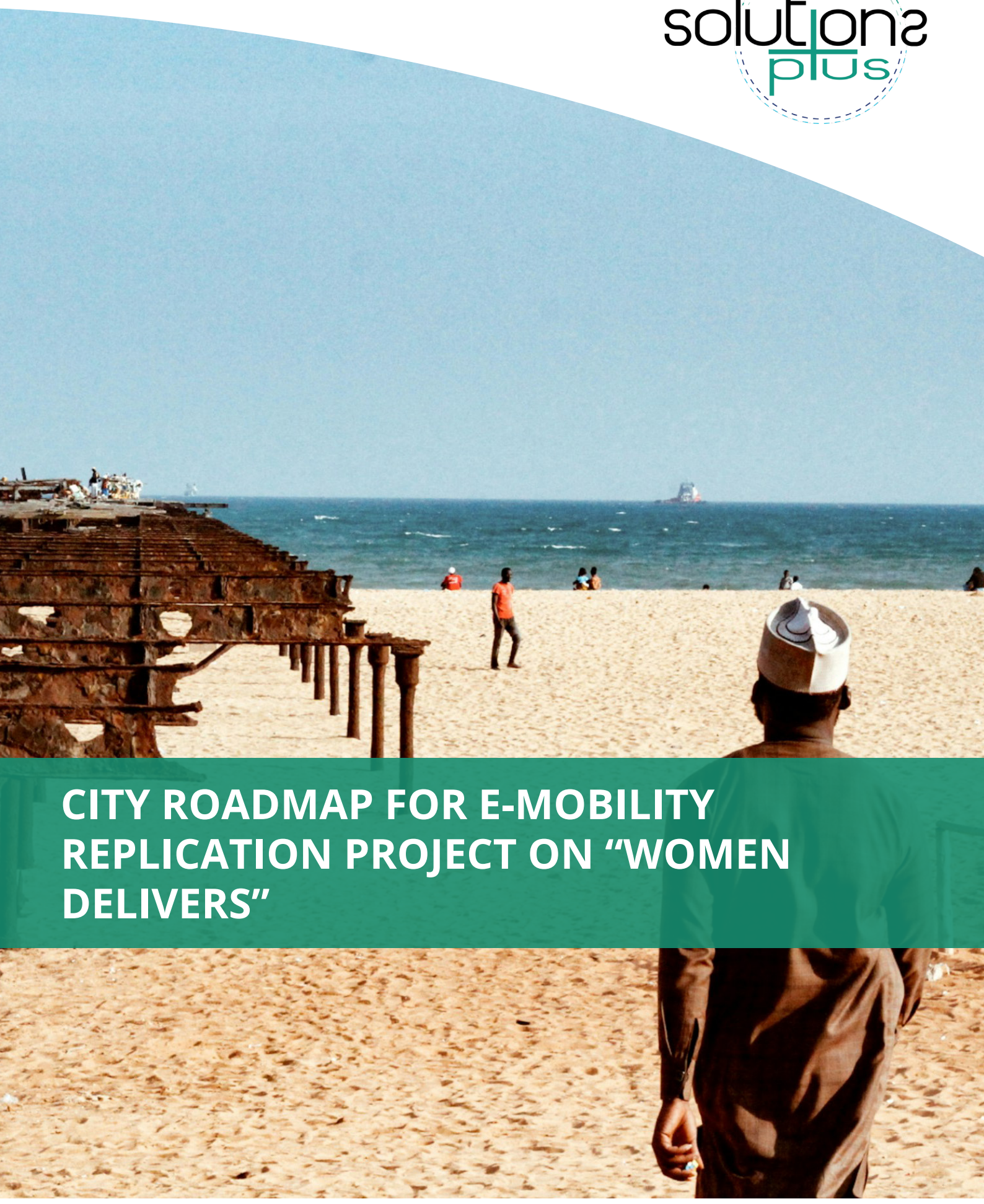
CITY ROADMAP FOR E-MOBILITY REPLICATION PROJECT ON "WOMEN DELIVERS"



This project has received funding from the European Union Horizon 2020 research and innovation Programme under grant agreement no. 875041

PROJECT PARTNERS

ABOUT

To provide a guideline for E-mobility Replication project on “Women Delivers” in the City of Lomé, Togo

TITLE

City Roadmap for E-mobility Replication project on “Women Delivers”

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DISCLAIMER

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All the other pictures are provided by the SOL+ partners

June, 2024

City Roadmap for E-mobility

Replication project on “Women Delivers”

Lomé / Togo

June 2024

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Executive Summary

Lomé is a coastal city located in the south of Togo. Togo's population is mainly concentrated in the capital, Lomé, which brings together 1.6 million people at the level of the agglomeration. This dynamism is largely linked to the activity of the port of Lomé. Constrained by natural limits (Gulf of Guinea to the South) and administrative limits (Ghana to the West), the urbanization has developed in recent years towards the East along the coast, but especially towards the North, along the Ghanaian border and the RN1 which crosses the country from South to North.

2 wheelers are the main mobility mode in the country. The motorcycle fleet can be estimated at around 500,000 units across Togo among which 5000 are electric. The national park of cars is probably around 140,000 cars. DTRF (Direction des Transports Routiers et Ferroviaires) annual statistics show exponential growth in motorization. Every year, the news registrations amount to nearly 50,000 motorized two-wheelers and tricycles and nearly 16,700 cars and vans, which would correspond to an annual increase of almost 10% in the fleet.

The mobility public transport operator is SOTRAL who operates 11 regular lines and 7 lines to serve the universities. The network covers most of greater Lomé, even if some neighbourhoods do not remain served.

Paratransit transport satisfies most of the demand for public transport and has quickly adapted to the urban growth of Greater Lomé. 3 types of vehicles are used : moto taxis, shared taxis and more recently tricycles. Several ride hailing apps have been deployed for taxis.

Several decrees (last one in 2023) have been taken to regulate the operation of moto taxis and tricycles in order to improve the safety, the air quality and the organisation of paratransit transport as well as the connections with public transport. At local level a PMUD (Plan Mobilité Urbaine Durable) is being elaborated by SYSTRA and should be terminated by the end of 2024.

This roadmap makes some hypothesis on the outcomes of the PMUD regarding the deployment of electromobility in Lomé. Its objective is to envisage the electrification of paratransit 2-3 wheelers operating in Lomé for the transportation of passengers and goods. This should facilitate the successful introduction of electric mobility in Togo and raise awareness on electro mobility for all stakeholders.

In order to do this, the roadmap establishes short, medium and long term goals to achieve this objective and to implement specific actions to move forward in filling the existing gaps for this service. To get there, it presents five focus areas:

- **Governance** since it will be necessary to improve the structure of paratransit activities before electrification.
- **Communication** adapted to the various stakeholders which need to be involved in the transition process
- **Regulation** in order to determine a clear framework for the deployment of these vehicles concerning various domain such low emission zones or restricted access areas, standards for the vehicles, batteries, aiming at a ban of traditional ICE vehicles in a near future

- **Economic and financial measures** which can be established at city level complementary to the national measures
- **Urban planning** to find the best locations where to implement charging infrastructure (e hubs and stations) and related equipment

Table of Contents

List of figures and tables

1. Background – Where are we now?

Several studies have been realized to assess the current situation of urban mobility in Lomé. The main conclusions of these studies are presented in this chapter.

1.1. Urban mobility context in Lome

A coastal country located on the Gulf of Guinea, Togo is home to nearly 8 million inhabitants. Its geometry in the shape of a rectangle, 700km long from North to South with a width of less than 150km, gives it on the one hand a variety of climate, landscapes and cultures and on the other hand the proximity of its neighbors that are Benin in the East, Ghana in the West, Burkina Faso in the North.

On the south coast, the port of Lomé serves as a gateway to the entire sub-region.

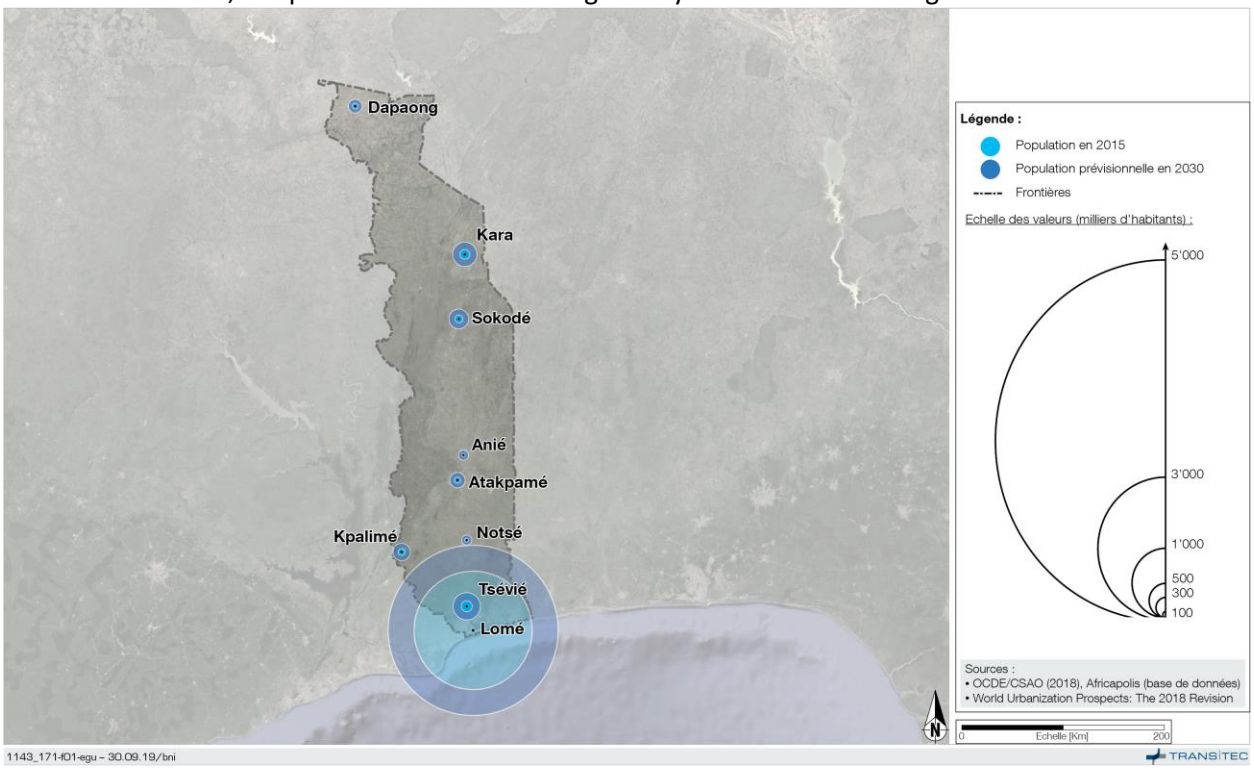

Figure 1 Situation of Lomé in Togo

Like most countries in the sub-region, Togo is experiencing rapid urban growth, suggesting significant challenges in terms of urban mobility: 42% of the population lives today in urban areas, and projections predict a rate of 57% by 2030.

The population is mainly concentrated in the capital, Lomé, which brings together 1.6 million at the level of the agglomeration. This dynamism is largely linked to the activity of the port of Lomé.

Constrained by natural limits (Gulf of Guinea to the South) and administrative limits (Ghana to the West), urbanization has developed in recent years towards the East along the coast, but especially towards the

North, along the Ghanaian border and the RN1 which crosses the country from South to North. It results a very restrictive urban structure, the main economic polarities being located in fringe of the urban area and not in the heart according to the classic urban plan. The historic center in South-West is home to administrations, banks and the large market, while the South-East is home to the port of Lomé and the industrial zone. With these very eccentric polarities, the development of the city is done by an extension of distances and the multiplication of commuting movements.

A certain rebalancing is, however, provided by the University of Lomé, located approximately 5 km to the north from the historic center. This rebalancing should continue in the coming years, on the one hand with the ongoing development of Lomé II which is intended to become a new polarity and, on the other hand, because spatial harmonization constitutes a strong axis of the town planning plan developed in 2015.

This highlights the challenge of increasing urbanization and therefore the need to improve and increase the infrastructure as well as the social and urban services in a more balanced manner across the territory.

By 2030, the Togolese population is estimated at 10 million inhabitants in 2050, 14 million, 70% of whom will live in urban areas.

1.1.1. Traffic organisation

The motorcycle fleet can be estimated at around 500,000 units across Togo among which 5000 electric. The national park of cars is probably around 140,000 cars. DTRF (Direction des Transports Routiers et Ferroviaires) annual statistics show exponential growth in motorization. Every year, the news registrations amount to nearly 50,000 motorized two-wheelers and tricycles and nearly 16,700 cars and vans, which would correspond to an annual increase of almost 10% in the fleet two-wheelers and 12% for private cars (based on OICA estimates/ International Organization of Motor Vehicle Manufacturers).

Lomé concentrates a large part of the vehicle fleet in Togo with probably nearly 20% of the Togolese fleet for motorized two-wheelers. This proportion is probably even higher for cars, particularly because infrastructure is very poorly developed in secondary cities.

Usage de véhicules	Nombre	Proportion
Privé	166 189	79,14%
Taxi	27 003	12,86%
Passagers	7 432	3,54%
Marchandises	9 376	4,46%
Total	210 000	100,00%

Figure 2 vehicles in Lomé in 2018

1.1.2. Public Transport Operator

Public services (SOTRAL network): SOTRAL operates 11 regular lines and 7 lines universities, with competitive and subsidized pricing. The network is therefore relatively extended and covers most of greater Lomé, even if some neighbourhoods do not remain served. To date it is a radial network, which converges towards the BIA bus station, nearby of the big market.

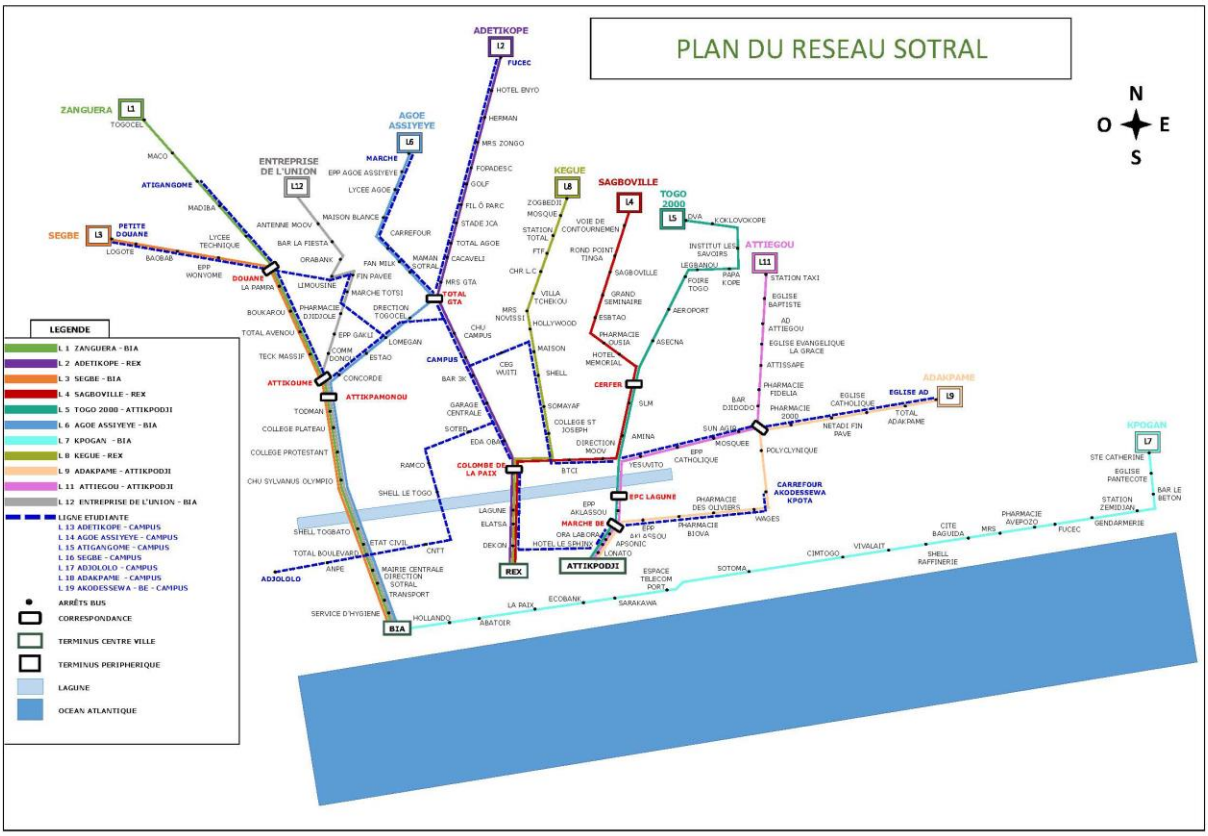

Figure 3 Map of the SOTRAL Network (Source SOTRAL)

However, SOTRAL has experienced major operating difficulties due to a fleet of ageing and insufficient vehicles. The park consists of a few buses "Chamotors" bought new in 2010-2012, second-hand buses offered in the framework of decentralised cooperation with SYTRAL (Lyon's Mobility Operator), and AOTU du Grand Lyon (Lyon Urban Mobility Authority)

Unfortunately, the manual gearboxes, the lack of spare parts and the poor adaptation of the vehicles to the operating context led to a very rapid dismissal of these buses. From 90 buses in 2015 only 10 were operational in 2021.

The lack of reliable vehicles has resulted in a quick deterioration in the quality of service, which has led to a direct impact on usage: increase in travel times, journey lengths, resulting in a sharp drop in ridership. New buses Man have been purchased since (for example, 10 in 2021) in order to improve SOTRAL service.

Buses do not have any reserved lanes in the city and while some stops have been set up so that users can easily locate bus stops, or even wait for shelter from the sun or bad weather, their quality is very uneven. In addition, there are conflicts of use with minibuses and taxis at the stops, due to the lack of support for these modes and the absence of multimodal hubs.

1.1.3. Paratransit

Paratransit satisfies most of the demand for public transport and has quickly adapted to the urban growth of Greater Lomé. Although this sector is governed by state authorisations, the majority of paratransit is informal. They are composed of:

- motorcycle taxis, called Oléyia or Zems, which dominate the artisanal transport system in Togo. On the scale of Greater Lomé, they represent at least 17,800 vehicles, making more than 475,000 daily trips for the inhabitants. There is an institutional framework in place to professionalize motorcycle taxis, but it is not enforced, only than 5% are declared as "professionals". The organisation is based on simple rental, leasing and direct exploitation of the owner with an average of 26 trips per day for motorcycle taxis for which this is the main activity.
- shared taxis, generally better regulated by the authorities, operated according to authorised routes within the municipality of Lomé, to which they pay a daily fee; Their number can be estimated at nearly 9,000 vehicles and they would represent around 270,000 trips per day of the inhabitants. Their circulation is authorized by the DTRF but they are managed by the trade unions grouped together in the National Union of Road Drivers of Togo (USYCORT), which brings together five unions. The driver is required to join one of the 5 unions and pay a membership fee that entitles him to operate from the Bus Station
- Recently, passenger transport by tricycles has emerged in Lomé, although it is not yet possible to estimate its extent. They have come together to form a National Union of Passenger Tricycles (SYNATRIP).

Several Ride Hailing Apps are deployed not only for moto taxis ; the most popular is Gozem which introduced through the digitalisation and the direct contact with drivers, new habits in the displacement of Lomeans by improving the practices that existed, based on the quality, reliability and safety of its services, for instance the cost of the travel being fixed before the ride, there is no possibility to bargain before/after the travel. Moreover, Gozem has developed urban logistics activities.

Finally, the use of a private vehicle would represent nearly 625,000 trips per day by inhabitants, of which 325,000 would be related to private cars and about 300,000 to motorcycles. Their fleet could be in the region of 54,500 cars and 76,300 motorcycles.

The city taxi sector is experiencing difficulties because it faces competition from motorcycle taxis, which are more flexible and have a larger catchment area. For this reason, city taxis tend to go outside the predefined routes. However, they play a complementary role with the bus network, which is not able to meet demand.

1.1.4. Modal Share

Walking is the main mode of travel for the inhabitants (more than half). There are no recent statistics on the modal share, but based on the ratios observed in other countries of the sub-region, the volumes of trips generated at the level of Greater Lomé could represent nearly 3.43 million daily trips by Lomeans over 10 years of age, including nearly 1.94 million non-motorized trips/day and 1.49 million motorized trips/day.

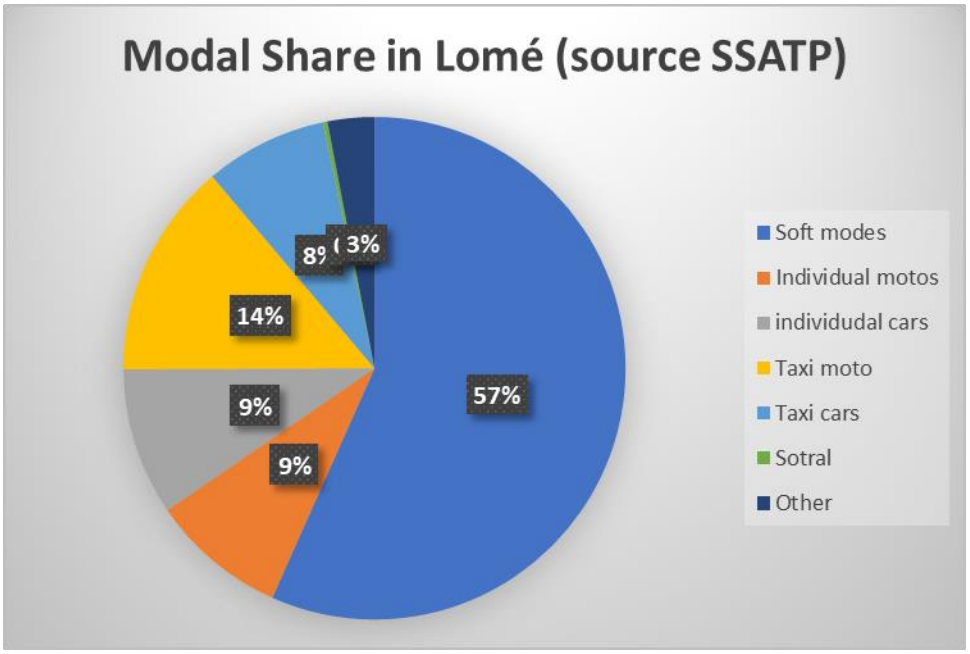

Figure 4 Modal Share in Lomé (source SSATP)

1.1.5. Legal and institutional framework

On December 22, 2022, the Togolese parliament passed a new transport orientation law. The text, which replaces the two-decade-old text, which has been in force since 1998, sets out the general contours of the different modes of transport in the country, and a new policy framework, in line with relevant conventions, treaties, bilateral and multilateral agreements. It clearly clarifies the roles of the State, local authorities and other actors, and takes into account public-private partnership issues, particularly in terms of financing, operation and maintenance of public infrastructure and equipment and transport, among others. In addition, it regulates access to and exercise of the transport professions and intermediation.

Then the Council of Ministers examined and adopted on October 20, 2023, a decree regulating the operation of motor vehicles such as taxis, motorcycle taxis and tricycles assigned to public transport. t establishes on the one hand for operators of public transport the obligation to obtain a license issued by the minister responsible for road transport and on the other hand the obligation to obtain a transport authorization for vehicles issued by local authorities.

The text adopted following the Transport Orientation Act aims to improve the general transport framework in order to guarantee road users safer and better organised mobility. The aim is to address issues of road safety, air pollution and the unprofitability of public transport activity.

Thus, the decree aims to regulate the operation of taxi, motorcycle taxi and tricycle transport. Its implementation will lead to a better organisation of public transport, the professionalization of the sector's players, a better identification of taxis and their scope of activities, as well as an improvement in road safety and better comfort for passengers.

1.1.6. Urban Mobility policies

The PNMU 2030 (National Urban Mobility Plan) is part of the general framework of the National Development Plan (NDP) 2018-2022, which aims to make Togo an economically, socially and democratically solid and stable middle-income nation by 2030, united and open to the world.

The objectives of the PNMU 2030 also respond operationally to the Togolese State's international commitments for sustainable development, starting with the 2030 Agenda which sets out the 17 Sustainable Development Goals (SDGs) and the Paris Climate Agreement to which Togo is committed, through the Intended Nationally Determined Contribution (INDC) to reduce fossil fuel consumption by 20% by 2030.

The urban mobility plan is divided into 11 strategic areas, including

- Improving the governance of urban mobility
- Organising institutions to ensure multimodal management of urban mobility and the interaction between urban planning and transport
- Define a multimodal strategy that responds to current mobility challenges and anticipates them by ensuring an articulation between urban planning and transport
- Strengthen the SOTRAL network on the main roads of Greater Lomé and develop public transport networks in the main secondary cities
- Regulate non-contracted modes of transport and target their field of action
- Improving the link between the SOTRAL network and non-contracted transport by organising stations in Greater Lomé

Faced with the challenges of a growing population, the **Schéma Directeur d'Aménagement Urbain (SDAU)** for Greater Lomé, drawn up in 2015, aims to promote multipolar metropolitan development by decentralising urban functions. The aim is to fight against urban sprawl in order to preserve the potential for urban agriculture and the natural spaces on the margins of Greater Lomé. The SDAU's strategy is broken down into 6 orientations, the fourth of which relates to the improvement of urban mobility. It provides the following main guidelines in the field of transport, in particular:

- Develop an Urban Mobility Plan (action provided for by the Emergency Programme of the CDS of Greater Lomé, a document prior to the urban plan);
- Setting up public transport infrastructure in connection with land use planning by pole;
- Strengthen the public transport network by road;
- Organize the development of dedicated public transit (TCSP) at the scale of the agglomeration

- Adapt roads to the duality of motorcycle (space-saving) and public transport (sustainability and spatial equity) modes of transport;

La démarche du Plan de Déplacement Urbain which had been launched in 2016 and halted due to a lack of resources mobilised, has been reactivated since 2018 by the cf reformation of the PDU commission.

This has been enlarged by the launching of a Sustainable Urban Mobility Plan (SUMP) for Greater Lomé. Co-funded by the European Union Commission and the Covenant of Mayors for Sub-Saharan Africa (CoMSSA) to the tune of 600,000 euros, the development of this document began this Tuesday, May 16, 2023 following a ceremony organized by the Ministry of Road, Air and Rail Transport.

Through this plan, the Togolese authorities aim to provide the capital with an urban transport system that takes into account the demographic development of the city. Thus, realistic and pragmatic mobility scenarios will be proposed via the document.

" Based on an approach that relies heavily on the multimodality of a transport system that is currently structured essentially around the motorcycle and the private car, the PMUD must guide the evolution of the transport system towards a more efficient use of resources.The PMUD must guide the evolution of the transport system towards a greater balance between the different modes of travel," said the representative of the Minister of Transport, Michel Komlan Tindano.

The document, according to the Ministry of Transport, should be available in 14 months. During this period, a study of the restructuring of the Lomé Transport Company (SOTRAL) will be carried out.

This new planning is the implementation of the strategic project 33 entitled: " Elaboration of the development plan of 10 main municipalities " included in the Government Roadmap Togo 2025. The process will be undertaken later in other cities of the country.

1.1.7. Organizational framework

The ministries concerned with urban jet mobility are as follows:

- Le **Ministère des Infrastructures et des Transports (MIT)** implements, in collaboration with the other ministries concerned, the infrastructure and transport policy adopted by the Government The Ministry is divided into six operational directorates, the following of which relate to urban mobility: Directorate of Planning and Monitoring and Evaluation (DPSE), Department of Public Works
- (DTP), Directorate of Road and Rail Transport (DTRF).
- Le **Ministère de l'Urbanisme, de l'Habitat et du Cadre de Vie (MUHCV)** implements the policy on urban planning, human settlements and the improvement of the living environment adopted by the Government. It defines and coordinates the interventions of the State and the various actors. It assists local authorities in urban management and provides urban development planning tools. In particular, it includes several departments with interfaces with urban mobility:
- Le **Ministère de l'Administration Territoriale et de la Décentralisation (MATD).** Within this Ministry, the Directorate of Decentralization and Local Authorities (DDCL) is responsible for implementing the State's policy on decentralization and ensuring its follow-up.

- Le **Ministère de la Sécurité et de la Protection Civile (MSPC)**, which includesthe **Division de la Sécurité Routière (DSR)** Created in 2014. The latter is in charge of educating and raising awareness among civil society, road checks, surveillance of intersections (traffic management at rush hour in particular) and community policing.

1.2. Current Policy Framework and Market Readiness for deployment of e mobility

1.2.1. Global Policy Framework

Following the strategies regarding Climate Chane adaptation and reduction of GHG, several measures regarding the transport sector have been launch since 20 years.
The most recent is the P36 promoting green mobility through the introduction of new technologies for

- The improvement of road infrastructures to decongestion city centers (AIRDCU)
- The growth of urban public transport by buses (DTCB)
- The elaboration of new standards for road transport

This program is mainly focused on electric mobility with the objective to reference Togo as a leaser of electric mobility in Africa.

Regarding electrification, specific programs are also on going such as a project to support the transition to electric mobility in Togo was launched on 5 September 2022 in Lomé by the Ministry of Environment and Forest Resources. It is funded by the Global Environment Facility (GEF) and has the United Nations Environment Programme (UNEP) as its implementing agency. With a total cost of 1,573,716 US dollars. The Togolese government's contribution, mainly in co-financing of the projects, is eight hundred thousand (800,000) USD. In addition to this co-financing, the Togolese government also contributes in kind.
It is structured into four components needed to remove barriers and facilitate the successful implementation of efforts to build an integrated, sustainable and low-emission transportation system, especially in transportation.

These components are the institutionalization of low-carbon electric mobility, the removal of short-term barriers through low-carbon electric mobility demonstrations, the preparation for the scale-up and replication of low-carbon electric mobility, and finally the long-term environmental sustainability of low-carbon electric mobility.

Moreover, the 2024 Finance law has extended tax exemption measures to electric vehicle batteries.

1.2.2. Electric 2-3 wheelers deployment

Regarding the development of electric 2 -3 wheelers, the Togolese market is largely occupied by the company Spiro, ex Mauto Electric Mobility (M Auto). Present in Benin, Togo and Rwanda with nearly 10,000 motorcycles, Spiro will soon extend its service to Uganda and Kenya, with an additional 15,700 motorcycles.

Spiro offers two models of electric motorcycles "Chap chap" and "Commando" in Togo. Commando the manufacturer's first model is a 125 electric motorcycle. Powered by a 6.5 kW electric motor, it has a

maximum speed of 80 km/h and is powered by a pair of removable batteries that can travel up to 75 km on a single charge.

Capable of travelling up to 65 km/h, the ChapChap is more an 125 cc electric scooter and allows up to 90 km of range. Chap Chaps are more specifically designed for women's vehicles.

Motos were built in China. Since the beginning o 2024, they are assembled in Togo and in the future, moer will mainly be manufactured in Togo, creating 2,000 jobs in the transport sector for young Togolese.

Figure 5 Example of motos électriques built par M Auto © ImpactAlpha

Piro belongs to the Equitane group, a conglomerate at the intersection of industrialization, innovation, and sustainability. Rooted in Africa with a global vision, Equitane serves as the parent company to a diverse portfolio of subsidiaries, including leaders in renewable energy, agribusiness, healthcare, and technology.

In order to accelerate the transition towards electro mobility, Spiro proposes :

- To swap batteries according a weekly fee quite affordable ; several swapping station are implemented around the city and the first charging station has been opened in February 2024
- To exchange ICE moto to electric one according to a "work and pay" system for motorcycle taxi drivers; who have to do about 20,000 km per month, and do about 150,000 km before becoming the owner of the motorcycle.
- To guarantee the procurement of spare parts, included in the renting contract

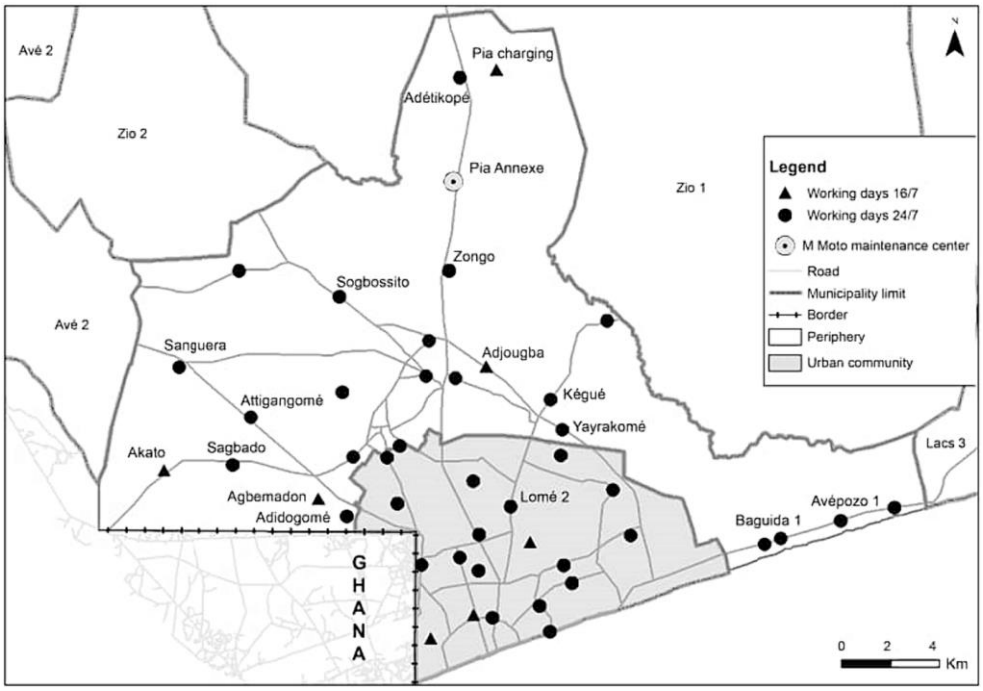

Figure 6 . Locations and working days of battery exchange stations. Source Yao

Another operator "Pikipiki" sells e-motos and proposes services to transport passengers and goods. It is far less develop than Spiro.
Other projects are also promoting the electromobility such as

- A project funded by UNEP and launched in December 223, intends to provide 10 e motos to the Ministry of transport for own services.
- The deployment of 4 electric cars in Lomé
- The construction of a "Ville Nouvelle" near Lomé which takes into account ttransportation with e busses

1.3. Replication Project

The project “Women Delivers” aims to empower economically disadvantaged women in Lome through mobility by creating women entrepreneurs in last-mile delivery while also reducing C02 emissions and establishing climate friendly mobility patterns with eBikes.

It is structured into five key objectives:

- Provision of and set up for the operating and maintenance of 20 Wahu eBikes and 1 battery swapping kiosk are established in Lome, Togo;
- Recruitment and training of 20 women from low-income backgrounds in Lome with technical and business skills developed through a structured rider program;
- Key commercial relationships are forged with ecommerce platforms and/or local businesses with a pipeline of deliveries available to riders for income generation;

- Localization and onboarding of the Wahu App for eBike performance monitoring and tracking data analytics.
- Dissemination of key learnings to stakeholders to promote electric mobility and enable scaling and replicability of the project in Togo

Alongside this, 1 battery swapping station will be procured. This will enable women from low income backgrounds to realise their entrepreneurial potential by preparing them to launch and grow their own micro courier business as eRiders through our App and, with it, assert their autonomy and independence.

The Project runs up to June 30 2024 so the main achievements are not yet consolidated. From the interim report, some difficulties arose at the beginning concerning mainly

- The availability of the bikes and spare parts
- The recruitment of women

Utilizing the critical insights derived from our iterative prototyping phase, we successfully implemented adaptations to the bike, culminating in the creation of our current flagship model.

Figure 7 Current MANA Bike used by WAHU *(MANA Bike specification)*

The MANA eBike used by WAHU is powered by a 1000W brushless hub motor and up to two 48V 1kWh lithium-ion swappable batteries, providing a range of up to 140km on a single charge. This means that riders can easily travel to work, run errands, transport cargo, or explore the city without worrying about running out of power. The eBike also has five levels of pedal assistance, making it easy to adjust the level of support based on the rider's needs. Additionally, the bike boasts a lower stand over height to accommodate for ease of mounting and dismounting for women riders.

In addition to its impressive range and power, eBike also comes with a range of convenient features. It has a bright LED headlight, tail light for visibility in low light conditions and a compact OLED display. Additionally, it also has a rear rack, mud guards and large, robust tyres making it easy to carry cargo and stay clean and dry in wet weather. Further, with the embedded IOT device our vehicle interfaces easily with the MANA App. With this, our riders are able to access vehicle information such as battery status, track rider metrics such as daily ridden distance.

1.4. Gender Issue

Considering the scope of the replication project, it is quite important to consider gender issues in Togo to elaborate the roadmap.

Togo is cited as one of the most-improved countries in the World Economic Forum's 2021 Global Gender Gap Report in its overall index, having narrowed the gender gap by 6.8 percentage points since 2020. -is means that in one year, Togo has made progress toward closing gender-based gaps in economic participation and opportunity, educational attainment, health and survival, and political empowerment (World Economic Forum 2021). However, more work is needed in Togo to achieve full gender equality. Togo still ranks 91st out of 146 countries in the Global Gender Gap 2022 Report (World Economic Forum 2022).

Between 2021 and 2022 the share of women in professional and technical roles as well as in senior, legislative and managerial roles increased and Togo has the very high share of women in senior roles, at 70.1%.

However Gozem (moto-taxis) drivers are almost exclusively male and low-education young people. The proposed explanation is that driver's profession requires considerable energy during the trip. It is physical and appears as an essentially male activity. This situation is also explained by the strong presence of men in the driving profession. According to the ministry in charge of transport of Togo (2020), "interurban drivers are made up of 99% of men and those of the urban environment are formed by 95% of men". According almost all customers interviewed, the arduousness of driving work marked by the deployment of physical energy excludes women from this activity.

In other countries, women already drive motos or cargo bikes to deliver goods ; so there should be no physical or technical difficulty to develop the Wana project in Togo except for some sociological barriers which could hamper this extension.

2. Approach – Methodology

The roadmap is based on the documents and conclusions mentioned previously. In our approach, it is assumed that the SUMP (PMUD) of Lomé will address urban logistics and envisage the development of electromobility in general. Existing delivery companies like Pikipiki will probably be concerned as well as the Wana project.

Although the replication project concerns only goods delivery, it must be included in a larger scope of e 2-3 wheelers since they will require the same resources, public equipment, etc. and must be equally considered regarding regulations or support. Moreover, many of the moto taxis transport indifferently passengers and goods.

So the scope of the roadmap will mainly concern the integration of the project in this global approach both on technical and sociological aspects

3. The Roadmap – Where are we going?

3.1 Vision

Togo aims to be carbon neutral by 2050 ; all cities will be sustainable smart cities in which transport vehicles will not emit GHGs or other pollutants nor generate noise or safety/health issues.
Then urban mobility must contribute to this ad more specifically light vehicles such as 2-3 wheelers transporting passengers or goods will abide by this vision
The vision is then to have more urban spaces for people, clean and safe 2-3 wheelers riding in dedicated lanes.

3.2 Objectives

To make this vision happens in 2050 several objectives have to be reached at short and medium term :
The objective is that by this time all 2-3 wheelers used for deliveries or passengers in Greater Lomé are electrified and represent a significant modal share. This is realistic considering the national strategies on electromobility and the life cycle of ICE vehicles.
But, following the outcomes of the replication project, half of these vehicles should be driven by women. This will contribute to broader issues related to gender equality, economic development, and sustainable transportation in Sub-Saharan Africa. It also aligns with global efforts to promote sustainable and equitable mobility and reduce carbon emissions.

3.3 Timeline

The roadmap will be implemented in the timeline presented on next page . It is organized by Focus areas as are described in the following section, and has milestones in the short, medium and long term. This table is a synthesis of measures, and details of each of these is provided in the implementation plan section according to each focus area.

Table 1. Timeline for roadmap deployment - Freetown

Phase	***Demonstration (2024-2026)***	***Scale-Up (2027-2030)***	***Mainstream (2030-onwards)***
Focus area 1: Governance	- *Stakeholder detailed analysis* - *Determine the relations and roles between Local transport Authority integrated in PMUD and operators,* - *Set up a Steering and a Technical Committees to supervise the deployment* - *Elaborate a Chart for governance* - *Create an observatory to follow the deployment of paratransit 2-3 wheelers*	- *Analyse the results of first implementations and adapt the rules and the integration in the global transport system* - *Set the observatory in operation* - *Follow the technical implementation and technical evolutions*	- *Continue the Steering & Technical committees, integrating new members* - *Analyse outcomes and propose technical or strategic improvements*
Focus area 2: Partnerships and public awareness	- *Prioritize each paratransit target groups and elaborate specific communication messages for them, with special effort for gender issues* - *Plan and implement communications campaigns to prioritized target groups;*	- *Continue implementation of communication campaigns and expand to all target groups;* - *Set up training sessions for the various target groups*	- *Continue implementation of communication campaigns* - *Continue training sessions*
Focus Area 3: Regulatory measures	- *Determine the type of paratransit specific regulations to be applied for the deployment of 2-3 e-W* - *Elaborate the schedule of their implementation* - *Define standards to applied to vehicles, batteries (swapped) and charging*	- *implementation of first access controlled zones* - *Ban the sale of ICE 2-3 wheelers* - *follow up the implementation and the integration of standards*	- *Extend the network of access controlled zones for 2-3 e W* - *Monitor the evolution of regulatory measures*
Focus Area 4: Economic and Financial measures	- *Facilitate replacements of ICE motorbikes by Electric ones (like Spiro model for instance)*	- *Explicit mention of LEVs in national-level incentives* - *Accompany the deployment of e-hubs and 2-3 eW fleet*	- *Monitor the incentives*

Phase	*Demonstration (2024-2026)*	*Scale-Up (2027-2030)*	*Mainstream (2030-onwards)*
	- *Include 2-3 eW in local-level incentives, grants and taxes* - *Elaborate accompaniment measures for start ups* - *Set up grouped procurement (with operators) for batteries (swapping) and other collaborative actions* -	- *Launch the call for purchase of batteries*	
Focus Area 5: Urban Planning Charging and other infrastructure	- *Define guidelines to determine the most suitable locations for deployment of e 2-3 wheelers* - *Identify first key locations for parking spaces, mobility e-hubs* - *Detail the operating and management activities of the e hubs* - *Plan the implementation of e-hubs and the growth of their functionalities*	- *Choose the sites, and define their implementation, financial plan and pilot scale-up* - *Purchase or develop (renting)agreements with the owners of the sites* - *Deployment of charging stations in public spaces (pilot deployment)* - *Build first e-hubs as pilots and analyse the impacts (indicators)* -	- *Extend the functionalities of e hubs according the utilisation and demand* - *Full network deployment of all charging-related infrastructure*

4. Implementation plan – How do we get there?

The elaboration of the PMUD gives Lomé's Local Authorities an opportunity to include the electrification of Paratransit in the global organisation of mobility in the City. However, this objective requires to clarify the position of the Transport Authority regarding Paratransit stakeholders and their relations. This governance aspect is preponderant over the economic or more technical aspects.

4.1. Focus area1 : Governance

The operators of Paratransit in Lomé are quite different, some are relatively well structured, already using electric motorcycle taxis, others much less.
In this context, the position of the Transport Authorities regarding the integration of Paratransit into the overall organization of mobility in Lomé must be clarified before defining the strategy of the electrification of the related vehicles. This electrification strategy must also be in line with the electromobility strategy developed at city level (see PMUD, mentioned above). In addition, it will obviously be necessary to ensure that the demand for electricity can be met by the grid.

For instance, relationships with stakeholders and integration of paratransit will be quite different :

- If the current situation is maintained, with a multiplicity of unstructured actors, the development of electrification will be similar to a traditional deployment for individual owners regarding the implementation of charging or battery swapping stations. However, it will be necessary to determine the organization of these stations, and their manager (public or private?). In this case, it will also be possible to offer financial and/or technical support to these players, possibly within the framework of national policies for the development of electromobility
- If, on the other hand, the strategy is to better structure Paratransit by bringing together several actors (EIGs, associations, trade unions, etc.) under a more formal status, the Transport Authority's efforts towards the electrification of vehicles can be more focused on specific needs.

The actions which could be set up to improve the relations and governance with Paratransit operators and facilitate the electrification are related to :

- The identification of main stakeholders to draw a clear mapping of the various practices and organisations, to collect actual and detailed data on the operating modes of drivers and to point out their main requirements. This approach will lead to different categories of operators, each with specific needs and constraints.
- The organisation of the relationships regarding the categories of actors, the definition of the roles of public and private partners in the deployment of electrification (especially for the management of shared resources like e-hubs), the promotion of women drivers and related gender issues. This could lead to the elaboration of a Chart agreed by all players.
- The definition of possible collective actions such as procurement, financing (loans, vehicles exchanges,…) guidelines of best practices, sharing resources (e hubs, coordination for charging for instance), education and training, data reliability (automatic reporting for instance,…)

- The monitoring of the process and the development of a specific observatory, with relevant indicators and measurement methods

For this to happen, it would be necessary

- Set up a specific Steering Committee grouping the main stakeholders to validate the paratransit electrification strategy and determine the main phases of the deployment in accordance with the PMUD; this Committee should also envisages any adaptation to the evolution of the technologies and other connected factors (technical, social, financial..).
- Set up a Technical Committee in charge of following the progress of the deployment of vehicles and charging infrastructure (eg charging stations, hubs) as well as the technical evolutions of the e mobility to inform the Steering Committee of any advance that should be considered in the related strategy

4.2. Focus area 2: Communication and public awareness

The main targets for the deployment of moto taxis are the operators, owners and drivers. A strong communication strategy must be elaborated to convince them to move towards e mobility. The main axes of this strategy could be

- Economy : to show the benefit of turning to electromobility and compare the TCOs (Total Costs of Ownership) of Ice vehicles versus Electric 2-3 wheelers inline with financial/Economic advantages)
- Technical knowledge : to organize shows, to demonstrate the performances and abilities of these vehicles, even in lending vehicles for a short period so that drivers get familiar with them
- Training : to organize practical training sessions / workshops for all actors from drivers to maintenance and managers

The second target comprises other stakeholders which contribute to the deployment of 2-3 wheelers:

- Salers of the vehicles who can promote and explain the advantages of the vehicles
- Manufacturers of 2-3 wheelers who can start producing/ assembling these new vehicles
- Clients of deliveries (shopkeepers) or passengers who can request that their travels or services are done with electric vehicles

The third target are the numerous users of these vehicles which can be

- Customers then the best way to convince them is to demonstrate the various advantages of the vehicles
- Individual users/owners of 2 wheelers for which specific awareness raising or sensibilisation campaigns may be launched, especially in line with the implementation of access zones or low emissions zones

In all actions which be engaged for these targets, considering the outcomes of the demonstration project, a specific effort regarding the place of the women and gender issues must be included in the elaboration of the messages and announcements.

4.3. Focus Area 3: Regulatory measures

The deployment of electric 2-3 wheelers must be accompanied by regulatory measures in order to facilitate their integration in the Lomé mobility organisation and to improve the security of users. 3 types of regulations should be established more or less progressively :

- Those related to access control, linked with urbanization and traffic management, such as dedicated lanes, low emission zones, congestion zones, delivery hours,…. The objectives of such measures are to limit the accessibility for ICE vehicles and to facilitate the utilization of e powered ones ; these measures should be coherent with the PMUD's strategies regarding traffic organisation.
- Standards for the vehicles regarding :
    - the frame ad performances of the vehicle (dimensions, speed, max load…..)
    - the batteries (especially for swapping), from their assembly (or importation) to the end of life of batterie
    - charging protocols, especially interoperability between providers and equipment since it is important to install powerful charging stations to minimize the charging time.
- Standards for the charging equipment in order to guarantee the interoperability on all aspects (technical/plugs, payment, accessibility…) and the accessibility
- The ban of non electric 2-3 wheelers which can begin by forbidding their importation and sales and taxations on the spare parts

4.4. Focus Area 4: Economic and Financial measures

Regarding electromobility, financial measures such as purchases incentives or tax exemptions, are more often decided at national level than at city level. However Local Authorities may also contribute to the economic support of the deployment of 2-3 wheelers. Actions can be engaged in several domains such as

- Facilitate the acquisition of e motor bikes in extending the exchange principle developed by Spiro
- Develop specific partnerships with the operators, for instance for the exploitation of e hubs or the implementation of charging stations on public properties, like procuring the equipment, the energy, low rents,, grouped tenders (ex for purchase of batteries)….
- Simplify the obtention of banks' loans for operators, especially the smaller ones (ensure warranties) ;
- Facilitate the negotiations with electricity providers to have specific costs for fleet operators
- Support the creation of start ups which intend to manufacture parts, assembly vehicles or even set up importation trades (eg for batteries' cells)

4.5. Focus area 6: Urban Planning and charging infrastructure

The main concern on urban planning will be to facilitate the paratransit utilisation of e 2-3 wheelers for passengers and goods in providing dedicated spaces for charging, parking or riding.

Charging facilities can be located in various spaces, on street, in parking areas, in e-hubs,…..

2 charging modes may be used in Lomé :

- Battery swapping for 2 wheelers since battery packs are not so heavy (less than 10 kg)
- Charging stations for 3 wheelers which require much heavier battery packs

Parking or customers' waiting spaces need to be clearly identified according to the potential users' demands, to the operators and to technical constraints on electricity accessibility as well as the topology and the land owners of the possible emplacement.

Several types of such spaces should be envisaged for instance :

- Parking spaces: specific secured parking spaces or waiting places for travelers ; these could be used by people taking a collective mass transport or by or taxis' drivers waiting for customers coming out mass transport or other attractive places.
- Small e hubs : with the parking areas, these locations are equipped with charging facilities, with (automated) storage of batteries for swapping, including secured parking or access. Such hubs may also comprise e-bike sharing stations/facilities for different operators
- Complete e hubs : extended facilities may be added to small e hubs to include services such as vehicle's maintenance/ repairing, advices on the driving, the charging or the ownership…. They can also include charging stations for cars or light utility vans

In order to achieve this, the following actions are necessary:

1. Define guidelines to determine the most suitable locations for integration of e 2-3 wheelers;
2. Identify key situations for they spaces and their facilities;
3. Engage land owners in the private or public sector who own land in sites that are suitable for the deployment of these locations and encourage their involvement
4. Choose the sites with highest probability of success, and define their implementation, financial plan and pilot deployment.

Regarding urban logistics, the deployment of e cargo 2-3 wheelers will also require specific actions to improve the urban organisation in order to facilitate the deliveries such as

1. Include specific delivery bays, equipped with charging facilities
2. Proximity storage areas where logistic compagnies can deposit their parcels, goods,… before their transfer to final destination / shops
3. Define guidelines to determine the most suitable locations for integration of e 2-3 wheelers;
4. Identify five key locations for mobility hubs;
5. Engage land owners in the private or public sector who own land in sites that are suitable for the deployment of these locations and encourage their involvement
6. Choose the sites with highest probability of success, and define their implementation, financial plan and pilot deployment.

5. Conclusion and next steps – what do we need?

This roadmap has presented an overview of existing situation in Lomé regarding the paratransit activities and more specifically the utilization of moto taxis for the transport of passengers and goods and their integration int the whole transport system.
The replication project confirmed the technical feasibility of the deployment of these vehicles in the city and the social feasibility of goods delivery by women.
However the volution towards full electrification of paratransit must be integrated in the global transport strategy of the city which is currently elaborated in the PMUD and several measures have to be taken to facilitate the acceptability among the operators .
The first actions should be to set up the framework for this deployment which should begin the clarification of the posistion of Transport Authority regarding the integration of paratransit activities in the transport system.
The methodology requires an intersectorial approach and should include representatives of the various stakeholders, paratransit operators and actors as well as local authorities and connected domains like energy distributors, training institutions,…
These various stakeholders should participate at all the different decision levels of the roadmap project, from the top (eg Steering Committee) to the most operational phases (like validation of pilot projects for instance or indicators). As there will be several simultaneous actions realised by different actors, a coordination body will be necessary to ensure the coherence between these actions.

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