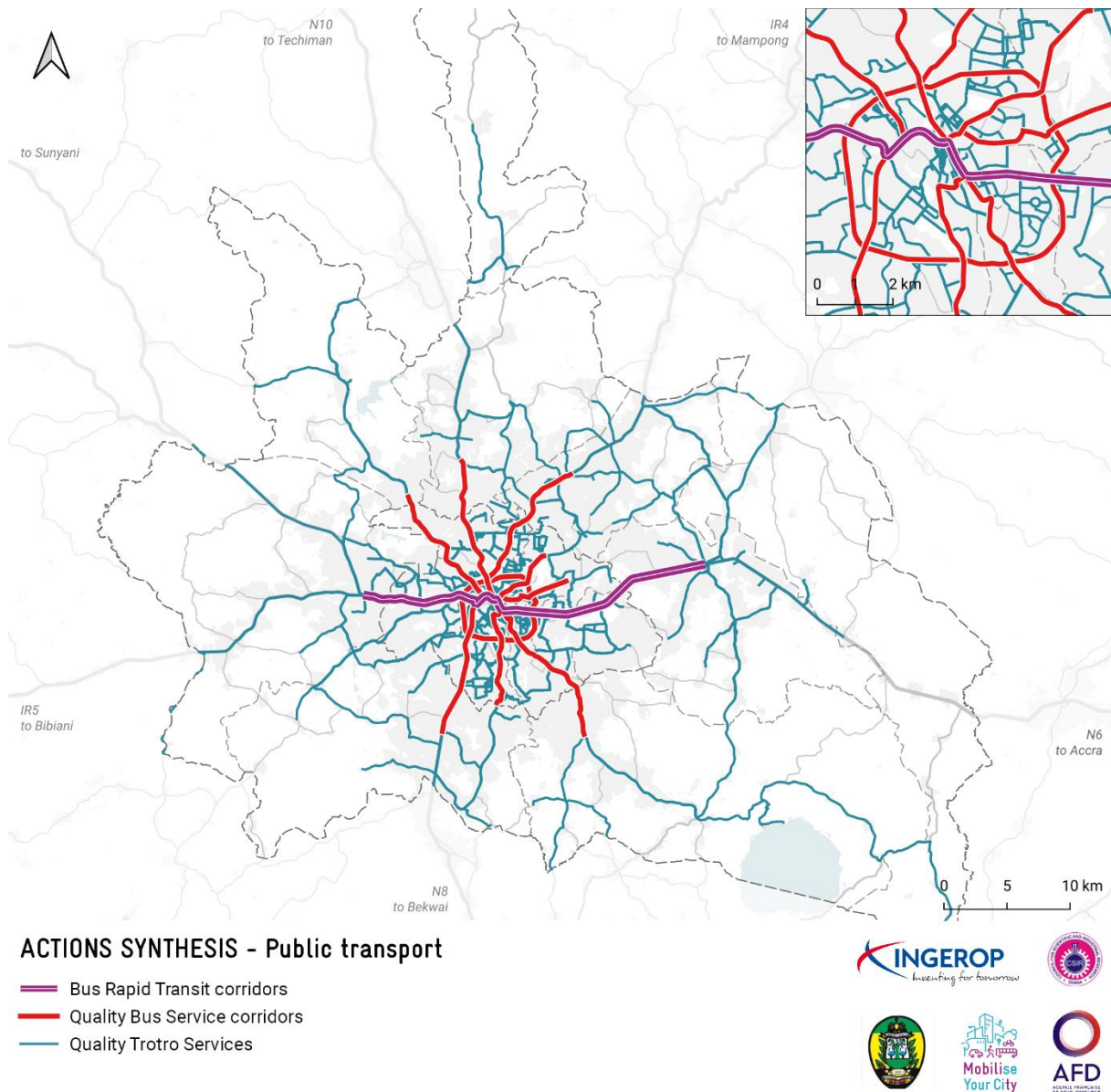


Figure 76: Public transport actions synthesis

Public transport related actions are the most extensive of the SUMP, as a new hierarchised network will be implemented, with three levels of service:

- Bus Rapid Transit (2 corridors)
- Quality Bus Services (9 corridors)
- Quality Troto Services (all other routes, enhancement of the existing system)

N°	Action	Contents	Horizon	CAPEX	OPEX	Stakeholders
	Hierarchisation and restructuring of the public transit network	<p>Detailed restructuring studies to refine the proposed concept and precisely locate the routes, size the offer, and identify the adequate infrastructure needs.</p> <p>Finalisation of the TRANSINFOMAP tool developed by KMA and extend its use to all MMDAs.</p> <p>Funding covers studies and the finalisation of TRANSINFOMAP (data collection and software development).</p>	Short term	21 M€ (3.5 M\$)	-	GKTA MMDAs' DoTs
	Bus Rapid Transit	<p>Implementation of BRT corridors between Kejetia and Ejisu and between Kejetia and Abuakwa, with the complete renovation of the right-of-way of the concerned roads (with a busway and stations), high-capacity rolling stock, depot and maintenance facilities, and Intelligent Transport Systems (ITS) features.</p> <p>Funding covers studies, all construction works, and buses purchase.</p>	Short term	3,012 M€ (502 M\$)	30 M\$ annually (covered by farebox revenues)	GKTA DUR
	Quality Bus Services	<p>Implementation of QBS corridors between Kejetia and Aputuogya, Kotwi, Kodie, Mamponteng, Buokrom, Asokore-Mampong Last Stop, Sokoban, Ahiwaa and on the ring road. High-capacity buses will be purchased and industrially operated (schedule-based, performance contract), with punctual infrastructure (stops, stations, queue jumps) and maintenance facilities.</p> <p>Funding covers the studies, all construction works, and the rolling stock purchase.</p>	Short term Medium term Long term	1,044 M€ (174 M\$)	19 M\$ annually (covered by farebox revenues)	GKTA DUR
	Quality Troto Services	<p>Development of QTS with the objective of covering all routes of the area. The concept is to give more incentive to vehicle owners and drivers to join the legal system by offering to join a fleet renewal program where loan access is eased.</p> <p>Construction of two new terminals in the city centre and stops.</p> <p>Funding covers the studies, all construction works, and a scrapping bonus for the fleet renewal program.</p>	Short term Medium term Long term	360 M€ (60 M\$)	175 M\$ annually (covered by farebox revenues)	GKTA MMDAs' DoTs Transport unions

Table 18: Synthesis of actions related to public transport

5.2.4 Accompanying measures: institutional and regulatory framework

6.1: Creation of a transport authority and joint enforcement

This measure proposes the creation of a transport authority for the entire area. This transport authority will lead all activities related to mobility and manage transdisciplinary projects. Ideally, this measure should be implemented in the short-term horizon as it is required to implement some other measures (among others, BRT development).

Transport authorities can have different geographical perimeters, scopes (only public transport, roads, traffic management...), funding schemes, etc. These depend on the political structure, decentralization, balance of responsibilities, etc. The definition of the jurisdiction, scopes, and funding schemes will have to be carefully done by all the related actors and public entities.

The formation of a transport authority can need a legal basis to be successfully implemented and last through time. Successful examples of transport authorities abroad include CETUD in Dakar or LAMATA in Lagos.

The transport authority will have a taskforce responsible for enforcement of mobility-related byelaws in the Expanded Kumasi area. These byelaws are more specifically the compliance to the licensing system for public transport vehicles, the compliance to the public transport dedicated lanes system (BRT), the fining of vehicles illegally parked, or the fining of trading activities illegally encroaching the street space (outside their dedicated spots).

6.2: Integration and regulation of pragia

This measure proposes to integrate pragia in the mobility system in order to regulate their operation and limit them to specific areas. Today, pragia essentially operates in rural/periurban areas, in the congested KMA CBD, and in specific areas of the city (Asokore-Mampong, Old Tafo, Mampong Road). In some areas, pragia even replaced traditional public transport vehicles (trotro and taxi). As of today, pragia operation for commercial purposes is forbidden by law (as motorbikes or other 2/3 wheelers). However, this law is not enforced, meaning pragia illegally operate and can't be regulated.

The integration and regulation will consider pragia as regular public transport vehicles, meaning that drivers must adhere to a union and the union must apply for each route it operates. This will be a source of revenue for the assemblies. The integration will allow public authorities to regulate the operations and restrict them to specific areas. These areas will be limited to the rural and periurban areas, where other means of transport do not exist because of low density or poor shape of roads.

6.3: Development of a parking fining system

This measure is about creating a byelaw enabling MMDAs or the transport authority to fine drivers of cars parked illegally. A clear and efficient fining system will be developed to prevent from illegal parking of vehicles on sidewalks and on the carriageway. When an officer spots a car parked illegally, they enter the information on a database linked to the DVLA database to track the driver. They leave a note on the car and the driver must go to the police station to pay the fine or will be processed for court.

6.4: Capacity building for stakeholders and the civil society

This measure is about offering periodic capacity building for stakeholders and education of the civil society throughout the entire process of the SUMP implementation. Education of the civil society can go through various medium, from periodic press releases to major events such as car-free days in city centres. This process was started during the preparation phase of the SUMP, where several press actions were organised, as well as focus groups and a household survey.

Education of the civil society will be closely coordinated with the National Road Safety Authority (NRSA) which already organises prevention events. Actions in schools is usually also an effective mean of education related to mobility. Capacity building of stakeholders was also started during the SUMP preparation and must be continued through the implementation phase, with training on specific topics, more general presentations to show alternatives and feedback from other projects, etc.

5.3 Cost estimates

Costing of each action is presented in the detailed description of the actions. A synthesis of investment costs is proposed below. Costing is presented in Ghana Cedis and US Dollars, both in the economic value of April 2022.

The total cost of the action plan implementation amounts to **around 6 bnGH¢, just under 1bn\$**. Averaged until 2040, the annual cost of the SUMP is around **400 MGHC¢ per year**.

Theme	Amount (MGHC¢)	Amount (MUS\$)
NMTs, road network, parking	1,524	254
Non-motorised transport improvement	722	120
Road safety and traffic conditions improvement	109	18
Road infrastructure development	687	115
Parking conditions improvement	6	1
Public transport	4,434	739
BRT system development	3,009	501
Quality bus services development	1,044	174
Trotro services enhancement	381	63
Institutional arrangements	27	4
Institutional framework enhancement	25	4
Regulation and enforcement enhancement	2	0
TOTAL	5,985	997

Table 19: Costing synthesis

Most **expenses go towards public transport**, and more specifically towards BRT development which accounts for around 50% of the total cost of the SUMP. However, the development of BRT corridors will not only affect public transport, but also other modes such as non-motorised transport, as it will consist of an entire renovation of the right-of-way, with the provision of quality sidewalks for example. The second source of expenses is the improvement of **non-motorised transport**, including the extensive development program of quality sidewalks over the entire metropolis. This accounts for around 12% of

the total cost of the SUMP. The third source of expenses is the **development of road infrastructure**, with the dualization of the inner ring road and the development of critical link roads. It will also improve non-motorised transport in the areas of implementation, as pedestrian infrastructure will also be part of these road projects. This accounts for around 11% of the total cost of the SUMP.

Action or sub-action	Amount (MGHC)	Amount (MUS\$)
1.1 Development of quality sidewalks	720	120
1.2 Shared bicycle system in KNUST (studies)	2	0.3
2.1.A Development of urban streets guidelines	2	0.4
2.1.B Extensive road safety program	59	10
2.1.C Provision of regulated commercial spots	15	2
2.2 Traffic plan preparation	3	0.4
2.2 Improvement of 20 junctions (traffic lights)	22	4
2.3 Centralised traffic management centre	7	1
3.1 Inner ring road dualization	129	22
3.2 Development of critical link roads	558	93
4.1 Development of on-street parking	4	0.6
4.2 Development of a multi-storey car park (studies)	2	0.3
5.0 Restructuration of public transport (studies)	15	2.5
5.0 Restructuration of public transport (monitoring tool)	6	1
5.1 BRT (infrastructure, ITS)	2,172	362
5.1 BRT (rolling stock)	750	125
5.1 BRT (studies)	90	15
5.2 QBS (infrastructure, ITS)	312	52
5.2 QBS (rolling stock)*	720*	120*
5.2 QBS (studies)	12	2
5.3 QTS (scrapping bonus)	175	29
5.3 QTS (basic infrastructure)	120	20
5.3 QTS (terminals)	65	11
5.3 QTS (studies)	3	0.5
6.1 Transport authority and enforcement	20	3
6.2 Integration and regulation of pragia (studies)	1	0.2
6.3 Parking fining system	-	-
6.4 Periodic capacity building	-	-
TOTAL	5,985	997

Table 20: Detailed costing summary

Costing and funding do not take into account expenses from the private sector, which will not have to be funded by public actors. Private funding concerns actions:

- **1.2: Shared bicycle system development:** only the costs of studies and procurement is supported by the public sector. The private operator will provide the bicycles which expenses will be covered by the revenues from the users' fares, without subsidies from the public sector.

- **4.2: Multi-storey car park mutualised with a public transport terminal:** only the cost of studies and procurement is supported by the public sector. The private operator will support the costs of construction and operation of the park which will be covered by the revenues from parking fares, without subsidies from the public sector.
- **5.3: Quality Trotro Services:** the costs of infrastructure and new terminals building will be funded by the public sector. Concerning the rolling stock, the public sector will fund the scrapping bonus given to the private owners of vehicles who join the system and renew their vehicle, but the cost of purchase of the vehicle will be supported by the private owners.

***Note: Action 5.2: Quality Bus Services:** the cost of infrastructure will be funded by the public sector. However, the cost of purchase of the rolling stock can be shared between the public and private sector (future operators of the routes), upon negotiations. To consider the worse scenario, in this and following chapters, it is considered that the rolling stock is fully funded by the public sector.

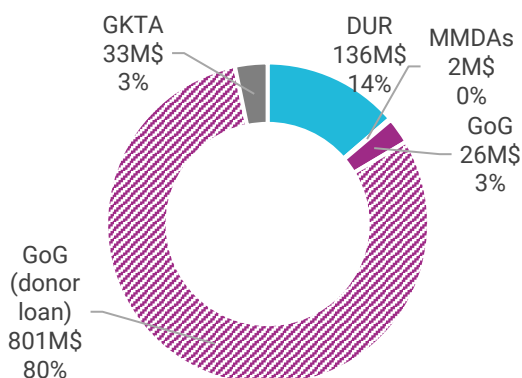
5.4 Implementation planning and funding

5.4.1 Funding sources and financing planning

Action or sub-action	Amount (MUS\$)	Funding agency
1.1 Development of quality sidewalks	120	DUR or MMDAs
1.2 Shared bicycle system in KNUST (studies)	0.3	OfMA
2.1.A Development of urban streets guidelines	0.4	DUR
2.1.B Extensive road safety program	10	DUR or MMDAs
2.1.C Provision of regulated commercial spots	2	DUR or MMDAs
2.2 Traffic plan preparation	0.4	KMA
2.2 Improvement of 20 junctions (traffic lights)	4	DUR
2.3 Centralised traffic management centre	1	GoG
3.1 Inner ring road dualization	22	GoG
3.2 Development of critical link roads	93	GoG (donor loan)
4.1 Development of on-street parking	0.6	KMA, AskMA, AMMA
4.2 Development of a multi-storey car park (studies)	0.3	KMA
5.0 Restructuration of public transport (studies)	2.5	GKTA
5.0 Restructuration of public transport (monitoring tool)	1	GKTA
5.1 BRT (infrastructure, ITS)	362	GoG (donor loan)
5.1 BRT (rolling stock)	125	GoG (donor loan)
5.1 BRT (studies)	15	GoG (donor loan)
5.2 QBS (infrastructure, ITS)	52	GoG (donor loan)
5.2 QBS (rolling stock)	120	GoG or operator
5.2 QBS (studies)	2	GoG (donor loan)
5.3 QTS (scrapping bonus)	29	GKTA
5.3 QTS (basic infrastructure)	20	GoG (donor loan)

5.3	QTS (terminals)	11	GoG (donor loan)
5.3	QTS (studies)	0.5	GoG (donor loan)
6.1	Transport authority and enforcement	3	GoG
6.2	Integration and regulation of pragia (studies)	0.2	GoG
6.3	Parking fining system	-	-
6.4	Periodic capacity building	-	-
TOTAL		997	

Table 21: Funding source by action (in M US\$₂₀₂₂)



By far, most of the funding is provided by the Government of Ghana, potentially through donor loans. MMDAs and the Greater Kumasi Transport Authority (GKTA) have a limited participation in the funding plan (around 3%), in regard with their financial capacities.

Figure 77: Synthesis of funding sources

5.4.2 Financial planning and impacts

The **current funding for mobility in the Expanded Kumasi** is estimated **around 94 MUS\$ per year in 2022**, which would expand to around 1.4 bnUS\$ in total until 2040. However, most of this funding is dedicated to road maintenance by the DUR, and therefore will also be necessary during the SUMP implementation.

The current budgets allocated to road maintenance should be kept for this purpose. As the action plan cost is around 1 bnUS\$, funding is a challenge: the action plan cumulated with the necessary road maintenance (which is included in the business-as-usual scenario) will necessitate **50% more annual funding than today**. This extra funding will need to be provided by the Government of Ghana, with or without the help of donor loans. The action plan proposes an indicative distribution of additional funding between the Government of Ghana and donor loans (contracted with the Government of Ghana), with nearly 80% of the necessary funding of the action plan coming from donor partners. However, the decision will be taken by the Government of Ghana for each action.

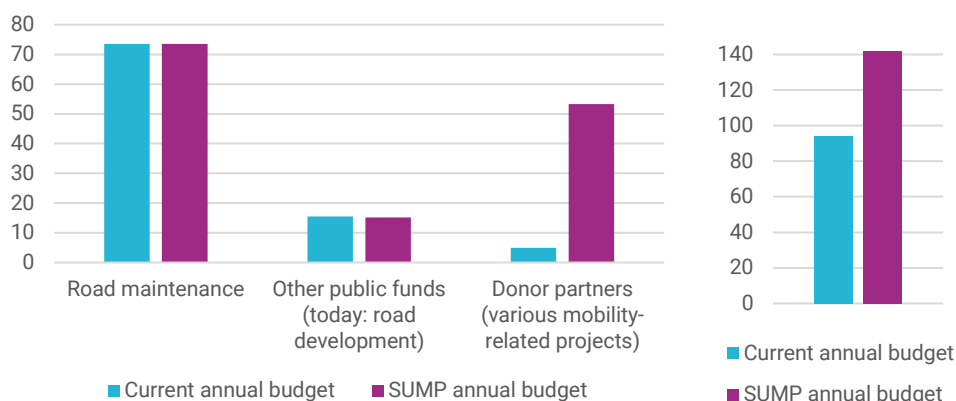


Figure 78: Breakdown of investment cost by funding source

5.4.3 Implementation schedule

Quick wins and short-term horizon

The **short-term horizon** encompasses many measures, among which some are implemented as “**quick wins**”, by the years 2025/2027:

- Creation of a Transport Authority and its associated enforcement taskforce
- Road safety and urban environment improvement (street design guidelines, development of commercial spots, on-street parking, etc.)
- Development of a traffic plan for the centre of the metropolis
- Development of a shared bicycle system at Kwame Nkrumah University of Science and Technology campus

Other actions are implemented **by the year 2030**, which marks the end of the short-term horizon:

- Bus Rapid Transit development (Kejetia-Ejisu and Kejetia-Abuakwa)
- Quality Bus Service pilot project: Kejetia-Aputuogya
- First phase of Quality Trotro Services development, including a first phase of rolling stock fleet renewal
- First phase of quality sidewalks development
- First phase (8 links) of development of the critical link roads to improve vehicular accessibility to remote communities
- Implementation of a centralised traffic management system, including existing traffic lights, traffic lights potentially created as part of the city centre traffic plan, and traffic lights created as part of the BRT development projects

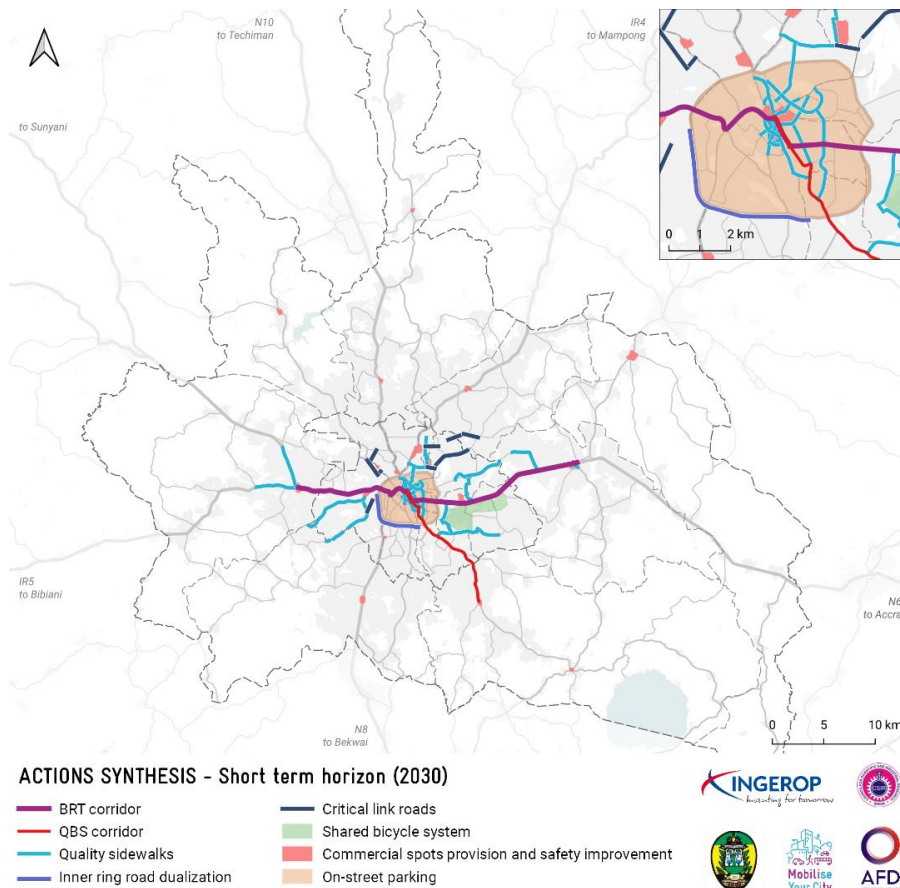


Figure 79 : Action plan synthesis map for the short-term horizon

Medium-term horizon

The **medium-term horizon** actions mainly consist in the extensive development of the public transport network, as well as the finalisation of non-motorised transport improvement programs, and some road and parking projects:

- Development of three corridors of Quality Bus Services (Kejetia-Kodie, Kejetia-Kotwi, and Kejetia-Mampong)
- Second phase of Quality Troto Services development, with a second phase of rolling stock fleet renewal
- Second and last phase of quality sidewalks development
- Dualization of the inner ring road
- Second and last phase (8 links) of development of the critical link roads
- Development of the multi-storey car park mutualised with a public transport terminal

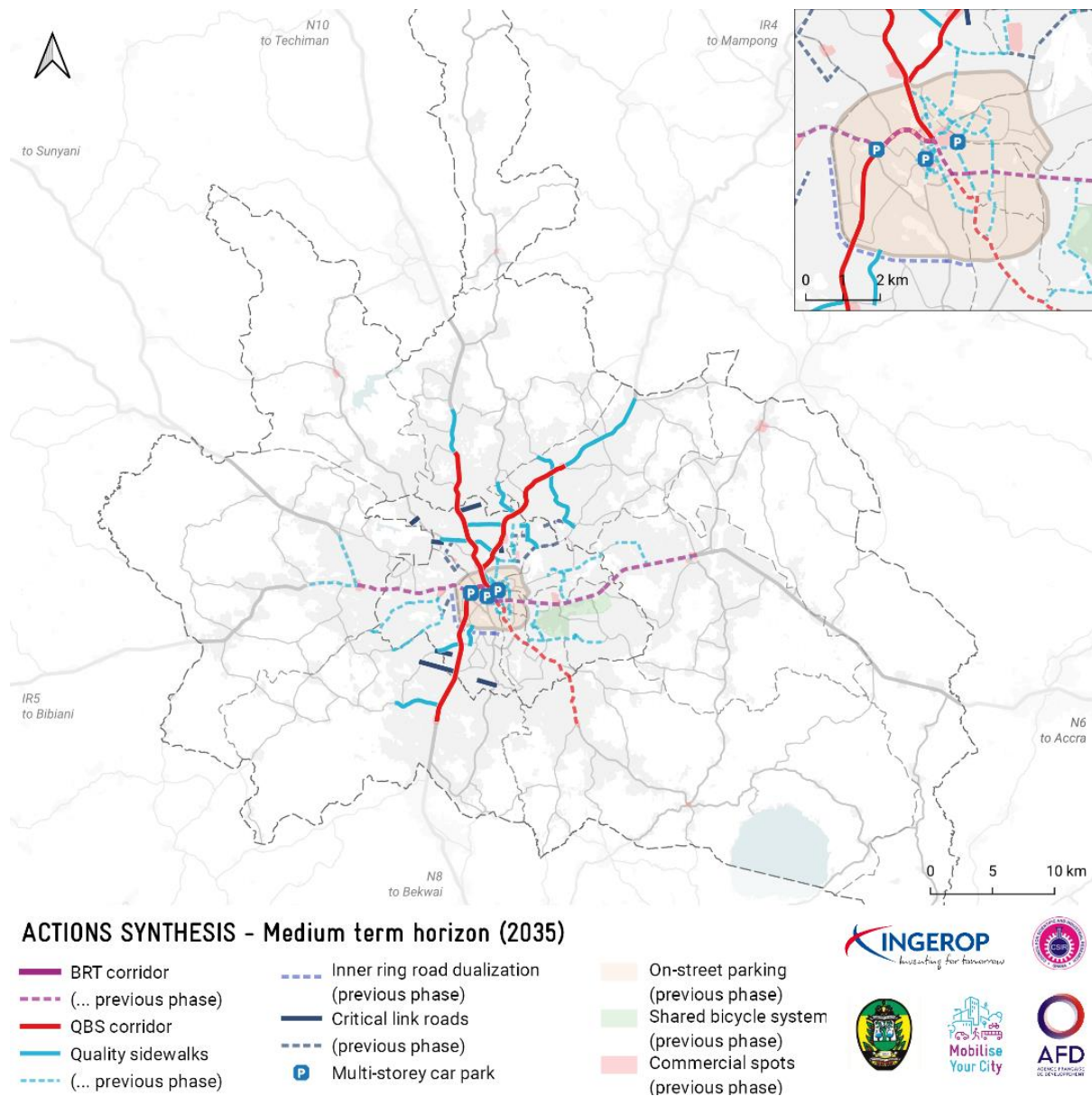


Figure 80: Action plan synthesis map for the medium-term horizon

Long-term horizon

The **long-term horizon** consists of the finalisation of the action plan implementation. This encompasses the last corridors of QBS, and the extension of the quality transport system:

- Development of five additional Quality Bus Service corridors (Kejetia-Ahiwaa, Kejetia-Buokrom, Kejetia-Sokoban, Kejetia-Asokore Mampong Last Stop, Inner ring road), finishing the development of the QBS network
- Third phase of the Quality Trotro Service development, including the third phase of rolling stock fleet renewal, raising the number of renewed vehicles to 5,000.

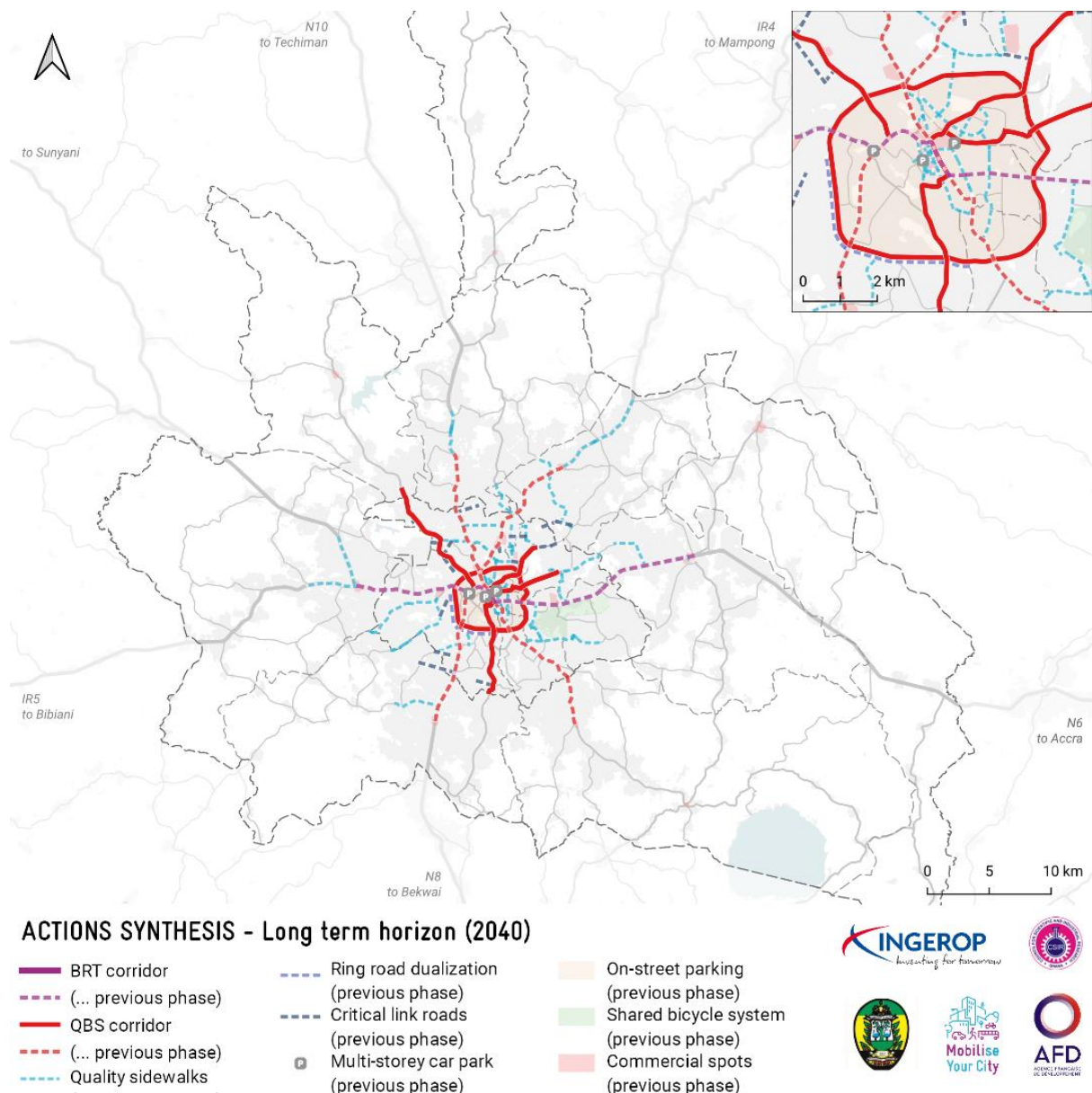


Figure 81: Action plan synthesis map for the long-term horizon

5.4.4 Action plan schedule summary

The synthesis of the phasing of each action is proposed hereafter:

Contents	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
1.1 Quality sidewalks	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
1.2 Shared bicycle system	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
2.1 Commercial spots & road safety improvement	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
2.2 Traffic management in KMA CBD	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
2.3 Centralised traffic management system	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
3.1 Inner ring road dualisation	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
3.4 Critical link roads	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
4.1 On-street parking in KMA (outside CBD)	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
4.2 Multi-storey car park mutualised with PT terminal	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
5.0 Restructuration of public transport	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
5.1 BRT - Ejisu and Sunyani corridors	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
5.2 QBS	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
5.3 QTS	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
6.1 Creation of a Transport Authority (GKTA)	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
6.2 Integration and regulation of pragia	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
6.3 Parking fining system	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
6.4 Periodic education for stakeholders	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			
Mobility observatory	Design	Design	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Construction	Commissioning			

Design	Design
Construction	Construction
Other phases (bid, wait, etc.)	Other phases (bid, wait, etc.)
Commissioning (full or partial)	Commissioning (full or partial)

Figure 82: Action plan schedule summary

5.4.5 Evaluation of the action plan

Key indicators

The results from the model allow to analyse the key indicators presented below:

- **Average travel time:** in minutes, represent the time on average spent by a passenger for one travel, excluding non-motorised transport travels.
- **Average transport cost of public transport:** in GH¢₂₀₂₂, represents the money on average spent by a passenger for one travel by public transport.
- **Affordability index for public transport users:** in %, represents the share of the mean cost of two travels by public transport compared to the daily income of the second quintile of population (income is considered constant throughout the years, as transport costs are expressed in constant prices of 2022).
- **Private car use:** in passengers.kilometres per day, represents the total distance travelled by passengers in a private car per day.
- **Public transport modal share:** in percentage, represents the share of travels made with public transport as the main mode among the total number of travels with a motorised mode of transport.
- **Public transport and NMT modal share:** in percentage, represents the share of travels made with public transport or non-motorised transport as the main mode among the total number of travels.
- **Total vehicular use:** in vehicles.kilometres per day, represents the cumulated number of kilometres travelled by vehicles of all types per day.
- **Total travels:** total number of travels within the metropolis per day.
- **Greenhouse Gases (GHG) emissions:** in kilotons of equivalent CO₂ (ktCO₂eq), represents the total emission of greenhouse gases from transport activities during one year. Unlike other indicators, it includes freight transport, accounting for around 20% of the total GHG emissions.
- **Population:** in inhabitants, total population of the metropolis.
- **Accessibility to public transport:** share of the population having access to a main public transport route (less-than-20-minutes headway in peak hours) less than 500m far from their homeplace.
- **BRT coverage:** share of the population having access to a BRT route less than 800m far from their homeplace.
- **Road safety index:** number of traffic fatalities per 100,000 inhabitants.
- **Air quality:** qualitative assessment of air quality around roadsides (it is not possible to quantify air quality without specific dispersion models and emission information about each type of vehicle).

Key indicators	Today (baseline)	BAU 2030	SUMP 2030	BAU 2035	SUMP 2035	BAU 2040	SUMP 2040
Average travel time	41 minutes	44 minutes	40 minutes	46 minutes	39 minutes	50 minutes	38 minutes
Average transport cost	5.2 GHS	5.3 GHS	5.5 GHS	5.4 GHS	5.8 GHS	5.4 GHS	6.1 GHS
Affordability index	21%	19%	20%	16%	17%	14%	15%
Private car use (daily passengers.kilometres)	3,246,000	6,107,000	4,995,000	9,211,000	7,394,000	13,537,000	11,295,000
Public transport modal share (among motorised modes)	76%	67%	71%	60%	65%	52%	57%
Public transport and NMT modal share	80%	72%	76%	66%	71%	59%	64%
Total vehicular use (daily vehicles.kilometres)	4,120,000	6,438,000	5,427,000	8,724,000	7,042,000	11,798,000	9,617,000
Total travels per day	2,922,000	3,816,000	3,816,000	4,531,000	4,531,000	5,400,000	5,400,000
GHG emissions (ktCO ₂ eq)	370	550	470	700	580	890	730
Population	3.1 million	4.1 million	4.1 million	5.0 million	5.0 million	6.2 million	6.2 million
Accessibility to public transport	62%	62%	75%	62%	82%	62%	90%
BRT coverage	0%	0%	6%	0%	6%	0%	6%
Road safety index	8.4	9.6	8.1	10.7	8.7	11.9	9.7
Air quality	PM _{2.5} : 35 µg/m ³	Worse than baseline	Worse than baseline, better than BAU	Worse than baseline	Worse than baseline, better than BAU	Worse than baseline	Worse than baseline, better than BAU

Table 83: Key Performance Indicators of the SUMP scenario and the business-as-usual scenario for each horizon

The evolution between “Today” and “Business as usual” show the consequences if the current trends are allowed to develop: If current trends are allowed to develop, private car use will increase, average travel times will increase (congestion), average costs will increase, GHG emissions and air pollution will increase.

The SUMP implementation allows a significant betterment of the mobility system for all horizons compared to the business-as-usual (BAU) scenario.

Thanks to the massive development of BRT systems, a **modal shift** is triggered from private cars to public transport, allowing to reduce the number of kilometres travelled by passengers in private cars by 29% compared to the BAU scenario in 2040. Moreover, many public transport passengers **shift from trotro or taxi to BRT**, decreasing the reliance on low-occupancy vehicles and reducing the total number of kilometres travelled by public transport vehicles, as BRT vehicles have a higher capacity. **In total, the kilometres travelled by vehicles is cut down by 18% in 2040.** This impact is higher as time goes, considering more BRT corridors and QBS routes are developed. However, the general development of the economy triggers an increase of the motorisation rate, increasing the potential private car passengers. **It is necessary to significantly enhance the public transport system in order to slow down the increase of private car use, which could rise up to nearly half of the travels in 2040 in the business-as-usual scenario.**

As road traffic decreases, **travel conditions** improve. At all horizons, the SUMP implementation significantly reduces private car usage compared to the BAU situation. Therefore, travel times similarly decrease, and the SUMP offer a noticeable improvement. This impact is moderated by a higher use of private cars, which even though generates congestion and reduces the speed of all modes, offer attractive travel times as they don't require the use of a feeding or access mode nor a waiting time. **Therefore, it is expected that travel times stay similar to today's conditions if the SUMP is implemented, whereas it could increase by more than 20% by 2040 in the business-as-usual scenario.**

Another direct consequence is the **diminution of the greenhouse gases emissions**. It is expected to be **cut down by 18% by 2040**, mainly thanks to the implementation of BRT and QBS corridors (decrease of private car use compared to the BAU scenario, reliance on more massive transport systems) and the improvement of the public transport vehicles (renewal of the trotro fleet).

The enhancement of the public transport system makes it more expensive. However, it allows to **contain the global cost of transport (including both private car and public transport users)**, as it encourages the use of public transport which is less expensive than the use of private cars (fuel and maintenance considered, not the investment in the private vehicle). Therefore, the **affordability index** (share of the average cost of two travels by public transport compared to the daily income) is higher in the SUMP scenario compared to the BAU scenario. However, it does not reflect the fact that for all the population, both private car users and public transport users considered, **the cost of mobility will actually be less in the SUMP scenario than in the BAU one.**

Finally, the SUMP implementation and the associated public transport system enhancement makes it possible to tackle **traffic fatalities** by nearly 20% in 2040 compared to the BAU scenario, thanks to less traffic and better infrastructure for non-motorised transport.

Analysis of modal shares

The figures in the next pages show the detail of modal shares in number of travels and in passengers.kilometres, (cumulated distance travelled by the passengers), as well as the modal shares by urban corridor in number of travels.

The SUMP scenario, with many BRT and QBS corridors, shows a great impact on the modal shares: 6% and 7% of passengers and 9% and 12% of passengers.kilometres respectively use BRT and QBS as their main mode of transport, raising the total **public transport modal** share to 47% and 54% respectively, showing respectively a **+4 points and +7 points gain** of the public transport modal share compared to the business-as-usual scenario.

Indeed, BRT and QBS are advantageous for longer distances, where the time gain induced by the high speed of the mode is worth the potential feeding service to access the BRT. For shorter travels, the time gain is less as the travelled distance is less, and sometimes is not worth the use of a feeding service. This makes BRT (especially) and QBS less advantageous in these cases.

The modal shares by **corridor** are relatively **homogenous**, with a share of around 30% of travels from/to/within the corridor made by BRT when implemented.

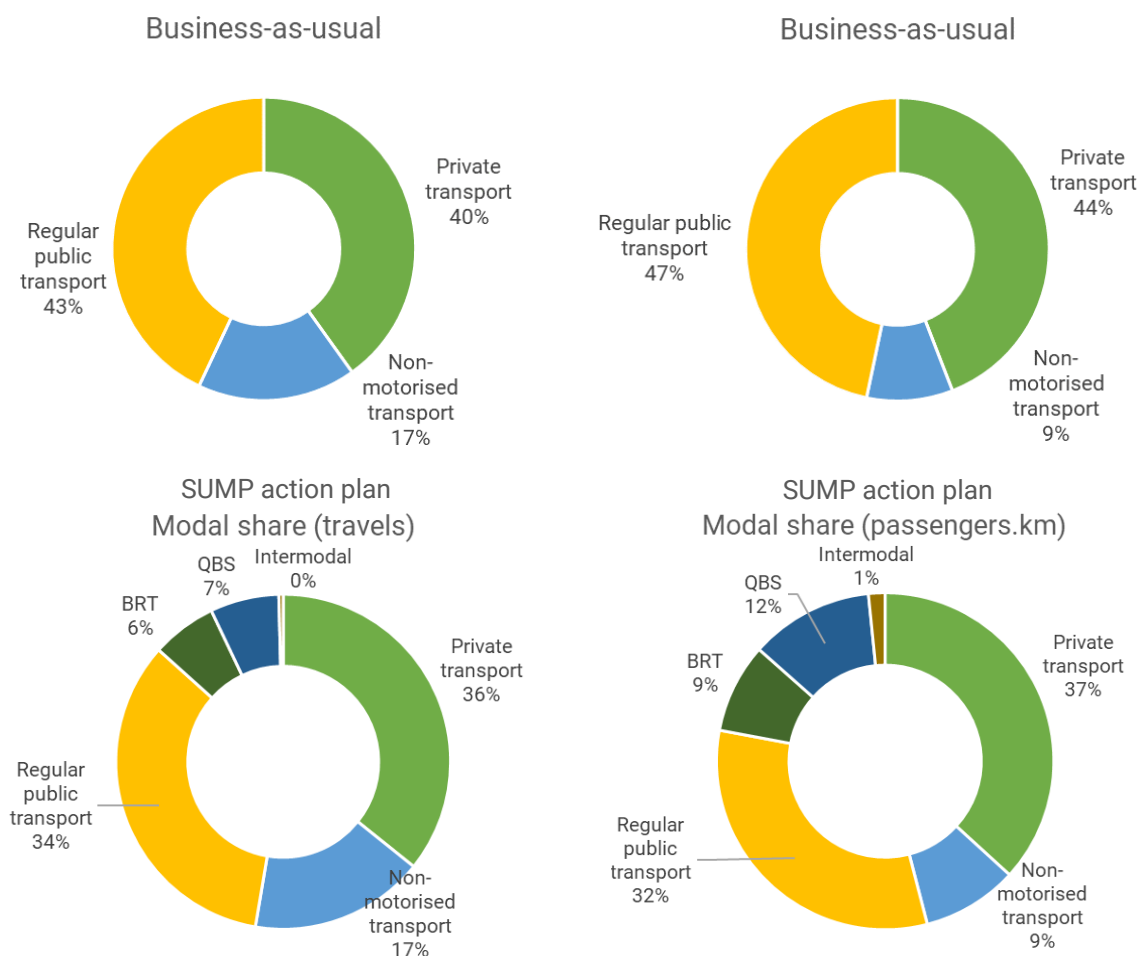


Figure 84: Modal shares in number of travels (left) and passengers.kilometres (right) for the year 2040

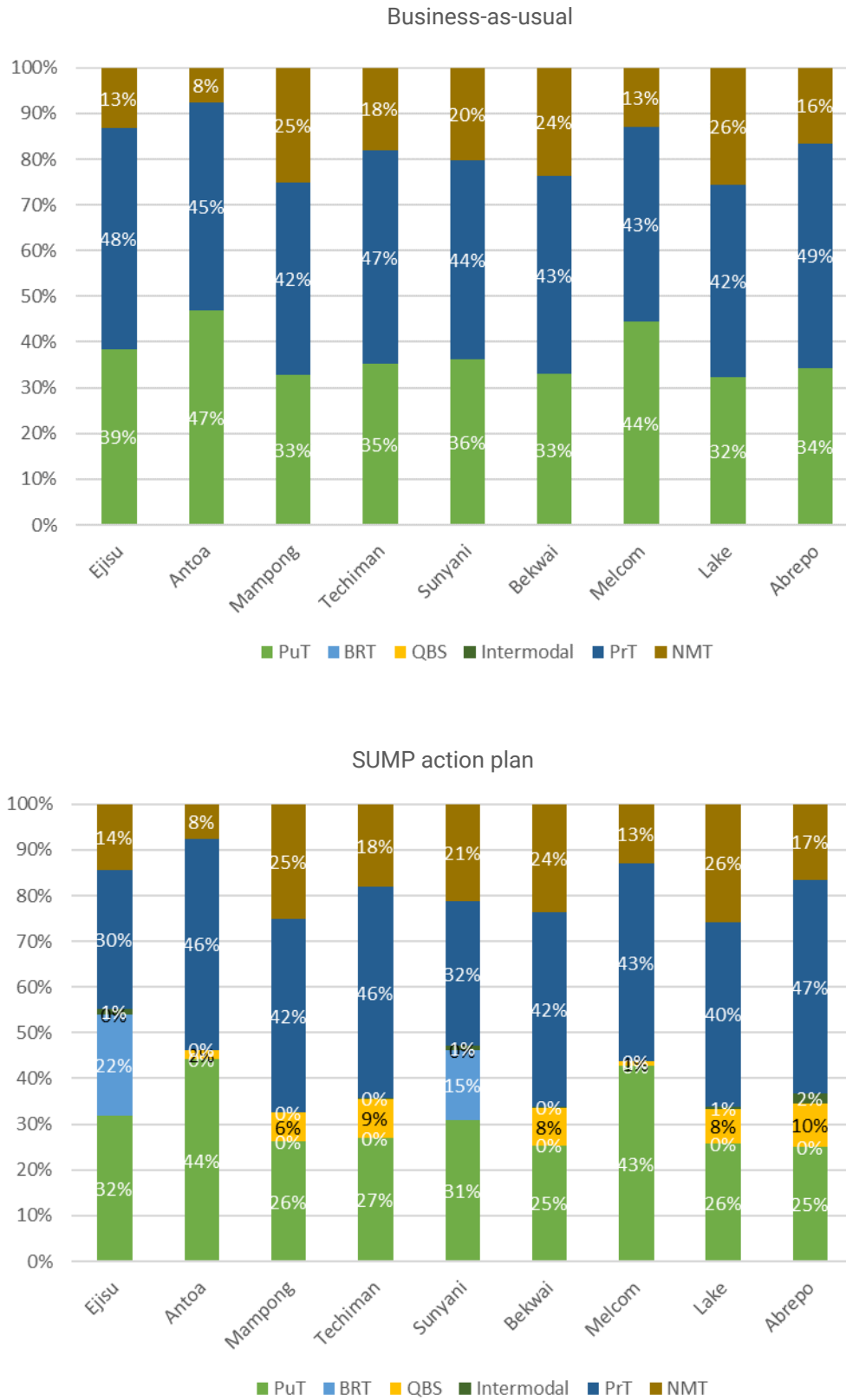


Figure 85: Modal shares (in number of travels) for each urban corridor for the year 2040

Cross-cutting analysis: the SUMP and gender issues in mobility

One of the stakes identified in the diagnosis regarded gender issues in the mobility system. The main conclusions in terms of mobility were that:

- Women are more likely to be **unemployed or self-employed**, working in the services and sales sector (mostly trading activities), linked to less access for women to formal **education**. Women are usually more **in charge of the children** of the household.
- Consequently, women are usually **less mobile than men**. They are also more likely to travel by **non-motorised transport** (for the lowest classes of income) and **public transport** (for upper classes of income). The use of private cars is limited for women.
- The public transport system is often restraining, with few room and seats and a high doorstep, hindering the movement of **women carrying goods** (as lots of them are traders and can't travel with a private vehicle), **pregnant women**, and **women carrying children**. Considering this, drivers sometimes prefer to board another passenger and stop the woman to enter the vehicle.
- Women usually feel **less safe** in public transport and are more likely to suffer from **violences** (harassment, assault, etc.). The most important factors of the feeling of insecurity are the **driver's behaviour** and the poor **conditions of the vehicle**. Women also pointed out that they are less trustworthy of the driver and expect a minimum of good behaviour from him (mostly not be drunk or under the influence of drugs) or prefer to travel with a known driver and vehicle.
- Women pointed out that pedestrian conditions were poor due to **inadequate walking infrastructure** and the **absence of street lighting**, which was also identified as an important factor of the feeling of insecurity.

As a response to these issues, the SUMP provides gender-responsive actions which considers gender as a cross-cutting issue:

- The conditions of non-motorised transport are widely improved with the provision of **quality sidewalks and systematic lighting**, providing both better conditions for women travelling on foot (whom are more than men) and **reducing the feeling of insecurity** in the streets. The streets design guidelines will also propose concepts which includes safety by design.
- The **professionalisation of the paratransit system** (quality trotro services) will help to enhance regulation and the quality of service, which should lead to an offer better adapted to the demand (therefore **less competition** between passengers to board vehicles), and a general improvement of the **safety conditions** (vehicles renewal). Women will be the first impacted by this.
- The introduction of **formal public transport** (Quality Bus Services, Bus Rapid Transit) will improve the public transport system, which is mostly used by women, and contain the **travelling costs**. It will also guarantee an **equality** towards the "right to board the vehicle", an **easy access** with low-entry floors for example, and more requirement for the drivers. An important topic in the introduction of these modes will be the possibility for people (mostly female traders) to easily carry goods onboard, as it was done in Dar-es-Salaam (Tanzania).

Cross-cutting analysis: the SUMP and affordability issues in mobility

The diagnosis identified that **affordability** was a key modal choice criteria. 40% of public transport users indicated that they chose to use public transport mainly for affordability reasons, and 30% because they hadn't any alternative (mostly because they can't have access to a private vehicle). Therefore, affordability must be considered carefully when proposing actions.

The enhancement of the public transport system and the introduction of formalised modes will help tackle affordability issues compared to the business-as-usual situation. Indeed, if nothing is done and the **system continues as it is today**:

- **Congestion** will increase due to **higher mobility demand** (strong population growth, especially in periurban areas, while the city remains hyper-centralised)
- **Congestion** will also increase as standards of living are improving and more people have access to **private cars**: if the image of the public transport system is not changed, people who can will shift towards private cars
- As a result, **travel times** for both private cars and public transport will increase
- **Fuel prices** are likely to continue to rise up considering the current economic context
- Therefore, the current business model of the public transport system risks to collapse: longer travel times and more expensive fuel mean **more expenses for the operators**, who will either **reduce the drivers' income** (and risk of losing the necessary workforce to operate the system), or **increase passenger fares**
- If the public transport offer reduces due to lower salaries for drivers, the system will be triggered and people will shift towards **low-capacity vehicles** such as prasia or motorcycle taxi, which are highly unregulated and tend to be **more expensive** for passengers at the end of the day

In conclusion, in the business-as-usual scenario, it is very likely that either **passengers fares** for trotro and taxi will **increase massively**, or that people will have to **patronise** more low-occupancy, **more expensive**, vehicles. **In both cases, mobility will become less and less affordable.**

The SUMP proposes a **massification** of a part of the transport system, and a **better regulation** of trotros and taxis. This will have the following impacts, affordability-wise:

- Congestion will not increase as much as **high-occupancy vehicles** will reduce the number of public transport vehicles compared to the BAU scenario, and also as this new mode will help to limit the modal shift towards private cars
- Trotros and taxis won't see their expenses rise as much as expected, thus **won't have to increase their fares** as much or reduce the drivers' salaries (giving less way to low-occupancy vehicles)
- Mass transport will be formalised with the transport authority, giving more leverage to the authorities to **control the fares**

As a result, the SUMP **improves affordability** issues in two ways: it limits the risk of public transport prices increase, and it also limits the shift towards private car, which is a more expensive mode than public transport.

5.4.6 Reach of the targeted objectives

As presented earlier, the objectives of the SUMP are the following:

- Improve **urban safety, pedestrian and non-motorised transport** conditions and **road safety**
- Enhance the **public transport system**
- Improve the **institutional framework and revenues**
- Improve **traffic and parking conditions**, especially in the CBD
- Enhance the **regulation and enforcement** systems
- Improve **sustainability** of transport and its externalities on the **quality of life**
- **Educate** the public about mobility issues

The table in the next page presents the synthesis of how these objectives are reached by the SUMP action plan.



























Improve urban and road safety, NMT conditions	
Pedestrian safety and comfort improvement	 +100km renewed sidewalks
Commercial activities regulation	
Bicycle use development	
Traffic taming	 -18% veh.km
Road safety	
Enhance the public transport system	
Existing system efficiency improvement	
Improvement of the accessibility	 12 minutes gain
Massification of the transport system	 6% modal share BRT
Improvement of security onboard and at terminals	 +5,000 trotros renewed
Improvement of intermodality	
Improve traffic and parking conditions	
Improve traffic conditions in KMA CBD	
Improve traffic conditions in main corridors	 40 junctions improved
Divert transit traffic from the centre of the metropolis	
Reduce illegal and unmonitored parking	 +2300 parking spots
Improve sustainability	
Reduce GHG emissions	 -18% GHG emissions
Reduce air and noise pollution	
Improve the institutional and revenues framework	
Enhance the regulation and enforcement systems	
Educate the public	
Main impacts	
Environmental and social impacts	
Economic feasibility	
Institutional feasibility	

Figure 86: Multicriteria analysis of the SUMP action plan

6. Monitoring and reporting

6.1 Introduction, goals, and rationale

A regular monitoring of the entire system must take place at **regular intervals** in order to highlight the evolution of different indicators and the achievement (or non-achievement) of previously set objectives. An **ad-hoc process** was designed for this purpose: the Observatory on Urban Mobility, also referred to as Monitoring, Reporting and Verification process (MRV). This Observatory and Monitoring and Reporting Plan was developed **with the relevant stakeholders**, in particular the SUMP Task force.

The **Observatory on Urban Mobility for Kumasi** is a set of mobility indicators compiled in a visual dashboard. It provides information on the evolution of mobility throughout the years, in comparison to baseline values and SUMP targets for each temporal horizon. The Observatory on Urban Mobility is an important component of mobility planning. The Observatory will benefit sub-national administrations, central agencies, international partners and the community in the management of mobility. Stakeholders such as MMDA, GKTA, GSS, BRRI and BRT operators must adhere in future years and participate to its updates.

It has several objectives:

- Follow the **implementation** of the SUMP actions.
- Ease the **reporting** to decision-makers and stakeholders.
- Provide insights on the **forecasted** situation: indicators allow quick insights on mobility. Outputs can be used for analyses and evaluations by Kumasi leaders for mobility planning.
- **Compare** the forecasted situations **with and without** the SUMP.
- Confront the **actual attainment** of the objectives compared to the forecasted one.
- Provide **timely** and **effective responses**: Observatory information and structure help identifying lagging progress and find effective mitigations.
- Provide **transparent** information:
 - If repeated over time, the Observatory will reveal the measures impacting mobility the most efficiently, thus creating a **benchmark** allowing to select best measures in the context of targeted actions in other cities.
 - Transparent information can benefit mobility initiatives from associations and citizens, developments and residents, other agencies unrelated to mobility, etc.
- Allow **continuous improvement**: indicators must remain flexible to allow evolution in their nature (update in the calculation method, update of targets depending on technology or priorities, etc.).

Forecasts were made for the **business-as-usual** situation and with **complete implementation of the SUMP action plan**, at several horizons: 2030, 2035 and 2040. These forecasts were established using the transport model developed for Kumasi, presented in the **Transport modelling report**. Forecasts for the business-as-usual and the SUMP action plan are **pre-implemented in the Observatory**: regular monitoring and reporting must then, **year after year, fill in values for the observed situation** to assess the actual mobility situation.

6.2 Indicators

The **indicators** for the Mobility Observatory were developed taking into account:

- **MobiliseYourCity standards.**
- Good practices and **common mobility indicators.**
- **Specific objectives** for mobility in Kumasi, identified through the diagnosis and presented in the Vision and Scenarios report.
- Availability of **data.**

A set of 43 indicators was thus established. Two types of indicators can be distinguished:

- **Implementation indicators**

These indicators aim to monitor the implementation of the SUMP action plan: **have the proposed actions been implemented following the proposed timeline?**

- **Effects indicators**

These indicators aim to monitor the effects on mobility of the SUMP action plan: **have the proposed actions attained the expected effects on mobility in the Expanded Kumasi area?** These effects indicators are organized by theme:

- Non-motorised transport & general mobility indicators
- Public transport indicators
- Sustainable indicators

To draw a coherent and contextualized understanding of mobility, **all indicators shall be preferably used as a whole set.**

Indicator	Rationale
KM of NMT infrastructure created or substantially improved	Measure the progress of action 1.1
KM of MRT built or substantially advanced	Measure the progress of action 5.1
BRT offer: performed veh.km	Measure the progress of action 5.1
BRT offer: frequency in peak hour	Measure the progress of action 5.1
Number of renewed trotros	Measure the progress of action 5.3
Number of BRT vehicles	Measure the progress of action 5.1
Number of QBS vehicles	Measure the progress of action 5.2
Number of registered paratransit vehicles	Measure the progress of action 5.3
City centre parking spaces subjected to active parking management	Measure the progress of actions 4.1 & 4.2
Number of vehicles adapted to people with reduced mobility	Measure the impact of actions 5
Leveraged and associated financing	Measure the implementation of the SUMP
Number of employees in the GKTA	Measure the progress of action 6.1
Number of employees in the enforcement task force	Measure the progress of action 6.1
Population	Needed to relate the mobility evolutions with the socio-economic context
Average mobility rate	Monitor the mobility evolutions which are independent from the SUMP
Average travel time for motorised travels	Monitor the time lost in transport, which can hinder economic growth

Indicator	Rationale
Average travel length for motorised travels	Needed to understand the distribution dynamics (more travels from outer areas for example as the urban area sprawls)
Safety (fatalities per 100k inhabitants) Safety (casualties per 100k inhabitants) Pedestrian safety (pedestrian fatalities per 100k inh.)	Monitor road safety and the effectiveness of some actions (1.1, 2.1, public transport measures decreasing traffic)
Modal share of PT and NMT	Measure the modal shift induced by the SUMP implementation
Total daily traffic	Monitor traffic level and traffic reduction with the SUMP implementation
Motorisation rate of households	Monitor the proportion of travels which can be made with a car
Total passenger car traffic	Monitor private car use and modal shift
Travel times on main corridors	Monitor congestion evolution
Modal share of PT among motorised modes	Measure the modal shift induced by the SUMP implementation
Modal share of BRT among motorised modes	Measure the attractiveness of BRT as a new mode
Modal share of PT (pax.km) among motorised modes	Measure the impact of mass transit development on regular public transport
Modal share of BRT (pax.km) among motorised modes	Measure the attractiveness of BRT as a new mode and its use (short or long trips)
Annual ridership of BRT	Measure the attractiveness of BRT as a new mode
Modal share of BRT on BRT corridors	Measure the attractiveness of BRT as a new mode
Modal share of other PT on BRT corridors	Measure the impact of mass transit development on regular public transport
Modal share of private transport on BRT corridors	Measure the impact of mass transit development on private car use
BRT operating speeds	Measure the efficiency of the BRT infrastructure and time wins induced
Accessibility to PT (% of population living less than 500m away from a PT stop)	Measure the impact of trotro system enhancement through access to transport
Accessibility to BRT (% of population living less than 500m away from a BRT stop)	Measure the impact of BRT development through access to mass transit
Affordability (average fare for one regular public transport travel)	Monitor the difference of affordability between public transport modes
Affordability (fare for 1 BRT trip)	Monitor the difference of affordability between public transport modes
Affordability (% of income spent on PT for 2nd quintile)	Measure the impact of the SUMP on transport poverty
GHG emissions	Measure the impact of the SUMP on climate change and the monitor energetic efficiency of the transport system
Air pollution (mean PM2.5 at road-based stations)	Monitor pollution around main roads which can trigger public health issues
Difference in mobility rate between men and women	Measure the impact of the SUMP on gender issues in public transport
Difference in modal share of motorised modes between men and women	Measure the impact of the SUMP on gender issues in public transport

Figure 87: List of mobility observatory indicators and rationale

6.3 Baseline and target values

The following tables present the baseline (2022) and target values of the indicators included part of the observatory.

PLANNED							
N°	Indicator	Unit	TOTAL	BASELINE-2022	2030	2035	2040
A.1	KM of NMT infrastructure created or substantially advanced	km	140	0	50	10	
A.2	KM of MRT commissioned	km	29	0	29		
A.3	BRT offer: performed veh.km	vehicle.kilometres		0	12,923,000	12,923,000	12,923,000
A.4	BRT offer: frequency in peak hour	buses per hour		0	60	60	60
A.5	Number of renewed trotros in operation	n°		0	2,059	3,529	5,000
A.6	Number of BRT vehicles in operation	n°		0	200	200	200
A.7	Number of QBS vehicles in operation	n°		0	40	150	300
A.8	Number of registered paratransit vehicles	n°		5,000	7,139	8,667	10,500
A.9	City centre parking spaces subjected to active parking management	n°		0	3,000	3,300	3,300
A.10	Number of vehicles adapted to people with reduced mobility in operation	n°		0	240	350	500
A.11	Leveraged and associated financing	MUS\$ ₂₀₂₂	997	0	142	56	29
A.12	Number of employees in the GKTA	n°		0	50	50	50
A.13	Number of employees in the enforcement task force	n°		0	30	30	30

Figure 88: Implementation indicators of the observatory

Indicator				2022	2030		2035		2040	
Category	Indicator	Unit	Core indicator	Baseline	BAU	Target	BAU	Target	BAU	Target
NMT & general mobility	Population	inhabitants		3,058,474	4,148,193	4,148,193	5,045,755	5,045,755	6,137,526	6,137,526
	Average mobility rate	trips/inhabitant/day		0.96	0.96	0.96	0.96	0.96	0.96	0.96
	Average travel time for motorised travels	minutes		00:41:13	00:44:13	00:40:19	00:46:10	00:39:03	00:50:04	00:38:15
	Average travel length for motorised travels	km		5.71	5.93	5.93	6.07	6.07	6.21	6.21
	Safety (fatalities per 100k inhabitants)	n°	X	8.4	9.6	8.1	10.7	8.7	11.9	9.7
	Safety (casualties per 100k inhabitants)	n°		87.6	100.9	85.1	112.4	90.7	125.0	101.9
	Pedestrian safety (pedestrian fatalities per 100k inh.)	n°		4.3	5.0	4.2	5.6	4.5	6.2	5.1
	Modal share of PT and NMT	%	X	80%	72%	76%	66%	71%	59%	64%
	Total daily traffic	vehicle.kilometres		4,120,332	6,438,000	5,427,000	8,724,000	7,042,000	11,798,000	9,617,000
	Motorisation rate of households	%		25%	31%	31%	35%	35%	39%	39%
	Total passenger car demand	passengers.kilometres		3,246,298	6,107,000	4,995,000	9,211,000	7,394,000	13,537,000	11,295,000
Travel times on main corridors	time		00:44:30	00:47:44	00:43:32	00:49:51	00:42:10	00:54:03	00:41:18	
Public transport	Modal share of PT among motorised modes	%		76%	67%	71%	60%	65%	52%	57%
	Modal share of BRT among motorised modes	%			0%	8%	0%	8%	0%	8%
	Modal share of PT (pax.km) among motorised modes	%		77%	68%	74%	60%	68%	51%	59%
	Modal share of BRT (pax.km) among motorised modes	%			0%	10%	0%	10%	0%	9%
	Annual ridership of BRT	passengers			0	77,957,000	0	90,223,000	0	105,889,000
	Modal share of BRT on BRT-implemented corridors	%			0%	23%	0%	23%	0%	23%
	Modal share of other PT on BRT-implemented corridors	%			0%	50%	0%	45%	0%	38%
	Modal share of private transport on BRT-implemented corridors	%			0%	26%	0%	31%	0%	38%
	BRT operating speeds	km/h			0.0	20.0	0.0	20.0	0.0	20.0
	Accessibility to PT (% of population living less than 500m away from a PT stop)	%	X	62.1%	62.1%	74.5%	62.1%	82.2%	62.1%	90.0%
	Accessibility to BRT (% of population living less than 500m away from a BRT stop)	%		0.0%	0.0%	6.0%	0.0%	6.0%	0.0%	6.0%
Affordability (average fare for one regular public transport travel)	GHC ₂₀₂₂		5.2	5.3	5.5	5.4	5.8	5.4	6.1	
Affordability (fare for 1 BRT trip)	GHC ₂₀₂₂		0.0	0.0	4.0	0.0	4.0	0.0	4.0	
Affordability (% of income spent on PT for 2nd quintile)	%	X	21.1%	19.4%	19.7%	16.2%	17.4%	13.5%	15.1%	
Sustainability	GHG emissions	annual ktCO ₂ eq	X	370	550	470	700	576	890	734
	Air pollution (mean PM2.5 at road-based stations)	µg/m ³	X	35.1						
	Difference in mobility rate between men and women	%		-14%	-14%	-8%	-14%	-4%	-14%	0%
	Difference in modal share of motorised modes between men and women	%		-4%	-4%	-2%	-4%	-1%	-4%	0%

Figure 89: Effect indicators of the observatory

6.4 Monitoring management

The objective of the Mobility Observatory is to **monitor mobility in Kumasi up to 2040**. The Observatory must be **regularly updated with data** to correctly monitor the mobility situation. Data sources may include projects reporting, surveys (censuses, household surveys, traffic counts etc), etc.

The following table outlines **recommendations for the monitoring of each indicator**:

- **Frequency** of the update: Depending on the difficulty to collect the necessary data to calculate an indicator, the frequency of update can span between 1 and 10 years.
- **Sources**, including **characteristics of the survey** if relevant.
- **Producer** of the data: stakeholder or institution in charge.

Indicator	Update (years)	Sources
KM of NMT infrastructure created or substantially improved	1	Projects reporting
KM of MRT built or substantially advanced	1	Projects reporting
BRT offer: performed veh.km	1	Transport plans of operators
BRT offer: frequency in peak hour	1	Transport plans of operators
Number of renewed trotros	1	Projects reporting
Number of BRT vehicles	1	Projects reporting
Number of QBS vehicles	1	Projects reporting
Number of registered paratransit vehicles	1	TRANSINFOMAP
City centre parking spots subject to active parking management	1	Projects reporting
Number of vehicles adapted to people with reduced mobility	1	Projects reporting
Leveraged and associated financing	1	Projects reporting
Number of employees in the GKTA	1	Projects reporting
Number of employees in the enforcement task force	1	Projects reporting
Population	10	Population census
Average mobility rate	10	Household survey
Average travel time for motorised travels	10	Household survey
Average travel length for motorised travels	10	Household survey
Safety (fatalities per 100k inhabitants)	1	BRRR road safety
Safety (casualties per 100k inhabitants)	1	BRRR road safety
Pedestrian safety (pedestrian fatalities per 100k inh.)	1	BRRR road safety
Modal share of PT and NMT	10	Household survey
Total daily traffic	10	Household survey
Motorisation rate of households	10	Household survey
Total passenger car traffic	10	Household survey
Travel times on main corridors	1	Travel times survey
Modal share of PT among motorised modes	10	Household survey
Modal share of BRT among motorised modes	10	Household survey
Modal share of PT (pax.km) among motorised modes	10	Household survey
Modal share of BRT (pax.km) among motorised modes	10	Household survey
Annual ridership of BRT	1	BRT ticketing devices
Modal share of BRT on BRT-implemented corridors	1	Corridor traffic counts

Indicator	Update (years)	Sources
Modal share of other PT on BRT-implemented corridors	1	Corridor traffic counts
Modal share of private transport on BRT-implemented corridors	1	Corridor traffic counts
BRT operating speeds	1	BRT system
Accessibility to PT (% of population living less than 500m away from a PT stop)	10	Household survey
Accessibility to BRT (% of population living less than 500m away from a BRT stop)	10	Household survey
Affordability (average fare for one regular public transport travel)	10	Household survey
Affordability (fare for 1 BRT trip)	10	Household survey
Affordability (% of income spent on PT for 2nd quintile)	10	Household survey
GHG emissions	10	Household survey
Air pollution (mean PM2.5 at road-based stations)	1	Air pollution stations
Difference in mobility rate between men and women	10	Household survey
Difference in modal share of motorised modes between men and women	10	Household survey

Figure 90: Characteristics of surveys, for each indicator, needed to update the Observatory

Several types of surveys are needed to update the observatory:

- **Population and housing census:** nationwide survey organised by the Ghana Statistical Services, approximately every ten years.
- **Household survey:** the household survey is the core of the observatory, but can only be organised with a recent population census, and is cost-extensive and long to implement; thus, it will be organised approximately every ten years (and should happen just after the implementation of major projects such as BRTs or QBS).
- **Corridors traffic counts:** the counts allow to give an approximate of modal shares on specific corridors, for example corridors where BRT have been implemented (counts should include rough occupation counts of public transport vehicles). They are cost-effective and easy to implement, thus will be organised every year once BRTs are commissioned. The survey can also be extended to QBS corridors.
- **Travel times surveys:** travel times surveys are useful to quantify the time loss on transportation (due to congestion) and its evolution. They are easy to implement and cost-effective, therefore will be organised every year on each of the eight main urban corridors.
- **BRRI road safety** audits are produced annually by the BRRI and accessible.
- **Air pollution stations** either require purchasing sensors (and then the measuring is done continuously), or through specific campaigns. Considering the relative difficulty to find surveying companies in this matter in Ghana and their fares, surveys will take place every five years if sensors are not purchased by the local stakeholders.

Other data sources include BRT systems (operating and commercial speed, ridership, etc.), transport plans of formal operators, and TRANSINFOMAP tool (see 3.12). These sources are accessible to the stakeholders in charge of updating the observatory.

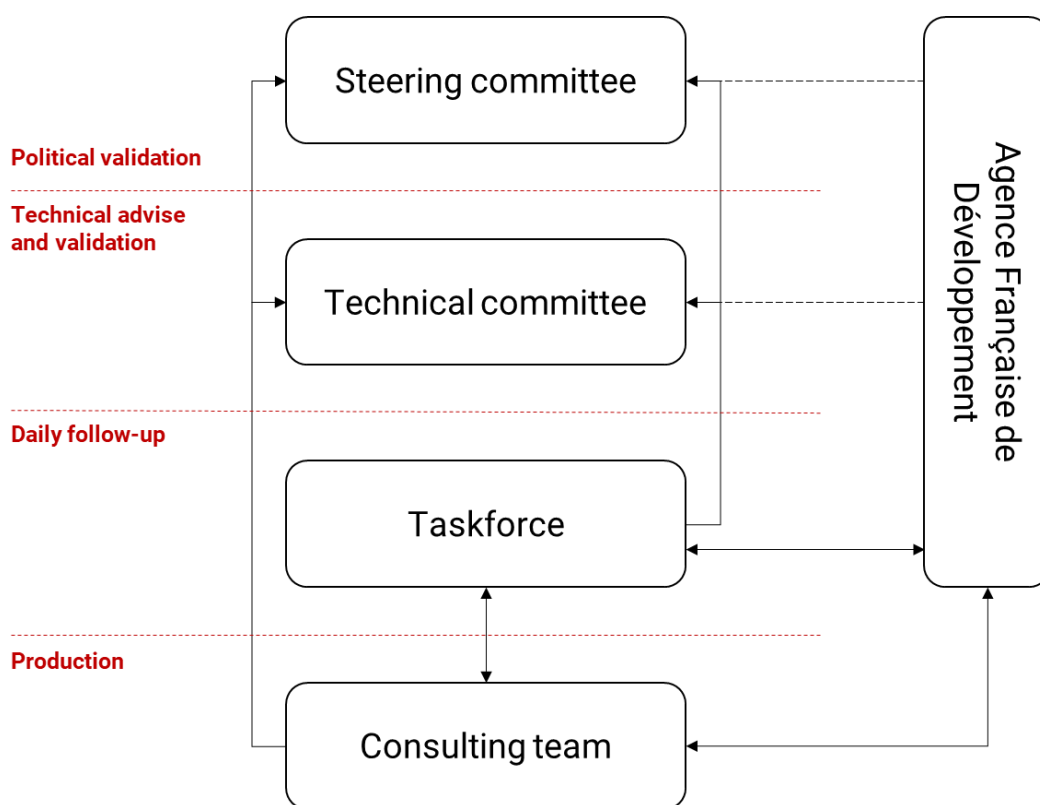
7. Appendix

7.1 List of contributors to the SUMP development

7.1.1 Introduction

The plan, developed by the consulting team in coordination with the beneficiaries of the study (MMDAs) and the client (AFD), undergoes a validation framework at all steps of its preparation. This framework can be divided in five instances:

- The consulting team, in charge of the production of the plan and the preparation of daily activities
- The taskforce, in charge of the daily follow-up of the activities
- The technical committee, in charge of technical advice and technical validation, prior to the steering committee
- The steering committee, in charge of the political validation of the plan
- The AFD, which as the client has a cross-cutting role and is involved in each of these instances (except the production part)



Governance framework of the SUMP preparation

The taskforce is regularly consulted and is the representing instance of the beneficiaries on daily activities, as well as its focal point. The taskforce makes its first comments on key points or reports prior to presentation to the technical committee so that their comments can be included beforehand. The taskforce reviews and validates all deliverables.

The technical committee meets at each end of component, and whenever it feels necessary to. The technical committee reviews and validates the main deliverables (diagnosis report, scenarios identification report, scenario development report, final SUMP report). Prior to this validation, a summary is presented to the committee to ease the process, present the key elements, and gather the first remarks.

The steering committee meets at each end of component. A summary of the component is presented to the committee, as well as a written executive summary. The steering committee makes its remarks during the meeting.

7.1.2 Steering committee

Institution	Position
Ashanti Regional Coordinating Council	Regional minister Regional coordinating director
Kumasi Metropolitan Assembly	Chief executive Coordinating director
Asokore Mampong Municipal Assembly	Chief executive Coordinating director
Asokwa Municipal Assembly	Chief executive Coordinating director
Kwadaso Municipal Assembly	Chief executive Coordinating director
Oforikrom Municipal Assembly	Chief executive Coordinating director
Suame Municipal Assembly	Chief executive Coordinating director
Tafo Municipal Assembly	Chief executive Coordinating director
Afigya Kwabre North District Assembly	Chief executive Coordinating director
Afigya Kwabre South District Assembly	Chief executive Coordinating director
Atwima Kwanwoma District Assembly	Chief executive Coordinating director
Atwima Nwabiagya North District Assembly	Chief executive Coordinating director
Atwima Nwabiagya South Municipal Assembly	Chief executive Coordinating director
Bosomtwe District Assembly	Chief executive Coordinating director
Ejisu Municipal Assembly	Chief executive Coordinating director
Juaben Municipal Assembly	Chief executive Coordinating director

Kwabre East District Assembly	Chief executive
<i>Agence Française de Développement</i>	Coordinating director
(Observer only)	Country director
	Local project officer

Composition of the steering committee

The steering committee validates key decisions for the project from a political level. It is therefore composed of the regional minister and the chief executives from all the MMDAs of the area, and their coordinating directors. The committee acts like a board and needs a quorum of 1/3 to operate. The committee is chaired by the Regional Minister, the honourable Simon Osei-Mensah, and co-chaired by KMA Chief Executive, the Honourable Samuel Pyne.

7.1.3 Technical committee

The technical committee has a consultative role; thus no quorum is needed.

Institution	Position
Kumasi Metropolitan Assembly	Transport officer
	Planning officer
	Head of administration
Asokore Mampong Municipal Assembly	Transport officer
	Planning officer
Asokwa Municipal Assembly	Transport officer
	Planning officer
Kwadaso Municipal Assembly	Transport officer
	Planning officer
Oforikrom Municipal Assembly	Transport officer
	Planning officer
Suame Municipal Assembly	Transport officer
	Planning officer
Tafo Municipal Assembly	Transport officer
	Planning officer
Afigya Kwabre North District Assembly	Transport officer
	Planning officer
Afigya Kwabre South District Assembly	Transport officer
	Planning officer
Atwima Kwanwoma District Assembly	Transport officer
	Planning officer
Atwima Nwabiagya North District Assembly	Transport officer
	Planning officer
Atwima Nwabiagya Municipal Assembly	Transport officer
	Planning officer
Bosomtwe District Assembly	Transport officer

	Planning officer
Ejisu Municipal Assembly	Transport officer
	Planning officer
Juaben Municipal Assembly	Transport officer
	Planning officer
Kwabre East District Assembly	Transport officer
	Planning officer
Department of urban roads	Director
	Development engineer
Department of feeder roads	Director
Ghana Highways Authority	Director
National Road Safety Authority	Director
Motor Traffic and Transport Division	Director
Ghana Road Transport Coordinating Council	Chairman (Ashanti region)
Ghana Private Road Transport Union	Chairman (Ashanti region)
Agence Française de Développement	Urban Development & Transport Project Officer

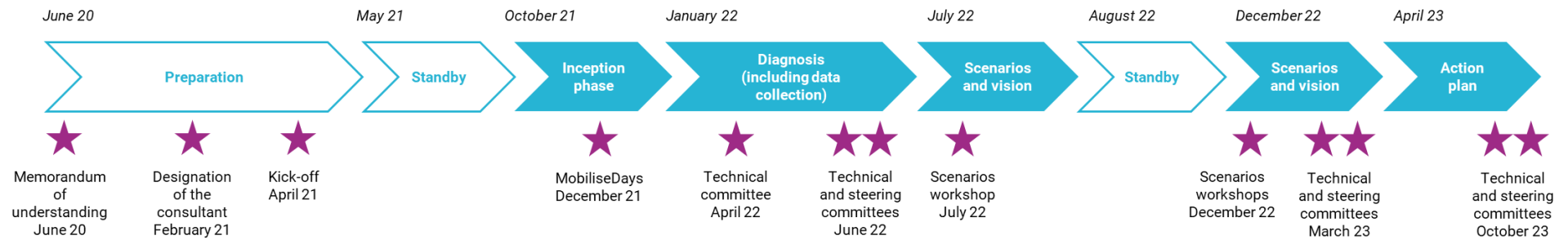
Composition of the technical committee

7.1.4 SUMP Taskforce

The SUMP taskforce is responsible of the daily follow-up of the process. The members are heads of departments or units of the KMA, two members of other assemblies, and one member of a governmental agency:

- Head of department of transport, KMA
- Administrative deputy director, KMA
- Metro Roads engineer, KMA
- Head of planning unit, KMA
- Head of department of physical planning, KMA
- Head of department of transport, Oforikrom Municipal Assembly
- Head of department of transport, Ejisu Municipal Assembly
- Head of development, Department of Urban Roads (Ashanti office)

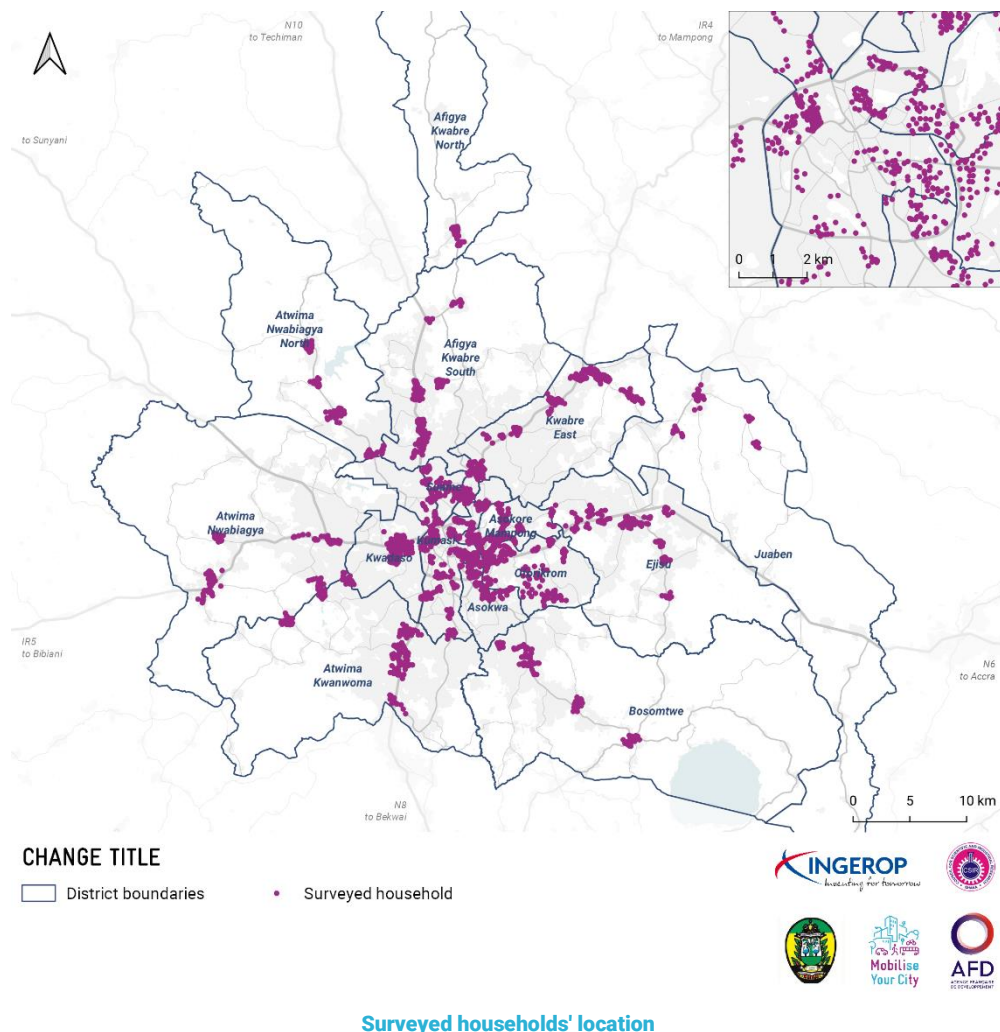
7.2 Timetable of SUMP development



7.3 Data collection methods

7.3.1 Household mobility survey

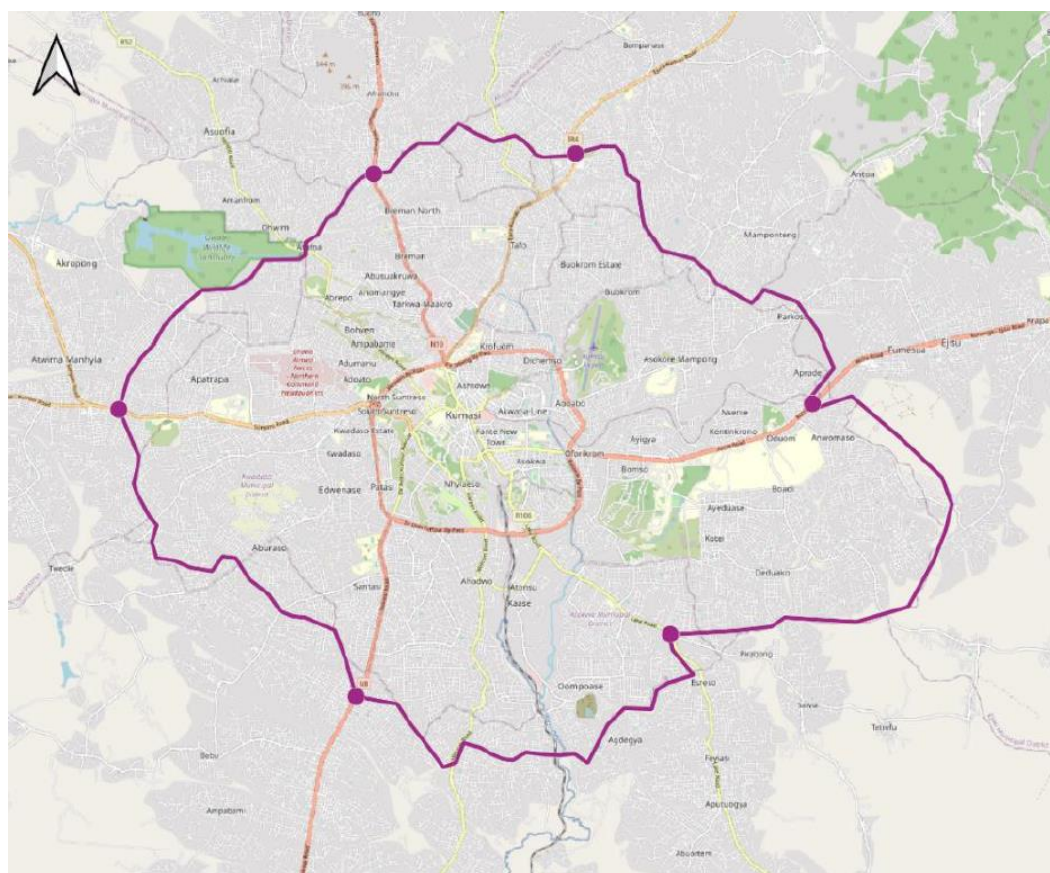
A household mobility survey was conducted in the Expanded Kumasi region in 2022. A household mobility survey involves visiting households and asking people about their mobility habits. First, a pilot collection of 77 households and 144 persons was organized to ensure data reliability. During this phase, a group of 37 enumerators was trained during 2 sessions and a pilot survey was conducted, to certify the correct application of the data collection instrument (mobility forms). The following phase consisted in refining the questions, in terms of quantity and comprehension, resulting in their final form.



The mobility survey was composed of 2,098 households, totalling 4,619 people above 12 years old. The number of households surveyed was proportional to the population of each survey area. Gender balance was respected, with 54% of female respondents and 46% male. The interviewers were responsible for defining households' locations and contacting the participants. The locations of surveyed households are illustrated in the above map.

7.3.2 Cordon line survey

This survey aims to complement the household survey, aiming at addressing mobility patterns which could not be perceived in the household survey. The objective is to determine mobility characteristics of transit flows through the study area, including trucks. The proposed cordon forms a belt around the dense urban area and vehicles were stopped at strategic points, with the assistance of the police, to be interviewed about their trip. Information such as origin, destination, purpose of the trip and the car occupancy and type of vehicle were noted. The vehicles were surveyed during the morning peak period (7am-10am) along major arteria entering the city and on the way towards the Central Business District (CBD). Each surveying point was accompanied by traffic counts to determine the actual surveying rate and therefore build representative data.



Cordon line survey points

7.3.3 Focus groups

The focus groups discussions were proposed as a qualitative approach to understand mobility patterns in the perimeter. Moderated by a sociologist, these discussions consisted of gathering 12 volunteer participants per group around a table to collect their personal perceptions towards specific topics. A profile variation was prioritized when inviting the participants to integrate the panels. The proposed discussions and the respective panel composition were:

- **Discussion 1: Paratransit and collective transport.** Were invited public transport riders (respecting gender balance); trotro, shared taxis, and pragia drivers. Jobs related to transport offer are mainly seen as a male role, in this manner, any female driver was identified.

- **Discussion 2: Gender issues in mobility.** This panel was 100% composed by women. Participated public transport riders with varied ages, trotro mates, women travelling long distances by foot, and women travelling accompanied by someone (elderly people, children, or any other related who needs assistance to travel).
- **Discussion 3: Mobility in suburban/rural communities.** There was no precision on this panel composition, but volunteers were elected respecting gender, socio-economical class, and age equity.
- **Discussion 4: Trading activities and mobility in the CBD.** Panel configuration aimed at having traders' unions, traders with shop extensions, street hawkers, people walking for long distances in the CBD, public transport riders, and traders from informal market. Gender balance was taken into account.
- **Discussion 5: Providing transport services to the vulnerable.** Were invited people working on disabilities Non-Governmental Organisations (NGOs), elderly, and physically impaired people. Gender balance was taken into account.
- **Discussion 6: Mobility to and inside the Kwame Nkrumah University of Science and Technology (KNUST) campus.** The University panel counted on students, lecturers, third-party team, and administrative employees. Gender balance was taken into account.

All the discussions were transcribed and analysed afterward (verbatim method).

7.3.4 Public transport terminals survey

The objective of the public transport terminals survey is to complement the ROM Transportation Engineering Ltd. survey data in terminals of the expanded Kumasi area. Data at terminals of the outer assemblies of the Expanded Kumasi (except Ejisu/Juaben), which were not covered by ROM, were collected. The proposed survey consisted of a census of the routes originating from the station: origin, destination, major intermediate stops and approximate frequency (peak and off-peak). The surveyed stations were:

MMDA	Stations
Bosomtwe	Kuntense and Aputuogya
Atwima-Kwanwoma	Kotwi; Twedie, Trede; Foase, and Atwima Boko
Atwima-Nwabiagya	Nkawie and Abuakwa
Atwima-Nwabiagya North	Barekese, Asuofia, and Akropong
Afigya-Kwabre South	Kodie and Atimatim
Afigya-Kwabre North	Boamang; Ahenkro, and Denase
Kwabre East	Aboaso; Mampong, and Asonomaso Nkwanta

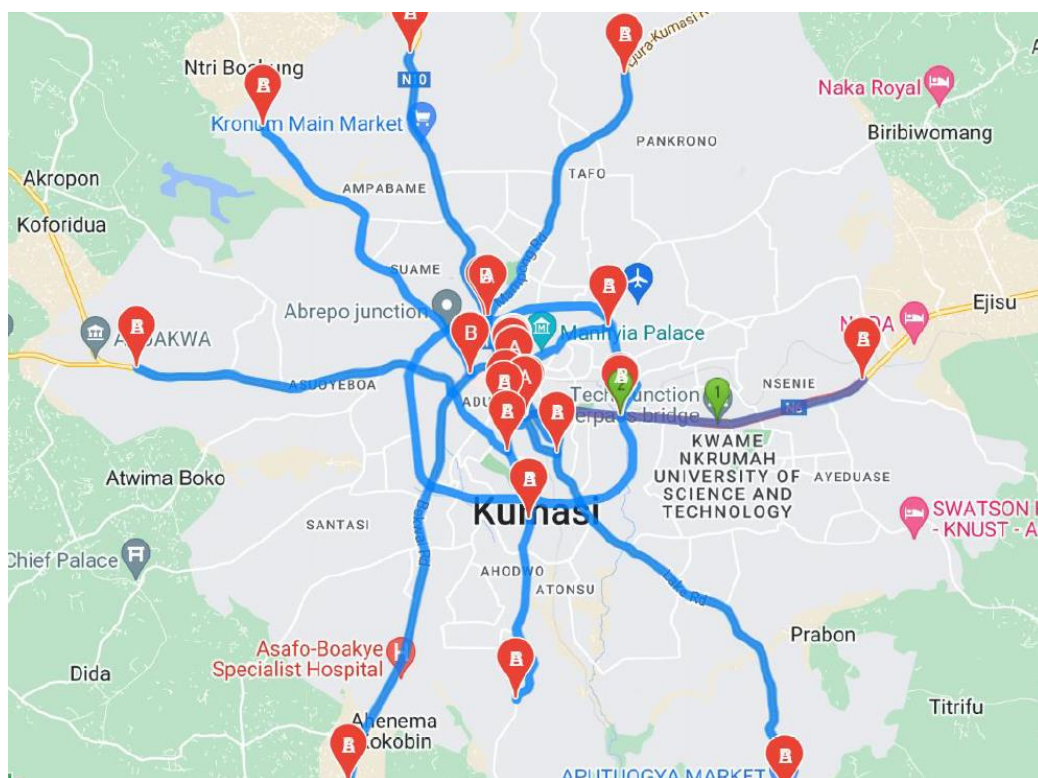
Identified stations for the public transport terminal survey

7.3.5 Directional traffic counts

Directional traffic counts will serve future stages of SUMP elaboration. It was proposed to hold directional traffic counts at the same location and time as the air quality measures. One exception is made for Kejetia roundabout, where the level of congestion forbids any representative traffic count. Traffic counts were made during the morning peak period (6am-9am) and evening peak period (4pm-7pm) of one representative day (Tuesday, Wednesday, or Thursday). Video graphic technique (cameras) was used in recording the movements, and the analysis of the videos were man-made.

7.3.6 Travel time survey

This survey aimed at identifying traffic difficulties (slow travel speeds, differing travel speeds between peak and off-peak hours) and travel times. From the data, it is possible to assess transport accessibility, have a clearer idea of traffic conditions on major routes, precisely determine peak periods, and traffic variability. These were conducted with the tool “InMobility” developed by INGEROP, which uses Floating Mobile Data for travel time measurements. Floating Mobile Data (FMD) tracks the GPS locations of mobile phones which are on-board vehicles⁹. The data obtained from these measurements is particularly relevant due to their accuracy and reliability of sources, which greatly reduces bias in processing the information collected. However, only the private car mode can be detected with this methodology, which does not include other vehicles such as the trotros. Measures were made during an entire week, every hour during off-peak periods, and every 15 minutes during peak periods (6-9am, 3-6pm).



Travel time survey perimeter

⁹ From the household survey, 92% of people who have access to a private car on a regular basis possess a cell phone with internet access, guaranteeing a very good sampling of the vehicles on the road network.

7.3.7 Air quality survey

Air quality measures were undertaken at strategic congestion spots around the city. The identified areas were Kejetia roundabout, Anloga junction, and Suame roundabout. The following indicators were measured:

- Air Quality Index (AQI) for Anloga junction and the first four days of the Kejetia roundabout survey.
- PM2.5 concentration.
- Total Volatile Organic Compounds concentration (TVOC).
- Carbon dioxide concentration.

Data collection was carried out using the BLATN Smart 128s Portable Air Quality Monitor, BOSEAN MOESAPU Air Quality Detector and the PCE-RCM 16 Air Quality Detector. The air quality measurements were carried out within 5 metres from the road pavement at Kejetia Roundabout, Anloga Junction, and Suame Roundabout. The instruments were placed on a tripod stand of 1.5 metres from the ground level to monitor the air quality.

The surveys were made during an entire week (Monday-Sunday) for each spot, during both the morning and evening peak periods (7am-10am, 4pm-7pm) each day. For Kejetia roundabout, data collection began on 28th March, but on 31st March, due to equipment failure, measures were interrupted, being completed later between 29th April to 1st May. At Anloga Junction, data collection took place between 4th May and 10th May. Finally, At Suame Roundabout, data collection took place between 4th May and 10th May.

7.4 Participation summary

7.4.1 MobiliseDays

The MobiliseDays had a kick-off effect for the SUMP process. This event managed to gather stakeholders from various sectors, from transport operators to local politicians, passing by business associations. The media coverage allowed to raise awareness of the project in the civil society. The event was held on November 30th and December 1st at the Miklin Hotel in Kumasi.

The attendees showed great interest in the topic and the presentations, reflecting in the quality of the interactions held during the program, for example during the brainstorming session. Stakeholders seemed willing to learn more about the project and be associated with the process. The event also emphasized the importance of political support to the project.

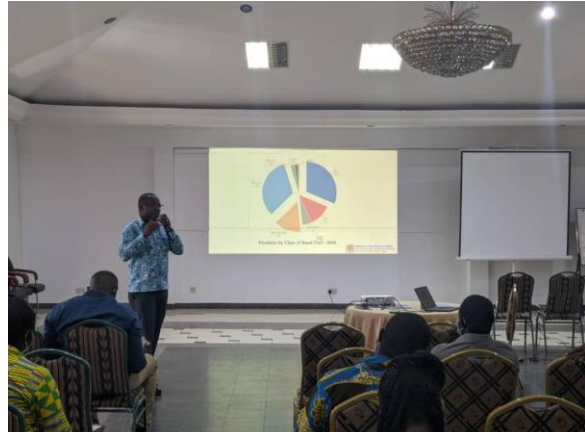
Several lessons were learned during the program, the main ones being:

- Education and enforcement are key to improving mobility conditions on roads.
- One of the main issues to be met in the plan implementation will be the commitment to the project by citizens due to cultural habits and mindset: how can we trigger the change in mobility habits?
- Detailed data collection is tremendous to understand mobility habits and the process should be data-driven.
- Stakeholders involvement and support is key for the future of the project
- Gender is a sensitive topic and should be looked at carefully in the plan to promote gender-inclusive mobility measures and narrow the gender gap.
- A proper BRT system is seen as a good option for the Greater Kumasi, but financing will be an issue
- Technical stakeholders and citizens sometimes fear that the plan will not be implemented.

These lessons will be included in the diagnosis, which is to be carried out, as well as all the comments during the presentations and all the ideas given during the brainstorming. The definitions of scenarios will also be done with regard to the ideas of measures given during the program.

The program gave new inputs to the study or confirmed pre-identified issues and ideas. The high interest of the attendees and the quality of the interactions, as well as the numerous ideas of measures identified, are encouraging for the development and implementation of the plan and its viability in the future.

The attendance of local politics shows a political wish to trigger the change in mobility practices and is a sign of desire to lead and implement the SUMP in the future. The presence of international cooperation institutions (European Union, French Embassy, World Bank, Agence Française de Développement) is also a great sign of desire to help and fund projects which will outcome the SUMP preparation process.



Pictures of the MobiliseDays

7.4.2 Institutional stakeholders participation

50 bilateral interviews were conducted during the components one, two, and three of the SUMP preparation. The scenario building process encompassed a workshop with the taskforce, but also a workshop for each MMDA, held in December 2022 and January 2023.

Four technical committees and three steering committees are scheduled, among which three technical committees and two steering committee were already held. The following table summarises the committees, their purpose, and their expected (or effective) time date. It must be noted that many invitees were missing at the first steering committee, which aimed to validate the diagnosis. Therefore, this political validation was postponed to steering committee 2, held in March 2023.

Regular meetings are organised with the taskforce. In particular, these meetings take place at the start of each on-site mission to present the detailed planning of the week and introduce new members of the team if necessary.

A major taskforce meeting was held in July 2022, aiming to set and prioritise goals and objectives, as well as identify and select measures. This workshop was coupled with the capacity building session 3.1 “Scenarios building and assessment”. The conclusions of this workshop are summarised hereafter.

Each attendant was invited to write 3 to 5 objectives on separate papers which she/he thought to be the most important ones regarding mobility in the Expanded Kumasi. Once the papers collected, they were displayed on a board and categorised in real time into thematic classes. Most objectives were cited multiple times, showing a common understanding of the objectives, both between participants and between participants and the consulting team.

During the session, the objectives were then simply grouped in categories to make the following preliminary objectives list:

- Improve urban safety, pedestrian and non-motorised transport conditions and road safety
- Enhance the public transport system
 - Efficiency of the existing system
 - Improvement of accessibility
 - Massification of the transport system
 - Improvement of security onboard and at terminals
 - Improvement of intermodality
- Improve the institutional framework and revenues
- Improve traffic and parking conditions, especially in the CBD
- Enhance the regulation and enforcement systems
- Improve sustainability of transport and its externalities on the quality of life
- Educate the public about mobility issues
- Change the infrastructure basics to accommodate better all modes and activities

Then, each attendant was invited to write several measures on separate papers to attain the objectives identified during the previous brainstorming session. Once the papers collected, they were displayed on a board and categorised in real time into thematic classes. It is important to note that one measure can

have an impact on several objectives. As for the objectives, many measures were cited by multiple participants.

The measures can be split in 8 categories:

- Pedestrians and non-motorised transport
 - Design of streets and infrastructure
 - Coexistence with commercial activities in the CBDs
 - Pedestrian-only areas
- Transport offer
 - Bus Rapid Transit/Mass Rapid Transit
 - Improvement of terminals
 - Reorganisation of the existing network
- Parking policies and infrastructure
 - Park and ride systems
 - Parking infrastructure in the CBD
- Institutional and educational
- Traffic conditions
 - Signalisation and coordinated traffic management
- Infrastructure (road network)
- Regulation and enforcement
- Data

After this exercise, some of the measures were transcribed on maps of the Kumasi area at different scales, to detail some of the measures regarding their locations and extensions.



7.4.3 Media coverage

Several media releases have been organised. The main first one was for the MobiliseDays, where the press was invited, which had a kick-off effect for the SUMP and allowed to raise awareness on the project by the citizens. 7 media covered the event:

- Leaky News (online news)
- Ghana News Agency
- Oyerepa (radio news)
- TV3 (TV news)
- City TV/FM (TV news, radio news, online news)
- Daily Guide (newspaper)
- Daily Graphic (newspaper)

The following press releases are available online:

Stakeholders discuss 'Sustainable Urban Mobility Plan' for Greater Kumasi

By GNA - Nov 30, 2021



Ghana News Agency

Stakeholders discuss 'Sustainable Urban Mobility Plan' for Greater Kumasi

<https://newsghana.com.gh/stakeholders-discuss-sustainable-urban-mobility-plan-for-greater-kumasi/>



SUMP-Greater Ksi: "Don't Allow Your Political Project"- Ing Atta Poku To Sam Pyne

December 1, 2021 · Enoch Akonnor · Comment(0)

Kumasi City Mayor Hon Sam Pyne has said he will ensure that the newly established (the Kumasi) Project delivers its mandate effectively and objectively.

Leaky News

SUMP-Greater KSI: "Don't allow your political influence to downplay benefits of the project"- Ing Atta Poku to Sam Pyne

<https://leakynews.net/sump-greater-ksi-dont-allow-your-political-influence-to-downplay-benefits-of-project-ing-atta-poku-to-sam-pyne/>

KMA to introduce Rapid Transit System

by Fati Aminu Ibrahim · November 30, 2021 · Reading Time: 2 mins read



Share Share Share

As part of efforts to reduce traffic congestion within the Kumasi Metropolis and other a

Citi TV-Citi FM

KMA to introduce Rapid Transit System

<https://citinewsroom.com/2021/11/kma-to-introduce-rapid-transit-system/>

TW news, radio news, and offline newspapers could not be collected.

A radio program was organised on February 9th, 2022, from 6:50 to 8:10 am, on “Luv FM 99.5”. The program, part of the morning talk-show, was entitled “A conversation on the sustainable urban mobility plan for the Greater Kumasi area”.

The program consisted of an interview of members of the consulting team (Dr. Williams ACKAAH (BRRI) and Simon LAVOINE (INGEROP)) by the presenter on mobility related topics, and then an open questions/remarks session from listeners who could call the radio station and express their idea on air. Randy WILSON (KMA) was unfortunately unable to attend the program but had the opportunity to talk briefly during the remarks session.

The participation turnout was good, with too many people calling the station regarding the time slot allocated. This showed a great interest from the citizens towards mobility.

The audio extract is joined in appendix.



Figure 91: Miniature of the radio program

The media was also invited to the second steering committee meeting, organised in March 2023. The following media covered the event:

- Asaase Radio
- Ghana Times
- Oyerepa TV
- Multimedia Group (MyJoy)
- City TV/FM
- Angle FM

The following media releases were gathered:

- <https://www.myjoyonline.com/kumasi-authorities-develop-plan-for-sustainable-urban-mobility/>
- https://www.youtube.com/watch?v=SJGZ9-4daul&ab_channel=JoyNews
- https://www.youtube.com/watch?v=S23SsFwlt0&t=6s&ab_channel=CitiTube
- <https://hbtvghana.com/kumasi-authorities-develop-plan-for-sustainable-urban-mobility/>

The media were also invited to the third steering committee meeting and closing ceremony. The following covered the event:

- Ghana News Agency

- Asaase Radio
- Citi TV/FM
- Angel TV/FM
- Daily Guide
- Otec FM

The following press releases were gathered:

- <https://www.asaaseradio.com/kumasi-urban-mobility-plan-promises-relief-from-traffic-congestion/>
- <https://gna.org.gh/2023/10/kumasi-gets-sustainable-urban-mobility-plan/>
- <https://www.dailymailgh.com/kumasi-initiates-sustainable-urban-mobility-plan-to-tackle-traffic-woes-improve-transportation/>
- <https://ghstandard.com/sustainable-urban-mobility-plan-approved-to-ease-congestion-in-kumasi-and-periphery/1837/>
- <https://www.mylibertynews.com/kumasi-gets-sustainable-urban-mobility-plan/>



Kumasi authorities develop plan for sustainable urban mobility

Source: Clinton Yeboah

Mon Apr 24 2023 15:49:5



The effective implementation of the sustainable mobility project in Kumasi is expected to help control the rapid urbanisation and population growth of the city.

Ghana's second most populated city is faced with severe traffic congestion and road safety issues due to overreliance on low-capacity passenger vehicles and poor road systems.

Media releases extract after the second and third steering committee meetings

7.4.4 Citizens participation

The household mobility survey was a major campaign of data collection of the study. It consists in coming into households and asking people about their mobility habits. It is a major tool in population consultation and information gathering.

The survey aims to give clear insights on mobility habits, opportunities, constraints, etc. Its extent was around 2 100 households, for which each member above 12 years old will be surveyed. The spatial division of the territory follows boundaries of the MMDA constituencies, with a subdivision in sub-metros for Kumasi Metropolitan.

The survey was disaggregated by gender and included questions about disabilities, resources, and education in order to capture mobility issues related to these topics. The demographic form contained an important part on mobility opinions, with questions asked such as:

- How do you go to your main activity (most often)?
- If you use a car, why (main reason)?
- If you use a car, do parking issues restrain your using a car?
- If you don't use a car, what is the main reason you chose your mode instead of another public transport mode?
- Would you be interested to shift to a new bus system (BRT)?
- Do you have mobility issues related to the cost of travelling?
- What are your main important expectations on mobility (rank from 1 to 5, 1 being the least important and 5 being the most important)?
- Do you feel safe in public transport?
- If no, why?
- Have you ever been victim of violence while travelling (physical assault, verbal abuse, harassment, etc.)?

This helped to capture the opinions of the citizens on mobility with a declarative method, which could then be cross-checked with non-declarative deductions issued from cross analyses of the other parts of the survey.

Focus group discussions are a good way to consult and collaborate with citizens. Most of the participants were chosen randomly to avoid any bias which could have happened with a precise selection. The participants had to match some criteria to ensure the good targeting of the group.

The groups were as followed:

- Group 1: Paratransit and collective transport
- Group 2: Gender issues in mobility
- Group 3: Mobility in suburban/rural communities
- Group 4: Trading activities and mobility in the Central Business District
- Group 5: Providing transport services to the vulnerable
- Group 6: Mobility to and inside KNUST campus

7.5 Long list of potential measures

1	Non-motorised conditions improvement	1.1	Development of quality sidewalks
		1.2	Shared bicycle system in KNUST campus
2	Traffic conditions and safety improvement	2.1	Urban safety and living environment
		2.2	Traffic management in the city centre
		2.3	Centralised traffic management system
3	Road network development	3.1	Inner ring road dualization
		3.2	Development of critical link roads
4	Parking offer management	5.1	Development of on-street parking
		5.3	Multi storey car park
5	Public transport enhancement	5.0	Restructuration of the public transport network
		5.1	Development of Bus Rapid Transit
		5.2	Development of Quality Bus Services
		5.3	Development of Quality Trotro Services
6	Institutional arrangements	6.1	Creation of a transport authority and enforcement
		6.2	Integration and regulation of prajia
		6.3	Parking fining system
		6.4	Periodic capacity building for stakeholders and civil society

[Summary of the SUMP actions](#)

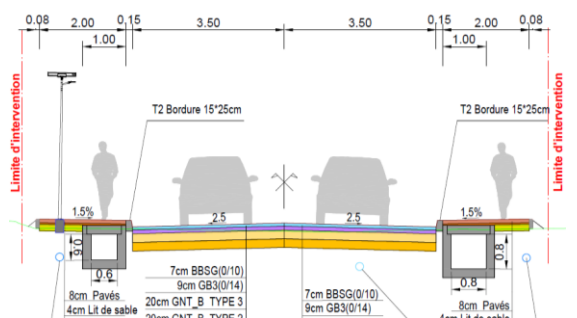
ACTION 1.1: DEVELOPMENT OF QUALITY SIDEWALKS NMT

Description

An extensive sidewalk development and renewal program will be carried out to provide quality infrastructure for pedestrians. This program will also provide drainage and street lighting infrastructure. When necessary, a re-asphalting of the carriageway is also included. It will cover 100km.

These sidewalks should be free of any encroachment, illicit parking, or other undesirable inconvenience. They should be clearly separated from the carriageway (curb, height difference, pavement difference). A minimum width of two meters (more in high pedestrian intensity areas) free of any furniture must be retained.

This program will also provide drainage infrastructure along each built or renewed sidewalk. The drainage infrastructure should be efficient enough to absorb rainy season stormwaters and prevent the street from flooding. The gutters should be covered by concrete slabs to avoid any tripping hazard. Lighting will also be included, by providing lighting poles and associated infrastructure along each built or renewed sidewalk. The lighting should emphasize on clear visibility for pedestrians for safety and security purposes.



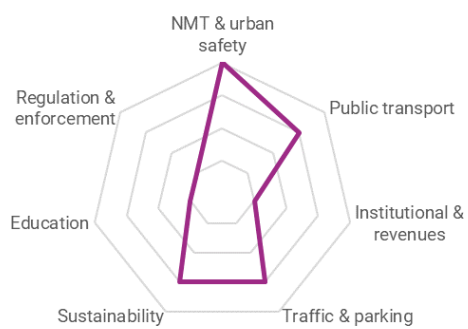
Cross-section of a road with sidewalks (INGEROP)



Quality sidewalks in Zanzibar, Tanzania (ITDP)

Targeted objectives


This action aims to address unsafe conditions for pedestrians identified in the diagnosis, for example, high road accidents for pedestrians in the evening time. Positive effects of this measure are expected on sustainability (promoting NMT); traffic & parking; and general urban comfort and safety.





Level of priority ✓✓✓




Features included

- Quality sidewalks on both sides of the carriageway
- Street lighting
- Drainage infrastructure (covered gutters)
- If necessary, re-asphalting of the carriageway
- Necessary studies


Investment cost		Funding
 <p><u>Costing includes:</u> Sidewalks along 100km of road Associated drainage infrastructure Associated lighting If necessary, re-asphalting of the carriageway Necessary studies TOTAL: 720 M€ (120 M\$)</p>	MMDAs' URD (local roads) or DUR (other roads) MMDAs' URD (local roads) or DUR (other roads) MMDAs' URD (local roads) or DUR (other roads) MMDAs' URD (local roads) or DUR (other roads) MMDAs' URD (local roads) or DUR (other roads)	

Implementing agency	
	MMDAs' Urban Roads Department (local roads) or DUR (other roads)

Operation costs	Operating mode
 <p>No operating costs (maintenance included in the current maintenance of the roads)</p>	Maintenance by the MMDAs (local roads) or DUR (other roads)

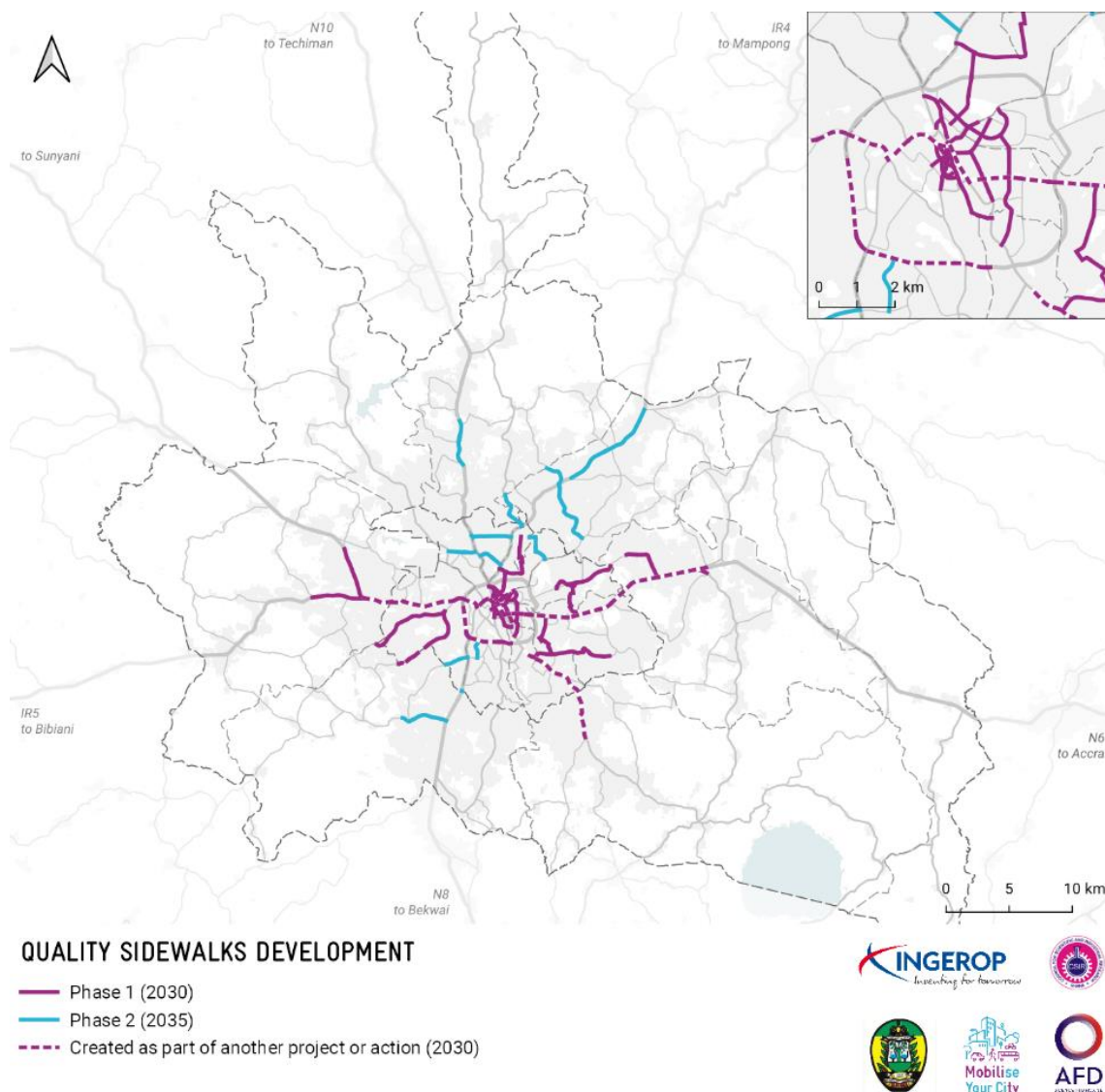
Feasibility constraints		
<p>Technical & environmental Competition for space from other road usages in the narrowest streets</p> 	<p>Social Potential impact on road commercial activities (stall traders, hawkers)</p> 	<p>Institutional -</p> 

Necessary previous actions	Necessary studies
Urban safety and environment improvement - Street design guidelines (action 2.1.A)	Detailed design for each stretch

Implementation phasing																																																																												
 <p>Though this action is a priority, the consequent financial investment doesn't allow a short-term implementation. Therefore, the program is phased through the short and medium terms to spread the investment costs over several years.</p>																																																																												
Calendar	<table border="1"> <thead> <tr> <th></th> <th colspan="2">Quick</th> <th colspan="6">Short</th> <th colspan="5">Medium</th> <th colspan="4">Long</th> <th rowspan="3"> <i>Continuous commissioning over time (stretch by stretch)</i> </th> </tr> <tr> <th>Year</th> <th>24</th> <th>25</th> <th>26</th> <th>27</th> <th>28</th> <th>29</th> <th>30</th> <th>31</th> <th>32</th> <th>33</th> <th>34</th> <th>35</th> <th>36</th> <th>37</th> <th>38</th> <th>39</th> <th>40</th> </tr> </thead> <tbody> <tr> <td>Phase 1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Phase 2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Quick		Short						Medium					Long				<i>Continuous commissioning over time (stretch by stretch)</i>	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Phase 1																			Phase 2																		
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Phase 1																																																																												
Phase 2																																																																												

Location and extent

Implementation is a priority in KMA CBD where pedestrians are most and conflicts with other users are common (shop extensions, hawkers, illicit parking, improvised public transport boarding and alighting, etc.). Then, works are phased to match the BRT and QBS implementations and guarantee a proper access to stations for pedestrians. BRT projects (action 5.1) and road infrastructure projects (actions 3.1 and 3.2) also includes the provision of quality sidewalks. Together with this program, they will cover 140km of roadway.



ACTION 1.2: SHARED BICYCLE SYSTEM IN KNUST CAMPUS

NMT

Description

A shared bicycle system will be implemented within the premises of Kwame Nkrumah University of Science and Technology. This system will allow users to rent a bicycle for a brief period of time (usually less than one hour) for a trip within the campus for an attractive fare. The bicycles can either be in free floating or dock-based:

- **Dock-based system:** bikes are picked from and returned to a station where they are electronically locked to a dock by the user
- **Free-floating system:** bikes are picked and returned wherever by the user in a delineated perimeter (the boundaries are electronically controlled)

The main advantage of the free-floating system is that it does not need infrastructure, therefore is less expensive and easier to implement, but raises more operation issues (incivilities, uncontrolled occupation of public space, maintenance), while the dock-based system is more expensive as it needs stations but enables easier operation.

Similar references can be found in Cairo and Kigali (dock-based) as well as in Nairobi’s UN campus (free-floating). Implementation is most often conducted through a form of public-private partnership.



Free-floating bikes in Nairobi (United Nations)



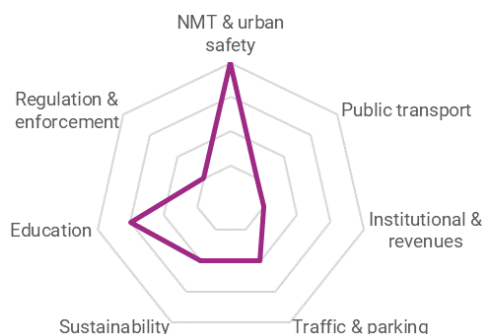
Shared bicycle users in Kigali (Xinhua)

Features included in the action

- Bicycle fleet
- If necessary, docking system
- Rental and payment mobile system
- Necessary studies

Targeted objectives


This action aims to provide an efficient alternative transport mode for KNUST users, considering the inadequate transport offer within campus (overcrowded shuttles, prohibited access of taxis, etc.). It also aims to raise awareness about mobility sustainability among the youth and introduce an alternative mode of transport.




Level of priority




Investment cost		Associated funding
 <p><u>Costing includes:</u> Studies TOTAL: 2 M€ (0.3 M\$)</p>	OfMA & KNUST	

Implementing agency
 <p>Oforikrom MA Department of Transport, in partnership with KNUST</p>

Operation costs	Operating mode
 <p>Not calculable – fully managed without public intervention</p>	Private operation without subsidies based on revenues from user fares or annex revenues (such as advertising)

Feasibility constraints		
<p>Technical & environmental Regulate of the parking of bicycles to avoid encroaching on the sidewalks </p>	<p>Social Possible social non-acceptance, needs intensive branding </p>	<p>Institutional Coordination with KNUST administration </p>

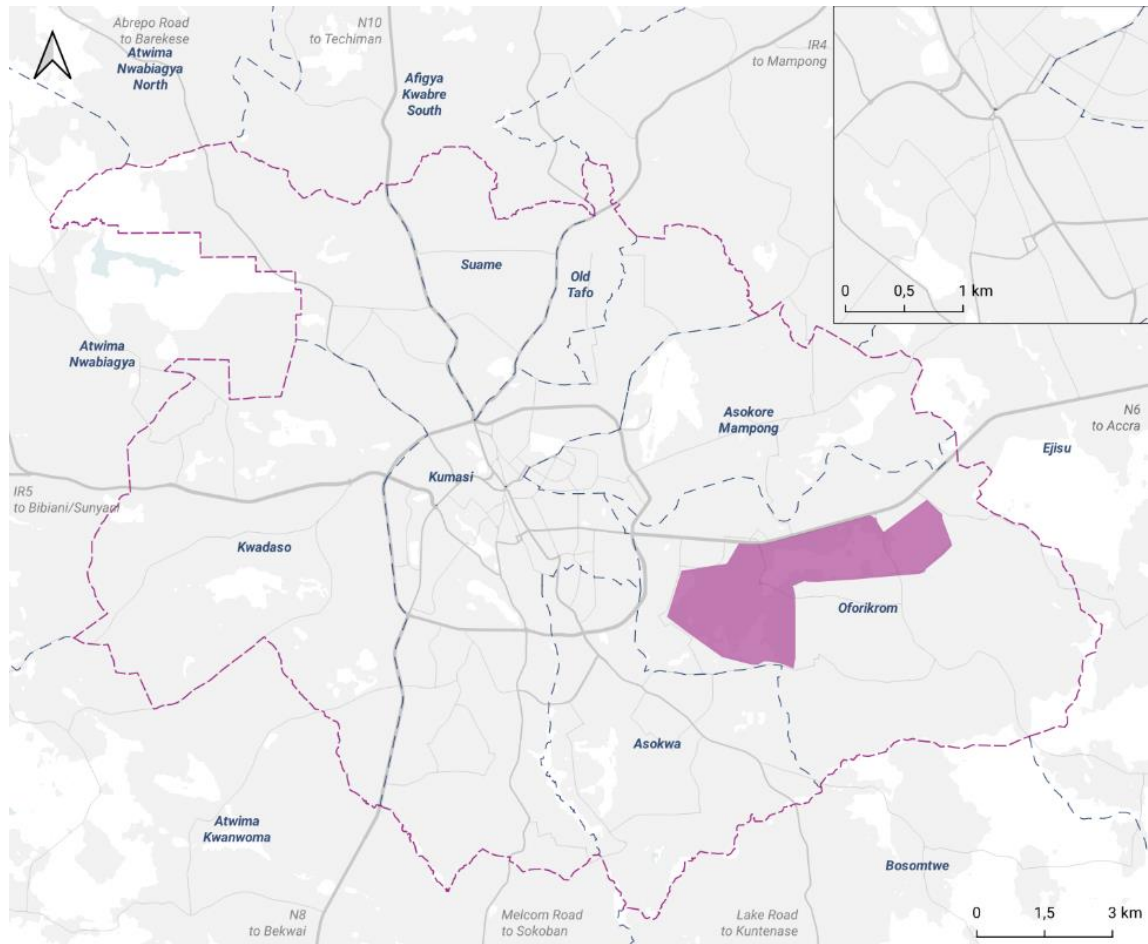
Necessary previous actions	Necessary studies
-	Feasibility study (delineation, choice between free-floating or dock-based), operator requirements and specifications

Implementation phasing																				
 <p>This action may not be as urgent as other ones, it is a quick win considering its very low implementing cost and low level of constraint. It may improve a specific issue and most importantly it will introduce alternative mobilities to the general public.</p>																				
Calendar		Quick			Short					Medium					Long					Commissioned in 2025
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
	Act. 1.2																			

Location and extent

The system will be developed within the premises of Kwame Nkrumah University of Science and Technology (KNUST), which is the main campus in the metropolis. The system will also cover the entering points of the campus (Tech Junction, Police Station roundabout, Ridge Road gate, etc.) to ensure intermodality with public transport systems.

The campus is well suited to experiment such a system as traffic is low and roads are in good condition. Most trips within campus are at biking distances and topography is limited.



SHARED BICYCLE SYSTEM

- Shared bicycle system
- Greater Kumasi
- District boundaries



ACTION 2.1: URBAN SAFETY AND ENVIRONMENT IMPROVEMENT

TRAFFIC

Description

This action encompasses several scopes, aiming at improving urban safety (especially for pedestrians) and rebalancing the share of urban space:

- 2.1.A: Development of urban street design guidelines:** these guidelines (to be applied to all road projects) will be adapted to the metropolis' specific context and will cover a wide range of types of streets (high-traffic wide arterial roads, residential roads, local roads with intense commercial activity, etc.). These guidelines will propose minimum widths and principles to prepare the ground for the implementation of "complete streets", catering for all modes (non-motorised transport, commercial activities, public transport, freight, private cars parking).
- 2.1.B: Extensive road safety program:** this program consists of implementing traffic taming measures (speed tables, better signage of limited speed areas, road marks, etc.) around sensitive areas (schools, markets, places of worship, etc.).
- 2.1.C: Provision of regulated commercial spots:** this program will offer traders delineated spots on the roadsides to carry on their activities without encroaching on the sidewalks and impeding with pedestrian and vehicular traffic. These spots are only areas with road markings to show the exact allowed extent of the stall. Enforcement (action 6.1) will be key to success.



Safe pedestrian crossing on a speed table (ITDP)



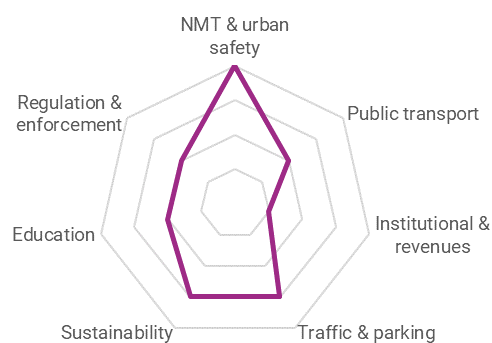
Regulated commercial area on the roadside (ITDP)

Features included

- Street design guidelines preparation
- Various traffic taming features: speed tables, signage, road marks, etc. in dense urban areas
- Delineation of dedicated spots for street trading


Targeted objectives


This action aims at improving urban safety, especially for pedestrians, by imposing a more adapted design of the streets, taming traffic around sensitive areas, and reducing the high encroachment of commercial activities on public spaces. It also aims at enhancing traffic conditions (with more segregation between modes) and enforcement (with clear delineations).






Level of priority




Investment cost		Funding
	Costing includes:	
	Guidelines preparation: 2 M€ (0.4 M\$)	DUR
	Traffic taming features: 59 M€ (10 M\$)	MMDAs' URD (local roads) or DUR (others)
	Delineation of trading spots: 15 M€ (2 M\$)	MMDAs' URD (local roads) or DUR (others)
TOTAL: 76 M€ (13 M\$)		

Implementing agency	
	2.1.A: DUR, in partnership with MMDAs URDs and DoTs, NRSA 2.1.B & 2.1.C: MMDAs URD (local roads), DUR (other roads)

Operation costs	Operating mode
 No operating costs	-

Feasibility constraints		
Technical & environmental Case-to-case solutions to find for the narrowest streets 	Social Necessary clear location plan of street traders and hawkers 	Institutional Possible negotiations with traders 

Necessary previous actions	Necessary studies
-	Commercial opportunity study (provision of commercial spots) and detailed design of road features (speed tables, crossings, etc.)

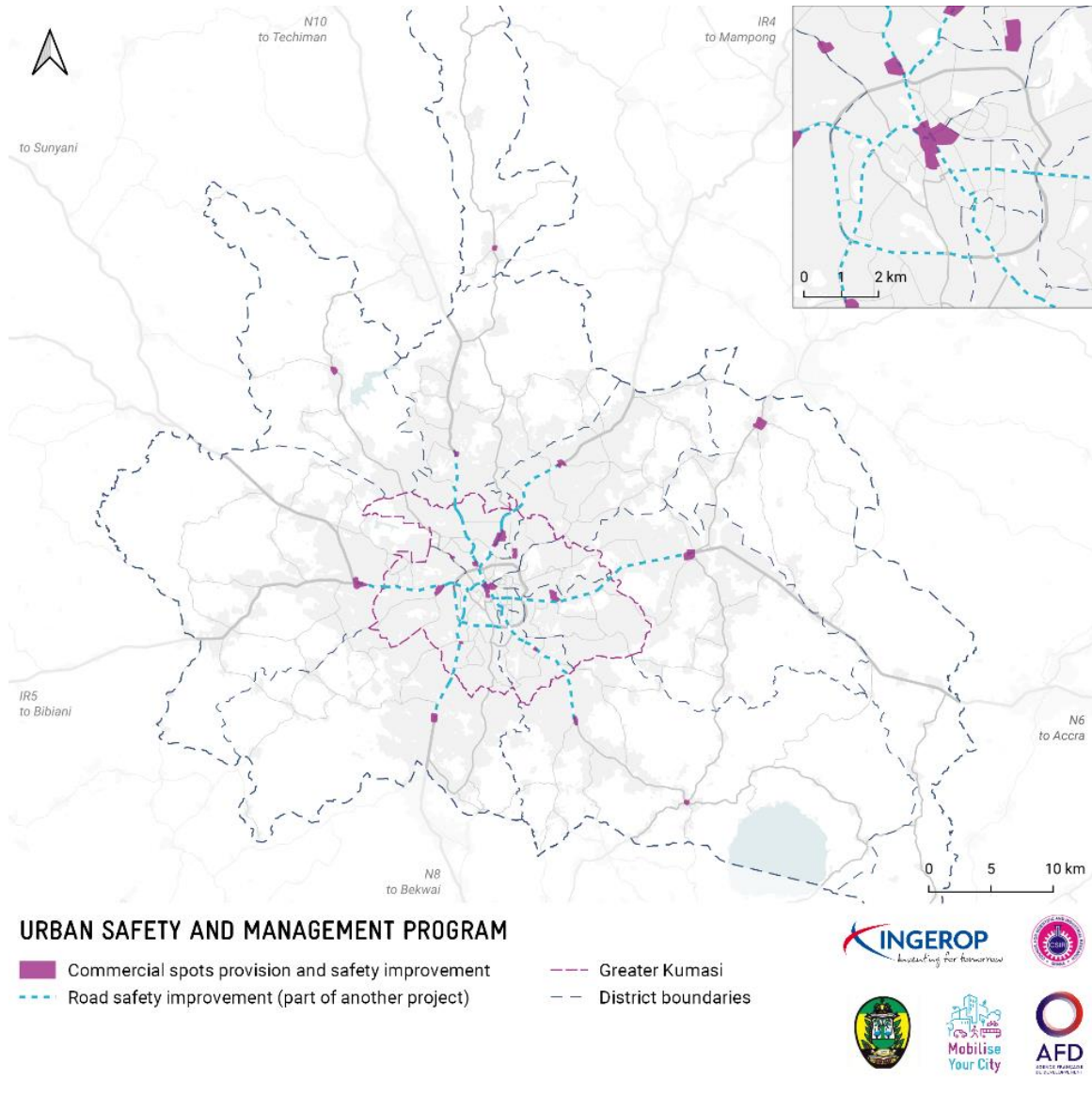
Implementation phasing																				
 The production of guidelines is the most urgent action of the SUMP as it is a prerequisite for many other actions and is very easy to implement, therefore is it a quick win. Road safety measures and commercial areas regulation are also urgent, but are less easy to implement, and therefore will be implemented through the short-term horizon.																				
Calendar		Quick			Short					Medium					Long					Approval of guidelines by mid-2024.
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
	2.1.A																			
	2.1.B																			
2.1.C																				

Location and extent

The guidelines will apply to all road projects within the Expanded Kumasi area.

The provision of commercial spots will be implemented in all CBDs of the area, where commercial activity is the most intense.

The road safety program will be in priority implemented in the same CBDs, as well as around areas with high pedestrian intensity. Moreover, road safety will be improved in other areas as part of other infrastructure projects (actions 3.1, 3.2, and 5.1).



ACTION 2.2: TRAFFIC MANAGEMENT IN THE CITY CENTRE

TRAFFIC

Description

A new traffic plan will be studied and implemented in the centre of the metropolis (Adum and Kejetia areas). This traffic plan will help to redistribute road space in urban streets receiving high pedestrian flows, intense commercial activities, and heavy vehicular congestion mostly due to misuses and behavioural patterns. It will also offer a better management of traffic flows thanks to a clearer space allocation (pedestrians on the sidewalks freed from encroachment, dedicated commercial frontages, forbidden parking, etc.). When road space is insufficient to provide suited spaces for pedestrians, commercial frontages, and public transport stops, as well as two ways for traffic, this plan may propose one-way streets to offer more space to other modes than vehicles. For the narrowest streets in the city centre, where pedestrians and commercial activities are the most, pedestrian-only malls can be considered.

This plan also encompasses the identification and improvement of critical junctions. Some of them will already be upgraded as part of other infrastructure projects (actions 3.1, 3.2, 5.1). These junctions will be improved to reduce congestion, but most importantly to provide safe crossings for pedestrians. Therefore, traffic lights will be preferred to roundabouts and interchanges as they provide better infrastructure for non-motorised transport and public transport.



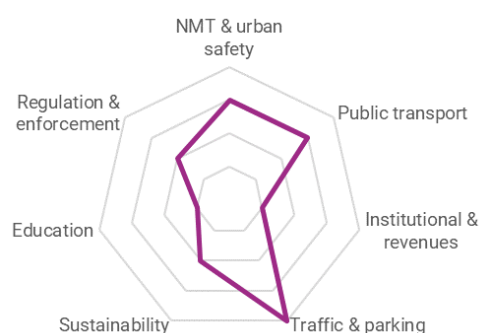
Best practice arterial junction (ITDP)

Features included

- City centre traffic plan preparation
- Signage to implement the traffic plan
- Improvement of critical junctions: rephasing of the existing traffic lights or implementation of traffic lights, including the necessary studies


Targeted objectives


Heavy congestion in Kejetia and Adum areas is mostly due to unregulated competition between urban functions in limited streets space, as well as behaviour issues from drivers. This measure aims to provide streets with a better space allocation, reducing congestion in the CBD and improving non-motorised transport conditions.







Level of priority




Investment cost		Funding
 <p><u>Costing includes:</u> Traffic plan preparation (including critical junctions identification and studies): 3 M€ (0.4 M\$) Improvement of 20 junctions (provision of traffic lights): 22 M€ (4 M\$) TOTAL: 25 M€ (4 M\$)</p>	KMA Metro Roads Department	
	DUR	

Implementing agency	
	<p>Traffic plan preparation: KMA Metro Roads Department, in coordination with DUR Improvement of junctions: DUR, in coordination with KMA Metro Roads Department</p>

Operation costs	Operating mode
 <p>200k\$ per year</p>	Operation and maintenance of traffic lights by the DUR (as of existing traffic lights)

Feasibility constraints		
<p>Technical & environmental Case-to-case solutions to find for the narrowest streets</p> 	<p>Social Potential impact on hawkers</p> 	<p>Institutional Possible negotiations with traders and shop owners</p> 

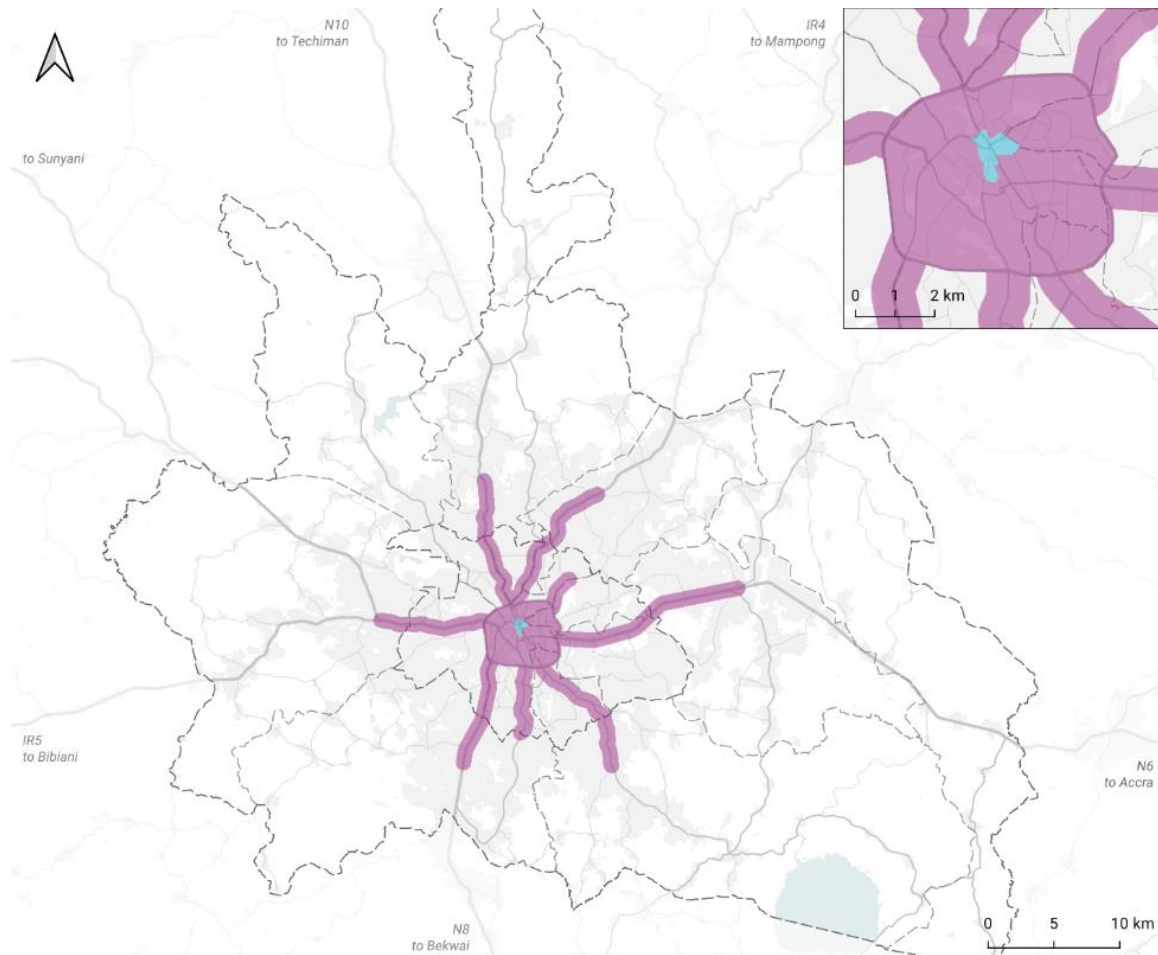
Necessary previous actions	Necessary studies
Urban safety and environment improvement – street design guidelines (action 2.1.A)	Wide traffic counts campaign in Adum and Kejetia, associated traffic plan and junctions design (lights phasing and detailed design)

Implementation phasing																			
	<p>The traffic management program in the city centre is urgent. Congestion in Adum and Kejetia areas impedes with public transport activities and triggers unsafe behaviours towards pedestrians. It also potentially hinders economic activity. Considering the relatively low constraints, mostly related to negotiations with traders who will have to respect the space allocated for them, this action will be implemented at the short-term horizon.</p>																		
		Quick		Short					Medium					Long					<p>Full commissioning in mid-2027</p>
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
	Plan																		
Junctions																			

Location and extent

This program is limited to the inner centre of the metropolis: Adum and Kejetia areas. These areas are the heart of the economic activity and the crossing point of all arterial roads and many public transport routes. Congestion is very heavy in this area, far worse than any other area of the metropolis.

Around 20 junctions will be improved (most probably new or renewed traffic lights) as part of this action. Other junctions will be improved as part of infrastructure projects (actions 3.1, 3.2, and 5.1).



TRAFFIC MANAGEMENT IN THE CITY CENTRE

- Perimeter of the traffic plan
- Perimeter of potential improved junctions



ACTION 2.3: CENTRALISED TRAFFIC MANAGEMENT SYSTEM

TRAFFIC

Description

A centralised traffic management system will be built and implemented, which will allow management of traffic lights throughout the metropolis from a single facility. The centre will allow operators and regulators to have an overview of all the traffic lights connected to the system in real-time and will enable to control them remotely in case of necessity (accident, unusual traffic, etc.). This process will help to improve the traffic flows when unusual situations are met.

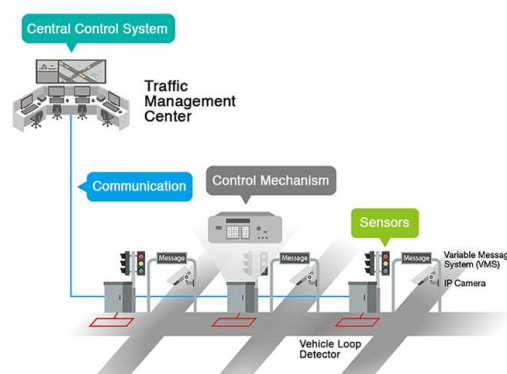
It also provides in real time information about the necessary maintenance of equipment, to enable fast repairs and continuity in the quality of service.

Finally, it is possible to use the system for automated enforcement or proof in litigious cases when accidents happen at junctions connected to the system. This can help enforcement and therefore improve road safety.

As traffic lights need to be compatible with the system to operate, the centre will be linked to the improved junctions (action 2.2) which will be provided of new compatible traffic lights. It will be implemented before the construction of other infrastructure projects (actions 3.1, 3.2, 5.1, and 5.2) so that their traffic lights can also be linked to the centre.



Centralised traffic management centre (ConstructionReview)



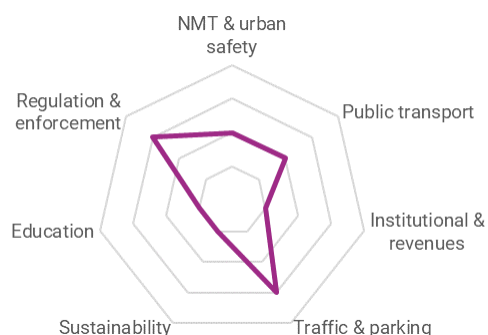
Principle of a centralised traffic management system (moxa.com)

Features included

- Construction of the traffic management centre
- Traffic regulation systems provision


Targeted objectives


This action aims to enhance traffic management, thus reduce the heavy congestion identified in the diagnosis, especially in the city centre and on the main arterial roads entering the city. It will also help enforcement thus improve road safety, which was identified in the diagnosis as key issues.



Level of priority




Investment cost		Funding
 <p><u>Costing includes:</u> Centralised system construction and equipment provision Necessary studies TOTAL: 7 M€ (1 M\$)</p>		Government of Ghana
		Government of Ghana

Implementing agency
 <p>DUR in partnership with KMA MRD</p>

Operation costs	Operating mode
 <p>50k\$ per year</p>	Operation by DUR on their annual budget

Feasibility constraints		
<p>Technical & environmental</p> <p>-</p> 	<p>Social</p> <p>-</p> 	<p>Institutional</p> <p>Necessary coordination with concerned assemblies</p> 

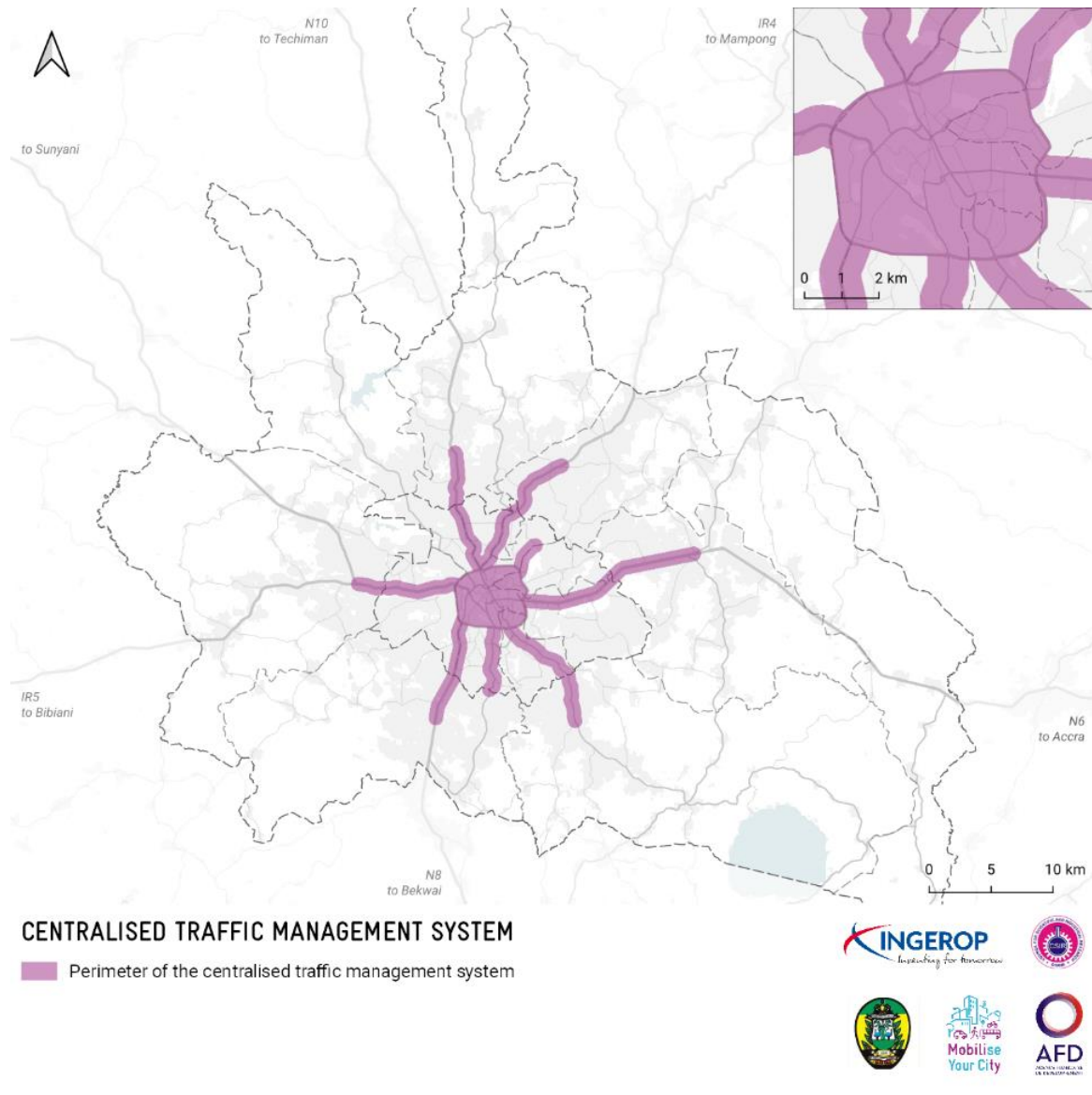
Necessary previous actions	Necessary studies
-	Feasibility studies of the centralised system (and related requirements for the provision of traffic lights as part as other projects)

Implementation phasing																				
	<p>Even though the centralised traffic management system is less urgent than other actions, it will still be of great benefit for a limited cost and with few implementation constraints. Moreover, it needs to be implemented before the first infrastructure projects (BRT, road development) which will be commissioned from 2030. Therefore, it will be implemented at the short-term horizon.</p>																			
		Quick			Short					Medium					Long					Commissioning in mid-2029
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
Act. 2.3																				

Location and extent

All traffic lights in the Expanded Kumasi area will be connected to the centralised system. As of today, traffic lights are found in Kumasi, Asokore-Mampong, Asokwa, Ejisu, and Suame constituencies.

More traffic lights will be added to the system with the actions 3.1, 3.2, and 5.1. The network of traffic lights will at the end of the day cover the city centre (inner ring road and within), as well as the main urban corridors, covered by BRT infrastructure.



ACTION 3.1: INNER RING ROAD DUALIZATION

ROADS

Description

The inner ring road belting the city centre of Kumasi is not dualized for a 6km-long stretch between Lake Road interchange and Sofoline interchange. This measure encompasses the dualization of this stretch and the provision of quality non-motorised and public transport infrastructure.

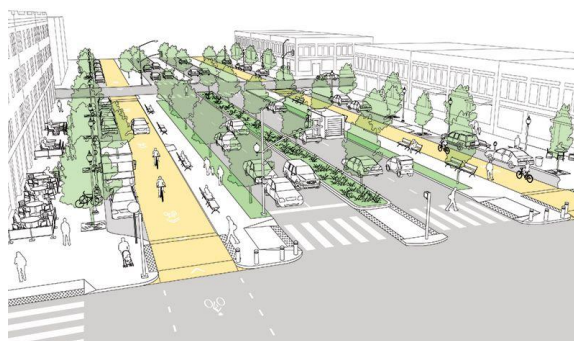
The last part of the inner ring road will be dualized in an already densely built-up environment. This means the road must be designed as an urban boulevard and cater for all modes, including non-motorised modes. Therefore, the road must include quality sidewalks (at least 2m wide on each side), street lighting and drainage, public transport stops, and if applicable bicycle lanes and parking bays.

The design can also include specific delineated areas for trading activities where commercial activity is observed today (e.g., around Santasi and Ahodwo roundabouts). The speed should not exceed 50km/h as it is in an urban area. Regular crosswalks potentially on speed tables should be provided.

Junctions will be managed with traffic lights as much as possible to offer safe and recurrent crossings for pedestrians.



Urban boulevard (National Association of City Transport Officials)



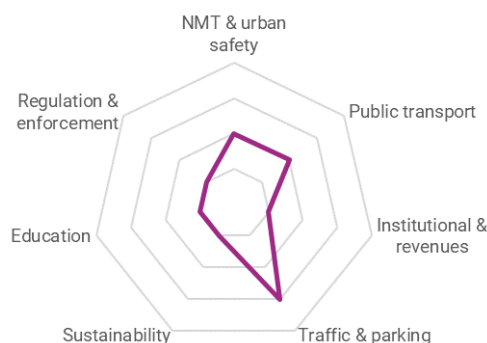
Typical cross-profile of an urban boulevard (ITDP)

Features included

- Extension of the existing single carriageway to a dual carriageway for 6km
- Provision of street lighting and drainage infrastructure (covered gutters)
- Provision of “complete streets” components: sidewalks, bus stops, etc.
- Implementation of traffic lights at junctions where it will be necessary
- Necessary studies


Targeted objectives


This action will help to tackle congestion due to the bottleneck formed by the single carriageway stretch of the inner ring road, thus improve travel conditions in the southwest quadrant of the city centre. It will also ease the operation of public transport in the area and therefore cut down travel times for passengers.






Level of priority




Investment cost		Funding
 <p><u>Costing includes:</u> Road infrastructure Street lighting, drainage Sidewalks, bus stops Traffic lights Necessary studies</p>		Government of Ghana
		Government of Ghana
		Government of Ghana
		Government of Ghana
		Government of Ghana
TOTAL: 129 M€ (22 M\$)		

Implementing agency
 <p>DUR (project already being developed by DUR)</p>

Operation costs	Operating mode
 <p>10 k\$ / km → 360 kGHS (60 k\$) per year</p>	Operation by DUR on their annual budget

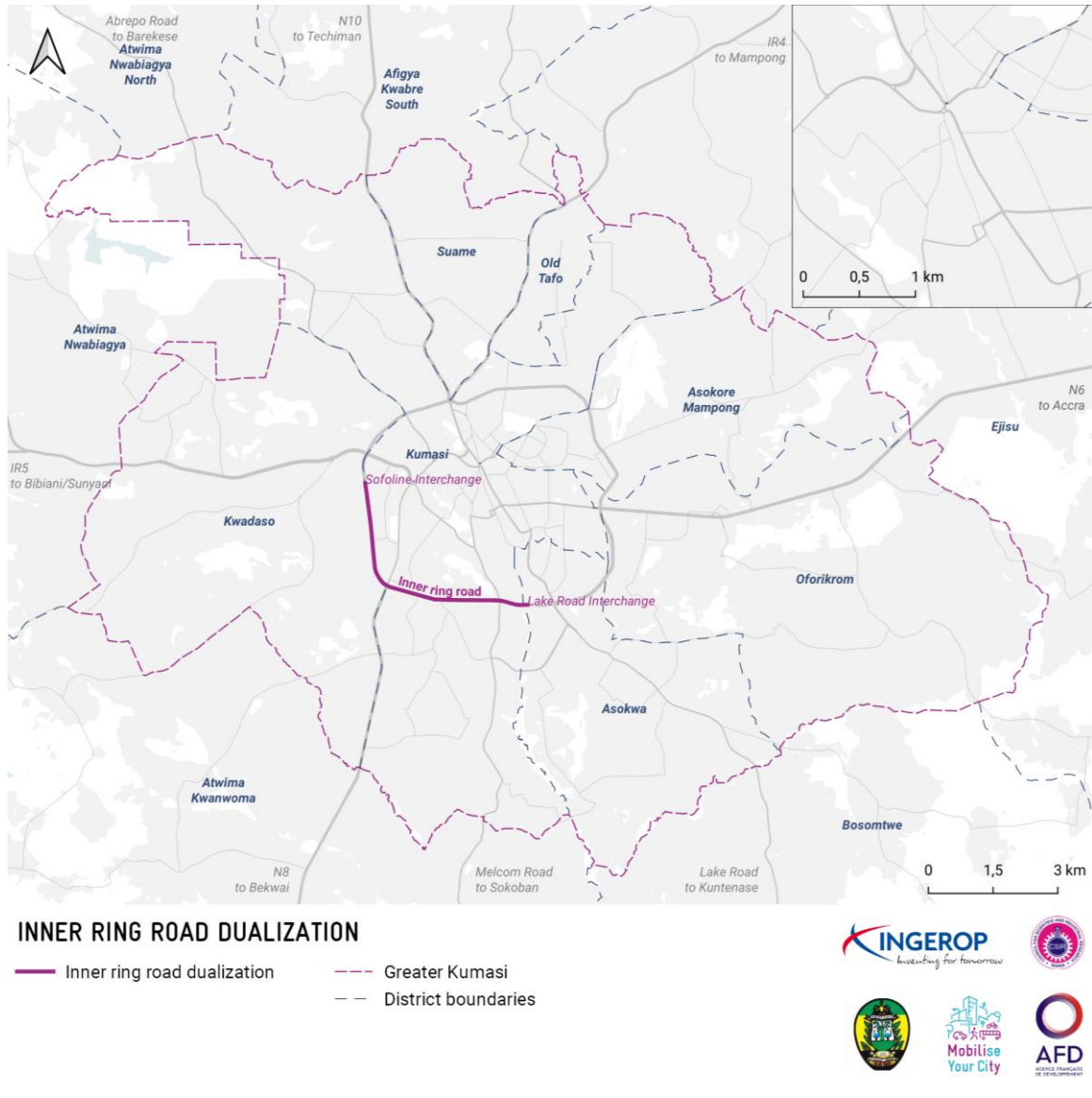
Feasibility constraints		
<p>Technical & environmental Possible negative impact on the environment due to waterproofing of the ground (widening of the road)</p> 	<p>Social Possible impacts on roadside residents (potential evictions) Possible impacts on street vendors along the road</p> 	<p>Institutional Possible land acquisitions</p> 

Necessary previous actions	Necessary studies
Urban safety and environment improvement – street design guidelines (action 2.1.A)	Feasibility studies and detailed design of the road and associated junctions

Implementation phasing																			
 <p>The inner ring road dualization is already being discussed by the Department of Urban Roads. Even though it is less urgent than other actions it will help to improve transport conditions in the southwest quadrant of the city and therefore be of great benefit. It will be implemented at the short-term horizon.</p>																			
Calendar		Quick		Short				Medium				Long				Commissioning in 2030			
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38	39	40
	Act. 3.1																		

Location and extent

The stretch of the inner ring road to be dualized is located between Lake Road interchange (in Asokwa constituency) and Sofoline Interchange (in Kwadaso and Kumasi constituencies). The stretch is 6km long.



ACTION 3.2: DEVELOPMENT OF CRITICAL LINK ROADS

ROADS

Description

The development of critical link roads is an action suggested by the steering committee. It aims to build access roads to communities which are remote from the main road network and do not have adapted streets to join it.

The created links will be in dense urban areas (mostly residential) and therefore will have to be adapted to all modes of transport, especially pedestrians. The provision of quality sidewalks, lighting, and drainage is necessary. Even though these links are developed to ease vehicular access to communities, speed should be limited by design (speed tables, pedestrian crossings, etc.) to ensure the safety of the inhabitants.

As these links are missing, today, it is likely that evictions and deconstruction operations must be undertaken to allow the construction of these streets. However, the benefit for the community in terms of accessibility will compensate these impacts.

The selected links were identified by DUR to answer to a local need, and are coherent with the general road network. This issue of missing links is not general to the entire metropolis but is limited to some communities.



Residential street in South Africa (Gettyimages)



Typical cross-profile of a residential street (Valley Transport Authority)

Features included

- Eviction and deconstruction of existing structures (if any)
- Construction of single carriageway stretches (22km in total)
- Provision of sidewalks
- Implementation of traffic lights at junctions where it will be necessary
- Necessary studies

Targeted objectives


This action will improve accessibility for communities aside from the main road network. It will allow public transport and private vehicles to enter these communities more easily.


This action does not answer to a general need for the entire metropolis but to local and specific needs and can have an important impact at the local scale.




Level of priority




Investment cost	Funding
 <p><u>Costing includes:</u> Construction of single carriageway roads (22km) Associated deconstruction and eviction Associated sidewalks Traffic lights TOTAL: 558 M€ (93 M\$)</p>	<p>Donor loan contracted with the GoG Donor loan contracted with the GoG Donor loan contracted with the GoG Donor loan contracted with the GoG</p>

Implementing agency
 <p>DUR in partnership with the concerned MMDAs</p>

Operation costs	Operating mode
 <p>10 k\$ / km → 1.3 M€ (220 k\$) per year</p>	<p>Operation by DUR on their annual budget</p>

Feasibility constraints		
Technical & environmental	Social	Institutional
<p>Possible negative impact on the environment due to waterproofing of the ground</p> 	<p>Probable evictions</p> 	<p>Possible land acquisitions</p> 

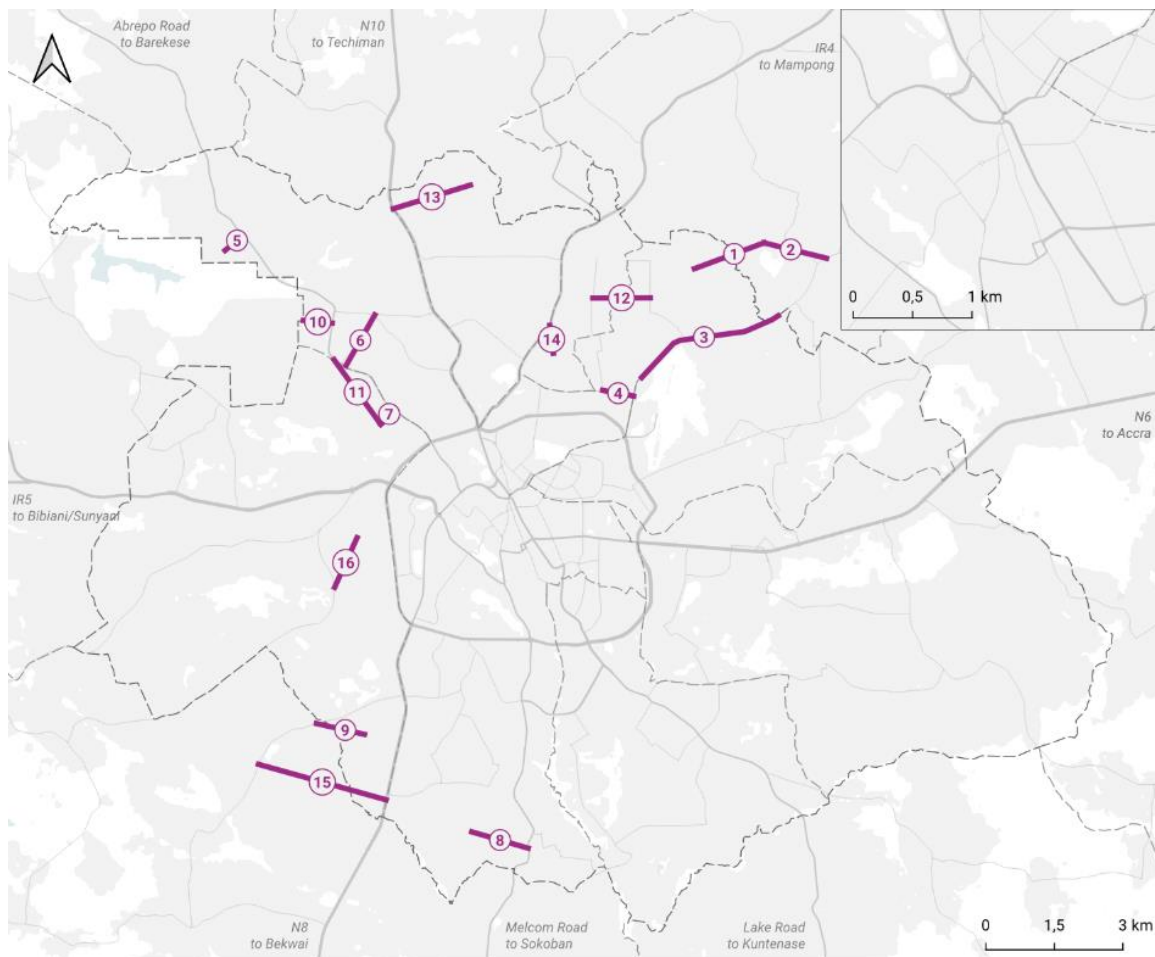
Necessary previous actions	Necessary studies
<p>Urban safety and environment improvement – street design guidelines (action 2.1.A)</p>	<p>Feasibility studies and detailed design of each road stretch</p>

Implementation phasing																																																																									
	<p>This action can be seen as a quick win as its extent is limited to some specific locations. However, the probable necessary evictions can trigger longer procedures. Moreover, even though it will be of great importance for the concerned communities, its impact at the metropolis scale is limited. Thus, it will be implemented in two phases, at the short- and medium-term horizons.</p>																																																																								
Calendar	<table border="1"> <thead> <tr> <th></th> <th colspan="2">Quick</th> <th colspan="4">Short</th> <th colspan="4">Medium</th> <th colspan="4">Long</th> <th rowspan="3" style="text-align: center; vertical-align: middle;"><i>Commissioning in 2030 and 2035</i></th> </tr> <tr> <th>Year</th> <th>24</th><th>25</th><th>26</th><th>27</th><th>28</th><th>29</th><th>30</th><th>31</th><th>32</th><th>33</th><th>34</th><th>35</th><th>36</th><th>37</th><th>38</th><th>39</th><th>40</th> </tr> </thead> <tbody> <tr> <th>Phase 1</th> <td></td><td></td><td></td><td style="background-color: #00A0C0;"></td><td style="background-color: #A0A0A0;"></td><td style="background-color: #800080;"></td><td style="background-color: #800080;"></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> <tr> <th>Phase 2</th> <td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td style="background-color: #00A0C0;"></td><td style="background-color: #A0A0A0;"></td><td style="background-color: #800080;"></td><td style="background-color: #800080;"></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>		Quick		Short				Medium				Long				<i>Commissioning in 2030 and 2035</i>	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Phase 1																			Phase 2																		
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Phase 1																																																																									
Phase 2																																																																									

Location and extent

The links were identified with the DUR based on their knowledge of remote communities in the area, and are located around the Greater Kumasi area. The cumulated length is around 22km. The links are the following:

- | | |
|---|--|
| 1. Quarry-South Africa (1.6km) | 9. Santasi New Site-Apire (1.1km) |
| 2. Dote Quarry-Truba (1.4 km) | 10. Katakylie Junction-Bronikrom (0.6km) |
| 3. Duase-Sepe (3.4km) | 11. Asubonteng Adumanu (1.7km) |
| 4. Moshie Zongo-Antoa (0.7km) | 12. Pankrono Estate-Buokrom Estate (1.3km) |
| 5. Ohwim New Site (0.5km) | 13. Kuronom-Bremang Estate (1.8km) |
| 6. Abrepo-Mpatasie (1.3km) | 14. Tafo Hospital-Tafo Santain (0.6km) |
| 7. Adoato Market (0.4km) | 15. Santasi Anyinam Kagyasi Apri-Heman (2.9km) |
| 8. Daaban New Site-Sokoban New Site (1.3km) | 16. Edwenanse-Kwadaso Estate (1.2km) |



CRITICAL LINK ROADS DEVELOPMENT

— Critical link roads development



ACTION 4.1: DEVELOPMENT OF ON-STREET PARKING

PARKING

Description

This measure consists of developing on-street parking in the centre of the metropolis, apart from the inner city centre (Adum, Kejetia). On-street parking is delineated in parking bays and can either be free or paid.

Parking bays along the carriageway will be implemented to provide legal and regulated parking. The bays must meet the following technical requirements:

- Two-meters wide
- Parallel to the carriageway
- At the same level as the carriageway
- Separated from the sidewalks by a curb with a height difference

Parking bays mustn't be implemented close to pedestrian crossing and intersections to ensure good visibility of users when crossing the road of the intersection and therefore guarantee safety.

Parking bays can be punctually interrupted with trees, bus stop shelters, commercial stalls, etc.



Example of a cross-profile with a parking bay (INGEROP)



Parking bay (ITDP)

Features included

- Marking of marking bays
- Necessary studies (identification of adapted streets)


Targeted objectives


This action aims to help solve the lack of parking offer in the metropolis centre identified in the diagnosis. This will consequently help reducing congestion in some parts of the city as illegal parking impedes with vehicular movements (private vehicles and public transport vehicles). It will also free some sidewalks from illegal parking thus improving non-motorised transport conditions.







Level of priority




Investment cost		Funding
 <p><u>Costing includes:</u> Parking bays marking Necessary studies TOTAL: 4 M€ (0.6 M\$)</p>	KMA, Asokwa MA, Asokore-Mampong MA KMA, Asokwa MA, Asokore-Mampong MA	

Implementing agency
 <p>Urban Roads Departments of KMA, Asokwa MA, Asokore-Mampong MA</p>

Operation costs	Operating mode
 <p>Included in the Transport authority and task force operation costs</p>	<p>Parking can be charged and generate funds (IGF) for the concerned MMDAs</p>

Feasibility constraints		
Technical & environmental	Social	Institutional
-	-	Necessary periodic and intense enforcement to keep the system effective
		

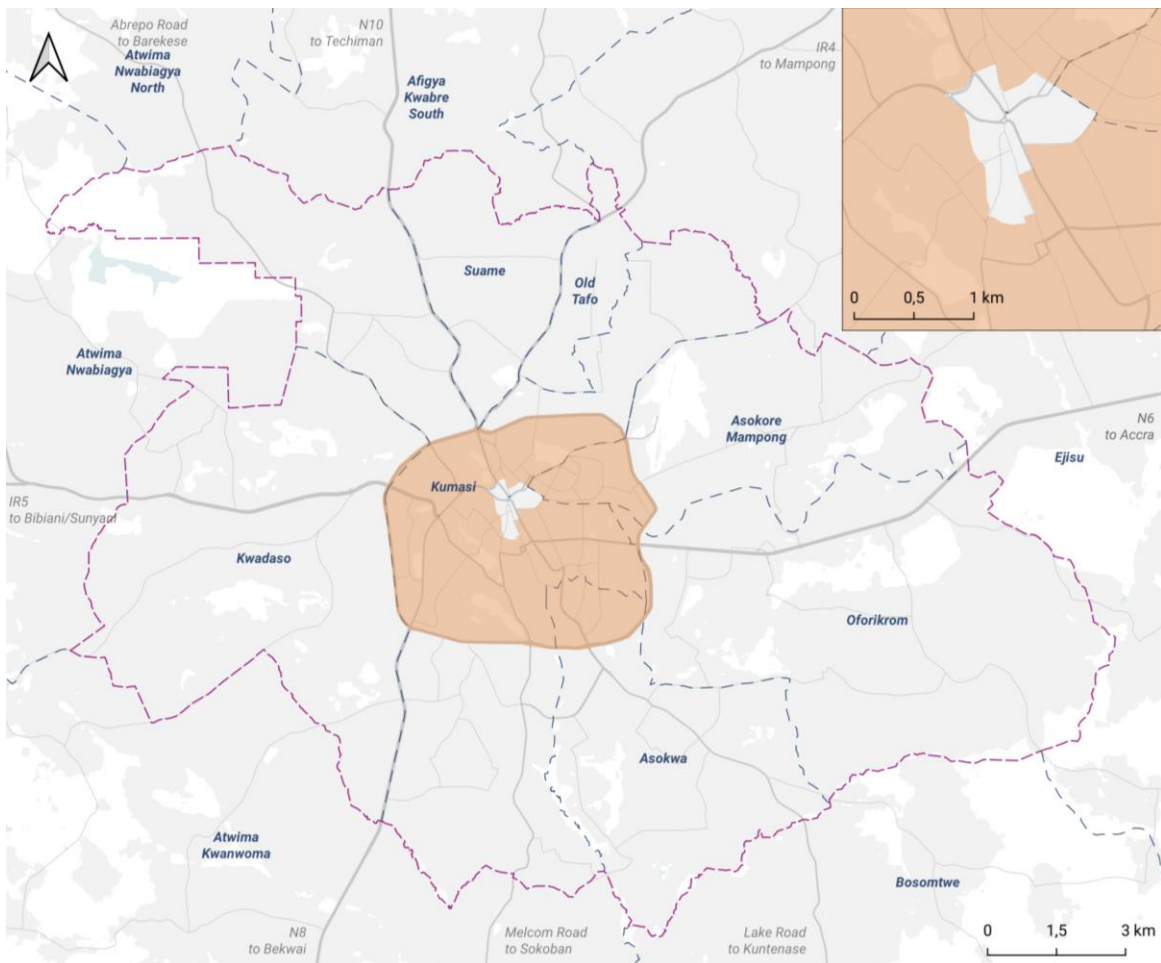
Necessary previous actions	Necessary studies
<p>Urban safety and environment improvement – street design guidelines (action 2.1.A)</p>	<p>Parking offer definition study (fare policy model, ticketing system, fining system, location assessment)</p>

Implementation phasing																			
 <p>Parking may not be as urgent as other actions; it can still significantly improve conditions in the centre of the metropolis. Moreover, it is a very cost-effective action as its financial commitment and constraints are very low. It can even generate revenues for the concerned assemblies, which can then be reinvested in other mobility projects.</p>																			
Calendar		Quick		Short				Medium				Long				Commissioning in 2027			
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38	39	40
	Act. 3.1																		

Location and extent

This measure will be implemented in the central area of the metropolis (within the inner ring road), but outside the busiest areas of the CBD which are Adum and Kejetia. At this stage, the extent of the program is estimated around 2,000 parking spots. Covered areas will encompass:

- Asafo (KMA)
- Asokwa/Amakom (Asokwa MA, KMA)
- Nhyiaeso (KMA)
- Patasi (KMA)
- Bantama (KMA)
- Manhyia (KMA)
- Asawase (Asokore-Mampong MA)



DEVELOPMENT OF ON-STREET PARKING

- Potential on-street parking
- Greater Kumasi
- District boundaries



ACTION 4.2: DEVELOPMENT OF A MULTI-STOREY CAR PARK

PARKING

Description

This measure consists of developing a high-end multi-storey car park in KMA CBD, close to the busiest areas (Adum, Kejetia), where on-street parking will be banned by KMA.

The localization of the car park is chosen to avoid any increase in car modal shares in the CBD: it is located outside the most central areas, and accompanies the ambitious plan by KMA to ban on-street parking in Adum and Kejetia.

The car park will be overground and built up on several levels to maximise the capacity compared to the necessary land occupancy. It will provide the necessary services for drivers (ticketing machines, toilets, etc.).

Drivers will be charged to park their car, either with a daily flat rate or with a rate depending on the duration spent in the car park. Fare collection can be either manual or automated.

This car park will be mutualised with a public transport terminal: the ground floor will be dedicated to public transport activities, whereas the elevated floors will be dedicated to private cars parking. This scheme will allow to fund a public transport terminal through a private operator, thanks to the revenues collected from the private cars' drivers. Thus the proposed car park will also help address the lack of land availability for public transport in the central areas.



Shopping centre car park (Grays Shopping Centre)



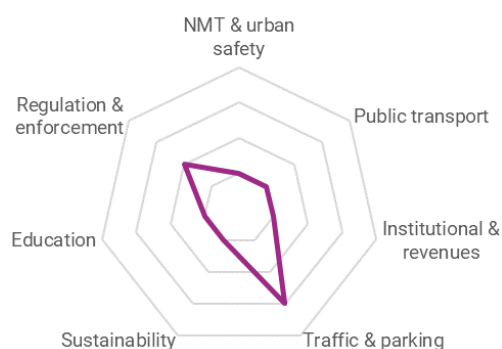
Inside a high-rise car park (ITDP)

Features included

- Building of the multi-storey car park and transport terminal
- Provision of ticketing system for the car park
- Equipment of the transport terminal
- Necessary studies

Targeted objectives


This action aims to help solve inadequate parking offer in KMA CBD identified in the diagnosis. The provision of a high-end multi-storey car park allows easy parking for drivers in KMA CBD. It is complementary to the on-street parking measure presented earlier.







Level of priority




Investment cost	Funding
 <p><u>Costing includes:</u> Studies and definition of the PPP TOTAL: 2 M€ (0.3 M\$)</p>	KMA

Implementing agency
 <p style="text-align: center;">KMA planning unit (already being developed by KMA)</p>

Operation costs	Operating mode
 <p>Not calculable: to be defined as part of the PPP</p>	Private operation of the car park and public transport terminal by the operator, without subsidies (based on the parking fares)

Feasibility constraints		
<p>Technical & environmental Need to find available suited land</p> 	<p>Social Potential evictions (limited probability)</p> 	<p>Institutional Necessary land control in dense areas</p> 

Necessary previous actions	Necessary studies
-	Opportunity studies (location and extent) prior to the procurement process

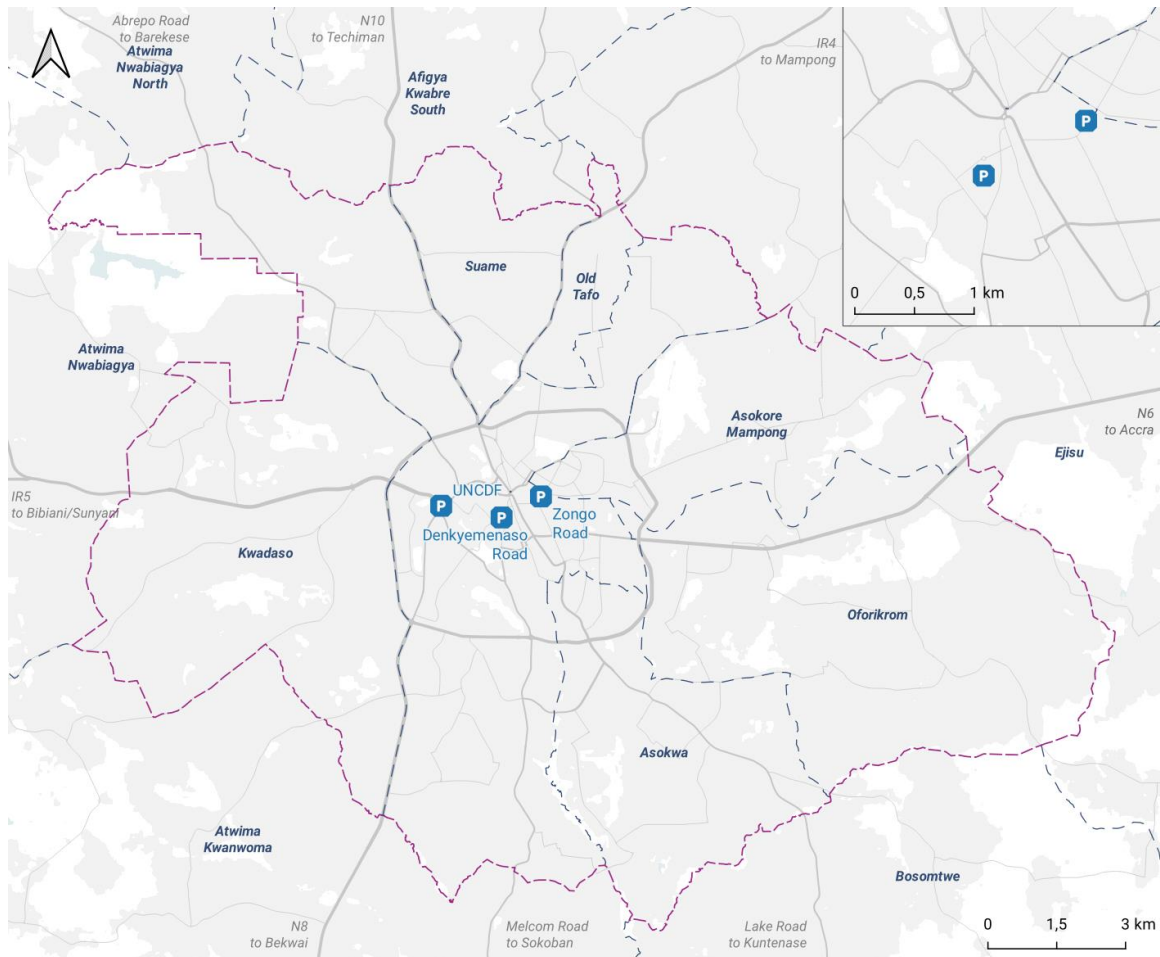
Implementation phasing																			
 <p>Even though this project will help to improve traffic and parking conditions in the city centre, it is complementary to the development of on-street parking (action 4.1) which will provide more parking spots. Moreover, land control will very probably be an issue in these high-density areas. Therefore, considering a significant level of constraint and an opportunity partially fulfilled by another action, the multi-storey car park will be implemented in the medium-term horizon.</p>																			
Calendar		Quick		Short				Medium				Long				<i>Commissioning in 2032</i>			
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38	39	40
	Act. 3.2																		

Location and extent

The car park will be located close the centre of KMA CBD, but not within to avoid bringing too much traffic in the inner centre of the city.

At this day, three locations were identified by KMA:

- United Nations Corporate Development Fund (UNCDF) old site
- Denkyemenaso Road, between Adum Methodist Church and Adum Post Office
- Zongo Road, between Zongo Police Station and Alabar



MULTI-STOREY CAR PARK

P Potential location for a multi-storey car park

--- Greater Kumasi
 - - - District boundaries



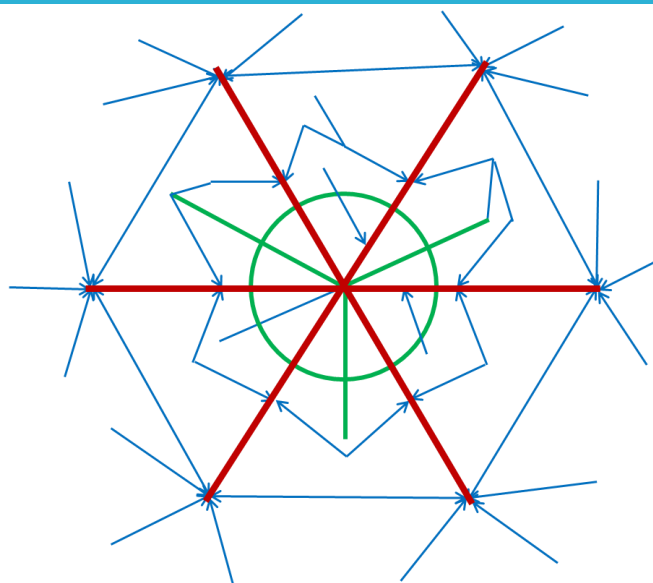
ACTION 5.0: RESTRUCTURATION OF PUBLIC TRANSPORT

PUBLIC TRANSPORT

Description

The SUMP proposes a new concept of public transport network, hierarchised, integrated, and adapted to the demand. This system is divided in three levels:

- **Level 1: Bus Rapid Transit (BRT):** mass transit system with 2 BRT corridors operating at high-speed and high capacity (high frequency, more-than-100-passengers-capacity buses), backbone of the network. Located on the very-high-demand corridors.
- **Level 2: Quality Bus Services (QBS):** new high-capacity (~50 passenger) buses with punctual infrastructure (terminus, stops, depots, etc.) and schedule-based high-quality operation. Located on the high-demand corridors.
- **Level 3: Quality Trotro Services (QTS):** improved existing trotro system with renewed minibuses and enhanced regulation by public authorities. Located on all other routes, including services feeding BRT and QBS corridors.



Hierarchised network principle (INGEROP)


A network restructuration study is necessary to precisely identify the sizing of each route, especially BRT routes and QBS routes where infrastructure should be precisely adapted to the demand (boarding/alighting by station for example) routes which will operate as feeder services, linked with the development of the Transport Demand Model for the BRT sizing. This study will be based over the present concepts and corridors identified for BRT and QBS as part of the SUMP. This study will also encompass preparation of the QTS framework (action 5.3) with the associated definition of the funding scheme for the fleet renewal and the prioritisation of the routes to integrate the system. It is possible to mutualise this study with the feasibility studies and business model for the QBS (action 5.2).


This action also includes the finalisation of the monitoring tool developed by KMA DoT (TRANSINFOMAP) which currently censuses most of the public transport routes in the constituency but is not fully complete. This tool needs to be extended to all the MMDAs of the metropolis (ongoing process for some of them), with some data collection. Hardware should also be provided (servers, computers) for it to be fully functional. This tool is necessary to ensure the efficiency of the QTS system and allow public authorities to enhance their regulation of public transport.

Features included

- Definition studies of a restructured hierarchised transport system
- Finalisation of KMA monitoring tool (TRANSINFOMAP) and extension to all the MMDAs, including the associated data collection

Targeted objectives		-
<i>Detailed by action</i>		
Level of priority	✓✓✓	


Investment cost	Funding
 <p>Costing includes: Studies: 15 MC (2.5 M\$) Monitoring tool including data collection: 6 MC (1 M\$) TOTAL: 21 MC (3.5 M\$)</p>	Transport Authority (from the GoG) Transport Authority (from the GoG)

Implementing agency	
	Transport Authority, in partnership with DUR, MMDAs, operators

Operation costs	Operating mode
	Detailed in each action
Detailed in each action	Detailed in each action

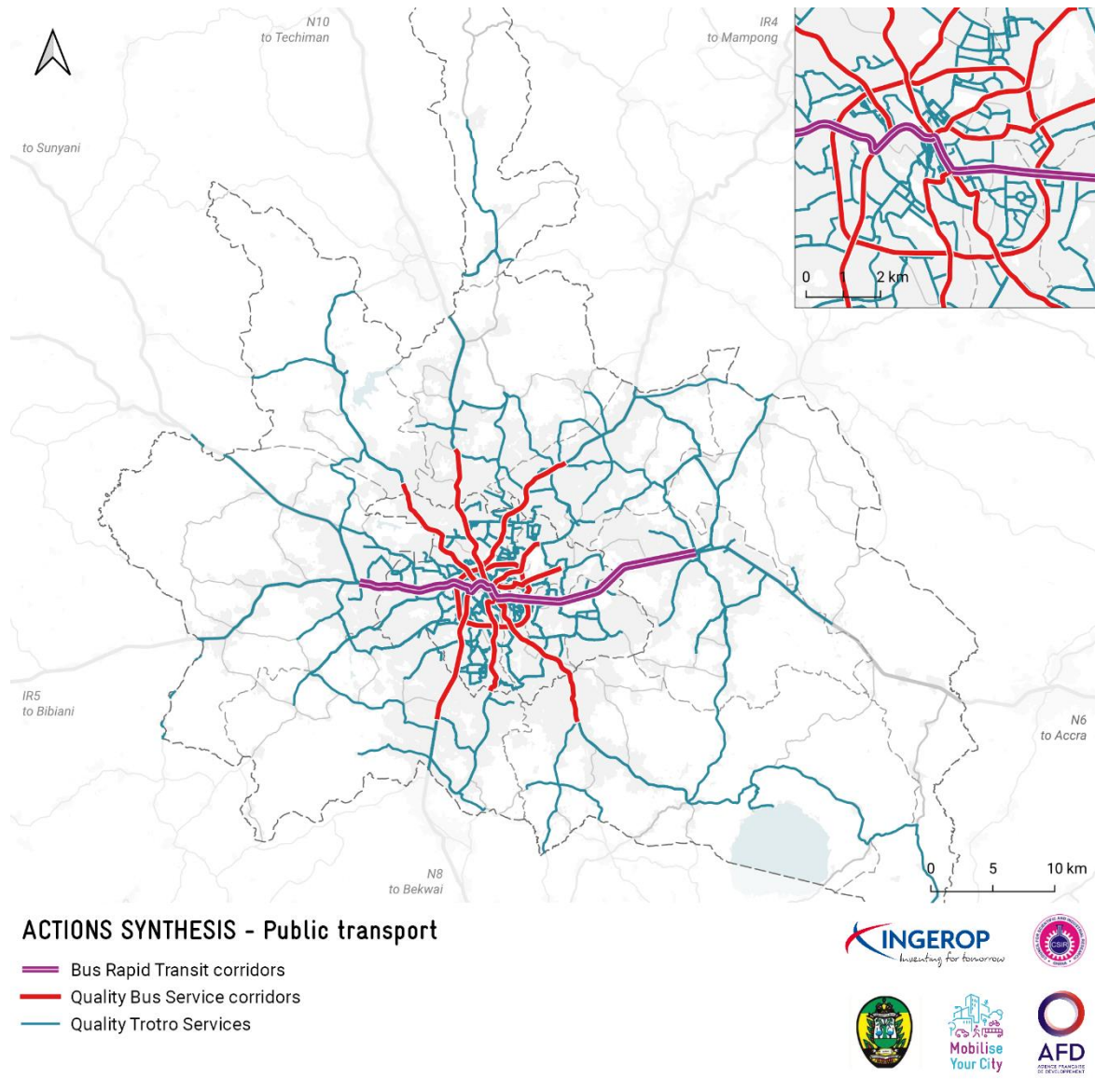
Feasibility constraints		
Technical & environmental	Social	Institutional
- 	- 	- 

Necessary previous actions	Necessary studies
-	-

Implementation phasing																		
		This action is a top priority as it is necessary for any action relating public transport to be implemented.																
Calendar		Quick		Short					Medium					Long				
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	Act. 5.0																	

Location and extent

The map below presents the proposed synthetical hierarchised public transport network at the long-term horizon (2040).



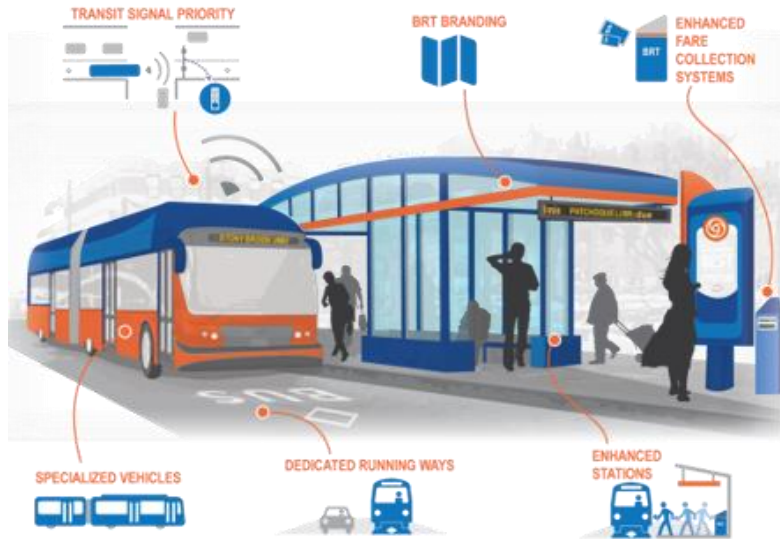
ACTION 5.1: DEVELOPMENT OF BUS RAPID TRANSIT

PUBLIC TRANSPORT

Description

This measure consists of an extensive development of Bus Rapid Transit (BRT) network in the metropolis. A Bus Rapid Transit allows high performances in terms of capacity, travel time, comfort, safety, frequency, and reliability. A BRT system encompasses key features:

- **Infrastructure:** dedicated busway, stations with off-board fare collection, terminus areas
- **Rolling stock:** high-end high-capacity buses
- **Operating mode:** schedule-based, industrial operation and economic framework
- **Maintenance processes:** industrial maintenance in a dedicated depot
- **ITS and passenger information systems**



Components of a BRT system (Suffolk County, New-York)

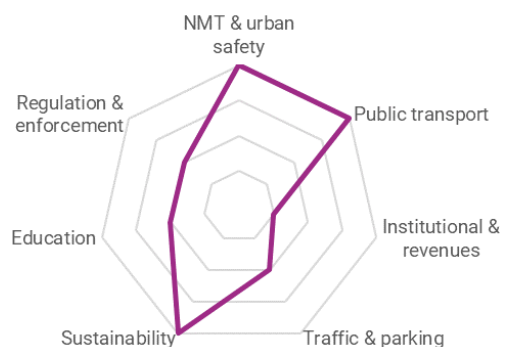
Even though several types of BRT exist, it must always include a dedicated busway, where only BRT vehicles are allowed to run. It must also include terminals in the city centre to allow transfers between BRT routes and with other public transport modes.

Features included

- Construction of linear infrastructure for the entire right-of-way (busway, stations, terminus areas, carriageway, sidewalks, bicycle lanes, etc.) on 30km
- Potential evictions and deconstruction of existing buildings
- Construction of punctual infrastructure: maintenance facilities, depots, and centralised management centre
- Provision of approximately 200 high-end high-capacity (articulated) buses
- Provision of Intelligent Transportation Systems (ITS) and passenger information systems
- Necessary studies


Targeted objectives


This action aims to develop Mass Transit as the backbone of the public transport network. By offering attractive travel times and travel conditions, the BRT aims to reduce car use compared to a business-as-usual scenario, thus also helps to improve NMT conditions, traffic conditions, and sustainability.







Level of priority




Investment cost		Funding
 <p>Costing includes: Infrastructure (including potential evictions), ITS for a 30km line: 2,172 M€ (362 M\$) Rolling stock (around 200 articulated buses): 750 M€ (125 M\$) Necessary studies: 90 M€ (15 M\$) TOTAL: 3,012 M€ (502 M\$)</p>		Donor loan contracted with the GoG
		Donor loan contracted with the GoG
		Donor loan contracted with the GoG

Implementing agency	
	Transport Authority, in partnership with DUR, MMDAs, operators

Operation costs	Operating mode
 <p>2.3 \$/veh.km, 13 Mveh.km/year → 180 M€ (30 M\$) per year</p>	Contract-based private operation, objective without subsidies (coverage of operation costs by passengers fares)

Feasibility constraints		
<p>Technical & environmental Complex project with a wide scope of actions, and with long completion durations</p> 	<p>Social Probable evictions to widen the right-of-way</p> 	<p>Institutional High-complexity project with specific governance issues</p> 

Necessary previous actions	Necessary studies
Public transport network restructuring (action 5.0)	Feasibility studies and business model, detailed design

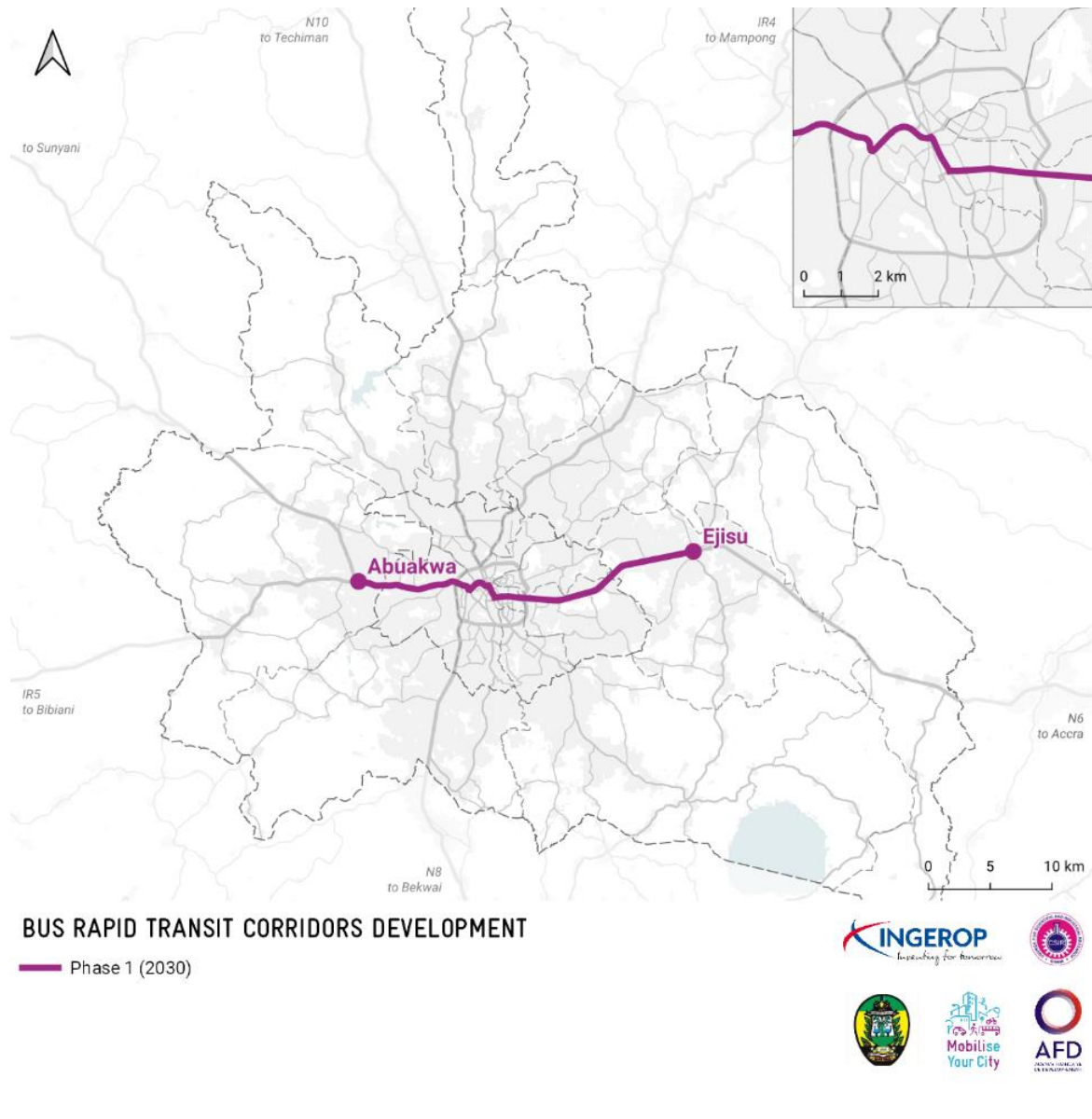
Implementation phasing																			
 <p>Massification of the transport system is one of the top priorities of the SUMP. However, the very high level of investment, the feasibility constraints, and the long building durations of such projects makes it impossible to implement quickly. Therefore, commissioning won't happen before 2030. However, studies and processes need to be started as soon as possible to avoid delaying this deadline.</p>																			
Calendar		Quick			Short				Medium					Long					Commissioning in 2030
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
	Phase 1																		

Location and extent

BRT systems are proposed along the main urban corridors where most flows are concentrated on this, the demand being by far mostly radial. Orbital demand is limited and therefore does not require BRT systems.

Even though more corridors could benefit from a BRT, cost constraints limit the extent of this action to two BRT corridors:

- Kejetia-Ejisu (Accra Road)
- Kejetia-Abuakwa (Sunyani Road)



ACTION 5.2: DEVELOPMENT OF QUALITY BUS SERVICES

PUBLIC TRANSPORT

Description

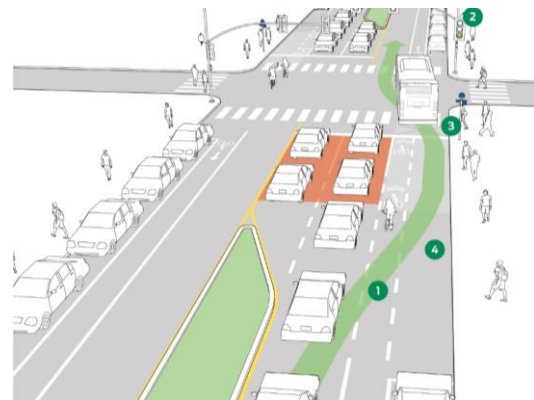
Quality Bus Services (QBS) are regular bus routes formally operated with an industrial operating mode (contractualization of the operator with the public authorities, schedule-based), modern buses, and basic infrastructure (formal stops, improvement of associated existing stations, depots).

Quality Bus Services encompasses several features, the main ones being:

- Performance-based contract between the operator and the public authorities: the operator is committed to provide the service agreed with the authorities (route, level of service, etc.)
- Medium-capacity modern vehicles (50 to 100 passengers)
- Schedule-based operation rather than “fill-and-go” operation
- Industrial processes: maintenance and storage in depots
- Basic infrastructure: stops, terminus



Medium-capacity bus (BYD Europe)



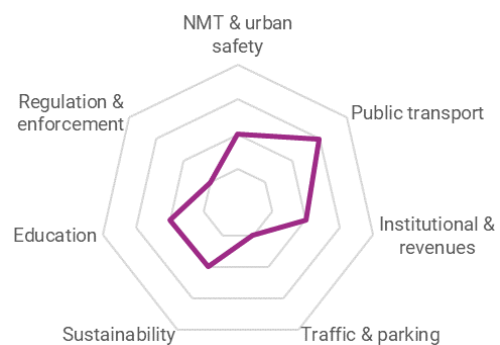
Priority access to junctions for buses (nacto.org)

Features included

- Provision of approximately 300 high-end high-capacity buses
- Construction of punctual infrastructure: stops, stations, terminals, queue jumps, etc.
- Construction of punctual infrastructure: maintenance facilities, depots
- Provision of Intelligent Transportation Systems (ITS) and passenger information systems
- Necessary studies


Targeted objectives


This action aims to improve the existing public transport network by proposing a high quality and capacity service (comfort, safety, reliability, and fare policy) on secondary demand corridors. The provision of basic infrastructure will also improve safety for passengers around stations.







Level of priority




Investment cost	Funding
 <p>Costing includes: Rolling stock (around 300 new buses): 720 M€ (120 M\$) Infrastructure, ITS (covering a 100km-long network): 312 M€ (52 M\$) Studies: 12 M€ (2 M\$) TOTAL: 1,044 M€ (174 M\$)</p>	<p>To be negotiated with the operator</p> <p>Donor loan contracted with the GoG</p>

Implementing agency
 <p>Transport Authority, in partnership with DUR, MMDAs, operators</p>

Operation costs	Operating mode
 <p>1.3 \$/veh.km, 15 Mveh.km → 114 M€ (19 M\$) per year</p>	<p>Contract-based private operation, objective without subsidies (coverage of operation costs by passengers fares)</p>

Feasibility constraints		
<p>Technical & environmental Need to develop new skills (industrial maintenance)</p> 	<p>Social Potential evictions (limited probability)</p> 	<p>Institutional Introduction of a new operating mode</p> 

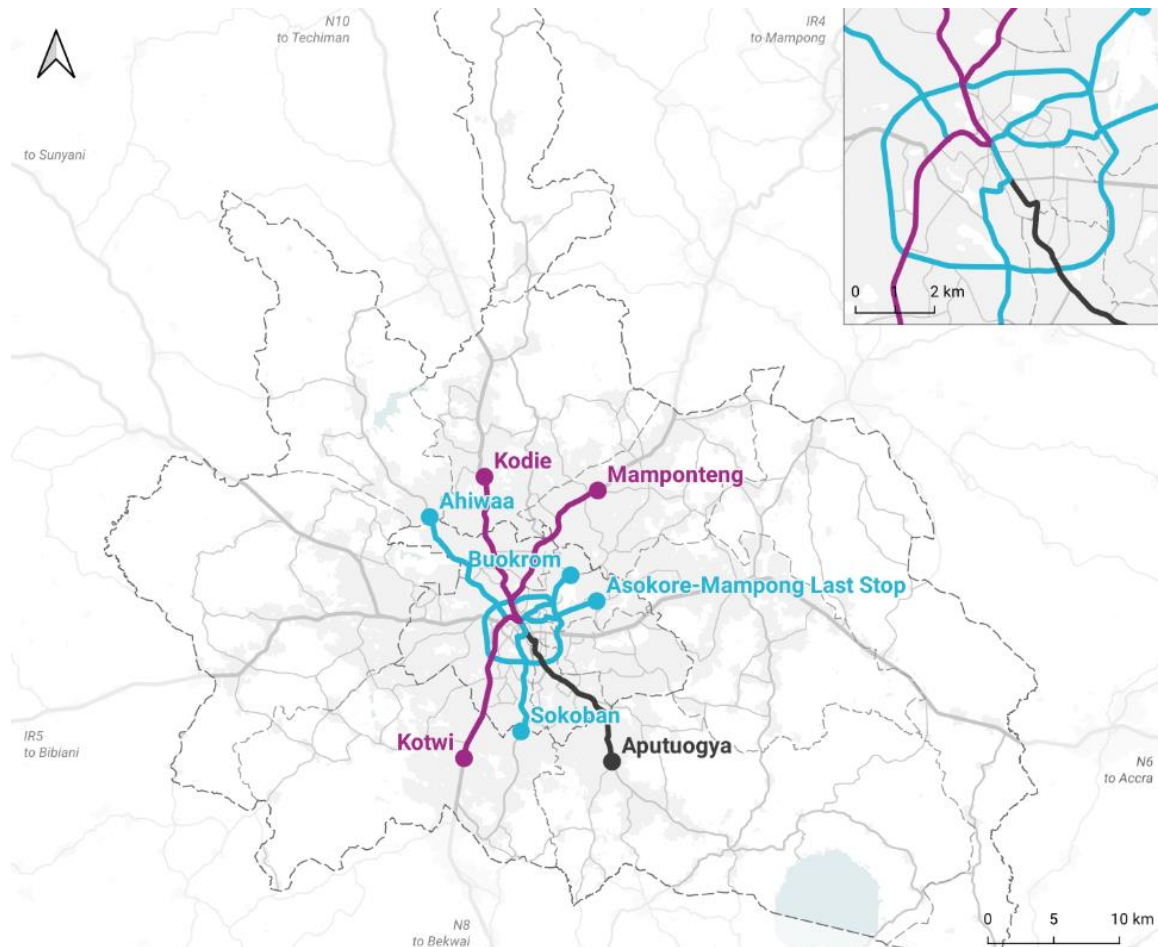
Necessary previous actions	Necessary studies
<p>Public transport network restructuring (action 5.0)</p>	<p>For each corridor, feasibility studies and business model, detailed design</p>

Implementation phasing																				
	<p>Quality Bus Services will be the secondary lines of a restructured network and will act as complementary to the BRT systems on corridors where high demand is met but BRT is not implemented. A pilot corridor will be implemented in 2030, with the necessary studies and procurements starting as soon as the public transport network restructuring study is finished (action 5.0). For other corridors, QTS (action 5.3) can prefigure QBS.</p>																			
Calendar		Quick		Short				Medium				Long				<i>Commissioning in 2030, 2035, and 2040</i>				
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38	39	40	
	Phase 1																			
	Phase 2																			
Phase 3																				

Location and extent

The corridors identified to implement QBS justify a more massive transport system than trotros but BRT aren't implemented, mainly for financial reasons and a more limited demand. The action is phased in three parts:

- **Phase 1:** Kejetia-Aputuogya (Lake Road) (pilot)
- **Phase 2:** Kejetia-Mampong(Mampong Road), Kejetia-Kodie (Techiman Road), Kejetia-Kotwi (Bekwai Road)
- **Phase 3:** Inner ring road, Kejetia-Sokoban (Melcom Road), Kejetia-Asokore Mampong Last stop (Asokore-Mampong Road), Kejetia-Ahiwaa (Abrepo Road), Kejetia-Buokrom (Antoa Road)



QUALITY BUS SERVICES DEVELOPMENT

- Phase 1 (2030)
- Phase 2 (2035)
- Phase 3 (2040)



ACTION 5.3: DEVELOPMENT OF QUALITY TROTRO SERVICES

PUBLIC TRANSPORT

Description

Quality Trotro Services (QTS) are the third level of hierarchy of the transport network and will consist of the far most of its routes. The development of these new services is based on the improvement of the existing system, by enhancing regulation from the public authorities and providing renewed rolling stock to improve safety and comfort conditions.

Quality Trotro Services encompasses several features, the main ones being:

- Enhancement of control and regulation from public authorities: more incentive to enter the legal system thus tackling the wawa issue, mandatory use of the monitoring tool (action 5.0)
- Ambitious vehicles renewal program with an easier access to loans from banks and donors (the Transport Authority engages loans with banks and the vehicle owners contract loans with the Transport Authority), with a scrapping bonus to encourage renewal (example of AFTU model in Dakar), thus encouraging operators to join the legal system
- Improvement of stations, formalisation of stops with basic infrastructure, development of two new terminals in KMA CBD (plus one terminal included in action 4.2)



Simple stop point in Dakar (CETUD)



Renewed "Tata" in Dakar (AFTU)

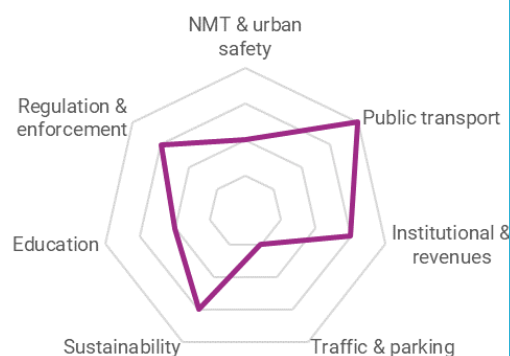
Features included


- Provision of approximately 5000 new minibuses
- Basic infrastructure: improvement works of existing stations, development of formalised stops
- Construction of two new terminals in KMA CBD
- Necessary studies, including the definition of the regulation and fleet renewal program framework and business model


Targeted objectives


This action aims to enhance the minibus operation in the metropolis, which will be the third and last level of hierarchy in the transport network. It will enhance regulation and enforcement of public transport operation, thus tackling the issue of "wawa" causing safety and congestion issues. It will also offer safer travel conditions to passengers with renewed vehicles and a better quality of service.



Level of priority




Investment cost		Funding
 <p><u>Costing includes:</u> Scrapping bonus for 5,000 vehicles: 175 M€ (29 M\$) Basic infrastructure: 120 M€ (20 M\$) 2 new terminals: 65 M€ (11 M\$) Necessary studies: 3 M€ (0.5 M\$) TOTAL: 360 M€ (60 M\$)</p>	Transport Authority (from the GoG)	
	Donor loan contracted with the GoG	
	Donor loan contracted with the GoG	
	Donor loan contracted with the GoG	

Implementing agency	
	Transport Authority, in partnership with DUR, MMDAs, operators

Operation costs	Operating mode
 <p>1 \$/veh.km, 15 Mveh.km/year → 1,050 M€ (175 M\$) per year</p>	Regulated private operation, without subsidies (coverage of operation costs by passengers fares)

Feasibility constraints		
Technical & environmental Need to find available suited land for terminals in KMA CBD 	Social Influence on the transport employment market 	Institutional Potentially difficult negotiations with operators 

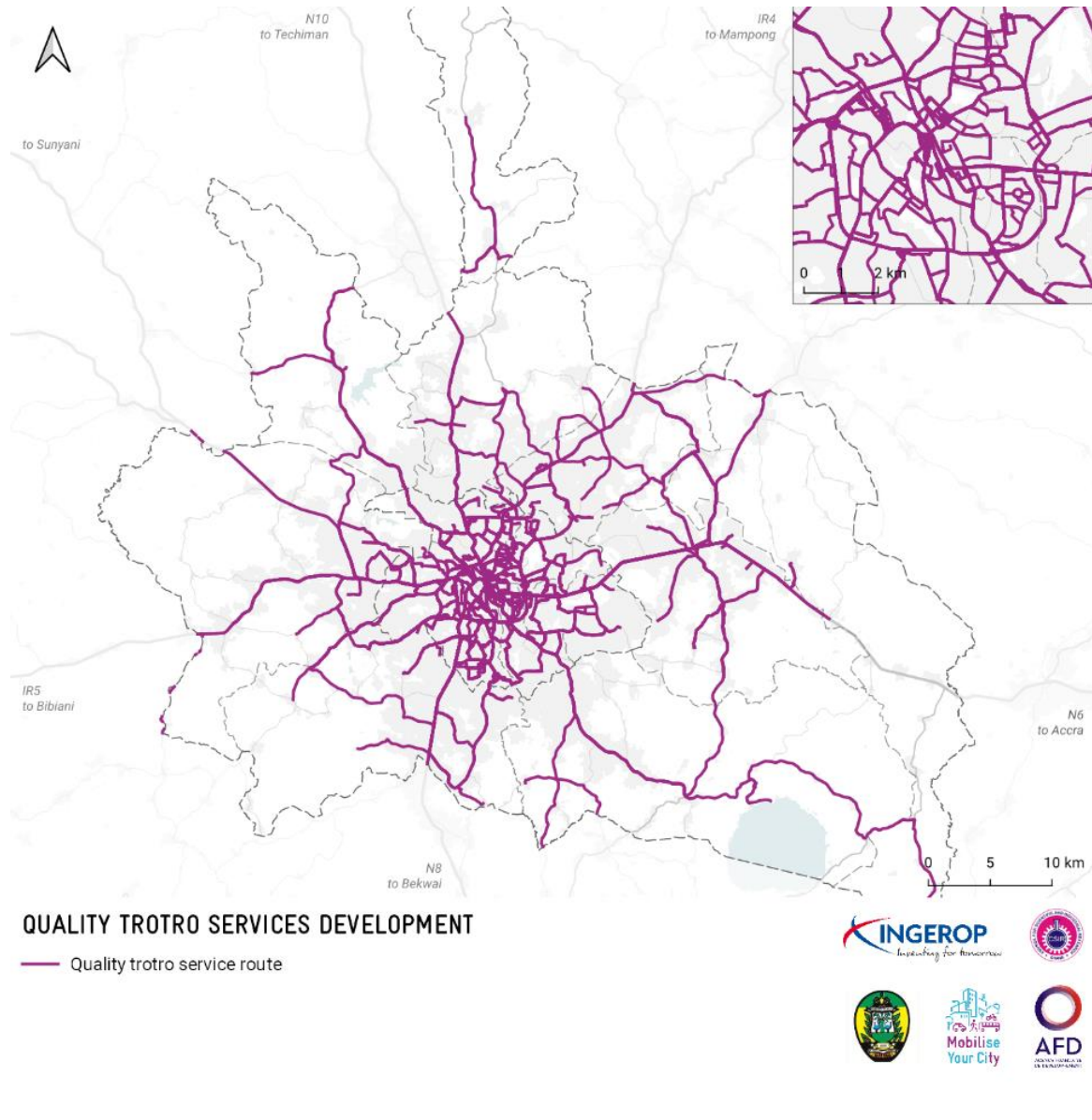
Necessary previous actions	Necessary studies
Public transport network restructuring (action 5.0)	Feasibility studies and detailed design of the terminals Definition of the fleet renewal program conditions and funding mechanisms

Implementation phasing																			
 <p>The objective is to implement Quality Trotro Services to all public transport routes (except BRT and QBS routes) by 2040. However, this program is likely to be phased through different waves of vehicle renewal considering its large extent. For example, in Dakar, around 1,600 vehicles were renewed between 2005 and 2016 during three phases. Considering the urgency of the action and the great benefits it can trigger, it should start as soon as possible, once the public transport network restructuring study is finished.</p>																			
Calendar		Quick			Short				Medium				Long				Continuous commissioning of vehicles during the implementation phases		
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		39	40
	Phase 1																		
	Phase 2																		
Phase 3																			

Location and extent

Quality Trotro Services should cover the entire area by 2040 and all routes (except BRT and QBS corridors). It is estimated that around 5,000 vehicles should be renewed by 2040.

Priority should be given on renewal of vehicles for feeder services to BRT routes. QTS can also prefigure QBS and BRT routes in the short-term horizon, and then will be transferred to another route when QBS/BRT on this route is commissioned.



ACTION 6.1: TRANSPORT AUTHORITY AND ENFORCEMENT**INSTITUTIONAL****Description**

This action proposes the creation of a transport authority for the entire area. This transport authority will lead all activities related to mobility and manage transdisciplinary projects.

Transport authorities can have different geographical perimeters, scopes (only public transport, roads, traffic management...), funding schemes, etc. These depend on the political structure, decentralization, balance of responsibilities, etc. The definition of the jurisdiction, scopes, and funding schemes will have to be carefully done by all the related actors and public entities. The formation of a transport authority can need a legal basis to be successfully implemented and last through time. Successful examples of transport authorities abroad include CETUD in Dakar or LAMATA in Lagos.

The target staffing of the authority is around 80 employees (among which 30 dedicated to the enforcement taskforce). However, the growth of the authority will be gradual, starting around 15 employees at its creation.

The transport authority will have a taskforce responsible for enforcement of mobility-related byelaws in the Expanded Kumasi area. These byelaws are more specifically:

- Compliance with the licensing system for public transport vehicles
- Compliance to the public transport dedicated lanes system (BRT)
- Fining of vehicles illegally parked
- Fining of trading activities illegally encroaching the street space (outside their dedicated spots)

While the transport authority is not yet created, it is possible for the MMDAs to conduct joint enforcement. Some assemblies already started this process.

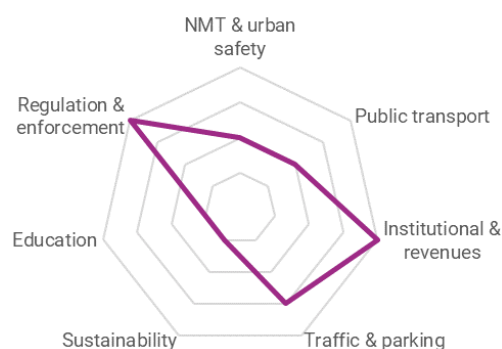
Features included


- Creation of the transport authority
- Formation of the necessary legal basis
- Staffing and equipment of the authority
- Enforcement of mobility-related byelaws


Targeted objectives


This action aims to improve the institutional framework regarding mobility, and in particular to ease the governance of multi-actor projects covering several MMDAs, such as BRT (action 5.1), QBS (action 5.2), or QTS (action 5.3).




It also helps to address the enforcement issues identified in the diagnosis. Dedicated taskforces will allow to complement the enforcement done by the national police and to enforce specific byelaws more efficiently.

**Level of priority**


Investment cost		Funding
 <p><u>Costing includes:</u> Creation of the authority Equipment Necessary studies (legal basis) TOTAL: 20 M€ (3 M\$)</p>	Government of Ghana Government of Ghana Government of Ghana	

Implementing agency
 <p>Creation by the Government of Ghana, possibly through the Ministry of Local Government, Decentralization, and Rural Development</p>

Operation costs	Operating mode
 <p>7 M€ (1 M\$) per year</p>	Autonomous operation of the authority on a dedicated budget, funded by the Government of Ghana

Feasibility constraints		
Technical & environmental - 	Social - 	Institutional Need for a strong political will Potential need for legal arrangements Need for human resources 

Necessary previous actions	Necessary studies
-	-

Implementation phasing																				
 <p>The Transport Authority has to be created as soon as possible to be able to carry multi-disciplinary projects such as BRT or QBS. It will also ease the process of paratransit reform associated with the QTS as it will allow operators to discuss with only one unique institution, which will be able to contract the loans for the rolling stock renewal. It is expected that the authority is operational by late 2025. From then, enforcement will be continuous throughout the time.</p>																				
Calendar		Quick		Short						Medium						Long				Commissioning in 2035 and 2040
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40		
	Act. 6.1																			

Location and extent
The jurisdiction of the transport authority will cover the entire metropolis and its sixteen assemblies.

ACTION 6.2: INTEGRATION AND REGULATION OF PRAGIA

INSTITUTIONAL

Description

This action proposes to integrate pragia in the mobility system to regulate their operation and limit them to specific areas. It is bound to national decisions to provide the necessary legal basis.

Pragia essentially operates in rural/periurban areas, in the congested KMA CBD, and in specific areas of the city (Asokore-Mampong, Old Tafo, Mampong Road). In some areas, pragia even replaced traditional public transport vehicles (trotro and taxi). As of today, pragia operation for commercial purposes is forbidden by law (as motorbikes or other two/three wheelers). However, this law is not enforced, meaning pragia illegally operate and can't be regulated.

The integration and regulation will consider pragia as regular public transport vehicles, meaning that drivers must adhere to a union and the union must apply for each route it operates. This will be a source of revenue for the assemblies. The integration will allow public authorities to regulate the operations and restrict them to specific areas. These areas will be limited to the rural and periurban areas, where other means of transport do not exist because of low density or poor shape of roads. KMA already started the process by forbidding pragia operation in the CBD in June 2023.



Pragia circulating on Antoa Road (INGEROP)



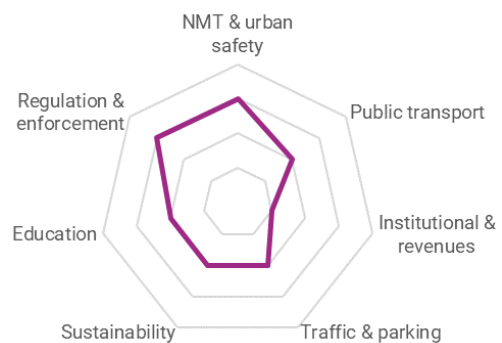
Pragia and trotro congestion on the Eastern bypass (INGEROP)

Features included

- Studies identifying the areas where pragia operation is authorised and the optimal number of licenses to deliver
- Formation of the necessary legal basis (byelaws)
- Integration of pragia in the paratransit regulation framework (mandatory belonging to a union, deliverance of licenses by the MMDAs, monitoring, etc.)


Targeted objectives


This action aims to tackle the identified risk of proliferation of low-capacity vehicles (pragia, motorbikes) for commercial purposes. It will therefore improve public transport and traffic conditions compared to the BAU scenario, and also improve safety as pragia was highlighted in the diagnosis as a factor of road unsafety.






Level of priority




Investment cost	Funding
 <p><u>Costing includes:</u> Necessary studies (restriction areas, number of licenses, regulation framework) TOTAL: 1 M€ (0.2 M\$)</p>	Transport Authority

Implementing agency
 <p>Transport Authority, in partnership with MMDAs</p>

Operation costs	Operating mode
 <p>-</p>	-

Feasibility constraints		
<p>Technical & environmental</p> <p>-</p> 	<p>Social</p> <p>Important impact on current pragia drivers and their economic balance</p> 	<p>Institutional</p> <p>Necessary legal arrangements as pragia are today not allowed to operate for commercial purposes</p> 

Necessary previous actions	Necessary studies
-	-

Implementation phasing																			
 <p>This action is urgent in some areas as the inner parts of KMA CBD but can be difficult to implement due to its important social constraints and the potential demonstration leverage of drivers. It also needs preliminary legal arrangements.</p>																			
Calendar		Quick		Short				Medium					Long					Commissioning in 2035 and 2040	
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		40
	Act. 6.2																		

Location and extent
<p>The action will cover the entire metropolis as pragia will be allowed to operate in some areas and banned in others. The allowed areas should be limited remote communities and periurban area where trotro and taxi do not operate. It can also be used as a way to offer deep service within residential areas where the urban mesh is dense but difficult to access for regular public transport vehicles. This way, inhabitants can use the pragia to travel within the area or from the area to regular public transport stops.</p>

ACTION 6.3: PARKING FINING SYSTEM

INSTITUTIONAL

Description

This measure is about creating a byelaw enabling MMDAs or the transport authority to fine drivers of cars parked illegally.

A clear and efficient fining system will be developed to prevent from illegal parking of vehicles on sidewalks and on the carriageway. When an officer spots a car parked illegally, they enter the information on a database linked to the DVLA database to track the driver. They leave a note on the car and the driver must go to the police station to pay the fine or will be processed for court.

The amount of the fine can vary depending on many factors, such as:

- Time of the infraction
- Area or zone of the infraction
- Time between the infraction and the police station meeting
- Etc.

It is also possible to let unregulated parking legal during certain times (usually night-time) for example.

The enforcement of this action is done by the Transport Authority Enforcement Taskforce (see action 6.1).

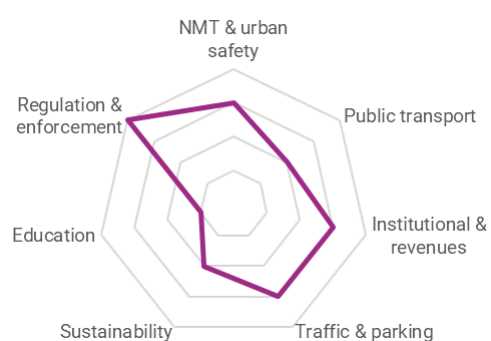
This action can generate Internally Generated Funds (IGF) for MMDAs.

Features included

- Setting up of the fining system (formation of the adequate byelaws)

Targeted objectives


This measure aims to address the issue of illicit parking on sidewalks and on the carriageway identified in the diagnosis. This will help to ensure quality and usable sidewalks for pedestrians, improve road safety, and reduce congestion of the roads while removing pedestrians and parked cars from the carriageway. It will also be a new source of revenue for the local authorities.






Level of priority




Investment cost	Funding
 -	-

Implementing agency
 Transport Authority, in partnership with MMDAs and the Driver and Vehicle License Authority (DVLA)

Operation costs	Operating mode
 -	Enforcement by the dedicated taskforce (see action 6.1)

Feasibility constraints		
<p>Technical & environmental</p> <p style="text-align: center;">-</p> <p style="text-align: center;">  </p>	<p>Social</p> <p style="text-align: center;">-</p> <p style="text-align: center;">  </p>	<p>Institutional</p> <p>Need to conduct necessary legal arrangements</p> <p>Need to access the DVLA database</p> <p style="text-align: center;">  </p>

Necessary previous actions	Necessary studies
-	-

Implementation phasing																																																					
	<p>This action is very interesting in some parts of the metropolis (especially in the city centre) but is bound to legal arrangements. It is less of a priority in some other parts of the city. This action cannot be realised without the necessary enforcement. Therefore, it will be implemented after the creation of the Transport Authority.</p>																																																				
Calendar	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th></th> <th colspan="2">Quick</th> <th colspan="4">Short</th> <th colspan="4">Medium</th> <th colspan="4">Long</th> <th rowspan="3" style="font-size: small;">Commissioning in 2035 and 2040</th> </tr> <tr> <th>Year</th> <th>24</th><th>25</th><th>26</th><th>27</th><th>28</th><th>29</th><th>30</th><th>31</th><th>32</th><th>33</th><th>34</th><th>35</th><th>36</th><th>37</th><th>38</th><th>39</th><th>40</th> </tr> </thead> <tbody> <tr> <td>Act. 6.3</td> <td></td><td></td><td style="background-color: #cccccc;"></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td> </tr> </tbody> </table>		Quick		Short				Medium				Long				Commissioning in 2035 and 2040	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	Act. 6.3																	
	Quick		Short				Medium				Long				Commissioning in 2035 and 2040																																						
Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38		39	40																																		
Act. 6.3																																																					

Location and extent
<p>The system will cover the entire metropolis.</p> <p>Emphasis will be put on the busiest areas of the city where illicit parking hinders the flows of vehicles (CBDs of MMDAs, but especially Adum and Kejetia areas in KMA).</p>

ACTION 6.4: PERIODIC CAPACITY BUILDING

INSTITUTIONAL

Description

This measure is about offering periodic capacity building for stakeholders and education of the civil society throughout the entire process of the SUMP implementation.

Education of the civil society can go through various medium, from periodic press releases to major events such as car-free days in city centres. This process was started during the preparation phase of the SUMP, where several press actions were organised (radio and TV programs, newspaper articles actions), as well as focus groups and a household survey.

Education of the civil society will be closely coordinated with the National Road Safety Authority (NRSA) which already organises prevention events. Actions in schools is usually also an effective mean of education related to mobility. Some major awareness-raising events can also be organised such as car-free days in city centres, free access to the BRT the first day of operation, etc.

Capacity building of stakeholders was also started during the SUMP preparation (in particular during the MobiliseDays) and must be continued through the implementation phase, with training on specific topics, more general presentations to show alternatives and feedback from other projects, etc. These topics should include in priority:

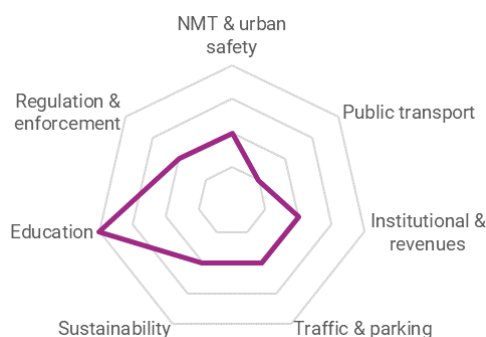
- Conception of “complete streets”
- Management of a contract-based transport offer
- Monitoring of mobility
- Design of public transport infrastructure

Features included

- Capacity building programs for mobility stakeholders
- Education of the civil society via awareness-raising actions and education of children in schools about mobility

Targeted objectives


This measure aims to address the identified poor education of citizens regarding mobility issues. It also aims at building the capacity of institutional key stakeholders to fully own and support the SUMP implementation phase.







Level of priority




Investment cost		Funding
	-	-

Implementing agency	
	Transport Authority, in partnership with NRSA and all concerned stakeholders

Operation costs	Operating mode
 4 M€ (0.6 M\$) over the SUMP duration (15 years)	Funded over the Transport Authority operation budget

Feasibility constraints		
Technical & environmental - 	Social - 	Institutional - 
Necessary previous actions		Necessary studies
-		-

Implementation phasing																			
	This action should be continuous throughout the SUMP implementation.																		
Calendar		Quick		Short				Medium				Long				Continuous			
	Year	24	25	26	27	28	29	30	31	32	33	34	35	36	37		38	39	40
	Act. 6.4																		

Location and extent	
This action will involve stakeholders and the civil society from the entire metropolis.	