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WORKING PAPER

Assessing supply chain barriers to and opportunities for advancing road transport electrification in Kenya

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CONTENTS

Executive summary 1
Introduction 4
About this working paper 4
Methodology 5
Findings 6
Market assessment: What vehicles do Kenyans drive? How do they finance them? 7
Where do the vehicles Kenyans drive come from? 11
Electric mobility investments 11
Summary of supply chain barriers to electrification 12
What is Kenya's government doing to promote electrification of transport? 16
What isn't Kenya's government doing that it could be doing? 17
How does Kenya's policy environment compare with policies in China, India, and Rwanda to mainstream EVs? 18
Recommendations: Opportunities for electrification 20
Conclusions 22
Endnotes 23
References 23
Acknowledgments 27

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Highlights

- Kenya's transport sector is the second-greatest contributor to the country's greenhouse gas (GHG) emissions, accounting for 13 percent of total emissions. Over 75 percent of Kenyans can access clean energy, so switching to electric vehicles (EVs) could help Kenya curb air pollution and reach its decarbonization goals. But far fewer than 1 percent of vehicles sold in Kenya annually are electric.
- This working paper analyzes the obstacles that are hampering the transition to cleaner vehicles, identifies opportunities to tackle these problems, and compares Kenya's efforts to promote electrification with what other countries are doing.
- It finds that, to increase EV uptake, the Kenyan government will need to bolster policy and regulatory interventions; improve access to EV technology, infrastructure, and financing; enhance the economic and commercial environment; raise awareness; and build technical capacity.
- Interventions should be data driven and employ targeted modelling to weigh budgetary costs, estimate business value, and design and conduct pilot programs.
- Africa is now regarded as the continent where sales of vehicles will surge the most, so tipping Kenya's market toward EVs could have an impact beyond its borders—on other countries and on the climate.

Executive summary

Context

Vehicle electrification has been identified as among the most impactful ways to cut GHG emissions, with a potential to bring down Kenya's transport sector emissions by 4.5 percent below emissions under a business-as-usual scenario by 2050, with the right mix of conservative electrification policies (Benedikt and Felix 2018).

World Resources Institute's 2023 *State of Climate Action* report points to global transport electrification as the only measure on course to achieve sectoral targets under the Paris climate agreement (Boehm et al. 2023). Governments around the world, such as those in the United States, China,

and India, are developing policies on EV manufacturing and deployment to spur growth in EV adoption (IEA 2023). But governments in sub–Saharan African countries have yet to intervene comprehensively to accelerate electrification. Africa's contribution to the global EV transition has been meager. This reflects the relatively low share of the population that drives motor vehicles (UNEP 2020) as well the absence of an elaborate vehicle manufacturing industry (Agarwal et al. 2022).

Kenya has recently moved aggressively to support electrification. For example, it has lowered the value-added tax (VAT) to zero for lithium-ion batteries, electric bicycles, motorcycles, and buses, and adopted a special subsidized electricity tariff for EV charging. However, like even the most advanced economies, Kenya can maximize the impact of efforts to support EV supply chains by continuously evaluating them. While research has been conducted on parts of the supply chain, Kenya's entire EV supply chain has not previously been evaluated. This paper fills this research gap by exploring the country's EV supply chain to uncover both barriers to and opportunities for road transport electrification with a systems-wide support infrastructure.

About this working paper

This paper analyzes Kenya's EV ecosystem, markets, policies, and regulations. It compares what Kenya is doing with steps other governments have taken to identify gaps and opportunities to accelerate progress in vehicle electrification. It also synthesizes insights from EV companies, financiers, government stakeholders, and users, and assesses the low-hanging fruit in EV advancement. We acknowledge that rail, marine, and aviation electrification have sets of barriers and opportunities that may be different from those of road transport and these are not explored in this paper. Neither do we delve into the details about raw material sourcing for EV batteries.

Key findings

EVs comprise less than 1 percent of Kenya's vehicle fleet and significantly less than 1 percent of new annual vehicle registrations. However, more than 75 percent of the Kenyan population has access to electricity, which is generated from over 90 percent renewable sources, so Kenya could drastically reduce emissions if more Kenyans drove EVs.

Kenya is counting on the electrification of transport to help reach its mitigation goal of reducing national GHG emissions by 32 percent below a business-as-usual scenario by 2030. Apart from air quality and climate mitigation benefits, EV adoption offers economic advantages as the total cost of ownership of EVs is 15–50 percent lower than that of internal combustion engine (ICE) equivalents (depending on the type of vehicle and operating period) (IEA 2022a; Carello 2024). Without the right mix of policies for electrification, the population is likely to continue to choose polluting ICE vehicles (ICEVs), which would aggravate air quality deterioration and continue to contribute to climate change.

What are the major obstacles to EV adoption?

While the Kenyan government has been proactive in promoting electrification, there are some policy and regulatory barriers. These include the absence of a comprehensive electric mobility policy, inadequate incentivization of production, and suboptimal classification of vehicles and utilization of standards to ensure the quality and safety of registered and operating EVs.

While EVs are undergoing research and development (R&D), EV technology cannot currently offer the same performance and durability as ICE vehicles at an equivalent upfront cost, posing a significant obstacle to electrification. Batteries that would pack enough energy to cover a similar distance as ICEVs on a tank of fuel are still expensive. Uncertainty surrounding end-of-life management of EVs is another hurdle. In addition, infrastructure that would increase the utility of EVs is growing, but still largely concentrated in the capital, Nairobi, with a very small footprint beyond the city. This spotty availability of adequate and accessible charging and battery-as-a-service (battery swapping) infrastructure causes range anxiety concerns, which reduce the uptake of EVs.

Another key obstacle keeping more people from purchasing EVs is their high upfront cost. This stems from, among other things, the cost of obtaining loans to manufacture and buy them. Most electric-mobility (e-mobility) companies are start-ups, and typically lack extensive banking history or collateral. For this reason, they are unable to access affordable commercial lending from banking or financing institutions and rely on equity investors, venture funds, and grants. Most end users also face several limitations to accessing credit to purchase an EV, including increased evaluation risk; unaffordable interest rates for available loans (usually more than 50 percent per annum; pa), largely provided by specialized lenders; and stringent criteria to access loans from mainstream commercial banks, which could offer better interest rates (between 18 and 24 percent pa).

In addition to expensive credit, other economic- and commerce-related obstacles take the form of currency fluctuations and devaluation, a lack of economies of scale in production because of the early market stage for EVs, as well as limitations in global shipping regulations for batteries. The net effect of these barriers is to increase the cost of doing business, which in turn raises the cost of the final products. There is also inadequate technical and institutional capacity (e.g., an insufficient number of skilled workers to repair and

maintain EVs and their infrastructure), a lack of awareness about EV technology and government incentives in the sector, and public misconceptions about EVs.

With a motorization rate estimated to be about 30 vehicles per 1,000 people, Kenya has low vehicle ownership. But, like other African countries, its population is growing rapidly and there will be increasing demand for transportation. Decisions made now could steer Kenya onto a path that could affect its emissions trajectory and influence other African countries.

How can Kenya address these obstacles?

Kenya has developed some policies and standards such as the National Automotive Policy, a preferential electricity tariff targeted to EVs, 35 safety standards, and Extended Producer Responsibility Regulations. However, these regulatory interventions were developed without a comprehensive electric mobility policy in place, which would provide the coordination mechanism Kenya needs to accelerate the EV transition.

Research in advanced markets has been focused on growing local capacity for EV production and maintenance. This R&D has contributed to progressive growth in countries' competitive advantages in manufacturing. Countries like India and China have implemented comprehensive policies that have grown their production and uptake of EVs using various instruments like tax incentives and subsidies. Kenya has the opportunity to promote local component manufacturing and use production incentives to meet quotas for local content. Current policies and regulations also need to be enforced and monitored to ensure maximum impact.

Companies in Kenya are already collaborating with EV producers for technology transfer, but the government has not expressly focused on building local technical capacity. Targeted R&D initiatives could help grow Kenya's production and assembly based on the country's competitive advantage in manufacturing. There is also an opportunity for a government-led initiative to provide strategic technical capacity building by incorporating EV education in the national curriculum.

For charging infrastructure, Kenya's government has lowered the electricity purchase tariff. But the private sector is leading the deployment of charging infrastructure. More government involvement in rolling out charging infrastructure would help increase EV acceptance.

Improving access to affordable financing will be key to increasing EV uptake on both the supply and demand sides. Advanced markets have used incentive grants and crediting systems whereby companies earn credits for producing and selling EVs. While the government may not provide direct grants, there is an opportunity to facilitate the development of green financing and provide de-risking mechanisms for investors in manufacturing and assembly and charging infrastructure to access affordable financing. There are significant opportunities to lower risks for EV purchasers through guarantees, innovative financing products, and leveraging on carbon financing.

The Kenyan government also has an opportunity to provide an attractive economic environment that overcomes hurdles and helps increase the uptake of EVs. It could set EV sales requirements; drive EV demand through captured fleets; and do more to promote the utility of special economic zones, which provide tax exemptions and preferential tariffs.

Raising awareness of available EVs and charging solutions, electrification incentives, and processes and regulations concerning electric mobility will also be necessary to enable sector stakeholders to benefit from government interventions to promote e-mobility and spur demand for the technology.

Companies will need to better position themselves by promoting vertical integration, adopting outsourcing strategies, and tapping into the wider East African Community regional market. All stakeholders will need to take advantage of a range of opportunities in a number of areas: policy and regulations, technology, financing, economics, commerce, awareness, and capacity enhancement. Investors and government leaders will need to deploy targeted modelling and make data-driven decisions concerning policies, regulations, and business value proposals.

Introduction

Africa has the world's lowest motorization rate compared with other continents, at 42.7 vehicles per 1,000 people (SLOCAT 2023). Kenya is estimated to have fewer than 30 vehicles per 1,000 people (GIZ 2021).

Africa accounts for less than 1 percent of global vehicle production and approximately 4 percent of vehicles currently in use around the world. But these figures are climbing. The African market depends primarily on imported used light duty vehicles (UNEP 2020) and on two- and three-wheelers for passenger transport. In 12 years, between 2010 and 2022, the number of two- and three-wheelers jumped more than fivefold, from 5 million to an estimated 27 million (Bishop and Courtright 2022). Globally, electric vehicles (EVs) are gaining popularity, with sales exceeding 10 million units in 2022 (approximately 14 percent of automotive sales). In Kenya, however, most are internal combustion engine (ICE) vehicles and less than 1 percent of the vehicle fleet is electric.

Kenya's transport sector is the second-greatest contributor to the country's greenhouse gas (GHG) emissions, accounting for 13 percent of total emissions. The sector is expected to produce over 20 million tonnes of carbon dioxide equivalent by 2030 assuming no intervention (GoK 2020d). Mitigating transportation emissions is a high priority in Kenya's nationally determined contribution, contributing to the national target of a 32 percent reduction in GHG emissions from the business-as-usual scenario, which would increase emissions by 46 percent in 2030 above 2015 emissions. In the entire Kenyan transport sector, which includes rail, marine, road, and air transport, vehicular electrification has been identified as among the most impactful mitigation measures, with a national mitigation potential of 4.5 percent by 2050 over baseline transport emissions (Benedikt and Felix 2018).

Over 75 percent of the Kenyan population has access to electricity, which comes from 90 percent clean energy sources (Kenya Power 2023). In addition, Africa, the continent with the world's second-largest population, is expected to see a surge in vehicle sales (Agarwal et al. 2022). With a projected increase in demand for vehicles and without the right mix of policies for electrification, it is likely that the population will continue to choose polluting ICE engines, which would aggravate air quality deterioration and continue to contribute to climate change. For this reason, electrifying road transport is the low-hanging fruit for reducing greenhouse gases emissions, improving energy independence, and protecting the public from air pollution.

Apart from their air quality and climate mitigation benefits, EVs have economic benefits, with a total cost of ownership for EVs between 15 and 50 percent lower than that of ICE equivalents, depending on the type of vehicle and operating period (Conzade et al. 2022).

The International Energy Agency's (IEA's) *Global EV Outlook 2023* suggests that governments must develop policies on EV manufacturing and deployment to boost EV adoption. Countries, like the United States, China, and India, deployed different but aggressive incentives targeted at EV supply chain elements in 2022–23 (IEA 2023). Africa is seen to make a meager contribution to this global EV transition because fewer motorized vehicles are driven and manufactured there than on other continents. However, whether the African population chooses ICEVs or EVs matters.

About this working paper

This paper examines Kenya's options for increasing the uptake of EVs. It makes use of the IEA's *Global EV Outlook 2023*, which documents other countries' recent efforts to promote EV manufacturing in a bid to stimulate their EV supply chains (IEA 2023). Some examples of these initiatives include the European Green Deal, the US Inflation Reduction Act, and India's Production Linked Incentives.

How this paper differs from and builds on existing research

Much of the existing research on speeding up electrification and EV supply chains has been centered on batteries and the minerals used to make them (IEA 2022b; Roland Berger 2022; Campagnol et al. 2022; Horowitz et al. 2021; Barman et al. 2023). EVs, and especially their batteries, require many minerals in their production, including lithium, nickel, cobalt, and graphite (IEA 2021). Kenya does not have significant mineral reserves for battery production and therefore will continue to rely on battery importation in the medium to long term. This paper focuses on other barriers to and opportunities for the widespread adoption of EVs in Kenya and elsewhere in Africa from a supply chain perspective.

Some of the obstacles Kenya is experiencing have been observed by researchers looking at the case of India (Mane et al. 2024). In their study of India's EV supply chain, Mane et al. (2024) identified inadequate charging infrastructure as well as technological and financial barriers affecting the country's EV supply chain.

Studies in Africa have looked at barriers to and opportunities for the transition to road transport electrification (Manufacturing Africa 2021a; ZE-Mobility 2023; Nyoni et al. 2023;

Carbon Tracker and Powershift Africa 2023). Others have looked at the potential EV transition in Kenya. These have touched on EV cost of ownership and market entry opportunities in Kenya (Manufacturing Africa 2021b), standards on EV charging and battery swapping (Mboa et al. 2022), business models and financing the EV transition (Shell Foundation 2022), and end-of-life management for batteries (Manufacturing Africa 2021b). None of the studies provide an in-depth analysis of Kenya's EV supply chain.

Methodology

We applied both qualitative and quantitative research methods: desktop research for regulatory and policy analysis, a vehicle operator/user survey, informant interviews, and market and industry analysis.

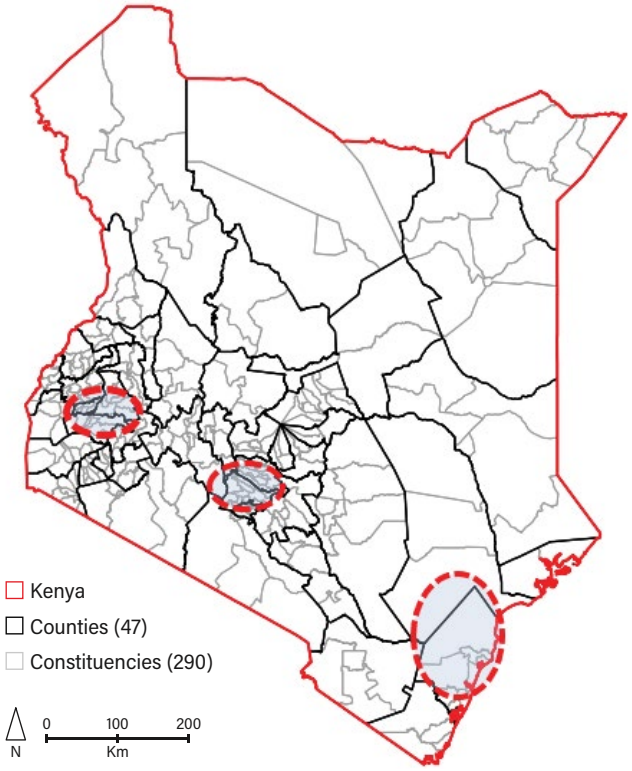
User survey

Our sample size for users included 531 responses (n=531) collected from vehicle operators (individual and corporate owners of two- and three-wheelers, cars, and buses) in Kenya, 16 responses from financing institutions, and 16 responses from distributors of two- and three-wheelers. The number of total vehicles in use was estimated at 2.4 million in 2016 and projected to reach 5 million units by 2030 (Ogot et al. 2018). It is common knowledge that the coastal region has comparatively more three-wheelers than other regions. The central region has mixed modes while the western region has higher numbers of two-wheelers. We therefore carried out the user survey in these representative regions: Kilifi County in the coastal region, Nairobi metropolitan area in the central region, and Kisumu County in the western region (see Figure 1). We interviewed users based on random sampling by cluster and distributed over various vehicle modes. We designed the survey to engage respondents and collect gender-sensitive data.

Key informant interviews

We interviewed key informants including policy and regulation experts; EV industry experts; and officials from government institutions involved in the supply chain, such as individuals in the ministries of trade and industrialization, energy, transport, and environment. We sampled industry firms based on their maturity in the subsector. We conducted additional interviews with financial institutions from a sample of the 39 licensed commercial banks in Kenya (CBK 2024). Interviews revealed processes, challenges, and opportunities encountered by EV companies, and the context of implementing proposals identified in this paper. We classified responses into policy and regulatory, technological, economic and commerce related, financing, and capacity and awareness categories. We collected time series data where appropriate.

Figure 1 | **Survey target counties**



Source: WRI authors.

This research also included a market analysis for Kenya and compared policies and regulations in Kenya with those in India, China, and Rwanda.

Limitations of the research methodology

Sample size: We conducted the survey and interviews from a randomly chosen sample to represent the entire EV ecosystem. The EV industry is in its early stages of development so the sample size is small, a potential limitation of the study.

Scope: We acknowledge the complexity of the battery supply chain with global geopolitical interactions influencing availability as well as the market leadership of other countries in battery manufacturing. Kenya lacks significant mineral reserves for battery production. The research does not delve into battery supply chains.

Conclusions: This paper does not outline how to achieve our proposed recommendations in detail. Further studies would be needed to crystalize the recommendations outlined in this study.

Findings

Automotive landscape and policies in Kenya

The Kenyan automotive sector dates to the 1960s with automotive production peaking at 13,000 vehicles in the 1980s. Market liberalization brought a rapid decline in assembly and a rapid increase in the importation of used vehicles. By 2018, local installed manufacturing and assembly capacity had fallen to less than 20 percent of the 1980s' capacity (KIPPRA 2022). Used imports now account for more than 85 percent of annual light duty vehicle registrations.

The number of two- and three-wheelers on the road increased from 16,000 in 2007 to over 186,000 in 2017, with average sales rising 37 percent annually since 2008, when the government created a tax exemption for assemblers and sellers of two- and three-wheelers in a bid to spur job creation. Several two- and three-wheeler assemblers have been licensed to assemble knocked-down units. This refers to a manufacturing process whereby vehicles are partially or completely disassembled at the country of origin and reassembled in another country. In 2017, however, assemblers were operating at 50 percent of their production capacities (KIPPRA 2022) and had not maximized local production capacity.

Licensed automotive component producers make components for two- and three-wheelers. Established coach builders for buses and trucks also develop coaches appropriate for the Kenyan market's loading capacity and road conditions.

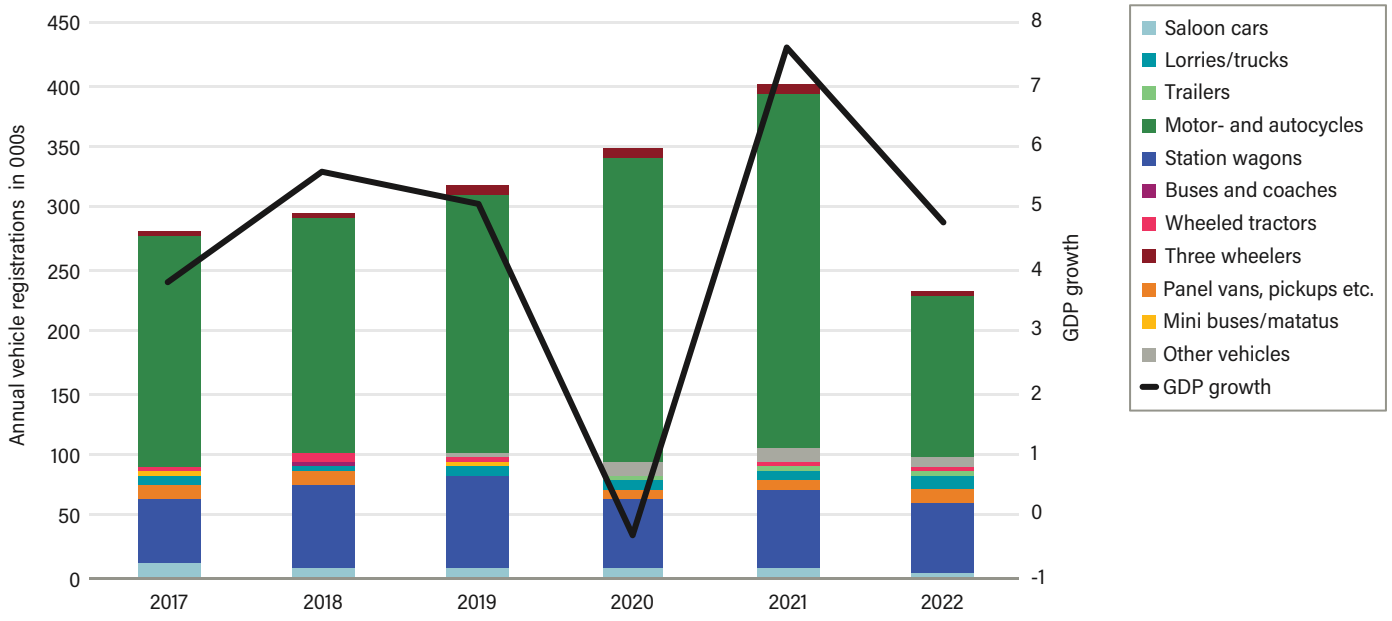
Several government ministries (transport, trade, treasury, and energy) develop policies, implement regulations, oversee automotive assembly and manufacturing, set standards, and enforce them.

In 2018, the active national vehicle fleet in Kenya was estimated at between 1.4 million and 1.6 million units (Ogot et al. 2018) and could likely be more than 2 million currently. Motorcycles dominate annual vehicle registrations, comprising an average of 67 percent of the total over the 2017–2022 period (see Figure 2).

EVs in Kenya

Since 2018, Kenya has seen a significant increase in EVs on the road, with over 3,700 registered as of December 2023. Eighty-six percent of these vehicles are two-wheeled motorcycles, excluding e-bicycles, while 4 percent are three-wheelers, reflecting similar trends in ICE vehicle registration (see Figure 3).

Figure 2 | **Annual vehicle registrations and GDP growth (2017-2022)**



Note: GDP = gross domestic product.

Source: WRI authors using data from KNBS 2023.

The number of EVs registered on Kenyan roads makes up less than 1 percent of all registered vehicles. Although there are efforts by the government, industry, and development partners to increase EV awareness, overall available and ready demand for EVs is relatively small compared with those in developed countries.

Market assessment: What vehicles do Kenyans drive? How do they finance them?

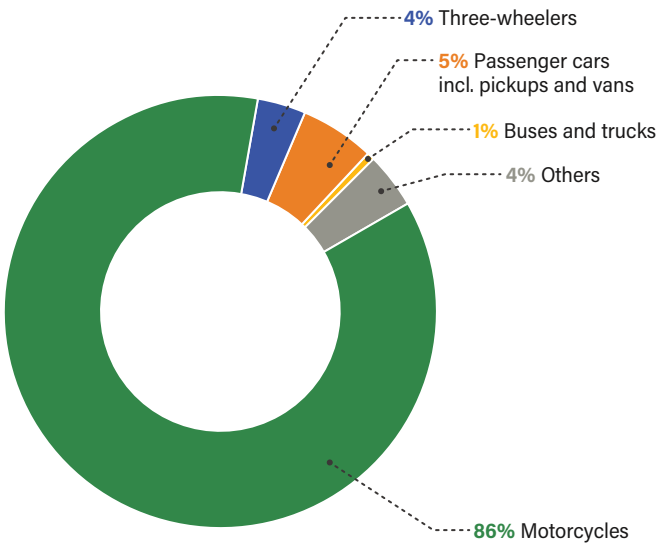
Motorcycles, also known as *boda-bodas*, account for 66 percent of annual vehicle registrations in Kenya, primarily used for commercial purposes and last-mile mobility (see Figure 4). They are owned by individuals and corporate fleet operators. Three-wheelers, also known as *tuk-tuks*, are used for commercial cargo and public transport, especially in areas not served by the public transport system. They are owned by individuals.

The market, as estimated by our survey, for two- and three-wheeler riders is dominated (71 percent of respondents) by young people, ages 18–35 years (Figure 5), who either operate two- and three-wheelers as their primary source of income or as a supplementary means of earning. They own the two- and three-wheelers or are operating them on lease or as employed riders. Among surveyed riders, 85 percent had monthly household incomes of up to KES 50,000 (approximately US$330) with a majority (56.42 percent) earning less than KES 25,000. About 75 percent of respondents owned one unit (Figure 6). Our survey reflects a male-dominated market for two- and three-wheelers as only 5 percent of respondents were female.

Most ICE two- and three-wheelers (about 64 percent of two-wheelers and 50 percent of three-wheelers) were acquired through dealerships that have business arrangements with original equipment manufacturers to supply two- and three-wheelers and provide after-sale service. Distributors have established financing arrangements with microfinance institutions. While distributors did not divulge what shares of their fleets are sold through microfinance credit, 64.4 percent of sampled two-wheeler riders indicated acquiring their vehicles through these institutions (see Figure 8a). Our survey also suggests there is a significant local secondhand ICE two-and-three-wheeler market, especially in satellite towns in Kenya. This market accounts for 31 percent of two-wheelers and 46 percent of three-wheelers.

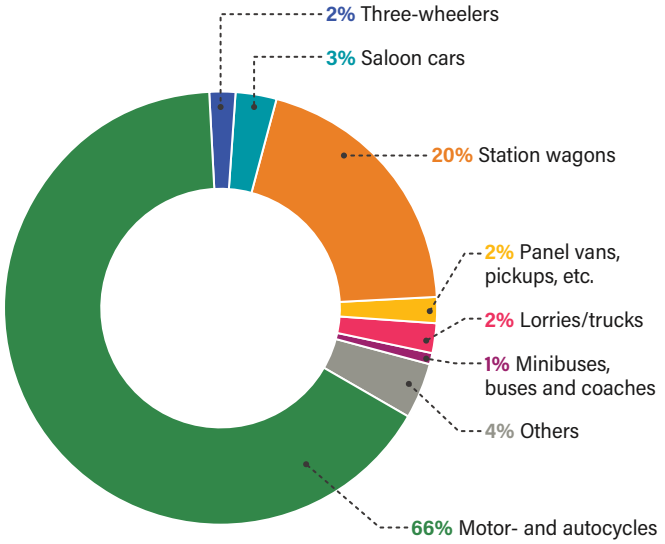
Electric two- and three-wheeler companies have yet to establish mainstream distributors as in the ICE segment. They partner with microfinancing institutions and ride-hailing companies to market their products. They also use their battery swapping stations as sales points for their products, which are sold with a financing option from the microlender. The companies also act as agents for lending institutions by connecting customers to them. When the customer has acquired the two- or three-wheeler through credit, repayments are done daily, weekly, or monthly. The most popular repayment period is daily (67.9 percent). After purchase, the vehicle is either operated by the owner or leased to riders who remit lease fees daily. E-commerce platforms have become a critical player in driving demand for electric two- and three-wheelers as they facilitate a connection between manufacturers and consumers.

Figure 3 | **Kenyan electric vehicle fleet composition**



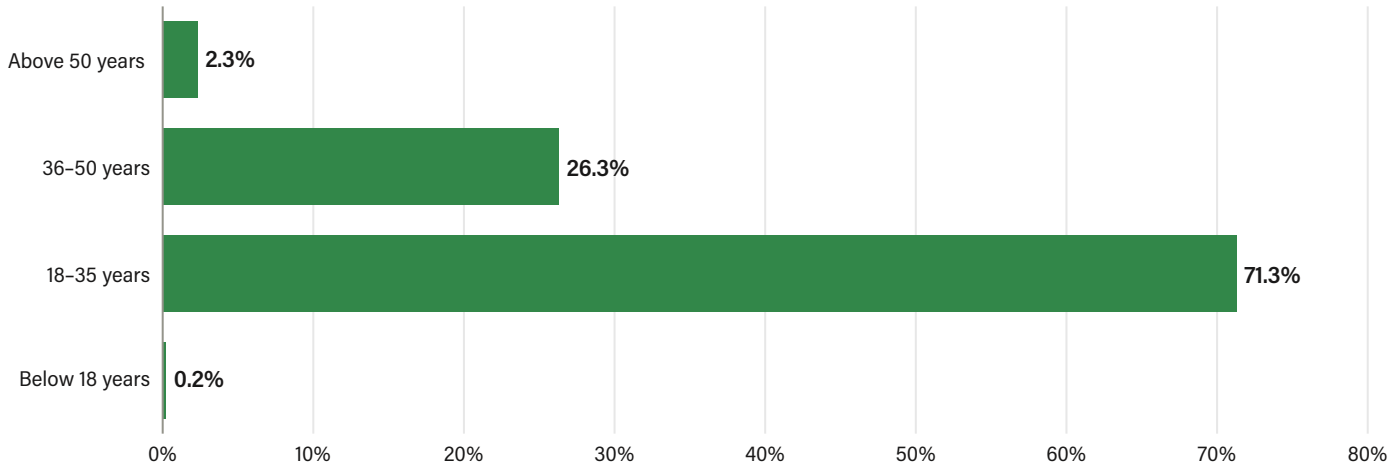
Source: KNBS 2023.

Figure 4 | **Average annual vehicle registrations by type of vehicle (2018–2022)**



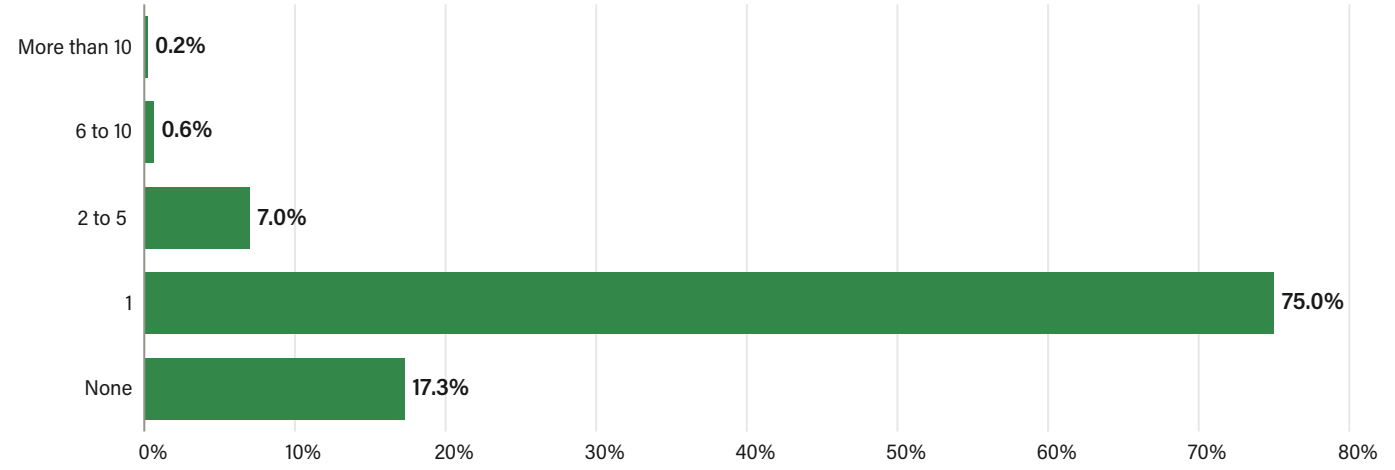
Source: KNBS 2023.

Figure 5 | **Average age of two- and three-wheeler riders**



Source: WRI authors.

Figure 6 | **Number of two- and three-wheelers owned per rider**



Source: WRI authors.

Our study shows that three-wheelers operate on predefined routes and have fixed fares while two-wheelers operate across various terrains and routes and do not have designated stops.

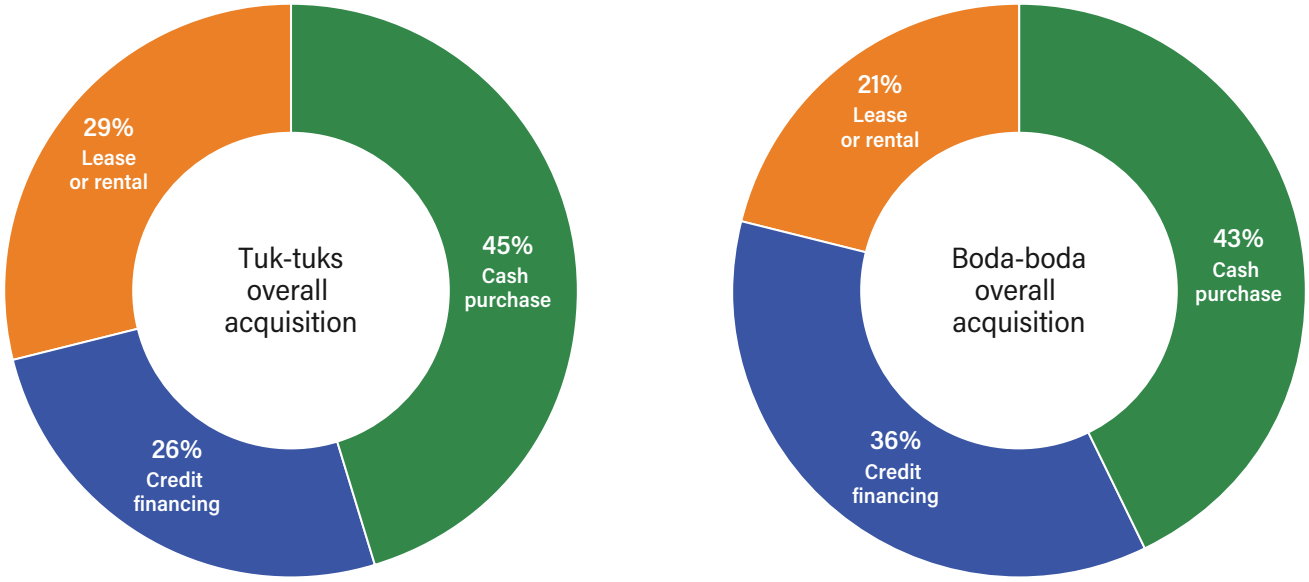
Despite two- and three-wheelers having different operating models, they are acquired in similar ways with cash purchases being the most common (see Figure 7). Most cash purchases for both modes (62 percent) are secondhand purchases (see Figure 8).

Over 90 percent of two- and three-wheelers on Kenyan roads are used for commercial purposes—transporting passengers or delivering goods—with most trips charging under KES 100 ($0.65) per trip for two-wheelers and under KES 300 ($2) for three-wheelers. Transport fees vary depending on distance travelled and goods delivered. We observed that most ICE two- and three-wheelers require routine service on a monthly basis (see Figure 9).

Battery-as-a-service (BaaS, or battery swapping) was the most popular business model used in the sale of electric motorcycles, with only two providers not adopting it. From our interviews, its ease of asset traceability and reduced maintenance burden make it easier for financiers to extend financing. There is also a smaller maintenance burden for the operator as battery maintenance is the BaaS provider's responsibility.

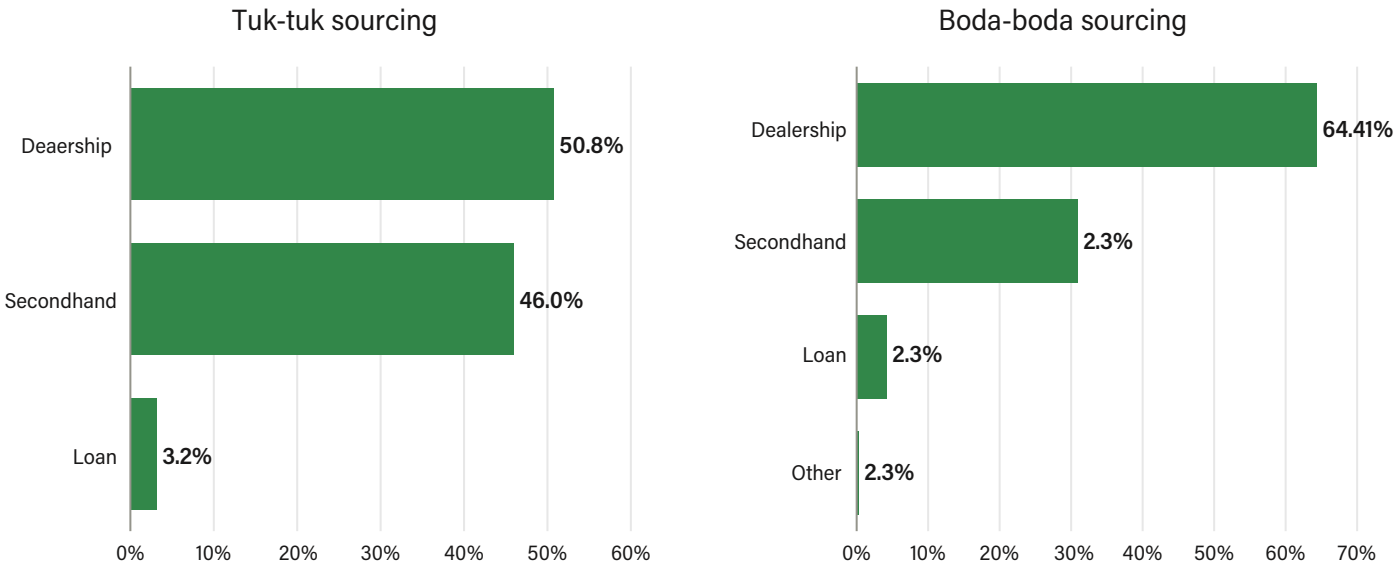
Passenger vehicles (saloon cars, station wagons, panel vans, and pickups) constitute 25 percent of annual registrations, of which over 85 percent are used imports. They are owned

Figure 7 | **How survey respondents paid for their ICE and electric two- and three-wheelers (+/-5%)**



Note: ICE = internal combustion engine. Boda-bodas are two-wheelers and tuk-tuks are three-wheelers.
Source: WRI authors.

Figure 8 | **Where survey respondents purchased their two- and three-wheelers**

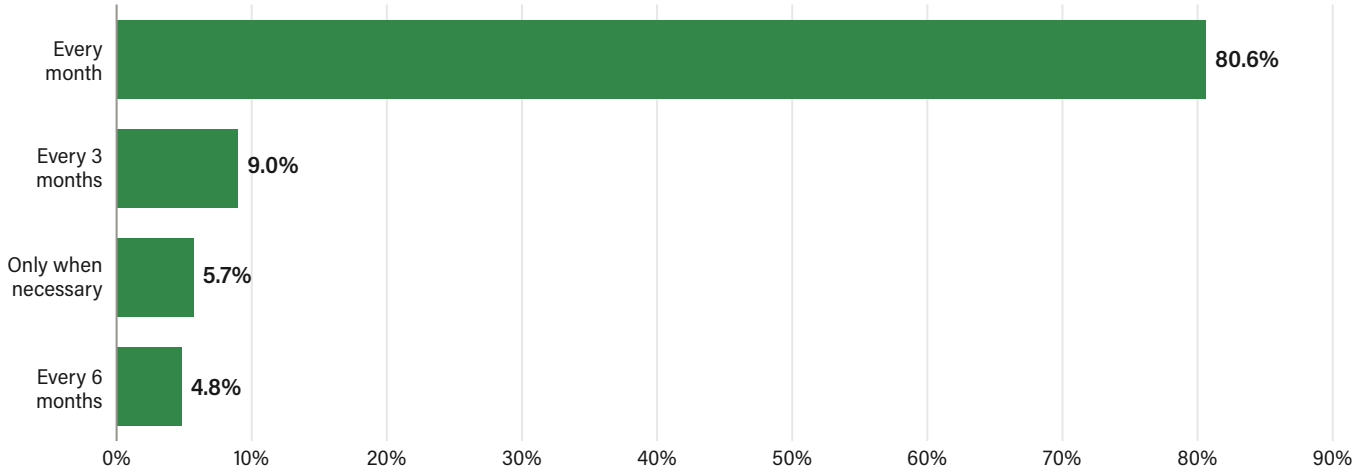


Note: Boda-bodas are two-wheelers and tuk-tuks are three-wheelers.
Source: WRI authors.

by individuals and corporations and are primarily used for private transport. New imports are either locally assembled or imported. Some vehicles are used as commercial taxis, especially through ride-hailing platforms, and may be acquired through asset financing from commercial banks.

Buses, minibuses, and coaches (*matatus*) typically provide public transport and are predominantly owned by bus operating companies or public transport groupings called Savings and Credit Cooperative Organizations (SACCOs). They provide commercial intra- and intercity public transportation and constitute about 1 percent of annual vehicle registrations.

Figure 9 | **Maintenance and service intervals for ICE two- and three-wheelers (+/- 5%)**



Source: WRI authors.

These vehicles are required to be part of a licensed company or SACCO and can operate only on designated routes as determined by the National Transport and Safety Authority.

SACCOs negotiate bus financing terms with commercial banks, which provide up to 70 percent of asset finance to operators (see Figure 10). The bus is registered and licensed as a co-owned asset and has SACCO branding. Fare collections vary based on the route and SACCO-set fares. Daily fares cover loan repayment premiums, labor costs, fueling, parking fees, maintenance, and insurance. Bus maintenance is the operator's responsibility. From our engagements with bus operators, 20–25 percent of the total cost of operation goes toward fueling diesel buses.

One e-bus provider in Kenya has adopted a similar bus acquisition model whereby the bus is sold at a similar cost to an ICE bus but with a battery leasing arrangement. Operators pay a per-kilometer subscription fee, which covers the battery lease, cost of charging, maintenance, and overnight parking.

Past studies on total cost of ownership have shown that electric buses are cheaper overall to own compared with their diesel counterparts (e.g., in India, the lifetime cost of an e-bus was 5–10 percent less than that of a diesel bus) (Vijayakumar et al. 2018).

Heavy-duty vehicles (lorries and trucks), which are owned by cargo companies or individuals, are used for cargo transport and comprise 2 percent of annual vehicle registrations. Other special vehicles such as trailers, cranes, and forklifts, among others, are largely owned by corporations and have specialized uses.

Figure 10 | **ICE bus operation model**

Bus supply/acquisition

- Bus manufacturers
- Banks (70% vehicle finance)

Bus operation

- Vehicles must operate under a SACCO
- Required to use SACCO brand and operate on designated routes
- Owners employ drivers

Daily operations

- Drivers and conductors operate the buses daily
- Daily fare collections submitted to owners daily
- Part of collections used to repay loans

Note: SACCO- Savings and Credit Cooperative; ICE- Internal Combustion Engine.
Source: WRI authors.

Several on-street chargers have been installed by private companies on a pilot basis in malls across the country with the objective of stimulating electric passenger vehicle demand. Currently, no fees are charged at these public chargers and proprietors cover affiliated costs. Some EV owners charge their vehicles at home.

Where do the vehicles Kenyans drive come from?

Vehicles in Kenya are either sourced as fully built units (FBUs), which are predominantly passenger vehicles, or semi-knocked-down (SKD) or completely knocked-down (CKD) two- and three-wheelers and buses, which are partially or fully disassembled at the point of origin to be reassembled in the country. Where assembly infrastructure exists, using CKD or SKD vehicles results in lower taxation and therefore makes a better business case for the industry players. Assembling two- and three-wheelers does not require heavy investment in machinery and can be done by hand.

Pre-export verification of conformity to standards is required for FBU imports. ICEVs must adhere to vehicle inspection code KS1515 (KEBS 2019), which focuses on ensuring that safety and emission standards are met. Aspects specific to e-mobility, e.g., battery state of health (SoH), are not addressed.

Vehicles meeting importing country requirements get issued a conformity certificate and are shipped to Kenya. Upon arrival, random inspections are conducted but due to a lack of e-mobility testing facilities at ports of entry, the Kenya Bureau of Standards conducts only visual inspections. Thereafter, imports go through custom clearance, inspection, and payment of import duties and insurance before entering the local distribution system.

Electric two-wheelers (bicycles and motorcycles) and three-wheelers are largely assembled locally. Most e-mobility companies in Kenya are dealing with two- and three-wheeler products. Between 2018 and 2021, companies imported knocked-down units with no local content. However, the companies have increased their local content input by incorporating parts common to both ICEVs and EVs. They source some of these components locally (e.g., seat, harness, footrest) and supplement unavailable parts by sourcing from both India (chassis) and China (batteries).

The only two e-bus companies in Kenya at the time of the study confirmed they largely source components from China. There are ongoing efforts to adopt local manufacturing and assembly with both companies partnering with Kenya Vehicle Manufacturers and Associated Vehicle Assemblers to meet e-bus assembly requirements. E-buses have gone through customization to meet the unique needs of the Kenyan market, including modifications for use as cargo or passenger carriers and improved sturdiness to drive on unpaved roads.

The current used electric passenger car market is dominated by Nissan Leafs imported from Japan, which is also a major source of ICEVs. New FBUs are dominated by Chinese EV brands.

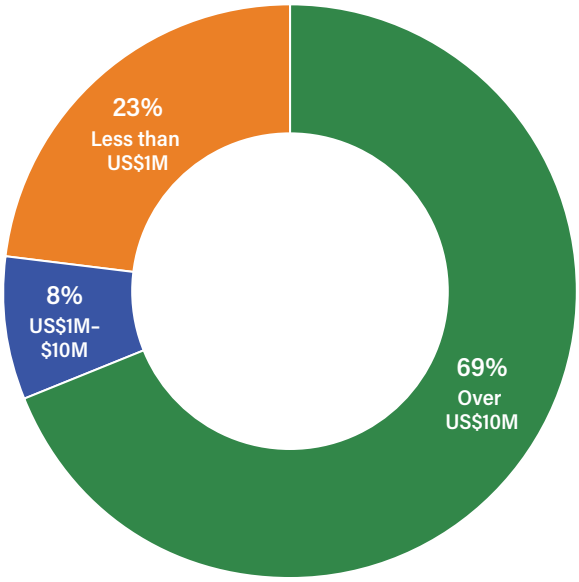
EV energy solution companies import batteries, chargers, and battery management systems largely from China. Other parts are sourced locally, e.g., BaaS prefabricated shipping containers.

Electric mobility investments

There are over 35 electric mobility companies in Kenya dealing with electric two- and three-wheelers, passenger cars, buses, trucks, and charging infrastructure (EMAK 2024). These companies range from assemblers and retailers to energy solution and technology providers. Most of them are start-ups with total capital investments under $1 million in the form of grants and investor equity. Only three companies have over $10 million in investments (see Figure 11). Companies with larger funding have external backing, which contrasts significantly with locally backed start-ups. The largest company has over 200 employees, but most start-ups interviewed have fewer than 10 employees. The companies adopt differing and mixed business models (e.g., business to business, pay as you go, business to customer, battery-as-a-service) and mostly identify as technology or energy companies.

All companies carrying out local assembly have trade relations with component or vehicle suppliers from India, China, or both. They are also seeking partnerships within the Kenyan market to improve competitiveness. Though ICE equivalents

Figure 11 | **Capital investments received by sampled companies in Kenya**



Source: WRI authors.

rely on imported parts, this specialized outsourcing strategy is a departure from ICEV manufacturers, which assemble vehicles from only specific original equipment manufacturers that have developed everything in-house. As a result, EV companies have adopted a nimble structure that is able to adapt to changes and make their products fit for purpose.

Financing: Supply side

Most e-mobility companies are start-ups, typically lacking extensive banking history or collateral. Therefore, they are unable to access commercial lending from banking or financing institutions and rely on equity investors, venture funds, and grants. Funding available from these sources is usually insufficient to support working capital requirements. This is comparable to start-ups in other sectors in Kenya where there is a perception of high risk, causing financing institutions to be hesitant to provide requisite funding (Mwasi and Aluoch 2023; Nakalembe et al. 2023). Debt financing is usually required for start-ups to scale, but proof of creditworthiness becomes a key barrier. Where start-ups can secure credit, the effects of foreign exchange (forex) depreciation and currency devaluation further erode the value of the acquired funding.

Financing: Asset acquisition

There are several asset financiers in Kenya: specialized lenders, mainstream banks, SACCOs, and microlenders. These institutions offer various credit facilities to cater to different customer segments.

Mainstream banks largely finance the acquisition of passenger vehicles, trucks, and buses. Specialized lenders predominantly finance the acquisition of two- and three-wheelers with special credit terms (e.g., flexible repayment terms, minimal down payment requirements, and no collateral requirement besides asset co-ownership). These features target low-income earners to compensate for risk, but the interest charged is usually prohibitive, about three times higher than that charged by mainstream commercial banks.

After-sales support

ICEV distributors in Kenya offer post-sales support for sold vehicles, but operators can also seek support from independent service providers. In the EV segment, after-sales support is provided by EV sellers or BaaS providers that are usually linked to assemblers and/or manufacturers.

Presently, no third parties offer after-sales support for battery EVs in Kenya. However, there is an emerging market for EV battery diagnosis and servicing.

Because Kenyan companies do not produce batteries, they rely on battery warranties from parent companies in China for locally assembled vehicles. In cases where a warranty must be claimed, the process of reshipping the batteries becomes complicated. None of the companies interviewed had reshipped faulty batteries, attributing this to high cost and logistical complications.

End-of-life management

Kenya has fewer than five companies currently working on reusing and recycling lithium-ion batteries and lead acid auxiliary batteries from vehicles.

The recently assented Extended Producer Responsibility Regulations require product manufacturers to take responsibility for proper product disposal or otherwise pay hefty fines as prescribed in the Sustainable Waste Management Act (GoK 2022c). While the regulations are forward looking, they have yet to be enforced.

Two e-mobility companies mentioned they are collaborating with end-of-life battery companies to be able to sustainably manage their battery waste. Battery reuse and recycling interventions will be crucial as soon as the technology matures and battery SoH for first-generation vehicles declines below the usable phase for EVs.

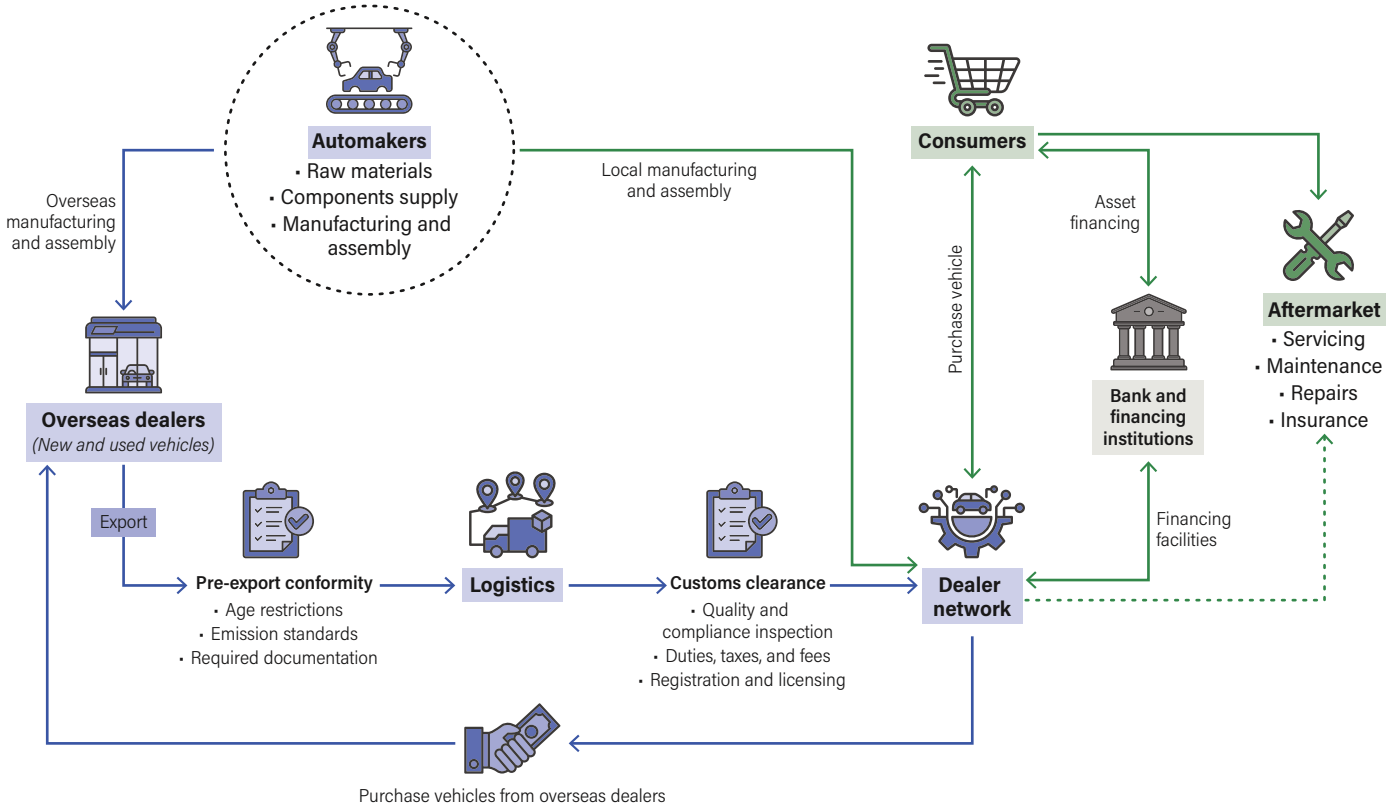
Summary of supply chain barriers to electrification

Financial obstacles include the high cost of acquiring EVs (at least 1.5 times more than ICEVs for four-wheelers and two- and three-wheelers with batteries), which stems from the high cost of production and the barriers to obtaining credit for both the production and utility sides of the ecosystem. The high cost and nascency of EVs and typical demographics of the purchasers present several limitations to accessing credit, including the following:

- Unfavorable economic conditions of loanees, which introduces evaluation risk
- Unaffordable interest rates from available loans (usually more than 50 percent pa), which are provided mostly by specialized lenders
- Stringent criteria to access loans from mainstream commercial banks, which offer better interest rates (between 18 and 24 percent pa)

EV manufacturers and assemblers and charging solution providers (see Figure 12) struggle to raise initial and working capital to ensure that they produce enough EVs to meet demand and support their operations. Most are start-ups requiring large capital outlays to set up production infrastructure. However, they lack the requisite collateral or banking history and may not meet the standard credit evaluation

Figure 12 | **EV supply flow map for Kenya**



Source: WRI authors.

criteria to access affordable financing. The EV subsector is also considered risky to finance as there is no significant experience in funding the sector locally. Where the firms have obtained finance through grants and equity, the resources are further depleted by currency fluctuations.

Economic- and commerce-related barriers are largely associated with currency fluctuation, devaluation, and a lack of economies of scale in production because of the early market stage for EVs. High interest rates as well as limitations in global shipping regulations for batteries pose additional hurdles. The effect of these barriers is an increased cost of doing business, which in turn raises the cost of the final products.

Technology presents some limitations; there are concerns about whether EVs can offer the same performance, durability, and cost as ICEVs. Energy-dense batteries are expensive, and EV companies will need to consider EV battery end-of-life management.

Adequate infrastructure is also a big concern as charging and BaaS infrastructure are not widespread in the country. This infrastructure is concentrated in the capital where most companies are based and where there are more EV adopters. In addition, most of the assemblers are based in the capital. To scale EVs, there needs to be a more widespread penetration of infrastructure in the country.

Inadequate capacity for and a lack of awareness of EVs at the sector level are also key hindrances in the EV transition. They help explain the insufficiently skilled workforce for repair and maintenance of EVs and EV infrastructure as well as why there is insufficient institutional capacity to implement initiatives that are geared toward promoting electrification. In addition, misconceptions about EVs are still prevalent among the public. This awareness gap needs to be closed if electrification is to scale.

Financial obstacles (in detail)

EVs are costly to acquire and to manufacture. Establishing and running production companies is often prohibitively expensive. As factory gate costs for energy-dense battery cells are still high at between $53 and $95 per kilowatt-hour (kWh) (IEA 2024), the overall upfront cost of EVs is relatively expensive compared with ICEVs, even though the total cost of ownership for EVs is less than that of ICEVs (Con-

zade et al. 2022). People seeking to purchase EVs must then look for alternatives to finance the acquisition and face several downstream financing limitations:

- Unfavorable economic conditions limit purchasers from securing favorable financing terms, commonly referred to as evaluation risk.
- Mainstream financial institutions offering affordable interest rates are reluctant to extend credit facilities for two- and three-wheeler riders, who are perceived as high risk. Specialized lenders have exploited the opportunity by offering loans at exceptionally high interest rates, sometimes more than 50 percent pa.
- Mainstream banks offer low interest rates but higher upfront down-payment requirements, ranging from 40 to 50 percent of the asset value, making it difficult to access affordable finance.
- Two- and three-wheeler operators from low-income households are required to agree to short repayment periods (up to 18 months), making it difficult for individuals to pay.

In addition, EV manufacturers, assemblers, and charging solution providers require significant resources to set up and fund their working capital requirements. For the EV transition to accelerate, these upstream industry players must produce more EVs and establish sufficient charging solutions to cover the market. Financing of these players has largely been through grants and equity investments. The small size of the Kenyan EV market has also led to limited financing activity in the Kenyan EV supply chain. In many instances, EV start-ups can't access debt financing due to the following:

- Start-ups often lack the collateral necessary to access loans (e.g., assets for term loans or cash covers for short-term working capital facilities).
- Charging and BaaS infrastructure are intensive from a capital expenditure perspective and have longer repayment periods, thus fewer financiers are interested in investing in them.
- Some companies lack the audited financial statements required by banks to extend credit facilities.
- Most companies lack sufficient bankable history to show historical cash flows in their bank accounts.
- Some business investments are capital intensive and require patient capital with longer payback periods.
- Mainstream financial institutions perceive electric mobility as a risky subsector and shy away from extending credit facilities, preferring the more traditional and well-funded ICEV sector.
- Established automotive companies with financial capacity to invest in the sector are hesitant to do so due to a perception that EVs are a relatively new technology.

Technology and infrastructure (in more detail)

Infrastructure and other disincentives to purchasing EVs include the following:

- There is inadequate charging infrastructure across the country, which is largely due to the low fleet numbers beyond Nairobi, which do not provide enough economic incentive for companies to invest.
- A robust charging infrastructure network is crucial for the widespread adoption of EVs, as range anxiety is a significant barrier to their purchase.
- Because of inadequate countrywide charging infrastructure, EVs are considered appropriate for only short commutes. Battery swap stations are concentrated in Mombasa and the Nairobi metropolitan area. And while there are a few standalone four-wheeler chargers in other towns, they are only single chargers operated on a pilot basis (Mboa et al. 2022).
- While most trips within cities are short and could be made by EVs, there is concern that EVs could not handle longer intercity trips.
- Current public charging infrastructure is inadequate to meet a higher level of demand as most are slow chargers and not sufficiently distributed in the cities.
- Electric two-wheeler providers mostly use a swapping model, which requires riders to return to swapping stations to obtain a recharged battery. These stations are often located in central areas with high demand to ensure the model is profitable. Unfortunately, this limits two-wheelers in terms of the distances they can cover as drivers must be able to return to these stations to recharge or swap for a recharged battery.
- The underdeveloped resale market for EVs causes resale anxiety (Zhang and Zhao 2023; Lim et al. 2014). EVs' long-term value and ability to resell is unclear because of the limited number of EVs on the road compared with the number of ICEVs. This could possibly be a deterrent to uptake.
- Due to the relatively young age of EVs in Kenya, the country hasn't yet had to deal with EV waste and end-of-life management for batteries. Despite some companies already rebuilding batteries for hybrid vehicles, the full extent of what's required to manage waste in the sector isn't understood.

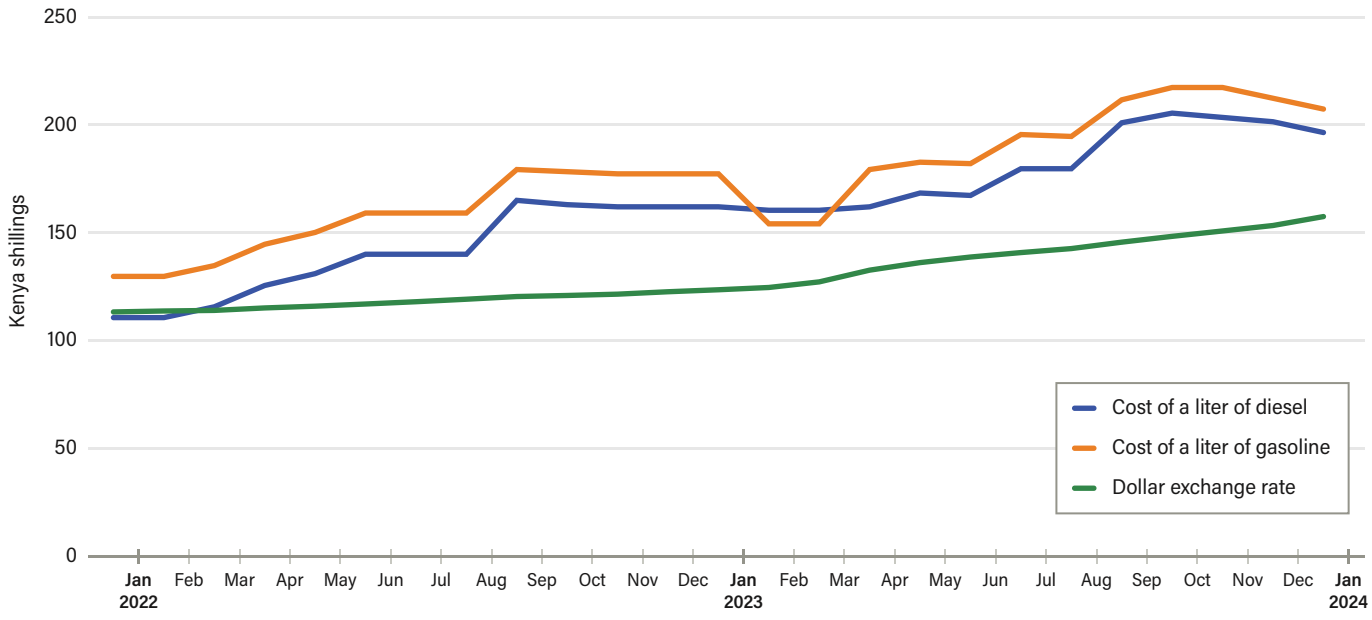
Economic- and commerce-related challenges

- A lack of economies of scale and reliance on imports hinders companies' abilities to scale. Kenya has over 50 e-mobility companies selling fewer than 2,000 EVs annually. Due to the split market from the booming start-up scene, companies have not reaped the benefits of economies of scale. For example, most start-ups mentioned annual production targets of 100 units, meaning that the cost of production per unit remains relatively high. Moreover, foreign suppliers' minimum order requirements in the high season are between 500 and 1,000 units, which disadvantages local start-ups, which must wait for the low season to have their orders fulfilled.
- While forex depreciation has raised the cost of fossil fuels (Figure 13) and provided a better case for electric mobility, it has also eroded start-up profits and delayed breakeven timelines. The shilling, for example, depreciated 42.7 percent between January 2022 and January 2024. Ordering EVs or components from other countries where currencies are stronger also puts an extra strain on local players, requiring them to supplement capital from other avenues. Currency depreciation affects the price offering of EVs, as locally assembled vehicles are sold in Kenyan shillings.
- Battery shipping also poses a challenge to managing costs. Due to the risk of thermal runaway, which can cause fires, shipping lines must adhere to United Nations (UN) regulations UN3480, UN3481, and UN3490, which limit the number of lithium-ion batteries that can be packed in shipping containers. Assemblers incur additional upfront costs for EV units, which undermines the desired market penetration of products. We couldn't ascertain how these regulations affect company costs as they impact all global battery shipments.

Awareness and capacity

- Varying interpretations of government policies have been problematic. There have been instances where agency personnel have had different interpretations of regulations regarding imports, such as how to classify CKDs or SKDs. Usually, CKD units are taxed at lower rates compared with SKD units. The incorrect classification of EV imports could lead to assemblers overpaying taxes and duties, indicating a capacity gap in government personnel handling EV imports.
- Government institutions have insufficient capacity to implement electric mobility policies and regulations. The Kenya Bureau of Standards, for example, which is mandated to ensure product quality, does not have e-mobility testing facilities at ports of entry and therefore must rely entirely on visual inspections of imported vehicles.

Figure 13 | **Kenyan shilling–US dollar currency depreciation and cost of fuel in Kenya (2022–23)**



Source: WRI authors using data from National Treasury forex and Energy and Petroleum Regulatory Authority fuel price data.

- As EVs are not currently part of the national education curriculum, start-ups have been training their personnel on how to technically repair and manage EVs.
- An awareness gap exists across the public, users, and firms about EV technology as well as government policy and regulatory incentives in the sector. From the user survey, while 87 percent of interviewed ICE two- and three-wheeler riders knew about EVs, only 54 percent of respondents expressed a willingness to own one. Raising awareness of the benefits of EVs and educating consumers about how they operate and are maintained is critical to driving higher demand for these vehicles.
- The government has provided several supply-side measures targeted at unlocking vehicle electrification in the country. For example, the government has special economic zones (SEZs) where tax exemptions and preferential tariffs apply. Yet, there haven't been significant efforts to create awareness of these measures among firms. All firms mentioned having had to seek out information, which was at times subjective. While not entirely attributable to a lack of awareness about the SEZs, none of the EV firms has set up in them. Further research is needed to identify why companies have not taken advantage of these subsidized zones.

What is Kenya's government doing to promote electrification of transport?

Assessment of current policies and regulations

We analyzed current policies and regulations addressing different parts of the electric mobility ecosystem in Kenya and compared the interventions with progressive measures other countries have deployed to stimulate electrification. We chose to study China as it has the largest EV fleet and market globally (IEA 2023) and selected India as a developing country that has created initiatives quickly to scale electrification. We chose Rwanda as a peer country since it has been applauded for its ambitious and effective policies to accelerate electrification.

Overarching policies

The Kenyan transport sector is governed by the following overarching policies:

- The Traffic Act (2012), a law regulating traffic on Kenyan roads (GoK 2012)
- The Integrated National Transport Policy (GoK 2020a), which provides a framework for development, regulation, and management of all transport modes
- The Green Economy Strategy and Implementation Plan (2016–2030) (GoK 2017), which guides the country's transition toward a low-carbon, resource-efficient, equitable, and inclusive development path
- The National Climate Change Action Plan (2023–2027) (GoK 2023a), which cites the transport sector's contributions to the national emissions footprint and to Kenya's plans for a green mobility transition

Targeted policies to promote electrification

The following other regulatory interventions target the e-mobility sector:

Electric Mobility Policy and Strategy: At the time of publication, the government was working to develop an overarching electric mobility framework to enable coordination among government institutions and guide the countrywide EV transition.

Electrification target: Kenya set a target to reach 5 percent annual EV sales by 2025 (GoK 2020b), despite EV sales comprising less than 1 percent of vehicle sales in 2023. Meeting this target will require instituting initiatives to encourage the industry to provide sufficient EVs for sale.

The Finance Act (2019 and 2023**)** outlines various fiscal interventions that the government will use in the financial year targeting various sectors in line with development priorities. These measures include taxation, exemptions, government expenditures, and revenue generation, among others. Finance Act 2019 (GoK 2019) and its 2023 amendment (GoK 2023b) established incentives to increase fuel efficiency and electric mobility:

- 10 percent excise duty for imported EVs; ICEVs pay 20–35 percent depending on engine capacity
- The importation and sale of electric bicycles, motorcycles, buses, and lithium-ion batteries are zero-rated for VAT
- Motorcycles under tariff heading 87.11 expanded to exclude electric motorcycles, exempting them from the excise duty
- Reduction of corporation tax from 30–37.5 percent to 15 percent for five years from the start of motor vehicle assembly operations. A five-year extension was provided for companies whose products were comprised of 50 percent locally sourced materials. EV companies setting up in Kenya would have significantly reduced their cost of doing business while promoting localization of manufacturing.

Unfortunately, after being in force for about a year, the 2023 amendment to the act was deemed unconstitutional, but it was responsible for the rapid growth of EVs in 2023.

The National Automotive Policy (NAP), which was approved in 2022 (GoK 2022a), aims to increase the local production of motor vehicles and parts, enhancing competitiveness by reducing the importation of used vehicles and parts, though it lacks an operationalization act. The NAP does not differentiate between promoting ICEV and EV production. Growing EV production will benefit from incentives aligned with the NAP.

The EAC Common External Tariff (CET) standardizes trade information and documentation in the East African Community (EAC 2022). The CET has established duty bands that are determined based on the percentage of raw materials and components that are sourced locally, influencing the cost of products exported within the region. Some countries, however, restrict the free trade of goods from EAC member states through gazette notices citing noncompliance with local content requirements. These products are subjected to higher duties, creating a barrier to regional trade.

The Tax Procedures Act (Unassembled Motorcycles) Regulations, 2020, mandate that motorcycles be assembled in a licensed, bonded warehouse (GoK 2020c), limiting the types of facilities that can be used. Such infrastructure is capital intensive and not accessible to most start-up firms, hindering their entry into the assembly business. Creative solutions, such as consolidating warehousing, are needed to meet these requirements.

The Insurance (Motor Vehicles Third Party Risks) Act requires that all vehicles be insured against third-party risks (GoK 1945). The insurance industry in Kenya has already extended competitive insurance services to EVs. However, no compensation from EVs has been called yet and there has not been experience in managing accidents, especially where there have been fires caused by batteries getting punctured. There will be a need to evaluate this in the future as more EVs are purchased and accident claims are made.

The Electric Mobility Electricity Tariff (EPRA 2023a) reduced the electricity tariff for EV charging facilities to KES 16 ($0.11) per kWh during peak periods and KES 8 ($0.05) per kWh during off-peak periods for energy consumption up to 15,000 kWh. This compares with the normal domestic tariff rate of KES 20.97 ($0.14) per kWh for consumption over 100 kWh. The maximum energy consumption cap of 15,000 kWh will be limiting in the future for companies with significant deployments of vehicles with larger-capacity batteries.

The Energy and Petroleum Regulatory Authority's guidelines for installation of charging and BaaS infrastructure (EPRA 2023b) limit the number of charging points in an area and provide minimum requirements. These measures aim to ensure grid reliability and moderate power loading, but could give early market entrants an undue advantage by dominating charge points in certain areas. As EVs reach critical mass, the government will need to reevaluate this and develop regulations to make the guidelines enforceable as required by Kenyan law.

Thirty-five electric mobility standards specify requirements for safety, performance, and testing of electric passenger cars and light commercial vehicles, motorcycles, and mopeds. The standards help protect the population from harmful or substandard products but do not hamper innovation.

Sustainable Waste Management Act 2022 provides regulations for sustainable sourcing by placing a strong emphasis on circularity, and the need for responsible and sustainable waste management practices including managing end-of-life batteries to minimize their impact on the environment (GoK 2022c).

Extended Producer Responsibility Regulations, 2022, though not enforced, are regulations to operationalize the Sustainable Waste Management Act by holding producers accountable for their products' entire lifespans, including EV batteries and end-of-life vehicles (GoK 2022b).

What isn't Kenya's government doing that it could be doing?

Policy and regulatory barriers include the absence of a comprehensive electric mobility policy, the inadequate incentivization of production, and the suboptimal classification of vehicles and utilization of standards to ensure the quality and safety of registered and operating EVs.

- *Overarching policy.* The absence of a comprehensive national e-mobility policy has impeded the roll out of well-thought-out interventions in e-mobility.
- *Production incentives.* The country's NAP (GoK 2022a), which limits the importation of used vehicles while incentivizing the local assembly of vehicles, has not been implemented, resulting in insufficient incentives for local automotive manufacturing including EV assembly. Further, the government could create greater awareness about the financial benefits associated with its SEZs.
- *Standardization for quality and safety.* The current 35 electric mobility standards cover only safety and testing protocols, missing key metrics like battery SoH checks that could ensure that only quality products are allowed into the country. This could potentially compromise the quality and lifespans of EVs in Kenya and erode gains made by early adopters.

How does Kenya's policy environment compare with policies in China, India, and Rwanda to mainstream EVs?

In markets where the EV transition has scaled quickly, governments have typically encouraged local manufacturing through several initiatives like production subsidies (see Table 1). The strategy aims to increase affordable EV access in the country, reduce transportation costs, and improve turnaround times, while fostering employment, stimulating the economy, enhancing local skills, and promoting sustainability.

Tax incentives and subsidies

Kenya relies largely on imports for automotive assembly components and vehicles. China and India, on the other hand, have advanced automotive production (MinInfra 2021). Incentives adopted for Kenya have focused on VAT exemptions for imported batteries, buses, and bikes and excise duty reductions for FBUs. On the other hand, India and China have provided aggressive, multistage sector tax incentives aimed at promoting the production and purchase of EVs. Kenya can promote local component manufacturing and use incentives to meet its quota for local content.

Skills and R&D

Research in the advanced markets has been focused on growing local capacity for production and maintenance of EVs. This R&D has contributed to the progressive growth of the countries' competitive advantages in manufacturing. On the other hand, Kenya and Rwanda have not expressly targeted building local technical capacity. A similar targeted R&D initiative in Kenya could help grow the country's production and assembly based on its competitive advantage in manufacturing. Companies in Kenya are already collaborating with EV producers for technology transfer. There is also an opportunity for a government-led initiative to provide strategic technical capacity building by incorporating EV education into the Ministry of Education's national curriculum and promoting government-to-government technology exchanges.

Charging infrastructure

Promoting access to charging infrastructure is a key intervention area that has been led by line ministries. Rwanda has provided free government land to set up this infrastructure. On the other hand, Kenya has only reduced the electricity purchase tariff. Deployment of charging infrastructure has been led by the private sector. More aggressive government involvement in rolling out charging infrastructure in Kenya is required.

Financing

The advanced markets have used incentive grants and a crediting system where companies earn credits from the production and sale of EVs. While the Kenyan government may not provide direct grants, there is an opportunity to facilitate the development of green financing and provide de-risking mechanisms for the private sector to access affordable financing.

End-of-life management

Like India and China, Kenya has Extended Producer Responsibility Regulations. However, these guidelines have yet to be implemented. Kenya should consider successes in India and China in combining requirements to transition to EV technology together with a scrappage policy for polluting ICEVs.

Table 1 | **Market comparison: Supply chain policies and regulations in China, India, Rwanda, and Kenya**

	CHINA	INDIA	RWANDA	KENYA
Upstream sourcing of raw materials and components	**Reduced import tariffs** for EV components Incentives for **advanced battery manufacture** **Collaboration with international automakers for** EV development	Customs **duty exemptions** for EV parts and components Requirement to source a percentage of EV components locally to qualify for incentives	**Import and excise duty exemption** for EVs, spare parts, batteries, and charging station equipment **Exemption of withholding tax** of 5% at customs	**VAT zero rating** for solar and lithium-ion batteries, electric bicycles, motorcycles, and buses

Table 1 | **Market comparison: Supply chain policies and regulations in China, India, Rwanda, and Kenya (cont.)**

	CHINA	INDIA	RWANDA	KENYA
Manufacturing and assembly	**Subsidies** to domestic EV manufacturers to support R&D and EV production[a] New energy vehicle **credit system**: Manufacturers earn credits for **producing and selling NEVs** and must meet certain credit targets; excess credits can be sold to other manufacturers with credit shortfalls **Mandatory production quotas:** Requires automakers to produce a percentage of their total vehicles as electric or plug-in hybrid vehicles Supported **research and development in EV technology** through grants, subsidies, and partnerships with academic and industrial institutions	**Production-linked incentives** for companies to set up[a,e] Incentives and grants to **research institutions and companies** in development of EVs, battery technology, and components **Incentives for the establishment of battery manufacturing units** **Skill development**: skilling initiatives in manufacturing, servicing, and maintaining EVs	**15% corporate income tax and tax holiday** (irrespective of investment value) for EV companies[b]	Corporation tax of 15% for companies outside SEZs[c,d] SEZ incentives: 10% corporate income tax; VAT zero-rating for supply of goods and services; exemption from stamp duty and import declaration fees; deduction of 100% of capital expenses from taxable income **Note:** None of the EV companies are set up in these zones
Distribution, sales, and purchases	EV purchases: **subsidies**, exemptions from purchase taxes Vehicle replacement subsidies	**Goods and services tax** on EVs and chargers reduced to 5% Demand-side incentives: **direct subsidies**, reduced EV loan interest, and income tax benefits for EV buyers **Subsidies for** public transport **e-buses**	**Rent-free land** for charging stations on government-owned land **Age limit imposed** on imported used vehicles	**Excise duty reductions** for imports from 20% to 10% for FBUs Age limit of 8 years for imported used vehicles
Operations, after-sales support, and maintenance	Government investment in EV charging infrastructure Subsidies for public charging infrastructure Dedicated EV parking spaces Home charging subsidies Charging fee subsidy Parking fee reduction EV access to **carpool lanes** **Regulatory frameworks to ensure safety and reliability** of EVs	**Reduced road tax**, registration fee waivers, and additional EV purchase incentives at the state level Public-private collaboration in developing **extensive charging infrastructure network** **Skill development** for servicing and maintaining EVs	Electricity tariffs for charging stations same as **industrial tariff** **Carbon tax** to discourage polluting vehicles EV **charging stations in building code** and city planning rules Green license plate to allow **preferential parking** for EVs and free entry to congestion zones Access to **dedicated bus lanes** **Free license** for commercial EVs Preference for EVs in **government-hired vehicles**	E-mobility **standards for safety** Preferential electric mobility **tariff** EV charging and battery swapping infrastructure **guidelines**
End of life	Extended producer responsibility system and traceability management to encourage battery recycling	Battery Waste Management Rules		Extended **Producer Responsibility** Regulations

Note: EV = electric vehicle. VAT = value added tax. R&D = research and development. NEV = new energy vehicle. SEZ = special economic zone. e-bus = electric bus. FBU = fully built unit.

Sources: a. IEA 2023. b. MinInfra 2021. c. Kenya Power 2023. d. GoK 2023. e. GoI 2024.

Recommendations: Opportunities for electrification

Policy and regulatory

Having in place functional enabling policies is key to a vibrant electric mobility ecosystem. We've identified the following opportunities in this area:

- An overarching electric mobility policy and strategy would boost investor confidence as the electric mobility sector continues to grow. This electric mobility policy and strategy should remain dynamic to accommodate anticipated changes in electric mobility uptake. The policy should provide a comprehensive framework that incorporates incentives to support EV manufacture and use.
- The government can support automotive and component assembly through production-linked incentives in line with the NAP's objectives, promoting innovation, R&D, and investment schemes. Tax policy should encourage local manufacturing over import reliance, and sound fiscal balance is necessary for a pragmatic and implementable policy. A rigorous review of the tax policy would be required, possibly following Juhász et al. (2023) who proposed using a broader range of policies rather than individual instruments and including a policy that promotes productivity.
- Kenya should introduce EV sales requirements—regulatory requirements for automakers to increase their share of EV production—as done by the countries that joined the zero-emission vehicles (ZEV) declaration at the 26th UN Climate Change Conference (COP26) (GoUK 2023). The California Air Resources Board program has a sales mandate whereby vehicle manufacturers are required to increase ZEV sales from 4.5 percent in 2018 to 22 percent in 2025 (CARB 2024b). Success of the program resulted in California achieving its goal of 1.5 million ZEVs sold two years ahead of the 2025 target (CARB 2024a). In China's New Energy Vehicle mandate, automakers are awarded credits for producing EVs and are allowed to trade excess credits to other automotive manufacturers. China's EV manufacturing dominance can be partly attributed to the existence of this credit system. Kenya could evaluate how such sales mandates would work in-country.
- To attract quality new and used EVs, there needs to be a requirement for a certification of conformity that limits the importation of EVs with batteries with reduced SoH. This would prevent negative publicity resulting from short lifespans of vehicles with depleted batteries. The government already has a program for pre-export verification of conformity for ICEVs. Metrics of evaluation for EVs are different from those for ICEVs; providing a similar protocol for EVs will be necessary.
- Available regulations and policies (e.g., Extended Producer Responsibility Regulations, National Automotive Policy) must be implemented.
- The energy regulator should operationalize the guidelines for establishing battery swapping and charging infrastructure by developing regulations as required by law.
- The Kenyan government should balance the use of fiscal policy to de-risk investment flows into the supply chain while ensuring countries are not held hostage by a reliance on imports. De-risking investments through attractive and predictable fiscal policies would ensure the country positions itself as an appealing investment destination for foreign investors. Constant monitoring is necessary to ensure the country's objective of promoting local manufacturing is not compromised, which would lead to a reliance on imports.
- The Finance Act amendment of 2023 introduced tax exemptions for companies in the e-mobility space. While fiscal expenditures deriving from these exemptions are not yet public, and the act has since been deemed unconstitutional, the government should consider extending such benefits to the entire EV ecosystem (e.g., to companies that manufacture specific components of EVs) to further support the industry as part of a broader set of policies.
- Leveraging the EAC CET, countries can adopt additional regulations to eradicate barriers to regional trade. Despite having the CET, countries in the region have repeatedly petitioned to lift the application of the CET, which effectively disallows other countries in the region from claiming concessions on taxes for products exported within the region. Additional regulations would limit country petitions that lift the application of the tariff in their countries. Also, the EAC needs to create a Harmonized System code for completely knocked down electric motorcycles.

Technological and infrastructural

- Companies providing superior products that can compete with ICEVs in terms of sturdiness and longevity will influence consumer choice. To ensure EVs entering the Kenyan market are of good quality, batteries should go through a pre-export verification process, which should include an SoH check.
- Local EV companies should invest in R&D so they can provide products and business models that can compete with those of ICEV companies. For example, industry firms mentioned they have progressively worked to adjust imported products to fit riding patterns, road quality, and local circumstances.
- Target modes should be expanded to include urban freight vehicles and e-bikes to leverage the rising demand for delivery services via e-commerce platforms and appeal to a younger demographic that appreciates physical activity.
- Since batteries that pack more energy are more expensive, costs affiliated with energy-dense batteries will ultimately determine the overall cost competitiveness of EVs. Any intervention providing solutions to energy access and availability is bound to increase the adoption of EVs (e.g., provision of adequate charging facilities).
- The opportunity exists to decrease a reliance on imports and lower local assembly costs by promoting local manufacturers of automotive components such as steel frames, footrests, lighting, direct current converters, seats, and storage compartments.
- Kenyan policymakers have not addressed the need for after-sale support for EVs. Battery recycling and reuse would provide an opportunity for new business ventures (e.g., reuse of EV batteries as solar back-up batteries) (Chen et al. 2023).

Economic- and commerce-related

Trade-related opportunities are largely centered around driving demand for EVs and creating a conducive environment for trade growth. We have identified the following opportunities in this area:

- The government's special economic zones have been used to attract foreign direct investment, though research shows there is hesitancy among independent evaluators to vouch for them as lucrative investment zones (Oringo et al. 2023). That notwithstanding, companies looking to set up in the zones could save on capital expenditures and operating expenses by, for example, reducing their corporate income tax for five years from 30–37.5 percent outside the SEZs to 15 percent inside the SEZs.
- Current ICEV manufacturers could pivot to also manufacture EVs. With their infrastructural advantage, they could easily shift—partially or wholly—to EV manufacturing with an interim assembly opportunity. Batteries could also be assembled in Kenya, though not battery making as the country does not have reserves of critical minerals.
- Promoting electrification in shared mobility and captured fleets, such as taxis and ride-hailing platforms, could drive demand opportunities. Policymakers can promote such use by providing financial incentives to operators willing to invest in EV marketing, sales, and distribution opportunities. These also need to be part of measures that ensure the government maintains a fiscal balance (e.g., that carbon taxes cover proposed incentives).
- Outsourcing manufacturing or warehousing could be used as a way to reduce cost (provide cost efficiency and aggregation of expertise as well as manufacturing infrastructure).
- Increased collaboration among countries along the supply chain would reduce costs as logistical processes are streamlined. For example, China has developed a vertical integration strategy for the production and distribution of lithium-ion batteries where companies collaborate with upstream and downstream players to increase cost efficiency and reduce overhead (Wang et al. 2022).
- As Kenya is the country with the highest number of start-ups in the subregion, it can position itself to meet the subregion's EV demand through exports. EV companies would further benefit from terms of the EAC CET.

Financial

- Loan guarantees should be provided to de-risk upstream companies (EV manufacturers and energy solution providers) as most don't meet debt financing criteria. Providing such guarantees would eliminate the requirement for start-ups to provide their banking history, collateral, and audited accounts to access debt financing. Guarantees have been used to de-risk the energy sector in Kenya (Amolo et al. 2020) and lessons learned (Saadani et al. 2011) should be used to design effective guarantee schemes.
- First loss guarantees on currency devaluation could protect firms from high interest rates and forex fluctuations, providing financial cushioning to businesses involved in electric mobility. This measure could help boost investor confidence and reduce the impact of currency-related trade fluctuations (Lubis and Karim 2021; Ogbonna 2016).

- Financing institutions could explore providing consumer subsidies through a results-based financing approach whereby payments are made after achieving predefined results. Consumer subsidies can help lower the initial purchase price of EVs, making them more accessible and attractive. More research and modelling are required to map out how such financing would look for EVs in Kenya.
- Carbon markets could be leveraged for financing (e.g., as SunCulture has done to accelerate access to and use of solar irrigation systems for farmers) (Shell Foundation 2023). This has been on a pilot basis, and therefore would need to be developed for practical applicability in electric mobility in Kenya. Other countries and regions, such as China, the United States, and the European Union (Zhou and Li 2019), have used carbon markets to finance zero-emission projects, and Kenya could draw lessons learned from their experiences.

Awareness and capacity

- It is essential for the government to provide clear information on new changes, interventions, and incentives in the electric mobility sector. Transparent policies, regulations, and incentives can encourage businesses and consumers to take advantage of the benefits of electric mobility while reducing market uncertainty.
- The government's institutional capacity should be strengthened so it can implement its mandates and support electrification. Government staff and infrastructure capacity (e.g., testing facilities) should be strengthened and, where nonexistent, be provided.
- A targeted technical curriculum on electric mobility will be necessary to produce a sufficiently large skilled labor force for EV production as well as after-sale support. The current competencies curriculum should therefore be revised to include technical skills for electric mobility.
- An open, simple-to-understand platform containing all interventions geared toward sector stimulation and tackling misinformation on EVs should be created. Countries leading in electrification have websites containing this information, and these could be used as models.[1]

Conclusions

This working paper has provided a high-level analysis of barriers to and opportunities for electrification in Kenyan road transport.

There is a need for data-driven solutions to the opportunities described in this paper. Investors and government leaders will need to employ targeted modelling to weigh budgetary costs, estimate business value, and design and conduct pilot programs, among other activities.

Interventions should address access to adequate and affordable financing for EV manufacturers, assemblers, energy solution providers, and end users.

Investors should evaluate proposed economic- and commerce-related opportunities with a view to driving and sustaining demand for EVs.

For policies to be successful, investors and the government will need to use innovative and wide-reaching means to ensure that awareness about the benefits of EVs becomes widespread and capacity gaps are filled.

Endnotes

1. India's, for example, can be found at https://e-amrit.niti.gov.in/.

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