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Accelerating a market transition in West Africa: **New Models for Electric Bus Deployment**

Drive Electric
CAMPAIGN

Accelerating a market transition in West Africa: New Models for Electric Bus Deployment

The objective of this project is to analyse the state of the West African bus market, including the current operator landscape in Dakar, Freetown, Accra, Abidjan, Lomé and Lagos, to highlight opportunities to support the deployment of electric buses (e-bus), including relevant commercial and financial arrangements.

Acknowledgements

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Disclaimers

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Opinions and Limitations

Unless otherwise indicated, the opinions herein are those of the authors and do not necessarily reflect the views of C40 Cities and UNEP.

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Acronyms / Abbreviations

AFCON	African Cup of Nations
AFC	Africa Finance Corporation
AFD	Agence Française du Développement / French Development Agency
AFDB	African Development Bank
AFTU	Association de Financement des professionnels du Transport Urbain / Urban Transport Professionals Finance Association
AMUGA	Autorité de la mobilité urbaine dans le Grand Abidjan / Greater Abidjan Urban Mobility Authority
BITP	Bus Industry Transition Program
BRT	Bus Rapid Transit
C40	C40 Cities Climate Leadership Group
CAPEX	Capital Expenditure
CFA	Central African Franc
CETUD	Conseil Exécutif des Transport Urbains de Dakar / Executive Council for Urban Transport of Dakar
CPCS	CPCS Transcom Limited
DBN	Development Bank of Nigeria
DDD	Dakar Dem Dikk
EAIF	Emerging Africa Infrastructure Fund
EBID	ECOWAS Bank for Investment and Development
E-BUS	Electric Bus
EDF	Environmental Defense Fund
EIB	European Investment Bank
ETI	Ecobank Transnational Incorporated
EU	European Union
EV	Electric Vehicle
FONSIS	Fonds Souverain d'Investissements Stratégiques / Strategic Sovereign Investment Fund
GAPTE	Greater Accra Passenger Transport Executive
GIE	Economic Interest Groups
GPRTU	Ghana Private Road Transport Union
GTPWU	General Transport, Petroleum and Chemical Workers Union
GCF	Green Climate Fund
GEF	Global Environment Facility
GiZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (
ICE	Internal Combustion Engine
IFI	International Financial Institution
ITP	Integrated Transport Planning
LAMATA	Lagos Metropolitan Area Transport Authority
LBA	La Banque Agricole

LBSL	Lagos Bus Services Limited
LNG	Liquefied Natural Gas
MMT	Metro Mass Transit
MTC	Metro Transit Company
NDC	Nationally Determined Contributions
NURTW	National Union of Road Transport Workers
OPEX	Operating Expenditure
PE	Private Equity
PTA	Public Transport Authority
QBC	Quality Bus Corridor
SLIDF	Sierra Leone Infrastructure Development Fund
SLIRUMP	Sierra Leone Integrated and Resilient Urban Mobility Project
SLPTA	Sierra Leone Public Transport Authority
SLRTC	Sierra Leone Road Transport Corporation
SOTRA	Société des Transports Abidjanais / Abidjan Transport Company
SOTRAL	Société des Transports de Lomé / Lomé Transport Company
SPV	Special Purpose Vehicle
SUMP	Sustainable Urban Mobility Plan
TCE	Total Cost of Fleet Electrification
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
ZEBRA	Zero-Emissions Bus Rapid Accelerator

Executive Summary

The West African transport sector representing 15% of regional CO_2 emissions (40% of these from fossil sources), is a significant contributor to greenhouse gas emissions and air pollution, making its decarbonization essential for achieving climate goals. Rapid urbanization across the region has outpaced the development of formal public transit, leading to widespread reliance on informal transport systems. West African cities face mounting challenges related to congestion, emissions, and limited mobility access. In this context, battery electric buses (e-buses) may represent a high-impact solution to improve air quality, reduce emissions, and enhance transport efficiency, yet their deployment is hampered by high upfront costs, infrastructure needs, and limited access to finance.

This study, led by C40 Cities and the United Nations Environment Programme (UNEP), assesses the readiness of six West African cities (Abidjan, Accra, Dakar, Freetown, Lagos, and Lomé) to deploy e-buses and identifies opportunities to scale their adoption. Drawing from international experiences such as the ZEBRA program in Latin America and South Africa, the study explores viable commercial, financial, and regulatory frameworks to support sustainable e-bus operations.

Given the high capital costs of vehicles and charging infrastructure, deploying e-buses requires innovative business models and financing approaches. The report analyzes contractual structures such as gross cost and net cost models, which determine how revenue risk and operational responsibility are shared between public authorities and operators. It also reviews ownership arrangements ranging from fully public models to private operator-led and leasing-based structures, as well as emerging asset-light models involving third-party ownership of buses, batteries, and charging infrastructure.

The following arrangements illustrate where each option tends to work best:

- **Gross Cost Contracts**. The authority bears demand and revenue risk, making it suitable when farebox recovery is weak or uncertain. Effective in cities with limited private capacity but strong public governance in low-revenue environments or where the authority needs strong control over service levels and fares.
- **Net Cost Contracts.** Operators retain fare revenue and assume demand risk, incentivizing efficiency and tactical decision-making. Works when fare revenues cover operating costs and part of capital costs, appropriate for high-demand corridors or markets with financially strong operators.
- **Fully Public Ownership.** Provides maximum control but requires major upfront investment and expertise from public sector. Effective where municipalities can access concessional finance and have strong capacity to manage all risks.
- **Operator Ownership.** Shifts most financial and technological risks to the private sector, but feasible only in mature markets with stable revenues. Suitable when operators are well-capitalized and can access credit.
- **Leasing Models.** Spreads costs over time, enabling adoption without large upfront investments. Relevant for cities pursuing rapid electrification under fiscal constraints, useful in transition phases or when operators face CAPEX barriers.
- **Asset-Light / Third-Party Ownership**. Ideal when neither public authorities nor operators can bear full investment risks. A third party (utility, manufacturer, etc.) owns buses, batteries, or charging assets and leases them to operators or the authority. Reduces local financial exposure but requires strong procurement processes, clear payment flows, and well-defined contracts and responsibilities.

Readiness, risks, and pathways to scalable e-bus deployment"

A comparative analysis of the six cities shows varying readiness and institutional setups. Dakar and Lagos are piloting e-bus projects with hybrid public-private models, while others are still building frameworks. Financing remains a core challenge due to low fare recovery, economic instability, weak financial institutions, and limited municipal borrowing. Investor confidence is also affected by currency risks, unreliable subsidies, and regulatory uncertainty.

To address these challenges, the report recommends moving beyond traditional financing approaches, such as standard commercial loans, which are often rigid and ill-suited to the needs of public or emerging fleets. It advocates for blended finance solutions that combine public subsidies, concessional loans, climate finance, and private investment. Key instruments highlighted for their ability to mitigate risks and enhance project bankability include:

- **Green bonds.** Best suited for large-scale fleet transitions in mature financial markets, where public operators can leverage environmental performance to access institutional capital.
- **Concessional loans.** Typically backed by development finance institutions, ideal for credit-constrained environments, helping lower borrowing costs and extend repayment terms.
- **Operating leases**: Compatible with limited cash flow or uncertain long-term ownership plans, offering predictable monthly payments and avoiding large upfront investments.
- **Credit guarantees**: Particularly effective in fragile markets, where they help unlock private capital by reducing lender exposure to currency volatility and regulatory uncertainty.

These mechanisms help mitigate currency volatility, extend repayment horizons, and lower upfront costs, which are critical levers in contexts marked by low farebox recovery and limited borrowing capacity. The TCE Toolkit[1] developed by the Environmental Defense Fund's provides further guidance on layered finance structuring, lifecycle cost modeling, and long-term asset performance evaluation under various ownership and procurement models.

Funding sources include governments, development finance institutions, commercial banks, sovereign wealth funds, and climate investors. Dakar has issued municipal bonds; Accra and Lagos explore public-private partnerships, while Lomé and Freetown require institutional support to strengthen financial capacity.

Addressing legal, financial, technological, and operational risks is vital, including clear regulations, solid business plans, stable energy supply, and strong institutional capacity in procurement and maintenance.

The essential involvement of the informal sector

Integrating the informal (paratransit) sector is critical to the success of e-bus deployment in West African cities, where these operators form the backbone of urban mobility, accounting for over 80% of total trips in all cities. Overlooking this segment risks undermining the effectiveness and inclusiveness of electrification strategies. Informal transport is not only widespread but also highly adaptive, often serving areas that formal systems do not reach.

Successful initiatives from the region demonstrate viable pathways to integration. In Dakar, credit facilitation programs have supported operators in transitioning to cleaner diesel fleets with stricter emissions requirements. Lagos has introduced structured contracting models to formalize relationships with informal providers. In East Africa, Nairobi's asset-leasing pilots offer a replicable model for minimizing upfront capital burdens. Meanwhile, initiatives in vehicle

[1] "Financing the Transition: Unlocking Capital to Electrify Trucks and Buses." EDF. 2020. https://www.edf.org/sites/default/files/documents/EDF_Financing_The_Transition.pdf

retrofitting schemes across different cities illustrate early efforts upgrading existing fleets rather than replace them entirely.

Therefore, targeted financial instruments, capacity-building efforts, and institutional reforms are essential to align paratransit stakeholders with the broader e-bus agenda. Creating inclusive frameworks that reflect their operational realities is not only equitable, it is fundamental for achieving scalable, sustainable urban transport transformation.

The Dakar BRT, an experience to build on

Dakar's electric Bus Rapid Transit (e-BRT) project, launched in 2024, exemplifies a successful deployment model. The project is implemented through a public-private partnership involving Dakar Mobilité, the private asset management company Meridiam, and Senegal's sovereign strategic investment fund FONSIS, with financing from the World Bank, EIB, and other partners. It features a dedicated corridor, a large e-bus fleet, and integrated infrastructure.

The project demonstrates how tailored contracts and coordinated financing can enable large-scale e-bus deployment in complex urban environments.

Though the six cities vary in institutional maturity, energy infrastructure, and regulatory readiness, all offer promising opportunities with tailored, context-sensitive approaches.

- Dakar should consolidate its experience and share best practices, especially in paratransit formalization and private sector engagement.
- Lagos, Abidjan, and Accra should shift from planning to execution, focusing on commercial models, stakeholder roles, and renewable energy supply.
- Lomé and Freetown should prioritize institutional strengthening and network design ahead of deployment.

More broadly, a successful e-bus transition requires a lifecycle strategy balancing risk and responsibility among public agencies, private operators, financiers, and energy providers. Regional collaboration is crucial to harmonize standards, share knowledge, and scale impact. Embracing these principles gives West African cities a unique chance to redefine urban mobility, delivering cleaner air, inclusive growth, and climate-resilient transport systems for future generations.

The 'what', 'who', and 'how' of e-bus deployment

The report outlines the essential components of e-bus deployment:

- **What**: Vehicles, batteries, charging infrastructure, and supporting systems.
- **Who**: Public transport authorities (PTAs), operators, manufacturers, energy providers, and financiers.
- **How**: Through coordinated planning, clear contracts, and compliance with regulatory frameworks.

E-bus deployment requires collaboration across six domains: electricity supply, vehicle and battery provision, charging infrastructure, maintenance, public transport operation, and end-of-life management. Energy providers ensure reliable and affordable power, manufacturers deliver buses and batteries with options for purchase or leasing, and PTAs and operators plan, finance, and operate services while ensuring safety and quality. Maintenance is shared between operators and manufacturers, and recycling or disposal of vehicles and batteries is managed by manufacturers and PTAs.

Several stakeholders play a critical role in this process. National and alternative energy providers guarantee power availability and cost control, while battery and bus manufacturers influence cost, reliability, and maintenance. PTAs regulate public transport and manage contracts, and operators

deliver services under various ownership models. Additional actors include bus or battery companies that provide leasing solutions and financiers who enable investment through loans and partnerships.

Project Background and Study Objective

Project background

Transport is a major source of emissions in West Africa[2], and decarbonisation of the sector is essential to meet the project countries' Nationally Determined Contributions (NDCs), and to improve air quality and reduce pollution.

Across the region, formal public transportation systems have not been able to match the rapid growth of urban populations, resulting in growth of large, informal public transportation systems alongside more limited formal bus services.

In this context, electric buses (e-buses) are expected to offer a promising short- to medium-term solution for reducing transport emissions, particularly given the significant modal share of buses in West African cities.

However, introducing e-buses in contexts where informal transit operators make up a large share of the bus sector presents several challenges. E-buses, while creating opportunities for long-term cost savings from lower fuel costs, are significantly more expensive than equivalent fossil fuel buses (up to two times the cost).

Additionally, e-buses require large up-front investments in charging infrastructure. They require a higher level of planning to facilitate the availability of electricity, charging schedules and specialized maintenance. Because e-bus batteries typically have a shorter lifespan than the buses themselves, the replacement of batteries must be factored into procurement decisions.

As a result of these challenges, formal public transit authorities are in the best position to negotiate with manufacturers, oversee the construction and maintenance of necessary infrastructure, and regulate bus operations. Given the small scope of formal transit systems in West Africa, the adoption of e-buses is embedded in broader processes of reorganization and formalization of the public transport sector, and collaboration with informal and paratransit operators will be essential.

Financing is another important challenge; the resources of local governments and transport authorities are limited, so innovative and creative models of financing will need to be leveraged in West Africa to manage the significant risks associated with e-bus deployment. Policy and regulatory systems will need to be adapted to meet the novel challenges posed by e-buses.

[2] The transport sector represents 15% of total (40% of fossil sources) CO_2 emissions in Senegal, Ghana, Nigeria, Sierra Leone, Côte d'Ivoire, and Togo, according to the CO_2 Emissions of All World Countries – 2024 Report (2024). Available at: https://edgar.jrc.ec.europa.eu/report_2024.

Study objective

The stated objective of the Assignment is:

> *…to analyse the state of the West African bus market, including the current operator landscape in 6 West African cities, and highlight opportunities to support West African cities in the deployment of e-buses, including relevant commercial and financial arrangements.*

The Assignment will focus on six West African cities:

Abidjan (Côte d'Ivoire), **Accra** (Ghana), **Dakar** (Senegal),
Freetown (Sierra Leone), **Lagos** (Nigeria) and **Lomé** (Togo).

It will emulate aspects of the **Zero Emission Bus Rapid Deployment Accelerator** (ZEBRA) in Latin America, a Partnership co-led by C40 Cities and the International Council on Clean Transportation, which has led to several notable successes in the procurement of e-buses and the mobilization of financing for e-bus adoption, and the initiative's recent assessment of the e-bus market in South Africa.

The project comprises six deliverables:

1. Inception Report (D1);
2. Preliminary E-bus Context in West Africa and Bus Operator Landscape report (D2);
3. Preliminary Commercial/Financing Arrangements report (D3);
4. Presentation slide deck for the e-bus workshop (D4);
5. Preliminary consolidated report (D5);
6. Final consolidated report (D6).

The aim is that the Final Report synthesizing the main findings of this Assignment will be an essential resource for advancing the adoption of e-buses in West Africa, and for better understanding the opportunities and challenges facing the sector.

1 Introduction

1.1 Authority of this report

This Final Draft Consolidated Report is prepared under the authority of the contract signed between the C40 Cities Climate Leadership Group (C40 Cities; the client), and CPCS Transcom Limited (CPCS; the Consultant), to provide consultancy services for the project entitled,

"Accelerating a market transition in West Africa:
New Models for Electric Bus Deployment."

1.2 Purpose of this report

The purpose of this **Final Consolidated Report (D6)** is to synthesize the key findings of the project's previous deliverables, the E- Bus Market Assessment and Operator Landscape (D2) and the Preliminary Commercial/Financial Arrangements Report (D3).

The report begins with an evaluation of the e-bus market in West Africa and a high-level feasibility assessment of e-bus deployment in the project cities.

It then analyzes the bus operator landscape across the six cities, considering both formal and informal transport sectors. This is followed by a review of the e-bus policy and regulatory frameworks in these cities. An initial assessment of challenges, opportunities, and overall e-bus readiness concludes this section.

Finally, the report evaluates potential commercial and financial arrangements for e-bus deployment and offers recommendations for immediate next steps.

Structure of the report:

- **Chapter 1:** Introduction
- **Chapter 2:** E-Bus Market Assessment
- **Chapter 3:** Bus Operator Landscape
- **Chapter 4:** Review of E-Bus Policy and Regulatory Frameworks
- **Chapter 5:** Commercial and Financial Arrangements
- **Chapter 6:** Conclusion and Recommendations
- **Annexes:** Annex Report provided as a separate document

2 E-Bus Market Assessment

The following chapter assesses the e-bus market in the six project cities by analysing a wide variety of factors, including geography, mobility demand, bus operating conditions and power supply.

2.1 Bus sector context

2.1.1 Transport sector context

2.1.1.1 Governance

Three overarching governance frameworks for the planning and management of formalised public transport are in place across the six cities. These models are outlined in the diagram below. The framework considers three levels: the system owner, manager, and operator. A mix of public, private and mixed entities fulfil these roles in the six cities.

Figure 2-1: Schematic of transport sector governance

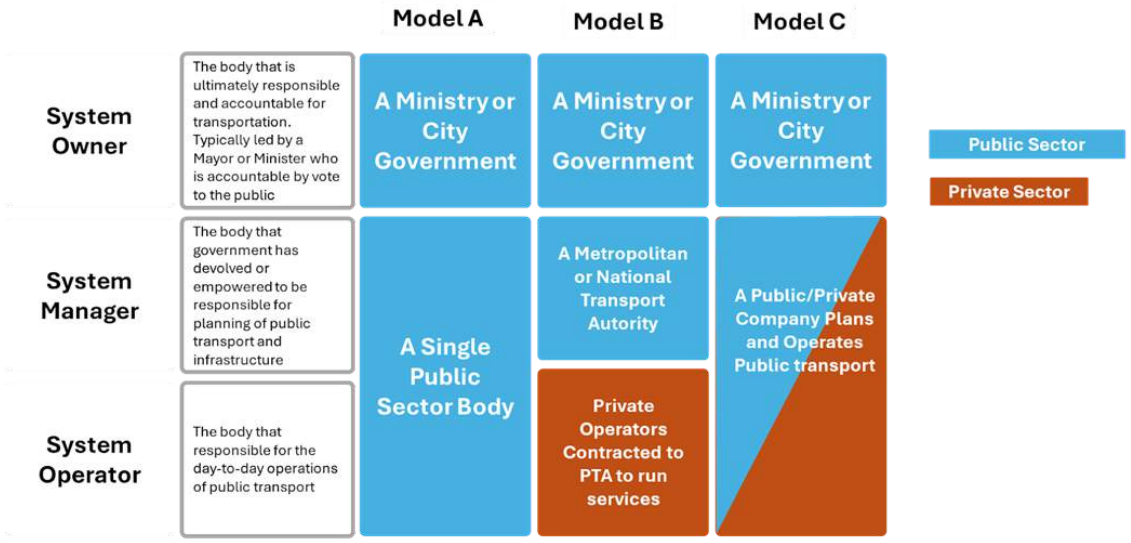


Figure 2-2: Transport sector governance in project cities

Note: SOTRA and SOTRAL are private sector entities but with public and private shareholders

2.1.1.2 Bus operations

All six of the study cities have a mix of formalised/regulated public transport and informal unregulated paratransit. Some of the cities have also developed, or are in the process of developing, Bus Rapid Transit Systems. Each type of operator will have a different level of readiness for electric bus deployment, and as such, we have identified four classifications of transport operators. These are described in Table below.

Table 2-1: Operator classifications

General characteristics of Operators in the project cities	
	**Paratransit.** Informal minibus operations deploying a fill-and-go model, with little or no route planning and/or regulation from government. Operators have small fleets and business models tightly tied to daily profits to enable them to keep operating. They have limited capacities for investment or service improvement. Different organisation models exist between drivers, owners and driver-owners with corresponding renting or leasing fees. Example: "Ndiaga Ndiaye" or "Cars Rapides" in Dakar
	**Semi-formal operations.** These services result from the structuring of paratransit. They follow more defined routes and schedules and operate often in cooperatives or associations, manage medium-sized fleets, with vehicles usually owned by private drivers. While some government regulation exists on fares and routes, enforcement is flexible. These services are better organized than paratransit but still rely mostly on daily revenue to stay operational, with limited investment in fleet renewal or service improvements due to financial constraints. Example: "AFTU" in Dakar

Formal Bus. These are fully formalized bus companies, typically operating larger fleets with fixed crews and staff. They may include state-owned legacy operators or companies formed through the consolidation of paratransit services. These companies may have government subsidiaries or other sources of revenue. They usually operate larger buses, but investment in fleet renewal is often limited.

Example: "Dakar Dem Dikk" in Dakar

Bus Rapid Transit. Highly formalized and professional operations designed to provide a higher level of service, often with dedicated lanes, or with partial or flexible right-of-way arrangements. These systems operate large fleets with contracted staff and maintenance crews, adhering to a set timetable. BRT services are typically managed through route contracts with authorities, often structured as gross cost or net cost contracts. Some BRT systems may operate under Public-Private Partnership (PPP) contracts, with provisions like traffic guarantees to ensure a certain level of service and ridership.

Example: "Sunu BRT" in Dakar

Based on the classifications above, the following Figure identifies the main modes of bus transport in each project city.

Figure 2-3: Public transport network classifications in project cities

	Paratransit	Formal Bus	BRT
Accra	Tro Tros	Quality Bus System	Aayalolo Bus (Unsuccessful)
Abidjan	Gbaka	SOTRA	Abidjan BRT (Under Construction)
Dakar	Ndiaga/Ndiaye	Dakar Dem-Dikk / AFTU	SunuBRT (E-Bus In Operation)
Freetown	Poda Poda	Waka Fine Bus	*Not Currently Planned*
Lagos	Danfo/Molue	First and Last Mile Quality Bus Corridors (project)	BRT Lite , BRT 1
Lome	Zemidjan	SOTRAL	*Not Currently Planned*

Note: QBCs are not implemented yet in Lagos. Zemidjan refers to moto-taxis operators

2.1.1.3 Passenger trips share and network coverage

In Freetown Poda-Poda accounts for up to 90% of trips whilst the recently commissioned Waka Fine Bus services only account for 5% of trips. Similarly in Lagos the Danfos and Koropes remains the dominant mode of public transport in the city. In Lome passenger trips are dominated by informal taxi bikes and shared taxis. In these very competitive conditions, there are no bus services for urban transport other than the formal operator SOTRAL.

In all project cities regulated trips in the formal transport sector make up less than 20% of total trips, ranging from around 20% in Abidjan to around 1% in Lomé. The extremely small share of formal trips in the project cities has major implications for e-bus deployment, as holistic interventions that address both the formal and informal transport sector are necessary to have maximise impact. The formal sector presents the fewest obstacles to e-bus deployment, and ongoing efforts to integrate paratransit into formal networks represent one opportunity for e-bus

deployment. Additionally, innovations in e-minibuses and battery swapping technology present opportunities for the deployment of e-buses in the paratransit sector, which will be explored in greater detail later in this report.

Network coverage varies between project cities, but in all cities, paratransit covers a much larger area than formal transport networks. All project cities have taken steps towards expanding formal coverage. Full network coverage maps can be found in **Annex A**.

2.1.1.4 Accessibility to Bus Transport

Access to transport varies between cities, but when paratransit is included, access is generally fairly high in the project cities. The below table presents the number of people living within 600 meters of a transport node for the various mode levels in each city.

Table 2-2: Population within 600 meters of bus transport

%Pop within 600m	Abidjan	Accra	Dakar	Freetown	Lagos	Lomé
Informal	73%	56%	78%	73%	34%	n/a
Formal	63%	n/a	70%	36%	17%	54%
BRT	2%	32%	10%	n/a	5%	n/a
Total Pop (Million)	**6.1**	**5.6**	**3.7**	**1.4**	**17.2**	**2.1**

This analysis shows that levels of access to formal transport are very low across the project cities, while paratransit is far more accessible to a larger share of the population. This demonstrates the importance of transitioning paratransit fleets as well as formal fleets, to ensure the maximum benefits to passengers and city residents. Detailed access maps can be found in **Annex A**.

2.1.1.5 Route Lengths and operated vehicle kilometers

The achieved range for an e-bus depends on a number of factors such as gradient, temperature, operating conditions such as speed, and length of the route. Shorter routes will ideally allow e-buses to operate without needing frequent charging. Longer routes may need additional consideration for opportunity charging, subject to operational requirements

Table 2-3: Route Lengths

Lengths	Abidjan	Accra	Dakar	Freetown	Lagos	Lomé
0-5 Km	47%	28%	0%	21%	25%	0%
5-10 Km	31%	40%	0%	56%	26%	18%
10-15 Km	15%	14%	0%	11%	17%	32%
15-20 Km	6%	9%	100%	6%	10%	41%
More than 20 km	2%	9%	0%	6%	22%	9%

Source: CPCS & ITP using GTFS data

Based on a combination of secondary data and calculations using GTFS and route timetable data, the annual vehicle kilometres produced in each city are shown below.

Table 2-4: Scheduled Vehicle Km's

City	Population (millions)	Fleet Size	Million KM	Ave. Annual Kilometre Veh
Abidjan	6.05	9,471	–	–
Accra	5.32	6,600	401	60,758
Dakar	3.65	2,915	93	31,904

Freetown	1.38	5,550	51	9,189
Lagos	17.15	76,325	5,250	68,785
Lomé	2.1	80	–	–

2.1.1.6 Reported air quality

To assess the existing air quality in the six cities, reported PM 2.5[3] secondary data on air quality has been considered. The table below shows the average annual PM2.5 measurement from air quality monitoring company IQAir for the six cities. All six of the cities have a score exceeding the World Health Organisation (WHO) maximum guideline of 5 µg/m³ by at least 3 times. The worst city for air quality is Freetown with a score over 6 times the WHO maximum guideline.

Table 2-5: Reported average PM2.5 (2023)

City	Abidjan	Accra	Dakar	Freetown	Lagos	Lomé
PM2.5 (µg/m³)	16.6	32.2	28.2	33.6	21.8	16.3

Source: IQAir 2023

The poor air quality in the six cities is not solely attributed to transportation and is also impacted by a variety of other emissions factors such as industry and the burning of fuel for cooking. Nevertheless, it is estimated that vehicle emissions account for 43% of total CO2 emissions in Africa and contributes intensively to PM emissions[4]. The main causes of vehicle emissions are the presence of highly polluting old vehicles and the slow traffic conditions causing idling (i.e. sulfur in diesel vehicles without particle filters and use of low-quality diesel).

This highlights the potential impact that transitioning the fleet to electric buses could have in improving air quality. However, it is important to note that while electric buses may help reduce emissions, they alone will not be sufficient to significantly improve air quality, as other factors like industrial emissions and other traffic congestion also play a major role.

2.1.1.7 Estimated baseline emissions

To better understand the exact impact and level of emissions generated by the public transport fleet, ITP has deployed an emissions estimation model (TESSE). This model takes the total daily operated vehicle kilometres (estimated from the GTFS timetable data), the fleet's EURO engine standard, average speed, and gradient, and through a series of calculations, estimates the emissions generated. The input values that have been used to calculate the baseline emissions for each city are shown in the table below.

Table 2-6: Emissions model inputs for all types of buses

	Lagos	Freetown	Dakar	Abidjan	Lome	Accra
Total Daily Veh Km	1,638,980	141,751	n/a	413,557	83,554	880,708
Euro 2 or less Fleet Share of Km	60%	95%	n/a	60%	50%	35%
Euro 3 Fleet Share of Km	20%	5%	n/a	30%	45%	20%
Euro 4 Fleet Share of Km	15%	0%	n/a	10%	5%	30%

[3] Particulate matter with a diameter of 2.5 micrometers or smaller, which can be inhaled into the respiratory system and cause various health problems. PM2.5 is commonly used as an indicator of air quality, as it represents fine particles that are hazardous to human health.

[4] https://blogs.worldbank.org/en/africacan/air-pollution-silent-killer-lagos

	Lagos	Freetown	Dakar	Abidjan	Lome	Accra
Euro 5 Fleet Share of Km	5%	0%	n/a	0	0%	15%
Average Gradient (average range between min and max of all routes)	22	100	n/a	44	29	42

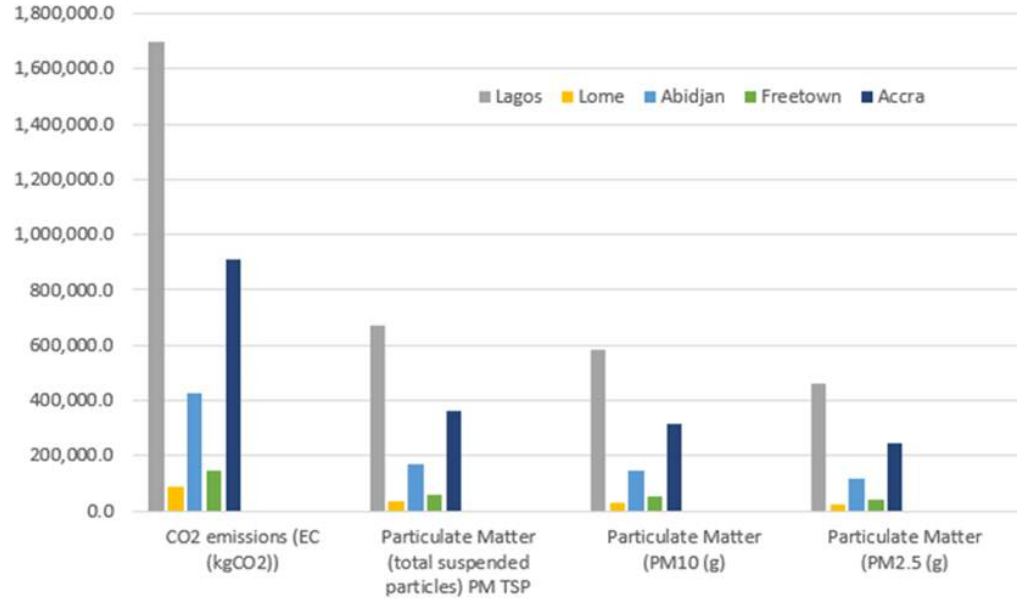
Source: ITP & CPCS from various data

This emissions model has been developed in a format which ensures, as far as possible, that it is compatible with the input datasets. These datasets include CAPMAS Statistical Databooks, MAPTIS 2020 surveys and the EIB 2019 Suez interconnection study.

The model operates using disaggregation by mode, powertrain, fuel used and location type.

The model results for the baseline assessment based on emissions generated from a full day's operation are presented below. The model is based on existing secondary data and assumptions and calibrated with operators' fleet data. The results shows that Lagos' transportation system generates the highest-level emissions across all measurements whilst Lome the lowest.

Figure 2-4: Daily Baseline Emissions in Six Study Cities



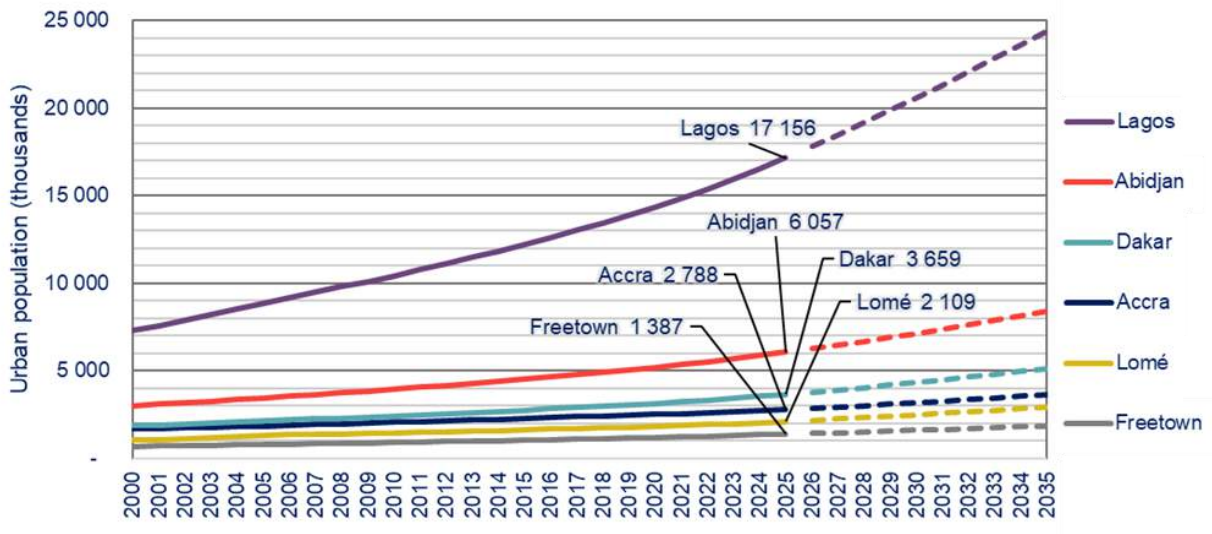
Source: ITP & CPCS

2.1.2 Mobility demand and social demographics

2.1.2.1 Population Growth and Distribution

All six project cities have experienced rapid population growth over the last three decades and are all forecasted to continue growing. Lagos is expected to reach 24 million inhabitants by 2035, whilst Abidjan is forecasted to reach 8.9 million. Population growth in each of the six cities is presented below.

Figure 2-5: Population growth 2000-2035



Source: UN World Urbanization Prospects, the 2018 Revision.

All six projects have seen population growth accompanied by low density urban sprawl, especially on the urban peripheries. This sprawl has increased the distances travelled and increased journey times. In response, longer public transport routes have been implemented that are less suitable for the deployment of electric buses.

Table 2-7: Population growth 2015-2035

City	Population			CAGR	
	2015	2025	2035	2015-2025	2025-2035
Abidjan	4 533	6 057	8 393	2,9%	3,3%
Accra	2 290	2 788	3 632	2,0%	2,7%
Dakar	2 758	3 659	5 135	2,9%	3,4%
Freetown	1 043	1 387	1 849	2,9%	2,9%
Lagos	12 239	17 156	24 419	3,4%	3,6%
Lomé	1 635	2 109	2 947	2,6%	3,4%

Source: United Nations, Department of Economic and Social Affairs, Population Division (2018). World Urbanization Prospects: The 2018 Revision, Online Edition.

2.1.2.2 Trip Demand and Modal Split

Based on available data, the total number of daily trips and trip rates are presented in the table below. The average trip rates range from 1.2 (Freetown) to 3.36 (Dakar).

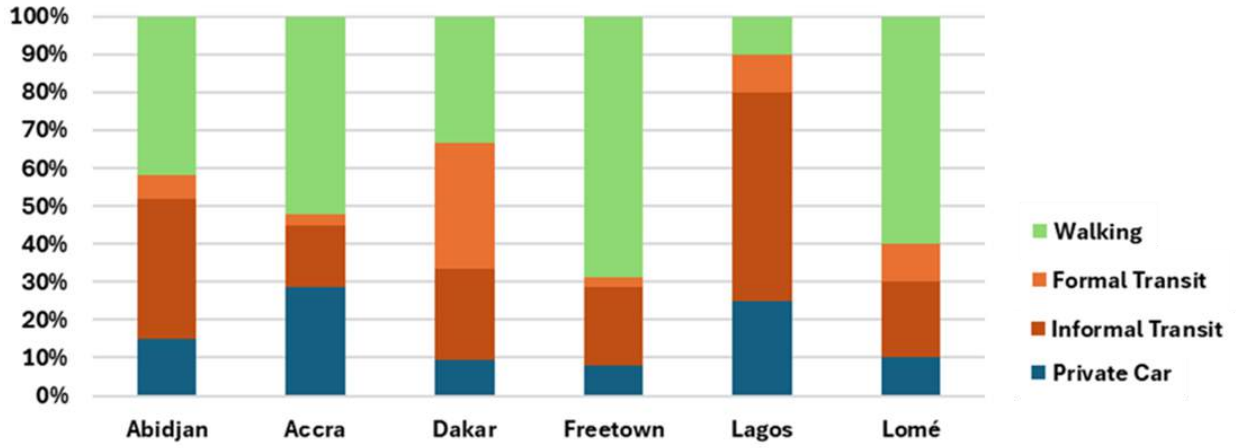
Table 2-8: Total number of daily trips (including non motorised transports)

City	Population (2024)	Trips	Trip rate	Sources
Freetown	1,347,560	~1,600,000*	~1.2*	IRUMP*
Accra	2,721,160	7,171,500	2.6	Changing Transport
Lagos	16,536,000	42,993,600	2.6	ISOCARP
Dakar	3,540,460	11,895,946	3.4	Mobilise Your City
Lome	2,042,730	4,698,279	2.3	Mobilize Your City
Abidjan	5,866,700	15,253,420	2.6	SSATP

Note: *Data from IRUMP gives a rate of 0.4 for motorised trips only, estimated assuming 70% of NMT trips

The modal split for the six cities is presented below. The data shows that all six cities have high levels of walking as a mode of transportation. This significant share of walking trips is primarily due to limited access to private vehicles and the high costs associated with public transport.

Figure 2-6: Modal Split



Source: ITP, based on various sources.

High walking trip percentage reflects the reliance on non-motorized modes of transport due to limited public transportation options, urban sprawl, infrastructure challenges and affordability of public transport. Vulnerable user groups such as the urban poor are likely to use walking whilst most existing public transport users are likely captive users meaning they have no choice but to use public transport.

Car ownership rates in all six cities are relatively low with Lagos having the highest at 60 per 1,000 people and Freetown the lowest at 11.3 per 1,000 people. But the number of vehicle rates have been increasing in all six cities over the past decade and are expected to continue rising as these cities experience further economic development.

This trend presents a significant challenge for maintaining high public transport shares, as more people gain access to private vehicles, which remain a key aspirational product. It is therefore vital that the quality of public transport is enhanced. Deployment of electric buses can form a part of this modernization process.

2.1.2.3 Equity and Vulnerable User Groups

Despite most citizens in the six cities not having access to private vehicles, government policy and infrastructure development has over the past decades mainly prioritised the movement of private vehicles with highway development projects such as the construction of third mainland bridge in Lagos or the Bypass Road in Accra.

In addition, uncontrolled roadside and city centre parking has given private vehicles an inequitable amount of finite road space in all cities. Prioritising public transport and non-motorised transport represents a more equitable approach serving a greater number of people. In addition, modern and accessible electric bus deployment can further enhance the inclusivity of the transportation system with features such a level boarding for people with reduced mobility and enhanced capacity for vulnerable user groups such as the elderly, women and children

2.1.3 Bus operating conditions

2.1.3.1 Prevailing traffic conditions

Traffic congestion is a common challenge in many major West African cities, including Abidjan, Lagos, Lomé, Freetown, Dakar, and Accra. These cities face significant traffic issues due to rapid

urbanization, limited road infrastructure, and the growing number of vehicles. The lack of efficient public transportation systems exacerbates the situation, leading to prolonged commute times and frequent traffic jams, particularly during peak hours. These conditions are a reflection of the broader urban planning and development challenges in the region.

Figure 2-7: Traffic congestion in Lagos (left), Freetown (centre), Abidjan (right)

To assess existing traffic conditions, we have considered average vehicle speeds in the six cities presented below. All six of the cities face high levels of network and localised congestion. A range of causes including high volumes of low occupancy paratransit, roadside encroachment, poor driver behaviour, poor lane discipline, and uncontrolled street and sidewalk parking all reduce highway capacity and cause congestion.

The reported average travel speeds range between 10-16 km/hr, however at specific traffic hotspots, speeds in all six of these cities reach a walking pace of less than 5 km/hr.

Slow bus speeds increase the Peak Vehicle Requirement (PVR) and reduce reliability. This makes electric buses less financially viable, as more buses are needed to maintain headways, raising both investment and operating costs. Slow, unreliable speeds also make charging harder to plan, increasing the risk of buses running out of battery during service.

Average speed has a big impact on fleet investment. For a 10 km route with 10-minute frequency, running at 9 kph needs 15 buses, but increasing speed to 19 kph cuts that to 7 buses. At an average bus cost of $350,000, 15 buses cost $5.25 million, while 7 buses cost $2.45 million : a saving of $2.8 million if speed improves.

This shows why boosting average speed through better traffic management, bus priority, or BRT is essential for reducing capital costs and making projects financially viable. So far, few bus priority measures have been implemented in the six cities. Dakar and Lagos have BRT corridors, but the rest of the bus networks operate in highly congested mixed traffic, making electric bus operations challenging. To improve journey time reliability and enable bus operations, better priority measures are needed on both BRT and non-BRT routes.

The BRT projects in Dakar, Lagos, and the planned BRT in Abidjan are compared to other systems in the table below. The data shows that these three cities' BRT systems are much smaller in length, number of corridors, and expected ridership than international examples. Mexico and Bogotá's larger BRT systems were developed before electric buses were common, so they mainly use internal combustion engine (ICE) buses and are now facing high costs to retrofit depots for electric charging. In contrast, Dakar and Abidjan skipped ICE buses and deployed electric buses from the start, building depots equipped for electric vehicles (EVs). Lagos, Africa's first BRT, was also built before e-buses and has yet to introduce them on its BRT corridor.

Table 2-9: International BRT Projects Networks

City	Length (km)	Stations	Corridors	Patronage	E-Bus fleet	E-Bus as % of Fleet
Dakar	18	23	1	300,000	144	100%

City	Length (km)	Stations	Corridors	Patronage	E-Bus fleet	E-Bus as % of Fleet
Abidjan	20	20	1	<500,000	100	100%
Lagos	22	26	1	200,000	0	0%
Mexico City	140	283	7	1.3 million	55	8%
Bogota	114	142	12	2.4 million	1,400*	14%
Jakarta	20	13	1	1.1 million	200	5%
Cape Town	31	42	36	70,000	0	0%

2.1.3.2 Secondary and Tertiary Corridors

Developing full BRT networks is an effective way to improve service quality, increase capacity, and cut emissions in the six cities, but it requires significant investment. Not all corridors need full BRT infrastructure like dedicated lanes and stations. Instead, improving speed and reliability on secondary and tertiary routes with targeted bus priority measures is key to supporting electric buses and high-quality service. Reallocating road space can be a practical, cost-effective way to give buses priority. Measures like dedicated lanes, traffic signal priority, and curbside management can greatly improve the efficiency of regular and non-BRT bus services.

Figure 2-8: Examples of Non-BRT bus priority measures

Two-way median-aligned bus lanes Hamburg Germany

Curb side Bus lanes In London

In Lomé, authorities have chosen an approach more aligned with the European model of BHLS (Bus with High Level of Service) systems as part of the program to strengthen SOTRAL's services. This strategy, which emphasizes operational efficiency and service quality without requiring full-scale BRT infrastructure, is being further developed within the forthcoming Sustainable Urban Mobility Plan (SUMP) for Greater Lomé.

2.1.3.3 Driver Performance

It is estimated that driver performance can reduce the capacity of a battery by over 30% through breaking, revving and unnecessary accelerating. As such, how operators train, and monitor driver performance is critical when deploying electric buses. To improve driver performance several ways to monitor can be carried out by the operator or transport authority. These are listed below.

- **Driver Training.** Drivers are trained to operate the buses in an optimal way limiting rapid breaking and revving and reckless driving habits.
- **Observers on the ground.** The operator or authority places individuals on the ground to monitor driver performance.

- **GPS Monitoring.** On board GPS equipment used to monitor driver performance via a control room.

Based on discussions with formal operators in the six cities, all cities provide driver training. Lagos, Abidjan, Dakar, and Lomé also use observers on the ground, public feedback, and GPS to monitor driver performance. Accra uses observers and public feedback but not GPS. Freetown only provides driver training and does not currently use other monitoring methods.

2.1.3.4 Gradients

The gradients of an electric bus route affect the driving performance, energy consumption, and range of the battery. As such it is critical to understand the gradient of the existing road network and bus routes in the six cities when assessing the opportunity and readiness for electric buses. Detailed topographic gradient maps can be found in **Annex A**.

Using route and topography data, a geospatial analysis assessed the gradients of bus routes in the six cities. It found that Lagos and Lomé have completely flat networks, with 100% of routes staying within a 0–75 m elevation change. Abidjan and Accra are also mostly flat, with 95% and 85% of routes, respectively, in the 0–75 m range. In contrast, Freetown's hilly terrain means only 72% of routes fall within 0–75 m, with the remaining routes having significant elevation changes up to over 300 m. GTFS data for Dakar's route was not available, but given the city's mostly flat to gently rolling terrain, most bus routes likely operate within moderate elevation changes.

Figure 2-9: Lagos's relatively flat terrain (left), and Freetown's hilly terrain (right)

2.1.4 Energy supply and power infrastructure conditions

2.1.4.1 Existing power supply sources

Energy use and dependence

A meaningful shift to e-mobility depends not only on the adoption of EVs but also on the sustainability, efficiency, and reliability of the electricity grid. Understanding how electric buses interact with national energy systems requires a comparison of electricity supply with existing fossil fuel use in transportation, as well as an assessment of each country's dependence on oil, whether imported or domestically produced.

The six project countries rely heavily on oil for their transport and energy sectors. While Ghana and Nigeria are notable oil producers, Côte d'Ivoire, Senegal, Togo, and likely Sierra Leone depend significantly on oil imports to meet demand.

Table 2-10: Energy use and dependence

Country	Domestic transport oil total final consumption (liter/capita 2022)	Total final consumption of oil products in the transport sector (%)	Total country oil supply, all sectors (TJ)	Share of domestic crude oil production of domestic supply (2022)	Total country natural gas supply, all sectors (TJ)	Share of domestic natural gaz production of domestic supply (2022)
Cote d'Ivoire	94	68%	134,496	30%	91,139	100%
Ghana	111	79%	178,233	4 814%	130,834	86%
Nigeria	100	90%	1,004,351	16 150%	694,056	196%
Senegal	92	82%	124,333	n/a	179	100%
Sierra Leone	n/a	n/a	n/a	n/a	n/a	n/a
Togo	50	77%	21,295	0%	6,046	n/a

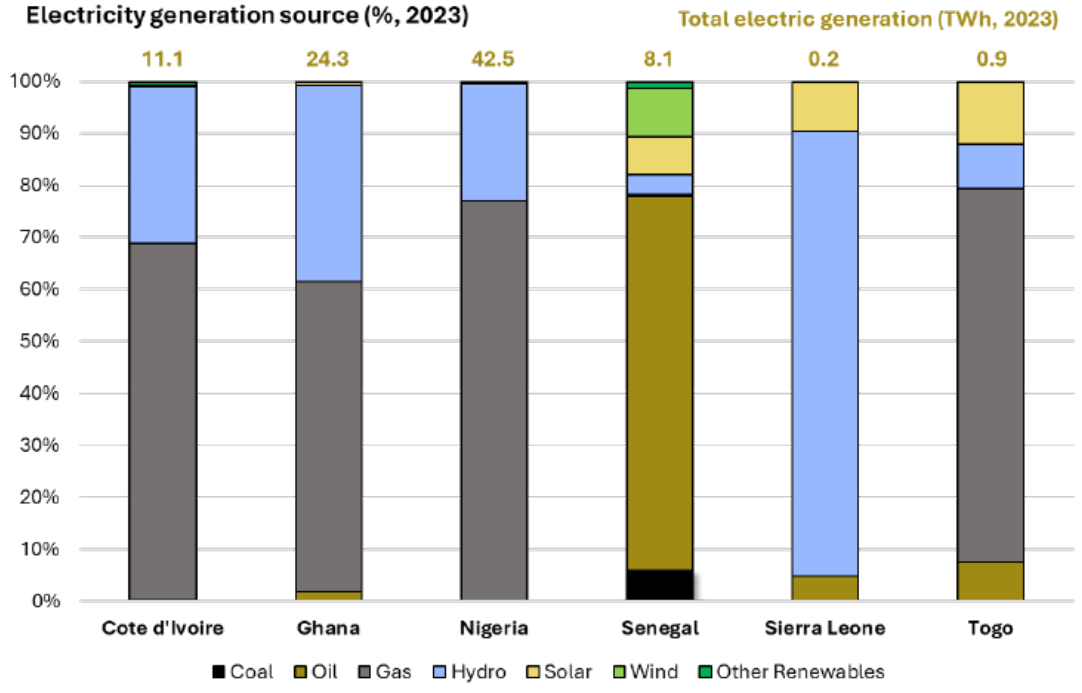
International Energy Agency (IEA).

Electricity mix and grid sustainability

To realize the full sustainability potential of electric buses, a sustainable supply of electricity to charge the batteries is preferable. While electric buses generally reduce emissions compared to diesel (even in coal-heavy grids), the overall benefit mainly depends on the carbon intensity of the electricity used. It is therefore important to aim for a progressive decarbonization of the grid to maximize these benefits.

To assess the readiness of the electricity supply in each of the six cities for a sustainable charging source, we have considered the Energy Mix data from EMBER. The data below shows that all six cities' electricity supply is over 50% sourced by fossil fuel sources, except for Sierra Leone (which generates only 210 MWh in 2023).

Figure 2-10: Energy mix in the six project countries



Source: EMBER

Access to electricity and the balance of imports and exports also vary widely across the countries:

- **Côte d'Ivoire** and **Ghana** are net exporters with strong electricity access, 70% and 90% of their populations, respectively, are connected.

- **Nigeria**, while a net exporter, has only 60% electricity access, indicating major infrastructure and reliability challenges.
- **Senegal** and **Togo** are net importers and rely heavily on neighboring countries to meet demand. Access remains uneven, with 74% of Senegal's population and 59% of Togo's connected.
- **Sierra Leone** neither imports nor exports power and struggles with capacity, reaching just 36% of its population.

Table 2-11: Electricity Access and Production

Country	Electricity production (GWh)	Electricity consumption (GWh)	Access to electricity (% of population)
Cote d'Ivoire	12 460	11 700	72%
Ghana	23 167	20 989	90 %
Nigeria	37 915	35 602	61 %
Senegal	7 549	8 126	74 %
Sierra Leone	210	210	36 %
Togo	820	2 350	59 %

Source: IEA & EMBER & WB

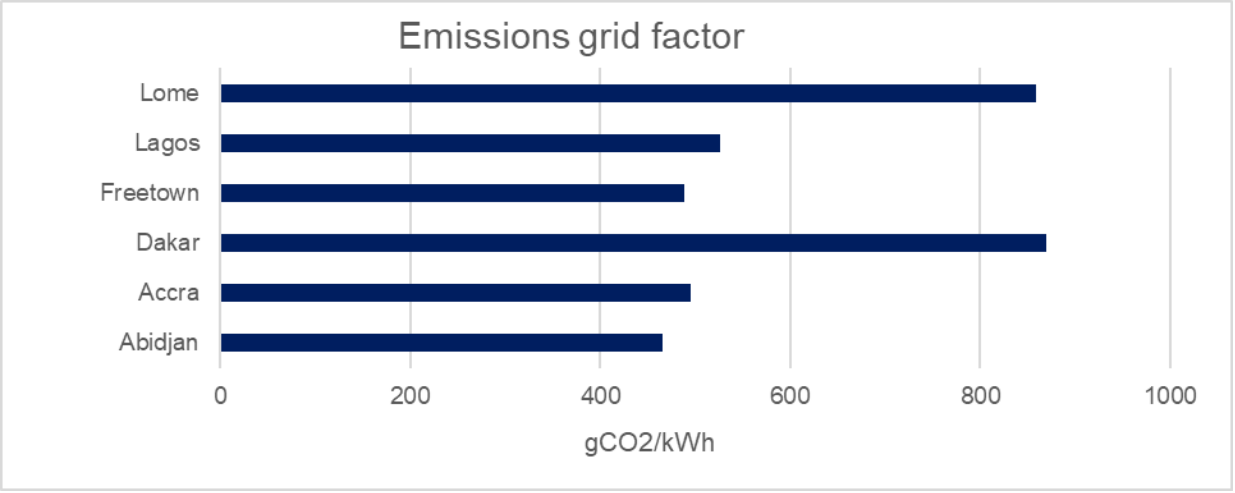
Grid Emissions Intensity

To understand the environmental impact of charging electric buses using the national grid, we examined the grid emissions factors (measured in gCO_2/kWh) provided by the Institute for Global Environmental Strategies (IGES).

For context, the average grid emissions factor in the EU is 409 gCO_2/kWh. Costa Rica, with high renewable energy usage, is at 108, while France, reliant on nuclear power, sits at 158.

Among the six project countries, all have grid emission factors above 400 gCO_2/kWh. Dakar records the highest emissions intensity, while Abidjan has the lowest. This means that charging electric buses from the existing grids would currently result in high lifecycle emissions[5].

Figure 2-11: Grid emissions factor



Source: Global Environmental Strategie (IGES)

Implications for Electric Bus Deployment

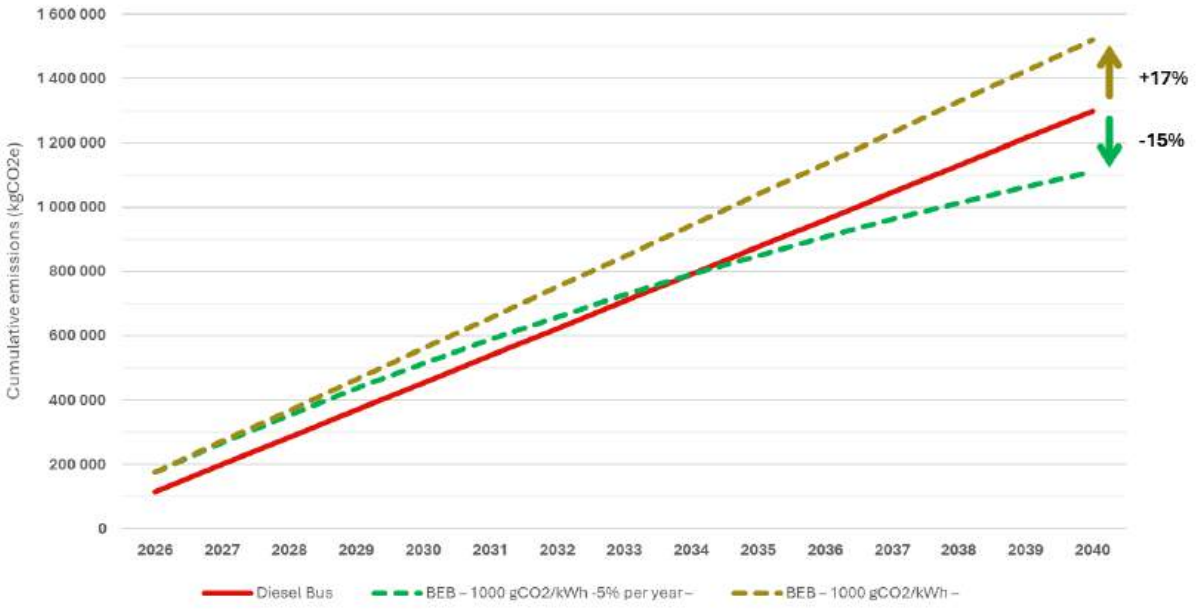
[5] To be noted that these emissions remain lower than those of a fully diesel-based solution, as shown in the calculations presented later in this report.

These findings present a clear challenge: without cleaner grids, the emissions benefits of electric buses are limited. However, this does not mean electrification should be delayed:

- Microgrids and depot-level storage solutions offer a practical pathway. By incorporating local energy generation, particularly solar power, and battery storage at bus depots, operators can bypass unreliable and carbon-intensive national grids for daily charging needs.
- Moreover, the emissions factor of a country's electricity grid is not static. Over time, national grids are likely to decarbonize as they transition to cleaner energy sources.

For example, over a 15-year bus lifespan, if the grid's emissions intensity decreases by just 5% annually, the cumulative CO_2 savings of an electric bus remain significant compared to a diesel bus. Comparing a Euro III diesel bus and an e-Bus (referred as BEB in the figure below), each traveling 60,000 km per year, and assuming a fuel efficiency of 47 L/100km for the diesel bus and 160 kWh/100 km for the e-bus; a diesel emissions factor of 3 $kgCO_2e/L$; and manufacturing emissions of 30,000 $kgCO_2e$ for the diesel bus and 80,000 $kgCO_2e$ for the e-bus. Assuming a base year electricity emissions intensity to be 1 $kgCO_2/kWh$ (roughly corresponding to a grid powered 50% by coal and 50% by fuel oil), with a 5% annual reduction in grid intensity: total cumulative emissions over the vehicle lifetime would amount to 1.3 million $kgCO_2$ for the diesel bus versus 1.1 million $kgCO_2$ for the electric bus, a 15% reduction. The figure below illustrates this.

Figure 2-12: Example of projected CO_2 Emissions of an Electric Bus vs. Diesel Bus



Source: CPCS

To reduce the emissions intensity of the electricity grids in all project cities, additional investments in solar and hydro power are essential. All cities possess a high potential for solar power generation, while Nigeria, Sierra Leone, Ghana, and Cote d'Ivoire all have high potential for future expansion of hydropower.

A more detailed breakdown of the solar and hydropower generation potential of each city can be found in **Annex A**.

2.1.4.2 Power supply reliability

Energy supply reliability is critical if operators are to charge from energy supplied through the national grid. Poor reliability could result in operators being unable to charge their vehicle, reducing the ability to operate scheduled kilometres. To assess the reliability of the grids in the six

study cities, data on the System Average Interruption Frequency Index (SAIFI) has been considered. This indicator considers the average number of service interruptions experienced by a customer in a year.

All six of the study cities have highly unreliable national grid networks, with scores above 15. For reference, the average EU score is below 1. The reasons for this may vary across cities. Significant seasonal variations play a role: on the supply side, this is primarily driven by fluctuations in hydroelectric power generation. Additionally, seasonal changes in demand, fluctuations in the supply of hydrocarbons, a lack of maintenance of certain older infrastructures, and insufficient backup solutions contribute to the issue.

Electric bus deployment in these settings would therefore come with additional risk. To mitigate this the operator must be informed if scheduled power shedding is implemented by the authority to guarantee that they can continue to maintain charging cycles for operations.

However, solutions do exist. The implementation of large-scale energy storage systems could be among the recommendations to improve reliability. Additionally, operators could have access to dedicated, secure distribution networks provided and ensured by the electricity supplier.

2.1.4.3 Grid access and connectivity, equitable transition and energy potential

Electric bus deployment requires grid connectivity, at minimum, at the depot location to ensure buses can charge overnight before daily services. However, to reduce dead kilometres in operations, it may be optimal to also develop charging infrastructure at terminating stops or even at stops along a route if opportunity charging infrastructure is opted for.

Nighttime illumination data from NASA has been spatially analysed with the first and last stop of all public transport routes. All the cities apart from Freetown, all routes start/end at a location that are well connected to the grid.

Existing electricity provision in the six cities is not universal. The existing electricity capacity does not serve all citizens with the urban poor living in informal settlements most affected by lack of connectivity to the national grid.

Table 2-12: Access to electricity (% of population)

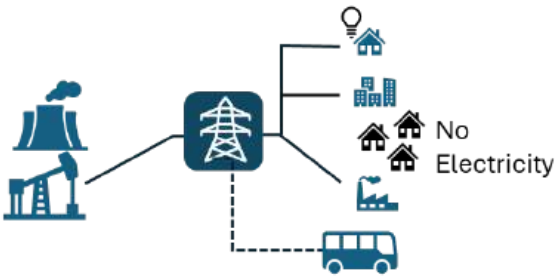
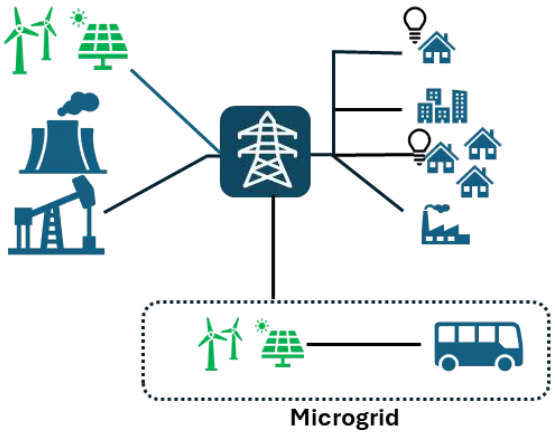
Country	CIV	GHA	SEN	SLE	NGA	TGO
Access to electricity (% of population)	72%	90%	74%	36%	61%	59%

Source: World Bank Data, 2023

The introduction of electric buses and the electricity demand that is required for their deployment must be considered in the wider context of national development. All six of the study cities are located within countries that do not have universal access to electricity, Sierra Leone having the lowest access at 36%. As such, deployment of electric buses must be considered in an equitable way, ensuring that electric buses energy demand is not prioritised ahead of increasing access to electricity to vulnerable citizens and rural communities.

This is elaborated in the diagram below.

Figure 2-13: Unequitable vs Equitable Approach to e-bus deployment

Unequitable Approach	Equitable Approach
 Despite substantial portions of the population not having access to electricity, electric buses draw power from the national grid for charging.	 A more equitable approach is to focus on strengthening the national grid and providing universal access to electricity. Electric buses should be developed with a microgrid at the depots/terminals. If the microgrid generates a surplus it should send this back to the national grid to further increase grid capacity.

Source: ITP & CPCS

2.2 Current state of e-bus deployment

2.2.1 Summary of current projects underway in project cities

As of December 2024, there are approximately 150 electric buses in operation within the six project cities. Electric buses have been procured and are in operation in Lagos, Abidjan, Accra and Dakar where 120 electric buses are in operation for the BRT. There are currently no commercial electric buses in operation in Lome and Freetown.

Figure 2-14: E-buses in Dakar (left), Abidjan (centre) and Lagos (right)

Table 2-13: Current state of e-bus deployment

City	Fleet OEM / Model	Number	Date
Abidjan, Côte d'Ivoire	Zhongtong / City coach	6	2024
	Bolloré / BlueBus 6m	6	2013
Accra, Ghana	Ankai	10	2024
	Yutong / 8m	6	2024
Lagos, Nigeria	Yutong	2	2024

Dakar, Sénégal	CRRC / Dakar BRT	121	2024
Freetown, Sierra Leone	Sierra Electric	1	2025
Lomé, Togo	–	0	–

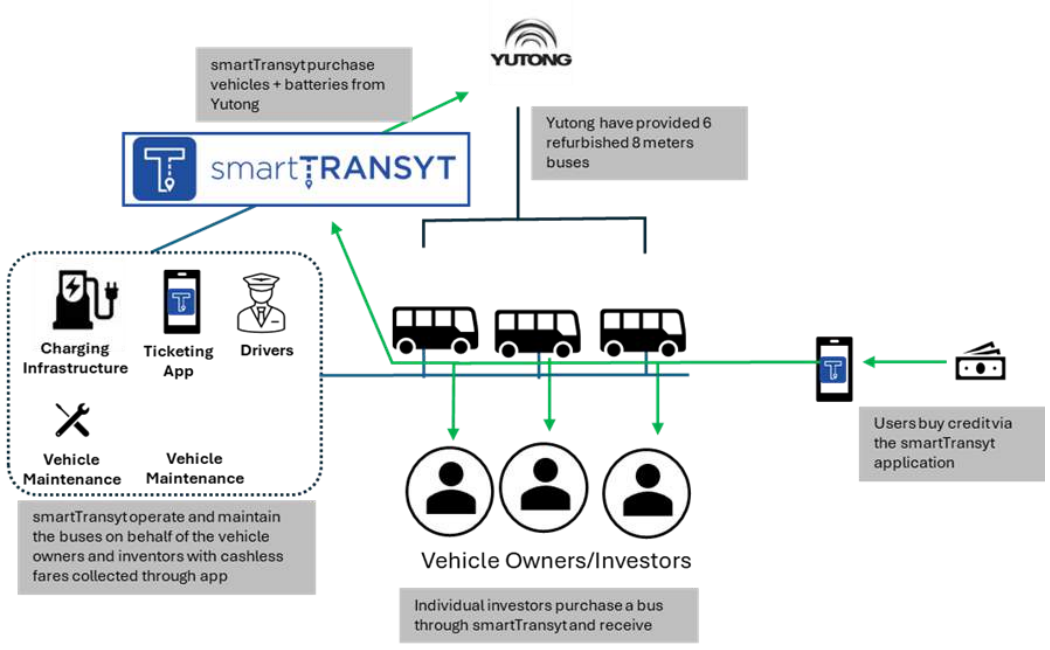
Abidjan. To cater for demand at the 2024 Africa Cup of Nations (AFCON) a pilot fleet of 6 electric buses was implemented in Abidjan[6]. The fleet of six e-bus[7] was a high floor Zhongtong city coach. This low-cost option is more suitable for intercity journeys but could be effectively used as a shuttle for bringing passengers to the stadiums.

Between 2013 and 2019[8] the Bolloré Group the Bluebus project at the Félix Houphouët-Boigny University to enhance student mobility through sustainable transportation. From October 2013 to May 2019, the Bluebuses transported approximately 6,400,000 passengers, averaging about 1,800 students per day. During this period, they covered nearly 250,000 kilometres within the university campus[9].

Accra – As of November 2024, Metro Mass Transit has started operating 10 electric buses on routes within the Adenta Municipality. These pilot routes form part of the GAPTE's plans for 100 vehicles. These vehicles are set to operate in mixed traffic conditions.

In addition to the buses being procured by the government, the private sector in Accra is also deploying electric buses. SmartTransyt is a startup focusing on the deployment of electric buses in the tro-tro industry. It is currently operating six refurbished eight-meter Yutong electric buses. Their business model sees owners and individual investors provide funds to purchase a vehicle and receive a share of the fare income. SmartTransyt charges a fee for operating and maintaining the buses. Their business model operates using a demand responsive model with passengers securing a seat via mobile phone application and a membership model.

Figure 2-15: SmartTransyt business model



Source: ITP, based on interviews with ??

[6] K., Cyprien. "Automobile: les véhicules électriques à la conquête du marché ivoirien" Abidjan.net. September 2, 2024. https://news.abidjan.net/articles/734033/automobile-les-vehicules-electriques-a-la-conquete-du-marche-ivoirien
[7] Source: https://news.abidjan.net/articles/734033/automobile-les-vehicules-electriques-a-la-conquete-du-marche-ivoirien
[8] After this period, the available sources do not provide precise information on the continuation or cessation of this operation.
[9] Source: https://news.abidjan.net/articles/658705/bluebus-plus-de-6-000-000-etudiants-transportes-en-5-ans-sur-le-campus-de-luniversite-de-cocody

Dakar. In 2024 the Senegalese capital launched Sub Saharan Africa's first fully electric BRT. As part of this project a fleet of 121 e-buses were procured from Chinese supplier CRRC. The project has received a high level of foreign private investment, and the operator Dakar Mobilité is a joint venture between Meridiam and the Senegalese sovereign fund with a highly experienced French bus operating company.

The BRT operates in 100% dedicated right of way mitigating the challenge of journey time reliability and battery management.

Lagos. To date there are 2 electric buses in operation in Lagos. These buses form part of the ongoing deal between LAMATA, Yutong and Oando energy. These vehicles are serving as pilots to enable the operators to learn lessons and build capacity.

Freetown. In Freetown, a local company, Sierra Electric, is focused on developing and deploying locally manufactured electric vehicles. They built a 100% electric shuttle minibus and work on retrofitting gas buses to electric, using mostly locally sourced materials. The company is working on scaling up production and launching pilot projects.

2.2.2 E-bus project pipeline

Dakar through its electric BRT is the only city that has thus far implemented a significant fleet of electric buses among the project cities. Abidjan, Lagos and Accra are all in the early or piloting stage of e-bus operations.

Dakar. Executive Council for Urban Transport in Dakar (CETUD) plans:

- The deployment of an additional 100 electric buses on the city's BRT line, in addition to the 121 currently in operation.
- A pilot project to compare electric and ICE buses in the AFTU and Dakar Dem Dikk Lines
- A cooperation for the retrofitting of informal buses ("cars rapides") through the EcoCar Solaire project.

Abidjan. As part of the ongoing Abidjan Yopougon–Bingerville BRT project, supported by the World Bank, operator SOTRA is preparing to procure over 100 fully electric articulated buses[10].

These buses will operate in dedicated lanes, similar to the Dakar BRT, reducing delays caused by traffic congestion. In addition to the Yopougon–Bingerville line, Abidjan is planning several other BRT corridors, such as the Boulevard Latrille and Y4 lines, both of which run along major thoroughfares in the city. These lines, currently at the feasibility study stage, could eventually be served by EVs. The GEF project, Integrated, Sustainable and Low Emissions Transport in Côte d'Ivoire, also supported the development of an investment plan for the electrification of SOTRA buses on non-BRT lines in 2024[11].

Accra. The government of Ghana has developed a pipeline for the procurement of 100 e-buses.

Lagos. LAMATA has set long term targets for e-bus procurement with the aim to increase the existing 2 pilot vehicles to 200 by 2024-2028, 450 by 2029-2034 and up to 3,000 by 2040.

Lomé. As part of the ongoing studies for the Sustainable Urban Mobility Plan of Lomé (PMUD), a component focuses on strengthening SOTRAL's capacity through the introduction of new buses. The exact number of electric buses is not specified in the document, but the plan aims to procure a total of 1,300 new buses between 2025 and 2040.

In the meantime, the Government of Togo is in the process of securing funding from the Green Climate Fund (GCF) for the Low-Emission Urban Transport (LEUT) Programme for Greater Lomé. The concept note envisions the acquisition of approximately one hundred electric buses, which will need to be confirmed through additional studies as part of the project preparation.

[10] To be noted that the World Bank restructuring paper, dated November 2024, of the Abidjan Urban Mobility Project (P167401) mentions an objective of 157 BRT buses in operation by 2028.
[11] Global Environment Facility, Integrated, Sustainable and Low Emissions Transport in Côte d'Ivoire (Project Implementation Report), September 9, 2024. https://www.thegef.org/projects-operations/projects/10302

3 Bus Operator Landscape

This chapter summarises the bus operator landscape in the six project cities. It will provide an overview of operations, current traditional and e-bus fleets, charging infrastructure and contractual and financial arrangements.

3.1 Categorisation of operators

3.1.1 Formal bus operators

Within the six cities a variety of different formalised operating entities exist. Some of these are legacy state operating companies, some are private companies established through investors and shareholders from within the transport sector and some are public-private partnerships (PPPs).

The table below summarises the formalised operators in the six cities.

Table 3-1: Formal operators in the six project cities

City	Operator	Description	Fleet Size 2024	Daily Patronage
Abidjan	**SOTRA**	Public-private partnerships originally setup by Renault and Government in 1960's.	1,471	800,000
Accra	**Metro Mass Transit**	A public private partnership between government and private operators	600	500,000
Dakar	**Dakar Mobilité**	A special purpose vehicle that was created to operate the BRT.	121	300,000
	Dakar Dem Dirk	State owned operator set up in 2000 to provide bus services in Dakar urban area	475	250,000
Lagos	**Primero**	A privately owned operator with local ownership. Operator of BRT and regular bus services	550	150,000
	TSL Metroline	A privately owned operator with local ownership	86	18,000 – 20,000
	LBSL	A privately owned operator with local ownership	300	50,000
Freetown	**Metro Transit Company**	A private company set up by incumbent paratransit operators to operate Waka Fine Bus Services	50	25,000
Lome	**SOTRAL**	State owned operator providing intercity and intracity services	80	26,000

Source: CPCS & ITP, based on interviews

3.1.2 Paratransit ecosystem

Paratransit is the dominant mode of public transport in all six of the cities delivered through an informal mode of "competition on street" services with little or no planning and regulatory control from government. These services come at no subsidy requirement to the government as they are delivered purely on a commercial basis. However, they provide a poor quality of service to passengers, specifically vulnerable user groups.

Unlike the formalised services within the six cities that operate using fixed schedules and timetables these services operate mainly using a fill up and go model of operations. This sees the minibuses wait at bus/taxi parks until they are full before starting a trip. This results in poor reliability, long waits at terminals for passengers and full services along the route.

Table 3-2: Existing paratransit services

City	Mode	Fleet Size
Abidjan	Gbaka	8,000
Accra	Tro Tro	10,000
Freetown	Poda Poda	5,500
Lagos	Danfo	75,000
Dakar	Ndiaga Ndiaye / Car Rapides	42,000
	AFTU	2,500
Lomé	*In Lomé, informal transport is primarily provided by two-wheelers (Zemidjans) and supplemented by city taxis*.	n/a

Source: Consultant based on diverse sources

3.1.2.1 Paratransit Ownership Models

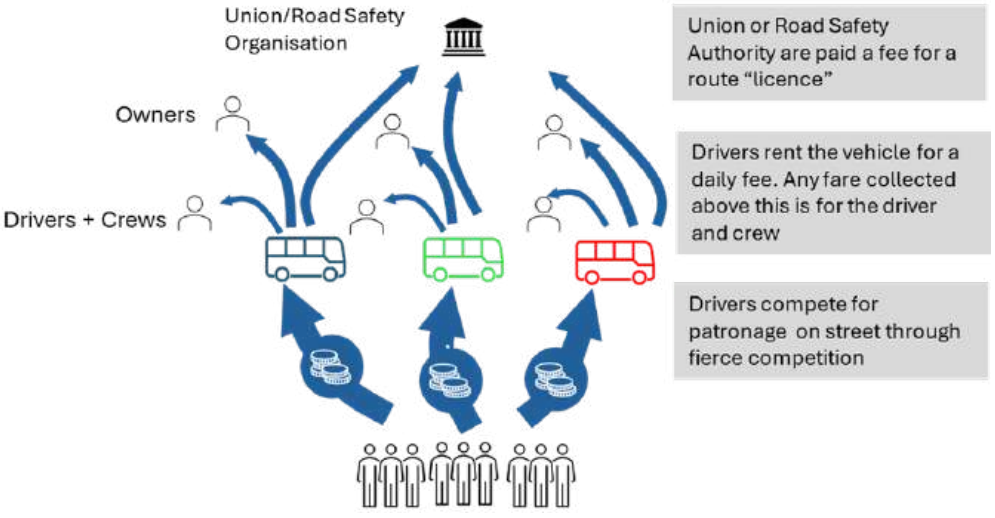
Across the six cities studied, the highly competitive nature of on-street operations and poor traffic conditions mean that incumbent paratransit operators are generally unable to invest in or improve their services. In most cases, they are simply struggling to maintain their existing fleets and service levels.

Fully informal model

Unlike more formalized operating companies that either own their vehicles or lease them from the government, paratransit systems in these cities typically operate under informal models. Drivers usually rent their vehicles from private vehicle owners for a daily fee. Any fare revenue collected above this fee is retained by the driver and their crew.

In addition, unions or road safety authorities may charge fees for the right to operate along certain routes or from designated terminals. However, despite collecting these fees, these organizations exert limited control over route planning, supply coordination, or the quality of service provided.

Figure 3-1: Paratransit Model



Source: ITP

Semi-Formal operators

In Dakar, the paratransit sector has undergone significant reforms aimed at professionalization and modernization. Central to these efforts is the *Association de Financement des Professionnels du Transport Urbain* (AFTU), established to facilitate the transition of informal transport operators into a more structured framework.

Through AFTU, individual operators were encouraged to form legally recognized Economic Interest Groups (EIGs), enabling them to access financial support for fleet renewal programs. This initiative led to the replacement of aging vehicles with new minibuses, thereby improving service quality and safety.

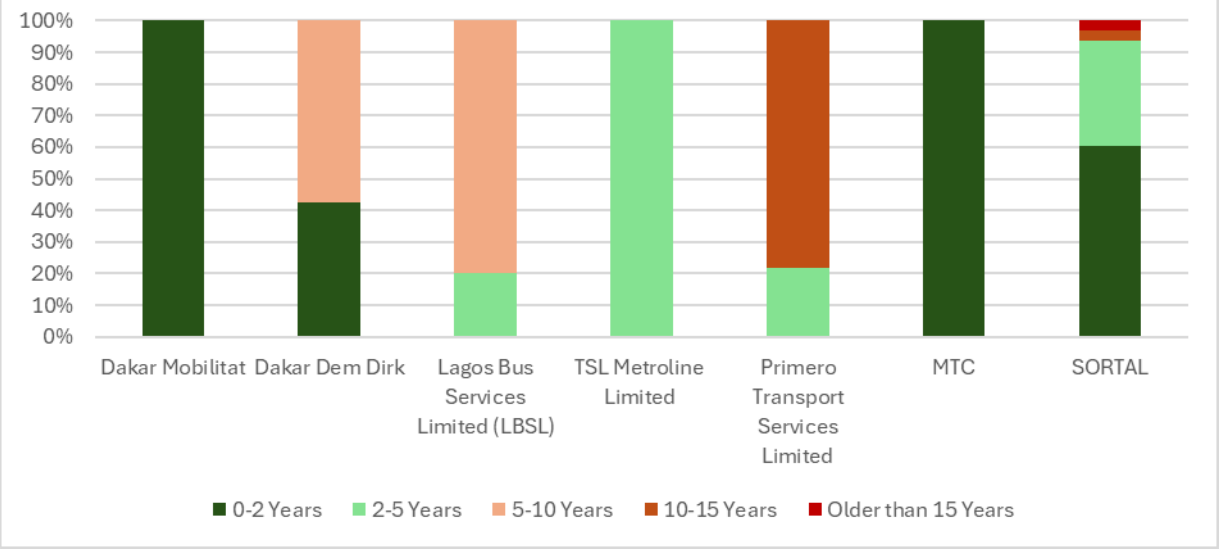
Furthermore, the reforms introduced formal route allocations, standardized fare structures, and salaried employment for drivers and conductors, moving away from the previous commission-based system. Despite these advancements, challenges remain, particularly concerning the working conditions of employees and the need for ongoing capacity building among stakeholders.

3.2 Condition of rolling stock and infrastructure

3.2.1 Bus numbers and age distribution

Based on interviews with stakeholders, the age of fleets is presented in the figure below. The data indicates that some operators, such as MTC in Freetown and Dakar Mobilité, are operating new fleets. In contrast, operators in Lagos are using vehicles that are over two years old. Specifically, Primero in Lagos operates a fleet primarily consisting of vehicles that are 10-15 years old.

Figure 3-2: Age of Fleet Reported By Operators



Source : CPCS & ITP, based on interviews

3.2.2 Bus makes and suppliers

Based on the stakeholder surveys with formal operators and analysis of secondary studies and literature the presence of 13 major bus manufactures has been identified across the six cities. Based on a combined fleet of 2,925 across all six cities the market share of each manufacturer is presented in Table 3-3. This analysis shows that Iveco has the highest market share. This is followed by Ashok Leyland ten Tata Marcopolo and Scania Marcopollo.

Table 3-3: Vehicle manufacturers in project cities

OEM	Abidjan	Accra	Dakar	Freetown	Lagos	Lomé	Market Share	
							NB.	%
irisbus IVECO	900						**900**	25,4%
ASHOK LEYLAND			475	50	68	10	**603**	17,0%
TATA Marcopolo	500						**500**	14,1%
YUTONG		50			434		**484**	13,7%
SCANIA Marcopol		245			192		**437**	12,3%
					300		**300**	8,5%
CRRC			121				**121**	3,4%
HYUNDAI	71						**71**	2,0%
MAN						53	**53**	1,5%
					45		**45**	1,3%
SUB						21	**21**	0,6%
TATA MOTORS					5		**5**	0,1%
VOLVO							**-**	-
IVECO							**-**	-
Total	**1471**	**295**	**596**	**50**	**852**	**84**	**3550**	**100%**

Source: CPCS & ITP, based on interviews

None of these manufacturers currently manufacture buses in any of the project countries. However, Volkswagen currently has automobile assembly plants in Ghana and Nigeria for cars. Volkswagen recently announced plans for the establishment of an e-tractor plant in Nigeria[12]. Renault also operates several assembly plans in Nigeria.

For paratransit services, the vehicles in use are mostly second-hand and are sometimes modified to adapt to public transport conditions. The main models identified include the Toyota Hiace, Mercedes Sprinter, Volkswagen Transporter T3, Volkswagen Kombi, Mercedes-Benz 407, Mercedes-Benz 508, Mercedes-Benz 608, and Renault Super Goélette. In Accra, SmartTransyt has started operating in the Tro-Tro segment with Yutong midibuses, while in Dakar, the EcoCar Solaire project is working on retrofitting the historic Renault Super Goélette into EVs.

3.2.3 Capital cost of buses

Based on reported fleet procurement costs in the six cities over the past 8 years the capital investment of fleets has been compiled in table below. Fleet procurement costs have ranged from less than 150,00 USD to over 500,000 USD per bus unit.

Despite an increase in lower cost electric buses entering the market over the past decade, such as Zhongtong city coach deployed in Abidjan for the African Cup of Nations (AFCON) 2024, larger

[12] Ekanem, Solomon. "German Automaker, Volkswagen set to begin e-tractor manufacturing in Nigeria." Business Insider Africa. February 24, 2025. https://africa.businessinsider.com/local/markets/german-automaker-volkswagen-set-to-begin-e-tractor-manufacturing-in-nigeria/hwtefe3

city e-buses still remain significantly more expensive than their internal combustion engine (ICE) counterparts, often costing twice as much.

As such the procurement of e-bus over an ICE bus will require a lot of external investment and commitment as demonstrated with the Dakar BRT project.

Table 3-4: Capital cost of buses

Location	Manufacturer/Model	Cost Per Unit	Type	Photo
Abidjan	Zhongtong	150,000 USD	E-bus	
Abidjan	Scania Marcopolo	>250,000 USD	Biofuel	
Accra	Scania Marcopolo	251,600 USD	ICE	
	Yutong (8m)	200,000 USD	E-bus	
Dakar	CRRC	500,000 USD	E-bus	
	Ashok Leyland	150,000 USD	ICE	
Freetown	Ashok Leyland	150,000 USD	ICE	

Source: CPCS & ITP

In contrast, the capital cost of minibuses commonly used in informal public transport systems is considerably lower, though highly variable. In cities such as Abidjan, Accra and Dakar, most vehicles are sourced from the second-hand market, often retrofitted for passenger service. Prices for a used minibus suitable for operations as Gbaka, tro-tro, or ndiaga-ndiaye can range widely, typically between USD 3,000 and USD 25,000 depending on age, condition, and modifications. This lower entry cost explains their prevalence in informal transport, but also contributes to heterogeneity in fleet quality, safety, and emissions performance.

3.2.4 Anticipated bus replacement per year

Based on the available data regarding the age of fleets purchased by each city, a replacement year has been estimated using a vehicle lifespan of 15 years, assuming proper preventive and regular

maintenance practices. However, if operators have not sufficiently maintained the vehicles, they may reach the end of their useful life before these estimated dates. The availability of spare parts and maintenance capacity has been a challenge in all six case study cities. Therefore, it is crucial that any fleet procurement includes the supply of spare parts and the training of mechanics and technical staff.

The table below provides an estimate of the anticipated fleet replacement year for existing services. It does not account for procurements related to future routes or bus deployment.

Table 3-5: Anticipated fleet replacement year

City	Operator	Fleet size	Expected replacement year			
			1–5	6–10	11–14	15+
Dakar	Dakar Mobilités	120	0	0	0	120
Dakar	Dakar Dem Dikk	480	0	290	0	190
Lagos	LBSL	300	0	240	60	0
Lagos	TSL Metroline	90	0	0	90	0
Lagos	Primero	550	440	0	110	0
Freetown	MTC	50	0	0	0	50
Lomé	SOTRAL	90	10	0	30	50
Abidjan	SOTRA	1470	70	1,180	220	0
Accra	Metro Mass Transit	600	0	0	0	600
	Total	**3750**	**520**	**1,710**	**510**	**1,010**

Source: Consultant, based on available data and assumptions.

3.2.5 Number and size of depots and terminals

Electric buses require depots and terminals with sufficient space for charging equipment, battery storage and solar power or wind turbines, if a microgrid is being installed. Existing depots and terminals can be retrofitted to include this infrastructure, or new terminals and depots can be developed with the new infrastructure. All six of the cities are densely populated with limited land availability.

It may be possible to retrofit existing ICE bus depots and terminals to facilitate charging of electric buses. With limited land available in all six cities this option could be more suitable than building new depots or terminals. Many cities have retrofitted bus depots as shown in the case study in London below.

In 2016 Trasport for London (TfL) redeveloped the Waterloo Bus Garage in central London to support their roll out of zero emissions fleets. This redevelopment led to the replacement of the entire vehicle fleet, with Waterloo becoming London's first 100% electric bus garage after Alexander Dennis Limited Enviro200 e-buses were introduced.	
Before	**After**

Dakar.

In Dakar, the public operator Dakar Dem Dikk has its own depots provided by the state in Ouakam and Thiaroye. The depot of the BRT operator Dakar Mobilités is located in Gadaye. There is no formal depot for the operators of the AFTU network.

Dakar has long had important bus terminals, especially for the informal sector. This is the case with the Peterson terminal in the city center. The release of part of these areas has made it easier to deploy the BRT project and establish Multimodal Transport Hubs.

Figure 3-3: Dakar Peterson station, before and after BRT project implementation

Source: Google Earth

Freetown.

Freetown has limited off-street designated public transport terminals and depots. The poda poda network primarily uses on-street terminals. The main depot in the city is the Blackhall Road depot, which was formerly owned by the Sierra Leone Road Transport Corporation (SLRTC) but was transferred to the SLPTA. This depot currently houses the 50 Waka Fine buses. The SLPTA has further plans for depots at Number 2 River in the West of the city and a sub depot at Jui in the East. The SLPTA currently has two major terminals one in the city centre located at the old railway station known as the central bus station and the recently opened Lumley transit terminal.

Figure 3-4: Lumley Transit terminal (left), Blackhall road Depot (right)

Source: SLPTA

Lagos.

LAMATA has developed several modern depots and terminals located across the city. These sites have been developed as part of BRT and other public transport projects. These sites provide high quality infrastructure for passengers and operators. Many of these sites present opportunities for retrofitting electric charging infrastructure for both opportunity charging and overnight charging.

Figure 3-5: Ikeja Bus Terminal


Source: LAMATA

Accra.

Accra has a network of the terminals (locally known as lorry parks) serving as main loading points for the fill up and go paratransit services. The land typically is owned by Municipal Assemblies however, the management is assigned to the unions and the bus companies. Some of the terminals are highly informal such as the Tema Park located in the center of Accra whilst some like the Achimota Bus terminal have been redeveloped through investment from government and are in turn more structured and organized.

Figure 3-6: Tema Bus Park (Left) Achimota Bus Terminal (Right)


Source: Ghana Business News

Abidjan.

SOTRA manages operations out of two large bus stations (Plateau Sud and Adjamé Nord) and nine smaller stations. Operations are split into seven bus "departments" with garages and workshops for each department.

Figure 3-7: Plateau Sud

Source: Universite Alassane Outtara

Lomé.

SOTRAL operates its services throughout Lomé. Currently, it operates from a single depot. The Ministry of Transport emphasizes the need for depots in peripheral areas to minimize empty return trips and reduce operational costs, which currently amount to 300 million FCFA per year. There are two bus terminals in the city center, very limited in size. Of the 400 stops within the city only 30 have shelters and are basic in level of infrastructure. The approach of SOTRAL is to maintain simplicity in urban infrastructure to avoid costs associated with vandalism.

Figure 3-8: Bus terminal and bus stops in Lomé

Source: SOTRAL

Some cities have multiple depots (Abidjan, Lagos), allowing for adequate territorial coverage. This enables, on the one hand, better operational management of fleets by avoiding deadhead trips, and on the other hand, provides more options for potential upgrades to accommodate charging stations and to assess grid access. Conversely, other cities (Lomé, Freetown) currently have fewer options. However, it is worth noting that new projects could lead to the development of greenfield depots, as was the case with the BRT in Dakar.

3.2.6 EV charging infrastructure

Dakar, with its e-BRT system, boasts the most advanced EV charging infrastructure for its fleet of 121 CRRC e-buses. Charging stations are located at key sites, including the main stations in Grand Médine, Guédiawaye, and Peterson, as well as the Gadaye maintenance centre. Technical details on the EV charging station standards have not yet been gathered.

Figure 3-9: View of the E-bus depot and maintenance center of the Dakar BRT in Gadaye

Source: Agence de Presse Sénégalaise

Figure 3-10: View of the EV charging station of the Dakar BRT in Gadaye

Source: SunuBRT. https://www.sunubrt.sn/

3.3 Human capital and staffing

Based on secondary data and interviews carried out with the formal operating companies the human capital and staffing has been assessed. Electric buses represent a step change in the operational and maintenance capacity requirements for operators.

Table 3-6: Human capital and staffing of operators

City	Operator	Estimated full-time equivalent (FTE)
Abidjan	SOTRA	Estimated total of 2 500 employees: Etudes et prospectives, Marketing & Commercial, Supports – 800 Exploitation et Maintenance – 1 700
Accra	Metro Mass Transit	2,474 (2020)
Dakar	Dakar Mobilité	2 200 (by 2043)
	Dakar Dem Dirk	3 800 (by 2043)
	AFTU	3 000 (by 2043)
Lagos	Primero	n/a
	TSL	n/a
	Metroline Limited	n/a
Freetown	Metro Transit Company	n/a
Lome	SOTRAL	Approximately 400, including about 200 operational staff.

Source: Abidjan: Assessment of the profiles and capacity-building needs of workers in the formal urban transport sector in Côte d'Ivoire (Louis Berger). Accra: Metro Mass Transit. Dakar: CETUD Economic analysis of the project proposed by the International Finance Corporation (IFC). Lomé: PMUD (Diagnostic Report).

3.4 Financial performance

All the necessary information from stakeholders regarding financial performance was not shared, which limited the ability to conduct a detailed analysis. As a result, the analysis may remain

incomplete, particularly in assessing the financial performance of Internal Combustion Engine (ICE) fleets and evaluating the potential impact of transitioning to electric buses on operating expenditures.

Based on the analysis of data from six cities, the total cost of owning a vehicle, including purchase, operation, and maintenance costs over its entire lifespan, has been evaluated. This assessment utilized assumptions and real data from each city to compare the Total Cost of Ownership (TCO) of purchasing and operating an ICE bus versus a battery electric bus.

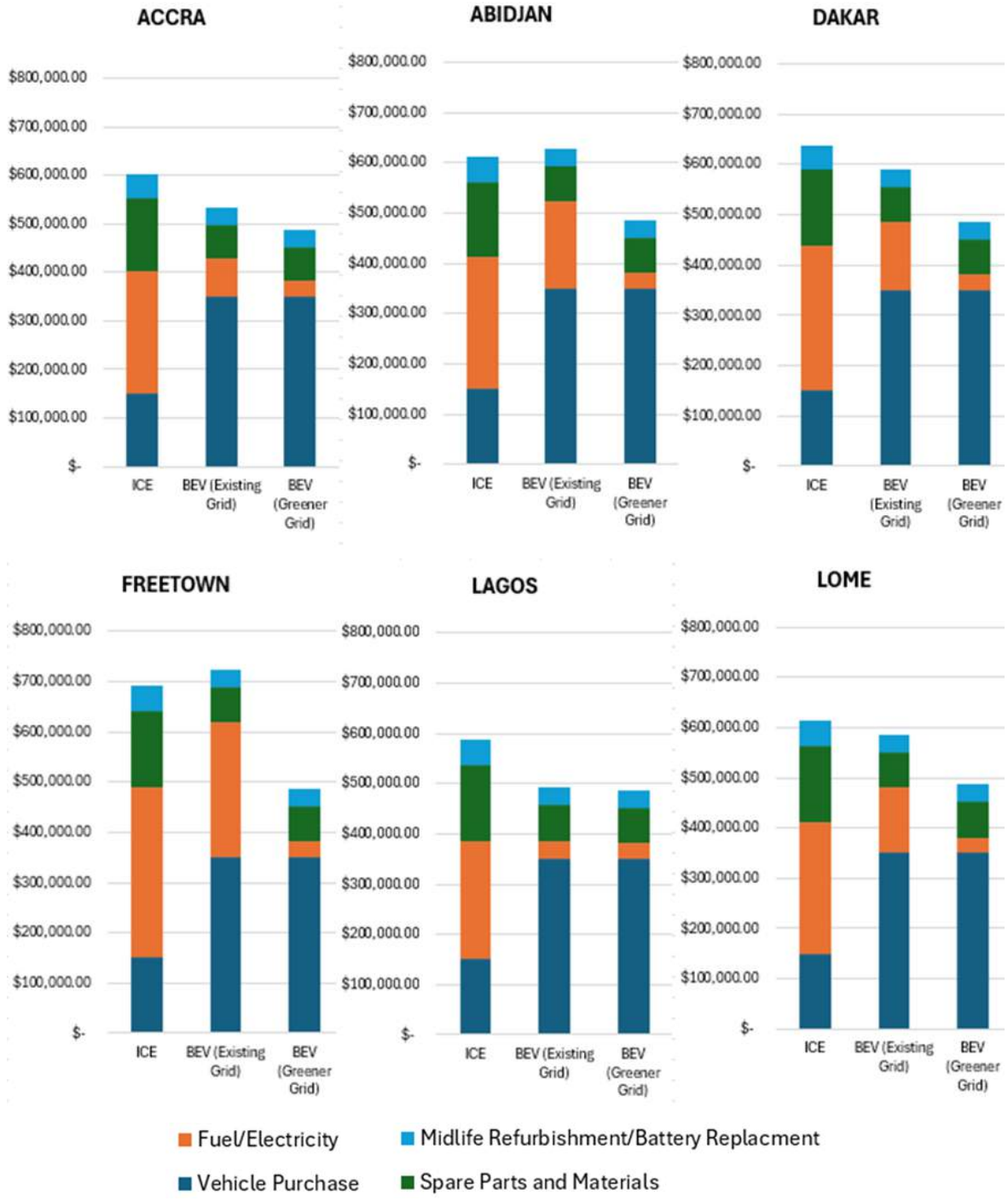
We present below a high-level summary of the TCO analysis, including main outputs and conclusions. A more detailed description of the TCO analysis can be found in **Annex B**.

3.4.1 Results from the TCO analysis for operators

The Total Cost of Ownership (TCO) analysis compares the purchase costs of a 12-meter Internal Combustion Engine (ICE) bus, priced at $150,000, and a 12-meter electric bus (e-bus) equipped with a 250 to 300 kWh battery, priced at $350,000. These figures represent mid-range prices for both ICE and E-bus models, reflecting the investment required for vehicles manufactured in China or Latin America.

The results of the TCO analysis show that operators in all cities, except Freetown and Abidjan, which face higher electricity prices, would benefit from TCO savings by switching to electric buses. In a variant that assumes substantial greening of the electricity grid, all six cities would experience TCO savings from electrification.

Figure 3-11: Total Cost of Ownership of ICE vs EV in the Six Cities



Source: Calculations ITP

The base scenario assumes 35,000 km of annual mileage per bus. Increasing this to 55,000 km, enabled by better bus priority measures, further strengthens the case for e-buses. With higher mileage, all cities achieve TCO savings even at current energy prices.

An alternative variant assumed higher battery replacement and refurbishment costs. In this case, all cities still see TCO savings when e-bus deployment is paired with grid decarbonisation, though competitiveness is lower under current electricity conditions.

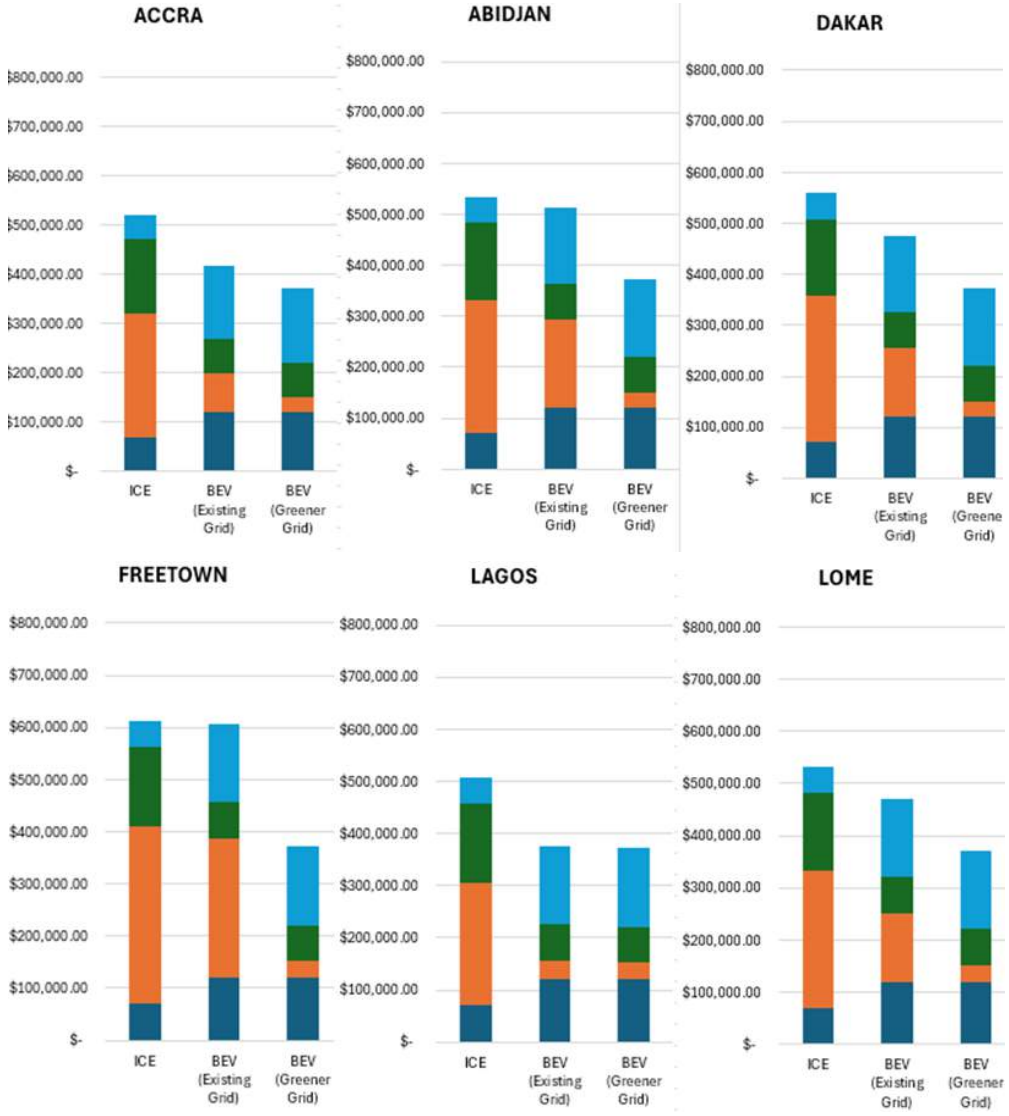
3.4.2 Analysis of TCO for paratransit fleet

As all six cities seek to modernize their existing paratransit informal fleets, fleet renewal programs may focus on replacing highly polluting mini/midibus paratransit fleets. Paratransit differs from country to country and covers a range of vehicle sizes. These tend to be purchased as second-hand vehicles and therefore difficult to cost, as this will depend on the age of the vehicle. In addition, the cost of second-hand electric vehicles needs to account for battery life, which will again depend on age of the vehicle. Examples of fleet renewal in Dakar, as well as the recent introduction of electric buses in Accra on Tro-Tro routes, illustrate a trend towards the deployment of midibuses, which are perceived as more modern.

We conducted a TCO assessment for the purchase of a 10-meter diesel midibus versus an e-bus.

For this assessment, the purchase prices used are $70,000 USD for a 10-meter EURO 4 diesel bus and $120,000 USD for a 10-meter battery electric bus (both Golden Dragon models). The results indicate that the TCO for renewing a fleet of 10-meter electric buses, compared to 10-meter diesel buses, is favorable in all six cities studied, potentially leading to significant cost savings.

Figure 3-12: Results for 10-Meter Bus at 35,000 km per year



Source: Calculations ITP

These savings are even higher under alternative scenarios where a 10-meter bus operates 55,000 km per year.

3.4.3 Summary of financial implications

The analysis of the Total Cost of Ownership (TCO) for Internal Combustion Engine (ICE) buses and Battery Electric Buses (e-buses) across six cities shows that, in general, e-buses offer significant cost savings, especially when supported by greener, more affordable electricity sources or improved network efficiency to increase bus mileage. While cities like Freetown and Abidjan, with higher electricity prices, limit the savings from electric buses, the overall trend favors the adoption of e-buses, particularly when assuming increased annual mileage or reductions in energy costs through cleaner grids.

The impact of midlife costs, such as battery replacement and refurbishment, highlights the complexity of the financial landscape, as higher costs for e-buses could influence their competitiveness. However, even in the most pessimistic scenarios, the TCO of e-buses remains competitive in most cities, emphasizing the financial viability of transitioning to e-buses as part of a broader strategy for sustainable urban mobility. Future analyses could further refine these results by incorporating more granular data on fuel consumption, maintenance practices, and local policy incentives to enhance the financial outlook for electric buses.

Another challenge in the transition to electric buses is the cost of upgrading the supporting infrastructure. Significant investments are required in charging stations and energy management systems to enable the adoption of electric buses. Although the TCO analysis presented above did not explicitly account for the cost of EV chargers, these costs can vary significantly depending on factors such as power rating, local installation expenses, and supply chain conditions. For electric buses, DC fast chargers are typically preferred to meet operational requirements, such as service frequency. The cost of installing a standard DC fast charger can range generally from US$21,000 to US$66,000 per unit.

It is important to note that the overall cost of charging infrastructure is highly dependent on the design and scale of the transit system. Variables such as the number of buses, battery capacity, charging strategy (e.g., overnight charging vs. opportunity charging), and operational schedules all influence the type and quantity of chargers required. As such, excluding charger costs from the TCO analysis is not necessarily an oversight, but rather a reflection of the need to tailor infrastructure planning to the specific characteristics of each project.

Over the operating life of an electric bus (10 to 15 years), chargers may need to be replaced. Therefore, transit operators must consider both the initial investment and potential replacement costs when conducting a detailed project analysis. Furthermore, the need to upgrade or reinforce the electrical grid to accommodate increased electricity demand, particularly in areas with inadequate existing infrastructure, represents an additional barrier to widespread adoption.

Nevertheless, from the perspective of an operator who does not bear the cost of vehicle purchase (as is the case, for example, with SOTRAL in Lomé), the operational cost savings are undeniable. These savings could significantly improve operational efficiency and enhance services for passengers. The reduction in fuel and maintenance costs, along with the long-term stability of energy prices, offers the potential for substantial reductions in operational expenses. The absence of fossil fuel costs, coupled with generally lower maintenance expenses for electric buses, makes this option particularly appealing to operators, even when considering the initial investments needed to upgrade the required infrastructure.

4 Review of E-Bus Policy and Regulatory Frameworks

The following section analyses the institutional framework for urban transport in the project cities, and the current state of e-mobility and e-bus regulatory frameworks. It concludes with a series of general and city-specific recommendations.

4.1 Necessary components of e-bus regulatory framework

A robust e-bus regulatory framework should focus on policy alignment, financial incentives, and risk mitigation. Policies must align national transport, energy, and environmental goals, with clear targets for e-bus adoption. Financial mechanisms such as subsidies, tax exemptions, and public-private partnerships are essential to offset high upfront costs and attract investment in vehicles, infrastructure, ICT, and recycling.

Regulatory bodies must have the expertise to oversee technical, financial, and operational aspects, working closely with manufacturers, operators, and energy providers. Public awareness and community engagement can also help build acceptance. Regulations should remain flexible to adapt to evolving technologies and local needs.

An empowered urban public transport authority is key to a sustainable transport ecosystem. It should have clear responsibilities, dedicated resources, and skilled staff. Such an authority can coordinate across government levels and independently implement, manage, and invest in public transport projects.

Key components of an e-bus regulatory kit may include:

Table 4-1: E-bus regulatory kit

Key Component	Description
Policy & Planning	National and local policies for transports and for e-mobility, fleet electrification targets, integration with other modes of public transport.
Institutional Setup	Share of transport competences between national and local bodies, status of Urban Mobility Authority if any, stakeholder engagement
Technical Standards	Standards and technical specifications for vehicle and, charging infrastructure, interoperability aspects
Financial Mechanisms	Subsidies, tax exemptions, duties exemptions, PPPs, risk-sharing tools
Energy & Infrastructure	Grid readiness, electricity pricing, streamlined permitting, conditions for micro-grid setting
Operational Guidelines	Fleet management, driver training, performance tracking
Environmental & Social Safeguards	Battery lifecycle management, job retraining, compliance frameworks
Gender Inclusion	Gender impact assessments, inclusive hiring practices, accessibility and safety, gender-aware design considerations
Manufacturing Capacity	Incentives for local assembly and manufacturing, quality standards, supply chain management
Employment Generation	Job creation, support for small and medium enterprises
Workforce Development	Training programs, development of certifications and standards

Source: CPCS & ITP

4.2 Comprehensive review of the policy and regulatory frameworks

The six project cities differ in the institutional and organisational structure of urban transportation, the maturity of e-mobility efforts, and the degree of alignment between transport, energy, and environmental policies. All of which shape the regulatory environment and directly impact the pace and feasibility of e-bus deployment.

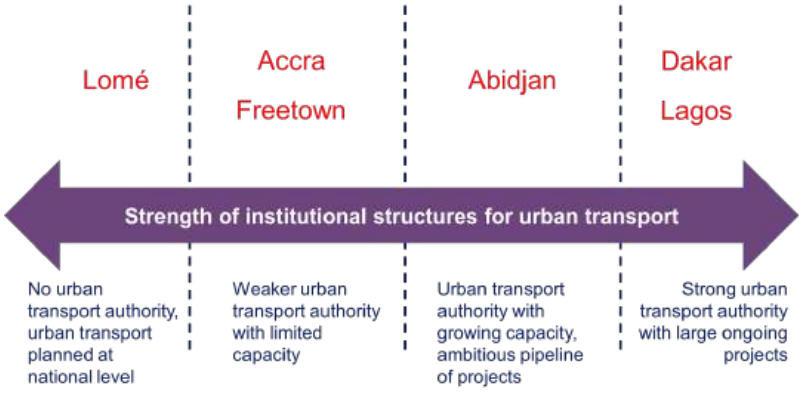
Institutional structure of urban transportation

The deployment of e-buses involves significant technical complexity and requires a higher degree of centralised coordination than traditional urban transport. A strong institutional structure is therefore a major advantage. Cities with an independent authority and a clear mandate to plan and coordinate urban transport are generally better positioned to deploy e-buses than those relying on fragmented efforts across multiple government levels.

All six project cities have made notable progress in urban transport in recent years. Several have recently established new public transport authorities and are working to expand their mandate and build capacity. International support, particularly from the World Bank, has been instrumental. The Bank has provided technical and financial assistance for the creation of public transport authorities in Accra, Abidjan and Freetown, and has supported institutional strengthening and large project implementation in Dakar and Lagos.

Despite this progress, differences remain. Lagos and Dakar have long-standing authorities implementing major projects, including BRT and rail, and managing extensive bus networks. Abidjan's relatively new authority is building capacity rapidly and developing an ambitious project pipeline. In Accra, past BRT implementation challenges have limited progress, but efforts are underway to rebuild capacity. Freetown has a new national authority with a recently developed regulatory framework and is starting to roll out new bus corridors. Lomé, currently in a decentralisation process, lacks a dedicated transport authority and relies on national ministries.

Figure 4-1: Relative strength of institutional structures for urban transportation



Source: CPCS & ITP

Regulations on e-mobility

All six cities have taken action to expand e-mobility, but none currently has a comprehensive e-bus regulatory framework as described in the previous section.

Dakar has the most e-bus regulations of any city, given that it has already deployed a significant number of e-buses on its BRT. However, Dakar lacks a clear strategic plan or roadmap for expanding e-mobility, and its regulatory framework has several key gaps including a lack of financial incentives for e-mobility.

Lagos, Freetown and Accra have all benefited from the development of national-level e-mobility strategies that lay out key priority reforms in crucial areas like technical standardisation, financial incentives and policy.

Abidjan is planning to use e-buses on its future BRT lines but currently does not have a strategy or roadmap in place for regulatory reforms. Lomé does not currently have an e-mobility roadmap in place but has taken steps to promote e-mobility, including financial incentives for the import of EVs.

Figure 4-2: Strength of e-bus regulatory framework

Source: CPCS & ITP

The table below identifies specific strengths and weaknesses of each city's e-bus regulatory framework, compared to the necessary e-bus regulatory kit identified in the previous section. The following sections will provide a more detailed analysis of the institutional and regulatory context of each project city.

Table 4-2: City-Specific Strengths and Weaknesses in E-Bus Regulatory Frameworks

Scope of regulation	Lagos	Lome	Accra	Abidjan	Freetown	Dakar
Institutional setup	High	Low	Low	Fair	Fair	High
Policy & Planning – urban transport	Low	Low	None	Low	None	High
Policy & Planning – e-mobility	High	Low	Fair	Low	Fair	Low
E-Vehicle licensing (Public Transport)	Low	None	None	None	None	Fair
Technical standards – bus maintenance and operation	Low	None	None	None	None	Fair
Technical standards – charging facilities	Low	None	None	None	None	Fair
Technical standards – energy production and supply	None	None	None	None	None	Low
Financial support mechanisms	None	Fair	None	None	None	None
Environmental & Social Safeguards	Low	Low	Low	Low	Low	Fair
Gender Inclusion	None	None	None	Low	Fair	Low
Manufacturing Capacity	None	None	None	None	None	Low
Employment Generation and Workforce Development	None	None	None	None	None	None

4.2.1 Lagos, Nigeria

4.2.1.1 Institutional framework for urban transport in Lagos

In Lagos, urban transport is primarily managed at the Lagos State level, with some involvement from national and local institutions.

The most important agency is the Lagos Metropolitan Area Transport Authority (LAMATA), which operates under the Lagos Ministry of Transportation (MOT). The MOT is responsible for high-level policy, regulation, and overall sector oversight. LAMATA manages public transport services, including buses and Bus Rapid Transit (BRT). It also handles the strategic planning and coordination of all transport modes, including paratransit.

LAMATA oversees multiple formats of bus operation. In some cases, operators own both their buses and depots. In other cases, they lease vehicles from LAMATA, which also provides depot space for these services.

Table 4-3: LAMATA responsibilities in the public transport sector

Direct responsibility	Regulation and oversight (operators' responsibility)
Network and route planning	Bus operations
Route contracting	Fleet procurement (some operators)
Infrastructure maintenance	Vehicle maintenance
Terminals	Bus depots (some operators)
Fleet procurement (leased to operators)	Ticketing
Bus depot (some directly owned)	–
Fare collection	–

The paratransit sector in Lagos is organised by a single officially recognised union: the National Union of Road Transport Workers (NURTW), formerly known as the Lagos State Parks and Garages Management (LASPG). The union manages specific routes, parks, and garages across the Lagos metropolitan area. Some paratransit operators receive licenses from the Lagos State Ministry of Transportation (MOT), although this is not universal.

LAMATA is working to improve the paratransit system along Quality Bus Corridors (QBCs). Its efforts include supporting operators in procuring new buses and upgrading bus stop infrastructure. LAMATA funds its operations independently. It does not receive financial assistance or subsidies from the government, except in exceptional situations such as the Covid-19 pandemic.

Multilateral development banks (MDBs) and international financial institutions (IFIs) have played a major role in Lagos's public transport sector. The city's first BRT systems were developed with World Bank support. More recently, LAMATA received a 50 million USD loan from the International Finance Corporation (IFC) to improve infrastructure on two key bus corridors[13]. The AfDB recently announced a commitment to support LAMATA in the construction of an additional light rail line[14]. Swedfund has provided support to LAMATA to study the potential for the use of biofuels in the city's bus network.

[13] "IFC, Lagos State Partner to Expand Access to Sustainable Urban Transport." International Finance Corporation. April 13, 2022. https://www.ifc.org/en/pressroom/2022/ifc-lagos-state-partner-to-expand-access-to-sustainable-urban-transport
[14] "AfDB to partner LAMATA in developing Lagos purple rail line, others." The Nation. January 11, 2025. https://thenationonlineng.net/afdb-to-partner-lamata-in-developing-lagos-purple-rail-line-others/

4.2.1.2 Policy and regulatory framework for urban transport in Lagos

Key policies that govern Lagos's urban transport sector include:

- **LAMATA Strategic Transport Master Plan (STMP) (2012)**[15] – is the main policy document guiding LAMATA's strategic planning. The current document covers development up to 2032 but is currently in the process of being revised with a time horizon of 2048.
- **MOT Transport Sector Reform Law (2018)**[16] – consolidated several pre-existing pieces of legislation. Most importantly, it established the "Bus Reform Programme" to be implemented by Lagos Bus Services Limited (LBSL) to operate medium and high-capacity buses along certain corridors. The Law also establishes several general commitments to develop more sustainable urban transportation.
- **E-Trans: Electric Mobility and Transition in Nigeria: Strategy and Implementation (2023)**[17] – World Bank and PPIAF-funded study prepared by the Energy Sector Management Assistance Program (ESMAP) and Molo that currently guides LAMATA's e-mobility efforts. The study recommends piloting e-buses along certain bus corridors in Lagos, a recommendation that LAMATA has followed with the procurement of two e-buses. The study also recommends a phased e-bus rollout plan for Lagos along BRT corridors.
- **Lagos Climate Action Plan (2020)**[18] – identifies priority climate actions for the Lagos State Government in the period 2020-2025. Priorities include expansion of the Lagos BRT network and encouraging the uptake of low-emission vehicles including EVs.
- **Feasibility study of the implementation of biofuels for Lagos buses**[19] – conducted by LAMATA with Swedfund support in 2023-2024. Its conclusion was that biogas coming from specific waste collection would be a valuable biofuel for buses. LAMATA is now considering the next steps for implementation.

4.2.1.3 Specific regulations on e-mobility in Lagos

LAMATA's e-bus deployment efforts are currently guided by the previously mentioned "E-Trans" study, funded by the World Bank and PPIAF and prepared by ESMAP and Molo in 2023. This study includes a roadmap for the electrification of buses in Lagos, taking the form of a phased rollout proceeding from an e-bus demo to a pilot and finally to an e-bus scale-up phase in the medium term. The roadmap makes several recommendations for complementary actions to facilitate e-bus deployment, including the development of policies to incentivize the importation of EVs and chargers and the development of local manufacturing.

The E-Trans study provides a comprehensive overview of barriers to e-mobility, encompassing both the policy and regulatory framework and financial limitations.

Specific policy recommendations made by the E-Trans study include:

- Development of technical standards for EVs and charging infrastructure.
- Development of parallel strategies of improvements to the national grid and development of off-grid supply and battery storage systems.
- Deployment of financial incentives for EVs, including both tax incentives and subsidies.

[15] Strategic Transport Master Plan (STMP). LAMATA. https://www.lamata-ng.com/stmp/
[16] Lagos State Transport Sector Reform Law (2018). Law Nigeria. https://lawnigeria.com/2019/10/19/lagos-state-transport-sector-reform-law-2018/
[17] E-Trans – Electric Mobility and Transition in Nigeria. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/099062023083566583/p176130009f7ed06a09cf1020f7a3f164c1
[18] Lagos Climate Action Plan: Second Five Year Plan 2020-2025. Lagos Ministry of Environment. https://moelagos.gov.ng/wp-content/uploads/2021/09/C40-Lagos_Indesign-Document-Full-Report-Revert-2_Update-2.pdf
[19] Lagos to power public buses with biogas following CPCS study. CPCS. https://cpcs.ca/lagos-lamata-buses-biofuel-study/

- Development of incentives for e-bus manufacture in Nigeria.
- Development of regulations for battery decommissioning in partnership with manufacturers.
- Workforce training of technicians needed to maintain eEVs and charging infrastructure.

While many of the recommendations of the E-Trans study have yet to be implemented, it provides a robust roadmap for the future development of a comprehensive e-mobility regulatory framework conducive to e-bus deployment.

LAMATA is in the process of implementing the recommendations of the E-Trans study. LAMATA has selected the companies Primero and LBSL as operators to franchise e-buses, and has deployed two e-buses on BRT corridors as a demo.

In 2023, Nigeria removed its long-standing subsidy on petroleum.

Table 4-4: Lagos – Status of regulations on e-mobility

Scope of regulation → Status	**Maturity**
Institutional setup → LAMATA is a Transport Authority with the ability and resources to drive e-mobility projects.	**High**
Policy & planning – urban transport → Elaboration of Sustainable Urban Transport Plan (STMP) under early implementation.	Low
Policy & planning – e-mobility → E-Trans: Electric Mobility and Transition in Nigeria: Strategy and Implementation (2023) includes a roadmap for the deployment of e-buses in Lagos.	**High**
EV licensing (Public Transport) → Partial measures to test e-bus operation; recommendations in E-Trans study to expand regulations.	Low
Technical standards – bus maintenance and operation → Partial measures to test e-bus operation; recommendations in E-Trans study to expand regulations.	Low
Technical standards - charging facilities → Partial measures to test e-bus operation; recommendations in E-Trans study to expand regulations.	Low
Technical standards – energy production and supply → The E-Trans study includes recommendations for the establishment of technical standards.	*None*
Financial support mechanisms → The E-Trans study includes recommendations for the deployment of financial incentives.	*None*
Environmental & Social Safeguards → Not specific to e-mobility	Low
Gender Inclusion → The E-trans study makes no mention of gender inclusion, except a passing mention in the section on rural connectivity.	*None*
Manufacturing Capacity → The E-trans study includes recommendations for the incentivization of domestic manufacturing of EVs.	*None*
Employment Generation and Workforce Development → The E-trans study makes no recommendations related to employment generation.	*None*

4.2.1.4 Key opportunities and challenges in Lagos

General urban mobility

- Strong Institutional Capacity: The Lagos Metropolitan Area Transport Authority (LAMATA) is one of the most developed urban transport agencies in West Africa. It has a clear institutional mandate, well-defined roles, and the technical capacity to lead public transport initiatives, including fleet modernisation and electrification.

- Leadership Potential: LAMATA's capacity positions it well to spearhead the transition toward cleaner bus systems. Its existing structure allows for greater integration and coordination of urban transport strategies across Lagos.
- Challenge – Policy Alignment: However, even with this strong institutional setup, there is a need for greater alignment between existing transport policies and long-term goals for decarbonisation. Fragmented implementation of the broader e-Trans roadmap risks undermining the consistency and scale of electrification efforts.

E-Mobility

- Initial Steps Taken: LAMATA has already introduced two electric buses and is beginning to develop supporting infrastructure, including charging stations. These early steps show momentum and willingness to test electric mobility solutions.
- Ad Hoc Implementation: These initiatives have so far been carried out without a comprehensive strategy. The absence of a dedicated e-mobility policy and a supporting regulatory framework limits effective planning, stakeholder coordination, and private sector engagement.
- Competing Fuel Priorities: Nigeria's status as a major LNG producer influences the national focus on alternative low-carbon fuels like compressed natural gas (CNG) and biogas. These energy sources compete directly with electric mobility for policy attention and financial support, potentially slowing e-bus adoption.
- Enabling Environment Still Lacking: Key regulatory tools, such as vehicle licensing schemes, technical standards for e-buses and chargers, and clear financing frameworks, remain underdeveloped. Without these in place, upscaling e-bus deployment beyond pilot projects will be difficult.

4.2.2 Lomé, Togo

4.2.2.1 Institutional framework for urban transport in Lomé

Since 1992, Togo has undergone a process of decentralisation. The most recent decentralisation law was passed in 2019.[20] In theory, these reforms devolved responsibility for transport functions to municipalities. However, they have not been accompanied by sufficient funding, and the division of responsibilities between national and local authorities remains unclear.

Since 2019, there has been a shift toward genuine decentralisation. One key development was the Law of 26 June 2019, which created the Greater Lomé Autonomous District (DAGL). This body is run by an elected council and has authority over a broad range of responsibilities, including urban mobility.

Despite this, national ministries still play a major role in urban mobility in Lomé. The most important is the Ministry of Infrastructure and Transport (MIT), which implements transport and infrastructure policy. The Ministry of Urban Planning, Housing and Living Environment (MUHCV) and the Ministry of Economy and Finance (MEF) are also heavily involved.

Municipalities are consulted on transport infrastructure projects in their territory. They are responsible for maintaining some infrastructure, such as bus stations, parking areas, and road signs. They share responsibility with the national government for building and maintaining municipal roads and for organising urban transport.

The Lomé Transport Company (SOTRAL), which operates the city's public bus network, was founded under the joint supervision of the Municipality of Lomé, the MIT, and the MEF. The

[20] "Togo: Décentralisation et libertés locales. Loi n°2019-006 du 26 juin 2019." Droit Afrique. Accessed February 26, 2025. https://www.droit-afrique.com/uploads/Togo-Loi-2019-06-decentralisation.pdf

Municipality of Lomé holds a 28 percent stake in SOTRAL. The largest shareholder is the Autonomous Port of Lomé, which owns 57 percent of the company[21].

MDBs and IFIs are active in Togo's e-mobility sector. UNEP and the GEF are financing a joint programme, "Support the Shift to Electric Mobility in Togo", to support the development of a national e-mobility strategy and policy framework[22]. The project includes capacity building for key stakeholders, development of a gender sensitive business plan, feasibility studies for electric moto-taxis, and development of fiscal and regulatory incentives for e-mobility.

4.2.2.2 Policy and regulatory framework for urban transport in Lomé

At the National level, as discussed above, the national government plays a central role in urban transport in Lomé. Several key laws and policies guide the sector, including:

- **National Urban Mobility Policy (2030)**[23] – This is the primary strategic planning document for urban transport in Togo. It includes several important objectives related to sustainable urban mobility in Lomé:
  - Establishes several objectives related to the sustainability of urban transport in Lomé, namely the clarification of institutional roles, the expansion of SOTRAL's network on busy corridors in Lomé and the regulation of informal operators.
  - Sets goals for improving the integration between SOTRAL's network and the informal network and to minimize mobility's negative effects on the environment.
  - Sets specific goals for SOTRAL, including the expansion of its fleet to 200 buses, expansion of bus lanes to encompass 10 – 20% of the network in Lomé and professionalization of 100% of Lomé's taxi fleet.
  - Makes no specific mention of e-mobility.
- **Transportation Law (2022)**[24] – Sets high-level commitments for the formalisation of the transport sector, the regulation of public transport and the protection of the environment.

At the Municipal level, in 2023, Lomé initiated the development of a Sustainable Urban Mobility Plan (SUMP). This process is funded by the French Development Agency (AFD) and carried out in partnership with MobiliseYourCity.

The SUMP is still under development and has not yet been finalised.[25]

4.2.2.3 Specific regulations on e-mobility in Lomé

Neither the National Urban Mobility Policy 2030 nor the 2022 Transportation Law make specific mention of e-mobility. Both refer broadly to emission reductions in the public transport sector, but without concrete commitments or plans for future studies.

According to the Africa E-Mobility Alliance's "Africa E-Mobility Readiness Tool," Togo scores 33 percent for policy, reflecting a lack of dedicated e-mobility regulations and strategies for electric vehicles (EVs). Togo is currently in the process of developing a national e-mobility strategy with UNEP and GEF support. The government has also provided some additional support for the

[21] Tindano, Michel. "Sotral : une offre de transport structurée pour la ville de Lomé ». Lomé, Togo: Société des Transports de Lomé, November 2017.

[22] "Support the Shift to Electric Mobility in Togo." GEF. https://www.thegef.org/projects-operations/projects/10272

[23] Policies for Sustainable Accessibility and Mobility in Urban Areas of Togo. SSATP. https://documents1.worldbank.org/curated/en/099756301312238187/pdf/P1533110277fa90ce0a0a8027c16c1eabc7.pdf

[24] Republic of Togo. *Projet de Loi d'Orientation des Transports*. Adopted by the Government, June 27, 2022. Lomé, Togo.

[25] MobiliseYourCity, "Factsheet: Lomé, Togo," 2024. https://www.mobiliseyourcity.net/sites/default/files/2024-03/15_Lom%C3%A9%2C%20Togo.pdf

electrification of two-wheelers, including conducting feasibility studies for electric moto-taxis with UNEP and GEF support and the exploration of battery swapping models.

Despite this, the national government has shown more targeted support for the electric two-wheeler market. A UNEP and GEF-supported programme is helping develop a national e-mobility strategy. The government has also adopted financial incentives to accelerate uptake.

Togo continues to subsidise refined petroleum products. Under an Extended Credit Facility agreed with the IMF in March 2024, the government pledged to reform fuel subsidies, but as recently as December it increased them.

In 2022, EVs were exempted from import duties, one of the few concrete fiscal measures supporting e-mobility[26].

Table 4-5: Lomé – Status of regulations on e-mobility

Scope of regulation → Status	**Maturity**
Institutional setup → There is no public transport authority with unified responsibility for urban transport. DAGL could potentially occupy this role in the future. There is an ongoing project with the Global Green Growth Institute to support the Togolese transport sector stakeholders for a new coordination mechanism and an engagement plan for sustainable mobility projects	Low
Policy & planning – urban transport → National Urban Mobility Policy and SUMP under early implementation	Low
Policy & planning – e-mobility → National e-mobility strategy under early implementation	Low
EV licensing (Public Transport) → None	*None*
Technical standards – bus maintenance and operation → None	*None*
Technical standards – charging facilities → None	*None*
Technical standards – energy production and supply → None	*None*
Financial support mechanisms → Togo exempted EVs from import duties	**Fair**
Environmental & Social Safeguards → Not specific to e-mobility	Low
Gender Inclusion → None	*None*
Manufacturing Capacity → None	*None*
Employment Generation and Workforce Development → None	*None*

4.2.2.4 Key opportunities and challenges in Lomé

General Urban Mobility

- Institutional Evolution: The creation of the Direction Autonome de la Gestion de la Mobilité Urbaine de Lomé (DAGL) marks a positive step toward decentralisation and stronger local involvement in urban transport. This move could enable the municipality to play a more active role in shaping mobility policy.
- Need for Clarification: However, the specific role, powers, and operational capacity of DAGL remain unclear. Without a well-defined institutional mandate, it will struggle to effectively coordinate or lead urban mobility efforts.
- Planning Framework Under Development: The finalisation of Lomé's Sustainable Urban Mobility Plan (SUMP) presents a key opportunity to provide strategic direction for the

[26] Benoit-Ivan Wansi. "TOGO: The State exempts electric vehicles from import duties." Afrik21. March 25, 2022. https://www.afrik21.africa/en/togo-the-state-exempts-electric-vehicles-from-import-duties/

sector. A completed SUMP would serve as a guiding document to align the actions of national ministries, municipal authorities, and development partners.

- Challenge of Fragmentation: Despite these developments, institutional fragmentation continues to hinder coherent policy implementation. The lack of a unified transport authority or clearly delineated responsibilities among actors limits efficient decision-making and reduces accountability.

E-Mobility

- Policy Signals: Togo has waived import duties on EVs, signalling an emerging interest in e-mobility. However, current incentives have mostly targeted private two-wheelers, with limited focus on the electrification of public transport systems.
- Regulatory Gaps: In Togo, there is currently no regulatory framework for e-mobility, no technical standards, no vehicle licensing processes, and no safety protocols for e-buses. This policy vacuum makes it difficult to structure and scale up e-bus deployment.
- Subsidy Misalignment: Continued subsidies for fossil fuels reduce the economic competitiveness of EVs, undercutting efforts to promote electrification. Without reforms, these subsidies act as a disincentive for both public and private sector investment in e-mobility.
- Coordination and Capacity Challenges: Effective progress in e-mobility requires stronger institutional coordination and long-term planning across ministries. At present, Lomé lacks the enabling environment, both in terms of governance and infrastructure, to drive a meaningful shift toward electric public transport.

4.2.3 Accra, Ghana

4.2.3.1 Institutional framework for urban transport in Accra

Like in Togo, the urban transport sector in Accra is relatively fragmented. Multiple agencies and levels of government are involved, and the roles of different actors are not always clearly defined. Historically, the national government has played a significant role in urban transport, especially the Ministry of Transport (MoT), Ministry of Roads and Highways (MRH), Ministry of Finance (MoF) and the Ministry of Local Government, Decentralization and Rural Development (MLGDRD). The MoT is the primary agency responsible for planning, directing and overseeing urban transport in Accra, and is the primary driver of many projects in the city. The Ghana Road Transport Coordinating Council (GRTCC) plays a role in coordinating the efforts of different ministries across the road transport sector.

In 2016, the MoT created the Greater Accra Passenger Transport Executive (GAPTE) to oversee and coordinate urban transport in Accra, especially the implementation of the Ayalolo Bus Services (ABS) BRT network and plays a regulatory and oversight role vis-à-vis private bus operators. The ABS was intended to reduce congestion and formalise public transport along key corridors in Accra but has largely been a failure. Bus operators struggled to recoup costs, and many buses have since been abandoned.[27] Factors that contributed to the struggles the project has faced include:

- Lack of continuous and segregated BRT right of way, especially at crossroads, which erased most of the travel time advantage the BRT compared to paratransit (trotros).
- Fierce competition from trotros, who adapted their fares to compete with the BRT, at least until it proved not to be a competitor anymore.

[27] "Abandoned 'Aayalolo' buses: Has Ghana's Bus Rapid Transit system failed?" Modern Ghana.com. October 26, 2023. https://www.modernghana.com/news/1268819/abandoned-aayalolo-buses-has-the-bus-rapid-tran.html

- Travel deemed uncomfortable by many passengers. BRT passengers often need to stand up during their trips while they are seated when using trotros. This might have been acceptable if relative discomfort had been compensated by a real gain of travel time, which did not occur due to the lack of bus priority measures.
- Lack of flexibility of service when compared to trotros. For example, on the BRT it is not possible for passengers to carry large bags for market and passengers need to stop at defined stops unlike on trotros.

The relatively unsuccessful implementation of the Ayololo BRT network left GAPTE without a clear mandate. Compared to urban public transport authorities in other cities it lacks a track record of implementing successful projects and experience in overseeing operations over a long period of time.

Metro Mass Transit (MMT) is a partially-government owned bus operator that operates both inter-city and some intra-city routes. The Government of Ghana is a 45% shareholder of MMT, with private partners owning the remaining shares. Fully private bus operators include Kingdom Transport and Pergah Transport.

MDBs and IFIs have played some role in public transport in Accra. The Ayalolo BRT corridor was developed with World Bank support. In 2017, UNEP funded a study on low-emission buses in Accra, focusing mostly on CNG buses and air filters. The AfDB has also supported infrastructure upgrades in Accra, mostly focused on road infrastructure.

4.2.3.2 Policy and regulatory framework for urban transport in Accra

There is no city-level document guiding the development of urban transport in Accra.

Key policies that guide the urban transport sector in Accra include:

- **National Transport Policy (2020)**[28] – establishes high-level goals in the transport sector, including the establishment of multi-modal mass transport systems in urban hubs and to minimise climate impacts. The strategy includes a commitment to "Mainstream green infrastructure, climate change and sustainability issues into the transport sector activities," but does not make any specific mention of e-mobility.
- **Accra Climate Action Plan (2020-2025)**[29] – guides the Accra Metropolitan Assembly's climate efforts. The plan includes a list of priority actions and an implementation plan spanning 2020-2025. Priority actions in the transport sector include the revival of Accra's BRT by 2030 running on either CNG or electricity, the upgrading of all buses to either biogas or electric by 2050, and the renewal of the city's tro-tro fleet by 2040. Sub-actions include the development of charging infrastructure and lobbying the national government to fund the upgrading of buses to electric or biogas by 2050.
- **Greater Accra Spatial Development Strategy (2017)**[30] – is the main planning document for the Greater Accra region. It is out of date with no plans currently to replace it. Priority actions included the construction of BRT lines in Accra under the MoT, which has been partially implemented.
- **Roadmap for the Promotion of Cleaner Buses in Accra, Ghana (2017)**[31] – document produced with support from UNEP and the Climate and Clean Air Coalition. It focuses

[28]National Transport Policy. Republic of Ghana Ministry of Transport. August 2020. https://mot.gov.gh/files/resources/Final_Approved_Revised_National_Transport_Policy.pdf
[29]Accra Climate Action Plan : First Five-Year Plan (2020-2025). Accra Metropolitan Assembly. https://ama.gov.gh/documents/Accra_Climate_Action_Plan.pdf
[30] Greater Accra Regional Spatial Development Framework. GIBB. June 2017. https://luspa.gov.gh/wp-content/uploads/2023/11/GARSDF-Vol-1.pdf
[31] Roadmap for the Promotion of Cleaner Buses in Accra, Ghana. UNEP. 2017. https://wedocs.unep.org/handle/20.500.11822/31213

primarily on technology to limit air pollutants, including the use of air filters and CNG-powered buses. The report makes no mention of e-mobility.

4.2.3.3 Specific regulations on e-mobility in Accra

In 2022, the MoT developed a National Electric Mobility Roadmap[32]. In 2023, the MoT developed a National Electric Mobility Policy[33]. Both documents were produced in partnership with UNEP and the University of Ghana. The National Electric Mobility Policy identifies e-buses as the highest priority mode for electric mobility and identifies several policy and infrastructure barriers including the lack of fiscal incentives, lack of charging stations, unreliable power supply, and the lack of domestic manufacturing capacity.

The Electric Mobility Roadmap roadmap lays out a set of strategies and goals for developing e-mobility in Ghana, including the following targets for e-bus deployment:

- 2025: 516 e-buses
- 2030: 3,373 e-buses
- 2050: 12,027 e-buses

However, while these targets are ambitious, they are unlikely to be met if other conditions and requirements are not met first. The roadmap makes several recommendations to accelerate EV deployment in Ghana, including:

- Progressive rollout of purchase waivers and subsidies for EVs.
- Development of conducive infrastructure like dedicated BRT lanes, contraflow bus lanes for e-buses and the installation of inter-city and intra-city charging stations.
- Review of the Harmonised Customs Code to produce incentives for EV imports.
- Standardisation, licensing and certification of EVs.

GAPTE is currently in the process of implementing some of the recommendations of the Roadmap and Policy. As of November 2024, Metro Mass Transit has started operating 10 e-buses on routes within the Adenta Municipality. These pilot routes form part of the GAPTE's plans for 100 vehicles.

Table 4-6: Accra – Status of regulations on e-mobility

Scope of regulation → Status	**Maturity**
Institutional setup → Greater Accra Passenger Transport Executive (GAPTE) exists but lacks operational authority over transport services	Low
Policy & planning – urban transport → Accra does not currently have a city-level document guiding the development of sustainable urban transport.	*None*
Policy & planning – e-mobility → National Electric Mobility Roadmap (2022) identifies priority actions and recommendations but does not include specific reference to e-buses in Accra.	**Fair**
EV licensing (Public Transport) → Development of regulations for licensing of vehicles recommended in E-Mobility Roadmap.	*None*
Technical standards – bus maintenance and operation → Development of technical standards for e-buses recommended in E-Mobility Roadmap.	*None*

[32] National Electric Mobility Roadmap in Ghana. University of Ghana. 2022. https://unepccc.org/wp-content/uploads/2022/08/national-electric-mobility-roadmap-upload-25072022.pdf

[33] National Electric Mobility Policy and Market Readiness Framework for Ghana, University of Ghana, 2023. https://unepccc.org/wp-content/uploads/2022/06/national-electric-mobility-policy-framework-ghana-final.pdf

Scope of regulation → Status	**Maturity**
Technical standards – charging facilities → Development of technical standards for charging facilities recommended in E-Mobility Roadmap.	*None*
Technical standards – energy production and supply → Development of regulations for licensing of vehicles recommended in E-Mobility Roadmap.	*None*
Financial support mechanisms → Review of financial incentives is recommended in E-Mobility Roadmap.	*None*
Environmental & Social Safeguards → Not specific to e-mobility.	Low
Gender Inclusion → While the National Electric Mobility Roadmap states that gender inclusion was one factor used to prioritise roadmap policies, specific recommendations on gender are absent.	*None*
Manufacturing Capacity → Significant efforts made in manufacturing of private, thermic vehicles but not e-buses.	*None*
Employment Generation and Workforce Development → The National Electric Mobility Roadmap includes recommendations to develop local skills among artisans and garage operators in EV deployment.	*None*

4.2.3.4 Key opportunities and challenges in Accra

General urban mobility

- While significant progress has been made, Accra's urban transport sector is still relatively fragmented. The lack of a unified planning approach for urban transport in the Greater Accra region makes coordination between numerous different actors involved in the sector more difficult.
- GAPTE is in the process of developing BRT corridors, though it remains to be seen how successful these efforts will be, given earlier struggles to develop a successful BRT.
- The paratransit sector (Trotros) is a strong competitor to other forms of organised urban transit. Development in the sector needs to integrate them in order to be successful.

E-mobility

- Clear Roadmap, but Implementation Challenges: The National Electric Mobility Roadmap lays out clear strategies and targets for expanding e-mobility in Ghana, with specific goals for e-bus deployment. However, there are significant barriers to implementation, including regulatory gaps, lack of infrastructure (like charging stations), and limited financial incentives. Despite this, the roadmap provides a strong foundation for Accra to guide its e-mobility efforts.
- Stakeholder Understanding: One major challenge identified by in the Electric Mobility Policy and Roadmap is the limited understanding of electric vehicles (EVs) among key stakeholders, such as local authorities and private sector players. This lack of awareness impedes progress and investment in e-mobility.
- High Initial Costs: The high upfront costs of EVs, particularly e-buses, remain a significant barrier. Financial constraints make it challenging to secure the investment needed to expand the fleet of e-buses and develop necessary infrastructure.
- Exclusion of Paratransit (Trotros) from E-Mobility Strategy: The current e-mobility strategies primarily focus on formal public transport, such as buses, without including paratransit services like Trotros. Since Trotros are an integral part of Accra's transport network, excluding them from the e-mobility roadmap will limit the overall success and impact of electrification efforts. A comprehensive e-mobility strategy that includes Trotros would have a much greater impact.

4.2.4 Abidjan, Côte d'Ivoire

4.2.4.1 Institutional framework for urban transport in Abidjan

Like in Accra and Lomé, ongoing decentralization efforts are reshaping the urban transport sector in Abidjan. Previously, national agencies like the Ministry of Transport shared responsibility for urban transport in Abidjan with local authorities. In 1998, the government of Côte d'Ivoire began a slow process of transport reform to consolidate authority and unify planning for the greater Abidjan area. This included the creation in 2000 of a short-lived unified transport authority that failed due to resistance from local authorities and a lack of fiscal autonomy.[34]

In 2019, the Ministry of Transport established a new unified transport authority, the Greater Abidjan Urban Mobility Authority (AMUGA). AMUGA was established as a fiscally autonomous independent public authority with a mandate to coordinate public transport in the Greater Abidjan region. AMUGA oversees the bus transport sector in Abidjan and is responsible for implementing the city's two planned BRT lines.

Though AMUGA has increasingly taken the lead on the planning and coordination of urban transport projects, national-level ministries still play an important role, particularly the Ministry of Transport, the Ministry of Economy and Finance and the Agency for the Regulation of Inland Transport (ARTI). AMUGA also collaborates with local level authorities, including the communes of Bingerville, Cocody, Yopougon, Adjamé et Plateau.

MDBs and IFIs have been highly active in Abidjan's urban transport sector. The World Bank Funded the Abidjan Urban Mobility Project (AUMP), which facilitated the formation of AMUGA and the development of the Yopougon-Bingerville BRT line. GEF and UNEP currently support a program entitled, "Integrated, Sustainable and Low Emissions Transport in Côte d'Ivoire". This project includes support for the development of a national e-mobility strategy (currently in progress), feasibility studies for the electrification of feeder routes in Abidjan, and pilot programs for the introduction of electric minibuses.

4.2.4.2 Policy and regulatory framework for urban transport in Abidjan

Key policies that guide the urban transport sector in Abidjan include:

- **Law on the Orientation of Interior Transport (**N°2014-812 of December 16, 2014). It is the main law governing the legal framework of land transport in Côte d'Ivoire. It has been amended several times, including in 2019 to allow for the formation of AMUGA.
- **Roadmap for Sustainable Mobility in Côte d'Ivoire**[35] – developed by the Ministry of Transport, identifies priority actions for promoting sustainable mobility in Côte d'Ivoire. Recommendations include the establishment of a "zero-emission urban centre" in Abidjan, continued development of urban mass transit and the fostering of an e-mobility start-up ecosystem.
- **Abidjan Urban Mobility Project**[36] – World-bank funded project that supported AMUGA in the planning of the Youpougon-Bingerville BRT line (construction currently underway), that will include e-buses. The project included efforts to modernise informal transport along the corridor as feeder lines for the BRT. The project also supported studies on additional BRT lines.

[34] Codatu. "Governance of urban mobility in Greater Abidjan: AMUGA's mandate." January 30, 2023. https://www.codatu.org/en/governance-of-urban-mobility-in-greater-abidjan-amugas-mandate/

[35] Projet feuille de route pour une mobilité durable en Côte d'Ivoire. Côte d'Ivoire Ministry of Transport. December 2019. https://www.climate-chance.org/wp-content/uploads/2019/12/projet-de-feuille-de-route-de-la-mobilite-en-cote-divoire_final.pdf

[36] Côte d'Ivoire – Abidjan Urban Mobility Project. World Bank. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/532181561946508500/cote-divoire-abidjan-urban-mobility-project

- **Abidjan Climate Action Plan**[37] – identifies priority climate actions for the city of Abidjan, including the development of "low carbon" urban transport systems.
- **Integrated, Sustainable and Low Emissions Transport in Côte d'Ivoire**[38] – GEF and UNEP funded project started in 2021 that includes the development of a national e-mobility strategy. The project also includes a feasibility study for the electrification of feeder bus routes in Abidjan, and pilots for electric taxis and minibuses. The program also extensive capacity building for key stakeholders, support for fiscal and regulatory reforms, the development of policies for EV battery disposal, and an investigation of opportunities for interlinking renewable energy generation and EV charging.

4.2.4.3 Specific regulations on e-mobility in Abidjan

The Global Environment Facility (GEF), in partnership with UNEP, began a program titled "Integrated, Sustainable and Low Emissions Transport in Côte d'Ivoire" in 2021. The project is currently underway and expected outputs in 2025 include the development of a national e-mobility strategy (currently under development and pending government approval), feasibility studies on the deployment of low carbon mobility solutions in Abidjan, the integration of renewable energy and the development of a national coordination body for e-mobility promotion.

Actions taken to date include the hiring of the consultancy firm TECH N'CHANGE to carry out a series of studies including an investment plan for the electrification of buses on SOTRA's service line, and an investment plan for the deployment of charging infrastructure in Abidjan. The firm started its work in September 2024. A draft national mobility strategy has also been prepared by an international consultant.

Table 4-7: Abidjan – Status of regulations on e-mobility

Scope of regulation → Status	**Maturity**
Institutional setup → AMUGA is empowered as Transport Authority and is building up capacity.	**Fair**
Policy & planning – urban transport → No explicit strategy, but planned BRT is an e-BRT	Low
Policy & planning – e-mobility → No explicit strategy, but planned BRT is an e-BRT. Study underway that includes an e-mobility dimension for PT	Low
EV licensing (Public Transport) → None	*None*
Technical standards – bus maintenance and operation → None	*None*
Technical standards - charging facilities → None	*None*
Technical standards – energy production and supply → None	*None*
Financial support mechanisms → None; GEF project will make recommendations on fiscal and customs incentives	*None*
Environmental & Social Safeguards → Not specific to e-mobility	Low
Gender Inclusion → UNEP-funded Cote d'Ivoire e-mobility project includes a gender action plan, ensuring that e-mobility strategy will include a gender analysis and mainstream gender equality, and that participation of women in regional and international events will be promoted.	Low
Manufacturing Capacity → None	*None*
Employment Generation and Workforce Development → None	*None*

[37] Plan climat du district autonome d'Abidjan (PAC-DAA). District Autonome d'Abidjan. https://www.aimf.asso.fr/wp-content/uploads/2023/04/Plan-Climat-Abidjan-Congres-AIMF-Juillet-2022.pdf
[38] Integrated, Sustainable and Low Emissions Transport in Côte d'Ivoire. GEF. 2021. https://www.thegef.org/projects-operations/projects/10302

4.2.4.4 Key opportunities and challenges in Abidjan

General urban mobility

- Institutional Progress: Abidjan has made significant strides in recent years by establishing the Greater Abidjan Urban Mobility Authority (AMUGA) as a fiscally autonomous body responsible for coordinating urban transport. This represents a promising step toward more unified and locally driven mobility governance.
- Coordinated Planning Potential: AMUGA's leadership in managing and implementing large-scale projects, like the Abidjan Urban Mobility Project and the under construction Yopougon–Bingerville BRT, indicates growing institutional maturity. The integration of feeder services from informal transport providers further demonstrates a holistic approach.
- Challenge – Coordination and Legacy Structures: Despite AMUGA's growing influence, national ministries (Transport, Economy and Finance, ARTI) continue to play central roles, which can create overlaps or bottlenecks in decision-making. The legacy of failed past attempts at unified governance also highlights the importance of sustained inter-agency coordination and political will.
- Challenge – Capacity and Implementation Risks: The BRT's success will be a major test of AMUGA's operational capacity. As the first such system in the country, risks remain around construction delays, intermodal integration, and long-term maintenance frameworks.

E-mobility

- Foundational Projects Underway: The GEF-UNEP "Integrated, Sustainable and Low Emissions Transport in Côte d'Ivoire" project is laying essential groundwork for e-bus deployment through the development of a national e-mobility strategy, charging infrastructure studies, and investment plans specific to Abidjan's public transport operator (SOTRA).
- Institutional Commitment to E-bus Pilots: The decision to electrify the planned BRT line signals high-level commitment to cleaner transport modes and sets a precedent for future e-mobility projects in Côte d'Ivoire.
- Absence of Regulatory Frameworks: Key components of an enabling environment remain missing. There are no regulations or standards yet in place for vehicle licensing, bus maintenance, charging infrastructure, or energy integration. The ongoing strategy development is expected to address these gaps, but implementation timelines are uncertain.
- Limited Technical and Manufacturing Capacity: Abidjan currently lacks domestic manufacturing capacity, workforce development programs, and dedicated funding mechanisms to support the transition to EV fleets. These structural limitations could delay large-scale deployment unless actively addressed in the upcoming e-mobility strategy.
- Policy Fragmentation: Although several mobility-related policies exist (e.g., the Roadmap for Sustainable Mobility, Abidjan Climate Action Plan), none currently provide a fully integrated or binding e-mobility framework. Policy fragmentation could impede the scaling of pilot initiatives.

4.2.5 Freetown, Sierra Leone

4.2.5.1 Institutional framework for urban transport in Freetown

Freetown's formalised public transport has historically been provided by the national government, originally through the Sierra Leone Omnibus company and later by the Sierra Leone Road Transport Corporation (SLRTC). In 2020, the World Bank-financed Sierra Leone Integrated and Resilient Urban Mobility Project (SLIRUMP) supported the transition of the SLRTC into a public transport regulator named the Sierra Leone Public Transport Authority (SLPTA) established through the passage of the SLPTA Act in 2023.

The SLPTA established the Waka Fine Bus system and procured 50 12-metre buses to be operated by contract with private operators. The SLPTA also oversaw the consolidation of paratransit operators and unions along two pilot corridors, resulting in the establishment of the Metro Transit Company (MTC), a private operator that manages these routes. The Waka Fine Bus began operations in February 2024.

4.2.5.2 Policy and regulatory framework for urban transport in Freetown

Key policies strategies and projects guiding the urban transport sector in Sierra Lene include:

- **Sierra Leone Public Transport Authority Act (2023)** – transformed the SLRTC into the SLPTA, a public transport authority with the mandate to coordinate and regulate urban transport in Sierra Leone, particularly Freetown.
- **Sierra Leone Integrated and Resilient Urban Mobility Project (IRUMP) (2019)**[39] – supported by $50 million USD grant from World Bank and $2 million USD of government funding. Supported the government of Sierra Leone in the transformation of the SLRTC into the SLPTA, the establishment of pilot bus corridors, the procurement of buses and the development of ancillary infrastructure. The buses began operations in February 2024.
- **Freetown Climate Action Strategy (2022)**[40] – lays out Freetown's priority climate actions. Goals related to urban transport include encouraging public transport and addressing land-use planning challenges. Priority actions include partnering with the Ministry of Transport and Aviation to increase the proportion of high-occupancy e-buses, in addition to expanding existing bus corridors.

4.2.5.3 Specific regulations on e-mobility in Freetown

In November 2024, the government of Sierra Leone and the Environment Protection Agency of Sierra Leone (EPA-SL), with support from UNEP and GEF, launched its Gender-Sensitive National E-Mobility Strategy.[41] The Strategy identifies the key barriers preventing the greater adoption of e-mobility in Sierra Leone and proposes a roadmap of priority actions. Key barriers include the lack of regulations for EVs, high purchase costs of EVs, low access to the electricity grid and low power quality, lack of local expertise in EV servicing and the lack of a vehicle scrapping or battery recycling policy.

The strategy sets targets for EV sales in Sierra Leone, including:

- 15% of all minibus purchases by 2030, 50% by 205.
- 5% of all standard bus purchases by 2030, 25% by 2050.

[39] Sierra Leone – Integrated and Resilient Urban Mobility Project. World Bank. 2019. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/199511560736915766/sierra-leone-integrated-and-resilient-urban-mobility-project

[40] Freetown's first Climate Action Strategy 2022-2030. Freetown City Council. 2023. https://fcc.gov.sl/wp-content/uploads/2023/01/CAP-Freetown-FINAL.pdf

[41] Gender-Sensitive National e-Mobility Strategy for Sierra Leone (2024-2035). Sierra Leone Environment Protection Agency. 2024. https://www.linkedin.com/posts/annika-berlin_gender-sensitive-e-mobility-strategy-for-activity-7267909041287307264-a-gR/

Priority actions identified in the strategy include:

- Implementation of financial incentives, such as concessional taxes and favourable customs duties.
- Development of classifications and standards for EVs, chargers and batteries.
- Integration of renewable energy for EV charging, and broader upgrades to the grid.
- Development of end-of-life management plan for EVs and batteries.
- Establishment of key roles between various government stakeholders.

In the medium term, the government of Sierra Leone and SLPTA has ambitions to expand the Waka Fine Bus network and procure additional buses, including plans to "green the fleet" with the procurement of e-buses in the next 5 years. To date no formal plans have been made for the transition to e-buses.

In addition to the development of the strategy, UNEP and GEF are also supporting the creation of an e-mobility coordination body, capacity building for key stakeholders, pilot EV programs, fiscal and regulatory reforms, and studies on the integration of renewable energy for EV charging as part of the Supporting Sierra Leone with the Shift to Electric Mobility program.[42]

Table 4-8: Freetown – Status of regulations on e-mobility

Scope of regulation → Status	**Maturity**
Institutional setup → SLPTA is empowered as a public transport authority, is currently working to develop and expand formal bus corridors	**Fair**
Policy & planning – urban transport → Freetown does not have a transport master plan or sustainable urban mobility plan.	*None*
Policy & planning – e-mobility → Gender-Sensitive National E-Mobility Strategy. The strategy identifies priority actions and reforms but does not include specific provisions for e-bus deployment.	**Fair**
EV licensing (Public Transport) → Development of licensing standards is planned as part of e-mobility roadmap.	*None*
Technical standards – bus maintenance and operation → Development of technical standards for EVs is planned as part of e-mobility roadmap.	*None*
Technical standards – charging facilities → Development of technical standards for chargers is planned as part of e-mobility roadmap.	*None*
Technical standards – energy production and supply → Development of technical standards for energy production is planned as part of e-mobility roadmap.	*None*
Financial support mechanisms → Implementation of financial incentives is planned as part of e-mobility roadmap.	*None*
Environmental & Social Safeguards → Provisions for safe disposal of EVs and batteries is planned as part of e-mobility roadmap.	Low
Gender Inclusion → Gender mainstreaming is a key principle of Sierra Leone's e-mobility strategy, which provides numerous policy recommendations to promote opportunities for female drivers, reduce harassment on public transport, and promote opportunities for female workers in the EV value chain. If these recommendations are implemented, Sierra Leone will be a regional leader in gender inclusion in e-mobility.	**Fair**
Manufacturing Capacity → None.	*None*

[42] Supporting Sierra Leone with the Shift to Electric Mobility. GEF. 2021. https://www.thegef.org/projects-operations/projects/10273

Scope of regulation → Status	**Maturity**
Employment Generation and Workforce Development → E-mobility strategy includes recommendations for specialized trainings for drivers and service technicians.	*None*

4.2.5.4 Key opportunities and challenges in Freetown

General Urban Mobility

- Institutional Advancement: The creation of the Sierra Leone Public Transport Authority (SLPTA) through the 2023 Act represents a major institutional reform. SLPTA is now tasked with regulating urban transport and has made strides by launching the Waka Fine Bus system and establishing formal bus corridors.
- Progressive Pilots and Public-Private Collaboration: The operationalization of 50 new buses and the establishment of the Metro Transit Company reflect a strong push toward formalizing public transport and engaging private operators. These efforts position Freetown for scalable improvements in service quality.
- Lack of a Strategic Mobility Framework: Freetown lacks a comprehensive transport master plan or sustainable urban mobility plan (SUMP). Without a long-term planning framework, expansion and integration of formal transport services may remain fragmented and reactive.
- Untested Capacity for Expansion: While SLPTA has made early progress, its ability to sustainably expand the bus network, manage private operators, and implement large-scale changes remains untested. Institutional capacity and infrastructure readiness could be stretched as the system scales.

E-Mobility

- Comprehensive National Strategy: Sierra Leone's Gender-Sensitive National E-Mobility Strategy, launched in 2024, outlines clear targets, policy reforms, and institutional coordination mechanisms. It addresses technical, regulatory, social, and environmental aspects of e-mobility — a rare level of detail for countries at a similar stage.
- Inclusive and Forward-Looking Priorities: The strategy emphasizes gender inclusion, end-of-life battery management, financial incentives, and the integration of renewables, setting Sierra Leone apart as a potential leader in equitable and sustainable mobility in West Africa.
- Early-Stage Implementation: Despite the strategy's strength, no e-bus deployment plans have been formalized yet. The recommendations remain aspirational unless backed by concrete investments, regulations, and a roadmap for e-bus integration in SLPTA's existing fleet.
- Regulatory and Infrastructure Gaps: Critical elements such as EV licensing, technical standards for vehicles and chargers, energy-grid integration, and financial incentives are still under development. These gaps pose risks to near-term deployment and require rapid institutional follow-through.
- Limited Grid Access and Technical Expertise: Low electrification rates, poor grid reliability, and lack of domestic servicing skills are major structural challenges. These factors could delay the viability of e-buses unless paired with upgrades in energy infrastructure and workforce development.

4.2.6 Dakar, Senegal

4.2.6.1 Institutional framework for urban transport in Dakar

Urban mobility in Dakar largely falls under the responsibility of the Executive Council for Sustainable Urban Transport in Dakar (CETUD). CETUD was founded in 1997 under Law N° 97-01 as a professional public establishment with a mandate to organise public transportation in the Dakar region. CETUD operates under the national Ministry of Land Transportation.

CETUD cooperates with national and local authorities. CETUD operates under the oversight of the national Ministry of Land Transport Infrastructure (MITD). Within MITD, CETUD collaborates closely with AGEROUTE which is responsible for maintaining road infrastructure. MITD is responsible for licensing of public transport operators and provides a subsidy to operators.

CETUD cooperates with the Commune of Dakar at the municipal level and the Regional Council of Dakar at the regional level to set priorities and coordinate initiatives.

Table 4-9: CETUD responsibilities in the public transport sector

Direct responsibility	Regulation and oversight (operators' responsibility)
Network and route planning	Bus operations
Licensing	Fleet procurement
Route contracting	Vehicle maintenance
Infrastructure maintenance (in collaboration with AGREROUTE)	Bus depots
Bus depots (owner)	Bus depots
Terminals	Ticketing

CETUD primarily plays a management and oversight role. Operations are carried out by several concessionaires. Dakar Mobilité is the main concessionaire for Dakar's BRT system. Dakar Dem Dikk operates the rest of Dakar's formal bus network.

The informal transport sector in Dakar is in the process of being formalized by the Urban Transport Professionals Finance Association (AFTU). CETUD has plans to fully integrate the city's informal network into AFTU's structure.

MDBs and IFIs have been highly active in Dakar's urban transport sector. Most recently, the World Bank, EIB, EBRD, AFD, and other international partners supported CETUD in the development of the city's first BRT line, which operates with e-buses. With MDB support, CETUD was able to develop an innovative financing structure for its BRT which brought in the French investment firm Meridiam as a 70% stakeholder of Dakar Mobilité. The involvement of Meridiam helped close the financing gap for the e-BRT, and helped attract other investment and international expertise to the project. World Bank support also facilitated the inclusion of the paratransit sector into the BRT project, helping preserve livelihoods and ensuring service continuity.

4.2.6.2 Policy and regulatory framework for urban transport in Dakar

The key policy that governs Dakar's urban transport sector is the:

- **Sustainable Urban Mobility Plan 2035 (Horizon 2035)**[43] – this plan recently replaced CETUD's previous Urban Mobility Plan (2008-2025). It lays out CETUD's strategic vision through 2035, organised around several themes, and was developed using MobiliseYourCity's methodology.

[43] https://www.mobiliseyourcity.net/sites/default/files/2024-07/PMUD-DK_Note%20synth%C3%A8se.pdf

The complete text of the Horizon 2035 plan has not been made public, but key objectives of the plan include:

- Complete integration of paratransit into the formal network, with a consistent standard of service and centralised regulation.
- Hierarchical integration of different modes of transportation, including light rail, BRT, full-size buses and midi-buses.
- Reduction of GHG emissions.

4.2.6.3 Specific regulations on e-mobility in Dakar

Dakar has no dedicated e-mobility strategy or roadmap, apart from general references in the Horizon 2035 plan. In early 2025, GEF approved the project, "Supporting the Shift to Electric Mobility in Senegal," which will support the Government of Senegal in the development of a National Electric Mobility Strategy, as well as providing support for capacity building of key stakeholders and pilot projects for e-buses along BRT feeder routes[44].

In July 2024, the Ministry of Infrastructure, Transport and Sustainable Development announced plans to develop a regulatory framework for EVs[45].

Some projects are already underway. Dakar Mobilité operates 121 e-buses as part of the BRT system. CETUD is also exploring a retrofit project with Swiss company MANDU to convert diesel buses to electric.

SENELEC, the national electricity utility, manages four charging stations and is responsible for their maintenance. Senegal currently offers no fiscal incentives or tariff exemptions for EVs.

The government spends around 259 million USD per year on fuel subsidies. It has announced plans to end all energy subsidies, including fuel, in 2025, though has currently not taken steps to do so[46].

Table 4-10: Dakar – Status of regulations on e-mobility

Scope of regulation → Status	**Maturity**
Institutional setup → CETUD is empowered as Transport Authority and is building up capacity	**High**
Policy & planning – urban transport → Sustainable Urban Mobility Plan 2035.	**High**
Policy & planning – global → No explicit e-mobility strategy, but BRT is an e-BRT	Low
EV licensing (Public Transport) → Defined and enforced for BRT operation	**Fair**
Technical standards – bus maintenance and operation → Defined and enforced for BRT operation	**Fair**
Technical standards - charging facilities → Defined and enforced for BRT operation	**Fair**
Technical standards – energy production and supply → Current e-BRT power supply from the grid	Low
Financial support mechanisms → None; GEF project will make recommendations on fiscal and customs incentives	*None*
Environmental & Social Safeguards → Have addressed the implementation issues of the BRT.	**Fair**
Gender Inclusion → Several gender inclusion targets as part of the Dakar BRT project.	Low

[44] Supporting the Shift to Electric Mobility in Senegal. GEF. 2024. https://www.thegef.org/projects-operations/projects/11080
[45] https://aps.sn/voiture-electrique-un-cadre-reglementaire-mis-en-place-au-senegal/
[46] Feuille de route pour la suppression des subventions dans le secteur de l'énergie à l'horizon 2025. Ministères de Finances et des Budgets. 2023. https://www.finances.gouv.sn/app/uploads/Feuille-de-route-suppression-subventions-energie.pdf

Scope of regulation → Status	Maturity
Manufacturing Capacity → Senbus Industries[47], a Senegalese automotive assembly company that have assemble 3,000 midibuses since 2005 under the first transport renewal program with CETUD.	Low
Employment Generation and Workforce Development → None.	*None*

4.2.6.4 Key opportunities and challenges in Dakar

General Urban Mobility

- Strong Institutional Leadership: CETUD has a long-standing mandate and plays a central role in planning, regulating, and overseeing urban transport in the Dakar region. CETUD works effectively with national ministries and local governments, enabling coordinated action across sectors.
- Multi-Modal Integration Strategy: With the Sustainable Urban Mobility Plan 2035 (Horizon 2035), CETUD has a clear long-term strategy to integrate BRT, light rail, full-size and midi buses and formalize paratransit.
- Dependence on Concessionaires: While CETUD plays an oversight role, operations are outsourced to entities like Dakar Mobilité and Dakar Dem Dikk. This limits CETUD's direct control over service quality, fleet modernization, and workforce standards, especially within the informal sector.
- Informal Sector Integration: Although CETUD plans to integrate informal transport via AFTU, the process is ongoing and complex. Ensuring service standards, labor protections, and route coordination will require sustained effort and investment.

E-Mobility

- Pioneering E-BRT Deployment: Dakar's e-BRT system is a regional first, with 121 e-buses in operation. CETUD's leadership and collaboration with international investors (e.g., Meridiam) and IFIs (e.g., World Bank) demonstrate its ability to mobilize capital and technical expertise.
- Innovative Financing & Retrofit Pilots: The use of a blended finance model and the launch of an e-bus retrofitting pilot with Swiss firm MANDU showcase CETUD's commitment to innovation in e-mobility.
- Absence of a National E-Mobility Strategy: Despite progress, Senegal lacks a comprehensive national e-mobility roadmap. Current deployments are project-based rather than policy-driven, limiting long-term coherence and scalability.
- Lack of Financial Incentives: Senegal offers no fiscal incentives, tax breaks, or tariff exemptions for EVs. With $259 million spent annually on fuel subsidies (set to end in 2025), there's a critical opportunity to redirect funds to support EV uptake, but no mechanisms are yet in place.
- Limited Technical and Institutional Coverage: While standards exist for e-BRT operations, there are no broader national regulations for public e-mobility, including licensing, manufacturing, energy integration, or workforce development. This regulatory gap poses risks as e-mobility expands beyond BRT.

[47] https://senbus.com/

4.3 Policy and regulatory frameworks recommendations

The below tables outline priority policy recommendations for accelerating e-bus deployment in a global and specific approach for each city.

The table below presents the key recommendations for each key topic related to e-bus deployment. A more detailed table showing recommendations and dedicated support actions can be found in **Annex C,** along with detailed policy recommendations for each city.

Table 4-11: Policy recommendations for accelerating e-bus deployment

Action area	Key recommendations
Institutional setup	• **Support the establishment and reinforcement of urban transport authorities** with careful attention to local institutional context and inclusivity • **Support the capacity of urban transport authorities to undertake e-mobility projects** by strengthening their technical expertise, operational planning capabilities, access to financing and legal authority to plan, procure, and regulate e- bus systems. • **Facilitate inter-regional coordination** on sharing best practices.
Policy & planning – urban transport	• **Facilitate the development of forward-looking and comprehensive urban transport policies and planning**. This includes the development of SUMPs and transport master plans to guide future investments, and the development of legal and regulatory frameworks that clarify the roles of different actors, including operators, urban transport authorities and paratransit operators. • **Support efforts to integrate paratransit operators into urban public transport**. These efforts should focus on inclusivity, preserving the livelihoods of paratransit operators and integrating gender aspects whenever possible, and sustainability, potentially through vehicle licensing and replacement programs. • **Integrate e-mobility as a key pillar of urban mobility development** and support the capacity of cities to elaborate urban mobility plans that include an e-mobility dimension.
Policy & planning – e-mobility	• **Support the development of comprehensive e-mobility strategies where they do not exist**, including roadmaps for the deployment of e-buses. These should include consideration both of formal operators and networks like BRT, and of paratransit and last mile connectivity including via walking and cycling. • **Fill in gaps in e-mobility legal and regulatory frameworks**, to ensure comprehensive coverage of issues like planning, licensing, technical standards, charging, battery reuse and replacement, financial incentives, workforce development and gender inclusion.
E- vehicle licensing (Public Transport)	• **Develop clear and conducive licensing frameworks** for EVs, to avoid any unnecessary obstacles in EV deployment. Such a licensing framework would include legal definitions for EVs, e-buses, and charging stations; a separate licensing procedure for EVs (as opposed to ICE vehicles); vehicle import rules; permitting systems for charging infrastructure;

Action area	Key recommendations
	robust safety and environmental standards; and guidelines for the training and certification of e-bus drivers and technicians.
Technical standards – bus maintenance and operation	• **Support the adoption of international standards** related to e-buses operation and maintenance. This effort will be led by international standardization organisations and national governments, with a limited role for individual cities. • **Support the localization of standards** and integration into local legal and regulatory frameworks.
Technical standards - charging facilities	• **Encourage the adoption of globally recognized charging standards** that ensure interoperability between charging infrastructure and various e-bus models. • Work between national governments and standardization bodies to **adapt global standards into national regulations**. • Include **clear references to charging standards** in procurement documents and infrastructure contracts.
Technical standards – energy production and supply	• **Promote the adoption of international standards** for grid integration, energy distribution, and safety in the context of e-bus operations. • **Encourage national regulatory agencies and energy ministries to adapt and enforce these standards** across all relevant infrastructure projects. • **Support the integration of renewable energy standards and smart grid technologies** to optimize sustainability and energy efficiency.
Financial support mechanisms	• Support the **development of financial mechanisms** to close the gap between e-buses and ICE buses.
Environmental & Social Safeguards	• **Specify and complement existing environmental and safeguard regulations and mechanisms** with specific ones related to e-mobility in general and e-buses in particular.
Gender Inclusion	• **Implement gender mainstreaming in all e-mobility strategies and roadmaps.** This includes ensuring gender parity at the decision-making stage, and ensuring that stakeholder consultations on policy measures include adequate gender representation. In addition, specific policies can enhance gender equality in e-mobility and public transit. These can include measures to hire more female drivers, technicians, and mechanics, along with physical improvements like adequate lighting at bus stations and onboard vehicles.
Manufacturing Capacity	• **Adopt policies promoting domestic assembly and manufacturing** of batteries, charging infrastructure and e-buses.
Employment Generation and Workforce Development	• **Develop local training and upskilling programs to train technicians and operators**. Particular attention should be paid to incumbent paratransit operators and women

5 Commercial and Financial Arrangements

This chapter summarises the commercial and financing models available for deploying e-buses in West Africa. It will examine commercial arrangements, financing models, and risk management and allocation in e-bus deployment, before providing a detailed examination of these issues in the West African context through the case study of Dakar.

5.1 Commercial Arrangements for E-Bus Deployment

This section will examine various contractual models for establishing relationships between public transport authorities and operators, then discusses different models for the procurement of e-buses, before providing an overview of existing contractual arrangements in the project cities.

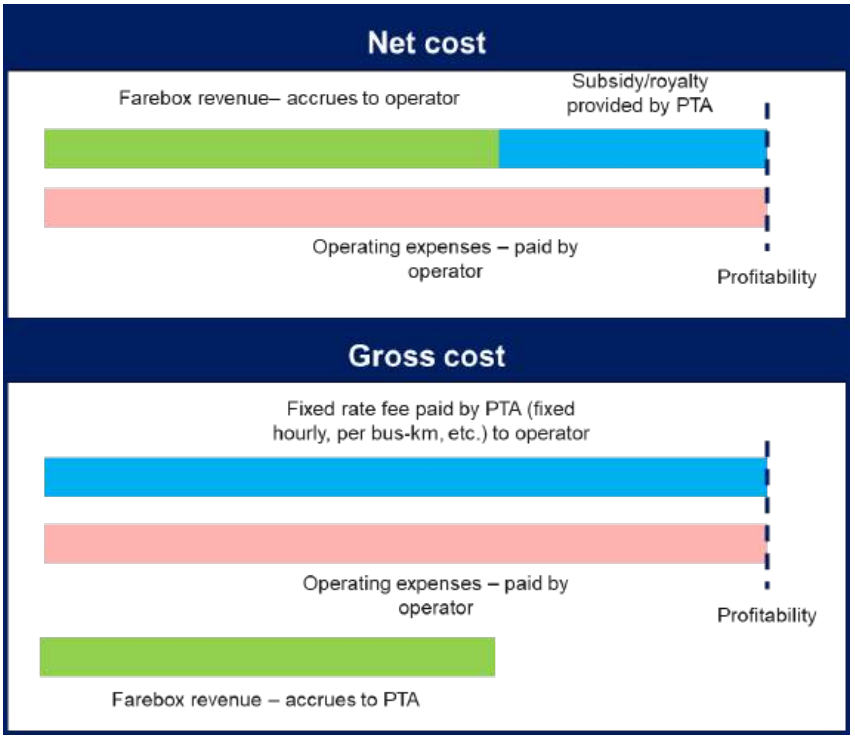
5.1.1 Commercial models for e-bus deployment

Commercial and contractual models facilitate the deployment of e-buses by providing the framework for investment, operation, and maintenance. These models define the responsibilities and expectations of all stakeholders involved, including government entities, private investors, and transport operators. By establishing clear terms for financing, ownership, and revenue sharing, they ensure that the deployment of e-buses is economically viable and sustainable. Furthermore, well-designed contractual arrangements can address the unique challenges of the paratransit sector, integrating e-buses into existing transport networks and enhancing service delivery. To assess opportunities for introducing e-buses in the project cities, it is necessary to consider the range of commercial and contractual models available, and the current models in use in the cities.

5.1.1.1 Contractual arrangements

There are two main forms of bus operations contract: **gross cost** and **net cost**.

Figure 5-1: Difference between net cost and gross cost contract



Source: CPCS and ITP. Note: A net cost contract may include a subsidy from the PTA, but this is not necessarily the case.

In a gross cost contract, the operator is paid a fixed fee by the Public Transport Authority (PTA). and the fare revenue is retained by the PTA, meaning the authority bears the revenue risk. In a net cost contract, the operator keeps the fare revenue and typically receives a smaller fixed payment or subsidy, assuming the revenue risk themselves. These two models each have varied advantages and disadvantages that are given below.

5.1.1.2 Net cost

In a net cost arrangement, operators bid the level of subsidy or royalty required[48] for providing services (i.e. the gap between fare box income and revenue requirements). Operators also define the level of bus services, passenger levels, and fare revenues.

Under a net-cost contract, the authority pays the operator a subsidy if the bus routes are unprofitable and receives a per-km royalty or fixed charge from the operator, if the route is profitable. The operator collects and retains all the revenues (mainly tickets, possibly advertisement income). Typically, rolling stock is provided by the operator under a net cost contract.

Net cost contracts are suited for arrangements where bus operators benefit from more 'tactical' decision making powers as route and fare optimization is possible, and when farebox revenues are high enough to cover operating costs and capital costs. The risk for the PTA in this type of contract is that it limits the PTA's capacity to define service levels as these are determined by the operator as part of their financial decision making.

Under this arrangement, operators retain demand risk and fare collection risk as well as operating cost and capital cost risks. If the operator underestimates or under-bids the necessary subsidy to achieve profitability, a drop in farebox revenue or unexpected operating costs could render the route financially unviable. As the agreed-upon subsidy does not change, the transport authority does not bear this risk though it may be called upon to provide additional support if the operator is not able to cover operating expenses.

5.1.1.3 Gross cost

In a gross cost arrangement, private operators bid the total cost required to run services. The contracted payment to the operator can take the form of a fixed hourly charge for the bus or a per kilometre charge. The authority typically defines the routes and level of service and selects the private operator that offers to provide the required service at the lowest cost. All fare revenues are transferred to the transport authority.

Gross cost arrangements are suitable where fare box revenues are insufficient to cover operating costs, and where the number of potential bidders could be large. Successful examples typically include some form of service quality incentive for operators.

As all revenues accrue to the authority, all demand risk is transferred to the public sector, as is collection risk. The operator bears cost risks associated with operating costs, while cost risks associated with capital expenditure accrue to the owner of the rolling stock (which could be either the public authority or operator). The public transport authority fully takes the demand risk and the fare revenue risk associated to it. This type of contract gives more capacity to the public transport authority to define the type and level of service as well as the fare level, though this can come at a public cost.

[48] If necessary, a public subsidy may be granted, but this should not be taken for granted. Essentially, in a net cost contract, the operator is paid from the fare revenues they collect. If needed, a public subsidy may top up these revenues if they are deemed insufficient to cover the operator's costs.

Figure 5-2: Advantages and disadvantages of net cost vs. gross cost contracts

	Advantages	Disadvantages
Net cost	Incentive for operators to improve efficiency and increase ridership. Removes need for public authority to collect fare revenues. Provides certainty on the level of subsidy paid by the authority. Minimizes cost to authority for transport service, limiting it to a subsidy.	May be costlier than gross-cost contracts due to conservative demand/ revenue estimates by bidders and increased demand risk. May be more difficult for authority to change network due to potential to impact profitability. May lead to tendency for operators to reduce service levels/frequencies to improve their financial results
Gross cost	Liability of the transport authority is limited to negotiated amount of payments to be made to the private operator. Incentive for operators to reduce costs. The ability of the Public Transport Authority (PTA) to closely define the type and level of service, as well as the fare structure.	No incentive to cater to demand as revenue is unaffected by demand. Can be mitigated by the introduction of a demand-related bonus. No incentive for operator to ensure revenue collection, requiring more oversight by authority. Service improvements/reductions need to be initiated by authority.

Source: CPCS & ITP

5.1.1.4 Provision and ownership of rolling stock

The previous section described different contractual relationships between operators and the public transport authority regarding the operation of buses and routes. This section will focus on various models for the provision and ownership of rolling stock. Different models of bus ownership can be applied regardless of whether the relationship between the transport authority and operators is based on a gross cost or net cost contract.

E-bus procurement presents several challenges relative to procurement of traditional ICE buses. Namely:

- **Higher CAPEX** – E-buses involve a significantly larger up-front cost in comparison to ICE buses, especially when the provision of charging infrastructure is included[49]. Crucially, while e-buses require a higher initial CAPEX, total costs across the buses lifespan can often be similar or lower than for ICE vehicles, due to longer lifespans and lower maintenance and fuel costs.
- **Longer lifespan** – While the lifespan of a typical ICE bus is around 10 years (15 years with a mid-life upgrade), e-buses typically have an effective lifespan of 14-15 years. E-bus batteries typically have a lifespan of around 7-8 years, meaning that e-buses require at least one battery replacement over their life cycle. As a result, e-bus procurement contracts cover a longer time span and typically include provisions for mid-life battery replacement.

[49] For example, the choice of electric technology for the Dakar BRT increased the project costs by 23%, equivalent to USD 102 million. This includes an additional USD 12 million for infrastructure and system adjustments, and an additional USD 90 million for e-bus rolling stock.

As a result of these factors, e-bus procurement is significantly more complicated up-front than ICE bus procurement, involving larger, more complicated contracts over longer periods of time. This can make it difficult for operators to finance the procurement of e-buses without some form of external support. The following sections will introduce typical models for bus procurement, then discuss innovative commercial models used in other cities to address these key challenges in e-bus procurement.

5.1.1.5 Models for e-bus procurement

Traditional models of bus procurement involve different relationships between the public transport authority and operators. A few of the most common models include:

- **Public transport authority owns rolling stock** – in this model, the public transport authority procures rolling stock itself and retains ownership throughout the lifecycle of the bus. Under this model, the operator is responsible mainly for providing drivers and other human resources. In this model, the authority assumes all technology and maintenance risk and bears the cost of procurement and financing.
- **Operator owns rolling stock** – in this model, the operator is fully responsible for procuring and maintaining rolling stock and maintains ownership for the lifecycle of the asset. The public transport authority may still play some role in e-bus procurement in the form of subsidies or other incentives. In this model, the operator assumes all technology and maintenance risk, and most costs of procurement and financing.
- **Public transport authority leases rolling stock** – in this model, the public transport authority is responsible for procuring rolling stock and then leases the buses to operators for a pre-agreed period of time, after which ownership transfers to the operator. In this model, risk is shared between the public transport authority and operator, while exact arrangements will vary based on the specifics of the leasing contract.

While these models are well-suited for the procurement of traditional ICE buses, the procurement of e-buses poses additional challenges as discussed. Large CAPEX requirements can make outright procurement of e-buses impossible for operators, and difficult for fiscally constrained public transport authorities. Leasing addresses some of these problems, as the public transport authority assumes the initial large CAPEX expenditure and recoups its cost over the long lifecycle of the asset, while operators are able to pay for buses through revenue generated by bus operations. However, this leaves some important questions unaddressed, including charging infrastructure and mid-lifecycle battery replacement.

One emerging approach that addresses some of these concerns are various "**separation of asset ownership**" models, whereby some third party retains ownership of assets and leases them to the public transport authority or bus operator. "Asset of ownership" models encompasses both **capital lease** models, where lease payments are made to a 3rd party leasing company for the vehicle and fixed infrastructure over a specified term, and **operation lease** models, where operators pay a third party for the use of bus and charging infrastructure over a fixed term. Capital lease models are similar to traditional leasing models, with an added layer of complexity to cover charging infrastructure and mid-life battery replacement. Operation lease models will be discussed in greater detail in the following section, as they are particularly applicable to the deployment of EVs in the paratransit sector.

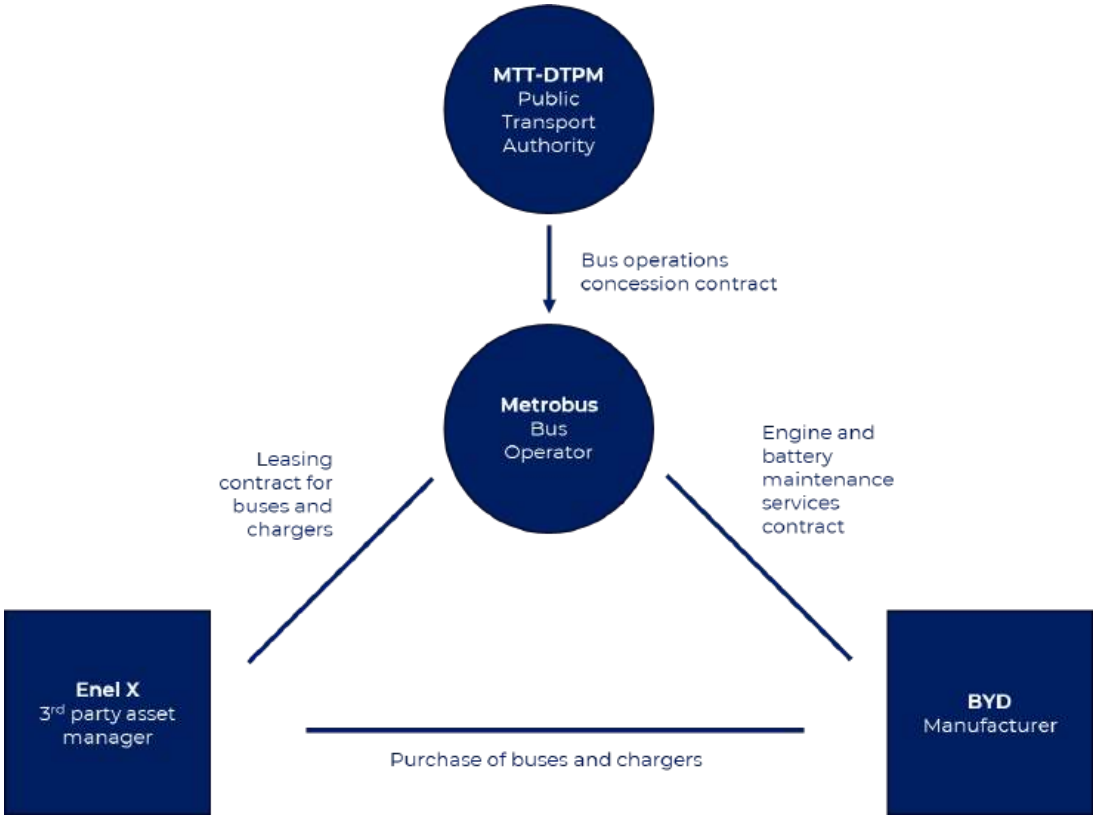
Under the capital lease model, a third-party company leases e-buses, batteries and/or charging infrastructure to bus operators or the public transport authority. This third party is oftentimes the vehicle manufacturer. E-bus assets can be bundled in different ways; sometimes this includes the e-bus chassis, battery and charging infrastructure, and sometimes only the battery is leased while the e-bus chassis is purchased directly. This model has the advantage of

limiting initial CAPEX expenditure and sharing risk between the public transport authority and additional private sector partners. However, it can add considerable complexity to the contractual arrangements due to the incorporation of additional stakeholders.

An example of this model can be seen in Chile, where a third-party company takes the role of asset owner and utility provider. In Santiago, the operator (Metrobus) operates under an operations concession contract with the public transport authority (MTT-DTPM). A private company (Enel X) purchased e-buses and chargers from the e-bus manufacturer (BYD). The operator then entered into a leasing agreement with the utility for e-buses and chargers, and a maintenance and services contract with the manufacturer.

The diagram below shows the relationships between stakeholders under this asset separation model.

Figure 5-3: Capital leasing model in Santiago, Chile



Source: Adapted from Sufa, Faela. "Electric Bus and Financing Models." ITDP. 2022. https://www.busworldseasia.org/sites/soasia/files/2022-02/Transformation%20of%20Indonesian%20Buses%20to%20New%20Clean%20Energy_ITDP.pdf

The strength of this model is that it limits the risk faced by any individual stakeholder, and helps operators overcome the large initial CAPEX costs for acquiring buses. However, it also relies on a high-capacity utility capable of maintaining charging infrastructure and playing an active role in e-bus deployment.

A major advantage of this model is that it spreads the key risks between multiple stakeholders, limiting the exposure of both the public authority and the private operator. The below table demonstrates the allocation of risks between stakeholders in this model.

The allocation of risk will be discussed in greater detail in Chapter 5.

Table 5-1: Allocation of risk in Santiago's asset separation model

Risk	Stakeholder who bears the risk	Mitigation strategies built into model
Legal and regulatory	Public transport authority	PTA is responsible for ensuring compliance of system with local and national laws, regulations and policy targets
Financial	3rd party asset manager	Leasing agreement with operator ensures steady return on investment (ROI)
Revenue	Public transport authority and operator	Shared based on provisions of gross cost operating contract
Technology	3rd party asset manager, operator and manufacturer	Shared between parties based on provisions of the purchase, leasing and maintenance contracts
Maintenance	Operator and manufacturer	Shared between parties based on provisions of maintenance contract
Safety	Operator and public transport authority	Operator is responsible for meeting standards set by the public transport authority, who is responsible for enforcing these standards

5.1.1.6 Paratransit sector

The vast majority of trips made by public transport in all six cities take place in the paratransit sector. In all project cities regulated trips in the formal transport sector make up less than 20% of total trips, ranging from around 20% in Abidjan to around 1% in Lomé. The extremely small share of formal trips in the project cities has major implications for e-bus deployment, as holistic interventions that address both the formal and informal transport sector are necessary to have maximise impact.

The commercial models discussed in the previous section typically involve formal sector bus operators, particularly those operating BRT systems. While these actors exhibit the highest readiness for the deployment of e-buses, it is important to note that only a small portion of total trips are made via formal public transport in the project cities. The vast majority of trips are made using paratransit, so to achieve the greatest impact it is necessary to also consider means of introducing e-buses in the paratransit sector.

Paratransit operators face many unique challenges in e-bus deployment, which must be addressed through tailored commercial and contractual models. These challenges include:

- **Small size of operators** – operators are typically small-scale, usually only owning one or a few buses. Some operators drive their own bus, while others hire drivers. Given their small size, operators have little access to loans or other financial instruments.
- **Variable margins** – paratransit operators can have profit margins that can vary according to the levels of competition, the level of fares, and sometimes from predatory practices by traffic / oversight authorities or Unions. Furthermore, payments are typically made in cash leaving little documentation or formal accounting. This situation can leave small margin for service / vehicle improvements.
- **Lack of oversight and regulation** – paratransit operators often exist outside of formal transport governance structures. While most project cities have made attempts to expand licensing and regulatory oversight of paratransit operators, the control exercised by public transport authorities is often limited. As a result, authorities have little ability to influence which routes are serviced or enforce operational and safety standards.

- **Lack of route or system planning** – the nature of the informal transport sector encourages operators to compete intensely for high volume, high margin routes. This can lead to severe congestion on major corridors and encourages unsafe driving and aggressive practices as operators attempt to fill their buses. At the same time, less profitable routes are underserved. Correcting these imbalances is one of the main focuses of most plans in the project cities to regulate major corridors.
- **Aging fleet** – due to the paratransit business model, and a lack of regulatory oversight, most minibus fleets consist of older diesel models often far outside their intended operational lifespan. In fact, a low value vehicle is often the key of a profitable business model for paratransit and changing this parameter can put this business model at risk. Furthermore, operators will often shirk on maintenance in order to achieve higher profitability. This can lead to higher maintenance costs in the long run, prohibitively high expenses for retrofitting vehicles, poor safety and operational standards, and higher emissions.
- **Operational conditions** – to conserve e-bus battery health, it is essential that drivers meet certain operational standards like avoiding harsh acceleration and braking, meeting regular charging schedules, managing battery temperatures and conducting regular maintenance. These conditions are often difficult to meet in the paratransit sector, where maintenance is often irregular and driving conditions are erratic and inconsistent. E-bus drivers need to be trained to maintain their vehicles, and infrastructure improvements will be necessary in some conditions to ensure better driving conditions.
- **Competition on street** – Informal minibus operators face intense competition on the streets for passengers, though this can be mitigated by Unions in some of the cities. They contend with other minibus operators, two- and three-wheelers, and shared taxis. This environment often results in reckless and dangerous driving habits. Moving towards s “Competition for the street” model with operators competing through tender for the operating rights of a route or an area could improve this situation and form part of wider professionalization and formalisation of the sector.
- **Lack of access to capital** – As a result of all the factors discussed above, incumbent paratransit operators cannot easily access capital. In their existing form commercial banks see financing fleet renewal as too risky and would likely only consider financing fleet renewal as part of wider reforms and professionalization of the sector.

Despite these challenges, in several countries there are models for formalizing and upgrading the paratransit sector which could be adapted to introduce e-buses.

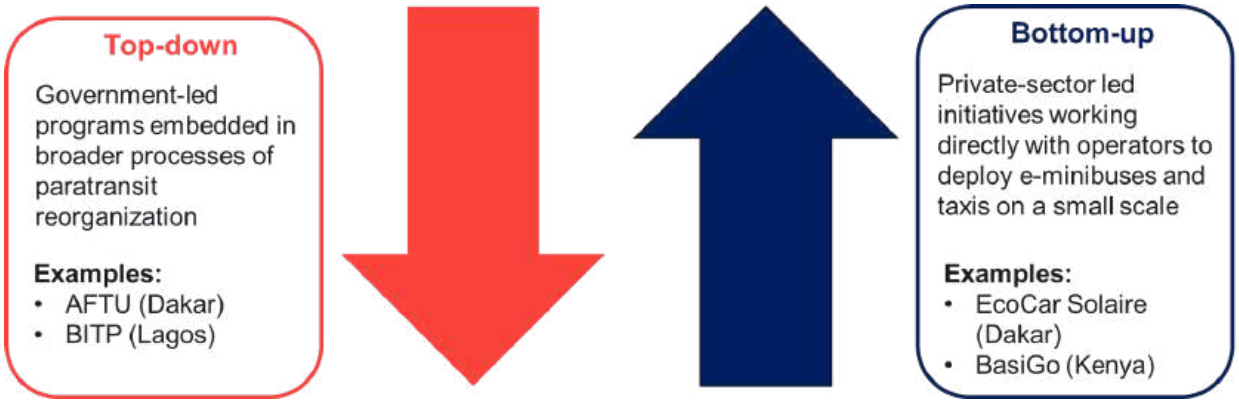
Many of these models incorporate elements of the **operation lease model** mentioned previously, where operators or even individual drivers pay a third party for the use of vehicles and charging infrastructure over a fixed period of time, often with an opportunity to purchase at the end of the lease term.

The specifics of how EVs can be deployed in the paratransit sector vary widely but can broadly be grouped into top-down and bottom-up approaches. Top-down approaches consist of government-led initiatives to reorganize the paratransit sector and often include fleet renewal components.

Currently, these approaches have not focused on e-mobility, but they provide frameworks that could relatively easily be adapted to facilitate the procurement of e-buses. Bottom-up approaches have focused on deploying e-buses on a small scale working directly with individual operators. While the scope of these programs is small, they can serve as pilots

providing valuable data on the feasibility of e-bus deployment in the paratransit sector and could potentially be scaled more broadly.

Figure 5-4: Top-down and bottom-up approaches in the paratransit sector



5.1.1.7 Top-down approaches

Urban Transport Funding Association (AFTU) – Dakar

- **Key actors:** Government-formed Urban Transport Funding Association and Economic Interest Groups formed from paratransit operators.
- **Mechanism:** In 2001, Dakar began a process of fleet renewal and reorganization of the paratransit sector.[50] CETUD established the Urban Transport Funding Association (AFTU) to facilitate access to credit for private paratransit operators. AFTU is an independent, non-profit organisation that includes representatives from operators, the Ministry of Transport, the Ministry of Finance and CETUD. In 2005, AFTU received a USD $15.9 million loan from the World Bank intended to cover 75% of the costs of fleet renewal. Senegal's national government tendered vehicle renewal internationally, and Tata International won the contract to provide 505 buses at USD $50,000 per unit. The vehicles were assembled in Senegal by Senebus, a public-private partnership.

To participate in the renewal program, paratransit operators were required to form Economic Interest Groups (GIEs) which would be responsible for repayment of the loan. GIEs were formed by two or more operators who then shared liability for the group's financial obligations. In total, 14 GIEs were established, involving 587 operators and 1 607 buses in 2017[51].

After the formation of the GIEs, CETUD established 18 formal bus routes operated by the GIEs through concession arrangements. The concession agreements included service parameters including vehicle capacity, area of operation, minimum number of buses to be operated, etc.

- **Funding:** 75% of fleet renewal costs covered by World Bank loan. Additional support was provided by the Ministry of Transport, Ministry of Finance, and CETUD.
- **Lessons learned:** While this arrangement was used for the renewal of the paratransit fleet with new diesel-fuelled vehicles, it could potentially be adapted for the deployment of EVs. This model is also reproducible, and in Senegal has already been implemented in other municipalities.

[50] SSATP. "Senegal, Dakar. Studies of Informal Passenger Transport Reforms in Sub-Saharan Africa." 2023. https://www.ssatp.org/sites/default/files/publication/Dakar_vf.pdf

[51] Sakho, P., & Diongue, M. (2024). "Quid du secteur informel dans les politiques publiques de modernisation du système de transport urbain de Dakar ?" Flux 135-136 (1): 164-176. Université Gustave Eiffel. https://doi.org/10.3917/flux1.135.0164

The model has proved robust over more than 20 years and currently cares for a third of Dakar daily public transport trips. The business model is strong and can provide up to a 10% annual profitability, including vehicle life cycle cost. Repayment rates of the vehicles by the operators is high (over 90%) making the system a trustful and reliable one. However, some limits can be highlighted. Vehicle maintenance tends to weaken significantly once the manufacturer's guarantee is over. This would have to be addressed in the context of a e-buses deployment. Even if quality of service has widely improved, scheduling and fare regulation remain a weaker aspect. This is caused by the absence of full fledge operation contract between the Transport Authority (CETUD) and the operators (GIE), which is a limit induced by the participative and negotiated nature of the transition process.

Bus Industry Transition Program (BITP) – Lagos

- **Key Actors:** LAMATA, Lagos State Government, Bus Operating Companies, Unions
- **Mechanism:** LAMATA is currently undergoing a Bus Industry Transition Program (BITP) to reorganise paratransit services over pilot corridors (Quality Bus Corridors – QBCs). It mixes both infrastructure investment and service reorganisation along the corridors. The objective is to contract bus operators in the QBCs on clear service and organisation requirements. Ticketing and fare collection would be dematerialised and centralised by LAMATA. Rolling stock renewal is a key aspect of the transition and some clean fuel options – including electricity- are considered for these new minibuses.
- **Funding:** AFD and World Bank are funding the infrastructure upgrade of the Quality Bus Corridors (QBCs) along with the Lagos State. These stakeholders also support the bus industry transition program (fleet renewal and reorganisation of services).
- **Lessons Learned:** Like the AFTU model in Dakar, the BITP represents a government-led approach to reorganizing the paratransit sector. The format that will be taken for the transition is still in discussion, but it is likely to consist in the contracting of a few operators (no more than one per QBC and possibly some common ones for several QBCs) to operate the upgraded bus services. These operators will be incentivised to purchase new vehicles. Existing paratransit operators will benefit from scrapping premiums that could be re-invested in the upgraded industry (e.g. as shareholder in a new operator).

5.1.1.8 Bottom-up approaches

EcoCar Solaire – Dakar

- **Key Actors:** EcoCar Solaire, a Swiss start-up
- **Mechanism:** EcoCar Solaire is a Swiss start-up leading a project to convert minibuses in Dakar ("cars rapides") into EVs using a specialized conversion kit. The initiative also includes the development of battery charging infrastructure and the establishment of operator cooperatives to manage the converted minibuses.

The envisioned business model closely resembles the battery-swapping system already implemented by electric mobility operators in the e-two- and e-three-wheeler sectors. The company will retain ownership of the batteries while commercializing their use. Minibus drivers and owners will have access to the retrofitting program and be equipped with swappable batteries, allowing for optimized vehicle usage throughout the day. Instead of immobilizing the vehicle for charging, drivers can replace the battery at dedicated swap stations within minutes. The first pilot vehicles are expected to be delivered and tested in early 2025.

- **Lessons Learned:** This represents an alternative model from the fleet renewal approaches discussed above. The retrofitting of existing minibuses could lower the initial CAPEX expenditures necessary and could potentially be scaled up to achieve a fleet-wide transition in a relatively short time. One potential obstacle is the age and lack of maintenance of many paratransit vehicles, which could restrict the lifespan of the retrofits. When implemented, the initial pilots may provide crucial data about the feasibility and scalability of this approach.

BasiGo – Nairobi

- **Key Actors:** Basi-Go, a Kenya-based start-up.
- **Mechanism:** Kenyan start-up BasiGo has developed a "Pay-As-You-Drive" model for the deployment of e-buses.[52] To overcome the high-price of EV purchases for paratransit operators, BasiGo instead provides the buses at a low up-front cost then collects a comprehensive "Pay-As-You-Drive" fee that includes charging and maintenance services. The "Pay-As-You-Drive" model is essentially an operation lease model deployed at a very small scale, to the level of individual paratransit owner-operators.
- **Funding:** This model is designed to be financially sustainable, based on the "Pay-As-You-Drive" fee.
- **Lessons Learned:** This model is similar to leasing and asset separation models, in that ownership of rolling stock and charging infrastructure is held by a third party, in this case BasiGo, and that equipment is leased to operators. It differs from the models discussed in the previous sections in that the purchaser is individual paratransit operators or collectives as opposed to a public transport authority or formal sector operator. This smaller-scale approach to e-bus leasing is difficult to scale but could be paired with top-down fleet renewal approaches to provide greater flexibility to individual operators.

5.1.1.9 Recommendations for e-bus deployment in the paratransit sector

Based on the various models discussed above, a combination of top-down and bottom-up approaches can overcome the significant barriers to e-bus deployment in the paratransit sector. Bottom-up private approaches like BasiGo and EcoCar Solaire can serve as testing grounds to prove the viability of e-minibus technology and build confidence among paratransit operators. EcoCar Solaire's retrofit model could serve as an alternative solution to reduce emissions in the paratransit sector even where full fleet renewal is not feasible. Their deployment requires little public involvement, as they rely primarily on the interest of individual / small private transport operators to turn electric.

However, past a certain point, more global top-down approaches like AFTU and BITP will be necessary to achieve a complete transition in the sector. These programs provide established models for fleet renewal and could be adapted to supply e-buses to paratransit operators so long as the technical and operational feasibility of this new technology is assured.

These two programs show the flexibility necessary for a paratransit transition process. CETUD in Dakar went into a lengthy concerted and participative process with the industry, allowing minibus drivers/owners to restructure while not taking direct service provision responsibility. This grassroot approach allows to keep current stakeholders in control but falls short of a full fledge incorporation. LAMATA in Lagos is considering a faster and more integrated track by setting small incorporated operators with whom to sign operation contracts caring not only for bus routes but also for level of service, ticketing and fare collection.

[52] BasiGo. "Bridging the Gap." https://www.basi-go.com/pay-as-you-drive-

Both programs can be expanded to include e-bus deployment, as Lagos is already considering through the BITP. This would lead however Transport Authorities to take additional responsibilities regarding charging stations and electricity provision.

Both private and public lead approaches can also be combined, with some levels of agreement being possible between Transport Authorities and charged-battery providers (like BasiGo) or vehicle retrofitters (like EcoCarSolaire) to support the transition.

In particular, the reorganization of paratransit workers into small-scale cooperatives facilitates oversight by the public transport authority and increases access to financing including through leasing models like that used by BasiGo, while retaining the flexibility and worker control that are the main benefits of paratransit solutions.

5.1.1.10 Existing contractual and commercial arrangements

The six project cities exhibit a range of different commercial structures. The table below summarises the contractual arrangements and bus ownership in the six project cities.

Table 5-2: Contractual arrangements and bus ownership in project cities

City → Operator	**Contractual arrangement**	**Bus ownership**
Abidjan → SOTRA	A service level agreement between SOTRA and the Ivorian government gives SOTRA exclusive operating rights of passenger transport (although competition from paratransit exists). Revenue risk is held by the government who provides a subsidy to SOTRA including concessions for certain passengers and fleet investment.	Fleets are owned and maintained by SOTRA
Accra → Metro Mass Transit	Concession agreement with GAPTE. Net cost contract arrangement with operator bearing operating and revenue risk. Government provides low level of subsidy to support operations.	Fleets are owned and maintained by the operator.
Dakar → Dakar Mobilité	A 15-year concession agreement with Government appointed through a competitive tender. Net cost contract with a Minimum Revenue Guarantee (MRG).	The private operator finances, procures, operates, and maintains a 121-bus electric fleet. The operator plans to deploy an additional 100 buses on a second BRT line, currently under construction.
Dakar → Dakar Dem Dikk	Concession with government for public transport services appointed through direct award. Operator receives a subsidy from the government in the form of operational subsidy payments, concessionary payments to offset revenue loss from reduced fares for vulnerable groups and fleet investment.	Fleets are owned and maintained by DDD

City → Operator	Contractual arrangement	Bus ownership
Freetown → Metro Transit Company	Interim Contract is a profit-sharing arrangement[53] between operator SLPTA and ticketing company. The plan is to transition to a Gross Cost arrangement as more routes are deployed.	Waka Fine pilot fleets are owned by Ministry of Transport and Aviation and leased to the MTC and maintained by third party. The intention is for future fleets to be procured by private operators.
Lagos → Primero	A 7 year "Operate-and-maintain" contract[54]. Operators are paid under a revenue share formula where the revenue is shared between the operators and other stakeholders within the public transport space which also includes the ticketing team.	Fleets are partly owned by operators and partly by Lagos State Government, which owns a portion of the fleet through Lagbus Asset Management Limited (Lagbus). Operators, such as Primero, own a part of the fleet while operating buses owned by Lagos State. For example, Primero operates a fleet of 550 buses, of which 434 are owned by the company and over 100 are provided by Lagos State.
Lagos → TSL Metroline		
Lagos → LBSL		
Lome → SOTRAL	SOTRAL has a concession agreement[55] drawn up by municipality of Lomé, Ministry of Infrastructure and Transport and Ministry of the Economy and Finance	Fleets owned and maintained by SOTRAL in house

Source: CPCS & ITP, based on interviews

In the six project cities, the informal sector is governed through an array of licensing and contractual schemes. In most cities, informal transport workers' unions also play a key regulatory role:

Table 5-3: Licensing and formalisation schemes of paratransit

City	Paratransit unions	Licensing and formalisation schemes
Abidjan	Approximately 350 different informal sector unions and 30 federations are formally declared, though fewer are operational on the ground[56].	Abidjan Urban Mobility Project (PMUA) includes stricter regulation of paratransit through the establishment of specific operating zones, designated parking locations, and plans for a fleet renewal program[57]

[53] Fare revenue is collected by SLPTA through a third-party revenue collection contractor.

[54] The contract is a net cost contract where operators bring their bus fleet / operate the Lamata bus fleet and are given back the fare revenues of their operation through a centralised fare collecting system managed by Lamata and operated by a private company (cowry). This System allow contacless payment with a card in the BRTs.

[55] The institutional framework of the company is governed by three supervisory authorities: the Lomé Municipality, the Ministry of Infrastructure and Transport, and the Ministry of Economy and Finance. These institutions, through a concession agreement, established the operational rules for SOTRAL, which define the public service principles it must uphold, including service regularity, a social fare policy, adaptability of service to demand, and punctuality and service continuity.

[56] "Abidjan Bus Rapid Transit and Metro: Labour Impact Assessment Research Report." Global Labour Institute. 2022. P. 31.

[57] Djah et al. "Abidjan Bus Rapid Transit and Metro: Labour Impact Assessment Research Report. Global Labour Institute. 2022. https://www.itfglobal.org/sites/default/files/node/resources/files/digital%20LIA%2013112023.pdf

City	Paratransit unions	Licensing and formalisation schemes
Accra	Several unions contest representation of "tro-tro" drivers. Historically, the Ghana Private Road Transport Union (GPRTU) has been the largest, but the Progressive Transport Owners' Union (PROTOA), Ghana Cooperative Transport Union (GCTA) and General Transport, Petroleum and Chemical Workers Union (GTPCWU) have become more active in the sector in recent years[58].	n/a
Dakar	The paratransit sector is largely governed through the Urban Transport Professionals Finance Association (AFTU) and the Economic Interest Groups (EIE).	Urban Transport Professionals Finance Association (AFTU) provides licenses to paratransit operators and provides support for vehicle replacement and upgrading. Under AFTU, operators are organised into Economic Interest Groups (EIE) who share responsibility for loans and financial liability. Currently, 14 EIEs operate 64 bus lines formed through the consolidation of paratransit routes
Freetown	Metro Transit Company is a formal sector operator formed through the consolidation of paratransit routes	Waka Fine Bus consolidated paratransit operators along several key transport corridors
Lagos	National Union of Road Transport Workers (NURTW) is the primary union representing paratransit workers	Quality Bus Corridors (QBCs) aim to regulate and formalise paratransit operators along select corridors in the city, including providing support to operators for the acquisition of new rolling stock
Lome	n/a	n/a

5.1.2 Recommendations and key findings

Based on the analysis presented in this chapter, the following strategic recommendations emerge as critical for successful implementation.

5.1.2.1 Contract structuring between the public authority and the operator is key

The design of the contract between the public authority and the operator is pivotal. The choice between net cost, gross cost, or hybrid models must reflect local demand dynamics, fare policy objectives, operator capabilities and fiscal constraints. The following considerations can guide this decision:

- **Gross cost contracts –** Best suited where fare revenues are uncertain or insufficient, and public control over service levels and tariffs is essential. The authority bears the revenue risk. Success depends on robust KPIs (e.g., punctuality, reliability, safety, energy efficiency, charger uptime), with bonus/malus mechanisms to drive performance.

[58] Spooner et al. "Informal Transport Workers in Accra: Livelihoods, Organisation and Issues." Global Labour Institute. February 2023. https://www.gli-manchester.net/wp-content/uploads/2024/08/Accra-Report-GLI-Edit-rev.pdf

- **Net cost contracts –** Ideal for corridors with strong, predictable demand. Operators retain tactical control over ridership and revenue. To prevent service gaps in low-income or low-demand areas, pair with tools such as Minimum Revenue Guarantees (MRG), cap-and-collar revenue sharing, and targeted subsidies for social service obligations.
- **Hybrid models –** Combine the strengths of both approaches. For example:
  - Gross cost with revenue-linked bonuses
  - Net cost with MRG and quality incentives
  - Include indexed cost pass-throughs for electricity and batteries, and performance warranties for mid-life battery replacements.

5.1.2.2 Leasing models have been proven as a model for e-bus deployment

Leasing vehicles, batteries, and charging infrastructure, via third-party asset companies or utilities, can reduce upfront CAPEX and distribute technology and residual value risks. Key success factors include:

- Availability-based payments tied to performance KPIs
- Battery State-of-Health guarantees
- Clear mid-life battery replacement obligations

Though underutilized in West Africa, these models should be prioritized for pilot programs, with templates adapted from similar markets.

5.1.2.3 Aggregate demand to lower costs and unlock finance

Pooling demand across operators, especially for paratransit, or cities enables:

- Lower costs through joint procurement and standardized specifications
- Centralized energy and charging via utility partnerships and depot-as-a-service models
- Creation of SPVs or cooperatives to negotiate with OEMs, lessors, and financiers.

5.1.2.4 Integrate carbon revenues and climate finance into the business model

Integrate carbon-crediting mechanisms into the business model to monetize emission reductions. Key actions:

- Establish credible MRV systems
- Use forward offtake agreements or price floors to stabilize income
- Reinvest proceeds in lease cost reduction, charging infrastructure upgrades, or fare subsidies
- Combine with climate finance and concessional capital to enhance early-stage viability.

5.1.2.5 Scale paratransit sector with combined top-down and bottom-up approaches

Combine top-down sector reorganization and fleet renewal with bottom-up operator-ready solutions:

- Pay-As-You-Drive (PAYD), Battery-as-a-Service (BaaS), and retrofit pilots
- Support cooperatives or corporatized entities to access credit and leasing
- Anchor with gross-cost–style contracts including AFC and performance KPIs

- Introduce scrappage incentives and targeted training on safe and efficient EV operations

5.1.2.6 Embed performance, data, and risk-sharing in every contract

Every contract should include:

- Clear service and energy KPIs
- Independent verification and transparent bonus/malus systems
- Explicit risk allocation (demand, revenue, electricity price, battery life, charger uptime, residual value)
- Mandated open data (ridership, km, kWh) to support payments, carbon MRV, and operational optimization.

5.1.2.7 Context matters: no one-size-fits-all

West African cities vary widely, from SPV concessions (e.g., Dakar BRT) to revenue-sharing regimes (e.g., Lagos). Each city/project should:

- Conduct a light bankability and grid-readiness assessment (duty cycles, depot siting, tariff outlook, grid capacity, land control)
- Tailor contract type, asset ownership model, and financing strategy to local realities.

5.2 Financing Options for E-Bus Deployment

5.2.1 Constraints in e-bus financing in West Africa

All six project countries face major financial constraints in the deployment of e-buses. E-buses tend to be more expensive up-front than equivalent Internal Combustion Engine (ICE) models and also require investments in complementary infrastructure like depots and charging stations. As a result, operators, transport authorities, and municipal governments are often unable to fund the transition to e-buses without external financial support.

Municipal governments and transport authorities in West Africa face several financial constraints compared to other parts of the world. These include:

- **Low farebox revenue and willingness to pay** – All six project countries exhibit a low GDP-per-capita, and a high proportion of public transport users are low income. As a result, fares must be kept low to ensure willingness to pay and equitable access to transit. Furthermore, due to the low quality and inaccessibility of transit options in many cases, demand is low. As a result, in many cases farebox revenue is sufficient to cover operator's operating costs, but with little if any funds left over for capital expenditures like investments in new rolling stock or infrastructure improvements. This dynamic also creates a cycle whereby aging ICE buses - often the heaviest emitters of greenhouse gases - remain in operation far beyond their intended service life, compounding environmental and public health impacts over time. Acquisition of new buses (whether ICE or EV) often necessitates some form of external support. However, with an adequate subsidy for CAPEX the business case for e-bus deployment can be sound.
- **Subsidy risk** – In cases where farebox revenue is insufficient to cover operating costs, additional public subsidies are necessary. However, these subsidies present a risk to investors, as governments may delay, reduce, or withhold payments, and operators often have limited legal recourse to enforce subsidy commitments. This makes business models that depend heavily on uncertain operating subsidies unattractive to

private investors. Alternatively, if a subsidy is used to support capital costs, such as the acquisition of rolling stock or to cover special reduced fares while the underlying business case for operations is sound, the investment risk is reduced and the case for e-bus deployment becomes more compelling.

- **Varied strength of local financial sectors** – The six project countries vary in the complexity and maturity of their financial sectors. Some countries, like Nigeria, have a relatively well-developed financial sector with highly capitalised local banks and lenders, while countries like Sierra Leone have relatively weak financial sectors. This limits access to domestic capital in certain countries, necessitating larger involvement from regional or international actors.
- **Political and economic instability** – All six countries face varied forms of political and economic instability that may deter investors. Côte d'Ivoire and Sierra Leone both experienced periods of civil war in the recent past, Côte d'Ivoire between 2002 and 2007 and 2010 to 2011, and Sierra Leone from 1991 to 2002.[59] These conflicts significantly disrupted private investment and made infrastructure development in these periods nearly impossible. While both countries have experienced recent protracted periods of peace, this history leads to a higher perceived investment risk. Senegal has recently experienced large protests and demonstrations ahead of the country's last presidential election. Nigeria and Ghana both face significant debt burdens and have a history of unpredictable economic policymaking, and Ghana is currently undergoing a debt restructuring process with the International Monetary Fund. All of these factors contribute to a higher perceived risk profile for the region by international investors, meaning that they frequently will require higher returns and some forms of risk guarantees to engage in the region.
- **Stability and convertibility of local currency** – Local currencies in the project countries, mostly SLE, GHS and NGN, exhibit considerable volatility or convertibility in international foreign exchange markets. This limits investors' willingness to engage in long-term debt like that necessary for 12-plus-year e-bus procurement or investments in public transport projects. This risk is somewhat mitigated in countries that peg their currencies, as do countries that use the Central African Franc (CFA) like Senegal, Côte d'Ivoire and Togo.
- **Risk of public authority default** – Investors are frequently wary of the credit-worthiness and default risk of public authorities in Sub-Saharan Africa. Efforts must be made to increase investor confidence in public authorities and alternative financing mechanisms can limit investors exposure to default risk.

As a result of these constraints, while traditional actors like domestic banks and public authorities can play a role in financing e-bus deployment, the involvement of additional actors like international development partners and the use of novel financing like PPPs, climate finance and others will be necessary as well.

5.2.2 Financing models for e-bus deployment

Given the financial constraints facing the project cities, several options exist for the acquisition of e-buses. The table below summarises these options. It is important to note that these options are not mutually exclusive.

[59] Kouakou, Armand. "Impact de l'instabilité sociopolitique sur les investissements publics et privés en Côte d'Ivoire." Université de Cocody Côte d'Ivoire - DESS hautes études en gestion de politique économique. 2010. https://www.memoireonline.com/12/13/8178/Impact-de-l-instabilite-sociopolitique-sur-les-investissements-publics-et-prives-en-Cte-d-Ivoire.html

Table 5-4: Overview of bus acquisition options

Method	Description	Ownership model	Advantages	Disadvantages
Cash purchase	Full capital purchase price is paid upfront	Operator	Operator retains ownership over asset	Operator must bear initial CAPEX costs
Loan purchase	Part of capital cost is paid upfront; remainder is borrowed	Operator	Lessens initial CAPEX costs by operator; operator retains ownership over asset	Operator assumes debt burden Lender bears credit risk
Capital lease	Lease payments are paid for the vehicle and/or fixed infrastructure for a specified term	Lessor (typically 3rd party or manufacturer); operator may purchase at specified residual value at the end of the lease[60]	Lessens initial CAPEX costs; operator can eventually acquire ownership of asset	Requires that local government or operator is viewed as trustworthy and has high credit rating Long-term financial commitments, changes in revenue could lead to default
Operation lease	Operator pays for the use of the bus and charging infrastructure over a specified term	Lessor (typically 3rd party or manufacturer); operator may purchase at specified residual value at the end of the lease	Lessens initial CAPEX costs; operator eventually acquires ownership of asset	Possibly higher costs to access ownership Long-term financial commitments, changes in revenue could lead to default
"Pay-as-you-Drive"	Similar to operation lease, model used by BasiGo in Kenya	Lessor (3rd party, BasiGo in case of Kenya); purchaser is individual paratransit operator or collective	Allows for operation leasing at a small scale; provides flexibility for paratransit operators to upgrade vehicles	Difficult to scale to the level of an entire system

[60] Typically a bus operator will lease the buses and there will be no issue of residual value purchase.

Method	Description	Ownership model	Advantages	Disadvantages
Vehicle rental	Operator pays a rent for the vehicle	Bus owner (manufacturer, PTA, third party) owns the vehicle; operator typically does not have an option to purchase at end of rental term	No ownership responsibility and fixed cost for the operator	Bus owner bears the risks and higher operating costs for the operator Operator never assumes ownership of asset Long-term financial commitments, changes in revenue could lead to default
Component rental	Operator pays for specific sub-components (e.g. battery) over time	Bus owner (manufacturer, PTA, third party) owns the battery and specific components	Solves challenge of battery replacement in e-bus procurement	Battery supplier assumes technology risk Operator never assumes ownership of asset

Source: Miller et al., "Financing the Transition to Soot-Free Urban Bus Fleets in 20 Megacities." ICCT. https://theicct.org/wp-content/uploads/2021/06/Soot-Free-Bus-Financing_ICCT-Report_11102017_vF.pdf

The Environmental Defense Fund (EDF) has developed a "Total Cost of Fleet Electrification (TCE) Toolkit" to overcome the main barriers in the procurement of e-buses and other EVs[61]. The toolkit includes instruments that increase access to capital, reduce exposure to risk or uncertainty, reduce and smooth up-front or recurrent costs and that support technical and policy actions to facilitate EV deployment.

In the West African context, key instruments such as concessional loans, blended finance, equity investments, and risk guarantees play a critical role in enabling fleet electrification. These tools help bridge financing gaps, attract private investment, and manage political and financial risks. An overview infographic below illustrates these instruments and their relevance, with more detailed explanations provided in the following section.

[61] "Financing the Transition: Unlocking Capital to Electrify Trucks and Buses." EDF. 2020. https://www.edf.org/sites/default/files/documents/EDF_Financing_The_Transition.pdf

Figure 5-5: Financial instruments and sources of financing

Source: CPCS and ITP

Key instruments and sources of financing described below:

- **Concessional or "soft" loans** – loans with low interest rates, longer maturity, reduced collateral requirements, grace periods or subordinated debt that can support fleet electrification. Typically used for investments that are not suitable for commercial-term borrowing. These were used by the Inter-American Development Bank for Bogota's e-bus rapid transit system, allowing for the purchase of e-buses with significantly higher purchase prices than traditional diesel buses. Concessional financing is frequently used by AfDB to finance various infrastructure projects, including Dar Es Salaam's BRT system.[62]
- **Blended finance** – structured financing arrangements that combine concessional funding from development finance institutions with commercial capital to improve the risk-return profile of e-bus projects. These platforms help attract private investment into projects that may not be viable on commercial terms alone. The Sustainable Energy Fund for Africa (SEFA), managed by the African Development Bank, and the Private Infrastructure Development Group (PIDG) uses blended finance to support low-carbon infrastructure in Sub-Saharan Africa, including the Green Mobility Facility for Africa, which is working to form an enabling environment for EVs and develop a pipeline of e-mobility projects in seven African countries including Nigeria, Senegal, and Sierra Leone.[63]
- **Equity investments** – investments made by public or private actors in exchange for ownership shares "equity" in a transport company or project. Can support a fleet electrification enterprise or project, spur the establishment and growth of businesses, and signal investment-readiness to the broader financial sector. This is essentially the strategy used by Meridiam in Dakar's e-BRT system.
- **Viability gap funding (VGF)** – one-time capital grants provided by governments or development partners to cover a portion of project capital costs that cannot be recovered through user fees or private investment alone. VGF helps make projects financially viable and is especially relevant for PPP models in transport. The Private Infrastructure Development Group (PIDG) Technical Assistance provided USD 10 million in viability gap funding for Dakar's e-BRT system to help finance mid-life battery replacement.
- **Municipal bonds** – debt instruments issued by public entities engaged in fleet electrification that entitle creditors to interest "coupon" payments. These can enable public entities to raise capital to finance large upfront costs for municipal projects. Municipal bonds are a growing instrument in Sub-Saharan Africa, though they face several obstacles in the project countries. Municipal bonds require strong legal and regulatory frameworks, and sub-national units of government must hold sufficient authority to issue and guarantee the bonds. Starting in 2011, Dakar began formulating an initial municipal bond offering aimed at raising funds to support informal traders. However, shortly before the launch of the bond in 2014 the initiative was blocked by the central government based on constitutional ambiguity and concerns about the

[62] "AfDB approves US $141.71-million for the Dar es Salaam Bus Rapid Transit System Project." African Development Bank. October 1, 2015. https://www.afdb.org/en/news-and-events/afdb-approves-us-141-71-million-for-the-dar-es-salaam-bus-rapid-transit-system-project-14767

[63] "$1 million: Sustainable Energy Fund for Africa grant to drive electric mobility shift in seven African countries." African Development Bank. January 31, 2023. https://www.afdb.org/en/news-and-events/press-releases/1-million-sustainable-energy-fund-africa-grant-drive-electric-mobility-shift-seven-african-countries-58650

country's debt level.[64] Cape Town and Johannesburg have both successfully used municipal bonds to raise funds in the past, and were aided by a conducive legal framework and clear legislation allowing cities to borrow money.[65]

- **Green/sustainability bonds** – public or commercial bonds that generate capital to fund high upfront costs where proceeds are earmarked for environmental projects, including fleet electrification. The "green" credentials of these instruments can attract heightened interest from investors and could lead to lower interest payments. These instruments will be discussed in greater detail in a later section.
  - **Operational expenditure grants** – include cash grants, rebates or reimbursements for operational costs connected to electric fleets, such as electricity and maintenance. These can help to reduce ongoing costs for fleet owners and operators. This instrument has been used successfully in South Africa, where the national government funds a Public Transport Operations Grant to subsidize the operational costs of specified forms of commuter transport, particularly bus services, in major cities.[66]
  - **Performance guarantees** – reduce investment risk by protecting e-bus purchasers from under-performance of vehicles or batteries. These are standard practice in many procurement processes used by multilateral agencies and public transport authorities. For example, the U.S. Federal Transit Administration[67] recommends clearly defining battery warranty and performance guarantees (e.g., minimum State of Health thresholds), specifying fleet availability targets with measurable KPIs, and including enforceable remedies such as penalties or corrective actions in case of non-compliance.
  - **Political and financial risk guarantees** – protect investors or purchasers of e-buses against losses due to a specified set of political risks (such as changes in vehicle, fuel or climate-related regulations or policies) or financial risks (losses due to debt servicing, under performance of assets, default) to reduce investment risk. These instruments are provided by several multilateral organizations. The World Bank's Multilateral Investment Guarantee Agency (MIGA) offers political risk insurance and credit enhancement guarantees to encourage foreign direct investment in developing countries. MIGA provided risk guarantees for Dakar's e-BRT. The AfDB provides partial risk guarantees as part of its financial services offerings, as does the AFD through the "Cityriz" guarantee program.[68]
  - **Other de-risking solutions** – To attract private financing for large-scale or innovative projects in transportation or infrastructure, it is crucial to address the perceived risks faced by investors. *Payment Security Mechanisms* ensure timely payments to investors and operators while C*redit Guarantee Mechanisms* assist the investors and operators.
    - **Payment Security Mechanisms (PSMs)** are financial tools that ensure timely payments to operators and investors, particularly where projects rely on public subsidies. PSMs protect against delayed or missed payments through instruments like escrow accounts, reserve funds, or third-party guarantees, and are especially valuable in contexts with weak public creditworthiness. In India, a Payment Security Mechanism jointly

[64] Gorelick, Jeremy. "Supporting the future of municipal bonds in sub-Saharan Africa: the centrality of enabling environments and regulatory frameworks." International Institute for Environment and Development (iied). Volume 30, Issue 1. February 1, 2018. https://journals.sagepub.com/doi/full/10.1177/0956247817741853

[65] Colenbrander, Sarah and Palmer, Ian. "African cities can raise more money. Kenya and South Africa offer useful lessons." IIED. 2018. https://www.iied.org/african-cities-can-raise-more-money-kenya-south-africa-offer-useful-lessons

[66] "National Public Transport Subsidy Policy." South Africa Department of Transport. December 2023. https://www.gov.za/sites/default/files/gcis_document/202402/50176gon4431.pdf

[67] Procuring and Maintaining Battery Electric Buses and Charging Systems – Best Practices, U.S. Federal Transit Administration, FTA Report No. 0253, August 2023. https://www.transit.dot.gov/sites/fta.dot.gov/files/2023-08/FTA-Report-No-0253.pdf

[68] "The Cityriz Guarantee." French Development Agency. https://www.afd.fr/en/cityriz-guarantee

supported by public and private funds was introduced in 2023 to ensure timely payments to e-bus operators, even when transit authorities face budget delays, helping unlock large-scale investment in fleet electrification[69].

- **Credit Guarantee Mechanisms (CGMs)** focus on reducing financial risk for lenders by providing third-party guarantees in case of loan default. Unlike performance or political risk guarantees, CGMs specifically mitigate the financial risk of borrowing for e-bus projects, enabling access to favorable loan terms, such as lower interest rates and longer repayment periods.

5.2.3 Sources of financing for e-bus deployment

The successful deployment of e-buses in West Africa will require a diversified and strategic approach to financing. Currently, the primary actors in the financing of urban infrastructure projects are national and municipal governments and international financial institutions (IFIs) or other development partners. These actors will continue to be the main sources of financing for the transition to e-mobility for the foreseeable future.

However, there are clear advantages to diversifying sources of funding beyond traditional public channels. National and municipal governments often face limited fiscal resources, weak credit ratings, and constraints in raising funds on capital markets. As a result, they must balance competing infrastructure and social spending priorities, and are rarely able to finance major e-mobility projects independently. Multilateral agencies are and will continue to be a major source of concessional finance and technical assistance. However, crowding in other public and private financiers can enhance the financial sustainability of e-bus projects, introduce innovation, and mobilize additional capital to bridge funding gaps. Blended finance mechanisms, risk-sharing instruments, and private sector engagement models are increasingly relevant in this context.

The following section will first consider the current financing landscape from the perspective of national and municipal governments, and multilateral agencies. It will then consider less conventional or emerging sources of finance.

The table below summarizes major sources of financing for e-bus deployment in West Africa. A more detailed analysis can be found in **Annex D**.

[69] Pandey and Dawra. “Exploring Payment Security Mechanism for E-Bus Expansion.” World Resources Institute. August 20, 2024. https://wri-india.org/blog/exploring-payment-security-mechanism-e-bus-expansion

Table 5-5: Sources of finance for e-bus deployment

Source of finance	Description	Examples of activities in e-mobility sector
National and municipal government	Public transport authorities are often directly involved in the purchase and/or leasing of e-buses using their own funds. They provide oversight over operators and the entire transport system, and a strong, high-capacity authority is crucial for inspiring investor confidence. Municipal and national governments can assist operators in purchasing e-buses through the extension of "soft" or concessional loans, or through subsidies covering the difference in CAPEX expenditure between e-buses and ICE models. National governments can create financial and tax incentives encouraging e-mobility, for instance by waiving import duties on EV purchases.	In 2024, Togo exempted all EV imports, including batteries, from duties and fees.[70] In Dakar, the government holds a partial equity stake in the city's e-BRT operator, Dakar Mobilité.
International financial institutions (IFIs) and development partners	IFIs have played a large role in public transport in the project cities through a mix of financial and technical instruments. These instruments primarily consist of loans and concessional loans, such as the World Bank's IDA credits with low or zero interest, or blended finance mechanisms, to fund large infrastructure developments. In fragile or post-conflict contexts like Sierra Leone, IFIs will sometimes provide grants to fund upgrades without adding to debt burdens. Most organizations also provide technical assistance as part of their offerings, supporting project design, institutional reform, and capacity building to ensure the long-term sustainability of transport systems.	The World Bank supports Dakar and Abidjan's BRT systems, and has supported BRTs in Lagos and Accra in the past Several IFI's provided financial support to Dakar's e-BRT, including the World Bank, the French Development Agency (AFD) and the European Investment Bank (EIB)
Commercial banks	Commercial banks have not yet played a significant role in financing e-mobility projects in the region. However, many regional banks are actively working to expand their finance offerings in renewable energy, mostly through the provision of loans for private operators. Commercial banks could play a larger role in the future as green and climate finance initiatives incentivize banks to offer green bonds or tailored loan products for e-mobility as demand for low-carbon transport grows.	Commercial banks can provide financing to e-bus companies. Blended finance models could help de-risk e-bus projects, making them more attractive to lenders. Partnerships with DFIs could allow banks to access concessional financing and reduce perceived risks. Commercial banks could be involved in restructured paratransit development once trust in the repayment capacity of the industry can be guaranteed.

[70] "Véhicules électriques : l'État étend les exonérations fiscales à l'importation des batteries." TogoFirst. January 9, 2024. https://www.togofirst.com/fr/transport/0901-13201-vehicules-electriques-l-etat-etend-les-exonerations-fiscales-a-l-importation-des-batteries

Source of finance	Description	Examples of activities in e-mobility sector
Sovereign funds and development banks	Nigeria, Ghana, and Senegal all have infrastructure funds or development banks focused on funding infrastructure and economic development. Development banks typically act as facility investors, investees/borrowers and/or project co-financiers. Development banks and sovereign wealth funds typically use a mix of equity investments, loans, and PPPs to finance infrastructure projects. These models help address funding gaps while aligning with national development goals.	Dakar's sovereign wealth fund, Fonds Souverain d'Investissements Stratégiques (FONSIS), is a key stakeholder in the city's e-BRT as an equity shareholder of the BRT operator
Venture capital and private equity	Venture capital firms, which are typically more focused on early-stage, high-growth companies, are particularly active in funding innovative technology-driven startups in sectors like transport, logistics, and e-mobility. Private equity firms, on the other hand, often target later-stage companies and larger-scale infrastructure projects, leveraging their capital to drive both financial returns and strategic development in emerging markets.	The French investment firm Meridiam is a key example, as a major financier of Dakar's BRT system and majority owner of the BRT bus operator. Proparco, a private equity subsidiary of the French Development Agency, provided a loan to the Dakar BRT to support the procurement of rolling stock.
Climate finance	Climate finance refers to financing mechanisms that support mitigation and adaptation actions to address climate change. This includes specific instruments like green or sustainability bonds, or sustainability-linked loans, along with facilities and funds established to finance transition activities. Climate finance is a particularly useful tool in e-bus deployment.	The Global Green Growth Institute (GGGI) is a partner in the ZEBRA initiative, and provided technical assistance for the piloting of e-buses in Mexico City The Global Environmental Facility (GEF) supports the Green Mobility Financing Facility for Africa, a regional initiative aimed at transforming urban mobility by promoting green mobility solutions, including e-buses and two- and three-wheelers.

5.2.4 Recommendations and key findings

Based on the findings from the previous chapter, the following recommendations can be made:

- **Utilize a mix of financing models** – Employ concessional loans, blended finance, and equity investments to reduce the financial burden on operators and attract private investment, improving the risk-return profile of e-bus projects.
- **Implement risk mitigation instruments** – Protect investors and operators from uncertainties by using performance guarantees, political and financial risk guarantees, and payment security mechanisms to enhance investor confidence.
- **Provide government support and incentives** – Offer financial and tax incentives, such as import duty exemptions and operational subsidies, and create strong legal and regulatory frameworks to facilitate the issuance of municipal bonds and attract investment.
- **Leverage the support of international financial institutions and development partners** – Utilize loans, grants, technical assistance, and blended finance mechanisms from IFIs and development partners to fund large infrastructure projects and provide technical expertise.
- **Engage with unconventional partners to access new sources of finance** – while commercial banks, private equity, sovereign funds, and venture capital have so far played a minor role in e-mobility in West Africa, these actors have the potential to become major players in the future.
- **Tap into climate finance mechanisms** – Access lower interest rates, longer loan terms, and risk mitigation measures through green bonds and sustainability-linked loans to significantly reduce the upfront costs and financial risks associated with e-bus deployment.

5.3 Risk Assessment and Mitigation Strategies

In addition to typical questions about the allocation of risk between authorities and operators in bus sector commercial arrangements, e-buses come with additional risk considerations that must be taken into account. The following section with outline the key risk considerations in e-bus commercial and financial arrangements, will discuss some of the key risk mitigation strategies that can be employed by public transport authorities and operators and assess the applicability of these measures to the project cities.

5.3.1 Key risk considerations for e-bus deployment

5.3.1.1 Main categories of risk

In the procurement and deployment of e-buses, there are several key risk categories to consider. These include:

- **Legal and regulatory** – lack of legal and regulatory framework can delay e-bus deployment. Sudden or unexpected changes in legal and regulatory frameworks can also disrupt operations or change the valuation of e-bus assets.
- **Financial** – uncertainty surrounding the availability, cost, and repayment of funds needed to develop and operate the system, potentially leading to project delays, cost overruns or debt servicing challenges.
- **Revenue** – uncertainty in revenue generated from bus operations, primarily through farebox revenue. In conditions where farebox recovery and willingness to pay are low, public subsidies

may be necessary, creating an additional subsidy risk (as subsidies can be removed with little notice).

- **Technology** – the adoption of a new and emerging technology like e-buses comes with a degree of uncertainty about longevity of the asset, maintenance, upkeep costs, etc. A specific risk involves battery technology. Unlike combustion engine technology, there is limited experience in maintaining and operating batteries across all six cities. Additionally, midlife battery replacements necessitate a reliable supply of new batteries and the safe removal and disposal of old ones.
- **Maintenance** – responsibility for maintaining the asset. Bus operators in both the formal and informal sectors often defer maintenance to lower operating costs. Given the higher up-front cost of e-buses and the specialized maintenance involved, this must be avoided to keep buses for their planned working life and to guarantee a sound availability level of the fleet.
- **Safety** – EV batteries carry a small but significant risk of fire, particularly during vehicle charging. This can be exacerbated by unreliable or unsafe connections to the grid or insufficient maintenance.
- **Climate resilience** – Although the deployment of e-buses will reduce greenhouse gas (GHG) emissions and mitigate climate change, their operations are more susceptible to climatic hazards already being caused by climate change. For instance, extreme heat can reduce battery performance, and flash floods can disrupt schedules due to their limited ability to wade through high water levels.
- **Availability of clean electricity** – e-buses require a steady supply of sufficient electricity for vehicle charging. If electricity is not available during the required charging periods, e-buses may be rendered inoperable. The use of fossil fuels to produce electricity may also pose a risk to the climate efficiency of e-buses (or reduce their benefits). From a social perspective, there could be competition between the use of electricity for e-buses and its use for domestic or other purposes. Electricity can be a scarce resource, so it is important to ensure that the deployment of e-buses does not negatively impact other uses.
- **Relationship with informal sector** – given the large size of the informal transport sector in the project cities, buy-in from informal operators is essential. Resistance from the informal sector could drastically affect operations in the form of strikes, blockages or disruptions to feeder networks. Competition with formal lines can also be a risk.
- **Residual value risk missing**

5.3.1.2 Risk allocation

In a commercial arrangement where the public transport authority or operator directly purchases e-buses, they bear all financial, technology and maintenance risk along with the financial burden of the initial CAPEX. For this reason, a key goal of alternative commercial arrangements for e-bus procurement is to spread the allocation of risk more evenly between the public transport authority, operator and other third parties like the vehicle manufacturer or electric utility.

Depending on the commercial and financial arrangement, the risks enumerated above can be shared between various stakeholders, as shown in the table below. What is shown below is the prime stakeholder responsible for bearing each risk. All stakeholders hold some exposure to all risks regardless of commercial and financial arrangement. For example, while financiers do not directly hold responsibility to managing maintenance risk, poor maintenance may interfere with operators' ability to make loan payments meaning the financier still bears some exposure.

Table 5-6: Risk allocation based on commercial arrangement

Type of risk	PTA purchases e-bus	Operator purchases e-bus	Operator leases e-bus from PTA	Operator leases e-bus from manufacturer	Operator leases e-bus from utility
Legal and regulatory	– Shared by all stakeholders	– Shared by all stakeholders	– Shared by all stakeholders	– Shared by all stakeholders	– Shared by all stakeholders
Financial	– Public transport authority (PTA), financier	– Operator, financier	– Operator, financier, leasing company	– Operator, financier, manufacturer	– Operator, financier, utility
Revenue	– Gross cost contract: PTA – Net cost contract: Operator	– Gross cost contract: PTA – Net cost contract: Operator	– Gross cost contract: PTA – Net cost contract: Operator	– Gross cost contract: PTA – Net cost contract: Operator	– Gross cost contract: PTA – Net cost contract: Operator
Technology	– PTA, as owner of e-bus	– Operator, as owner of e-bus	– PTA, as owner of e-bus	– Manufacturer	– Utility
Maintenance	– PTA, as owner of e-bus	– Operator, as owner of e-bus	– PTA, as owner of e-bus	– Operator, manufacturer	– Operator, utility
Safety	– PTA, as owner of e-bus; also depends on ownership of depots	– Operator, as owner of e-bus; also depends on ownership of depots	– PTA, as owner of e-bus; also depends on ownership of depots	– Operator, manufacturer	– Operator, utility
Availability of electricity	– PTA, operator, utility	– PTA, operator, utility	– PTA, operator, utility	– PTA, operator, utility	– PTA, operator, utility
Relationship with informal sector	– PTA and operator	– PTA and operator	– PTA and operator	– PTA and operator	– PTA and operator

5.3.2 Mitigation strategies

For each key type of risk identified above, it is necessary to identify potential mitigation measures that can be built into contractual, commercial and financial arrangements. The exact mitigation measure will depend on the precise nature of the risks faced by each stakeholder.

The following table summarizes each stakeholders' exposure to all risk categories and provides examples of risk mitigation strategies.

A more detailed table mapping specific risks and mitigation measures to each stakeholder can be found in **Annex E**.

Table 5-7: Risk mitigation measures

Type of risk	Potential risks	Mitigation measures
Legal and regulatory	Non-compliance with national, regional, and municipal laws Sudden changes to policy or regulatory frameworks	Clear legal and regulatory framework that defines the responsibilities of different stakeholders Clear and transparent standards for licensing, regulations, and technology that are not subject to frequent changes
Financial	Exposure to volatile farebox revenue, inflation, currency depreciation Non-payment risk for loans and leasing agreements	Pursue diverse funding and blended finance approaches Leverage development partners, climate finance for concessional loans, risk guarantees, equity participation Use of leasing agreements can spread risk and limit CAPEX expenditure
Revenue	Need for PTA to provide a subsidy to operators where farebox revenue does not cover operating costs Sudden changes in farebox revenue can limit operators' ability to repay loans, make lease payments	Pursue options for non-fare revenue generation (advertising rights, real estate, retail concessions, land value capture, etc.) Use targeted subsidies for vulnerable groups (families, low-income riders, people with disabilities) rather than blanket fare subsidies Under gross cost arrangements, design performance-based contracts where operators are incentivized to improve farebox recovery and promote ridership
Technology	Defective or poorly implemented technology can lead to service disruptions, increased costs, operator resistance Integration of new charging technologies into grid carries risk of load issues, equipment failure	Use of pilot projects to introduce new technology and build public trust/enthusiasm Ensure vehicle and charger contracts include long-term warranties, especially on batteries and powertrains.
Maintenance	Higher maintenance costs than expected Unexpected maintenance issues generating higher costs and less vehicle availability	Establish clear maintenance standards and monitor operator compliance Operators should set aside a dedicated portion of the operating budget specifically for ongoing maintenance costs

Type of risk	Potential risks	Mitigation measures
		Develop a procurement plan for spare parts including local supply chains
Safety	Passenger or driver injuries from accidents or malfunctions, in particular fires from faulty or poorly maintained EV batteries Legal liability for failure to enforce safety rules and regulations Poor oversight can lead to service quality issues and public dissatisfaction	Provide comprehensive safety training for drivers, maintenance staff, and operators Develop and enforce clear safety regulations for operators and passengers Ensure that all e-buses are fully insured against accidents, damages, and liability claims
Availability of electricity	Lack of electricity can cause disruptions to service, and can cause public dissatisfaction	Implement battery storage or on-site energy storage at charging depots to manage demand peaks Deploy solar-power charging stations at depots to reduce grid reliance Work with utility to ensure grid compatibility with e-bus technology Include provision for charging infrastructure and on-site storage in procurement contracts
Relationship with informal sector	May face political resistance, protests, direct disruption by informal sector operators and unions if e-buses are seen as a threat	Involve informal sector representatives early in planning processes Offer retraining, financial support, or alternative employment pathways to informal drivers affected by the transition to e-buses.

5.3.3 Recommendations and key findings

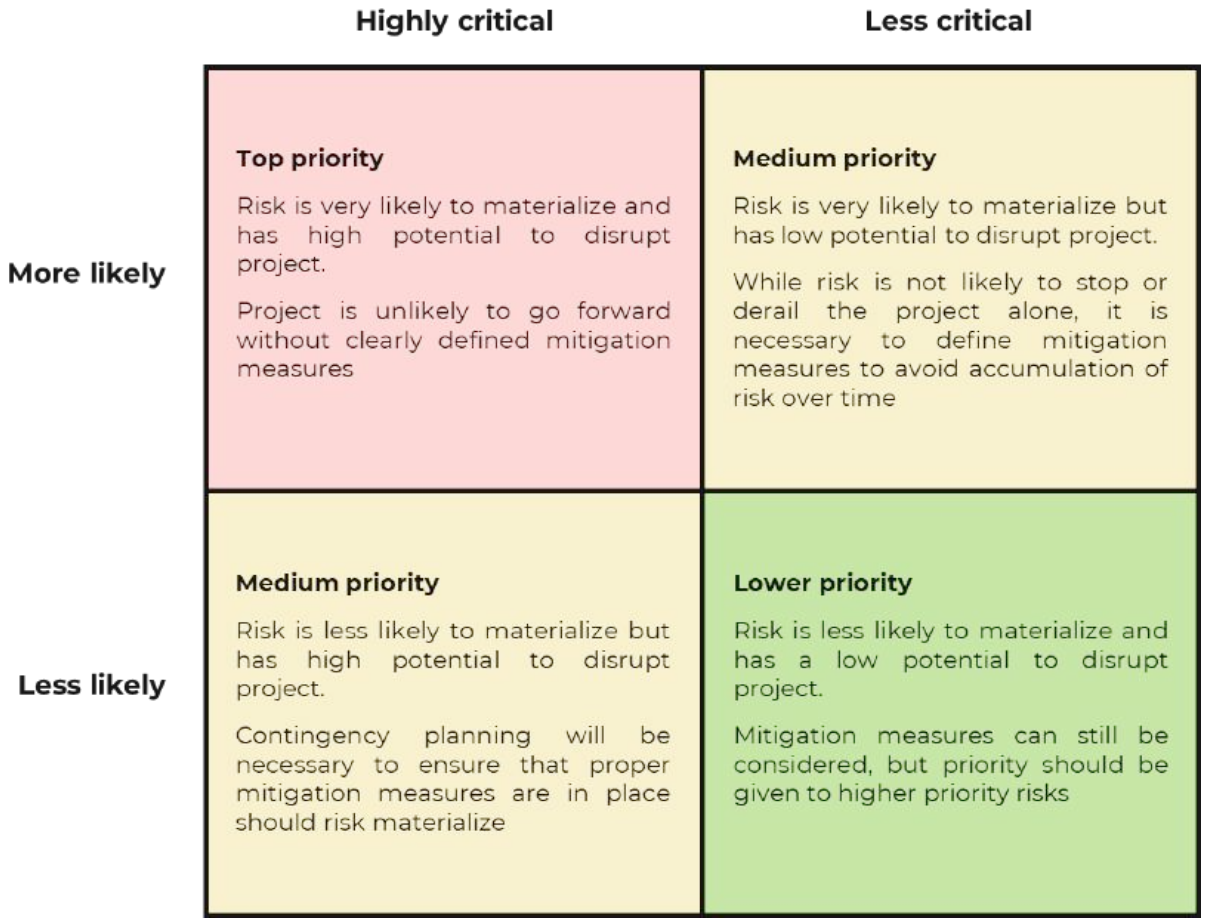
Mitigation measures should be prioritised based on the criticality of the risk involved and its likeliness to materialize.

A **highly critical risk** is one that has the potential to disrupt or block the project should it materialize. Risk criticality reflects the severity of consequences on project objectives such as operational continuity, financial viability, public trust, and regulatory compliance. A critical risk may result in halted services, large-scale financial losses, social unrest, or irreparable damage to the project's credibility.

A **highly likely risk** is one that can be predicted to materialize at some point over the lifespan of the project. Determining the likelihood of a risk involves assessing the underlying conditions, vulnerabilities, and contextual factors that make its occurrence probable. Prior experience is a crucial tool in determining risk likelihood, and this is an area where cities can learn from the examples of other cities that have already deployed e-buses.

Criticality and likeliness of various risks will be highly context-specific and will need to be determined at the planning stage for specific projects. The risk matrix below could be used as a starting point for in-depth discussions with public transport authorities, operators, financiers and manufacturers to determine risk mitigation priorities.

Figure 5-6: Risk matrix for prioritisation of mitigation measures



While the criticality of specific risk categories will be context-dependent, the following categories can be considered highly critical, in that financing or project support will be difficult to secure if they are not sufficiently mitigated.

- **Availability of electricity** – Without a steady and reliable supply of electricity, it will be very difficult to develop a compelling business case for e-bus deployment.
- **Legal and regulatory** – If a clear legal and regulatory framework are not in place, investors bear a large risk if they choose to engage in a long-term transaction like e-bus deployment. This is particularly the case if there is a likelihood that regulations could change suddenly or unexpectedly.
- **Financial** – Investors are unlikely to participate in a transaction if they are uncertain of their ability to be repaid.
- **Relationship with informal sector –** In all project cities the presence of a large informal transport sector constitutes a key stakeholder that will need to buy in to reforms. If the informal sector feels threatened by the introduction of EVs, this could seriously undermine a project's viability means that managing the relationship with informal operators will be critical. Without proper mitigation measures, this relationship has the potential to seriously undermine a project's viability.

All other risks discussed in this chapter would fall at least in the "**Medium Priority**" category, as experiences in other cities show that they are highly likely to materialize and have the potential to be disruptive.

5.4 Case study: Dakar e-BRT

As the only city in West Africa to have deployed significant numbers of e-buses, Dakar's example provides many lessons for other cities interested in deploying e-buses. The case study of Dakar demonstrates how the use of blended finance, including the mobilization of diverse financial stakeholders, can bridge the infrastructure gap and make bus fleet electrification at a large scale in West Africa possible by diffusing risk and mobilizing necessary technical expertise.

5.4.1 Project background

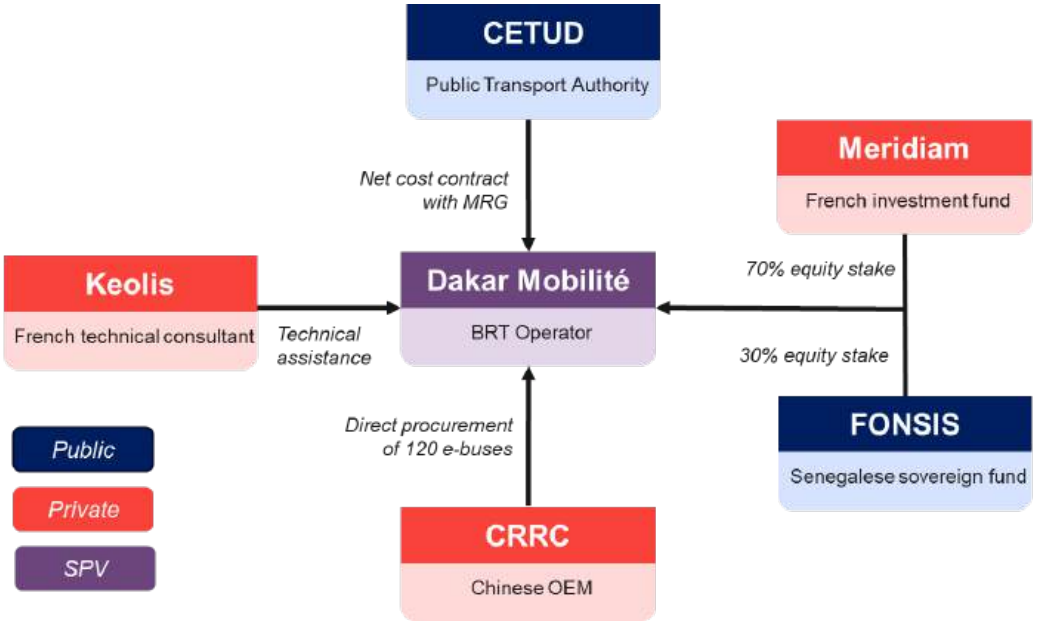
Like the other project cities, urban transport in Dakar has traditionally been dominated by informal paratransit operators, most of whom drive minibuses. This has led to significant traffic congestion and pollution as the city has continued to expand. In an earlier wave of reforms, the city formed Dakar Dem Dikk, a formal sector operator formed through the consolidation of paratransit operators along several key corridors. To further relieve congestion, the city has planned a series of BRT lines and an urban rail corridor.

In 2024 Dakar launched Sub Saharan Africa's first fully electric BRT. The Dakar BRT spans 18.3 km, featuring central median running lanes and elevated platforms, designed to facilitate efficient and accessible transit service across the city. The system has an average daily ridership of 300,000 passengers. The BRT operates in 100% dedicated right of way mitigating the challenge of journey time reliability and battery management. As part of this project a fleet of 121 e-buses were procured from Chinese supplier CRRC. The power system used to charge the BRT batteries is the same as the power system used for the urban rail project under construction.

5.4.2 Commercial arrangements

The Dakar BRT was the result of a PPP between the public transport authority (CETUD), Senegal's sovereign wealth fund and international financial and technical partners.

Figure 5-7: Commercial model of Dakar BRT



The BRT operator, Dakar Mobilité, was formed as a special purpose vehicle (SPV) to operate the system, with 70% ownership by the French investment firm Meridiam and 30% ownership by the Senegalese sovereign wealth fund, Fonds Souverains d'Investissements Stratégiques (FONSIS). The involvement of an investment firm like Meridiam in the ownership of a bus operator is unusual but was successful in this instance by increasing investor confidence in the project and attracting the involvement of other international partners. In particular, the French firm Keolis was brought into the arrangement as a technical consultant to Dakar Mobilité, which brought considerable global experience and helped smooth over the challenges of adapting to BRT and e-bus operations.

Dakar Mobilité operates through a net cost contract with CETUD that includes a Minimum Revenue Guarantee (MRG). The MRG helps limit Dakar Mobilité's exposure to revenue risk, which is typically a main concern of net cost contracts. This also helped increase confidence in the operator and helped attract investment.

For the BRT, Dakar Mobilité procured 121 e-buses from the Chinese manufacturer CRRC. In this case, the operator purchased the buses directly and maintains direct ownership. The operator is also responsible for the maintenance of charging facilities and depots, though ownership of these facilities ultimately falls to CETUD.

Fares were set based on a zonal fare system. Fares were set between 400-500 CFA (0.87 USD)[71]. To mitigate the impact of the relatively high fare, a social tariff was established for approximately 17% of potential riders, who receive a 50% discount on the regular fare. Over a 15-year period, the government will compensate the Dakar Mobilité with USD 17 million to make up for the lost revenue caused by the reduced fare[72].

5.4.3 Financial arrangements

The BRT project required a significant investment of USD $614 million in 2023[73] covering different aspects of the BRT ecosystem to ensure its longevity. As per the Dakar Bus Rapid Transit Pilot Project, the overall project is divided into four components:

- **Component 1**: BRT infrastructure, fleet, and systems (indicative of US$ 531 million in 2023).
- **Component 2**: Public transport network restructuring and road works (indicative cost of US$ 54 million in 2023).
- **Component 3**: Capacity building and project management (indicative cost of US$ 26 million in 2023).
- **Component 4**: Road safety (indicative cost of US$ 3 million in 2023).

The overall project arrangements are estimated US$ 85 million equivalent from the EIB, US$ 144 million from the private sector, US$ 15 million from the Government of Senegal and US$ 370 million equivalent provided by the World Bank's International Development Association (IDA). These funds covered the construction of infrastructure, and were coordinated between CETUD, the government of Senegal, and international partners.

The choice of electric technology for the BRT system has increased the BRT infrastructure, fleet, and systems costs (Component 1) by 23%, equivalent to US$ 102 million. This includes US$ 12 million for the BRT infrastructure and system adjustments to electric technology, and a US$ 90 million increase for e-bus rolling stock[74] for a rolling stock total cost of US$ 144 million. Financing was provided to Dakar Mobilité, who directly purchased the rolling stock from CRRC.

[71] Sénégal: mise en service du Bus Rapid Transit (BRT) - Africa24 TV

[72] ITDP Africa The Dakar BRT System's Pioneering Journey Towards Inclusive Electrification in Africa - Institute for Transportation and Development Policy (itdp.org)

[73] World Bank Report No: PAD5385. Additional Financing for Dakar Bus Rapid Transit Pilot Project (P180789)

[74] According to World Bank Report No PAD5385, the cost of the electric fleet is three times higher than the diesel fleet.

Figure 5-8: Financing structure of Dakar BRT

To access the required funds for the e-bus system, the project drew on varied and diverse funding sources:

- As owners of Dakar Mobilité, Meridiam and FONSIS provided the equity.
- Rolling stock and equipment were financed through a EUR 85.4 million loan to Dakar Mobilité from Proparco (the Agence Française de Développement's private sector subsidiary) and the Emerging Africa Infrastructure Fund (EAIF)[75].
- Proparco and EAIF provided an additional loan of EUR 6.4 million to fund the replacement of batteries at the end of their life.
- The EU provided a EUR 7 million grant to support the restructuring of the public transport system.
- The Private Infrastructure Development Group (PIDG) provided an EUR 10 million grant to support viability gap financing.

5.4.4 Risk management and allocation

A structured approach to risk management and allocation should ensure that risks are distributed among multiple stakeholders, enhancing the financial and operational sustainability of the Dakar BRT project. The table below summarizes the principal categories of risk and the actors involved in mitigating them.

Table 5-8: Risk management and allocation for Dakar BRT

Risk category → Stakeholder	**Mitigation strategy**
Political alignment → Government / PTA (CETUD)	Despite strong initial political support for the project's implementation, this support could have been weakened if there had been complaints from citizens. To mitigate this risk, the PTA developed an extensive communication campaign and engaged stakeholders at all stages through various mediums.

[75] "Dakar Mobilité secures financing for first ever 100% electric BRT system in sub-Saharan Africa." Meridiam. November 30, 2023. https://www.meridiam.com/news/dakar-mobilite-secures-financing-for-the-first-ever-100-electric-brt-bus-system-in-sub-saharan-africa/

Risk category → Stakeholder	**Mitigation strategy**
Legal and regulatory → Shared	Ensuring that all stakeholders, including the government, PTA, and operators, collaborate to align the project with existing laws and regulations. Building a shared e-strategy for public transport.[76]
Financial → Financiers (multiple)	Risk shared by multiple stakeholders who provided different financing streams Infrastructure costs were covered through a mix of concessional development finance, private and government funds. The operator was formed through an SPV combining public and private funds. Specific gaps were funded by grants. By making use of blended finance models, exposure of any one stakeholder was limited.
Infrastructure → Government / Financiers (World Bank Group)	The infrastructure is financed by the government with support from the World Bank. As a result, the operator is not required to bear these costs on its balance sheet.
Revenue → Operator (Dakar Mobilité)[77]	MRG used to share risk between operator and PTA Municipal government provided subsidy for social tariff
Operational → Operator (Dakar Mobilité)	Operations are sometimes interrupted by congested intersections. This was managed at the design stage by limiting the number of intersections and grade segregation, and through coordination with other modes of traffic management (traffic lights, traffic police, etc.)
Technology → Operator (Dakar Mobilité)	Technical consultant brought in to smooth transition to e-bus operations (Dakar Mobilité partnered with the French firm Keolis as a technical consultant)
Maintenance → Operator (Dakar Mobilité)	Battery replacement built into procurement contract and financing plan
Safety → Operator (Dakar Mobilité) / PTA (CETUD)	Operator is fully responsible for safety of bus operations on BRT lanes and in BRT terminals. Operator is responsible for safe use and proper maintenance of BRT vehicles. Operator is responsible for appropriate and safe use of charging infrastructure. As ownership of terminals and charging infrastructure is retained by the PTA, it has the responsibility to provide safe and properly maintained charging infrastructure and bus terminals.
Availability of electricity → Operator (Dakar Mobilité) / Energy provider (SENELEC)	Secure Energy provider's commitment to ensure a reliable power supply. Signature of MOU for the installation of a solar power plant dedicated exclusively to supplying electricity to the BRT charging infrastructure
Relationship with informal sector → PTA (CETUD) / Operator (Dakar Mobilité)	Informal sector operators were brought into the BRT system

The paragraphs below present brief narrative elaborations on each of these categories to illustrate how risk was managed in practice.

[76] In late 2024, the GEF approved a project "Supporting the Shift to Electric Mobility in Senegal" which will support coordination between government entities and the development of an e-mobility strategy. https://www.thegef.org/projects-operations/projects/11080

[77] With the minimum revenue guarantee set in the operation contract, the revenue risk is also partly covered by CETUD.

- **Political Alignment** – This risk was considered substantial. Although there was strong political support for the project, this could have been weakened had there been complaints from citizens. This risk was mitigated by CETUD's extensive and focused communication campaign and stakeholder involvement at all project phases and through various mediums (social media, flyers, mainstream press, television, radio dialog platform, dedicated physical center designed to promote the project, etc.).
- **Legal and Regulatory Alignment** – One of the first challenges was ensuring that Dakar's evolving public transport framework was aligned with the BRT's legal and institutional structure. CETUD played a central role in this coordination, acting as both regulator and strategic planner. The BRT's development benefited from strong collaboration across ministries and agencies, ensuring legal clarity and institutional backing, especially important given the novel aspects of right-of ways and e-mobility transportation?.
- **Financial Risk Sharing** – To reduce financial exposure and increase project bankability, Dakar's BRT project adopted a layered financing structure. This involved a mix of public and private funds, including grants, concessional loans, and equity. By diversifying funding sources the project spread financial risk and attracted development finance institutions and private investors. This structure increased resilience against potential funding gaps or delays.
- **Revenue Risk Mitigation** – Revenue shortfalls are a common challenge for transit systems. Dakar Mobilité operates under a net cost contract with a Minimum Revenue Guarantee (MRG), significantly limiting the operator's revenue risk and sharing some risk with the public transport authority. Additionally, to ensure affordability, the government introduced a social fare subsidy that provides discounted travel for vulnerable users. These mechanisms strike a balance between financial viability and social equity, and it allows the operator to finance and assume the technological risk associated with the rolling stock.
- **Managing Technological Transition** – Introducing e-buses required a steep learning curve. To manage this risk, Dakar Mobilité partnered with the French firm Keolis as a technical consultant. Keolis brought global experience in BRT and e-mobility operations, which proved critical in managing the technology shift and ensuring successful deployment and operations.
- **Ensuring Sustainable Maintenance** – A key risk with electric fleets is the long-term cost and management of battery maintenance. From the outset, battery replacement was included in the procurement contract and financing plan. A specific loan from Proparco and EAIF was dedicated to end-of-life battery replacement, ensuring continued performance of the fleet and long-term sustainability of service.
- **Operational Safety Measures** – CETUD retained ownership of key infrastructure such as charging stations and passenger terminals, enabling centralized oversight of safety and maintenance standards. This co-ownership model reduces the burden on the operator while allowing for clear lines of accountability and risk sharing between CETUD and Dakar Mobilité. This will make it easier to renew at the end of the concession and allow any potential new operator to have access to equipped and suitable depots
- **Electricity Supply Assurance** – To address the reliability of power supply, the project involves the commitment[78] of SENELEC (National Electricity Company of Senegal) to support electricity supply. The aim is to leverage a captive power plant. An agreement protocol has been signed[79] to install a 20 MW solar power plant with a storage capacity of 88 MWh per day, exclusively intended to power the buses of the BRT network. This mitigates the risk of power outages disrupting service and sets a precedent for integrated power planning in public transport.

[78] https://www.senelec.sn/actualites-medias/visite-de-chantier-du-projet-pilote-du-brt-a-gadaye-

[79] https://www.senelec.sn/actualites-medias/signature-de-convention-entre-brt-meridiam-et-senelec

- **Integration with the Informal Sector** – An analysis[80] by the International Transport Workers' Federation (ITF) prior to the BRT rollout found that 30% of informal paratransit workers expressed concern over the need for integration into the BRT system. As part of the project implementation, Dakar Mobilité trained former paratransit drivers to transition into roles as BRT drivers and other support staff, with the project expected to create 1,000 direct jobs. In parallel, efforts included scrapping aging vehicles and restricting incumbent paratransit operations along the BRT corridor, while offering operators the opportunity to integrate into the formal system. Despite formalization efforts, residual paratransit services are expected to persist along the corridor, especially in areas with lower enforcement. The extent of enforcement and the inclusion of paratransit as feeder services will ultimately shape the evolving relationship between informal transport and the BRT.

5.4.5 Key lessons for other West African cities

The development and implementation of the Dakar BRT provide valuable insights for other West African cities looking to establish sustainable and efficient public transit systems. Key lessons from Dakar's experience highlight critical factors such as investment mobilization, private sector participation, conflict resolution with existing operators, and energy security—offering a roadmap for cities aiming to transition towards modern, electrified public transport systems.

- The financing structure of the BRT reveals the advantages of a layered approach, incorporating EUR 369 million from a variety of sources including international development partners, development funds and infrastructure financing facilities. The World Bank provided the majority of infrastructure financing, combined with funds put forward by the concessionaire (Dakar Mobilité), the EIB, the EU, and the government of Senegal. Rolling stock and battery replacement were covered by a loan from Proparco and the EAIF, while viability gap financing was provided via a grant by the PIDG. The strategic use of public and donor funds to build high quality infrastructure was in this case successfully used as a seed to encourage private investment in the form of Meridiam's large equity stake in Dakar Mobilité.
- The involvement of Meridiam as a majority owner of the bus operator along with FONSIS is a novel solution that increased investor confidence. This was achieved through risk-sharing, long-term commitment, and the integration of international expertise, particularly via its technical partnership with Keolis. The case also highlights the potential of sovereign wealth funds and other infrastructure financing mechanisms to catalyze the growth of e-mobility. While there are no other specific examples of sovereign wealth funds investing in e-buses in Western Africa, there are notable international instances. The China Investment Corporation (CIC) has plans to invest in BYD's e-bus manufacturing plants in Mexico. In Qatar, the Qatar Investment Authority (QIA) is planning to invest in the Zero Emission Public Transport by 2030 initiative. Additionally, in Jakarta, sovereign wealth funds have been considered as grant issuers, providing seed funding to support the procurement of e-buses.
- The Dakar BRT addressed potential conflicts with existing paratransit operators by incorporating them into the system's operational plan, thereby preserving livelihoods and ensuring service continuity. These efforts included providing training and jobs to around 1,000 paratransit operators and leveraging existing paratransit routes as feeders to the BRT. It should be noted that these efforts synergize with Dakar's ongoing AFTU program, which provided a path to formalization and fleet renewal to paratransit cooperatives.
- Dakar Mobilité is able to fund its operations through farebox revenue, while the operator's exposure to revenue risk is limited by a MRG provided by CETUD. In addition, the Senegalese government provides a targeted subsidy to the operator to establish a social tariff. This type

[80] https://www.itfglobal.org/sites/default/files/node/resources/files/2020%20Dakar%20BRT%20LIA%20EN.pdf

of arrangement balances the need to provide inclusive public transit to low-income residents while developing a strong enough business case to attract international investment. The use of targeted subsidies to fund specific programs, and a MRG to cover the operator's revenue risk, limits the perceived subsidy risk of the system making it more attractive to international investors.

– A captive power plant can help addressing the challenge of poor power grid reliability. Future investments will be needed to increase the share of renewable energy used to power the buses, to reap the full benefits of e-bus deployment. As Dakar Mobilité deploys additional buses, it will be necessary to ensure that investments in power grid capacity keep pace with demand.

The Dakar BRT project demonstrates how strategic partnerships, innovative financing structures, and proactive stakeholder engagement can help overcome common challenges associated with large-scale transport infrastructure projects. It is important to note that the example of the Dakar BRT combines many tools and practices applied in other contexts but does not follow a "one-size-fits-all" model. Other West African cities could follow this philosophy, picking and choosing tools to fit their particular operational contexts, leveraging existing relationships with international partners, identifying new sources of financing, and leveraging blended approaches to distribute risk and deliver a successful project.

5.5 Recommendations for Commercial and Financial Arrangements

The following section will begin with some key global considerations for e-bus deployment that must be taken into account for all project cities. It will then proceed with a discussion for the appropriate series of steps that should be taken for the deployment of e-buses and conclude with high-level recommendations tailored for each city.

5.5.1 Key considerations for e-bus deployment

5.5.1.1 EV batteries

The key element that distinguishes e-buses technologically, commercially and operationally from ICE buses is the battery. An accurate understanding of the way this key component is managed can contribute to a definition of the organisation of e-bus deployment. This approach also allows to understand what aspects of the e-bus deployment organisation are specifically related to power supply and what components are common to any public transport project.

Several aspects need to be addressed: Who supplies the battery (and the bus chassis)? Who finances it? Who owns it? Who charges it? Who maintains it? Who replaces it at the end of its lifecycle? Who disposes of the used ones?

Giving the proper answers to this set of question allows to understand the different possible options with a clear understanding of what is power specific and what is not. These answers are specific to a city context and to the type and scale of bus deployment (numbers of units, types of services from BRT to minibuses, etc.).

Some examples can highlight the different possible options:

– **Third party approach**: Bus services can be transitioned to electric with a dedicated company (battery/rolling stock company) providing the batteries and caring for their charging and maintenance. For the rest, the company also provides buses/minibuses but leaves the choice fully open to own, lease or rent the vehicle, thus fitting with different types of business organisation and leaving public transport organisation to operators. Manufacturers, energy providers or dedicated companies can play this role. This

organisation has the advantage to free the operators from power aspects and leave them to concentrate on their core skills. This approach can fit well with small (even individual) operators.

- **Operator approach**: the operator takes the responsibility to buy, own, charge, maintain and replace the battery. These responsibilities go beyond public transport operation but allow for the control of operation inputs and to ensure the reliability and availability of the vehicles in the bus operation plan. This organisation also allows to have a closer control of costs. The operator needs specific training and certification to assume these new responsibilities. However, a maintenance contract can be signed with the manufacturer to commission him over all technical aspects. Electricity provision and charging can also be contracted to a provider. This level of responsibility requires the operator to have significant size and capacity.
- **Public transport authority approach**: the PTA can take the same responsibility as operators to buy, own, charge, maintain and replace the battery. They would then lease or rent the buses to operators. Contracts can be signed with the manufacturer to care for technical aspects (battery maintenance and replacement) and with an energy provider to provide chargers and electricity.

Some variations can be brought to these examples according to how battery responsibilities and risks are shared between the different stakeholders. More broadly, this battery organization will fit in different public transport organisations (ownership of rolling stock, type of public operation contract, etc.).

5.5.1.2 Conditions for successful e-bus deployment

Before e-buses can be deployed, a few preconditions should ideally be met:

- **Institutional framework and capacity** – E-bus deployment is most feasible in cities where a strong public transport authority is present, with a broad purview over public transport and experience working with formal sector operators. Dakar, the only city where e-buses have been deployed at-scale in West Africa, is a strong example. The city has a public transport authority, CETUD, which has a track record of delivering complex transport projects and a broad mandate for improving public transport. As an empowered public body, CETUD inspired sufficient confidence from investors and international partners to lead the BRT project, attract financing, and oversee e-bus operations. Without a strong institutional framework, this would have been far more difficult to achieve.
- **Policy and regulatory frameworks** – E-buses come with a set of novel policy, regulatory and standards related concerns, especially concerning batteries and charging infrastructure. Cities with strong frameworks in place, including a roadmap or strategy for e-mobility, technical standards for e-buses and charging infrastructure, clear procurement rules, battery disposal policies, operational guidelines, and financial incentives will more easily be able to deploy e-buses successfully.
- **Energy availability and renewable mix** – Without a consistent supply of reliable electricity, e-bus charging is not feasible. Frequent disruptions to electricity supply or rolling shortages will make the deployment of e-buses extremely difficult, without compensatory measures like the construction of microgrids or captive power plants. In addition to these concerns, the energy mix of energy supply is important to consider. If the electricity for e-buses is produced through the burning of fossil fuels, the net reduction in emissions will be significantly smaller, significantly weakening the environmental case for e-buses. However, it is important to note that throughout the lifespan of a bus electrification project, the greening of the electric grid can occur in stages and is not a prerequisite for the project's initiation. There is no need to wait for a fully decarbonized electricity supply for e-buses to achieve significant CO2 emission reductions in their usage (GHG assessments should be carried out to evaluate the full life cycle impact).

Currently, none of the project cities have a fully comprehensive policy and regulatory framework, and all face challenges in the reliability of their electricity grid and rely heavily on fossil fuels for energy production. This does not necessarily mean that e-buses cannot be deployed in these cities. In Dakar, for instance, e-buses have been successfully deployed despite a high share of fossil fuels in the city's energy mix and a non-comprehensive policy and regulatory framework. Nonetheless, strengthening these two aspects should be a priority in all project cities.

The project cities vary in the strength and capacity of their institutional structures. Dakar, Lagos, Abidjan and to some extent Accra have the necessary institutional structures in place to successfully deploy e-buses at scale. For cities like Lomé and Freetown, the priority should be continued support for the institutional strengthening of public transport authorities and restructuring of the paratransit sector. There may still be options for e-bus deployment, particularly at a smaller scale in the paratransit sector, but large-scale deployment is not feasible now.

5.5.1.3 360 degrees e-bus deployment

It is important to consider e-bus deployment in a holistic manner encompassing all scales of public transport, from BRT to paratransit.

Formal sector

On one end of the scale, e-buses can be deployed by large formal operators covering BRT or formal bus services. Dakar is a showcase for this scale, with Dakar Mobilité being the BRT operator and owner of e-buses, responsible for charging, operation and maintenance. However, it is also important to be cautious with existing formal operating companies which can have fragile business plans relying on public subsidies and may not be robust enough to accommodate e-bus deployment.

Paratransit

At the other end of the scale, e-bus deployment can be considered with regard to paratransit, which provides the large majority of public transport in the six cities. Given the number of trips this mode covers, the effect of e-bus deployment in the paratransit sector could have a very large impact. However, this would require a transition to more organised transport from the current informal situation to allow e-bus deployment to be carried out in sound economic conditions. As small scale (sometimes individual) operators don't have the capacity to charge and maintain batteries, some arrangements need to be taken to have it mutualised through a third party or the PTA.

Market potential can be taken from these two scales, large one and small one to multiply the opportunities of e-bus deployment.

5.5.1.4 Pathway to e-bus deployment

Given the findings of this and the previous report, it is possible to define a general pathway to e-bus deployment. For those cities that possess the institutional prerequisites for e-bus deployment, commercial and financial arrangements will have to encompass the entire lifecycle of e-buses: electricity production and availability; battery provision, charging and maintenance; public transport operations and battery disposal.

Key milestones and challenges to address are:

– **Electricity Production and Availability** – Cities must ensure a reliable and sustainable source of electricity. This involves collaboration with national and other energy providers to secure power production licenses or establish dedicated power units and distribution

networks. The challenge lies in guaranteeing power availability and reliability, especially during peak demand periods.

- **Battery Provision** – The provision of batteries is critical, as the cost, reliability, and lifespan of batteries significantly impact the adoption of e-buses. Cities need to establish partnerships with battery manufacturers and bus manufacturers to manage the lifecycle of batteries effectively. This includes direct purchase or leasing arrangement and after life management (cf. Battery Disposal).
- **Charging Infrastructure** – Developing robust charging infrastructure is essential for the efficient operation of e-buses. This includes depot charging and overnight charging facilities. Cities must work with energy providers and public transport authorities to install and maintain these facilities, ensuring they meet the operational needs of the bus fleet.
- **Maintenance** – Regular maintenance of batteries and vehicles is crucial to ensure their longevity and reliability. Cities should establish contracts with bus operators or third-party service providers for comprehensive maintenance services, including battery health monitoring and availability of spare parts.
- **Public Transport Operations** – Effective service planning, scheduling, driver training, fare collection, and customer service are vital for the successful operation of e-buses. Cities must formalize these operations through contracts between bus operators and public transport authorities, ensuring high standards of service and operational efficiency.
- **Battery Disposal** – At the end of their lifecycle, batteries must be disposed of responsibly. This involves exploring second-life applications and recycling processes to minimize environmental impact. Cities should collaborate with bus operators and battery manufacturers to implement sustainable management practices.

The Figure below provides a schematic overview of these key concerns.

Figure 5-9: The what, who and how of e-bus deployment

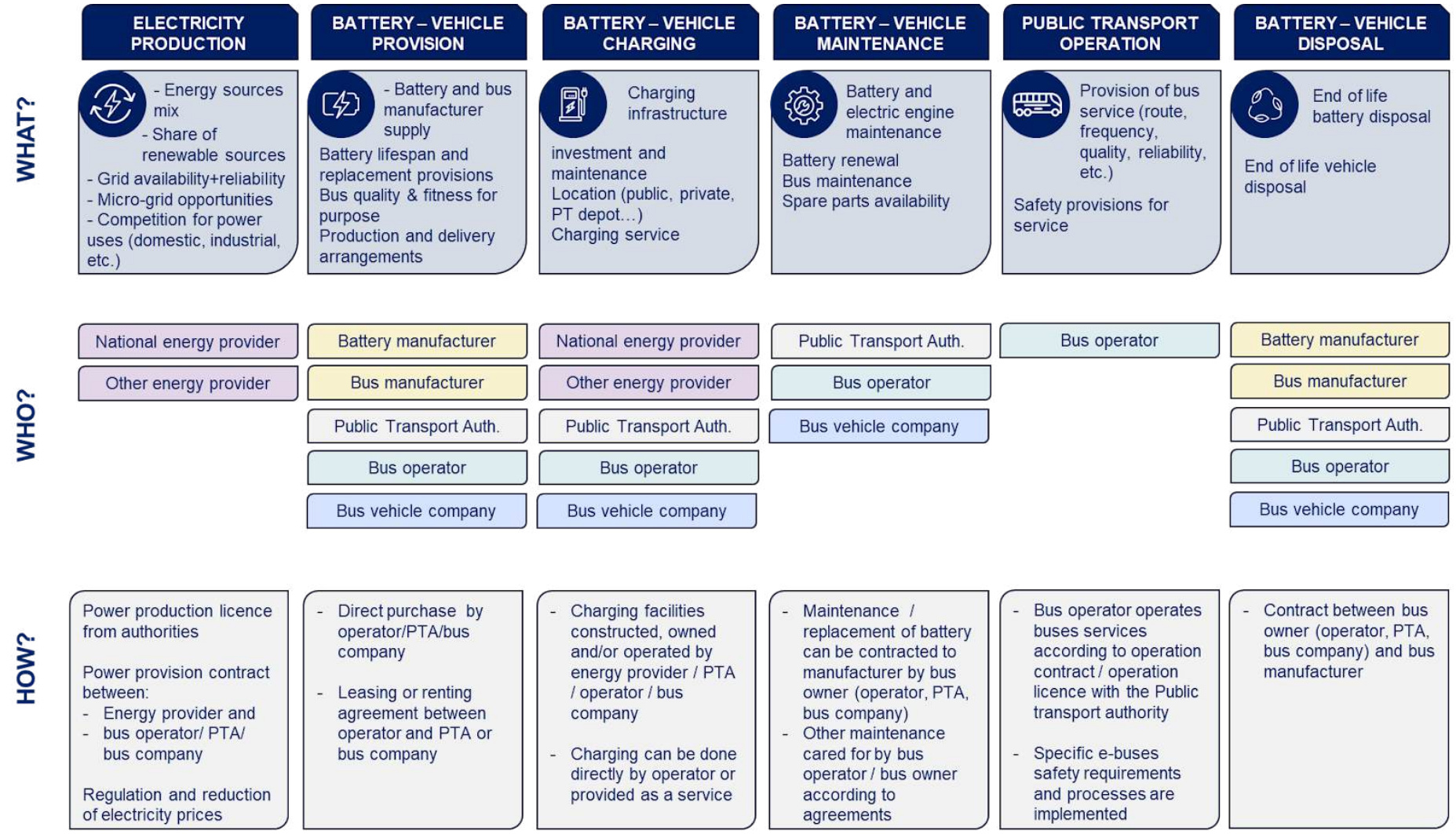


Figure 5-10: Roles and responsibilities of different stakeholders

National energy provider	Supplier of power on the national grid. Provide power for different users (households, services, industries, etc.). Supposed to guarantee power availability and reliability (according to context, not granted)
Other energy provider	Smaller power provider through dedicated power units and distribution network (micro grid). Opportunity to guarantee power availability and reliability and to keep costs under control.
Battery manufacturer Bus manufacturer	The key distinctive piece of an e-bus is its battery (along with electric engine). Cost, reliability or lifespan of the battery are crucial factors for ebus capex and opex. Maintenance and replacement aspects are key factors to be integrated.
Public Transport Authority	Public Transport Authority regulates urban public transport. Competences can be gathered in a single body or dispatched between different metropolitan / national bodies. It provides bus operation licences or signs bus operation contracts. It can own or lease the e-buses or leave that to operators or bus vehicle companies.
Bus operator	The bus operator provides bus services with different levels of formalisation (route, stops, frequency) and different types of vehicles (capacity, comfort). It is contracted or licensed by the PTA. Status of ownership of buses vary (full ownership, leasing, renting). Bus provider can be manufacturer, bus dealer, PTA or vehicle company
Bus / battery company	The bus or battery company is a third party that acts as a middleman, renting/leasing the bus or battery asset, typically to the operator. In a renting arrangement, this company retains ownership of the asset throughout the term of the contract while in a leasing arrangement the operator (or potentially PT authority) has the opportunity to purchase the asset at the end of the contract term.
Financiers	Support the investments through loans, leases, or other financial tools. They play a key role in ensuring liquidity for stakeholders. These actors may include banks, development institutions, and/or private partners.

One of the key questions is the distribution of responsibilities and risk between key stakeholders.

As the primary user of the buses, the operator holds the main responsibility for maintenance and meeting operational standards.

However, the financial and risk burden on the operator can be reduced through the involvement of additional key stakeholders. The public transport authority can provide revenue guarantees and targeted subsidies to supplement CAPEX or the provision of social tariffs. Energy providers can play a major role both in energy provision and potentially the maintenance of charging infrastructure as well. The financial and risk burden on operators can be further reduced through leasing or renting arrangements with vehicle or battery manufacturers, or third-party renting/leasing companies.

While there are near-limitless different combinations of commercial and financial arrangements that can be used in the deployment of e-buses, the overarching concern of these instruments is the distribution of risk and responsibility between these actors. Specific choices of financial and commercial arrangements will have to be made based on the specific goals and circumstances of governments, public transport authorities and operators.

6 Conclusions and Recommendations

Based on the findings of this report, the following section will identify the main challenges and opportunities facing e-bus deployment in each city and categorize each city based on readiness level. It will then provide a set of recommendations based on the readiness level of each city, identifying key next steps to be taken to accelerate e-bus deployment in the West Africa region.

6.1 Challenges and Opportunities for E-Bus Deployment

Global opportunities for e-bus deployment include:

- **Empowerment of urban transport authorities** – Many project cities either possess strong urban public transport authorities (Lagos, Dakar) or are in the process of strengthening new bodies (Abidjan, Accra, Freetown).
- **Plans for expansions of bus networks** – Several project cities are in the process of developing BRT systems (Dakar, Lagos, Abidjan, Accra),
- **Plans for paratransit transition** - almost all cities are in the process of consolidating and professionalizing paratransit operations along key corridors.
- **Development of e-mobility strategies** – Many project cities have developed or are in the process of developing e-mobility strategies to guide their future efforts.

Global challenges for e-bus deployment include:

- **Lack of regulatory frameworks for e-mobility** – No project city has a comprehensive regulatory framework for e-bus deployment. This challenge often needs to be addressed at national level.
- **High mode share of paratransit** – The vast majority of trips in all project cities are taken via paratransit, with formal networks occupying a small share.
- **Traffic congestion** – All project cities exhibit high levels of traffic congestion, lowering operating speeds and necessitating the deployment of additional buses.
- **Unsustainable sources of power** – The energy mix in all project cities is highly reliant on fossil fuels.
- **Unreliable power grids** – Power grids in all project cities are unreliable, with frequent disruptions.
- **Lack of government support** – Government support at the national, state or municipal level for e-mobility and e-bus deployment is often sporadic or lacking.
- **Lack of access to climate finance** – cities currently struggle to access climate finance for e-mobility and e-bus deployment due to a lack of technical capacity and unfamiliarity with funding procedures. The conducting of emission reduction assessments for e-bus deployment would be a potential starting place for attracting climate financing.

6.1.1 Lagos, Nigeria

6.1.1.1 Opportunities

- **Strong public transport authority** – LAMATA is a strong public transport authority with a track record of implementing complex projects and managing the interests of

multiple stakeholders. It has the capacity to act as a strong champion for e-bus deployment.

- **Ongoing e-bus pilot and clear roadmap for expansion** – Lagos is currently piloting e-buses on some BRT routs, and the E-Trans study provides a clear roadmap for future efforts. By following the recommendations of this strategy, Lagos is well positioned to deploy e-buses more broadly. Additional technical assistance that could help includes micro-grid support, to help address grid capacity constraints at e-bus depots.
- **Ongoing restructuring strategy for paratransit** – the Bus Industry Transition Program (BITP) is an opportunity to bring paratransit operators into the formal system along Quality Bus Corridors (QBCs) and possibly bring in e-minibuses.
- **Favourable terrain for e-buses** – Lagos's terrain is relatively flat, with few large elevation changes except in the urban periphery. This terrain will allow e-buses to operate more efficiently.
- **Strong demand for public transport** – Lagos's public transport system has strong demand and extremely high ridership of different modes. This means that, if tariffs are set strategically, that farebox recovery could be very strong.

6.1.1.2 Challenges

- **Lack of legal and regulatory framework –** Nigeria currently does not have a legal and regulatory framework for e-mobility, with provisions for technical standards for vehicles and charging infrastructure, licensing requirements and financial incentives. The "E-Trans" Study provides a roadmap for the development of a more comprehensive framework.
- **High mode share of paratransit** – Despite recent efforts to expand formal public transport options like BRT and light rail, an exceptionally high share of passenger trips in Lagos are still serviced by paratransit. Efforts like the Bus Industry Transition Program (BITP) are steps in the right direction, but for the moment are still pilot schemes and are not yet developed at a full scale.
- **Traffic congestion** – Lagos's main transport corridors are highly congested, leading to a low average operating speed. Large portions of Lagos's existing BRT network are not grade-separated, mitigating potential speed gains from BRT. As a result, a larger number of buses is required to maintain reasonable headways.
- **Unsustainable sources of energy** – The majority of Lagos's electricity is derived from fossil fuels, mostly natural gas. As a result, the reduction in overall emissions from a transition to e-buses will be more limited. This is partially mitigated by Nigeria's relatively large share of hydropower (over 20%), but nonetheless e-bus deployment must be accompanied by efforts to green Nigeria's power grid or develop renewable energy-fuelled microgrids.
- **Low power grid reliability** – Lagos's power supply is unreliable, posing challenges for EV charging. EV deployment must be accompanied by efforts to make the grid more reliable or develop renewable energy-fuelled microgrids.
- **Strong competition from fossil fuel** – Nigeria ranks 17th among the world producers of natural gas and plans to use it to fuel a part of its bus fleet. Competitive advantage of natural gas is very strong and allows some significant gains of bus emissions when compared to conventional diesel. The incentive to go for e-buses may then be reduced.

- **Competition from other sources of renewable energy** – Lagos is planning to develop the production of biogas to fuel a part of its buses, which could be a limit to the development of e-buses.
- **Access to finance** – While Nigeria has a relatively well-developed financial sector compared to the other project countries, access to finance remains a challenge. Due to the lack of investor confidence in many public Nigerian entities, raising capital can be a challenge.

6.1.2 Lomé , Togo

6.1.2.1 Opportunities

- **Financial incentives for EVs** – Togo has already put in custom duty exemptions for the import of EVs. Such subsidies can contribute greatly to the competitiveness of EVs and is a signal that the government is serious about expanding e-mobility.
- **Development of SUMP** – Lome is currently in the progress of developing a SUMP, which provides a vital opportunity to coordinate the actions of different stakeholders and agree on a clear vision for the development of e-mobility
- **GEF and GCF e-mobility projects** – The GEF and the GCF both have major e-mobility projects in Togo, which are helping to define strategies and policies for the sector, sensitize the key stakeholders, coordinate government actions, and pilot new solutions.

6.1.2.2 Challenges

- **Lack of e-mobility strategy** – Togo currently does not have an e-mobility strategy or regulatory reform roadmap in place, though one is currently under development with the support of GEF and UNEP.
- **Lack of legal and regulatory framework** – Togo currently does not have a legal and regulatory framework for e-mobility, with provisions for technical standards for vehicles and charging infrastructure and licensing requirements. However, the e-mobility strategy and fiscal and regulatory reforms currently being developed with the support of UNEP and GEF could help fill this gap.
- **Lack of urban public transport authority** – Despite ongoing decentralisation efforts, urban transport in Lomé is still largely managed at the level of the national government. The lack of a single urban public transport authority makes the coordination of different actions more difficult and means that there is not a clear champion to steer e-bus deployment.
- **High mode share of paratransit** – The vast majority of trips in Lomé are taken via paratransit, mostly via two or three-wheelers. Paratransit operators will have to play a major role in further consolidation of the city's bus network and future deployment of e-buses.
- **Traffic congestion** – Lomé's main transport corridors are highly congested, leading to a low average operating speed. As a result, a larger number of buses would be required to maintain reasonable headways.
- **Unsustainable sources of energy** – The majority of Lomé's electricity is derived from fossil fuels, mostly natural gas. As a result, the reduction in overall emissions from a transition to e-buses will be more limited. This is partially mitigated by Togo's relatively large share of solar photovoltaic (over 10%), but nonetheless e-bus deployment must be accompanied by efforts to green Togo's power grid or develop renewable energy-fuelled microgrids.

- **Low power grid reliability** – Lomé's power supply is unreliable, posing challenges for EV charging. EV deployment must be accompanied by efforts to make the grid more reliable or develop renewable energy-fuelled microgrids.
- **Access to finance** – Togo has a poorly developed financial sector. Due to the lack of investor confidence in many public entities, raising capital can be a challenge.

6.1.3 Accra, Ghana

6.1.3.1 Opportunities

- **National EV strategy provides a roadmap** – Ghana's national EV strategy provides several recommendations which, if implemented, would significantly spur the development of e-mobility in the country. However, this strategy makes few references to e-buses specifically.
  - **Plans for deployment of e-buses** – Accra is in the process of developing its first BRT network and is exploring options for the deployment of e-buses. This presents a strong opportunity for knowledge sharing and dissemination of best practices.
  - **Potential restructuring of paratransit** – If adequately supported to renew the sector, paratransit operators can play a major role in further consolidation of the city's bus network and of future deployment of e-minibuses.
  - **Private companies such as Smart Transyt deploying e-buses** – Ghana has a dynamic private sector that is independently developing e-buses for use in the paratransit sector. These companies are a vital source of innovation creating new solutions that could be scaled up.

6.1.3.2 Challenges

- **Lack of a strong urban public transport authority** – Compared to other urban public transport authorities in West Africa, GAPTE has less capacity due to the relatively unsuccessful development of Accra's BRT. However, it is taking bold action to restart the city's BRT and expand its remit.
- **Lack of legal and regulatory framework** – Ghana currently does not have a legal and regulatory framework for e-mobility, with provisions for technical standards for vehicles and charging infrastructure, licensing requirements and financial incentives. Ghana's e-mobility strategy offers strong recommendations to develop the regulatory framework, which should ideally be implemented.
- **High mode share of paratransit** – A high share of passenger trips in Accra are serviced by paratransit (trotros). If no restructuration steps are taken, paratransit minibuses will keep relying on conventional diesel to run.
- **Traffic congestion** – Accra's main transport corridors are highly congested, leading to a low average operating speed. As a result, a larger number of buses is required to maintain reasonable headways. Efforts like the future development of the city's BRT network could help relieve congestion.
- **Unsustainable sources of energy** – The majority of Accra's electricity is derived from fossil fuels, mostly natural gas. As a result, the reduction in overall emissions from a transition to e-buses will be more limited. This is partially mitigated by Ghana's exceptionally large share of hydropower (over 35%), but nonetheless e-bus deployment must be accompanied by efforts to green Ghana's power grid or develop renewable energy-fuelled microgrids.

- **Very low power grid reliability** – Accra's power supply is particularly unreliable compared to other project cities, posing challenges for EV charging. EV deployment must be accompanied by efforts to make the grid more reliable or develop renewable energy-fuelled microgrids.
- **Access to finance** – Ghana has a poorly developed financial sector. Due to the lack of investor confidence in many public entities, raising capital can be a challenge.

6.1.4 Abidjan, Côte d'Ivoire

6.1.4.1 Opportunities

- **Recently empowered public transport authority** – AMUGA has rapidly increased its capacity recently and is beginning to undertake ambitious projects to transform urban transport in Abidjan. It increasingly has the capacity to act as a strong champion for e-bus deployment.
- **Ambitious pipeline of projects** – Abidjan is in the process of developing its first BRT line, which it plans to operate with e-buses.
- **Potential restructuring of paratransit** – If adequately supported to renew the sector, paratransit operators can play a major role in further consolidation of the city's bus network and of future deployment of e-minibuses.

6.1.4.2 Challenges

- **Lack of e-mobility strategy** – Côte d'Ivoire currently does not have an e-mobility strategy or regulatory reform roadmap in place. As Abidjan begins to deploy e-buses on certain corridors, this could hamper the coordination of initiatives by different actors. The development of an e-mobility strategy is currently underway with GEF support as part of the "Côte d'Ivoire e-mobility" project.
- **Lack of legal and regulatory framework** – Côte d'Ivoire currently does not have a legal and regulatory framework for e-mobility, with provisions for technical standards for vehicles and charging infrastructure, licensing requirements and financial incentives. These are under development by the GEF project.
- **High mode share of paratransit** – A high share of passenger trips in Abidjan are serviced by paratransit. If no restructuration steps are taken, paratransit minibuses will keep relying on conventional diesel to run.
- **Traffic congestion** – Abidjan's main transport corridors are highly congested, leading to a low average operating speed. As a result, a larger number of buses is required to maintain reasonable headways. Efforts like the future development of the city's BRT network could help relieve congestion.
- **Unsustainable sources of energy** – The majority of Abidjan's electricity is derived from fossil fuels, mostly natural gas. As a result, the reduction in overall emissions from a transition to e-buses will be more limited. This is partially mitigated by Côte d'Ivoire's relatively large share of hydropower (over 20%), but nonetheless e-bus deployment must be accompanied by efforts to green Côte d'Ivoire's power grid or develop renewable energy-fuelled microgrids.
- **Low power grid reliability** – Abidjan's power supply is unreliable, posing challenges for EV charging. EV deployment must be accompanied by efforts to make the grid more reliable or develop renewable energy-fuelled microgrids.

- **Access to finance** – Côte d'Ivoire has a poorly developed financial sector. Due to the lack of investor confidence in many public entities, raising capital can be a challenge. However, the country does benefit from a stable currency through its use of the CFA.

6.1.5 Freetown, Sierra Leone

6.1.5.1 Opportunities

- **Strong e-mobility strategy** – Sierra Leone has a robust e-mobility strategy that offers a clear roadmap for the further expansion of e-mobility.
- **Ambitious efforts to reform public transport** – SLPTA has recently been empowered as a public transport authority, and ongoing efforts to consolidate Freetown's main bus corridors offer potential opportunities for e-bus deployment.
- **Potential restructuring of paratransit** – If adequately supported to renew the sector, paratransit operators can play a major role in further consolidation of the city's bus network and of future deployment of e-minibuses.

6.1.5.2 Challenges

- **Lack of legal and regulatory framework** – Sierra Leone currently does not have a legal and regulatory framework for e-mobility, with provisions for technical standards for vehicles and charging infrastructure, licensing requirements and financial incentives. Sierra Leone's e-mobility strategy offers strong recommendations to develop the regulatory framework, which should ideally be implemented.
- **High mode share of paratransit** – Efforts to develop a formal public transport system in Freetown are still in early stages, and the vast majority of trips are taken via paratransit. If no restructuration steps are taken, paratransit will keep relying on conventional fossil fuel to run.
- **Unfavourable terrain for e-bus deployment** – Freetown has highly hilly terrain, posing an operational challenge for e-bus deployment. Appropriate corridors will have to be chosen to ensure that e-buses are technically viable.
- **Traffic congestion** – Freetown's main transport corridors are highly congested, leading to a low average operating speed. As a result, a larger number of buses would be required to maintain reasonable headways.
- **Unsustainable sources of energy** – A significant portion of Sierra Leone's electricity is derived from unsustainable sources, mostly natural gas. As a result, the reduction in overall emissions from a transition to e-buses will be more limited. E-bus deployment must be accompanied by efforts to green Sierra Leone's power grid or develop renewable energy-fuelled microgrids.
- **Low power grid reliability** – Freetown's power supply is unreliable, posing challenges for EV charging. EV deployment must be accompanied by efforts to make the grid more reliable or develop renewable energy-fuelled microgrids.
- **Access to finance** – Sierra Leone has a poorly developed financial sector. Due to the lack of investor confidence in many public entities, raising capital can be a challenge.

6.1.6 Dakar, Senegal

6.1.6.1 Opportunities

- **Large numbers of e-buses deployed and ambitious plans for expansion –** Dakar has deployed by far the most e-buses of any project city, with 121 in circulation and plans to

deploy 100 more. Dakar's experiences will generate significant learning opportunities both for CETUD and other cities, attract additional funding and can serve as a potential model.

- **Strong public transport authority** – CETUD is a strong public transport authority with a track record of implementing complex projects and managing the interests of multiple stakeholders. It is already acting as a strong champion for e-bus deployment.
- **Organised paratransit** – Dakar has been supporting and organising paratransit operators for over 20 years, especially through the organisation of vehicle procurement. This could be an opportunity to consider the deployment of e-minibuses.

6.1.6.2 Challenges

- **Lack of e-mobility strategy –** Senegal currently does not have a national e-mobility strategy, and CETUD has not developed a formal e-bus deployment or e-mobility strategy. While this has not hampered its efforts so far, the development of a strategy would help coordinate the efforts of different stakeholders.
- **Gaps in regulatory framework** – Senegal currently has several gaps in its e-mobility regulatory framework, including no financial incentives for e-mobility and a lack of technical standards for buses and charging infrastructure. As CETUD's e-bus fleet expands, this could hamper its efforts and limit benefits for other aspects of the e-mobility ecosystem.
- **High mode share of paratransit** – Despite recent efforts to expand formal public transport options like BRT and regional rail, a high share of passenger trips in Dakar are still serviced by paratransit with minibuses running on conventional diesel.
- **Traffic congestion** – Dakar's main transport corridors are highly congested, leading to a low average operating speed. As a result, a larger number of buses is required to maintain reasonable headways. Efforts like the future expansion of the city's BRT network could help relieve congestion.
- **Very unsustainable sources of energy** – A particularly high share of Dakar's electricity is derived from oil, giving it the highest grid emissions factor of all project cities. As a result, the overall emissions reduction from introducing EVs will be relatively low. Efforts to expand e-mobility and deploy e-buses must be accompanied by efforts to green Senegal's power grid or develop renewable energy-fuelled microgrids.
- **Low power grid reliability** – Dakar's power supply is unreliable, posing challenges for EV charging. EV deployment must be accompanied by efforts to make the grid more reliable or develop renewable energy-fuelled microgrids.
- **Access to finance** – Senegal has a poorly developed financial sector. Due to the lack of investor confidence in many public entities, raising capital can be a challenge.

6.2 Next steps and recommendations

Based on the challenges and opportunities to e-bus deployment described in the previous section, the project cities can be broadly placed in three readiness levels. This classification helps identify tailored priority actions that reflect each city's current capacity to address key barriers and leverage strategic opportunities for electric bus deployment:

- **Leaders in e-bus deployment** – Cities that have already deployed e-buses at scale and are now focused on consolidating progress, deepening regulatory and energy frameworks, and sharing expertise with peers.

- **Ready for e-bus deployment** – Cities that possess many of the prerequisites for deployment, including pilot projects and planned infrastructure, but require support to mobilize financing, structure risk-sharing models, and scale operations.
- **Laying the foundation** – Cities at an early stage of readiness, where priority actions should focus on strengthening institutions, formalizing transport networks, and preparing the energy and regulatory environment for future deployment.

6.2.1 Leaders in e-bus deployment (Dakar)

Knowledge sharing and leadership –

As the only West African city that has deployed a significant number of e-buses. Dakar is well positioned to play a role as thought leader. Dakar's e-BRT was developed through innovative commercial and financial arrangements that brought many different stakeholders together, distributing risk and reducing the financial burden on public authorities. This could serve as a strong model for other cities in West Africa and beyond. Dakar should participate in international workshops and learning exchanges. Best practices from Dakar should be incorporated into IFI technical assistance offerings in West Africa. Technical experts in Dakar should be leveraged to support other cities in the region hoping to deploy e-buses.

Building on existing paratransit fleet renewal program –

Dakar's AFTU has been highly successful at integrating paratransit operators into the formal transit system and at placing old, highly polluting minibuses with newer and more efficient models. This system could potentially be adjusted to facilitate the deployment of e-buses in the paratransit sector. If successful, this could be a potential model for other cities interested in increasing the sustainability of the paratransit sector.

Improvement of renewable energy –

Dakar's electricity grid currently uses one of the largest shares of fossil fuels of the project city. Greening of the main grid or the development of renewable energy microgrids would greatly enhance the positive environmental impact of e-bus deployment and should be a priority for the city. This could be accomplished by developing microgrid projects near bus depots, partnering with utilities to increase solar and wind energy in the grid, and exploring battery storage solutions to stabilize energy supply for charging stations

Further development of policy and regulatory framework – Despite Dakar's success in deploying e-buses, the city's policy and regulatory framework still exhibits key gaps, including the lack of a comprehensive e-mobility strategy for the region, a lack of financial incentives for EV procurement, and improved frameworks for gender inclusion and workforce development. The development of a comprehensive e-mobility strategy could facilitate the growth of the e-mobility sector beyond the e-BRT, including paratransit. As the e-BRT system grows, clear technical and licensing standards will ensure continued clarity and efficiency of operations.

Dakar should consolidate the progress it has already made in e-bus deployment. Dakar should share what it has learned with other cities in the region. It should build on its successes by developing a comprehensive e-mobility strategy and work to improve access to renewable energy. Given the strength of the AFTU program, Dakar is a particularly strong candidate to pilot approaches for deploying e-buses in the paratransit sector. Doing so would further Dakar's role as a regional leader in e-mobility.

6.2.2 Ready for e-bus deployment (Lagos, Abidjan, Accra)

Improvement of energy supply –

All three cities in this group face significant challenges with the availability of electricity, reliability of the grid and the share of renewable energy. As a first step to e-bus deployment, measures should be identified to ensure a steady supply of electricity, including increasing renewable energy generation, the deployment of microgrids and the development of captive power plants to support e-bus charging. All of these approaches will require coordination between the municipal government, utilities, and public transport authorities. In the short term, this coordination should focus on addressing the specific needs of e-buses through the development of utility or public transport authority-owned renewable energy-powered microgrids linked to charging infrastructure. In the long term, this could consist of general improvements to the grid and increasing the share of renewable energy.

Development of policy and regulatory frameworks –

All three cities would benefit from further improvements to their policy and regulatory frameworks regarding e-buses and e-mobility. Lagos and Accra both have road maps for the deployment of e-buses, while Abidjan currently has plans for the development of a roadmap in place. Further work should be done on the development of technical standards for buses and charging infrastructure, licensing requirements and financial incentives for e-mobility. National should develop financial incentives and customs exemptions for EVs and support local manufacturing efforts. Municipal governments and public transport authorities should develop technical and operational standards for e-buses and charging infrastructure, clear licensing frameworks, and local workforce development strategies.

Definition of roles and responsibilities –

All relevant stakeholders will need to be identified based on the schematic provided in the previous section, with clear roles at each stage of e-bus deployment. This will include identification of a future operator, which may be an incumbent operator, or a newly defined operator based on the context. This will inform future choices about commercial models, which will further define the roles of public transport authority, utilities and any additional third parties.

Identification of financial partners –

Governments should explore a blended financing approach, combining public funding (e.g. government subsidies), private investment (e.g. commercial banks, leasing models), and international financing (e.g. climate funds, development banks). Lessons from Dakar's model suggest that PPPs can help de-risk investments and attract long-term financing.

Allocation of risk –

Careful allocation of risk between operational and commercial partners and financiers will be necessary to secure financing and ensure sustainable operations in the future. Key considerations will include those identified in the relevant sections of this report.

Explore options for paratransit fleet renewal –

While the deployment of e-buses in the short to medium term is most feasible on established BRT or formal bus routes, the deployment of e-minibuses on selected paratransit routes should also be explored. A global fleet renewal program like AFTU in Dakar is one possibility. Alternatives include the model pioneered by BasiGo in Nairobi and Kigali. Lagos is currently developing a pilot transition program for the informal bus industry on 8 Quality Bus Corridors (QBCs) throughout the city. These efforts should be paired with pilots for small-scale e-minibus deployment following models established by BasiGo and EcoCar Solaire.

Lagos, Abidjan, and Accra all have plans for the deployment of e-buses. As public transport authorities in all three cities conduct e-bus pilots and continue the development of BRT infrastructure, they can continue developing sound foundations for e-bus deployment through

the upgrading of energy infrastructure and development of suitable commercial and financial arrangements.

All three cities should explore options for the deployment of e-buses in the paratransit sector.

6.2.3 Laying the foundation (Lomé, Freetown)

Institutional strengthening of public transport sector –
Lomé currently lacks a dedicated public transport authority. Freetown has recently established a public transport authority and defined the city's first formalised bus routes. Further consolidation of both cities' public transport authorities and development of formal bus services will be necessary to support the successful deployment of e-buses. Lomé should develop an independent transport authority with the power to oversee and guide transport throughout the region. Freetown should build on the successes of the SLIRUMP project and continue expanding its formal network through the consolidation of paratransit routes. As the city's public transport authority builds a portfolio of successful projects, investor and development partner confidence in the feasibility of e-bus deployment will increase. E-bus deployment in both cities could be paired with large-scale BRT deployment as in Dakar, with formal operators as is currently being piloted in Lagos, or through the paratransit sector.

Improvement of energy supply –
Both cities in this group face significant challenges with the availability of electricity, reliability of the grid and the share of renewable energy. To lay the groundwork for future e-bus deployment, municipal governments and utilities should work together to identify measures to ensure a steady supply of electricity. In the short term, this could include establishing legal and regulatory frameworks for microgrids to power charging infrastructure. In the long term, this could consist of general improvements to the grid and increasing the share of renewable energy.

Development of policy and regulatory frameworks –
Both cities have major gaps in their policy and regulatory frameworks for e-mobility. Both would benefit from the development of sustainable urban transport master plans that situate e-mobility and e-buses withing a broader strategy to decarbonize the transport sector. Lomé would benefit from the definition of an e-mobility strategy that provides strategic direction to the city's efforts and a roadmap for the development of clear licensing and operational standards for e-buses and charging infrastructure. The national government of Sierra Leone and Freetown's municipal government should work to implement the recommendations of Sierra Leone's Gender Sensitive National E-Mobility Strategy, including the development of financial incentives for EVs and the development of technical and operational standards.

Explore options for paratransit fleet renewal –
While the deployment of e-buses in the short to medium term is most feasible on established BRT or formal bus routes, the deployment of e-minibuses on selected paratransit routes should also be explored. This should start with pilots of e-minibus technology to assess their feasibility given local operating conditions. To scale the deployment of e-minibuses in the paratransit sector, a global fleet renewal program like AFTU in Dakar is one possibility. Leasing models like that used by BasiGo in Nairobi and Kigali is another, as is the retrofit model used by EcoCar Solaire. Incentives and subsidies could be provided to private operators to invest in e-minibuses.

While Lomé and Freetown are further from large-scale deployment of e-buses than the other project cities, both have already made notable progress. Togo is one of the only project countries to have waived import duties for EVs, while Freetown has made significant strides in development a formal bus network. These efforts can be supported by further improvement of legal and regulatory frameworks, further consolidation of paratransit into the formal bus network, and improvements to energy supply and accessibility.

These cities should also explore options to pilot e-minibus technology in the paratransit sector.

7 Annexes

Annex Report (Separate Document)

The annexes are provided in a separate document for ease of reference and detailed review.

Annex A: Supplemental Maps and Charts

Annex B: Total Cost of Ownership Analysis

Annex C: Detailed Policy Recommendations

Annex D: Sources of Financing for e-bus deployment

Annex E: Risk Mitigation Strategies