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# Women's economic empowerment and electric vehicles in Kenya

**Confidential**

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**Query Question:**

1. What is the status of gender-inclusive design of electric vehicles in Kenya and across sub-Saharan Africa?
2. What are the barriers for women as users of electric vehicles in Kenya, across sub-Saharan Africa and elsewhere? E.g. in terms of design, the safety of women, social norms etc.
3. What are the opportunities of gender-inclusive design of electric vehicles? Include the benefits to women and their families, private sector manufacturers of electric vehicles, to governments and other actors at the national level, and to broader society. Use case studies, including those from Asia which may inform/inspire manufacturers/assemblers in Africa.

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## Acronyms

EV	Electric Vehicle
FCDO	Foreign, Commonwealth and Development Office
ICE	Internal Combustion Engine
E2W	Electric Two-Wheelers
E3W	Electric Three-Wheelers

# Executive Summary

**This paper reviews the status of gender-inclusive design in relation to electric vehicles, with a focus on two-wheelers and three-wheelers.** Where relevant, evidence on electric buses were also included. It explored potential barriers to women's use of these vehicles, as well as opportunities for increased uptake and in turn, promoting greater women's economic empowerment. The report aims to highlight how private companies can address these barriers and opportunities, including informing the E2W (Electric Two-Wheelers) and E3W (Electric Three-Wheelers) markets.

**There is no publicly available information on the adaptation of design of two- and three-wheel electric vehicles for women.** As such, this review looked more broadly at how two- and three-wheel vehicles *in general* have been adapted for women. For two wheelers, the review incorporates data on gender and e-bikes;<sup>1</sup> petrol motorbikes; and cycles. For three-wheelers, the review expanded to look at gender and tuk tuks; and tricycles.

**Despite expanding the types of vehicles examined beyond electric offerings, the review found very little in terms of how the physical *design* of these vehicles have been adapted for women.** Instead, the research found that addressing wider barriers for women to two- and three-wheel vehicle products, including cost; safety; and social norms; would have greater impact in electric vehicles appealing to female customers, and making products more inclusive.

**Some broad principles on how the design of two-wheel electric vehicles can be adapted for women can be drawn from non-electric vehicles.** For example, design considerations for standard bicycles aimed at women could also be applied to the development of e-bikes, or extrapolated to consider the equivalent adjustments for motorbikes where possible. This includes tailored saddles, grips, and tuned suspensions to accommodate the average lighter weight of women. Available evidence suggests that design decisions should be locally informed and context-specific catering to diverse preferences or body types, rather than necessarily having to be gendered offerings. One case was found of a 3-wheel electric vehicle scheme, Try.ke, being targeted specifically at women, but no specific details on gender-inclusive design were available. The female-founded Liv Cycling, a UK based company, designs cycles with women in mind, including frame sizing, component design and suspension tuning, employing women engineers, executives and marketing staff.

**Although no specific barriers for women regarding electric vehicles were found, design barriers for standard bicycles and existing barriers for women in transportation and mobility may still apply to EVs and provide valuable insights.** The design of vehicles can pose barriers to women, especially in contexts where there is a lack of female-friendly product offerings. Women's need for carrying cargo or traveling with children has been identified as a consideration for the design of gender-inclusive vehicles. Cultural barriers in some contexts can also prevent women from utilising 2-wheeled vehicles, for example, in some contexts, including Liberia, Sierra Leone and Uganda, there was a perception that two-wheeled vehicles are 'too heavy' and that women are 'not strong enough' to drive them (Courtright, 2021; Courtright et al., 2022; Jenkins et al., 2020). Concerns about safety and the risk of gender-based violence were also found to be significant barriers for women in using two-wheeled and three-wheeled vehicles. Lastly, cost was found to be a barrier. Addressing these barriers will be crucial in making EVs more inclusive of women and expanding opportunities to help the industry grow.

**There are significant market opportunities for EVs in Kenya and Sub-Saharan Africa.** There is a rapidly growing number of 2-wheel and 3-wheel vehicles in the region, which provide an opportunity for EV

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<sup>1</sup> An e-bike is defined as a bicycle equipped with an [electric motor](#) to assist pedalling.

adoption. EVs can provide a cleaner and more efficient way for the sector to grow and reduce air pollution and greenhouse gas emissions. EV technology offers cost savings that could open up the market to low-income groups, including women who are overrepresented in low-income groups due to the barriers they face in accessing education, employment and credit for instance. Kenya's increased access to energy and a growing start-up ecosystem focusing on EVs also creates an enabling environment for uptake of EVs. Gender-inclusive approaches will be a critical way for companies to respond to these opportunities in a way that ensure no one is left behind. **Some 2-wheel EV companies in Kenya, such as PayGo for E-bikes, Solar E-Cycles, and Ecobodaa, are targeting women as their key customers.**

**There is a compelling business case for gender-inclusive EVs in Kenya and Africa.** This business case is based on the potential to increase the customer base, enhance innovation and productivity through women employees, and strengthen supply chains by engaging women entrepreneurs. Designing transport to be safe, attractive, convenient, and affordable for women can increase ridership, revenue, and emissions savings from green transport investments (EIB, 2021). Women are more likely to adopt sustainable travel, and research shows they are more inclined to buy electric two-wheelers, as they tend to travel shorter distances, which could provide an expanded customer base (Jayasingh et al., 2021). Engaging women as employees presents a critical opportunity for companies to enhance productivity and growth potential, as well as accessing and building a more diverse and skilled workforce. Increasing the number of women employed in the transport sector enhances service delivery, increases perceptions of safety for users, and attracts talent, resulting in greater productivity and financial performance. Investors and lenders are also increasingly interested in ESG, impact investment and gender-lens investment, which provides opportunities for EV companies to access climate finance through making their operations and products more gender-inclusive. Annex 1 provides illustrative entry points to reflect the business case for a gender-responsive approach.

**The opportunities presented by EVs and their potential growth in sub-Saharan Africa, combined with the benefits of adopting a gender-inclusive approach provides a compelling case for EV companies in the region.** Several recommendations are presented to respond to these barriers and opportunities. Findings from this review highlight the need to think more broadly than design adaptations for EVs to appeal to women as customers, including adapting business models to address the spectrum of barriers faced by women. As a result, recommendations include conducting market analysis, developing gender-responsive and context-specific designs, tailoring cost and payment options to women, digitising riding services to improve trust and safety, supporting positive role models and women champions, assessing the safety and accessibility of supporting infrastructure from a gender perspective, enhancing opportunities for women as employees, and targeting women entrepreneurs with access to mobility. These actions would enable EV companies to develop products and services that meet the needs of women and tap into the latent demand represented by them.

# 1. Introduction

**This paper reviews the status of gender-inclusive design in relation to electric vehicles, with a focus on two-wheelers and three-wheelers.** It explores potential barriers to women's use of these vehicles, as well as opportunities for increased uptake and in turn, promoting greater women's economic empowerment and increased market opportunities for EV manufacturers and assemblers. The report aims to highlight how private companies in particular can address these barriers and opportunities.

The paper was conducted via desk review, which examined three questions:

1. What is the status of gender-inclusive design of electric vehicles in Kenya and across sub-Saharan Africa?
2. What are the barriers for women as users of electric vehicles in Kenya, across sub-Saharan Africa and elsewhere? E.g. in terms of design, the safety of women, social norms etc.
3. What are the opportunities of gender-inclusive design of electric vehicles? Include the benefits to women and their families, private sector manufacturers of electric vehicles, to governments and other actors at the national level, and to broader society. Use case studies, including those from Asia which may inform/inspire manufacturers/assemblers in Africa.

**The objective of this paper is to help inform programmes that are seeking to promote the use of E2Ws and E3Ws as a green alternative, with a particular focus on why private sector companies may want to adopt gender-inclusive approaches in the design and marketing of these products.** It goes beyond focusing solely on the design of vehicles to also consider how EV companies can adopt gender-inclusive business practices and the benefits this can result in. It examines the diverse roles women play, including as customers, employees, and service providers – and what the implications of these roles are, versus treating women as a homogenous group.

The paper focuses on E2W and E3Ws, bringing in evidence on electric buses where relevant. Electric cars are not considered in this report. The primary geographic focus is Kenya and Sub-Saharan Africa, but wider examples from Asia, Latin America and New Zealand are drawn upon where there were evidence gaps. Due to lack of evidence specific to EV markets, the review was expanded to cover relevant lessons from standard 2/3W vehicles (including motorbikes, bicycles, tuk tuks, and tricycles) and relevant evidence on barriers from the green transport sector more widely. There was limited evidence available on women from socially excluded groups, including women with disabilities, and their access to and uptake of EVs.

Section 2 examines any existing evidence of gender-inclusive design in electric vehicles, with a particular focus on Kenya and Sub-Saharan Africa.

Section 3 outlines potential barriers to women's use of electric vehicles.

Section 4 presents key opportunities that EVs present for women and EV manufacturers and assemblers, including the business case for gender-inclusive approaches.

Section 5 provides a set of recommendations for how EV providers can respond opportunities identified.

## 2. What is the status of gender-inclusive design of electric vehicles in Kenya and across sub-Saharan Africa?

### 2-wheelers

**This review found no evidence of gender-inclusive design of 2-wheel electric vehicles in Kenya, Sub-Saharan Africa, or globally.** While some design barriers to women riders' uptake of 2-wheel vehicles were found (see section 3), there were no examples found of modified electric vehicle designs in response to these challenges.

**Some 2-wheel EV companies are tailoring their offer to women as customers through their business models.** While information on gender-inclusive design of electric vehicles was not available, some providers of 2-wheel electric vehicles in Kenya are targeting women as a key customer base, including through targeting outreach and cost models that take into account cost barriers to women customers. Examples found include:

- **PayGo for E-bikes** focuses providing e-bikes to more women, in what it describes as a male-dominated space, through “studying barriers to women’s participation in the sector and supporting product design for women” (P4G, n.d.) so that it can offer solutions designed by and for women, including response to “the challenges faced by women who drive and ride motorbike taxis, including safety concerns and gender bias” (Surratt et al, 2022). However, no specific details were found on what these solutions or designs are.
- **Solar E-Cycles** provide affordable environment-friendly, solar-powered mobility and power for homes or small businesses. They aim to make their cycles accessible by ‘the poorest of the poor in Africa’, with a pay-as-you-go model that enables customers to continue to pay for the e-cycles using the earnings the e-cycles provide access to. (Solar E-Cycles, n.d.) The initiative notes that women bear a disproportionate burden in terms of time poverty, and that mobility could help tackle this (Solar E-Cycles, n.d.).
- **Ecobodaa**, a company offering electric Motorbike Taxis, is also operating in Kibera, Kenya’s largest slum. The business model includes offering battery swaps, which are billed based on the percentage of power used by the rider, and therefore making the cost of an electric vehicle more accessible to low income groups (including women). Ecobodaa targets women as customers and has shortlisted, vetted, and trained women Boda Boda riders in Kibera who will then benefit from the initial commercial launch batch of Ecobodaas (Kuhudzai, 2020).

#### Box 1. Case Study: M-KOPA’s approach to E2Ws for women

A semi-structured interview was conducted with M-Kopa, a fintech platform that provides credit and digital financial services to underbanked consumers in Africa, on their activities around offering E2Ws to women in Kenya. The discussion confirmed much of what was found in the literature reviewed for this study. Some key highlights on M-KOPA’s approach and learnings are below – these have been informed by the petrol- motorbike market as their work on electric motorbikes is in its piloting stage.

- M-KOPA's pay as you go model was designed specifically to address financial inclusion issues identified in the market
- Most customers tend to be Boda Boda drivers or delivery drivers, with women favouring roles as the latter.
- Women who tend to use motorbikes for leisure purposes tend to be more affluent women who are less worried about breaking social norms, and less likely to be engaged in productive work as a Boda Boda driver or delivery driver.
- It is common for M-KOPA's women customers to purchase the E2Ws to lease onwards. This means that some women customers are not necessarily even riding the bikes, but leasing to male riders. In some ways this bypasses some of the barriers to women as customers for these products.

### **Key barriers for women customers**

They have identified three main issues for women:

1. Cost – over the medium/long term EVs offer a cheaper alternative to having to pay for fuel
2. Safety – described as the biggest barrier to women using E2Ws
3. Access to charging

*(See section 3 for more information on barriers.)*

### **Gender-responsive product offerings is still a nascent area**

- M-KOPA have conducted research on gender and mobility and are using this to inform their approach. They have not however, been able to conduct extensive research into design features/options for adapting e-motorbikes for women but have begun to explore this area e.g. looking at E2W associated safety products and accessories, such as helmets, and how these could be designed for women.
- Battery swap stations operate through partners, so M-KOPA has less influence on the location and nature of these stations. However, charging points are provided by M-KOPA, so considering how location and access to these charging points could influence perceptions of safety for women, as well as convenience for women who are more likely to trip-chain, was something that could be considered.
- Bikes are also equipped with tracking technology, which allows M-KOPA to analyse routes used by women operators and help inform location of charging points, as well as enhance safety for operators.

### **Social norms influence women's access and use of E2Ws**

- There was a preference for women drivers to operate as delivery drivers rather than Boda Boda operators. This was due to perceptions of safety, and it being safer to do deliveries rather than transport passengers on a two-wheel vehicle.
- M-KOPA are working with manufacturers to adapt electric motorbikes for use as Boda Boda as well as deliveries, which involve distinct types of modifications (for example, the need for expanded cargo space for delivery bikes). Given that women are more likely to use motorbikes for deliveries, this could be considered in the marketing of these motorbikes.
- There is a perception in Kenya that women are not skilled drivers, hence a preference amongst customers for a male Boda Boda operator.

*(See section 3 for more information on barriers.)*



**Some design considerations for gender can be drawn from standard bicycles that could be applied to e-bikes.** Some cycle manufactures provide different kinds of cycles based on gender. These cycles vary in their design, namely around the size of frames and dimensions being more suited to women. While these features are not specific to EVs, they could be applied to the development of e-bikes. Design features are highlighted in box 2. However, some cycle manufacturers have noted that gender-based product offerings should be phased out in favour of simply offering a range of sizes, unisex or universal designs (Bonkoski, 2023; Knapp, 2018). This is because, for example, while women tend to be shorter, not all women are – and some men may be shorter. Therefore it makes more sense to provide options in a variety of sizes.

**There are some elements of gendered cycle designs which may be context specific.** Some features of cycles, such as step-through frames and downward sloping top tubes, are traditionally associated with women’s bikes as they were designed to allow riders wearing skirts to easier mount the frame (Knapp, 2018; Bonkoski, 2023). However, while manufacturers based in the USA or Europe have said these are legacy that are no longer relevant, there is evidence to suggest step-through frames are a preference in Kenya (Mwaura, 2023). This highlights the need for design decisions to be locally informed and context specific, as well as the need for universal offerings that cater to a diverse range of preferences or body types, rather than being simply generic gendered offerings.

#### **Box 2. Design considerations for bicycles aimed at women**

**Size:** Women's cycles are generally designed with shorter stack heights and reach lengths to fit women's proportionally shorter torsos and smaller hands.

**Stem:** A shorter or longer stem can be used to fine-tune a bike's frame reach for the rider. Women-specific stems may also offer a higher handlebar position that's more comfortable for riding.

**Seat:** Women's saddles are generally shorter and wider, but some performance riders prefer narrow saddles that free up their pedaling motion. Women tend to prefer wider and more cushioned saddles. Bike makers often assume that the saddle is one of the first components riders will change to match their preferences.

**Handlebar:** Women have narrower shoulders on average, so a narrower handlebar might be more suitable. Some women may experience sore shoulders, which could be an indicator that a narrower handlebar is needed.

**Suspension:** Lighter riders may need suspension that’s tuned to their lower weight. Brake levers: Shorter riders often have smaller hands, making it hard to reach and comfortably operate brake levers. Short-reach brake levers or those with adjustment screws to reduce lever reach may be used to address this issue.

**Step through frames:** Traditional woman’s bikes featured a downward-sloping top tube, which was originally designed to facilitate women riders who wore skirts. Women report that these frames are easier to mount and dis-mount.

*Sources: Bonkoski, 2023; Decker, 2022; Knapp, 2018; Mwaura, 2023.*

**There is limited evidence available on how EV design can promote greater inclusion and access for women with disabilities.** By reducing the physical exertion needed to travel, EVs could be beneficial for increasing mobility and access to key services (Wheels for Wellbeing). Electric three-wheel bikes can be more accessible as they can be easier to maintain balance on. Other accessibility features

include lower heights for step-throughs, swooping frames, reduced impact frames, footrests, stick holders and tailored backrests (Hovsco, n.d.).

### 3-wheelers

**This review found no evidence of gender-inclusive design of 3-wheel electric vehicles in Kenya and Sub-Saharan Africa, or globally.** The review conducted online searches of commercial and grey literature.

#### Using 3W EVs being used to promote women's economic empowerment in Kenya.

3-wheel electric vehicle scheme, Try.ke, is targeted specifically at women (For Tomorrow, 2021). Materials found on this case focused specifically on the economic opportunity provided by these vehicles for women and girls, and enabling them to earn from further productive uses of electricity through the solar-powered tricycles (LEO, n.d.). Users of the Try.ke can utilise the vehicle's energy storage capabilities for lighting their homes at night as an alternative to paying electricity utility bills; powering refrigeration units on the vehicle, which can be used by women street vendors to offer new types of goods including fresh produce. Programme partner Strathmore University Institute of Small Business Initiatives will train selected users in micro-business management of a variety of revenue generation models and will monitor impacts. (For Tomorrow, 2021). This is an example of a design feature which goes beyond the physical useability of the EV by women, but considers how it could meet their wider needs and provide a source of economic empowerment.

### Benefits of EVs for women's economic empowerment

This review found evidence of the electric vehicle industry providing economic opportunities for women in skilled and unskilled roles.

- **In Kenya**, for example, Opibus, are converting fuel car engines to electric ones, have a workforce comprising of 40% women (Chepkoech, 2021). They note that "equality between the genders means we will design better products for everyone, having in mind the masses and their various needs. That makes us more effective in business" (Chepkoech, 2021; Page, 2022).
- **In India**, recruiters reported that six of every ten experts being hired in the EV sector today are women (McLoughlin, 2022). EV provider Saera (2022) notes that given the EV industry is more focused on electrical and electronic assembly, and less on mechanical or dependent on physical labour compared to the traditional automobile industry, this is enabling more women to enter the industry.
- **In Mexico**, the electric cars made by the female-founded company Zacia, are assembled by an all-women team of mechanics (Barbeito, 2022; Ettinger, 2022). Women are employed in every department, including company directors, designers, mechanics and sales. The founder intends to encourage diversity and inclusion in the male-dominated sector.

### 3. What are the barriers for women as users of electric vehicles in Kenya, across sub-Saharan Africa and elsewhere?

**This review did not find information specific to electric vehicles in terms of barriers for women as users of electric vehicles however, there is relevant evidence from experiences of making the design of standard vehicles more inclusive.** There are also many well documented barriers to women in the literature in relation to green transport and mobility that apply to EVs. These barriers include cost, social norms, and safety concerns. Responding to these barriers will be an important part of making electric vehicles more inclusive, while simultaneously expanding opportunities to help the industry grow. This section outlines relevant barriers, with a focus in particular on 2-wheel and 3-wheel vehicles where possible.

#### Design Barriers

**Lack of products designed for women has been found to be a barrier to two-wheel vehicles for women in Kenya.** A recent study in Kenya found that a lack of female-friendly bike offerings may contribute to the low demand for bicycles among women (Mwaura, 2023). In this study, women indicated that they prefer bicycles with a step-through frame. Such bicycles are easier to mount and dis-mount, and also have wide cushioning saddles, which are preferred by women and girls. However, few cycle shops stock them. E-bikes that are not designed for women's preferences may replicate the same barriers if not addressed and reduce uptake by customers.

#### **'Shrink and pink': design changes based on stereotypes can lead to negative outcomes**

**In some markets, women's bikes tend to emphasis form over function, leading to bikes that do not meet the diverse needs of women.** Research in New Zealand into women and cycling found that this emphasis on the aesthetic quality of bikes marketed to women over quality functions, meant many women gave up cycling because their bikes fell apart within 18 months (Wild et al, 2021). The study noted that entry level step-through bikes for women did not have more than three gears, meaning these women's bikes were not fit for traveling up-hill (ibid). This example highlights the need for gender-inclusive design to go beyond being a simple marketing concern and be designed around actual needs. This tendency has been described as 'shrink and pink' (Decker, 2022) where the design philosophy behind many women's bikes equates to supplying a smaller frame size and providing a supposedly female-friendly paint job.

**Perceptions of two-wheeled vehicles being too heavy dissuade some women from using these vehicles.** For example, research into motorcycle taxis in Liberia and Sierra Leone found that many women felt they lacked the strength to become operators and that they would be at risk of accidents. In particular, if they were ever required to carry a load or additional cargo this could pose additional risks (Jenkins et al, 2020). Some respondents to the same research also pointed out that this is simply a perception, and that women are more than capable of riding bikes. However, it is important to

consider how the perception alone may also dissuade some women from adopting electric vehicles and to consider the role that marketing can play in addressing these misconceptions.

**Women are often more likely to carry cargo or travel with children compared to men.** This can impact women's decisions about transport modes or impact their mobility. This pattern was found in a variety of contexts. For example, a survey in Nigeria found that 84% of those who carried two bags were women and 95% of the 119 commuters traveling with children were women. (Zhen, 2021) Another survey in Uganda found that women were far more likely to be accompanying children on trips (Courtright, 2021). Another survey of electric car users in the USA also found that women's purchasing options were influenced by the fact that they are more likely to be transporting children or cargo (Maceachern, 2021). Electric vehicles designed for women need to consider design options that would cater to the practical needs of women in this way else they may opt for alternate transport modes, or their mobility may be limited entirely.

## Safety

**The risk of gender-based violence and sexual harassment were a key concern for women, particularly in the use of two-wheel or three-wheel vehicles.** For example, research in Liberia into barriers for women in operating motorcycle taxis found that some women felt the risk of sexual harassment while carrying male passengers was risky (Jenkins et al, 2020). Similarly, fear of sexual harassment including obscene verbal commentary and non-consensual physical contact was found to be a barrier to cycling in Kenya in a recent study, where 45% of female cyclist respondents reported having encountered sexual and physical harassment on the road within the past six months (Mwaura, 2023). A study in Uganda on Boda Bodas found that women deal with safety risks from both strangers on the road and from operators themselves. Women were noted to face a heightened risk of assault at night, along unlit roads (Courtright, 2021).

### Tackling sexual harassment and violence on Kenya's transport systems

The Usalama wa Uma project was developed in 2015 following public stripping incidents at matatu stages in Kenya in 2014. The project focused on training public transport providers, including matatu drivers, conductors and traffic police, on preventing sexual harassment, gender sensitization, customer service and personal and professional development. By 2019, they had trained more than 700 public transport providers. Participants trained have served as agents of change by implementing gender-sensitive initiatives in the workplace, such as customer service charters, sexual harassment policies, codes of conduct and amending human resources policies to promote the employment of women in transport.

Source: Courtright et al., 2022; Flone Initiative, n.d.; Flone Initiative, 2022

**Similar concerns have been a feature of women using 2-wheel and 3-wheel vehicles in other regions.** For example, in Indonesia, various motorcycle taxi services operated for and by women exclusively have arisen in response to harassment and safety concerns (Rondonuwu, 2015). In Lahore, Pakistan, women-only rickshaw services have been launched, driven by women for women (Shahzad, 2016). These examples highlight that gender based violence, and measures to address it, are a critical consideration in providers of 2-wheel or 3-wheel EVs, and the services provided with them.

**Poor physical infrastructure and road safety were cited as concerns for women.** In many contexts, roads are not fit for purpose and traffic rules are not enforced, making utilising 2-wheel and 3-wheel

vehicles challenging. This was found to be a barrier to women cycling in Kenya, for example (Mwaura,

#### Gender inclusive electric buses in Peshawar, Pakistan

To develop sustainable and inclusive urban transport in Peshawar, the first integrated BRT corridor is designed to deploy a fleet of hybrid electric buses with dedicated lanes to reduce congestion. This will also improve air quality and reduce carbon emissions, improving the health of citizens and contributing to low-carbon development. A gender analysis conducted at the start of the project found that 90% of women felt unsafe using the existing bus service and preferred to walk or take alternative transport, if they could afford it. A “Safe Travel Programme” was developed to address issues of sexual harassment, theft and bullying to increase the ridership of women, older people, people with disabilities and other marginalised groups. Proper lighting, CCTV and dedicated seating areas for women were introduced, staff were trained on how to deal with reports of harassment, and multimedia campaigns against sexual harassment are played on board transport. In addition, at least 15% of commercial spaces in stations was reserved for women and a target was set for 10% of employees to be women.

Source: ADB, 2017; ADB, 2021.

2023). In addition to poor roads, women have concerns around traveling at night on cycles or Boda Boda due to poor lighting (Zhen, 2021). For example, in Kabraole, Uganda, a female Boda Boda rider noted an instance where she experienced an attempted robbery at night, and changed to daytime driving as a result (Courtright et al, 2022). The driver now avoids picking up passengers from the roadside, instead relying on a list of trusted and regular clients.

**‘Range Anxiety’ has been reported to put women off from investing in EVs, particularly due to safety concerns from being stranded alone if the battery runs out.** Availability of public and private charging units at regular intervals is important to address these concerns (Page, 2022). Sivakumar (2022) notes that reliability of the EV is an essential consideration for women in e-cars. This anxiety has also been found in research in the US on women’s use of electric vehicles, including running out of battery before reaching their destination; not having anywhere to recharge, or being stranded for extended periods during a recharge (Maceachern, 2021).

### Social Norms

**Cultural beliefs and social norms can limit women’s access to 2-wheel vehicles in particular, as well as limit their roles as operators or drivers of vehicles.** While not an issue in every context, in many places, “cultural” beliefs about women’s virginity, dignity, and respect, also present barriers to accessibility beyond that of men (Courtright, 2021). In more conservative communities, one study found there is a belief that women can lose their virginities by sitting split-legged on motorcycles or bicycles (Courtright, 2021). Patriarchal language exists in many African countries that paints highly mobile women as uncaring or unfaithful wives, which was found to be a considerable barrier to women’s mobility, as women can be threatened with violence when they seek improved mobility.<sup>37</sup> (Courtright, 2021). Beliefs around the appropriate way women should ride 2-wheel vehicles, for example, riding motorcycles ‘side-saddle’ as being more appropriate can cause safety issues for women. Specifically, sitting side-saddle is less secure, and fast driving or potholed roads can then pose a larger danger for side-saddle passengers (Courtright, 2021).

**A 2023 study of promoting cycling among women in Nairobi found low levels of uptake** due to negative socio-cultural perceptions, unsafe roads, a lack of security, barriers to learning to cycle, barriers to cycling infrastructure and infrastructural deficits (Flone Initiative, 2023). Many of these barriers also apply to the use of 2- and 3-wheel electric vehicles.

**Social norms combined with poor product offerings for women prevents them from picking up the skills and confidence to use two-wheel vehicles.** A study in Kenya on cycling found that women are socialised from a young age towards a negative approach to cycling, including the perception that cycling was for boys (Mwaura, 2023). Women encountered disapproval from peers and adults in cycling, and concerns around ‘male gaze’ and comments on appearances while wearing cycling attire was found to be a deterrent to women taking up cycling. In addition, the conditions within which any cycle training is conducted is not considered to be safe for women which meant that many gave up after an initial attempt. Those who gained some skills reported not having the confidence to cycle on the road, particularly due to past traumatic cycling experiences or barriers to learning about traffic rules.

**A lack of trust in women’s driving skills impacts their ability to work using vehicles.** For example, another female Boda Boda driver from Uganda relates that many people doubted her riding skills at first and would only let her carry luggage, out of doubt for her abilities. She notes however, that this perception shifted once people realise she is a capable driver (Ashaba, 2020). A study from Sierra Leone of motorcycle operators showed that ‘lacking strength’ was a frequently cited reason for why there are no female operators, followed by ‘no interest’ and ‘no support.’ (Jenkins et al, 2020).

**These kinds of attitudes have also led to political and organisation exclusion and lack of representation of women.** For example, a female Boda Boda driver in Uganda noted that she joined the male-dominated Boda Boda Association to work, but planners and engineers do not consult with women drivers. She also experienced ostracization from men not wanting to work with her (Courtright et al, 2022), which was reported in a number of anecdotes around opposition from men to women operators (Ashaba, 2020; Courtright, 2021). This was noted in one case to be a particular barrier to the potential of electric 2-wheelers, where in many countries women do not drive powered two-wheelers (Sivakumar, 2022).

**Vehicles can often be considered a male-dominated domain, acting as a barrier to women’s access.** For example, in the context of buying cars, the automotive industry across the world is notoriously tailored to men, where women complain about being ignored or disdained when buying a car, especially if they’re shopping with a man (Maceachern, 2021). In the African context, Boda Boda are often operated from ‘stages’ which serve as a social venue for men also. This could deter women as potential customers or operators of electric vehicles if not planned for.

**Gendered division of labour can be a barrier to women taking up jobs as operators of motorcycle taxis (Jenkins et al, 2020).** Care commitments for family and children were cited as a reason women can not take up riding. Many felt that women taking up jobs as operators could strain relationships with husbands or partners, due to jealousy (Jenkins et al, 2020; Courtright, 2021). This would equally apply to women considering purchase of an electric vehicles as a means of economic income. However, EVs can simultaneously provide a means of time saving for women due to their mobility and ease of use.

## Cost

**Not having the money to finance a motorcycle was a key concern that prevents women for taking up roles as operators.** This can also be a reason for women to not learning how to drive. Women responding to research in Liberia and Sierra Leone note that cash grants or loans alongside training to drive motorcycles would be necessary, for example (Jenkins et al, 2020). In Kenya the cost of cycles



means that cycling is often associated with middle- and high-income earners, in sharp contrast to other developing countries, where it is viewed as a mode of transport for low-income earners (Mwaura, 2023). This can act as a major limiting factor to women from low-income households. Women from socially excluded groups, including women with disabilities, are more likely to be in poverty due to additional levels of discrimination and barriers to accessing education and employment.

**In Kenya, standard cycling is associated with middle- and high-income earners** (Flone Initiative, 2023). In contrast to other counties, cost of cycling is a key concern in Kenya, particularly for women from low-income households. This may also be a barrier for EV purchase.

**Payment structures for vehicles are not always suited or designed to women, particularly from low-income households.** For example, ecobodaa and other e-bike providers estimate cost of e-bikes based on how much Boda Boda drivers make in a day. This cost model would not apply to women who may be unable to work a full day in the same way due to their care responsibilities or gendered division of labour. Jenkins et al's (2020) research asked why women cannot enter into a work-and-pay agreement like men often do, for example, and one participant explained that there is a misconception that women are not as brave or as strong as men, so finding a friend, family member or local entrepreneur who would be willing to enter into a work-and-pay agreement with a woman is difficult. Research in Uganda also found men were often reported to be unwilling to rent vehicles to women, as they claimed women were more likely to be robbed (Courtright et al, 2022). Porter et al. (2012) found that women in Ghana expressed a similar interest in riding bicycles, only to hand over the bicycle to their husbands once provided with it (Jenkins et al, 2020). In Ethiopia, men are more likely to hire a bajaj, which is a three-wheeler, than women because they have greater control over the household budget and more decision-making power than their spouses, whilst women are more likely to take crowded mini- or midi-buses, walk or not take the journey (ReCAP, 2017). Service offerings around electric vehicles should come with payment options that respond to the situations and needs of women.

Cycles marketed to women may prioritise aesthetics over function, detracting from women's comfort and safety in cycling or the durability of the bike, causing them to stop using them or to break earlier (Wild et al, 2021). These barriers may extend to women's willingness to access e-bikes

## 4. What are the opportunities and benefits of gender-inclusive design of electric vehicles?

### Market opportunity for EVs in Kenya and Sub-Saharan Africa

This section briefly outlines some key trends in EV markets and the opportunities arising to promote greater gender equality and social inclusion.

**Alternatives to petrol engines are needed to meet the Kenyan government's hopes to transition into a 100 percent green energy nation**, with more than 80 percent of its energy coming from hydro, solar, geothermal and wind. Africa could see a 50 percent increase in air pollution by 2050 in low- and middle-income countries by 2050, according to a study by the Global Environment Facility (Kibet, 2021). As the number of vehicles on the continent grows, the challenge for sub-Saharan Africa will be to push for more sustainable mobility and also to avoid the risk of becoming the dumping ground for the world's unwanted used ICE vehicles (McKinsey, 2022).

**EV technology offers cost savings that could open up the market to low-income groups including women.** For example, Ecobodaa says its pilot program showed that the company has been able to save riders 36% on daily fuel spend, over 75% on repairs, and 90% on servicing over a period of 3 months. These are significant savings for Boda Boda riders. Lowering their operating costs will help riders build some savings (Kuhudzai, 2022). Electric vehicle providers are also experimenting with batter swapping systems, which can help save buyers money as many sellers follow a model in which they retain ownership of the battery, the bike's most expensive part. (Page, 2022; Reuters, 2022) By excluding the battery from the cost under this system, Ecobodaa has been able to offer electric vehicles for around the same price as a combustion-engine bike thanks to the exclusion of the battery from the cost. (Reuters, 2022)

**EVs can provide a cleaner, more efficient way for the sector to grow.** Experts have suggested that the “largest opportunity” for EVs in East Africa is two- and three-wheeled vehicles more than cars (Page, 2022). Shifting to electric bikes in Kenya, Rwanda, Uganda and elsewhere could reduce costs, air pollution and greenhouse gas emissions, as well as create jobs (Kibet, 2021). A Boda Boda rider in Kenya, who has been using an electric bike for six months within Nairobi from the service Ecobodaa, notes that maintenance is cheaper on e-bikes compared to ICE bikes (Kibet, 2021). These electric vehicles could be an important way for the country to tackle rising emissions, with petrol-fuelled motorbikes can 10 times more polluting than electric alternatives (Reuters, 2022).

**Kenya's access to energy may provide an opportunity to promote the adoption of electric vehicles.** Access to electricity in the country is over 75 per cent, according to the World Bank, and even higher in Nairobi. (Reuters, 2022) In 2020, over 90% of the electricity used in the country was generated from renewable sources such as hydropower, geothermal, solar PV and wind. A year earlier, Kenya also reduced the import duty for fully electric vehicles followed by releasing a comprehensive strategy to increase the adoption of EVs (Page, 2022; Toll, 2022) The country's power utility estimates it generates enough to charge two million electric motorcycles a day (Reuters, 2022). However, experts have noted a transition of this kind still requires large investments in the upgrade of electricity distribution units, at homes and businesses (Page, 2022).

**Localisation is already underway, presenting an opportunity to incorporate gender-inclusive design.** Many companies have noted the need to design EV models they offer from scratch because no existing motorcycles matched local users' needs, which includes the need for something that is “very strong, very versatile, very robust, easy to repair and cheap at the same time” (Page, 2022) Almost 90% of the motorcycles are built and designed locally,” says Lucy Mugala, a research and development engineer who helped create the motorbike. “(Electric vehicle manufacturing) is quite new in this county, so we are sort of pioneers” (Page, 2022).

**Kenya and Sub-Saharan Africa are already seeing a growth in EV related companies.** McKinsey (2022) notes that there is a growing start-up ecosystem focusing particularly on electric two-wheelers emerging in the region, and estimates that as of the end of 2021, there were more than 20 start-ups in the ecosystem, which combined raised over \$25 million in funding that year. Another estimate suggests that there are 15 startups in the sector in Kenya (Kuhudzai, 2023).

**There is rapid growth in the number of 2-wheel and 3-wheel vehicles in Kenya and in Africa more widely.** The motorcycle industry supports 5.2 million Kenyans directly or indirectly, which is about 10 percent of Kenya's population. There are 1.4 million motorcycle riders in Kenya (Kibet, 2021). The country also imports more gasoline motorbikes than cars, doubling its fleet every 7 to 8 years, and it is estimated that the newly registered gasoline motorcycles, commonly used as taxis (boda-boda), which stood at 1.5 million in 2018, will likely hit 5 million by 2030 (ibid). 3-wheelers, or Tuk-tuks, are a key segment especially in the coastal region of Kenya in places such as Diani, Mombasa, Kilifi, Watamu, and Malindi. (Kuhudzai, 2023)



## Benefits to women and their families from EVs

**The benefits of transport for accelerating women's economic empowerment are well documented.** Gender-responsive transport investments can promote women's economic empowerment by increasing mobility, reducing time poverty, and providing access to expanded opportunities (Jobes et al., 2017). Whilst approaches that do not consider the needs of diverse women can increase exclusion and increase the risk of harm.

**Access to EVs can reduce time poverty for women by replacing slower means of transport,** such as walking, pedal bikes and public transport. Public transport often does not take the needs of women into account. This is particularly the case for women living in informal settlements in Kenya who may have to walk to their destinations or rely on unscheduled public transport (Mitullah et al., 2019). Women with disabilities face additional barriers due to inaccessible transport and reluctance from operators to allow assistive technology or mobility aids on board. There are also often safety concerns associated with walking or taking public transport. Reduced travel time allows for more time to be spent on education, employment or other tasks.

## Business case for gender-inclusive EVs

**Gender-inclusive approaches in the EV sector present a number of opportunities for businesses and manufacturers.** Gender-focused solutions increase the commercial returns on investment by reaching new customers and realising latent demand, through increasing the customer base by appealing to women. There are also opportunities to enhance innovation and productivity by increasing the numbers of women employees, and to strengthen supply chains by engaging with women entrepreneurs. Many of these opportunities overlap with documented and evidenced business case from the mobility sector.

**Appealing to women as operators could promote more ridership from other women.** As 2-wheel and 2-wheel electric vehicles seek to get a foothold in markets across Africa, making vehicles accessible and affordable to women as operators could lead to increased ridership and revenues from taxi services. In many contexts, including in Africa and Asia, women have expressed preference for women drivers or operators. For example, in Jenkins et al's study (2020) in Liberia and Sierra Leone, many women indicated that they would prefer to ride with a female operator of motorcycle taxis. In Indonesia, recognition of cultural preferences for women operators has led to the establishment of businesses such as LadyJek, and app-based ride hailing service, whose drivers dress in pink jackets and helmets, and Sister-Ojek, another similar app-based start-up (Rondonuwu, 2015).

**Research shows that women are more inclined to buy electric two-wheelers, and could provide an expanded customer base.** As consumers, women make 80% of household buying decisions worldwide (Deloitte, 2011). Women are also recognised as being more likely than men to adopt sustainable travel (European Parliament, 2012), making them a key potential market for electric vehicles. Research has shown this tendency extends to two-wheelers, where women are more inclined to buy electric two-wheelers as they usually travel less distance and prefer low-speed vehicles in comparison to men (Jayasingh et al, 2021). In India for example, Electric Vehicle industry is noted to be driven more by scooters rather than cars – and a large percentage of women in India use scooters. This makes them a critical market for EVs (McLoughlin, 2022).

**Making transport, particularly motorcycle-taxis, more accessible to women opens economic opportunities.** Motorcycle-taxis in Africa are a critical lifeline to many women passengers as well as business owners. They can be an affordable way to access healthcare and education, or to help small businesses move goods and provide deliveries (Courtright, 2021). EV companies seeking to enter the market could see increased sales and revenues if they are able to provide affordable transport solutions to this market segment – which at the same time would boost economic activity and

productivity. In addition, the lack of affordable and safe transport, particularly after dark, is a major barrier to formal employment outside the home.

**Women can provide critical workforce for the EV industry.** As the EV sector seeks to grow, engaging women as employees presents a critical opportunity for enhancing productivity and growth, as well as accessing a skilled workforce. Saera, an EV manufacturer from India, notes that the EV industry is more focused on electrical components rather than mechanical and physical labour required in traditional automotives (Saera, 2022). This often suits the skillsets available from women employees, and has resulted in many EV companies employing a large percentage of women. In India, recruiters reported that six of every ten experts being hired in the EV sector today are women (McLoughlin, 2022). Similar trends can be seen in Kenya’s EV companies, where the company Opibus have a workforce comprising of 40% women (Chepkoech, 2021). There are wider benefits to transport provides from increasing the number of women they employ. For example:

- Transport infrastructure with more women employees has been shown to enhance service delivery, increase perceptions of safety for users, increase ridership, create greater operating efficiencies, attract talent and increase the retention of women (European Commission, 2018).
- A study by DG Move, European Commission, on female employment in the transport sector, including aviation, public transport, logistics and planning and engineering, found that benefits to employers included: increased retention rates, improved decision-making, creativity and innovation; a more congenial workplace environment; and increased employee satisfaction, all of which resulted in greater productivity and financial performance (Giannelos et al., 2018).
- It is estimated that companies with three or more women in senior management functions score higher in all dimensions of organizational performance (McKinsey & Company, 2017).
- in the aviation sector, KLM has found that diversity within their teams results in new and innovative solutions, challenging team members to think outside of the box, consider a wider variety of challenges and solutions and also handle stress better (Giannelos et al., 2018).

## 5. Recommendations

This section provides a series of recommendations in response to the barriers and opportunities identified above. They are written primarily for EV companies, manufacturers and assemblers, and for donors aiming to increase uptake and promote equality and inclusion.

1. **Conduct market analysis into the needs of women using electric vehicles.** Given the lack of information on gender-inclusive designs of E2W and E3Ws, companies could ensure that gender is integrated into existing market analysis to identify the needs of women as customers. This could include product testing and identifying design needs; as well as women’s preferences and practical mobility needs in general. The needs of a wide range of women, including women with disabilities and poor women, should be considered to avoid leaving anyone behind. This market analysis would allow EV companies to develop product offerings with suitable financing arrangements that would tap into latent demand represented by women.
2. **Identify context specific design options through engagement with women.** E2W and E3W manufacturers should develop designs based on local country context and preferences. This could involve conducting market research with women’s rights organisations and women-led organisations of persons with disabilities, through surveys or focus group discussions. This could

also be built into existing business activities through customer relations, marketing and sales or research and development departments.

3. **Develop tailored cost and payment options for EVs that respond to the diverse roles women play.** The research indicates that pricing models for EVs developed with men in mind are not necessarily accessible to women. Providers should consider a variety pricing packages and models for EVs that enable access to low-income groups, including women. EV technology also provides an opportunity to provide mobility at lower costs – which could be a unique enabler for different pricing models.
4. **Digitisation of riding services to improve trust and safety.** Safety is a key concern and barrier for women when considering options for transport. Some providers have started to digitize their services, such as through ride hailing apps, GPS trackers and digital monitoring devices, with research suggesting positive effects on boda-boda operator behaviour as a result (UNDP, 2022). EV providers seeking to provide vehicles for taxi services could consider integrating this technology at the outset. It is important to consider accessibility of digitised approaches for low-income and marginalised groups. In Kenya, mobile phone ownership is common (92% of men and 86% of women) however, there is a larger gender gap in who accesses mobile internet (56% of men and 32% of women) (GSMA, 2021).
5. **Assess the safety and accessibility of supporting infrastructure from a gender perspective.** Concerns around safety related to electric vehicle infrastructure are a key barrier. This includes ‘range anxiety’ and concerns relating to operating out of male dominated ‘stages’. EV manufacturers should go beyond a focus simply on their products, to consider how accessible related spaces are to women. This includes charging points, points of sale, and areas of congregation for operators. Making these spaces accessible and safe for women can help boost uptake of EVs amongst women. Measures could include, for example:
  - Gender safety audits of charging points and their locations.
  - Analysis of routes and trips taken by women, and installing charging points or battery stations that take these routes into account. Charging stations could be installed in places where women are more likely to travel or trip chain. Women should be consulted in these decisions.
  - EV sales teams that include women so that women feel safer, more welcome and supported to enquire and purchase vehicles.
  - Provide women-only services or spaces if appropriate, for example women-only taxi services offered via EVs.<sup>2</sup>
6. **Support and invest in women as ‘champions’ of EVs.** Positive role models and trailblazers were found to be an effective way to challenge stereotypes around women’s ability to drive 2-wheel vehicles. Many riders face reluctance or opposition at first to their services as motorcycle taxis, with many assuming they were not strong enough. However, their experience was that once customers saw that they were competent drivers, they were willing to utilize their services or loan vehicles to them. EV providers could support women drivers by tailoring their designs and financing models to meet women’s needs and profiling women drivers in their marketing efforts. Donors could support women drivers or operators through measures including:
  - Training women to ride E2Ws to enhance skills and confidence

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<sup>2</sup> See for example women’s only Rickshaws in Lahore, Pakistan: <https://www.theguardian.com/world/2015/apr/10/women-only-rickshaw-hits-the-road-in-lahore> & LadyJEK in Indonesia: <https://www.techinasia.com/22yearold-building-gojek-competitor-exclusively-women>

- Providing grants or concessions to women drivers wanting to work as operators of EVs
  - Supporting grassroots associations representing women riders, such as women Boda Boda associations (which tend to receive less funding and support). This support could involve companies or donors partnering with or meaningfully engaging with these associations on the design or uptake of EVs. Meaningful engagement with women’s rights organisations and representative organisations can also help maximise the benefits of EVs for low-income and underserved groups.
7. **Enhance opportunities for women as employees.** Many EV companies across the world, including in Kenya, are already recognizing the opportunities in employing women as part of their workforce. EV companies should proactively seek to attract more women to their workforces, which could help them offer products and services that are more appealing to women customers. Measures could include:
- Establish context-specific quotas for female workforce and recruitment
  - Ensure training activities include both women and men
  - Create a female-friendly workplace environment to facilitate greater female participation and retention in the workforce and can even help break down harmful gender stereotypes in the automotive sector
  - Provide women employees with access to information, training to support retention and career progression
8. **Target women entrepreneurs with access to mobility.** EVs have wider potential benefits to women beyond the mobility they can provide. EVs could be designed and marketed to women entrepreneurs and business owners to facilitate productivity. For example, this could include providing renewable energy charging in the way offered by Try.ke.
9. **Produce gender-responsive and targeted marketing materials.** Including representations of diverse women in marketing materials and advertising can challenge negative stereotypes and normalise the idea of women using two- and three-wheel EVs.

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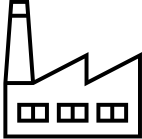

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# ANNEX 1

The table below contains illustrative examples of measures and impacts that could promote greater gender equality in EV uptake, which could be further developed to support action.

	Entry Point	Business Case	Example Project Features
	Design	Gender-responsive design of vehicles means that the products will appeal to a wider audience.	A fleet of electric buses are designed to meet the needs of women, as identified through stakeholder consultations, including fully adjustable driving seats and control features.
	Manufacturing	Increased opportunities for businesses to access a wider labour force by attracting women to skilled and non-skilled electric vehicle assembly jobs	Employing a significant amount of women in the workforce and leadership positions.  Commitments to make progress towards gender balance in the workforce, a gender-inclusive work environment, and introducing measures to support women's advancement, e.g. mentoring, or training.
	Access to transport	Making transport safer and more accessible for women boosts ridership and revenue.	An electric bus project that aims to reduce the risks of gender based violence and harassment via the implementation of digital solutions such as CCTV and emergency call points.



### Entrepreneurship

More affordable access to electric vehicles can create income-generation opportunities for women, that in turn lead to an increase in taxi or delivery services that appeal to other women.

Women are trained and supported to become Boda Boda drivers.

Flexible finance models designed around women's needs and ability to pay



### Expanded market activity

Increased access to transport can allow women to increase sales, save more and expand their businesses, strengthening supply chains.

A project that focuses on enabling women to travel more easily between key residential and commercial and market districts, as identified through stakeholder consultations.

A supplier targets female start-ups and entrepreneurs with electric two wheelers, enabling them to bring products more easily to market.

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