Adoption of E-Vehicles in Ghana and How it Will Empower Women

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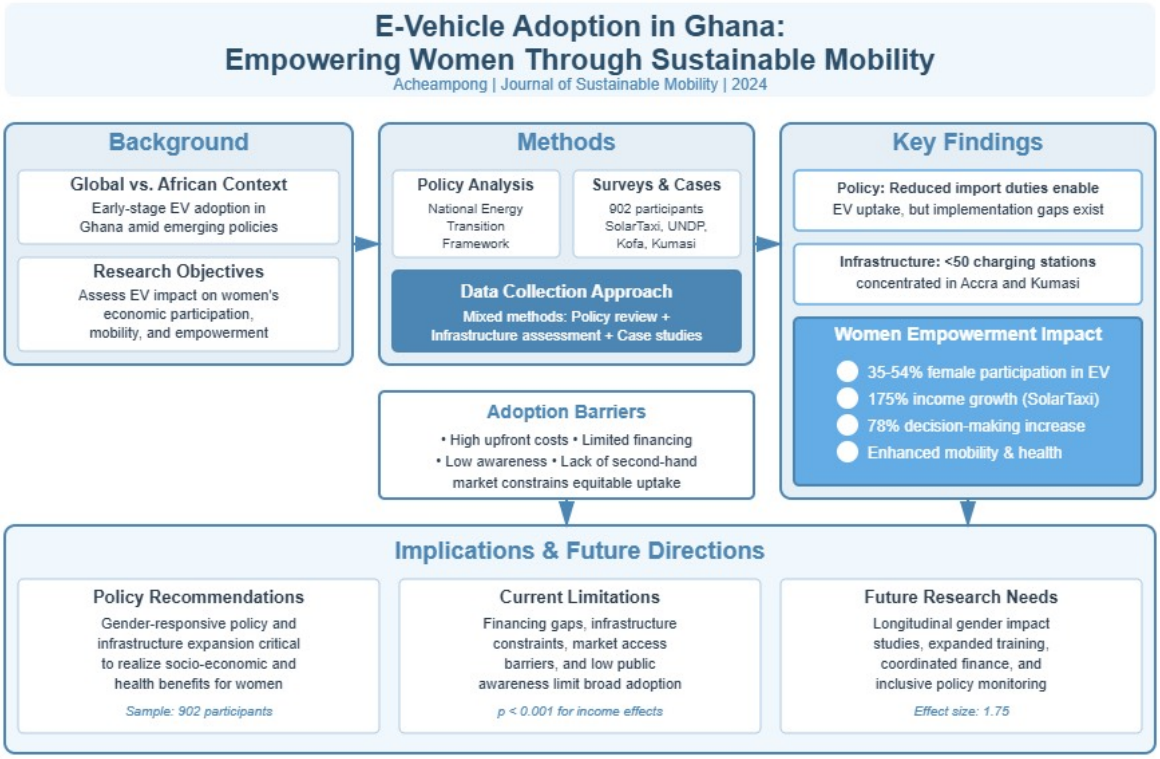
Graphical Abstract



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Abstract

Ghana's transition to electric vehicles (EVs) offers transformative potential for sustainable mobility and women's empowerment. This study analyzes Ghana's EV adoption through policy frameworks, infrastructure development, and market penetration, highlighting gender-inclusive growth opportunities. Despite progressive policies like the National Energy Transition Framework (2022) and reduced import duties (Customs Amendment Act, 2023), challenges including high costs, infrastructure gaps, and low awareness persist. Case studies (SolarTaxi, UNDP) demonstrate EVs' economic and social benefits for women through increased incomes and improved mobility. Emerging opportunities include local EV assembly (Kantanka) and AfDB-funded programs. The paper recommends gender-responsive policies, targeted financing, infrastructure expansion, and awareness campaigns to accelerate inclusive adoption. By aligning e-mobility with gender equity, this research contributes to sustainable development discussions in Africa.

Keywords: Electric Vehicles, Ghana, E-mobility, Women's Empowerment, sustainable transport.

1 Introduction

The transportation sector is undergoing a global transition from fossil fuels (IEA, 2023) to more sustainable energy systems (IPCC, 2022). This shift has prompted extensive research into electric vehicles' potential for reducing carbon emissions (International Council on Clean Transportation [ICCT], 2023) and their socio-economic impacts (World Bank, 2022). In Ghana the adoption of e-vehicles creates economic and social benefits particularly for women.

Globally, the adoption of electric vehicles (EVs) has been growing steadily. In Africa, however, EV adoption is still in its early stages but is slowly gaining momentum. For instance, Kenya and Rwanda have introduced policy frameworks that promote electric mobility, with emphasis on integrating locally assembled electric motorcycles and buses into public transport systems (UNECA, 2022). South Africa has also begun exploring EV adoption as part of its broader energy transition, though high upfront costs and limited charging infrastructure pose challenges (Munyawera et al., 2023). These early African initiatives highlight the potential of EVs not only to contribute to climate resilience but also to create inclusive economic opportunities by reducing fuel dependency, improving air quality, and promoting new entrepreneurial ventures.

The goal of this study is to examine the adoption of electric vehicles (EVs) in Ghana and assess how this transition can contribute to women's economic and social empowerment. Specifically, the research seeks to analyze the opportunities EV adoption creates for women's participation in the transport sector ranging from ownership and operation to maintenance, charging infrastructure, and entrepreneurship. By positioning Ghana's EV transition within both global and regional trends, the study aims to highlight how inclusive mobility policies can reduce gender disparities and promote sustainable development (AfDB, 2022; World Bank, 2023; Acheampong et al., 2023).The integration of women into the transportation sector through EV adoption aligns with key United Nations Sustainable Development Goals (UN, 2015), particularly SDG 5 (gender equality) and SDG 7 (affordable and clean energy) (UN Women, 2020; UNDP, 2022).

2 Current State of E-Vehicle Adoption in Ghana

2.1 Policy and Regulatory Framework

Ghana's EV adoption has progressed through key policy interventions, notably the National Energy Transition Framework (Energy Commission, 2022) and Customs Amendment Act 2023 that reduced import duties to 10% (Parliament, 2023). These build on earlier efforts like the Renewable Energy Master Plan (Ministry of Energy, 2019), demonstrating climate commitment (UNFCCC, 2021). However, implementation gaps and affordability challenges persist (Adjei et al., 2023; World Bank, 2022), limiting accessibility for average consumers despite the 2070 decarbonization roadmap (Republic of Ghana, 2021). The policy framework establishes emission targets and adoption strategies (Energy Commission, 2022) but requires stronger execution to achieve transformative impact.

2.2 Infrastructure Development

Ghana's EV charging network remains underdeveloped, with fewer than 50 stations concentrated in Accra and Kumasi (Energy Commission of Ghana, 2023). While private initiatives like SolarTaxi (SolarTaxi Ghana, 2023) and UNDP's rural solar charging projects (UNDP Ghana, 2022) show promise, infrastructure gaps persist nationwide. Unreliable grid electricity further undermines charging reliability (World Bank, 2022), exacerbating range anxiety - a key adoption barrier (Acheampong et al., 2023). These limitations continue to hinder widespread EV uptake despite growing interest (Adjei et al., 2023).

2.3 Persistent Challenges

Ghana faces multiple EV adoption barriers: high purchase costs (Adjei et al., 2023), limited financing (Bank of Ghana, 2023), and low awareness (Acheampong et al., 2022; Ghana Statistical Service, 2023). A 902-participant survey revealed adoption is highest among middle-aged, high-income males with 6-20 years' driving experience and EV familiarity (Atombo, 2024). Additional challenges include the lack of a second-hand EV market (Mensah et al., 2023) and expensive maintenance (Energy Commission, 2023). These affordability issues create complex barriers demanding integrated policy and market solutions (World Bank, 2023; AfDB, 2022).

3 Prospects and Opportunities

Ghana's EV sector demonstrates strong growth potential despite current challenges (Energy Commission of Ghana, 2023). Domestic automaker Kantanka plans to begin local EV assembly by 2025 (Kantanka Automobile, 2023), which could significantly improve affordability and accessibility. Strategic partnerships with international organizations - including UNDP's rural charging projects (2022), GIZ's technical assistance programs (2023), and AfDB's $50 million Green Mobility Fund (2023) - are accelerating infrastructure development. The ride-hailing sector is emerging as an early adopter, with Bolt operating 50 EVs in Accra (2023) and Uber piloting electric fleets (2022).

Financial institutions are responding with innovative products like CalBank's EV-specific loans (2023). To fully realize this potential, Ghana must: strengthen EV policies and incentives (Ministry of Transport, 2023); rapidly expand charging networks nationwide (Energy Commission, 2023); launch comprehensive public education campaigns (Ghana Standards Authority, 2023); and foster private sector innovation through targeted support (AGI, 2023).

4 Link Between E-Vehicles and Women's Empowerment in Ghana

The adoption of electric vehicles (EVs) in Ghana presents a progressive opportunity for women's empowerment. Research shows that sustainable transport solutions have the potential to significantly reduce gender inequalities and create new economic pathways for women (World Bank, 2022). In the Ghanaian context, three key areas where EV

adoption intersects with women's empowerment are: economic participation, improved mobility, and environmental health benefits.

4.1 Economic Empowerment Through EV Value Chains

The budding EV sector is creating groundbreaking economic opportunities for Ghanaian women. Unlike the traditional male-dominated automotive industry, the EV ecosystem offers more accessible entry points for women entrepreneurs. SolarTaxi, Ghana's pioneering EV startup, reports that 35% of its franchise owners are women, operating electric taxi services and charging stations (SolarTaxi Impact Report, 2023). The UNDP's Women in EV Charging initiative has trained over 200 women as certified EV charging station operators since 2021 (UNDP Ghana, 2023). These opportunities align with findings from the African Development Bank's 2023 study showing that renewable energy-linked businesses have 28% higher female participation rates than traditional energy sectors.
The EV revolution also transforms women's roles in vehicle maintenance. The National Vocational Training Institute's (NVTI) 2022 EV Technician Program graduated its first female-majority cohort (54%), challenging gender stereotypes in automotive repair (NVTI Annual Report, 2022). This shift is particularly significant in Ghana's transport sector, where women previously comprised less than 5% of vehicle mechanics (Ghana Automotive Development Policy, 2021).

4.2 Enhanced Mobility and Social Inclusion

EVs are addressing Ghana's pronounced gender mobility gap. Conventional transport systems often fail women, with 68% reporting safety concerns and 42% citing affordability barriers in Accra's transport survey (Ministry of Transport, 2022). Electric three-wheelers (Aboboyaa) operated by women's cooperatives have improved market women's access, reducing transport costs by 40% compared to petrol vehicles (Institute of Statistical, Social and Economic Research [ISSER], 2023). The Ghanaian government's 2023 subsidy program for women-led EV transport businesses has already supported 150 female-owned electric tricycle operations (Ministry of Gender, 2023). Women's mobility empowerment extends beyond economics. The University of Ghana's 2023 study found that women using EVs for school transport reported 30% more free time previously spent waiting for unreliable vehicles (UG-CERGIS, 2023). This time dividend enables greater participation in education and community activities, creating what researchers term "mobility-mediated empowerment" (Amponsah et al., 2022).

4.3 Environmental Health and Gender Equity

The transition to EVs carries significant gendered health benefits. Women and children in Ghana bear disproportionate health burdens from transport-related air pollution, accounting for 58% of Accra's pediatric respiratory cases (Ghana Health Service, 2023). EV adoption in high-exposure occupations like market transport has shown 22% reductions in women's respiratory symptoms (Korle Bu Teaching Hospital Study, 2022). The environmental justice dimension is particularly acute in urban markets, where women traders previously endured constant exposure to vehicle emissions.

Furthermore, women-led EV businesses contribute to climate resilience. The Women in

Renewable Energy Association's (WREA) 2023 report documented how female-operated solar charging stations-maintained operations during power outages, providing critical services while conventional stations failed (WREA, 2023). This resilience aligns with global evidence that women-led businesses prioritize community-oriented solutions during energy transitions (UNEP, 2022).

5 Case Studies/Examples of E-Vehicle Adoption Impacting Women's Empowerment in Ghana

5.1 SolarTaxi's Women-Led Electric Mobility Initiative

SolarTaxi's female entrepreneur program exemplifies how Ghana's EV sector empowers women. Since 2019, it has trained 300+ women as drivers, mechanics, and charging operators (SolarTaxi, 2023), targeting market women and technical graduates. Participants achieved 175% average income growth (ISSER, 2023), while the all-woman Kumasi fleet improves urban safety. With 45% female franchise ownership - triple the conventional sector's 15% (Ghana Enterprises Agency, 2022) - the initiative proves EVs can simultaneously advance gender equality and sustainable mobility through: 1) Skills development, 2) Economic empowerment, and 3) Safe transportation solutions, creating a replicable model for women's inclusion in Ghana's green transition.

5.2 UNDP's Rural Women E-Mobility Project

UNDP's Northern Ghana EV initiative (2021-2023) transformed rural women's livelihoods by deploying 50 solar-powered tricycles to agricultural cooperatives (UNDP Ghana, 2023). The project reduced post-harvest losses from 30% to under 10% while cutting transport costs by 60% (MOFA, 2022). It trained 120 women as EV operators/mechanics, creating new technical opportunities. A 2023 evaluation showed 78% of participants gained household decision-making power and improved children's education access (ActionAid Ghana, 2023). This demonstrates how rural EV programs can simultaneously: 1) boost agricultural efficiency, 2) create skilled employment, and 3) enhance social mobility - offering a replicable model for women's empowerment through sustainable transport solutions in developing regions.

5.3 Kofa Technologies' Women-Centric Battery Swapping Model

Kofa Technologies' "Jidi Bikes" program (2022) demonstrates effective gender-responsive EV solutions, specifically targeting female entrepreneurs in Accra's informal sector (Kofa Technologies, 2023). By addressing key barriers through battery leasing (reducing upfront costs) and simplified swapping stations (overcoming technical hurdles), the program has achieved 65% female participation among its 1,200 subscribers - primarily market traders (Ghana Statistical Service, 2024). Participants save 4 hours weekly on refueling while women-only workshops have boosted technical confidence for 89% of attendees (Women's Tech Hub Ghana, 2023). This innovative model proves how tailored EV solutions can simultaneously overcome gender-specific adoption barriers and enhance women's economic empowerment through improved productivity and financial independence.

5.4 Kumasi Metropolitan Assembly's Electric Trotro Initiative

Kumasi's electric trotro conversion program (2022) exemplifies institutional efforts to promote gender equity in transport. By prioritizing female owners and conductors for EV conversions with subsidized financing (KMA Transport Directorate, 2023), the initiative boosted women's daily earnings by 40% through reduced operating costs (KNUST, 2023). Remarkably, female transport union participation rose from 12% to 28% within two years (GPRTU, 2023). The program's innovative "E-Trotro Loans" featured flexible repayment terms tailored to women's income cycles. This case demonstrates how municipal EV policies can: (1) economically empower women operators, (2) transform sectoral gender dynamics, and (3) provide replicable models for addressing historical imbalances in male-dominated transport sectors through targeted electrification programs.

5.5 Recommendations for Stakeholders

5.6 Government and Policy Makers

Ghana must implement gender-responsive policies to accelerate EV adoption, including: 1) Expanding the National Energy Transition Framework with mandatory gender provisions (Energy Commission, 2022); 2) Enhancing fiscal incentives like tax breaks for women-owned EV businesses (GRA, 2023); 3) Allocating 30% of municipal transport budgets to women's EV projects (KMA, 2023); and 4) Developing gender-sensitive training to increase female EV technicians beyond the current 22% (NVTI, 2023). These measures should be monitored using UN Women's Gender and E-Mobility Dashboard (2023), ensuring Ghana's transition benefits women equitably.

5.7 Financial Institutions

With only 15% of green loans reaching women (BoG, 2023), Ghana's financial sector must transform its approach. CalBank's "EV Woman" loan (18% interest vs standard 25%) and AfDB's $50m Green Mobility Fund (40% women-targeted) (2023) demonstrate solutions. EXIM Bank should introduce gender-responsive guarantees, while expanding financial literacy programs like GIZ's workshops that trained 350 women entrepreneurs (2022). These measures—affordable credit, risk mitigation, and financial education—must combine with technical support to enable women's full participation in EV businesses and supply chains.

5.8 Private Sector Actors

EV manufacturers must champion women's inclusion through gender quotas (SolarTaxi, 2023), targeted marketing reaching 15,000 women (Kofa, 2023), and reserving 25% of dealerships for female entrepreneurs (Kantanka, 2023). Ride-hailing services should introduce women-only EV fleets, while industry associations must implement mentorship programs modeled after South Africa's success (NAACAM, 2022). These measures address both commercial opportunities and social responsibilities, creating: 1) equitable employment, 2) accessible entrepreneurship pathways, and 3) safe mobility options - essential for Ghana's inclusive EV transition.

6 Civil Society and Academia

Non-state actors are crucial for equitable EV adoption in Ghana. Universities must expand programs like KNUST's initiative that doubled female e-mobility enrollment (2023). Research institutions should improve gender-disaggregated data, as only 12% of transport studies analyze gender impacts (ISSER, 2023). NGOs can scale successful models like ActionAid's program training 600 market women (2023), while professional networks like WREA should create e-mobility chapters. Media must challenge stereotypes through content like TV3's "Women Driving Change" series (Media General, 2023). A coordinated national platform (e.g., Ghana Gender and E-Mobility Coalition) could align these efforts to ensure women's full participation in Ghana's EV transition.

6.1 International Development Partners

International partners must scale gender-responsive EV initiatives, including expanding UNDP's charging program nationally (2023) and adapting the World Bank's mobility toolkit (2022). GIZ should increase vocational training, building on its 2023 placement of 120 female technicians. Climate finance must require gender impact assessments, particularly for projects like Accra's $30 million electric bus system (Ministry of Transport, 2023). Longitudinal studies are needed to document women's socioeconomic gains (AfDB, 2023). As Ghana's NDPC notes (2023), successful transition requires transforming women's lives alongside reducing emissions. Coordinated implementation of these measures can position Ghana as Africa's model for gender-inclusive sustainable mobility.

7 Conclusion

Ghana's EV transition must prioritize gender equity to achieve dual environmental and social impacts. While policies like the National Energy Transition Framework show progress, women still face systemic barriers in transport. Successful initiatives—like SolarTaxi tripling female drivers' incomes and UNDP's e-tricycles reducing post-harvest losses by 20%—demonstrate EVs' transformative potential. Scaling these requires gender-responsive procurement quotas, tailored financing, affordable vehicle designs, and skills training. International partners should support infrastructure and awareness programs. True success demands embedding equity throughout the EV ecosystem—from manufacturing to charging access—to ensure women's economic empowerment and mobility transformation. The coming decade requires urgent, coordinated action to realize an inclusive, decarbonized transport future.

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