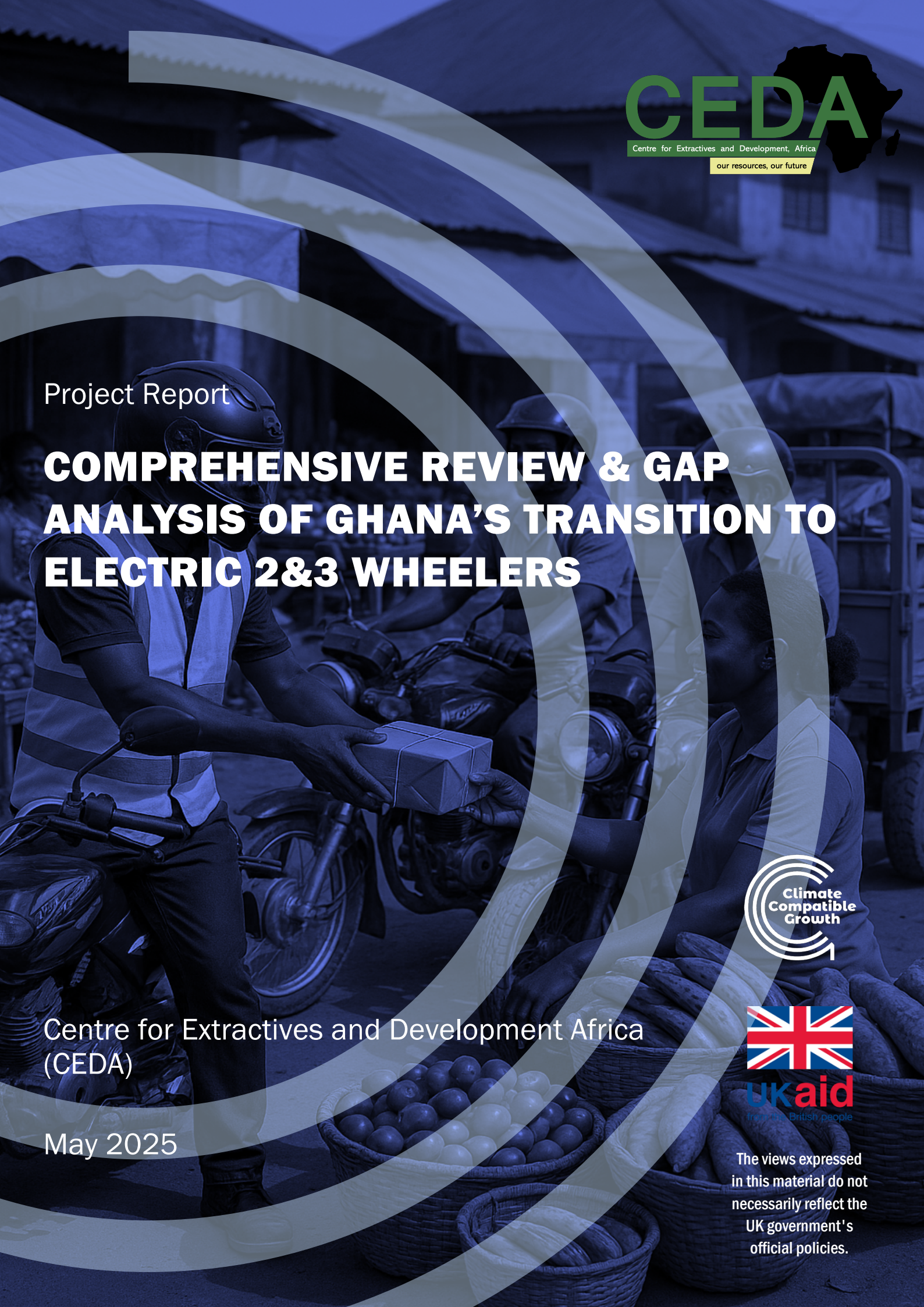

CEDA
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Project Report

COMPREHENSIVE REVIEW & GAP ANALYSIS OF GHANA'S TRANSITION TO ELECTRIC 2&3 WHEELERS

Climate Compatible Growth

Centre for Extractives and Development Africa (CEDA)

May 2025

UKaid
from the British people

EXECUTIVE SUMMARY

Current Landscape of Electric Two- and Three-Wheeler Mobility in Ghana

Ghana's transport sector represents a disproportionately large source of national greenhouse gas emissions, significantly exceeding both African and global averages. Electric two- and three-wheelers (E2&3Ws) present a viable pathway for emissions reduction, enhanced accessibility, and economic opportunity. However, Ghana's transition remains in its nascent stages.

Market Development and Economic Significance

Official vehicle registration data reveals modest but accelerating growth in electric two- and three-wheeler adoption over recent years, though market penetration remains minimal. Conventional two- and three-wheelers dominate informal transport and last-mile logistics across Ghana, with particularly high concentrations in major urban centres and northern regions where these vehicles have achieved strong cultural acceptance and functional integration.

The sector provides critical economic lifelines. Operators earn daily incomes substantially exceeding minimum wage levels, whilst cargo tricycles facilitate substantial goods movement supporting thousands of direct jobs. These vehicles enable market access for women traders, deliver healthcare through innovative ambulance adaptations in rural areas, and support youth livelihoods through commercial transport operations. Despite this economic importance, the sector remains largely informal, characterized by precarious working conditions, limited union representation, and inadequate safety protections. Women's participation remains minimal, particularly in southern Ghana where cultural norms relatively restrict motorcycle use.

Policy and Infrastructure Gaps

Ghana possesses foundational policy architecture through recent electric mobility policies, roadmaps, and transition frameworks establishing strategic intent with substantial projected investment allocations. However, critical gaps persist. Major transport and automotive policies lack explicit provisions for E2&3Ws but focus predominantly on four-wheeled vehicles. Commercial motorcycle operations exist in legal ambiguity, with regulatory bans failing to distinguish between conventional and electric variants. Fiscal incentives remain fragmented, with inconsistent customs classifications and high import duties undermining affordability.

Institutional coordination suffers from inter-ministerial fragmentation despite recent ministry restructuring. No systematic multi-stakeholder platform coordinates government, private sector, and civil society actions. Publicly accessible monitoring mechanisms for tracking transition progress remain absent. Infrastructure challenges are comprehensive: Ghana currently lacks dedicated E2&3W charging networks, standardized protocols, or battery swapping systems. Grid reliability issues compound deployment constraints. Technical capacity for EV maintenance remains limited, whilst safety and performance standards specific to light electric vehicles remain undeveloped.

Comparative Analysis: Best Practices and Strategic Positioning

This study examines four countries representing diverse policy approaches: India and China demonstrating Asian scale and industrial integration, Kenya and Rwanda exemplifying African innovation and targeted interventions.

Policy Framework Approaches

India employs multi-level governance combining central policy guidance with state-level implementation flexibility. Substantial investment in domestic battery and component manufacturing supports industrial development. Legal recognition of electric three-wheelers formalized commercial operations, creating regulatory clarity Ghana currently lacks. Fiscal measures include significant tax reductions on electric vehicles and financial incentives for consumers.

China demonstrates transformative impact through regulatory mandates. Widespread municipal bans on petrol-powered two-wheelers created immediate market demand for electric alternatives. National vehicle phase-out rules coupled with favorable classification of electric two-wheelers as non-motorized vehicles accelerated adoption, yielding the world's largest electric two-wheeler fleet.

Rwanda exemplifies comprehensive fiscal reform tailored to resource-constrained contexts. Fully electric vehicles enjoy complete elimination of import duties, VAT, and excise taxes. Industrial electricity tariffs for charging reduce operational costs, whilst rent-free public land provision removes infrastructure development barriers. High-level political commitment through presidential championing and clear electrification targets demonstrates policy coherence and sustained political will.

Kenya prioritizes private sector-led innovation supported by emerging government facilitation. Industry association formation unified stakeholders, enabling coordinated policy advocacy that contributed to recent tax exemptions. Kenya's approach emphasizes creating enabling conditions through cost reduction and regulatory flexibility rather than heavy mandates.

Stakeholder Ecosystem and Infrastructure Development

Successful transitions demonstrate robust coordination mechanisms absent in Ghana's fragmented landscape. China features centralized government leadership with coordinated enforcement. India's sophisticated multi-level governance involves central policy direction whilst states manage implementation details. Kenya exemplifies entrepreneurial dynamics where private sector innovation preceded government policy development. Rwanda integrates systematic engagement with operator cooperatives, ensuring transition buy-in through participatory planning.

Infrastructure deployment varies significantly. China developed comprehensive charging networks and physical infrastructure upgrades. Kenya emphasizes private-sector innovation with battery swapping networks enabling rapid exchanges and solar-powered charging hubs. Rwanda established dense swapping station networks despite its small size. India's infrastructure emphasizes removable batteries enabling manual swapping at scale.

Implementation Outcomes

Economic impacts prove substantial where adoption scales. Rwandan operators achieve significant annual savings in fuel and maintenance costs whilst increasing take-home income considerably. Kenyan riders using electric variants realize substantial annual savings compared to petrol models. India's Battery-as-a-Service models address affordability barriers for low-income operators through subscription-based energy access.

Gender inclusion successes demonstrate the importance of deliberate interventions. Rwanda's active recruitment and training programs significantly increased women's participation in

motorcycle taxi operations, supported by favorable financing arrangements. India's permit reservation systems for women drivers exemplify affirmative regulatory mechanisms redistributing market access. Large-scale industrial facilities employing predominantly female workforces demonstrate feasibility of gender-integrated manufacturing.

Gap Analysis

Ghana's policy readiness lags considerably behind comparator countries. Major policy instruments lack E2&3W-specific objectives and implementation mechanisms. Commercial motorcycle operations remain legally ambiguous, whilst outdated traffic regulations fail to differentiate between conventional and electric vehicles. Fiscal incentives prove inadequate, with standard import duties and multiple tax levies eroding price competitiveness. This contrasts sharply with comprehensive tax elimination regimes observed in successful adoption contexts.

Institutional coordination capacity remains insufficient. Inter-ministerial coordination operates without systematic platforms for multi-stakeholder engagement. Private sector participation lacks organizational coherence. Financial sector integration is minimal, with no tailored loan products, leasing mechanisms, or insurance packages for electric two- and three-wheeler operations.

Infrastructure gaps are comprehensive. No dedicated charging infrastructure, battery swapping networks, or standardized protocols exist. Grid reliability challenges compound deployment constraints. Local assembly and maintenance capabilities remain undeveloped, whilst regulatory frameworks for safety and technical standards are absent.

Social inclusion barriers persist without targeted interventions. Cultural constraints on women's participation remain unaddressed. No affirmative mechanisms comparable to permit quotas or cooperative models exist. Youth unemployment and rural exclusion receive insufficient policy attention despite representing critical demographics for intervention.

Recommendations

Policy Framework Development

Policy Sequencing

The comparative analysis underscores that while fiscal incentives have been powerful catalysts in countries like India and Kenya, their design and timing must reflect each country's **economic capacity and industrial structure**. In India, fiscal incentives were deliberately structured to reinforce an already strong domestic manufacturing base and robust fiscal space—conditions that Ghana does not yet fully share. Ghana should therefore adopt a **phased and context-sensitive approach**, combining targeted fiscal incentives with gradual regulatory development and capacity building.

Kenya's sequence of introducing modest fiscal measures alongside pilot programs before expanding to comprehensive regulations presents a more feasible pathway. Rwanda's integrated approach remains aspirational but requires institutional and budgetary strength that Ghana must build progressively. The key policy lessons across all cases are:

- **Alignment with economic context and fiscal space** to avoid unsustainable incentive commitments.
- **Clear targets and accountability mechanisms** rather than rigid timelines.
- **Well-coordinated fiscal measures** that prioritise affordability for end users and stimulate demand.

- **Strong stakeholder engagement platforms** to sustain cross-sector coordination.
- **Integration with national transport, energy, and climate policies** to ensure coherence and long-term stability.

Priority Policy Actions

To operationalise these lessons, Ghana should adopt **a phased implementation approach** rather than fixed timelines. The following strategic priorities are recommended:

- **Establish a legal and regulatory framework** recognising E2&3Ws as commercial transport modes, drawing from Kenya's and India's formalisation of boda-boda and e-rickshaw operations.
- **Design targeted, fiscally sustainable incentives**, for instance, selective VAT or import duty reductions focused on electric motorcycles, batteries, and charging components, while conducting fiscal impact assessments to ensure budgetary prudence.
- **Launch pilot programmes** in collaboration with private operators and municipalities to test charging, battery-swapping, and financing models before nationwide scaling.
- **Create a multi-stakeholder coordination platform**, modelled on Kenya's E-Mobility Association (EMAK), to harmonise actions across government, industry, financial institutions, and civil society.
- **Develop an integrated E2&3W policy framework** that situates e-mobility within broader transport decarbonisation and industrial strategies, progressively introducing standards for batteries, charging, and vehicle safety as institutional capacity grows.
- **Explore regional cooperation under ECOWAS and AfCFTA** to benefit from collective procurement, shared standards, and potential manufacturing synergies.

Stakeholder Coordination and Capacity Development

Multi-Stakeholder Platform Development

Ghana should establish an inter-ministerial coordination committee that will operate under the Ministry of State for Climate Change and Sustainability, ensuring high-level political oversight while coordinating across sectoral ministries.

The coordination mechanism should include scheduled inter-ministerial meetings with standardized agenda, stakeholder forums including private sector and civil society, strategic planning sessions with development partner participation and technical working groups on specific issues (regulations, infrastructure, financing).

Private Sector Ecosystem Development

Ghana must catalyze its startup ecosystem by establishing regulatory sandboxes and targeted support mechanisms that reduce barriers to entry for new ventures. Drawing from Kenya's approach, this could include business incubation, seed funding, technical assistance for local assembly and servicing, and preferential regulatory treatment for pilot projects. These measures would stimulate local innovation and build domestic supply chain capacity in the sector.

Financial Stakeholder Integration Strategy

To unlock E2&3W-mobility at scale, Ghana must design financial instruments tailored to the unique needs of the sector. This includes working with banks, non-bank financial institutions, and insurance providers to create dedicated financing products for E2&3W. Priority innovations

should include microcredit offerings for motorcycle taxi operators, battery-leasing and "battery-as-a-service" models, fleet financing for commercial service providers, and insurance packages adapted to the operational profile of E2&3Ws.

At the institutional level, Ghana should initiate a coordinated development finance strategy that aligns donor efforts under a shared vision for E2&3W with a harmonized structure for donor coordination, funding alignment, technical assistance, and monitoring to prevent institutional duplication, optimize impact, and accelerate project delivery across the sector.

End-User Stakeholder Organization

Successful transition to E2&3Ws requires intentional engagement with end users, particularly informal commercial operators. Ghana can draw lessons from Rwanda's cooperative-based engagement model while adapting it to suit its more fragmented informal sector. A coherent strategy should include structured dialogue with operator groups, piloting electric vehicle deployments in willing communities, and delivering targeted training on EV operation and maintenance. Additionally, financial inclusion support, such as simplified credit access and digital payment integration, will be critical to reducing adoption barriers for these low-income user groups.

Strategic Infrastructure Development Framework

Ghana's infrastructure development for E2&3W electrification will require a phased, adaptive approach that evolves in response to real-world performance, technological advancements, and market feedback. Successful implementation will depend on several critical enablers, including clear institutional coordination, sustainable financing mechanisms, reliable grid infrastructure, strong private sector participation, and alignment with national energy and transport planning objectives. The approach must also account for equity in access, ensuring that infrastructure rollout supports inclusive adoption across geographic and socioeconomic groups.

Specific and context-responsive infrastructure recommendations will be developed based on the detailed findings of the forthcoming **D4 – Electrification Constraints Working Paper**, which will examines Ghana's electrical grid capacity and reliability to support increased charging demand, evaluate existing charging infrastructure and identifies optimal locations for expansion. The assessment includes technical analysis of power distribution networks and their ability to accommodate electric vehicle charging loads without compromising grid stability.

However, from the comparative analysis done in this study, evidence suggests that integration of E2&3W assembly within Ghana's existing Automotive Development Policy framework while positioning for ECOWAS market access under AfCFTA provisions will present an early mover advantage in establishing certified assembly capacity. This could position Ghana as West Africa's E2&3W manufacturing hub, creating employment while reducing import costs across the subregion. By establishing assembly hubs that serve the 15-member ECOWAS market (population 400+ million), Ghana can achieve economies of scale unavailable in its domestic market alone. This requires coordination with ECOWAS transport and energy frameworks to harmonize technical standards, facilitate cross-border movement of components, and develop regional supply chains.

Targeted Inclusion Interventions

Gender Integration Strategy: Establish quota systems for women in initial pilot programs while creating women-only technical training pathways in partnership with existing vocational

institutions. Draw from China's observation that appropriate technology characteristics enable organic gender inclusion when supported by accessible design and safety infrastructure.

Youth Employment Framework: Implement technical skills development within Ghana's existing TVET system, while creating apprenticeship programs linking youth with e-mobility service networks. Establish innovation hubs encouraging youth-led solutions for Ghana-specific challenges such as rural charging infrastructure, learning from China's organic delivery economy growth.

Rural and Peri-Urban Integration: Implement a rural E3W model for agricultural transport while establishing solar-powered battery swap kiosks in market centers. Models could further target women farmers' cooperatives for E3W programs supporting produce transportation, addressing both mobility and economic empowerment objectives.

Financial Inclusion Support: Leveraging existing microfinance infrastructure will be critical to reducing adoption barriers for low-income user groups. Ghana should leverage its established microfinance institutions and rural bank networks which have proven track records in serving informal sector operators and women entrepreneurs to deliver gender-responsive E2&3W financing. This approach builds on Rwanda's cooperative model while utilizing Ghana's stronger microfinance sector penetration. Specific mechanisms should include:

- E2&3W-specific loan products through rural and community banks with preferential terms for women and youth
- Partnership between E2&3W suppliers and microfinance institutions for embedded financing at point of purchase
- Mobile money integration for battery-as-a-service subscription
- Savings-based acquisition schemes through women's groups/cooperatives and trade associations

Way Forward

Ghana possesses significant untapped potential for E2&3W adoption given the sector's economic importance, geographical distribution patterns, and emerging market readiness. However, translating this potential into scaled adoption requires urgent policy action addressing identified gaps through coordinated, evidence-informed interventions.

The comparative analysis demonstrates that successful transitions combine appropriate fiscal incentives, clear regulatory frameworks, robust stakeholder coordination, strategic infrastructure deployment, and deliberate social inclusion measures. Ghana must adapt these lessons to its specific institutional capacity, fiscal constraints, and socio-economic context whilst leveraging opportunities for regional coordination and international climate finance mobilization.

Subsequent working papers in this research programme will provide detailed assessments of local manufacturing potential, infrastructure requirements, socio-economic impacts, and implementation pathways, enabling refinement of strategic priorities and actionable roadmaps for Ghana's E2&3W transition.

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LIST OF ACRONYMS AND ABBREVIATIONS

2W	Two Wheeler
3W	Three Wheeler
AfCFTA	African Continental Free Trade Area
AfDB	African Development Bank
AGI	Association of Ghana Industries
AUC	African Union Commission
CBA	Cost Benefit Analysis
CKD	Completely Knocked Down
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CSO	Civil Society Organization
DVLA	Driver and Vehicle Licensing Authority
E2&3W	Electric Two and Three Wheelers
E2W	Electric Two Wheeler
E3W	Electric Three Wheeler
EASI	EnableShift Improve Avoid
EC	Energy Commission
ECF	Extended Credit Facility
ECG	Electricity Company of Ghana
ECOWAS	Economic Community of West African States
ECREEE	ECOWAS Centre for Renewable Energy and Energy Efficiency
EIA	Environmental Impact Assessment
EMAK	Electric Mobility Association of Kenya
EPA	Environmental Protection Agency
ETIP	Energy Transition and Investment Plan
EV	Electric Vehicle
FAME	Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles
FBU	Fully Built Unit
FCDO	Foreign, Commonwealth and Development Office (UK)
FEC	Future of Energy Conference
FONERWA	Rwanda Green Fund
GAC	Gender Advisory Committee
GADP	Ghana Automotive Development Policy
GEF	Global Environment Facility
GEMSA	Ghana Electric Mobility Stakeholder Alliance
GESI	Gender Equality and Social Inclusion
GFEI	Global Fuel Economy Initiative
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GSA	Ghana Standards Authority
GST	Goods and Services Tax (India)
HC	Hydrocarbon
HS	Harmonized System (customs classification)
ICE	Internal Combustion Engine
ICLEI	Local Governments for Sustainability
IEA	International Energy Agency
IMF	International Monetary Fund
JET	Just Energy Transition
LEV	Light Electric Vehicle
L.I.	Legislative Instrument
MCDA	Multi Criteria Decision Analysis
MEGT	Ministry of Energy and Green Transition
MEST	Ministry of Environment, Science and Technology
MESTI	Ministry of Environment, Science, Technology and Innovation
MININFRA	Ministry of Infrastructure (Rwanda)
MSCCS	Ministry of State for Climate Change and Sustainability
MT	Ministry of Transport
$MtCO_2e$	Million Tonnes of Carbon Dioxide Equivalent
MTTD	Motor Traffic and Transport Department
NDC	Nationally Determined Contribution
NEDCo	Northern Electricity Distribution Company
NEMMP	National Electric Mobility Mission Plan (India)
NEMP	National Electric Mobility Policy
NETF	National Energy Transition Framework
NHIL	National Health Insurance Levy
NITI Aayog	National Institution for Transforming India
NRSA	National Road Safety Authority
PEA	Political Economy Analysis
PESTEL	Political, Economic, Social, Technological, Environmental, Legal
PGPE	Politics, Governance, Power, and Economy
PLI	Production Linked Incentive
PM	Prime Minister / Particulate Matter
PM2.5	Particulate Matter 2.5 micrometers or less
PWD	Person with Disabilities
R&D	Research and Development
REMP	Renewable Energy Master Plan
RNTP	Revised National Transport Policy
RURA	Rwanda Utilities Regulatory Authority
SDG	Sustainable Development Goal
SKD	SemiDown Knocked
SLCP	Short Lived Climate Pollutant
SOE	State Owned Enterprise
SSATP	Sub Saharan Africa Transport Policy Program
SUV	Sport Utility Vehicle
TNA	Training Needs Assessment
TVET	Technical and Vocational Education and Training
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNITAR	United Nations Institute for Training and Research
USD	United States Dollar
UTM	Urban Transport and Mobility
VAT	Value Added Tax
ZEVTC	Zero Emission Vehicles Transition Council

1. INTRODUCTION AND BACKGROUND

1.1. Context

Ghana's transport sector is a major source of greenhouse gas emissions. In 2021, transport contributed 61.5% of the CO_2 emissions from the energy sector and was the single largest source within that sector[1], also accounting for about 38% of Ghana's total CO_2 emissions[2]. This is higher than the African average, where transport contributes about 30% of total CO_2 emissions[3], and above the global average of 23% of energy-related CO_2 emissions from transport[4].

Electric two and three-wheelers (E2&3Ws) are identified as viable solutions in reducing transport emissions due to their significant potential for emissions reductions, affordability and suitability for Ghana increasing last mile accessibility. The Electric two and three-wheelers and are characterized by low production costs and adaptability to battery swapping, offering an accessible entry point for Ghana to significantly reduce transport emissions significantly.

Globally, two- and three-wheelers (2&3Ws) are becoming an essential part of urban transportation systems due to their tremendous growth in import and usage. In Ghana's transportation system, 2&3Ws are similarly becoming increasingly common, especially in urban and peri-urban regions where they are vital means of moving both people and small-medium cargo for traders, farmers, delivery services, and households, filling critical gaps in mobility where public transport is limited or unavailable.

Economically, 2&3Ws provide a more accessible and affordable transportation system for low- and middle-income populations, with electric 2-wheelers achieving cost parity with internal combustion engines after only two years of ownership, while electric 3-wheelers are more economical from the outset and up to 40% less expensive to own by the fifth year[5]. This is vital given Ghana's projected increase in poverty rates. Additionally, the increasing cost of fuel enhances the comparative advantage of making the 2&3Ws operational costs relatively cheaper than the conventional.

The use of outdated two-stroke petrol engines, still common in many imported used 2&3Ws, leads to increased emissions of hydrocarbons (HC) and carbon monoxide (CO), worsening urban air pollution and public health risks. For urban dwellers, this presents major health hazards, particularly for individuals in vulnerable populations including children, the elderly, and unorganized laborers exposed to roadside pollutants. The lack of emission testing regulations and lax enforcement of vehicle maintenance requirements further increase the environmental cost.

1.1.1. Global Alignment

Electric vehicles play a critical role in helping the world achieve carbon emissions reduction targets set under the Paris Climate Change Agreement. The transport sector globally records emissions of 23% and is growing rapidly than other energy end-use sector. Due to the rapid growth of the transport sector, the greenhouse gas emissions trajectory is expected to increase up to 53 billion

[1] UNFCCC (2024) Ghana's Fourth Biennial Update Report (BUR4) to the UNFCCC. United Nations Framework Convention on Climate Change. https://unfccc.int/sites/default/files/resource/gh_BUR4_UNFCCC_submission_02032024.pdf
[2] SLOCAT Partnership (2023) Transport and Climate Change Global Status Report – Ghana Country Fact Sheet. SLOCAT. https://tcc-gsr.com/wp-content/uploads/2023/08/Ghana.pdf
[3] International Energy Agency (2025) Africa emissions. IEA. https://www.iea.org/regions/africa/emissions
[4] Intergovernmental Panel on Climate Change. (2022). AR6 Climate Change 2022: Mitigation of Climate Change. Chapter 10: Transport. IPCC. https://www.ipcc.ch/report/ar6/wg3/chapter/chapter-10
[5] International Energy Agency IEA (2024), Trenda in other light-duty electric vehicles. https://www.iea.org/reports/global-ev-outlook-2024/trends-in-other-light-duty-electric-vehicles

tons (GtCO2) in 2050 unless measures are taken[6]. In the pursuit of limiting the global temperature increase to below 2 degrees celcius, the International Energy Agency (IEA) requires an inter alia commitment to the increase of the sales in electric vehicles of 20% by 2030 and of this, 2&3Ws are expected to increase to more than 400 million[7]. E2&3Ws could therefore potentially deliver more immediate and widespread impacts on emissions reduction and energy transition compared to electric cars, especially in developing economies like Ghana. To add to this, import data from the International Trade Centre (ITC) reveals that between 2017 and 2021, Ghana imported 17,660 PEVs with E2&3Ws accounting for 96%[8]. The substantial proportion indicates an emerging market for E2&3Ws in Ghana, which is likely to grow in alignment with global trends if appropriately supported by enabling policies and infrastructure.

Ghana's commitment to reducing greenhouse gases in the transport sector is deeply intertwined in the global EV trends and highly influenced by its obligations under the Paris Agreement, particularly its Updated Nationally Determined Contribution (NDC 2021–2030). Recognizing the transport sector as a major contributor of greenhouse emissions as backed by data, Ghana, through the Ministry of Transport and key development partners developed an Electric Vehicle Roadmap and a National e-Mobility Framework, with targets for 35% EV penetration by 2035 and a complete cessation of new petrol/diesel vehicle imports by 2045[9].

1.2. Report Scope and Objectives

This research will conduct a comprehensive gap analysis of policies governing two and three-wheeler vehicles, examining the regulatory frameworks, implementation mechanisms and outcomes in Ghana. The scope encompasses an evaluation of current policy in Ghana on how electric two-and three-wheelers are regulated, promoted, and integrated within the transport systems. The study will analyse policies and legislations relating to safety standards, environmental regulations, licensing requirements, infrastructure development and economic incentives or restrictions in adopting Electric 2 and three-wheelers. Also, the research will review international frameworks on two and three-wheeler adoption, and a comparative analysis with countries that have successfully adopted two and three-wheelers.

Specifically, the research paper seeks to.

- ✓ Map and analyse Ghana's current policy landscape for two and three-wheelers.
- ✓ Assess policy implementation gaps and enforcement challenges.
- ✓ Analyse the socio-economic impact of two and three-wheeler.
- ✓ Identify policy innovations and best practices.
- ✓ Develop evidence-based policy recommendations in Ghana's context

[6] Peterson Institute for International Economics, Baseline Emissions under Business as Usual. https://www.piie.com/publications/chapters_preview/6079/02iie6079.pdf
[7] United Nations Environment Programme, Global Electric Two-and Three Wheeler Conference. https://sustmob.org/EMOB/pdf/Workshop_Report_E23W-Thailand.pdf
[8] Ghana Shippers Authority, Assessing the opportunities Available for the Importation of Electric Vehicles. https://shippers.org.gh/index.php/assessing-the-opportunities-available-for-the-importation-of-electric-vehicles/#:~:text=The%20worldwide%20electric%20vehicle%20(EV,in%20various%20forms%20and%20classifications.
[9] Ministry of Transport, President Launches Ghana's Electric Vehicle Policy. https://www.mot.gov.gh/10/16/1/150/president-launches-ghanas-electric-vehicle(ev)-policy

2. MATERIALS AND METHODS

This paper adopted a mixed-methods approach, integrating qualitative, quantitative, political economy analysis and gender analysis to comprehensively identify and assess regulatory and economic gaps in Ghana's transition to electric two and three wheelers.

2.1. Literature and Policy Review

We conducted a systematic review of relevant national, regional, and global legal, regulatory, and policy frameworks on electric two- and three-wheelers. This included national legislation, sector-specific regulations, institutional mandates, international benchmarks, policy papers, and peer-reviewed academic literature. The in-depth review provided a comprehensive understanding of the existing regulatory landscape for electric two- and three-wheelers in Ghana, enabling the identification of inconsistencies, omissions, and regulatory gaps.

This review also informed our understanding of the key stakeholders across the value chain, the political economy dynamics, and the barriers and challenges affecting the adoption of electric two- and three-wheelers in Ghana. These insights were instrumental in shaping the design and focus of stakeholder engagement tools, including the formulation of questions that effectively elicited the necessary information from participants.

2.2. Political Economy Analysis

To complement the literature and policy review, a political economy analysis (PEA) was updated from the inception phase in **Section 2.2** to deepen understanding of the underlying power structures and institutional dynamics influencing the legal and regulatory landscape for electric two- and three-wheelers (E2&3Ws) in Ghana. Update was informed by targeted stakeholder consultations, review of new policy developments, and integration of insights from the D1 Validation Workshop, ensuring that the findings reflect both evolving political dynamics and the most recent institutional shifts. Insights from the analysis facilitated identification of non-technical barriers that influence the adoption of E2&3Ws and make informed policy recommendations that address the unique concerns of stakeholders.

2.3. Gender Equality, Disability and Social Inclusion (GEDSI) Assessment

A Gender Equality and Social Inclusion (GEDSI) analysis was integrated into the methodology to ensure that equity considerations informed both the framing of research questions and the interpretation of secondary data. Applying a GEDSI lens allowed the study to identify how existing regulatory frameworks, institutional arrangements, and transport trends differentially impact women, youth, low-income groups, and persons with disabilities. Leveraging on the in-depth expertise of our Gender Advisory Committee (GAC), we further undertook a gender-sensitive review of existing EV policies and regulations, which underscored the study's recommendations and GESI considerations across policy development, regulatory design, and implementation frameworks.

2.4. Case Study and Comparative Gap Analysis

The selection of case studies for the comparative gap analysis was based on criteria prioritising **contextual relevance, geographical diversity, policy innovation**, and **data availability**. These criteria, outlined below, provided the basis for determining which countries were selected for the comparative analysis.

2.4.1. Case Study Selection Criteria

- **Relevance to Ghana's economic and regulatory context**

All four countries reflect economic, social, and institutional conditions that are comparable to or instructive for Ghana, especially with respect to the structure and function of two- and three-wheelers in national transport systems. In Ghana, motorcycles and tricycles are heavily embedded in informal transport, delivery services, and rural mobility accounting for over 60% of commercial transport activities in some regions. This pattern is similarly observed in:

- **Kenya**, where two-wheelers (commonly referred to as *boda bodas*) constitute a vital segment of informal mobility and employment, especially for youth and low-income earners. The government has implemented supportive fiscal measures and is working with private actors like Spiro to deploy electric motorcycles and battery swapping infrastructure.
- **Rwanda**, where three-wheeler usage in both urban logistics and public transport mirrors Ghana's own use of *aboboyaa* and *pragyas*. The Rwandan government has introduced zero-VAT and import duty exemptions specifically for electric two-wheelers, resulting in the deployment of over 3,000 e-motorcycles by startups like Ampersand.
- **India**, where electric two- and three-wheelers dominate the light EV market, bolstered by targeted national schemes such as FAME II and widespread use in last-mile logistics and public transit contexts that mirror Ghana's informal mobility patterns in cities like Accra and Tamale.
- **China**, whose pioneering efforts in regulating and mass-producing E2&3Ws including city-level bans on ICE two-wheelers and direct subsidies for electric alternatives provide an illustrative model of how coordinated policy and industrial strategy can rapidly shift transport markets, even in informal sectors.

Given these similarities, the selected countries offer contextually relevant insights into how two- and three-wheeler electrification can be harnessed to achieve Ghana's dual objectives of decarbonizing transport and promoting inclusive economic development.

- **Diversity in geographical and policy approaches**

To ensure a balanced analysis, the study considered geographical and institutional diversity. The inclusion of two African countries (Kenya and Rwanda) alongside two Asian economies (India and China) reflects distinct regional trajectories, political economies, and infrastructural starting points all of which are critical for understanding the spectrum of feasible interventions for Ghana.

- **Kenya and Rwanda** exemplify African approaches to E2&3W electrification that rely heavily on donor support, public-private partnerships, and leveraging renewable energy sources (Kenya's grid is over 90% renewable). Their experiences are valuable for Ghana, where similar policy ambitions are being pursued within the Energy Transition Framework (2022–2070) and the Renewable Energy Master Plan (2019).
- **India and China**, by contrast, highlight scaled policy ecosystems with embedded fiscal tools, industrial incentives, and local manufacturing capabilities that have rapidly matured E2&3W markets. India's prioritization of E2&3Ws under national missions and China's integration of battery standards, recycling infrastructure, and incentives for local assembly

offer lessons in how Ghana could expand its Ghana Automotive Development Policy to include light electric vehicles.

This diversity allows for the identification of both shared constraints (e.g., high upfront costs, weak charging infrastructure, informal market dominance) and divergent solutions (e.g., battery swapping vs plug-in charging; targeted subsidies vs industrial policy), enriching Ghana's policy menu.

- **Availability of data and documented impact**

Each case study country was also selected based on the availability of publicly documented E2&3W initiatives, regulatory frameworks, and third-party evaluations, allowing for an evidence-based comparative analysis.

- **Kenya's** National Electric Mobility Policy includes explicit references to battery-swapping stations for motorcycles, supported by robust data from companies like Spiro and pilot evaluations from UNEP's Global E-Mobility Programme.
- **Rwanda's** success in scaling electric motorcycle adoption is documented through tax incentive assessments, rider-level economic impact studies, and programmatic reviews by GIZ and Ampersand, which reveal cost savings of 30–50% and improved earnings among riders.
- **India's** FAME II scheme tracks subsidies granted per vehicle category, with data disaggregated for E2&3Ws. The scheme's targeted design and rigorous monitoring have demonstrated clear improvements in affordability, user uptake, and domestic value addition.
- **China's** expansive E2W deployment now exceeding 300 million units nationwide is supported by a wealth of regulatory documentation, impact assessments on urban air quality, and industrial data on battery production and recycling capacity. These resources provide a robust basis for benchmarking Ghana's fragmented and largely unregulated E2&3W market, which currently lacks national quality standards and coherent after-sales support structures.

Moreover, all four countries participate in UNEP's Global E-Mobility Programme, ensuring a level of standardization in reporting and policy assessment that enhances cross-country comparability.

2.4.2. Comparative Analysis Framework and Analytical Approach

The comparative analysis in **Section 6.2.1** employs a structured multi-dimensional framework combining PESTEL environmental assessment, weighted performance benchmarking, and strategic transferability analysis to systematically evaluate Ghana's E2&3W ecosystem readiness against the four selected case study countries. This hybrid analytical approach identifies transferable lessons, implementation pathways, and specific policy interventions that can accelerate Ghana's transition to E2&3Ws.

The framework evaluates countries across seven core dimensions critical to successful E2&3W ecosystem development:

1. **Policy Framework Analysis** Examines the existence, scope, comprehensiveness, and integration of national policies governing or related E2&3W adoption and use. This includes

assessment of policy sequencing approaches, target-setting mechanisms, legal recognition of commercial E2&3Ws, and alignment between transport, energy, and climate policy frameworks.

2. **Stakeholder Ecosystem Assessment** Evaluates coordination models across government agencies, private sector engagement patterns, civil society contributions, financial sector integration, and end-user organisation structures. This dimension assesses institutional capacity for multi-stakeholder coordination and the robustness of public-private partnership mechanisms.
3. **Fiscal and Financial Incentive Architecture** Analyses the design, scope, and effectiveness of financial instruments including import duty structures, VAT regimes, purchase subsidies, financing mechanisms, and innovative funding approaches for overcoming affordability barriers.
4. **Infrastructure and Technology Deployment** Assesses charging infrastructure models, battery swapping networks, grid integration capacity, technology adaptation for local conditions, and infrastructure financing mechanisms. This includes evaluation of public versus private deployment strategies and interoperability standards.
5. **Local Manufacturing and Assembly Capacity** Examines industrial policy integration, local content requirements, supply chain development, technology transfer mechanisms, and the alignment between E2&3W policies and broader automotive industrial strategies.
6. **Market Uptake and Social Integration** Evaluates adoption patterns across user demographics, integration with informal transport systems, commercial versus personal use patterns, and the effectiveness of targeted programmes for specific user groups.
7. **Implementation Outcomes and Social Inclusion** Assesses measurable impacts on economic inclusion, gender participation, youth employment, rural accessibility, and the effectiveness of targeted interventions for marginalised groups.

The comparative assessment is further operationalized through two complementary matrices presented in **Section 7.6**: a PESTEL-based environmental assessment evaluating macro-level political, economic, social, technological, environmental, and legal conditions that enable or constrain E2&3W adoption; a multi-criteria performance ranking matrix providing weighted scoring across the seven dimensions to quantify each country's ecosystem maturity; and a strategic positioning and transferability matrix categorising interventions according to their implementation feasibility for Ghana.

The Strategic Positioning and Transferability Matrix in **Section 7.6.2** incorporates systematic transferability assessment categorising interventions as depicted in Figure 1.

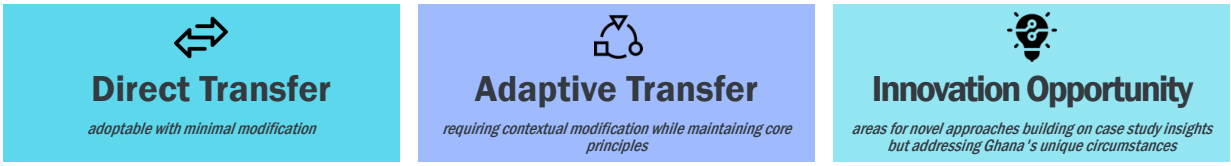


Figure 1: Classification Categories for Transferability

2.5. Data Analysis and Quantification

Driver and Vehicle Licensing Authority (DVLA)

Quantitative analysis centered on administrative data from the Driver and Vehicle Licensing Authority (DVLA), examining vehicle registration trends across sixteen regions from 2019 to 2024 to establish baseline market conditions and identify regional adoption patterns.

2.6. Stakeholder Consultations and Validation

Validation at FEC 2025

To ensure the robustness and practical applicability of the D1 findings, a stakeholder validation session was conducted at the Future of Energy Conference (FEC) 2025 in Accra on 26-27 August 2025. The session adopted an interactive exhibition and facilitated dialogue format for 85 minutes, designed to validate preliminary findings, surface implementation insights, and collaboratively refine policy recommendations.

Stakeholders engaged with four immersive "insight stations" presenting visual summaries of key research themes: the D1 Summary Overview, Regional 2&3W Utilization Patterns, E2&3W Value Chain dynamics, and the Legal & Institutional Framework timeline. Participants rotated through stations in small groups, reviewing visualizations and providing structured feedback through quick-rating cards and sticky-note comments on clarity, relevance, and potential gaps. This was followed by a 30-minute prioritization dialogue where stakeholders suggested refinements and identified priority intervention areas.

Stakeholder feedback was systematically documented and integrated into the final D1 report, enhancing the evidence base, addressing identified gaps, and ensuring recommendations reflected practical implementation considerations and diverse stakeholder perspectives. This participatory validation process strengthened the report's policy momentum and generated new partnerships around inclusive e-mobility financing, local value chains, and coordinated data generation efforts.

3. CURRENT E2&3W MOBILITY LANDSCAPE IN GHANA

This section provides a comprehensive overview of the current scale of electric mobility in Ghana, with a specific focus on electric two- and three-wheelers (E2&3Ws). It explores their geographical distribution, examines their role in the national transport ecosystem, and considers the socio-economic and environmental implications of their integration into Ghana's mobility framework.

3.1. Size of E-Mobility Sector

Official data from the Driver and Vehicle Licensing Authority (DVLA)[10] show that registered electric two-wheelers (E2Ws) grew from 815 in 2019 to 1,834 in 2024. Similarly, electric three wheelers (E3Ws), which had negligible market presence in earlier years, accounted for 247 registered units by 2024.

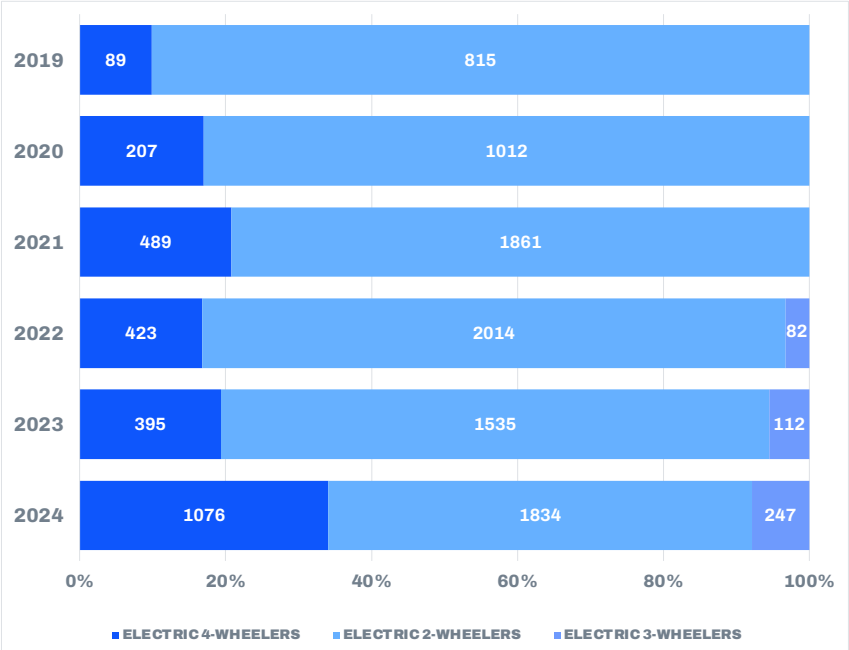


Figure 2: DVLA Registration Trends for Electric 2, 3 and 4 Wheelers

As depicted in Figure 2, the registration trends are clear indicators of early-stage electric adoption with accelerating growth: electric 2&3W registrations increased 155% from 2019-2024, reaching 2,081 units despite representing only 1.96% market penetration. Electric 4-wheelers show dramatic growth with 1,109% increase, indicating significantly growing consumer acceptance. The abovementioned, paired with the emergence of E3Ws in 2022 and its steady climb in 2023 and 2024 signals market diversification, growing commercial operator interest in alternative fuel technology and readiness for broader EV adoption across Ghana's transport sector.

Ghana's Energy Transition Investment Plan projects that electric vehicles particularly two and three wheelers will account for nearly 40% of emissions reductions in the transport sector by 2060. Cumulative investment in e-mobility is estimated at USD 110 billion by 2060, of which a significant portion is expected to support the electrification of light-duty vehicles. Furthermore, the GIZ- Ghana

[10] Administrative Data from the Driver and Vehicle Licensing Authority (DVLA) on Regional Registration from 2019 to 2024

Mobility Study (2023)[11] underscores that the electric two and three wheelers present one of the fastest and most cost effective paths to scale up e-mobility adoption in Ghana.

Despite this potential, structural barriers continue to inhibit sector expansion. The market for electric two and three wheelers remains fragmented, with most imports occurring outside formal regulatory frameworks. There is limited after-sales support, a lack of consumer financing options, and an absence of national quality standards for components such as batteries, motors, and chargers. Moreover, most electric vehicles in Ghana are still imported as used units without warranty or quality assurance, creating consumer hesitancy and limiting scalability.

3.2. Geographical Distribution

Motorcycles and tricycles are extensively used throughout Ghana, but regional data show notable patterns that can help inform targeted electrification strategies. Greater Accra remains the leading region in terms of total registrations, accounting for over 22,000 motorcycles and more than 5,000 tricycles in 2024 alone (see Figure 3). The region's dense population, extensive ride-hailing and delivery markets, and relative access to electricity make it a natural starting point for e-mobility pilots. Greater Accra and Ashanti Region account for 40% of all registrations, indicating urban economic hubs where charging infrastructure investment would yield maximum impact.

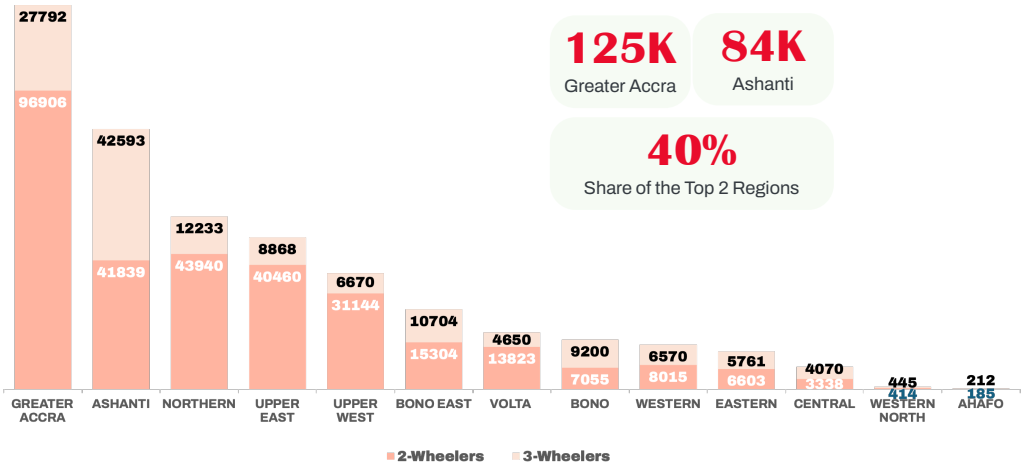


Figure 3: Regional 2&3W Utilisation Patterns[10]

Outside these urban hubs, Northern, Upper East, and Upper West also show significant numbers of motorcycle and tricycle registrations. In these areas, 2&3Ws are fundamental and serve a dual-purpose carrying passengers and transporting goods especially in peri-urban and rural zones where roads are less developed and public transport options are limited. These vehicles are essential for connecting communities to markets, schools, and healthcare facilities.

The peripheral and secondary urban areas are "untapped potential markets" for electric mobility and their suitability for decentralized energy systems, such as solar mini-grids, makes them ideal

[11] Ghana Mobility Study – SPTA. Market Potential, Clients and User Groups for New Mobility Services in Ghana. https://changing-transport.org/wp content/uploads/2023_Mobility_Study_Ghana_MaaS_Opportunities.pdf

for piloting off-grid EV charging hubs. Furthermore, the relatively short travel distances and frequent stops associated with 2&3W use in these areas align well with the current capabilities of light EV batteries. For rural electrification strategies to align with e-mobility expansion, policies must therefore consider integrating renewable energy and transport planning to ensure reliable and affordable access to EV charging.

3.3. Economic Role of 2- & 3-Wheelers

3.3.1. Last-Mile Transport and Mobility Access

2&3W fill service gaps where demand is dispersed or roads are narrow/rough, providing door-to-door connections to markets, schools, clinics, and transit hubs. In Kumasi, cargo tricycles now move substantial volumes of urban freight, valued at approximately GH₵693 million annually, while contributing GH₵205 million to the local economy and supporting nearly 3,000 direct jobs[12]. Tricycles are also widely used for goods delivery and directly supporting municipal services like waste collection, underlining their role in everyday urban logistics[13].

3.3.2. Employment and Income Generation (Low Barriers to Entry)

Operating an okada (motorcycle taxi, 2W) or pragya/aboboyaa (tricycle, 3W) is a common micro-enterprise pathway, particularly for youth. Indicative figures show that okada drivers earn an average net daily income of about GH₵39.4 compares significantly higher than Ghana's 2022 minimum wage of GH₵13.5[14]. Licensing and permit fees also remain relatively affordable: a DVLA commercial licence costs GH₵20 per year, while assembly permits range between GH₵20 and GH₵70[15]. Surveys in Accra and Kumasi document rapid uptake and operator confidence to expand fleets when reliable riders are available. Specifically, studies found that tricycle owners with reliable riders were 96% more likely to acquire additional tricycles rather than invest in other assets, and that commuters preferred tricycles over traditional urban transport modes because they significantly reduced both travel time and cost[16].

3.3.3. Support for Informal Trade and Micro Commerce

3Ws play a vital role in sustaining Ghana's informal economy by bridging critical gaps in urban and peri-urban logistics. They are widely used for transporting small cargo, fresh produce, construction materials, and market goods between communities and trading centers where larger vehicles cannot easily operate. In Kumasi, for instance, tricycles have become integral to solid-waste collection systems and last-mile goods distribution, supporting both municipal functions and small

[12] Adarkwa, K. K., Nanor, M. A., & Asibey, M. O. (2024). The contribution of cargo tricycles to the urban economy of Ghanaian cities: A case study of Greater Kumasi Metropolitan Area. African Transport Research. https://doi.org/10.1016/j.aftran.2024.100005

[13] Fosu, G. O. (2025). Exploring the Role of Tricycles in African Cities with Emphasis on Ghana's Aboboyaa and Pragya. SSRN Working Paper. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5228593

[14] Ministry of Labour, Jobs & Employment (2021) Communique by the National Tripartite Committee (NTC) on the 2021 and 2022 National Daily Minimum Wage. https://fairwages.gov.gh/wp-content/uploads/2021/12/NDMW-2021-2022.pdf

[15] GIZ (2023). Ghana Mobility Study: MaaS Opportunities. (Tables A-5, A-6) https://changing-transport.org/wp-content/uploads/2023_Mobility_Study_Ghana_MaaS_Opportunities.pdf

[16] Antwi-Boasiako, J. (2023). Supply Creating its Own Demand in Ghana's Urban Transportation: Economic Analysis of Motor Tricycle Transport System in Kumasi. ResearchGate preprint. https://www.researchgate.net/publication/369008155_Supply_creating_its_own_Demand_in_Ghana's_Urban_Transportation_Economic_Analysis_of_Motor_Tricycle_Transport_System_in_Kumasi

business activities[17]. Their affordability, maneuverability, and ability to navigate narrow or unpaved roads make them indispensable for micro-enterprises and informal traders who rely on consistent, low-cost mobility to sustain livelihoods and local commerce.

3.3.4. Cost Efficiency and Fuel Savings

On a per-kilometre basis, 2Ws consume approximately 4.6 L of fuel per 100 km compared with over 22 L for passenger cars in African on-road measurements, supporting their cost advantage for short trips and light loads[18]. This efficiency directly lowers operating costs for drivers and delivery operators, especially in congested urban areas where frequent stops and starts increase fuel consumption for larger vehicles. For electric variants, analyses report operating-cost savings of up to 80% versus internal combustion engine baselines in African contexts, strengthening the business case for delivery and taxi uses[19].

3.3.5. Catalysts for Electrification and Green Transition

Between 2017 and 2021, Ghana imported about 9,431 electric two- and three-wheelers, with nearly all units originating from China[20]. This reflects growing market confidence and the feasibility of electrifying light mobility fleets ahead of heavier vehicle segments. Government frameworks such as the National Electric Mobility Policy and the Energy Transition Framework identify electric 2&3W as key to achieving early emissions reductions and lowering fuel import dependency. This matches global inclusive electrification pathways, where small vehicles are often first movers due to lower power/charging needs and short-haul duty cycles.

3.3.6. Enabling Market Expansion and Inclusivity

By providing affordable and flexible transport, 2&3Ws expand economic participation across income groups and regions. By reducing travel time and first/last-mile costs, 2&3W enable service providers to reach customers in otherwise hard-to-serve areas[21]. They allow small vendors, delivery operators, and service providers to access new markets and customers at lower cost, especially in peri-urban zones where transport alternatives are limited. Commuter studies consistently highlight speed, convenience, and accessibility as primary reasons for choosing motorcycles or tricycles over minibuses or taxis, particularly for short urban trips[22]. These vehicles also improve mobility for women, informal workers, and low-income populations who depend on reliable, low-cost transport for daily livelihoods, making them an essential component of inclusive economic growth.

3.3.7. Resilience in Constrained Infrastructure Settings

[17] Armoh, S. Y., Aryeetey, S., Kamasah, J. S., Boahen, K. G., Owusu, M., Adjei Boateng, A., ... Sylverken, A. A. (2023). Solid waste motor tricycle operators in Kumasi, Ghana, harbour respiratory pathogens; a public health threat. PLOS ONE, 18(4), e0284985. https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0284985

[18] Mbandi, A. M., et al. (2019). Estimating on-road vehicle fuel economy in Africa: A case study based on an urban transport survey. Energy Policy https://www.researchgate.net/publication/332016309_Estimating_On-Road_Vehicle_Fuel_Economy_in_Africa_A_Case_Study_Based_on_an_Urban_Transport_Survey_in_Nairobi_Kenya

[19] Cleantech Group (2024). The Rise of Two and Three-Wheelers in Africa. https://21242328.fs1.hubspotusercontent-na1.net/hubfs/21242328/Two%20Wheel%20African%20EV%20Final%20Report%2020240613.pdf

[20] International Trade Centre. (2023). Motor cars and other motor vehicles principally designed for the transport of persons (Product code: 8703) https://www.trademap.org/Product_SelProductCountry

[21] Fosu, G. O. (2025). Exploring the Role of Tricycles in African Cities with Emphasis on Ghana's Aboboyaa and Pragya. SSRN Working Paper. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=5228593

[22] Tuffour, Y. A., & Appiagyei, D. K. N. (2014). Motorcycle taxis in public transportation services within the Accra Metropolis. American Journal of Civil Engineering, 2(4), 117–122. https://doi.org/10.11648/j.ajce.20140204.12

In rural and peri-urban areas with narrow or unpaved roads, 3W maintain access to essential services when four-wheel vehicles are impractical, improving response times for health referrals and deliveries.

In rural Ghana, poor road infrastructure and difficult terrain often prevent conventional ambulances from reaching patients, leaving communities without timely emergency care especially in maternal and child health cases. To address this challenge, the Ghanaian startup designed and deployed three-wheeled ambulance tricycles built to navigate narrow, rugged, and unpaved roads. These vehicles, assembled locally at roughly one-tenth the cost of traditional ambulances, are compact yet sturdy enough to carry a patient, caregiver, and essential medical supplies over difficult terrain[23].

Figure 4: Motorized Tricycles Designed by Ghanaian Startup Moving Health[23]

Since their introduction, the tricycle ambulances have cut travel times to hospitals by half and now serve more than 100,000 people across rural Ghana, demonstratin how locally adapted, low-cost transport innovations can bridge critical healthcare access gaps and strengthen emergency response systems in underserved communities.

3.4. Stakeholder Mapping

Stakeholders in Ghana's electric mobility and energy transition space vary in mandate but operate within active ecosystems of coordination, advocacy, and policy dialogue. Identifying the key players as well as understanding these interaction patterns is essential for shaping a targeted and effective engagement strategy.

3.4.1. 2&3 Wheeler Riders

Riders - motorcycle taxi operators ("okada") and tricycle drivers - are frontline stakeholders: they own, lease, or operate vehicles; manage routes and schedules; and engage directly with passengers. According to the Okada Riders Association of Ghana (ORAG), the okada business began in 2008 around Korle-bu and has grown under a rider-led association that provides training,

[23] Siegel, J. (2025, May 28). How tricycle ambulances are saving lives in rural Ghana. GBH/The World. https://www.wgbh.org/news/international-news/2025-05-28/how-ambulance-tricycles-are-saving-lives-in-rural-ghana

advocates for recognition, and seeks to improve service standards[24]. ORAG thus functions as a de facto representative body for riders, interfacing with government, regulators, and law enforcement.

However, external studies show that riders' organization is uneven and informal. In Accra, informal transport workers (including okada riders) often operate without formal worker protections, with limited union presence and long working hours. A 2023 study of informal transport in Accra documents that many riders and vehicle crews work more than ten hours per day, often six or seven days a week, and lack access to social safety nets, health insurance, or labor protections[25].

In the tricycle (3W) sector, owner-operator relations add another layer of precarity. A study[26] of tricycle operations in northern Ghana reveals that many operators do **not** own the vehicles they ride. Instead, ownership is often held by formal-sector workers (e.g., teachers, civil servants, businessmen) who lease 3Ws to operators under fixed-rent or "work and pay" contracts. In Wa, for example, 60% of operators surveyed did not own their 3Ws; lease agreements were common, with operators expected to pay fixed rent or periodic installments to owners. This dynamic makes riders vulnerable as they must generate sufficient daily revenue to meet rent obligations, absorb vehicle maintenance costs, and manage risks (accidents, fines) without formal support.

On unionization and regulatory developments, Ghana's 2025 proposed licensing reforms include new rules stipulating that okada and tricycle operators must belong to recognized transport unions or be employed by licensed commercial motorcycle/tricycle companies[27]. Ghana's riders are known as good riders who earn and hold the trust of their customers, with high integrity among the community. This stems from the business model's evolution from riders being attached to Ghana's "trotro" and taxi stations, ensuring they could always be traced to a physical location and found, building accountability into operational structures.

Under new reforms, the police would gain greater authority to enforce road traffic rules, and a national registry for 2&3Ws would be established to enhance accountability and oversight. These measures suggest a policy move toward formalizing riders' organization and integrating them into structured regulatory frameworks. Whether these union requirements translate into genuine worker protections, bargaining power, or better working conditions remains to be seen.

3.4.2. Government

Government coordination is led through inter-ministerial platforms and committees, for example, the Inter-Ministerial Committee on Ghana's Energy Transition Plan. Chaired by the Ministry of Environment, Science and Technology and Innovation, this body brings together key ministries and agencies to align policies, clarify roles, and address implementation challenges, particularly around EV infrastructure and regulation. It also facilitates engagement with international partners and technical stakeholders.

3.4.3. Private Sector

[24] Okada Riders Association of Ghana. (n.d.). About ORAG. https://ghokada.com/about-orag/ ghokada.com
[25] Spooner, D., Mwanika, J. M., Baotang-Pobee, L., Whelligan, J., & Owusu Boampong, D. (2023). Informal transport workers in Accra: Livelihoods, Organisation and Issues. Global Labour Institute / TRANSITEC. https://www.researchgate.net/publication/375826485_Informal_transport_workers_in_Accra_Livelihoods_Organisation_and_Issues
[26] Akaateba, M. A., Akanbang, B. A. A., & Ibrahim, Y. (2023). Co-producing urban transport informality: Evidence from owner-operator relations in the motor tricycle taxi industry in a Ghanaian town. International Development Planning Review, 45(3), 273-296. https://doi.org/10.3828/idpr.2022
[27] Agambila, D. (2025, April 8). Ghana introduces new rules for Okada riders; only 25-year-olds and above can ride. Business Insider Africa. https://africa.businessinsider.com/local/markets/ghana-introduces-new-rules-for-okada-riders-only-25-year-olds-and-above-can-ride/tpykgyz

Private sector players such as EV assemblers and logistics companies coordinate through associations like the Ghana Automotive Dealers Association and Association of Ghana Industries (AGI). These platforms help members advocate for incentives, contribute to regulatory development, and co-create implementation strategies.

3.4.4. Civil Society Organizations

Civil society organizations (CSOs) often coordinate through structured coalitions and thematic networks that support joint advocacy and resource sharing. The Ghana Energy Transition Consortium (GETC) is a key example, offering CSOs a platform to align goals, influence policy, and engage government and donors. These coalitions frequently contribute to national processes, such as the national review of the countries NDCs, by providing technical input and participating in consultations. Donors play an enabling role by funding CSOs and hosting regular coordination meetings to align sector support.

At the technical level, events like the Future of Energy Conference and the Energy Commission's Drive Electric series foster peer learning, policy dialogue, and multi-sector networking among all stakeholder groups. These conferences also spur smaller-scale exchanges, including one-on-one discussions between vendors and government, donor-CSO meetings, and expert roundtables, which often shape policy and investment priorities.

The stakeholder table below reflects the range and interdependence of actors shaping Ghana's e-mobility transition.

Sector	Main Institution	Role
Government	Ministry of Transport (MT)	Sets policy direction and manages the transport sector. • Promote sustainable transportation. • Develop electric vehicle infrastructure. • Encourage cleaner fuels.
	Ministry of Energy and Green Transition (MEGT)	Sets overall policy direction and manages the power sector. • Increase the share of renewable energy in the power generation mix. • Modernize grid infrastructure. • Encourage private sector participation.
	Ministry of Environment, Science and Technology. (MEST)	Sets policy direction and manages environmental issues. • Strengthen regulatory capacity. • Promote environmental impact assessments (EIAs). • Encourage best practices for environmental management.
	Office of the Ministry of State for Climate Change and Sustainability (MSCCS)	Implements the Ghana National Climate Change Policy, which focuses on adaptation, social development, and mitigation.
	Energy Commission (EC)	Regulates and supervises the utilization of energy resources, including renewable energy. • Licensing, regulation, and supervision of energy resource utilization.

	Driver and Vehicle Licensing Authority (DVLA)	Registers and licenses vehicles. • Implement regulations and standards for vehicle emissions and efficiency. • Promote electric vehicle adoption.
	Driver and Vehicle Licensing Authority (DVLA)	Promotes road safety and reduces accidents. • Enhance road safety measures and regulations. • Promote eco-friendly transportation practices
	National Road Safety Authority (NRSA)	Promotes road safety and reduces accidents. • Enhance road safety measures and regulations. Promote eco- • friendly transportation practices.
	Ghana Standard Authority (GSA)	Formulating and enforcing technical standards for EVs and their associated infrastructure.
Private	Wahu Mobility	Electric bicycle manufacturing and distribution for gig economy workers and commuters in Ghana
	Solar Taxi	Manufacturing E mobility Vehicles and 2 -3 wheelers
	DriveEV Ghana	Importers of Electric Vehicles
	Max Ghana	Import and Assemble 2 wheelers for courier services
	Charge Express	Establishing rapid charging stations
	Apsonic Moto	Importers of 2-3 wheelers
	Okada Ridders Association (ORA)	Drivers and Users of 2 wheelers for commercial purposes.
	Financial Institutions (Banks)	Providing financial assistance for the private sector in the E-mobility sector.
Academic Institutions (AI)	UG, KNUST, The Brew Hammond Energy Centre, ISSER etc.	Providing technical knowledge and research in the E-mobility sector.
Civil Society Organization (CSOs)	NRGI, CDD, IMANI, ACEP, CEDA etc.	Advocating for the adoption of Electric 2-3 Wheelers. Past studies and reports, and evaluations of E-mobility markets, projects and readiness.
Development Partners (DP)	FCDO (JET Programme), EU, UNDP, GIZ, World Bank and AfDB	Providing financial and technical support, facilitating knowledge transfer, and fostering partnerships between public and private sectors. Past studies, reports, and evaluations of E-mobility markets, projects and readiness.

3.5. Political Economy Analysis

This section summarises and updates the Political Economy Analysis (PEA) conducted during project inception (see PR1 – Inception Report), reflecting new institutional developments, post-election fiscal adjustments, and recent climate policy processes, including the ongoing review of Ghana's Nationally Determined Contributions (NDCs).

3.5.1. Macroeconomic and Fiscal Context

The 2024 election cycle placed considerable pressure on Ghana's fiscal framework, leading to deviations from targets set under the IMF Extended Credit Facility (ECF). Pre-election spending overruns and delayed reforms expanded the fiscal deficit and arrears, while inflation exceeded programme thresholds. In response, the new administration's first post-election budget prioritised fiscal consolidation through spending controls, tariff adjustments, and public financial

management reforms. These measures aim to stabilise the macro-economy and rebuild investor confidence by strengthening revenue mobilisation, rationalising expenditure, and improving oversight of State-Owned Enterprises (SOEs), especially in energy and cocoa.

Fiscal consolidation has gradually evolved beyond austerity to encompass structural transformation, with a particular emphasis on energy sector reform and sustainability. The reconfiguration of the Ministry of Energy into the Ministry of Energy and Green Transition and the establishment of a Ministry of State for Climate Change and Sustainability signal high-level commitment to integrating green growth and climate resilience into fiscal policy.

3.5.2. Policy and Institutional Dynamics

Recent institutional shifts demonstrate increasing political traction for energy transition and electric mobility. In June 2025, the Minister for Lands and Natural Resources, announced that cabinet ministers in Accra may soon be required to use electric vehicles (EVs) as official transport, an important symbolic and behavioural shift that could help normalise EV adoption in the public sector and send positive market signals to private investors.

Complementing this momentum, the Ministry of Environment, Science and Technology (MEST) launched the Nationally Determined Contributions (NDCs) Review Process to assess progress under the 2021 NDC (NDC 2.0) and inform the new iteration with ambition to 2035, as part of the global cycle. Under the Paris Agreement cycles, countries were required to submit updated NDCs by February 10, 2025. However, only a minority met that deadline. The UNFCCC and partner organizations extended the effective deadline for inclusion in the synthesis report to 30 September 2025, giving additional time for high-quality, ambitious submissions.

Following a stocktaking exercise initiated in May 2025, Ghana's first sectoral technical consultations were held in July 2025 with dedicated engagement slots for civil society organisations (CSOs) including CEDA, development partners, and sector ministries[28]. The process is expected to generate updated the NDC 3.0 with mitigation and adaptation commitments that align national actions with evolving global climate priorities. This renewed policy activity provides opportunity to reinforce Ghana's positioning of electric mobility as a practical instrument for achieving its NDC transport-sector targets.

3.5.3. Sub-National and Sectoral Power Dynamics

While national-level reforms anchor strategic direction, implementation success depends heavily on sub-national actors. District assemblies, municipal authorities, and metropolitan planning departments are responsible for enforcing transport regulations, allocating land for charging infrastructure, and integrating e-mobility into local development plans. Variations in capacity and revenue generation across assemblies shape the pace of adoption: better-resourced cities like Accra and Kumasi lead pilot initiatives, whereas rural districts lag due to infrastructure and budget constraints.

Regional disparities further define the political economy of e-mobility. In northern regions, where motorcycles and tricycles constitute up to 98% of registered vehicles, cultural acceptance and functional utility make these areas ideal for pilot electrification programmes[29]. In contrast, southern metropolitan areas such as Accra and Takoradi face sparringly enforced restrictive bans

[28] https://www.undp.org/ghana/press-releases/ghana-advances-ndc-30-revision-first-sectoral-technical-consultations

[29] Moses Aikins et al., "Economic Burden of Motorcycle Accidents in Northern Ghana," Ghana Medical Journal, 46(2): 46-53, June 2012.7

on commercial motorcycles, limiting scale-up despite growing demand from delivery and logistics services.

Traditional authorities, **local business coalitions** and regional offices of power utilities (ECG, NEDCo) continue to play influential roles. Their cooperation or resistance can accelerate or stall local implementation. This underscores the need for continued stakeholder coordination and targeted incentives to ensure that electrification initiatives deliver both environmental and socio-economic gains.

3.6. GESI Analysis

Ghana's transition to electric two- and three-wheelers (E2&3Ws) presents a valuable opportunity to advance gender equality and social inclusion, yet it also risks reinforcing existing inequalities if deliberate actions are not taken. Gender Equality and Social Inclusion (GESI) in the e-mobility context encompasses addressing systemic barriers that prevent women, low-income individuals, persons with disabilities (PWDs), and rural populations from equitably accessing, benefiting from, and participating in electric transport ecosystems.

The National Electric Vehicle Policy (2023) explicitly commits to a "just, equitable, and inclusive transition," acknowledging that the benefits of electric mobility must extend to all segments of society. However, implementation remains fragmented and insufficiently attuned to the nuanced social dynamics that govern mobility access and participation in Ghana. The evidence suggests that while electric mobility has the potential to improve livelihoods and public health outcomes, particularly for informal sector workers and low-income communities, certain groups face multiple layers of exclusion.

Women, for instance, remain significantly underrepresented in the 2&3W ecosystem, especially in southern Ghana where cultural norms around modesty, risk, and male dominance in public transport usage cast motorbike use as a predominantly male activity[30]. These norms not only limit women's participation as riders and vehicle owners but also constrain their presence in mechanical and engineering roles within the emerging electric mobility industry. Furthermore, women's mobility needs often shaped by caregiving responsibilities, safety concerns, and financial limitations are rarely considered in the design and deployment of light electric vehicles. Without targeted interventions, such as female-targeted financing schemes, awareness campaigns, and gender-sensitive training programs, women may remain peripheral to Ghana's e-mobility transition.

Low-income populations, who represent the majority of current two- and three-wheeler users and operators, also face structural barriers to electric mobility adoption. The initial cost of electric vehicles remains significantly higher than used internal combustion engine (ICE) models, despite long-term savings on fuel and maintenance. Financing options are limited, and many informal sector workers such as okada riders and roadside mechanics lack access to credit or formal employment protections. In addition, the concentration of EV infrastructure in Accra exacerbates regional disparities and risks excluding rural communities where motorcycles constitute the bulk of registered vehicles. Without mechanisms to subsidize EV adoption and expand infrastructure equitably, the transition could widen spatial and economic inequalities.

[30] Asante, L. A. (2021). Gender inequalities in the use of technologies of mobility in Accra and Kumasi, Ghana-West Africa: The case of the motorcycle. ResearchGate. https://www.researchgate.net/publication/354376169_Gender_Inequalities_in_the_Use_of_Technologies_of_Mobility_in_Accra_and_Kumasi_Ghana-West_Africa_The_Case_of_the_Motorcycle

Youth and persons with disabilities (PWDs) also warrant specific attention. Youth comprise the majority of informal transport workers, yet often operate in precarious conditions without access to formal training or social protection. Electrification offers opportunities to formalize this sector and improve working conditions, but only if young people are included in upskilling and entrepreneurship programs. PWDs, meanwhile, are frequently overlooked in transport planning, despite the potential of adaptive electric vehicles to expand their mobility. Current e-mobility initiatives lack provisions for accessible design, limiting the transformative potential of EVs for this marginalized group.

Social attitudes and institutional practices also compound exclusion. Community norms that stigmatize young male riders as deviant or dismiss female riders as inappropriate reinforce resistance to inclusive transport innovations. In many cases, these norms intersect with institutional inertia, where regulations such as bans on commercial motorcycles fail to distinguish between conventional and electric vehicles or recognize the informal sector's vital role in transport provision.

3.7. Safety of 2&3Ws and Associated Risks

A ten-year analysis[31] of accident data in Accra (2011–2020) recorded 3,197 motorcycle casualties, with 77% fatal and 74% severe injuries. Most victims were men (85%), and pedestrian collisions accounted for nearly a third of fatalities, reflecting the high exposure of both riders and road users. The main contributing factors were inattentiveness (47%) and speeding (20%) suggesting a combination of rider fatigue, poor road discipline, and limited enforcement capacity.

The risks are concentrated among young riders aged 16–35, who make up over 60% of fatalities, and accidents are most frequent between 6 p.m. and midnight, when visibility and enforcement are lowest. These trends reveal the systemic effects of informality in Ghana's light-mobility sector: **despite the legislative ban on commercial motorcycle operations (L.I. 2180), operations go on with weak enforcement and the absence of formal training or licensing structures which further allows unsafe practices to persist.**

Beyond the human toll, 2W accidents impose significant economic and social costs including loss of productivity, medical expenses, and strain on emergency services. Comparable accident data for tricycles are limited, but similar vulnerabilities exist, especially on narrow and mixed-traffic roads. Addressing these risks requires embedding safety measures, helmet standards, structured rider training and licensing and enforcement of maintenance regulations into policy frameworks to ensure that gains in mobility and employment do not come at the expense of human life and wellbeing.

[31] http://theijes.com/papers/vol11-issue3/A1103010106.pdf

4. POLICY AND REGULATORY FRAMEWORK IN GHANA

This section provides an in-depth analysis of existing national policies, climate commitments, regulatory standards, and fiscal instruments. It identifies critical gaps and proposes evidence-based policy recommendations to facilitate the uptake of E2&3Ws in Ghana. Importantly, it adopts a policy-oriented approach to ensure that findings are actionable, context-sensitive, and aligned with the broader development agenda.

4.1. Overview of National Policies

4.1.1. National Electric Mobility Policy (2023)

Ghana's transition to electric mobility is anchored in two complementary instruments: the National Electric Mobility Policy (NEMP) and the National Electric Mobility Roadmap (2022)[32]. Together, they form the strategic basis for decarbonising the country's transport sector while promoting inclusive, low-carbon development.

The NEMP serves as Ghana's principal policy framework for electrifying the transport sector. Developed by the Ministry of Energy in collaboration with key stakeholders, the policy outlines a broad strategic vision centred on five pillars: (i) governance and institutional alignment, (ii) infrastructure development, (iii) financing and incentives, (iv) capacity-building, and (v) public awareness. It places particular emphasis on the role E2&3Ws in enhancing mobility for low-income populations and addressing last-mile connectivity challenges, especially in peri-urban and underserved areas. The policy further advocates for the local assembly of electric vehicles (EVs) and the deployment of battery swapping infrastructure.

While the NEMP articulates a forward-looking vision for electric mobility, it exhibits key limitations. Notably, it lacks specific implementation timelines, quantitative adoption targets for E2Ws and E3Ws, and regulatory provisions for the informal transport sector, which comprises a significant share of urban mobility services. These gaps undermine the policy's operational utility and its capacity to guide coordinated national action.

To complement and operationalise the NEMP, the National Electric Mobility Roadmap, developed by the University of Ghana in partnership with the UNEP Copenhagen Climate Centre, provides a more detailed and time-bound strategic framework. The roadmap aligns closely with Ghana's Nationally Determined Contributions (NDCs) under the Paris Agreement, aiming to decarbonise a transport sector projected to emit approximately 74 $MtCO_2e$ by 2050 under a business-as-usual trajectory.

The roadmap identifies 22 cross-cutting barriers spanning economic, infrastructural, technical, policy, and social domains and proposes integrated, context-specific interventions to address them. These include fiscal incentives (e.g., tax exemptions and carbon credit schemes), investment in charging infrastructure and battery recycling facilities, development of technical capacity (through training and retrofitting programs), regulatory reforms (such as updated standards and customs codes), and public awareness campaigns. Notably, the roadmap targets the deployment of 1,000 electric buses by 2025 (achieving a 16% share of the public bus fleet by 2030), a 32% market share for electric cars by 2050, and cumulative CO_2 emission reductions exceeding 117

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

million tonnes. Additionally, while Ghana currently benefits from an electricity surplus that can support near-term EV deployment, energy demand forecasts highlight the need for integrated energy planning to avoid supply constraints by 2030.

In essence, the NEMP establishes the policy intent and strategic priorities for electric mobility, while the roadmap provides the operational architecture for implementation. Their combined and coordinated execution is essential for positioning Ghana as a frontrunner in electric mobility within the West African subregion and for ensuring that the transition contributes meaningfully to climate mitigation, economic inclusion, and sustainable transport development.

4.1.2. National Transport Policy (Revised 2020)

Ghana's Revised National Transport Policy (RNTP)[33] of 2020 is a strategic response to the country's evolving mobility challenges, particularly those arising from rapid urbanization, environmental degradation, and climate change. The policy aims to develop an integrated, safe, efficient, and sustainable transport system that aligns with national development goals and international commitments, including the Sustainable Development Goals (SDGs) and the Paris Agreement. It covers multiple transport modes from road, rail, air, maritime, urban, and freight logistics while promoting infrastructure development, intermodal integration, private sector participation, and environmental sustainability.

A key strength of the policy is its emphasis on low-emission and energy-efficient technologies. However, despite this, the Revised National Transport Policy fails to explicitly address E2&3Ws whose electrification offers significant benefits, including reduced fuel consumption, lower emissions, and enhanced affordability. Yet, the policy provides no regulatory framework, fiscal incentives, or infrastructure planning to support their adoption.

This omission stands in contrast to other national frameworks such as the National Electric Mobility Policy (2023) and the Energy Transition Framework (2022–2070), which explicitly recognize the role of electric two and three wheelers in achieving low carbon and inclusive transport goals. The lack of alignment between these frameworks and the Revised National Transport Policy weakens implementation efforts and limits Ghana's ability to coordinate institutional actions, attract investment, and scale solutions for sustainable mobility.

Furthermore, existing regulatory barriers such as bans on motorcycle taxis ("okada") compound the policy gap. While the Revised National Transport Policy reflects a progressive vision overall, its silence on electric mobility undermines efforts to modernize Ghana's transport sector in a climate-smart and socially inclusive manner.

4.1.3. Automotive (Motor Vehicle) Policy (2019)

The Ghana Automotive Development Policy (GADP),[34] introduced by the Ministry of Trade and Industry, seeks to position Ghana as a fully integrated and competitive industrial hub for the automotive industry in the West African sub-region. The policy outlines a comprehensive framework for establishing vehicle assembly and manufacturing capacity through partnerships with global, regional, and domestic stakeholders. Its strategic objectives include promoting local value

[33] Ghana's Revised National Transport Policy (RNTP)
https://www.brr.gov.gh/acc/registry/docs/NATIONAL%20TRANSPORT%20POLICY.pdf
[34] Ghana Automotive Development Policy (GADP) https://rome.mfa.gov.gh/uploads/SectionImagWithLinks/3286_AUTO_Brochure_NEW.pdf

addition, creating skilled employment, ensuring environmental protection, improving vehicle safety, and transforming the national transport fleet.

The GADP's initial scope focuses on assembling new passenger cars, SUVs, and light commercial vehicles (e.g., pickups, minibuses, and cargo vans), with plans to expand to medium and heavy-duty commercial vehicles and buses. It introduces a tiered structure for assembly operations Semi-Knocked-Down (SKD), Enhanced SKD, and Completely-Knocked-Down (CKD) to guide incentive allocation and regulatory oversight.

Key policy components include tax holidays of up to 10 years, duty waivers on assembly kits and equipment, and a 35% import duty rebate scheme for Fully Built Units (FBUs) linked to local production volume. Market development strategies cover preferential government procurement, vehicle financing schemes, streamlined port procedures, and export promotion, particularly to ECOWAS and AfCFTA markets.

The policy also places emphasis on standards and environmental safety, including compulsory vehicle testing and homologation, emissions control, and anti-theft vehicle marking systems. Industrial infrastructure plans propose automotive parks to co-locate assemblers and suppliers, while skills development strategies aim to equip artisans, technicians, and SMEs with competencies required by modern assembly and supply chains. Although the policy includes provisions for incentivizing electric vehicle assembly, its focus has predominantly been on four-wheeled passenger cars and light commercial vehicles.

Despite the policy's breadth, there is no explicit focus on E2&3Ws which are increasingly vital for urban mobility, informal transport, and last-mile delivery in Ghana. Although the policy encourages the use of energy-efficient technologies and seeks to improve environmental standards, it does not outline a regulatory or fiscal framework specifically tailored to support EV adoption, infrastructure (such as charging stations), or the localization of electric drivetrain components.

This omission is particularly significant given the growing policy emphasis on EVs in other national strategies, such as the National Electric Mobility Policy and the Energy Transition Framework. The absence of their consideration in the GADP highlights a missed opportunity for integration between industrial development and e-mobility goals.

4.1.4. National Energy Policy & Strategy

Ghana's 2021 National Energy Policy[35], developed by the Ministry of Energy, outlines a comprehensive and long-term strategy to guide the development of a secure, sustainable, and modern energy economy. The policy aims to ensure universal access to reliable, affordable, and clean energy to support national development objectives. It is structured around key thematic areas including power generation, transmission and distribution, petroleum, renewable energy, energy efficiency, and energy governance.

A central objective of the policy is to promote the diversification of Ghana's energy mix through increased use of renewable energy sources, energy efficiency technologies, and clean fuels. The policy explicitly recognizes the need to reduce greenhouse gas emissions in line with the country's international commitments under the Paris Agreement. It commits to increasing the penetration of

[35]National Energy Policy
https://www.energymin.gov.gh/sites/default/files/2023-09/2021%20ENERGY%20POLICY.pdf

renewable energy from 1% in 2020 to 10% by 2030 and integrating sustainable energy solutions into all sectors of the economy, including transportation.

The 2021 Energy Policy supports the transition to clean and efficient transportation by promoting low-carbon alternatives, particularly the electrification of Ghana's transport fleet. This includes commitments to expand electric vehicle (EV) infrastructure, promote investment in EV technologies, and provide the regulatory framework needed for widespread EV adoption. The policy highlights the role of electric mobility in reducing reliance on imported fossil fuels, improving urban air quality, and enhancing energy security.

However, while the policy supports the overall transition to electric vehicles, it does not offer detailed strategies specific to electric two- and three-wheelers—a key segment of Ghana's informal and last-mile transport ecosystem. These vehicles, commonly used for personal mobility, delivery services, and commercial transport, represent a significant opportunity for emissions reduction and economic inclusion. The lack of targeted attention to this segment suggests a gap in the policy's practical approach to equitable e-mobility, especially given the affordability and widespread use of light electric vehicles.

Moreover, the policy emphasizes private sector participation, innovation, and public-private partnerships as mechanisms to achieve its goals. It also acknowledges the need for investment in charging infrastructure, grid modernization, and capacity building for technical personnel and regulators. These components are vital for supporting the transition to electric mobility and ensuring that infrastructure is resilient and inclusive.

To support a more inclusive energy transition, future iterations of the policy should incorporate tailored measures to accelerate the adoption of electric two- and three-wheelers. This could include fiscal incentives, dedicated charging infrastructure in informal transport hubs, and technical standards to guide vehicle importation and assembly. Such provisions would align with Ghana's broader goals of universal energy access, climate mitigation, and green industrial development.

4.1.5. Ghana Beyond Aid & Medium-Term Development Frameworks

The Ghana Beyond Aid Charter[36] and its operationalization through Medium-Term National Development Policy Frameworks (MTNDPFs)[37] highlight the imperative for economic self-reliance, green industrialization, and infrastructure development. These frameworks are aligned with global sustainability agendas, including the Sustainable Development Goals (SDGs), and advocate for local content development in key sectors. While the frameworks do not directly reference electric two- and three-wheelers, they create a conducive backdrop for EV localization policies, job creation in green manufacturing, and fiscal reforms that favor sustainable technologies.

4.2. Climate and Environmental Commitments

4.2.1. Nationally Determined Contributions (NDCs)

Ghana's Updated Nationally Determined Contribution (NDC)[38], submitted in 2021 under the Paris Agreement, outlines the country's climate action roadmap from 2020 to 2030. The

[36]Ghana beyond Aid Charter http://psrs.gov.gh/images/GBYA/ghana_beyond_aid_charter_new.pdf
[37]NATIONAL MEDIUM-TERM DEVELOPMENT POLICY FRAMEWORK 2022-2025 https://ndpc.gov.gh/media/MTNDPF_2022-2025_Dec-2021.pdf
[38] Updated Nationally Determined Contribution under the Paris Agreement (2020 - 2030) https://unfccc.int/sites/default/files/NDC/2022-06/Ghana%27s%20Updated%20Nationally%20Determined%20Contribution%20to%20the%20UNFCCC_2021.pdf

implementation of the NDC is coordinated by the Ministry of Environment, Science and Technology (MEST) with technical support from the Environmental Protection Agency (EPA). The updated NDC reaffirms Ghana's commitment to building a climate-resilient, low-carbon economy while enhancing social inclusion, sustainable development, and environmental integrity. It articulates 47 distinct adaptation and mitigation measures across ten priority sectors, with the potential to reduce cumulative greenhouse gas emissions by 64 $MtCO_2e$ by 2030. These measures are expected to generate over one million green jobs, benefit approximately 38 million people, and avoid 2,900 premature deaths due to improved air quality.

The NDC emphasizes the integration of climate policy into national development frameworks, including Ghana's Medium-Term Development Policy Framework (2022–2025), the Ghana Beyond Aid Charter, and the Coordinated Programme of Economic and Social Development Policies. The 2021 NDC is designed to catalyze both domestic and international investments, with estimated implementation costs ranging from US$9.3 to US$15.5 billion. Of this amount, US$3.9 billion will support unconditional actions, while US$5.4 billion will be mobilized to implement conditional actions, contingent on international support and private sector engagement.

Notably, the updated NDC explicitly supports sustainable transport and air quality enhancement through the expansion of inter- and intra-city transport systems, energy-efficient vehicle promotion, and investment in low-carbon transport infrastructure. However, while electric mobility is referenced particularly in connection to public transportation and emissions reduction strategies the NDC does not sufficiently highlight electric two- and three-wheelers, despite their centrality to Ghana's informal transport economy. These vehicles play a crucial role in urban and peri-urban mobility, goods delivery, and livelihood support for low-income populations. Their electrification presents a cost-effective and socially inclusive path toward reducing transport-sector emissions and improving public health.

Several mitigation actions under the NDC, including the promotion of clean cooking, low-carbon electricity generation, and alternative urban waste management, acknowledge the co-benefits of reducing short-lived climate pollutants (SLCPs), such as black carbon and PM2.5. These co-benefits are especially relevant for E2&3WS, which offers considerable potential to reduce particulate emissions from gasoline-powered motorcycles and tricycles.

As highlighted in the PEA in **Section 2.2,** the Ministry of Environment, Science and Technology (MEST) launched the Nationally Determined Contributions (NDCs) Review Process in May 2025 in alignment with the extended deadline under the Paris Agreement cycles and is set to submit in September 2025.

4.2.2. National Climate Change Policy & Master Plans

The National Climate Change Policy (NCCP)[39] of Ghana, developed under the Ministry of Environment, Science, Technology and Innovation (MESTI), provides a strategic blueprint to tackle the complex impacts of climate change on Ghana's development. The policy seeks to foster a climate-resilient and climate-compatible economy through adaptation and mitigation measures that protect livelihoods, promote inclusive growth, and ensure environmental sustainability. Aligned with national development goals and international commitments like the UNFCCC and Paris Agreement, the NCCP focuses on five key areas: agriculture and food security, disaster

[39]Ghana National Climate Change Policy
https://www.clientearth.org/media/p13faarf/national-climate-change-policy-ext-en.pdf

preparedness, natural resource management, equitable social development, and energy, industrial, and infrastructure development.

A core aim of the NCCP is to integrate climate change considerations into national planning and budgeting. Recognizing climate change as a cross-sectoral issue impacting vulnerable groups such as women, youth, and rural communities, the policy advocates for institutional frameworks, capacity building, and public awareness initiatives to strengthen resilience and governance. It also promotes climate-smart infrastructure and technology transfers to drive sustainable development and low-carbon growth.

In the energy and infrastructure sector, the NCCP emphasizes diversifying Ghana's energy mix, expanding renewable energy, and implementing energy efficiency measures. It supports cleaner transport systems, including alternative fuels and eco-friendly vehicle technologies. However, the policy provides only general guidance and notably omits specific references to electric vehicles (EVs), particularly electric two and three wheelers, which are critical to Ghana's informal transport economy. This gap is significant, as these vehicles offer a scalable solution to reduce greenhouse gas emissions, improve urban air quality, and enhance energy security while supporting social equity by providing affordable mobility for low-income communities. The lack of targeted measures such as incentives for EV adoption, charging infrastructure investment, or vehicle safety standards limits the policy's effectiveness in advancing sustainable transport.

The NCCP also highlights the importance of financial innovation, including climate finance, public-private partnerships, and market-based instruments, which could support investment in electric mobility, especially for light-duty vehicles in urban and peri-urban areas.

4.3. Regulatory Standards and Institutions

4.3.1. Road Traffic Regulations (L.I. 2180) and Amendments

Ghana's Road Traffic Regulations, 2012 (L.I. 2180)[40], established under the Road Traffic Act, 2004 (Act 683)[41], serve as the core legal instrument governing the administration of road transport, vehicle registration and classification, driver licensing, traffic enforcement, and public transport operations. The regulations are enforced by institutions such as the Driver and Vehicle Licensing Authority (DVLA), the Motor Traffic and Transport Department (MTTD) of the Ghana Police Service, and the National Road Safety Authority (NRSA). They are designed to enhance safety, order, and operational efficiency in Ghana's rapidly growing road transport sector.

The Road Traffic (Amendment) Act, 2020 (Act 1014) provides detailed guidelines on vehicle classification and registration, driver licensing standards, roadworthiness certification, and inspection procedures. It also regulates commercial passenger transport, specifying conditions for taxis, buses, and goods vehicles, and it prescribes offenses, sanctions, and enforcement procedures related to traffic infractions. The regulation has historically provided the foundation for vehicle regulation and traffic safety in Ghana.

A major shortfall of the Act 1014 is the urban policies that restrict or ban the use of commercial two and three wheelers commonly known as "okada" in major cities such as Accra. While these bans are intended to curb traffic accidents and lawlessness, the regulatory framework fails to

[40] https://kuclawstudentsunion.com/wp-content/uploads/2024/09/ROAD-TRAFFIC-REGULATIONS-2012.htm

[41] https://lawsghana.com/post-1992-legislation/table-of-content/Acts%20of%20Parliament/ROAD%20TRAFFIC%20ACT,%202004%20(ACT%20683)/207

differentiate between internal combustion engine (ICE) motorcycles and their cleaner, safer electric alternatives. Consequently, electric motorcycles despite their environmental benefits and potential role in low-carbon urban mobility remain subject to the same restrictions as conventional ICE vehicles.

4.3.2. Environmental Protection Agency (EPA) Guidelines

The Environmental Protection Agency (EPA) of Ghana, established under Act 490 (1994)[42], is the key institution for regulating environmental protection, pollution control, and sustainability. Its mandate includes enforcing environmental impact assessments (EIAs), emissions standards, and permitting processes for infrastructure and industrial activities. While EPA guidelines have traditionally focused on pollution from internal combustion engines, they are increasingly relevant in the context of Ghana's transition to electric mobility.

Electric vehicles (EVs) particularly two and three wheelers present both opportunities and risks. While they reduce urban air pollution and support Ghana's climate goals, they also introduce new environmental challenges related to battery use and disposal. Historically, EPA regulations have lacked clear provisions on electric vehicle battery lifecycle management, charging infrastructure, and light electric vehicle (LEV) standards.

To address these gaps, the Environmental Protection Agency (Amendment) Act 1124, 2025[43] expanded the EPA's regulatory authority. It now includes oversight of EV battery recycling, licensing of e-waste handlers, and environmental permitting for EV infrastructure such as charging and battery-swapping stations. The amendment also enhances coordination with the Ghana Standards Authority and Energy Commission on setting technical standards for EV components.

Despite these advancements, Ghana still lacks specific EPA guidelines tailored to electric two- and three-wheelers vehicles widely used in informal transport and logistics. Without such guidelines, issues related to unsafe battery reuse, informal retrofitting, and unregulated disposal persist, undermining the environmental integrity of Ghana's e-mobility transition.

4.3.3. Ghana Standards Authority (GSA) Standards

The Ghana Standards Authority (GSA), re-established under the Ghana Standards Authority Act, 2022 [44](Act 1078), is mandated to develop, enforce, and monitor national standards for goods and services to ensure public safety, environmental protection, and industrial competitiveness. The Act empowers the GSA to issue technical regulations, conduct conformity assessments, and coordinate with other regulatory bodies, including the EPA, Energy Commission, and DVLA.

In the context of Ghana's transition to electric mobility especially the growing use of electric two and three wheelers for informal transport and delivery, GSA plays a vital role in setting safety, performance, and environmental standards. However, the current regulatory framework lacks specific national standards for light electric vehicles (LEVs), including those governing battery safety, charger compatibility, retrofit kits, and end of life battery disposal. This gap exposes the market to unsafe imports, limits consumer confidence, and undermines sustainability efforts.

[42] https://faolex.fao.org/docs/pdf/gha13234.pdf

[43] https://faolex.fao.org/docs/pdf/gha232276.pdf

[44] Ghana Standards Authority Act file:///Users/bernardgyebi/Downloads/Ghana%20Standards%20Authority%20Act%202022.pdf

As of 2023, the GSA, in collaboration with the Energy Commission and other stakeholders, began the process of adopting and adapting international electric vehicle standards, such as IEC 61851, which governs communication and safety requirements for electric vehicle conductive charging systems. These emerging frameworks are essential for ensuring the interoperability, performance, and safety of EV chargers in Ghana. Yet, current efforts are largely focused on four wheeled electric vehicles and public charging infrastructure, with limited specific focus on Electric two and three wheelers. Electric two and three wheelers, which dominate informal and last-mile transport in many urban and peri-urban areas, require tailored standards covering aspects such as:

- Battery safety and voltage thresholds (to reduce fire and explosion risks)
- Charger compatibility and plug configurations
- Durability and environmental resistance of EV components
- Retrofit kits and conversion standards

The lack of such standards creates regulatory ambiguity, increases the risk of substandard or unsafe EV imports, and limits consumer trust in light electric mobility technologies. It also impedes the development of a local EV manufacturing and assembly ecosystem, which relies on harmonized technical standards to achieve certification and quality assurance for products destined for both domestic and export markets.

Act 1078 provides the legal basis for the GSA to collaborate with institutions to regulate the importation, assembly, and recycling of EVs and their components. It also supports regional and international harmonization of standards, essential for Ghana's participation in cross border EV markets.

To ensure the safe and effective integration of electric two- and three-wheelers into Ghana's transport system, the GSA must urgently develop and implement tailored standards that address their unique technical and environmental characteristics. This will be key to achieving Ghana's low-carbon transport goals while safeguarding public health and safety.

4.3.4. Import Duties and Taxation

Ghana's import duty and taxation system, governed by the Customs Act, 2015 (Act 891)[45], significantly influences the cost and adoption of electric vehicles (EVs). While recent budget statements and the National Electric Mobility Policy (2023)[46] propose import duty exemptions for EVs especially for public transport the implementation remains limited, particularly for electric two- and three-wheelers.

Currently, the majority of imported electric motorcycles and tricycles are still subject to standard import duties ranging between 5% and 20%, in addition to 12.5% VAT, GETFund and NHIL levies, and other port-related fees. These charges significantly erode the price advantage that electric two- and three-wheelers typically offer over their fossil fuel counterparts, making them less competitive in local markets. Moreover, classification inconsistencies at the ports due to outdated HS codes that do not clearly differentiate between electric and internal combustion engine (ICE) vehicles often result in arbitrary or inflated tax assessments.

[45] Customs Act, 2015 (Act 891)
https://www.odekro.org/Images/Uploads/Customs%20Act,%202015.pdf
[46] National Electric Mobility Policy (2023)
https://unepccc.org/wp-content/uploads/2022/06/national-electric-mobility-policy-framework-ghana-final.pdf

While incentives under the Automotive Development Policy (2019) such as tax holidays and duty waivers mainly benefit four-wheeled vehicle assemblers, excluding local manufacturers of electric motorcycles and tricycles. This creates a policy mismatch that disadvantages the light EV segment.

To support equitable electric mobility uptake, Ghana must update customs classifications, extend tax reliefs to electric two- and three-wheelers, and include LEVs in its automotive industrial incentives. Without such reforms, the fiscal framework will continue to hinder the widespread adoption of clean, affordable transport solutions.

4.4. Energy Sector Plans

4.4.1. Renewable Energy Master Plan (2019)

Ghana's Renewable Energy Master Plan (REMP)[47], launched in 2019, provides a strategic framework for scaling up the deployment of renewable energy technologies across the country. Developed by the Ministry of Energy in collaboration with the Energy Commission and UNDP, the plan aims to increase the share of renewable energy in the national energy mix, enhance energy security, and support inclusive green growth. It outlines specific targets for solar, wind, biomass, and small hydro technologies while proposing investment strategies, policy interventions, and capacity-building measures to attract private sector participation.

A core ambition of the REMP is to increase the renewable energy contribution in the electricity generation mix to 10% by 2030 (excluding large hydro). The plan also emphasizes decentralized energy systems such as solar mini-grids and standalone systems for rural electrification, alongside efforts to create green jobs and support local manufacturing of renewable energy components.

Although primarily focused on energy generation, the REMP makes important references to the electrification of transport as a cross-cutting opportunity for integrating renewable energy with end use applications. The plan advocates for pilot projects to demonstrate electric vehicle (EV) feasibility, the use of renewable-powered charging infrastructure, and the long-term development of clean transport systems that reduce fossil fuel imports and urban pollution.

However, the Master Plan does not provide targeted actions or strategies specific to electric two and three wheelers, which are increasingly dominant in informal transport and last-mile mobility in Ghana. These vehicles are ideally suited for integration with distributed solar energy systems due to their low power requirements and flexible charging potential. Their omission from the plan's investment and policy frameworks represents a missed opportunity to link renewable energy development with inclusive, low-carbon transport access.

4.4.2. National Energy Transition Framework (2022–2070)

Ghana's National Energy Transition Framework (NETF)[48], launched in 2023, provides a long-term strategic roadmap for transitioning to a low-carbon and resilient energy economy by 2070. Anchored in Ghana's commitment to the Paris Agreement and national development goals, the framework sets out ambitious targets to reduce greenhouse gas emissions, diversify the energy mix, enhance energy access, and support inclusive green growth. It outlines specific interventions

[47]Ghana's Renewable Energy Master Plan
https://faolex.fao.org/docs/pdf/gha208774.pdf
[48]Ghana's National Energy Transition Framework
https://www.energymin.gov.gh/sites/default/files/2023-09/FINAL%20GHANA%27S%20NATIONAL%20ENERGY%20TRANSITION%20FRAMEWORK_2023_compressed%20%281%29_compressed%20%282%29.pdf

across power generation, transport, industry, buildings, and agriculture, while emphasizing job creation, energy security, and social equity.

In the transport sector, the NETF explicitly recognizes electric mobility as a key pillar for decarbonization. It projects that Ghana can reduce transport-related emissions by nearly 50% by 2070 through a phased transition to electric vehicles (EVs), improved fuel economy standards, and modal shifts toward mass and non-motorized transport. The framework promotes the integration of renewable energy into EV charging systems, the development of e-mobility infrastructure, and the establishment of supportive regulatory and fiscal policies.

Notably, the NETF identifies electric two and three wheelers as a cost effective, scalable solution for reducing emissions in the informal transport sector. These vehicles are widely used across Ghana for commercial passenger transport and logistics, particularly in urban and peri-urban areas. Their electrification is considered a "quick-win" due to their relatively low energy requirements, affordability, and compatibility with decentralized solar charging systems. The framework recommends targeted subsidies, tax incentives, and concessional financing schemes to promote their adoption.

Additionally, the NETF calls for the development of local EV assembly capacity, the introduction of battery safety and recycling standards, and enhanced coordination with institutions like the Ghana Standards Authority (GSA) and Environmental Protection Agency (EPA) to address lifecycle environmental risks. It also emphasizes inclusive stakeholder engagement, particularly involving women, youth, and informal sector operators, to ensure that the energy transition does not exacerbate social or economic inequalities.

Despite these strong policy directions, the framework notes key implementation challenges, including limited investment in charging infrastructure, outdated regulatory instruments (e.g., Road Traffic Regulations), and insufficient alignment across ministries and local authorities. The framework proposes institutional reforms and inter-agency collaboration to overcome these barriers.

4.4.3. Energy Transition Investment Plan (2030/2060)

Ghana's Energy Transition and Investment Plan (ETIP)[49], launched in 2023, builds upon the country's National Energy Transition Framework (NETF) and outlines a clear pathway to achieving net-zero greenhouse gas emissions by 2060. Developed with support from Sustainable Energy for All (SEforALL), the ETIP provides a detailed investment roadmap and strategic interventions across energy generation, transport, buildings, industry, and hydrogen production. It emphasizes low carbon growth, energy security, socioeconomic inclusion, and international investor alignment.

The transport sector is a cornerstone of the ETIP, accounting for approximately 70% of the projected USD 550 billion investment needed by 2060. Within this, electrification of vehicles including electric two and three wheelers is identified as a key decarbonization strategy, expected to drive nearly 40% of all emissions abatement. The plan projects a full transition of passenger vehicles and light transport (including 2&3Ws) to electric technologies by 2060, with electric motorcycles becoming cost competitive as early as 2030 due to battery price declines and second hand EV market development.

[49] Ghana's Energy Transition and Investment Plan (ETIP)[49], https://www.seforall.org/system/files/2025-05/Ghana-ETIP.pdf

Electric two and three wheelers are highlighted as especially impactful for Ghana's informal and low income mobility segments. The ETIP notes that these vehicles are not only affordable and scalable, but also compatible with decentralized solar powered charging, making them ideal for rural and peri-urban transport electrification.

The Plan outlines several policy and investment priorities to support this transition:

- USD 110 billion in cumulative investment for EVs and 2&3Ws by 2060;
- Development of EV charging infrastructure, including home and grid-connected stations;
- Fiscal incentives such as tax credits, trade-in programs, and reduced registration fees;
- Regulations to encourage fleet electrification and phase out ICE vehicles;
- Public-private partnerships for vehicle assembly and local battery manufacturing;
- De-risking mechanisms (e.g., guarantees, concessional finance) to attract private capital.

Moreover, the ETIP acknowledges key implementation challenges including high upfront costs, limited charging infrastructure, and weak alignment between sectoral regulations. To address these, it proposes the establishment of an Energy Transition Office and calls for harmonized laws and cross-sectoral policies to fast-track investment and deployment of clean transport technologies.

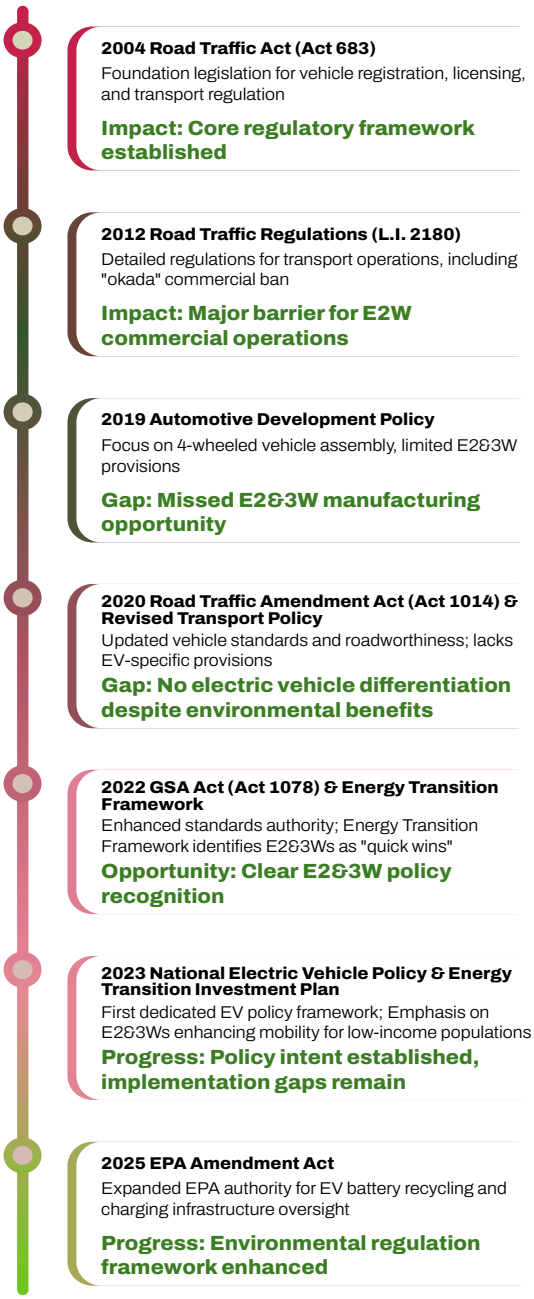


Figure 5: Legal and Policy Timeline

5. REGIONAL CONTEXT (AFRICA)

How are regional bodies and agreements creating an enabling environment for e-mobility? What lessons can Ghana draw from peer African countries' e-mobility initiatives, in terms of policies, business models, and consumer adoption? What common challenges do African countries face, and what innovative solutions are being tried regionally?

5.1. African Union Energy and Transport Frameworks

At the continental level, the Sustainable Transport Africa Policy Program (SSATP) serves as the African Union's main technical platform for advancing transport policy reform and sustainable mobility. Established in partnership with the African Union Commission (AUC), UN Economic Commission for Africa (UNECA), African Development Bank (AfDB), and the World Bank, SSATP provides policy frameworks and technical guidance to promote regional integration, road safety, and clean urban mobility across Africa[50].

The SSATP's core frameworks, especially the EASI (Enable-Avoid-Shift-Improve) model, are directly applicable to electric two- and three-wheeler (E2&3W) strategies: by promoting integration of informal mobility modes into formal planning, incentivising cleaner technologies, improving safety, and fostering modal shift in dense urban corridors[51]. SSATP's Urban Transport & Mobility (UTM) pillar has supported diagnostic studies in Ghanaian cities (Accra, Kumasi) as part of its pilot country portfolio, offering empirical insight into how motorcycles and tricycles function in urban access.

In parallel, the SSATP-endorsed Managing Road Safety in Africa and Safe System approach (highlighted in its recent reports) advance road safety principles specifically tailored to vulnerable users such as motorcycles and tricycles, emphasizing institutional capacity, data systems, and regulation enforcement[52]. Together, these continental frameworks provide a policy scaffold Ghana can adapt to regulate, support, and scale the E2&3W transition in urban and peri-urban contexts.

5.2. ECOWAS Transport & Energy Plans

Within West Africa, the ECOWAS e-Mobility Program, housed under ECREEE (ECOWAS Centre for Renewable Energy and Energy Efficiency), is grounding regional coordination for electric vehicle uptake, including support for E2&3WS. Since 2019, it has produced baseline assessments and policy recommendations for e-mobility across 14 member states, and calls for harmonised vehicle data, labeling systems, and fiscal incentives. The recently issued Terms of Reference (2025) confirms ECOWAS's intent to develop a regional e-Mobility Policy, Strategy, and Action Plans that would standardize legal frameworks and investment pathways across member states[53]. This mechanism, once operational, would reduce cross-border fragmentation and lower transaction costs for E2&3W enterprises in Ghana participating in regional trade and mobility networks.

ECOWAS's Regional Climate Strategy (RCS) & Action Plans also embed transport and mobility under its priority sectors (along with energy, land use, industrial emissions) and therefore create a policy anchor to integrate e-mobility into national climate commitments[54]. For Ghana, aligning its e-

[50] SSATP. (2020). Urban Mobility Diagnostic Study for African Cities (Accra and Kumasi Case Studies). SSATP Urban Transport and Mobility (UTM) Program. https://www.ssatp.org/publication/urban-mobility-diagnostic-study-african-cities

[51] SSATP. (2020). Urban Mobility Diagnostic Study for African Cities (Accra and Kumasi Case Studies). SSATP Urban Transport and Mobility (UTM) Program. https://www.ssatp.org/publication/urban-mobility-diagnostic-study-african-cities

[52] SSATP. (2022). Fourth Development Plan (DP4, 2022–2026): Africa's Transport Policy Program. The World Bank / SSATP. https://www.ssatp.org/who-we-are

[53] ECREEE. (2025). Terms of Reference: ECOWAS e-Mobility Policy, Strategy & Action Plans. https://www.ecreee.org/wp-content/uploads/2025/09/ToR-Electric-Mobility-Policy.pdf

[54] ECOWAS. (2022). Regional Climate Strategy (Transport & Mobility Component). https://disasterdisplacement.org/wp-content/uploads/2022/10/ECOWAS-Regional-Climate-Strategy_FINAL_compressed.pdf

mobility strategies with ECOWAS and regional climate frameworks may unlock grant funds and more coherent regulation across regional corridors.

5.3. Financing and Market Challenges in Africa

The region is widely faced with low energy security because of grid reliability and power supply, which becomes a disincentive for people to buy E2&3Ws as energy security is directly linked to the use of EVs practically for charging.

Also, a lack of local manufacturers is a notable barrier to the market of EVs in Africa. Even though automakers have committed to introducing EVs in the world by creating manufacturing or assembling hubs, Africa relies heavily on imported EVs from countries such as China, and this has contributed to increased cost[55]. Many African markets face a 50% investment gap in clean mobility funding, especially for small-scale or informal vehicle segments[56].

Generally, there is a lack of awareness and understanding of electric vehicles in with concerns about access to affordable maintenance and the availability of changing stations, making EVs less desirable in Africa[57].

The upfront cost of electric vehicles remains a significant barrier to widespread adoption in the region, as citizens have low purchasing power compared to other continents. Traditional ICE variations typically have lower price ranges compared to EVs, and this proves to be a major deterrent to purchasing electric variants.

Forgoing the cost-benefit of EVs to purchase low-cost ICE vehicles, the general lack of government incentives makes this worse. To make EVs more financially appealing to both individual consumers and companies wishing to electrify their fleets, few African nations presently provide incentives like tax rebates, subsidies, or lower import taxes. Adoption is therefore being slowed down by the financial environment, which makes it difficult to close the pricing difference between conventional and electric vehicles[57].

[55] Barriers of EV Adoption in Africa anf How to Overcome Them https://www.leadventgrp.com/blog/barriers-to-ev-adoption-in-africa-and-how-to-overcome-them#:~:text=High%20upfront%20costs%20remain%20a,is%20the%20underdeveloped%20charging%20infrastructure.

[56] Dalberg / FMO. (2023). Catalyzing Investment in Electric Mobility. https://www.fmo.nl/l/en/library/download/urn%3Auuid%3Ad39db2ef-afde-45d6-b246-5f5514cd66bd/dalberg%2Breporrt.pdf

[57] Electric Vehicles in Africa: Challenges and Opportunities for Sustainable Transport https://tech-ceos.com/electric-vehicles-in-africa-challenges-and-opportunities-for-sustainable-transport/

6. INTERNATIONAL STANDARDS AND GLOBAL BEST PRACTICES

What are the global trends? What success stories tell the most effective levers to accelerate e-mobility? Which international vehicle standards and practices should Ghana adopt to ensure quality and interoperability? How can Ghana leverage international support for its e-mobility ambitions?

6.1. IEA Global EV Market Trends

A significant and accelerating shift in the automotive industry characterises the global electric vehicle (EV) trend. This transformation is marked by unprecedented growth in EV sales and market penetration worldwide. By 2024, global electric car sales had surpassed 17 million units, representing more than 20% of new car sales globally (see Figure 6)[58].

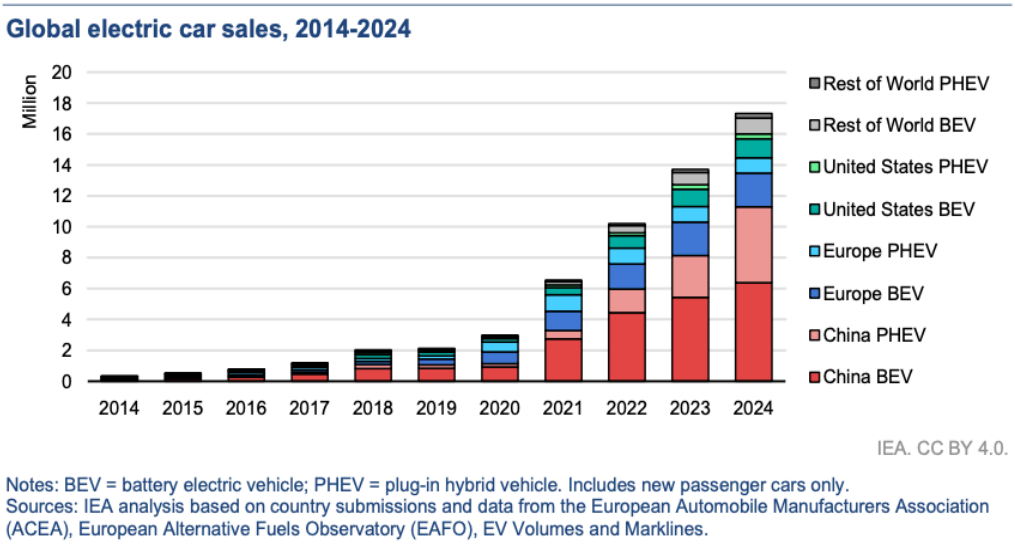
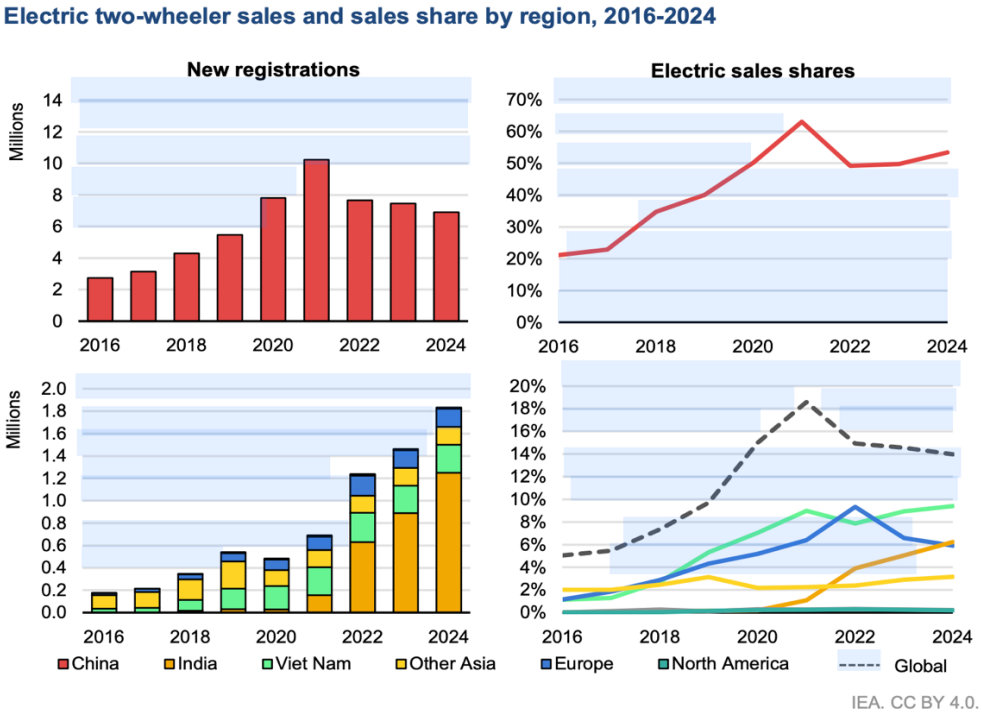


Figure 6: Global EV Sales

Two-and three-wheelers remains the most electrified road transport segment, with over 9% of the global fleet being electric and holds a 15% share of the global sales by that totalling 10 million units in 2024. Though sales in China slowed due to the shrinking market, sales in other Asian countries such as India and Southeast Asia dominated the market, accounting for 80% of global sales, with E2&3Ws being crucial for daily transport in India and Southeast Asia. It is noted that the Asian market dominates the sales of two-and three-wheelers.

The reason for the E2&3Ws dominating the market is identified by its affordability and accessibility in the EV space. Many modules of the 2&3 wheels have removable batteries, and this helps in reducing the user's reliance on charging infrastructure as the battery can be removed and charged at home or swapped for a small token. E2&3Ws have a low operating cost than an electric car making the 2&3Ws a preferred mobility option and is promising to be a solution for cutting urban emissions and improving air quality in emerging developing economies like Ghana. Compared to electric cars, 2&3Ws require low upfront cost and operating costs making them a solution for mobility.

[58] Global EV Outlook 2025 https://www.iea.org/reports/global-ev-outlook-2025



Source: IEA Global EV Outlook 2025

In 2024, the IEA EV outlook recorded a 7 million units production of 2-wheelers in China; however, there was a slowdown in domestic purchases, which could be attributed to consumer preference for electric cars and an adherence to stricter regulations on 2W in major cities. Notably, the market is shifting toward high-value motorcycles, suggesting a change in the demography of consumers. In the same period, the Chinese government launched a trade-in programme for electric bicycles in 2023, boosting e-bike sales, especially among urban commuters seeking affordable transport options. Facing a decline in domestic sales, leading manufacturers are expanding overseas. Such as Yadea a leading company in 2&3W began building a USD 150 million plant in Indonesia in 2024, aiming at producing 3 million 2&3Ws by 2028. With other manufactures expanding to Southeast Asian countries for production and to increase their market. Countries such as Vietnam, Philippines and Thailand are becoming top players in these regions' electric 2&3Ws[59].

6.2. Key International Frameworks:

6.2.1. Zero Emission Vehicles Transition Council (ZEVTC)

The **Zero Emission Vehicles Transition Council (ZEVTC)** is a ministerial-level international coalition designed to coordinate political commitment and practical pathways toward zero-emission vehicle adoption globally, with emphasis on emerging markets. Its Global ZEV Transition Roadmap guides member countries to align on common policy levers such as purchase mandates, fiscal incentives, charging infrastructure deployment, and grid readiness—that support scale and consistency in EV

[59] Global EV Outlook 2025
Accessed on 9th July 2025
https://www.iea.org/reports/global-ev-outlook-2025

markets[60]. For Ghana's E2&3W transition, aligning with ZEVTC allows drawing on collective best practices, strengthen government buy-in, and use the council's standards to benchmark local policy design such as timelines for electrification, charging norms, incentives.

In particular, ZEVTC's emphasis on accessibility, affordability, and just transition ensures that no mobility mode is left behind. Their action plan highlights the importance of equitable access, battery health standards, and second-life markets, which are especially relevant for light electric two- and three-wheelers in developing contexts[61]. Ghana can leverage ZEVTC's frameworks to ensure that its E2&3W shift is not only technically sound, but socially inclusive and sustainable.

6.2.2. UNEP / GEF Global Electric Mobility Programme

The Global Electric Mobility Programme (supported by UNEP and GEF) is aimed at accelerating electric mobility adoption in low- and middle-income countries by offering technical assistance, funding support, and capacity building. It has been rolled out across more than 60 developing countries, emphasizing integrated solutions in policy, infrastructure, and energy planning[62]. For Ghana, this program presents a direct opportunity to access global support for E2&3W pilots, regulatory design, and charging deployments.

Because E2&3W represent light vehicle segments with lower capital and power requirements, the GEF programme's tailored assistance models can help Ghana avoid overbuilding infrastructure or importing incompatible technologies. Its integration of mobility and renewable energy planning also aligns well with Ghana's grid constraints and the need for smart charging strategies. Ghana can use this framework as a reference for developing scalable, climate-compatible e-mobility systems anchored in global expertise.

6.2.3. Global Fuel Economy Initiative (GFEI)

The **Global Fuel Economy Initiative (GFEI)** is a collaborative partnership (UNEP, IEA, ICCT, etc.) focused on improving vehicle energy efficiency worldwide and accelerating the transition to low- and zero-emission vehicles[63]. While originally targeted at conventional vehicles, GFEI's work on baseline assessments, efficiency standards, and regulatory instruments provides conceptual and technical scaffolding for policy shifts in emerging EV markets.

GFEI frameworks can help benchmark energy-use baselines, set progressive efficiency performance standards, and orient the policy dialogue toward fuel savings trajectories as a transition to electrification. Though not exclusively electric in origin, GFEI's models allow Ghana to position E2&3W adoption within a gradual efficiency-to-electrification continuum, mitigating disruptions and building institutional capacity around regulation and data.

[60] ZEVTC (2024) Roadmap to 2030 Enabling a Global Transition to Zero Emission Vehicles https://zevtc.org/wp-content/uploads/2024/11/Global-ZEV-Roadmap_2024.pdf
[61] Zero Emission Vehicles Transition Council. (2022). Zero Emission Vehicles Transition Council: 2022 action plan. Retrieved from https://www.gov.uk/government/publications/zero-emission-vehicles-transition-council-2022-action-plan/zero-emission-vehicles-transition-council-2022-action-plan
[62] GEF Global E-Mobility Programme https://www.iea.org/about/international-collaborations/gef-global-e-mobility-programme?utm_source=chatgpt.com
[63] Global Fuel Economy Initiative (GFEI). Global Fuel Economy Initiative: Global action for cleaner vehicles. https://www.globalfueleconomy.org/

7. COMPARATIVE CASE STUDY AND GAP ANALYSIS

This section builds directly on the comparative assessment methodology outlined in **Section 2.4**, applying the multi-dimensional framework to benchmark Ghana's electric two- and three-wheeler (E2&3W) ecosystem against selected international case studies.

7.1. Policy Framework

7.1.1. India

To drive E2&3W adoption, India's central government launched the National Electric Mobility Mission Plan (NEMMP) was in 2013, under which the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME) program has been the flagship. While FAME I (2015–2019) provided purchase subsidies for E2&33Ws, buses, and hybrids[64], FAME II (2019–2024) shifted focus toward scaling up charging infrastructure and required higher local content in manufacturers receiving subsidies. By late 2024, India introduced a new PM e-Drive policy targeting emerging EV segments (including E2&3Ws, buses and trucks) with purchase incentives to support 2.5 million E2Ws by 2026, 2.5 times the earlier FAME II target[65].

Beyond purchase subsidies, India has set ambitious EV adoption targets to drive policy. By 2030 the government aims for 80% of new 2&3Ws sales to be electric, along with 30% of cars[66]. While these targets are very aggressive relative to current uptake, they signal clear long-term intent. Complementary national policies have also reinforced progress. For example, the Goods and Services Tax on EVs was cut from 12% to 5%, and electric two/three-wheelers were exempted from commercial permit requirements (unlike traditional auto-rickshaws) to ease deployment[64]. The government also clarified that selling electricity for EV charging is a service, not the sale of power, enabling private charging and swapping businesses to operate legally. To further encourage consumer uptake, authorities introduced income tax deductions on interest for EV loans and supported installing charging stations (e.g. tax rebates for highway chargers at 25 km intervals).

In 2022, recognizing infrastructure constraints, India's policy think-tank NITI Aayog drafted a dedicated Battery Swapping Policy, focusing on standardization and incentives for swappable batteries in E2&3Ws[67]. India also amended the Motor Vehicles Act in 2015 to low-speed E3Ws, bringing them into the formal regulatory framework and closing a major policy gap, that Ghana still contends with for motorcycle taxis[68]. India's experience shows that proactive policy can formalize and support emerging e-mobility modes rather than banning them, highlighting a path Ghana could take to integrate informal.

Industrial policy has been another pillar of India's strategy, recognizing the opportunity to build a domestic EV manufacturing base. The 2021 Production-Linked Incentive (PLI) scheme for Advanced Chemistry Cells and EV components allocated ₹25,000 crore (over $3 billion) to support local battery cell and EV parts production[64]. This supply-side push aims to reduce import

[64] Saon Ray, S. (2025). Challenges and opportunities: India's electric vehicle industrial policy. Center for the Advanced Study of India, University of Pennsylvania. https://casi.sas.upenn.edu/iit/saon-ray-2025
[65] Mishra, V. (2025). How India moves: Two-wheelers and three-wheelers lead the EV surge. Down To Earth. https://www.downtoearth.org.in/air/how-india-moves-in-india-and-southeast-asia-two-wheelers-and-three-wheelers-are-predominant-modes-of-private-passenger-transport
[66] Wells, P. (2025). India's transition to electric vehicles. Polytechnique Insights. https://www.polytechnique-insights.com/en/columns/economy/indias-transition-to-electric-vehicles/
[67] Ministry of Heavy Industries, Government of India. (2022). Draft battery swapping policy. NITI Aayog. https://www.niti.gov.in/sites/default/files/2023-03/20220420_Battery_Swapping_Policy_Draft_0.pdf
[68] Ghate, A. T., & Suneja, D. (2018). The e-rickshaw story: Was the advent of electric mobility in India planned? TERI Blog. https://www.teriin.org/blog/e-rickshaw-story-was-advent-of-electric-mobility-in-India-planned

dependence and spur local innovation. Foreign automakers are now required to partner locally to qualify for reduced import duties—dropping from 70–100% to 15% for firms investing at least $500 million in domestic production with 50% local content[66].

State-level incentives have attracted global and domestic investors to set up E2&3W assembly plants in India. Leading states like **Delhi, Karnataka, Maharashtra, and Tamil Nadu** offer additional purchase rebates, waive registration fees, and support manufacturers with land, tax breaks, and capital subsidies[64]. India's multi-level governance approach, featuring central guidelines and funding paired with state-specific incentives has been pivotal and can be replicated in Ghana by aligning national targets with regional implementation strategies and incentives.

7.1.2. Kenya

Kenya's approach emphasizes fiscal incentives and pilot programs rather than comprehensive mandates. The Kenyan government's policy approach so far emphasizes fiscal incentives and pilot programs rather than heavy mandates. Notably, tax and tariff incentives have been introduced: recent Finance Acts exempt import duty and value-added tax for electric vehicles and associated parts (including motorcycles and batteries), aiming to reduce upfront costs[69].

This has lowered prices of e-motorcycles relative to petrol models, directly addressing one key adoption barrier. Additionally, the government has signaled support through public targets, for instance, there is an ambition to deploy over 200,000 E2Ws by end of 2024 which reflects EV uptake as part of national climate strategy[70]. While hard bans as seen in China are not in place, Kenya's policies include pilot programs for public fleets such as introducing electric bikes in postal service or police fleets and developing an e-mobility policy framework to guide standards and safety.

Moreover, collaboration with industry associations informs policy: the Electric Mobility Association of Kenya (EMAK) has been actively advising on a policy roadmap. Unlike India's manufacturing-focused approach, Kenya's policies prioritize market entry through cost reduction. In 2025, EMAK released a white paper proposing a comprehensive policy package, including full tax exemptions, targeted subsidies, and even time-bound electrification targets under high-support scenarios[71]. The government is considering these measures, recognizing that without stronger support, the market may remain limited. In summary, Kenya's policy measures are trending toward creating an enabling environment – reducing cost barriers, improving regulations – though many policies (e.g. direct purchase subsidies, large infrastructure investments) are still in early or planning stages.

7.1.3. Rwanda

Rwanda has taken an aggressive approach to create a supportive policy environment for e-mobility in East Africa. A hallmark is the comprehensive incentive scheme introduced in 2021, which the government has since reinforced: Fully electric vehicles (including motorcycles) enjoy zero import duty, zero VAT, and no excise duty on imports[72]. This effectively removes the usual tax costs,

[69] Kuhudzai, R. J. (2025). Electrifying Kenya's Transportation Sector — EMAK Proposes Policy Measures to Promote Electric Mobility. CleanTechnica. https://cleantechnica.com
[70] Payton, B. (2024). EV manufacturing shows signs of promise in Africa. African Business. https://african.business
[71] Electric Mobility Association of Kenya. (2025). Policy measures to promote electric mobility in Kenya. EMAK White Paper.
[72] Changing Transport. (2024, October 31). Driving Rwanda's Green Future – Highlights from the Electric Mobility Forum. Changing Transport (GIZ). https://changing-transport.org/driving-rwandas-green-future/#:~:text=Rwanda%E2%80%99s%20commitment%20to%20sustainable%20transportation,become%20carbon%20neutral%20by%202050

making electric motorbikes much more price-competitive with ICE equivalents and presenting a stark contrast to many countries where EVs are taxed as luxury goods.

The government also implemented an industrial electricity tariff for EV charging which gave a discounted rate for charging stations to reduce operating costs for e-mobility services. Further, Rwanda provides rent-free public land for charging and swapping infrastructure development, recognizing that securing sites can otherwise be a hurdle for private investors.

Beyond financial incentives, Rwanda's leadership has set clear targets and mandates: the government's goal is to electrify 30% of the country's motorcycle fleet by 2030, and President Kagame has called for a rapid phase-out of new petrol motorcycles by *2025*[73]. This ambitious timeline sent a strong market signal to investors and operators that Rwanda is committed to a fully electric two-wheeler future.

All these measures are embedded in a broader vision of a low-carbon transport system, as e-mobility is a pillar of Rwanda's NDC and its climate action strategy. Rwanda's policy measures create a highly enabling environment: strong fiscal incentives, clear political mandates, and integration of E2&3W-mobility into national planning.

7.1.4. China

China's electrification strategy has been driven by strong regulatory measures rather than fiscal incentives alone. Over the past two decades, regulatory bans on gasoline motorbikes in major cities have been a cornerstone; by 2025 nearly 200 cities implemented partial or total bans on gas-powered two-wheelers[74]. Early examples include Beijing's area-by-area progressive restriction of petrol motorcycles from 1986 to 2000 and Guangzhou's citywide ban in 2007. These bans created a massive market opening for electric two-wheelers as the central government also enforced vehicle phase-out rules, requiring scrapping of gas motorcycles after 13 years or 120,000 km with cash incentives for retirement of younger vehicles.

At the same time, E2Ws were classified as non-motorized vehicles, minimizing licensing and registration hurdles for consumers. This favorable classification, alongside generous subsidies, accelerated adoption as e-bikes required no driver's license and had lower fees, making them accessible to low-income riders. For instance, national subsidy programs and local incentives have sometimes offered cash rebates for switching to newer electric models.

More recently, China introduced technical standards for e-motorbikes to cap speed at 25 km/h and weight at 55 kg and mandating GPS/BeiDou units on new bikes ultimately to improve user and general public safety. These strict standards and bans showcase China's top-down policy approach that, although raising costs for users, spurred widespread electrification.

7.1.5. Policy Sequencing and Contextual Adaptation

The comparative analysis reveals distinct policy sequencing patterns. India and China began with broad frameworks before refining implementation, while Kenya and Rwanda started with targeted

[73] ICLEI Africa. (2025). Accelerating the deployment of e-motos in Rwanda (Rwanda E-Moto Project) – Project Description. https://iclei.org/activity/accelerating-the-deployment-of-e-motos-in-rwanda-rwanda-e-moto-project/#:~:text=air%20quality.through%20access%20to%20tailored%20finance

[74] VnExpress International (2025). How electric motorbikes took over China, one city at a time. https://e.vnexpress.net/news/news/traffic/how-electric-motorbikes-took-over-china-one-city-at-a-time-4914588.html

interventions. Rwanda's comprehensive approach from inception contrasts with South Africa's incremental development, highlighting how political commitment influences policy coherence.

While South Africa isn't a core case study country, its experience contrasts with Rwanda's to demonstrate cautious policy development; despite being Africa's most industrialized economy with advanced automotive manufacturing capacity, limited policy support resulted in minimal EV uptake, with only around 1,000 electric vehicles by 2023 compared to Rwanda's rapid deployment of over 5,000 E2Ws[75].

The multi-level governance approach proves crucial. India's coordination between central guidelines and state-specific incentives enabled tailored implementation, while Rwanda's centralized approach ensured rapid deployment but required strong institutional capacity. Kenya's private sector-led model with emerging government support suggests alternative pathways for countries with limited state capacity.

7.2. Stakeholder Ecosystem

7.2.1. Government Leadership Models

Centralised Coordination Approach

China demonstrates the most centralised stakeholder coordination model, characterised by strong central and municipal government leadership setting and enforcing the policy agenda through bans, standards, and subsidies[76]. The central government enforces vehicle phase-out rules requiring scrapping of petrol motorcycles, while local governments and city police enforce traffic rules and retrofit infrastructure. This approach created a self-reinforcing ecosystem where government leads, industry responds at scale, and citizens rapidly adopt new technologies.

Rwanda similarly employs a centralised coordination model, with high-level political leadership through the presidency and ministries acting as champions and convenors. The Rwanda Development Board actively courts e-mobility investors, The Rwanda Development Board actively courts e-mobility investors, while FONERWA (the national Green Fund) provides financial support to projects[77]. Unlike China's regulatory enforcement focus, Rwanda's approach emphasises creating enabling conditions through fiscal incentives and public-private partnerships.

Decentralised Innovation Model

Kenya presents a contrasting bottom-up, entrepreneurial stakeholder dynamic where private-sector stakeholders have been the primary drivers of E2W growth, with government now catching up. A vibrant ecosystem of startups including Roam (formerly Opibus), Ampersand, Ecobodaa, and Kiri has introduced E2Ws and tuk-tuks, often assembling locally and piloting battery swapping services[78]. Furthermore Kenya's formation of the EMAK) has unified industry players, academics and advocates to lobby government and coordinate efforts[77]. This entrepreneurial model contrasts

[75] Zhuwakinyu, M. (2024). Despite big hurdles, long journey to electric mobility begins across Africa. Engineering News – Creamer Media. https://www.engineeringnews.co.za/article/despite-big-hurdles-long-journey-to-electric-mobility-begins-across-africa-2024-12-13-1
[76] Ho, T. (2025). How electric motorbikes took over China, one city at a time. VnExpress International.
[77] Saon Ray, S. (2025). Challenges and Opportunities: India's Electric Vehicle Industrial Policy. Center for the Advanced Study of India, University of Pennsylvania
[78] Mishra, V. (2025, May 19). How India moves: Two-wheelers and three-wheelers lead the EV surge. Down To Earth.

with China's top-down approach, demonstrating how innovation can precede heavy regulation when market conditions favour private sector leadership.

Multi-level Governance Framework

India showcases a sophisticated multi-level governance approach where central government ministries set overall policy direction through programmes like FAME, while state and city governments serve as critical on-the-ground implementers[77]. State governments handle vehicle registration and permits, electricity tariffs for charging, and local incentives. Many states facilitate stakeholder coordination by forming EV promotion cells or task forces that include utilities and transit agencies. This multi-level approach creates structured coordination mechanisms at multiple governance levels while maintaining policy coherence.

7.2.2. Private Sector Engagement Patterns

The role of domestic versus international manufacturers varies markedly across cases. China's manufacturing sector has massively scaled up production of compliant e-bikes, with over 420 million E2Ws in circulation by mid-2025, supplied by companies capitalising on economies of scale[77]. Local governments and city police support this ecosystem through infrastructure retrofitting and enforcement.

In contrast, Kenya's private sector focuses on local assembly and adaptation rather than mass manufacturing. Companies assemble motorcycles locally from imported kits, with adaptations for Kenyan conditions including reinforced suspension and higher torque for hills[79]. This approach recognises that off-the-shelf Chinese models often cannot withstand rough roads, necessitating local innovation.

India demonstrates the most diverse manufacturing ecosystem, with over 200 companies now producing E2Ws, including homegrown startups like Ola Electric and Ather Energy alongside established firms like Hero MotoCorp and Bajaj[78]. Such Financial Sector Integration

Financial stakeholders play increasingly important roles across all cases, though with different approaches. India's robust mobile banking and fintech sector facilitates microlending for e-motorcycle purchases, with companies partnering with mobile loan providers to offer instalment plans to boda-boda riders[77]. Several non-bank finance companies now focus specifically on micro-loans for E3W drivers or lease financing for fleet operators.

Kenya's financial stakeholders are beginning to facilitate e-mobility through partnerships. Companies partner with mobile loan providers to offer installment plans, while development agencies provide grants for charging infrastructure to help de-risk new technologies[79].

Rwanda's financial integration occurs primarily through international development partners and the national Green Fund, provides financial support to e-mobility projects[80], demonstrating how smaller economies can leverage international climate finance to build domestic capabilities.

7.2.3. Civil Society and Academic Contributions

Research and Pilot Implementation

[79] Kuhudzai, R. J. (2025). Electrifying Kenya's Transportation Sector — EMAK Proposes Policy Measures to Promote Electric Mobility. CleanTechnica.
[80] Changing Transport. (2024). Driving Rwanda's Green Future – Highlights from the Electric Mobility Forum. Changing Transport (GIZ).

Civil society organisations and academia contribute differently across countries but consistently play important roles in piloting solutions and providing evidence for policy development. In Kenya, development agencies like GIZ and UNEP have run pilot projects in Nairobi and Kisumu to test e-bike taxi operations and provided grants for charging infrastructure[79].

India's NGOs and think tanks conducted early pilots for E3Ws in cities, providing crucial data on what works and continuing to advise on policy through safety standards and consumer awareness campaigns. Ride-hailing and e-commerce fleet operators represent another stakeholder group driving demand, with companies like Uber, Zomato, and Amazon announcing plans to deploy tens of thousands of electric two-wheelers.

Rwanda's approach includes systematic engagement with motorcycle taxi cooperatives and driver unions, with the government working with these groups to ensure buy-in for the transition through favourable financing arrangements and involvement in swap station placement planning[80].

International Development Partners

The role of international development partners varies significantly across cases, reflecting different levels of domestic capacity and financing needs. Rwanda demonstrates the most integrated approach, with the World Bank and Global Environment Facility funding e-mobility studies and pilots, while GIZ provides technical assistance through the Rwanda E-Moto project[81]. UNDP has launched programmes to retrofit existing motorbikes to electric, highlighting a collaborative approach to inclusive transition.

Kenya's development partners focus more on de-risking technologies and providing technical expertise, with agencies helping to test new business models and providing grants for infrastructure development. Global players are also deploying technology in Kenya, with Uber's first African E2W fleet launched in Nairobi in 2023, showcasing confidence in Kenya's tech deployment. By one scenario, if high government support is sustained, Kenya could see over 1.5 million electric two-wheelers on the road by 2040, pointing to massive future impact on carbon reduction (over 3.2 $MtCO_2e$ avoided by 2040 under that scenario)[77]. This approach recognises Kenya's stronger private sector capabilities while addressing specific technical and financial gaps.

China's development partner engagement is minimal, reflecting the country's domestic financial and technical capabilities. Instead, China has become an exporter of e-mobility technology, with Chinese firms now serving as world leaders in e-bike technology, exporting to Asia and Africa.

7.3. Infrastructure and Technology Deployment

7.3.1. Charging Infrastructure Models and Deployment Strategies

China's comprehensive charging network represents the most extensive deployment globally, with thousands of dedicated charging stations and dense battery-swapping networks in major cities. Chinese cities rolled out physical infrastructure upgrades including separate e-bike lanes, dedicated traffic signals, and networks of charging and battery-swapping stations[82]. This

[81] ICLEI Africa. (2025). Accelerating the deployment of e-motos in Rwanda (Rwanda E-Moto Project) – Project Description. ICLEI – Local Governments for Sustainability, Africa
[82] Ho, T. (2025). How electric motorbikes took over China, one city at a time. VnExpress International

infrastructure integration reduced range anxiety and improved safety for e-bike users while leveraging economies of scale achievable through mass production and standardisation.

Kenya's infrastructure development contrasts markedly with China's centralised approach by emphasising private-sector innovation and targeted deployment. By 2024, battery swapping networks had been established in Nairobi by private firms, with Ampersand setting up swapping stations enabling riders to exchange batteries in under five minutes[83] and, similarly, Roam has built solar-powered charging hubs to leverage Kenya's ample solar resource for clean charging.

Despite its small size, Rwanda has established one of Africa's most advanced charging ecosystems. Ampersand has established 32 battery swapping stations around Kigali, creating a network dense enough that drivers are typically always within a few kilometres of a swap point[84]. Companies like Kabisa are installing public charging stations targeting one station every 100 kilometres on major routes, some of which are solar-powered to ensure resilience during grid outages[85].

India's infrastructure development showcases the potential for standardisation at scale across diverse conditions. By mid-2020s, India has installed more than 5,000 public charging stations dedicated to two and three-wheelers, including swap points and countless private and home chargers[86].

7.3.2. Battery Technology and Management Systems

China's market evolved from simpler lead-acid battery e-bikes to more advanced lithium-ion models, though policy has sometimes intervened to encourage safer battery technologies. The enforcement of technical standards, including anti-tampering requirements on batteries and controllers, pushed manufacturers to incorporate safety and tracking technology into their designs.

Kenya's approach emphasises technological adaptation for local conditions. Motorcycles are often locally assembled from imported kits, with adaptations for Kenyan conditions including reinforced suspension, higher torque for hills, water-resistant electronics for heavy rains and dual-battery systems for extended range [87].

India's battery technology deployment emphasises removable batteries and comprehensive swapping infrastructure. Because most E2&3Ws have relatively small battery packs (typically 1.5–3 kWh), manual battery swapping in minutes is feasible[86]. By April 2024, a start-up called Battery Smart operated over 1,000 battery swapping stations, and Sun Mobility, another provider ran about 630 swap stations across 19 cities[88].

7.3.3. Infrastructure Financing and Development Models

The financing models for infrastructure development demonstrate varied approaches to public-private partnerships and investment strategies. China's infrastructure development relied heavily on government investment and coordination, with local governments and city police enforcing

[83] Kuhudzai, R. J. (2025). Electrifying Kenya's Transportation Sector — EMAK Proposes Policy Measures to Promote Electric Mobility. CleanTechnica.
[84] Changing Transport. (2024). Driving Rwanda's Green Future – Highlights from the Electric Mobility Forum. Changing Transport (GIZ)
[85] ICLEI Africa. (2025). Accelerating the deployment of e-motos in Rwanda (Rwanda E-Moto Project). ICLEI – Local Governments for Sustainability, Africa
[86] International Energy Agency. (2025). Global EV Outlook 2025 – Regional Highlights. Paris: IEA.
[87] Atino, D. (2025). Kenyan startup Roam unveils upgraded electric motorbike. The Ouut. https://theouut.com/kenyan-startup-roam-unveils-upgraded-electric-motorbike
[88] Down To Earth. (2025). How India moves: Two-wheelers and three-wheelers are predominant modes of private passenger transport in country, South East Asia. Down To Earth. https://www.downtoearth.org.in/air/how-india-moves-in-india-and-southeast-asia-two-wheelers-and-three-wheelers-are-predominant-modes-of-private-passenger-transport

traffic rules and retrofitting infrastructure while offering incentives like scrappage payments. Infrastructure providers, often city authorities in partnership with private firms, built the extensive supporting ecosystem.

Kenya's infrastructure financing emphasises private sector leadership with selective government support and features a vibrant ecosystem of startups and firms spearheading innovation. This includes companies introducing E2&3Ws while piloting battery swapping services. Furthermore, development agencies have run pilot projects and have provided grants for charging infrastructure, helping de-risk new technologies. The "Promoting electric mobility in Kenya" project (2022–2026) under GIZ works directly with the State Department of Transport to strengthen regulatory frameworks, build institutional capacity, and support pilot applications for e-mobility, including the deployment of charging infrastructure and E2Ws in urban and rural areas[89].

The Rwanda government provides rent-free public land for charging and swapping infrastructure development, recognising that securing sites can otherwise be a hurdle for private investors[84]. Through FONERWA, the Rwanda government provides financial support to projects while private companies invest in training riders, local assembly facilities, and battery management systems.

India's infrastructure financing demonstrates the complexity of coordinated multi-level governance. State and city governments handle vehicle registration and permits, electricity tariffs for charging, and local incentives, while facilitating stakeholder coordination through EV promotion cells or task forces. The interplay between central guidelines and funding paired with state-specific incentives has been key to India's implementation success.

7.4. Implementation Outcomes and Social Inclusion Impact

7.4.1. Adoption Patterns

While China's transition was largely organic, driven by urban commuters seeking affordable alternatives to restricted petrol motorcycles, India's adoption spans both personal and commercial use, with 2W serving primarlly for urban commuting, whilst E3Ws provide livelihoods for low-income male drivers[90]. Across all cases, commercial use drives early adoption: delivery services, motorcycle taxis, and three-wheeler transport show highest uptake rates due to immediate fuel cost savings and high daily utilisation patterns.

Kenya and Rwanda prioritised commercial motorcycle taxi riders who were predominantly young men in the 20-35 age range who could immediately benefit from reduced operational costs. Kenya's Roam (an electric mobility company) partnered with 4G Capital, a licensed digital credit provider regulated by the Central Bank of Kenya. Through this partnership, the Roam Air Motorcyle (an E2W) is offered to boda boda (motorcycle taxi) riders with financing arrangements specifically tailored to their operational realities[91]. The financing model includes a low initial deposit and structured repayment plans, complemented by business support services to enhance the sustainability of vehicle ownership among motorcycle taxi operators.

[89] GIZ. (2024). Promoting electric mobility in Kenya. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. https://www.siemens-stiftung.org/en/call-for-rd-piloting-high-impact-solutions-on-the-e-mobility-transition-in-kenya/

[90] Aithal, D. (2023). India is one of the world's fastest-growing EV markets. This is why. Associated Press. https://apnews.com/article/electric-vehicles-india-boom-rickshaws-55e7ed315fc41d0ba56461386ad44a4b

[91] Roam Electric. (2025). Mastercard Foundation backs affordable e-mobility financing for women and youth entrepreneurs. Roam Electric. https://www.roam-electric.com/post/mastercard-foundation-backs-affordable-e-mobility-financing-for-women-and-youth-entrepreneurs?ref=insightev.com

7.4.2. Economic Impacts

The economic benefits of E2&3W implementation demonstrate significant potential for inclusive development, though distribution patterns vary markedly across contexts. In Rwanda, E2W taxi drivers save approximately $840 per year in fuel and maintenance costs and increasing their take-home pay by 45%[92]. Similarly, Kenya's financing pilot by Roam found that riders save about KSh 500 (≈$3.50) per day on operational costs when using E2Ws compared to petrol models, translating to roughly $1,200 annually in savings[91].

India's experience illustrates the importance of targeted financing for economic inclusion. Traditional subsidy approaches failed to reach low-income operators, necessitating innovative Battery-as-a-Service models in their policy frameworks, where drivers purchase vehicles without batteries and subscribe to battery swapping services[93]. Swapping has proven effective for high-utilization vehicles in India, as an e-rickshaw driver can make as many swaps as necessary per day to keep earning, a system far more efficient than long plug-in charging sessions. It also addresses infrastructure and power reliability challenges, as batteries can be charged at convenient rates at swap hubs. This approach reduced upfront costs while converting energy expenses into manageable operational costs.

In terms of job creation and technology transfer, China's massive domestic manufacturing created hundreds of thousands of jobs, from assembly workers to informal repair mechanics while India's PLI scheme has led to at least 50 GWh of lithium-ion cell manufacturing capacity under development domestically[64]. India's approach to technology transfer and capacity building operates has emerged with traditional auto component suppliers successfully pivoting to produce EV parts (motors, controllers, battery packaging), illustrating how an existing automotive industry can adapt to electrification.

7.4.3. Economic Inclusion

Exemplifying inclusive economic and workforce gender inclusion, India’s Ola Electric setup a factory in Tamil Nadu which is run by 10,000 women[94]. The initiative involved significant training of women who often had no prior manufacturing experience. The success of these factories can be showcased to encourage more economies to invest in women workforce.

Motorcycle taxi driving in Rwanda has traditionally been male-dominated, with women comprising only about 4% of the transport sector workforce as of 2019[95]. To shift this narrative, Ampersand (an E2W company), actively recruited and trained women drivers. By 2023, over 60 women had joined their fleet, marking a significant step toward challenging gender norms in the sector[96]. Through the program, female beneficiaries purchased E2Ws through 18-month-long financing plans supported by Ampersand and a UN Habitat program. Upon completing payments, beneficiaries owned their vehicles outright, turning them into micro-entrepreneurs and a part of a cooperative enable women to collectively own or lease E2Ws while benefiting from shared financial

[92] Automag Rwanda. (2025). How Rwanda is becoming a hub for electric mobility in Africa. https://automag.rw/2025/05/28/how-rwanda-is-becoming-a-hub-for-electric-mobility-in-rwanda/
[93] India Battery Swapping Policy (2022) NITI Aayog https://www.niti.gov.in/sites/default/files/2023-03/20220420_Battery_Swapping_Policy_Draft_0.pdf
[94] The Energy and Resources Institute. (2025). The E-rickshaw story: Was the advent of electric mobility in India planned? https://www.teriin.org/blog/e-rickshaw-story-was-advent-of-electric-mobility-in-India-planned
[95] Mirage News. (2025). Women drive global electric transport revolution. https://www.miragenews.com/women-drive-global-electric-transport-revolution-1418993
[96] Fintech News Kenya. (2024). The rise of electric motorcycles in Kigali as a sustainable mode of transport. https://fintechnews.co.ke/the-rise-of-electric-motorcycles-in-kigali-as-a-sustainable-mode-of-transport

risk, peer support, and targeted training. These cooperatives help overcome gender-specific barriers such as asset ownership and upfront capital requirements.

In contrast, India's (Delhi) reservation of electric auto-rickshaw permits for women demonstrates a top-down policy mechanism aimed at directly redistributing market access. Under the Delhi Electric Vehicle Policy, a certain percentage of new E3W permits are reserved to women drivers (33% in 2022[97]), with streamlined application processes and dedicated financing windows. This quota-based model explicitly acknowledges structural inequities in transport sector participation and aims to correct them through affirmative regulatory action. While Rwanda and Kenya emphasize enabling environments through support systems and financial inclusion, India's strategy highlights how legal instruments can be used to secure economic entry points for marginalized groups.

7.4.4. Social Inclusion Barriers and Successes

Social inclusion faced consistent barriers across all countries, primarily driven by cultural and infrastructural factors:

- In **China**, while widespread adoption significantly improved mobility for women, lingering safety and stigma around low-status perceptions remain challenges[98].
- **Kenya's** cultural barriers to women entering boda boda driving have begun shifting with women-focused training programs, though safety concerns persist[99].
- **Rwanda** overcame initial gender barriers by actively promoting women drivers through cooperative models and targeted support[100].
- In **India**, deep-rooted cultural norms restricted women's participation in transport jobs, but progressive policies and visible successes have started shifting societal attitudes[101].

Infrastructure constraints also create geographic and social exclusion patterns. Kenya's urban-centric charging infrastructure limits rural adoption, as rural and peri-urban areas often lack reliable electricity or any charging/swapping stations for batteries. Similarly, India's limited rural electrification has been reoprted to constrain E3W deployment outside cities. Rwanda's compact geography enables more comprehensive coverage, but battery swap networks require careful placement to serve all operators equitably.

Safety also emerges from the case studies as a critical inclusion challenge requiring proactive management. China's experience with rising e-bike accidents led to mandatory helmet laws and registration requirements[102], while India's battery fire incidents in 2022 prompted stricter safety standards[103]. These incidents disproportionately affected low-income users purchasing cheaper, sub-standard models. In fact, sub-standard models sold in India's grey market, often exploiting

[97] TRF Context. (2021). Move over: The women steering India's electric vehicle drive. https://www.context.news/socioeconomic-inclusion/long-read/move-over-the-women-steering-indias-electric-vehicle-drive
[98] Institute for Transportation and Development Policy. (2023). Women on Wheels: Gender and Cycling in Chinese Cities. https://itdp.org/publication/women-on-wheels-gender-and-cycling-chinese-cities/
[99] UNITAR. (2024). Green Mobility and Youth Employment. https://unitar.org/sustainable-development-goals/peace/our-portfolio/green-mobility-and-youth-employment
[100] Africa Digest News. (2025). The Rise of Electric Motorcycles in Kigali as a Sustainable Mode of Transport. https://fintechnews.co.ke/the-rise-of-electric-motorcycles-in-kigali-as-a-sustainable-mode-of-transport/
[101] Context by Thomson Reuters Foundation. (2025). Move Over: The Women Steering India's Electric Vehicle Drive. https://www.context.news/socioeconomic-inclusion/long-read/move-over-the-women-steering-indias-electric-vehicle-drive
[102] World Health Organization. (2025). Protecting Chinese e-bike users from road injuries and deaths. WHO. who.int
[103] Elumalai, D. (2024). Ensuring EV safety: The role of battery certification and India's new regulations. Sify. sify.com

regulatory loopholes, have been found to use recycled lithium-ion cells and lack essential battery management systems, heightening fire risks among low-income buyers[104].

7.5. Gap Analysis

7.5.1. Policy Readiness [cross-ref: 7.1]

This assessment evaluates Ghana's current policy framework against proven international models ***(Section 7.1****) to identify critical policy gaps and prioritize intervention opportunities. The analysis employs a comparative synthesis approach, examining Ghana's policy landscape against the spectrum of regulatory approaches, enabling identification of policy options most suitable to Ghana's institutional capacity and economic context.*

Policy Landscape

Ghana's National Electric Vehicle Policy (2023) does not have specific objectives or strategies for electric two- and three-wheelers, representing a significant gap compared to all case study countries. While India's NEMMP and Rwanda's comprehensive framework explicitly target 2&3Ws, Ghana's policy framework remains oriented only toward four-wheeled vehicles.

The absence of clear regulatory status for motorcycle taxis creates additional complexity. Unlike India's proactive integration of e-rickshaws through legal recognition in 2015, Ghana's motorcycle taxis remain in legal ambiguity. This also contrasts sharply with Rwanda's supportive regulations fnd Kenya's emerging framework for commercial E2Ws.

Fiscal Policy Architecture

Ghana's current fiscal structure needs the targeted incentives demonstrated across successful cases studies. Kenya's elimination of import duty and VAT on electric vehicles provides a direct model for Ghana, given similar economic contexts and import-dependent markets. Rwanda's comprehensive zero-tax regime (import duty, VAT, excise duty) also presents a more aggressive approach that could accelerate market entry. This need was strongly reinforced by private sector stakeholders during the project's inception meeting, who emphasized that high energy costs and steep import tariffs are significant barriers to e-mobility uptake, underscoring the urgency of fiscal reforms to make electric two- and three-wheelers financially viable.

Unlike India's manufacturing-linked incentives or China's regulatory mandates, Ghana could adopt Kenya's fiscal-first approach given limited domestic manufacturing capacity. The case studies demonstrate **that fiscal incentives must precede comprehensive regulatory frameworks in import-dependent markets**.

Institutional Capacity to Inform Policy

Ghana's e-mobility transition is progressing within a more fragmented institutional landscape compared to countries like India, Kenya, and Rwanda. While India benefits from strong central-state coordination and Rwanda has demonstrated high-level political commitment through a centralized development structure, Ghana's transport and energy policies often operate in silos, limiting strategic alignment.

[104] Times of India (2025). Unregistered electric scooters flood the streets in Chennai, raise fire and insurance risks. The Times of India. timesofindia.indiatimes.com

Similarly, whereas Kenya has fostered a unified private sector voice through associations like EMAK, Ghana's private sector engagement remains dispersed. This unified voice in Kenya has enabled coordinated industry input into policy design, streamlined communication with government, and collective advocacy for incentives and standards in response to direct industry needs, helping to align public and private priorities and accelerate sector-wide progress.

7.5.2. Stakeholder Ecosystem Analysis [cross-ref: 7.2]

*This assessment evaluates Ghana's stakeholder ecosystem capacity against proven coordination models from China, Kenya, Rwanda, and India (**Section 7.2**). The analysis examines institutional readiness, private sector capabilities, and coordination mechanisms to identify capacity gaps and development priorities.*

Government Stakeholder Readiness

Ghana's government stakeholder landscape shows mixed readiness for coordinating e-mobility transition. The recent creation of the Ministry of Energy and Green Transition and the Ministry of State for Climate Change and Sustainability demonstrates high-level political commitment to energy transition integration. However, as noted in the project's political economy analysis (insert cross reference to PR1), key sector agencies are still seeing significant changes following the January 2025 government transition, which affects institutional memory and coordination capacity.

The Ministry of Transport's early priority focus on developing legislation to formalise commercial E2&3W indicates recognition of the regulatory gaps that have hindered adoption in other contexts. This proactive approach contrasts positively with South Africa's policy inertia, where lack of proactive incentives can stall adoption (see Appendix C for detailed South Africa case study).

While Ghana established an inter-ministerial committee to draft its Energy Transition Plan[105], there is limited evidence that this platform has been leveraged to systematically coordinate e-mobility efforts across ministries. In contrast, Rwanda demonstrates a more integrated model, with its Ministry of Infrastructure (MININFRA) and agencies like the Rwanda Utilities Regulatory Authority (RURA) actively collaborating with development partners to refine and implement standards on vehicle performance, safety, and battery recycling. This institutional alignment has enabled more coherent and adaptive policy development in support of electric mobility.

Despite the structural foundations in place, Ghana's government engagement on e-mobility lacks operational coherence, transparency, and strategic financing alignment. There is currently no publicly accessible dashboard or monitoring tool to track progress on the Energy Transition Framework or NDCs, limiting stakeholder visibility and accountability. CSOs, including those with limited resources, have had to self-fund their participation in ongoing consultations for the NDC review. This underlines a broader issue: meaningful multi-stakeholder engagement is not yet institutionalised, and government commitment to ensuring inclusive, transparent policy processes is still insufficient.To strengthen leadership and impact, specific institutional roles must be clarified and reinforced.

Private Sector Ecosystem Assessment

The inception phase identified emerging players including Solar Taxi, Wahu Mobility, and Charge Express, alongside traditional importers like Apsonic Moto. However, this ecosystem falls short the

[105] https://mesti.gov.gh/inter-ministerial-committee-ghanas-energy-transition-plan/

scale and diversity found in Kenya's vibrant startup environment or India's 200+ electric two-wheeler manufacturers[106].

Unlike Rwanda's systematic engagement with driver unions to ensure transition buy-in, Ghana has not yet developed structured engagement mechanisms with commercial operators who could drive adoption through fleet electrification.

Furthermore financial sector engagement remains limited, contrasting sharply with India's robust microlending ecosystem and Kenya's emerging fintech partnerships for e-mobility financing. Ghana's financial institutions have not yet developed EV-specific loan products or leasing mechanisms that proved crucial in other contexts for overcoming affordability barriers.

7.5.3. Infrastructure Gap Analysis [cross-ref: 7.3]

*This assessment evaluates Ghana's infrastructure readiness against international best practices through comparative analysis (**Section 7.3**) of deployment models, technological integration, and capacity requirements. The analysis identifies critical infrastructure gaps and prioritises intervention areas based on feasibility and impact potential.*

Ghana needs dedicated charging infrastructure for electric two and three-wheelers, with no established battery swapping networks or standardised charging protocols. Unlike Kenya's targeted private-sector approach or Rwanda's coordinated public-private model, Ghana has no clear infrastructure development strategy or institutional framework for e-mobility deployment.

Grid integration capabilities require immediate attention, particularly given the lessons from Kenya's renewable energy integration and India's systematic power management approaches. Ghana's electricity distribution challenges, including reliability issues in certain regions, contrast unfavourably with Rwanda's proactive grid planning and solar backup integration.

Local assembly and maintenance capabilities represent another significant gap. While India demonstrates successful automotive industry adaptation and Kenya shows innovative local modifications, Ghana currently has limited technical capacity and inadequate policy framework to support local e-vehicle assembly or comprehensive maintenance networks. The absence of technical training programmes specific to electric vehicle technology further compounds this capacity deficit.

The regulatory framework for infrastructure standards remains underdeveloped compared to international best practices. China's comprehensive technical standards and India's iterative safety regulation updates contrast sharply with Ghana's limited regulatory provisions for general electric vehicle and specific E2&3W infrastructure, safety protocols, or interoperability standards.

7.5.4. Implementation Pathway and Social Inclusion Assessment [cross-ref: 7.4]

*This assessment evaluates Ghana's implementation readiness against international best practices through analysis of adoption patterns, social inclusion outcomes, and implementation challenges (**Section 7.4**). The evaluation prioritizes interventions based on social equity impact and feasibility within Ghana's institutional and economic context.*

Ghana's current position reflects characteristics of pre-implementation phase evident in Kenya's early experience, with informal transport operators representing the primary target beneficiary group but lacking supportive policy frameworks demonstrated in Rwanda and India. Unlike

[106] Mishra, V. (2025). How India moves: Two-wheelers and three-wheelers lead the EV surge. Down To Earth.

successful cases where government leadership drove market creation, Ghana's fragmented institutional landscape constrains coordinated implementation.

Unlike China or India, where large-scale deployment of E2&3Ws has been actively shaped by either market forces or centralized state mandates, Ghana will benefit from a streamlined adoption pathway or scaled pilot programs. While small numbers of e-mobility startups exist (e.g. SolarTaxi, Kofa), their reach remains limited, and uptake is slow. In contrast, Rwanda and Kenya have leveraged their motorcycle taxi economies to foster rapid uptake through coordinated public-private pilots. Ghana lacks a comparable national framework roadmap specific to E2&3Ws for targeting high-use informal transport modes as early adoption nodes.

For both African case studies, efforts to drive economic impacts focus primarily on driver's income improvements rather than industrial employment, reflecting different economic priorities. **This must however not be overlooked in the Ghanaian context because industrial linkages are are central to the country's broader job creation strategy, localisation agenda, and long-standing ambitions to grow domestic automotive assembly.** The Project's Working Paper on Local Manufacturing and & Assembling Potential (D4) will identify the specific industrial pathways and employment linkages across assembly, components, and servicing that must be strengthened to align E2&3W-mobility with Ghana's job creation, localisation, and skills development objectives.

In addition, Ghana currently lacks affirmative policies or financing mechanisms that lower access barriers for marginalised groups, such as flexible credit, permit reservation, or cooperative-led ownership schemes. Cultural barriers to women and persons with disabilities in transport are present in Ghana (see GESI analysis in **Section 3.6)** but remain unaddressed in e-mobility planning. Compared to Rwanda's women-led cooperatives and India's women-only permit schemes, Ghana lacks both the institutional structures and policy instruments to address deep-seated gendered exclusions.

7.6. Comparative Assessment Matrices

This section employs a hybrid analytical framework combining **PESTEL analysis** for external environmental factors, **multi-criteria ranking matrices** for systematic performance assessment, and **strategic positioning analysis** to provide comprehensive comparative assessment. This three-tier approach bridges the dimensional analysis (**Sections 7.1-7.4**) with the gap analysis (**Section 7.5**) by systematically evaluating each country's E2&3W ecosystem performance and identifying strategic positioning opportunities for Ghana.

7.6.1. PESTEL-Based Environmental Assessment Matrix

This matrix evaluates the macro-level political, economic, social, technological, environmental, and legal conditions that enable or constrain E2&3W adoption in each case study country. The assessment outlines systemic factors beyond direct policy control that shape implementation feasibility and reveals Ghana's external environment challenges, particularly in legal frameworks and technological infrastructure, while highlighting strong environmental drivers for adoption.

Table 1: PESTEL-Based Environmental Assessment Matrix

Ghana	India	Kenya	Rwanda	China

Political	• Recent ministerial restructuring creates uncertainty • High-level commitment through green transition ministries • Fragmented inter-agency coordination	• Strong multi-level governance framework • Central-state policy coordination • Political consensus on E2&3W priorities	• Government responsive to private sector innovation • Emerging policy framework development • Regional leadership aspirations	• Centralised high-level political commitment • Presidential championing of green mobility • Rapid policy implementation capacity	• Strong centralised policy control • Local government enforcement alignment • Long-term strategic planning capability
Economic	• Import-dependent market structure • Limited local manufacturing base • Fiscal constraints affecting incentives	• Large domestic manufacturing capacity • Multi-tier market serving all income levels • Robust financing ecosystem	• Private sector-led innovation • Import-dependent with local assembly • Emerging fintech integration	• Development partner funding support • Coordinated public-private investment • Small market with focused interventions	• Massive scale economies • Industrial policy integration • Export-oriented production
Social	• Cultural barriers to women's participation • High youth unemployment in transport sector • Limited public awareness of E2&3W benefits	• Social acceptance of diverse transport modes Strong informal sector integration Gender initiatives in transport	• Entrepreneurial culture Technology adoption readiness Youth-driven innovation	• Community-based cooperative models Women's participation programmes High social cohesion	• Rapid social adaptation to technology Urban lifestyle integration Mass behavioural change capability
Technological	• Grid reliability challenges in some regions • Limited technical capacity for EV maintenance • No standardised charging protocols	• Advanced battery swapping technology • Local adaptation and innovation • Technical standards development	• Local assembly with imported components • Solar integration innovations • Mobile payment integration	• Technology transfer partnerships • Solar-powered infrastructure • Maintenance network development	• World-leading battery and motor technology Comprehensive charging networks Advanced vehicle management systems
Environmental	• High transport emissions (38% of total CO_2) • Urban air quality challenges • Climate commitments driving policy	• Severe urban air pollution • Strong environmental policy drivers • Co-benefits of E2&3W adoption	• Renewable energy integration opportunity • Environmental awareness growing • Climate finance availability	• Strong environmental commitments • Renewable energy integration • Carbon-neutral development goals	• Air pollution crisis driving adoption • Regulatory bans on ICE vehicles • Environmental benefits realised

Legal	• Motorcycle taxi legal ambiguity • Limited E2&3W-specific regulations • Outdated road traffic laws	• Legal recognition of E3Ws • Comprehensive EV regulations • Iterative legal framework updates	• Tax incentives for electric vehicles • Emerging regulatory framework • Pilot-friendly legal environment	• Comprehensive fiscal incentives • Zero-tax regime for EVs • Supportive legal framework	• City-level ICE vehicle bans • Mandatory technical standards • Comprehensive regulatory system

7.6.2. Strategic Positioning and Transferability Matrix

This matrix categorises successful interventions from case study countries according to their implementation feasibility for Ghana, distinguishing between policies directly transferable with minimal adaptation, those requiring contextual modification, and opportunities for Ghana-specific innovation.

Table 2: Strategic Positioning and Transferability Matrix

Strategic Element	Direct Transfer Potential	Adaptive Transfer Requirements	Innovation Opportunities
Fiscal Incentives	**Kenya Model:** VAT/import duty exemptions directly applicable given similar import-dependent markets	**Rwanda Model:** Comprehensive zero-tax regime requires fiscal space assessment and implementation capacity	**Ghana Innovation:** Graduated incentive system linking benefits to local assembly and employment creation
Policy Sequencing	**Kenya Sequence:** Fiscal-first approach suitable for Ghana's current institutional capacity	**India Model:** Manufacturing incentives require automotive industry development strategy adaptation	**Ghana Pathway:** Public-private pilot programmes in Greater Accra and Ashanti regions before national rollout
Stakeholder Coordination	**Kenya's EMAK Model:** Industry association structure transferable with government convening role	**Rwanda's FONERWA:** Green fund model requires institutional development and donor coordination	**Ghana GEMSA:** Government-convened alliance leveraging existing energy transition platforms
Infrastructure Development	**Rwanda's Land Provision:** Rent-free public land policy directly applicable to Ghana's context	**China's Comprehensive Networks:** Requires massive public investment and urban planning integration	**Ghana Solar Integration:** Solar-powered charging hubs leveraging Ghana's renewable energy potential
Legal Framework	**India's E-rickshaw Recognition:** Legal pathway for commercial E2&3W directly transferable	**China's Vehicle Bans:** Require strong enforcement capacity and alternative transport provision	**Ghana Graduated Approach:** E2&3W pilot zones in major cities before nationwide implementation
Manufacturing Strategy	**Kenya's Local Assembly:** Import kit assembly model suitable for Ghana's current industrial capacity	**India's PLI Scheme:** Requires comprehensive automotive industrial policy development	**Ghana Assembly Hubs:** Integration with existing automotive policy and ECOWAS market access
Social Inclusion	**Rwanda's Cooperatives:** Women's cooperative models adaptable to Ghana's social structures	**India's Quota Systems:** Permit reservation requires formal sector integration and monitoring	**Ghana GESI Framework:** Gender-responsive financing through existing microfinance institutions

8. RECOMMENDATIONS

8.1. Policy Framework Development

8.1.1. Policy Sequencing

The comparative analysis underscores that while fiscal incentives have been powerful catalysts in countries like India and Kenya, their design and timing must reflect each country's **economic capacity and industrial structure.** In India, fiscal incentives were deliberately structured to reinforce an already strong domestic manufacturing base and robust fiscal space—conditions that Ghana does not yet fully share. Ghana should therefore adopt a **phased and context-sensitive approach**, combining targeted fiscal incentives with gradual regulatory development and capacity building.

Kenya's sequence of introducing modest fiscal measures alongside pilot programs before expanding to comprehensive regulations presents a more feasible pathway. Rwanda's integrated approach remains aspirational but requires institutional and budgetary strength that Ghana must build progressively. The key policy lessons across all cases are:

- **Alignment with economic context and fiscal space** to avoid unsustainable incentive commitments.
- **Clear targets and accountability mechanisms** rather than rigid timelines.
- **Well-coordinated fiscal measures** that prioritise affordability for end users and stimulate demand.
- **Strong stakeholder engagement platforms** to sustain cross-sector coordination.
- **Integration with national transport, energy, and climate policies** to ensure coherence and long-term stability.

8.1.2. Priority Policy Actions

To operationalise these lessons, Ghana should adopt **a phased implementation approach** rather than fixed timelines. The following strategic priorities are recommended:

- **Establish a legal and regulatory framework** recognising E2&3Ws as commercial transport modes, drawing from Kenya's and India's formalisation of boda-boda and e-rickshaw operations.
- **Design targeted, fiscally sustainable incentives**, for instance, selective VAT or import duty reductions focused on electric motorcycles, batteries, and charging components, while conducting fiscal impact assessments to ensure budgetary prudence.
- **Launch pilot programmes** in collaboration with private operators and municipalities to test charging, battery-swapping, and financing models before nationwide scaling.
- **Create a multi-stakeholder coordination platform**, modelled on Kenya's E-Mobility Association (EMAK), to harmonise actions across government, industry, financial institutions, and civil society.
- **Develop an integrated E2&3W policy framework** that situates e-mobility within broader transport decarbonisation and industrial strategies, progressively introducing standards for batteries, charging, and vehicle safety as institutional capacity grows.

- **Explore regional cooperation under ECOWAS and AfCFTA** to benefit from collective procurement, shared standards, and potential manufacturing synergies.

8.2. Stakeholder Coordination and Capacity Development

8.2.1. Multi-Stakeholder Platform Development

Ghana should establish an inter-ministerial coordination committee that will operate under the Ministry of State for Climate Change and Sustainability, ensuring high-level political oversight while coordinating across sectoral ministries.

The coordination mechanism should include scheduled inter-ministerial meetings with standardized agenda, stakeholder forums including private sector and civil society, strategic planning sessions with development partner participation and technical working groups on specific issues (regulations, infrastructure, financing).

8.2.2. Private Sector Ecosystem Development

Ghana must catalyze its startup ecosystem by establishing regulatory sandboxes and targeted support mechanisms that reduce barriers to entry for new ventures. Drawing from Kenya's approach, this could include business incubation, seed funding, technical assistance for local assembly and servicing, and preferential regulatory treatment for pilot projects. These measures would stimulate local innovation and build domestic supply chain capacity in the sector.

8.2.3. Financial Stakeholder Integration Strategy

To unlock E2&3W-mobility at scale, Ghana must design financial instruments tailored to the unique needs of the sector. This includes working with banks, non-bank financial institutions, and insurance providers to create dedicated financing products for E2&3W. Priority innovations should include microcredit offerings for motorcycle taxi operators, battery-leasing and "battery-as-a-service" models, fleet financing for commercial service providers, and insurance packages adapted to the operational profile of E2&3Ws.

At the institutional level, Ghana should initiate a coordinated development finance strategy that aligns donor efforts under a shared vision for E2&3W with a harmonized structure for donor coordination, funding alignment, technical assistance, and monitoring to prevent institutional duplication, optimize impact, and accelerate project delivery across the sector.

8.2.4. End-User Stakeholder Organization

Commercial Operator Engagement Strategy

Successful transition to E2&3Ws requires intentional engagement with end users, particularly informal commercial operators. Ghana can draw lessons from Rwanda's cooperative-based engagement model while adapting it to suit its more fragmented informal sector. A coherent strategy should include structured dialogue with operator groups, piloting electric vehicle deployments in willing communities, and delivering targeted training on EV operation and maintenance. Additionally, financial inclusion support, such as simplified credit access and digital payment integration, will be critical to reducing adoption barriers for these low-income user groups.

8.3. Strategic Infrastructure Development Framework

Ghana's infrastructure development for E2&3W electrification will require a phased, adaptive approach that evolves in response to real-world performance, technological advancements, and market feedback. Successful implementation will depend on several critical enablers, including clear institutional coordination, sustainable financing mechanisms, reliable grid infrastructure, strong private sector participation, and alignment with national energy and transport planning objectives. The approach must also account for equity in access, ensuring that infrastructure rollout supports inclusive adoption across geographic and socioeconomic groups.

Specific and context-responsive infrastructure recommendations will be developed based on the detailed findings of the forthcoming **D4 – Electrification Constraints Working Paper**, which will examines Ghana's electrical grid capacity and reliability to support increased charging demand, evaluate existing charging infrastructure and identifies optimal locations for expansion. The assessment includes technical analysis of power distribution networks and their ability to accommodate electric vehicle charging loads without compromising grid stability.

However, from the comparative analysis done in this study, evidence suggests that integration of E2&3W assembly within Ghana's existing Automotive Development Policy framework while positioning for ECOWAS market access under AfCFTA provisions will present an early mover advantage in establishing certified assembly capacity. This could position Ghana as West Africa's E2&3W manufacturing hub, creating employment while reducing import costs across the subregion. By establishing assembly hubs that serve the 15-member ECOWAS market (population 400+ million), Ghana can achieve economies of scale unavailable in its domestic market alone. This requires coordination with ECOWAS transport and energy frameworks to harmonize technical standards, facilitate cross-border movement of components, and develop regional supply chains.

8.4. Targeted Inclusion Interventions

Gender Integration Strategy: Establish quota systems for women in initial pilot programs while creating women-only technical training pathways in partnership with existing vocational institutions. Draw from China's observation that appropriate technology characteristics enable organic gender inclusion when supported by accessible design and safety infrastructure.

Youth Employment Framework: Implement technical skills development within Ghana's existing TVET system, while creating apprenticeship programs linking youth with e-mobility service networks. Establish innovation hubs encouraging youth-led solutions for Ghana-specific challenges such as rural charging infrastructure, learning from China's organic delivery economy growth.

Rural and Peri-Urban Integration: Implement a rural E3W model for agricultural transport while establishing solar-powered battery swap kiosks in market centers. Models could further target women farmers' cooperatives for E3W programs supporting produce transportation, addressing both mobility and economic empowerment objectives.

Public education campaigns must highlight diverse use cases of 2&3Ws for vulnerable groups, drawing on international examples including women coffee and vegetable sellers using them as delivery carts in Mali, and elderly and disabled persons across the world using accessible three-wheelers with appropriate lane infrastructure as mobility assistance devices.

Financial Inclusion Support: Leveraging existing microfinance infrastructure will be critical to reducing adoption barriers for low-income user groups. Ghana should leverage its established microfinance institutions and rural bank networks which have proven track records in serving

informal sector operators and women entrepreneurs to deliver gender-responsive E2&3W financing. This approach builds on Rwanda's cooperative model while utilizing Ghana's stronger microfinance sector penetration. Specific mechanisms should include:

- E2&3W-specific loan products through rural and community banks with preferential terms for women and youth.
- Partnership between E2&3W suppliers and microfinance institutions for embedded financing at point of purchase.
- Mobile money integration for battery-as-a-service subscription.
- Savings-based acquisition schemes through women's groups/cooperatives and trade associations.

9. CONCLUSION

9.1. Summary of Key Findings

Ghana stands at a critical juncture in its transport sector transformation. Transport emissions constitute 61.5% of energy-related CO_2 and 38% of total national emissions, positioning the sector as both a primary climate challenge and an opportunity for meaningful intervention[2]. Electric two- and three-wheelers offer a strategic entry point for decarbonization given their affordability, compatibility with Ghana's transport patterns, and potential for rapid deployment.

The research establishes that 2&3Ws perform essential economic functions across Ghana's mobility ecosystem. They provide last-mile connectivity in urban and peri-urban areas, support informal trade and micro-commerce, enable youth employment, and deliver affordable transport for low-income populations. In Kumasi alone, cargo tricycles move GH₵693 million worth of goods annually whilst supporting nearly 3,000 direct jobs[13]. Daily earnings for operators significantly exceed minimum wage levels, demonstrating the sector's livelihood potential.

Current adoption remains nascent. Registered E2Ws grew from 815 units in 2019 to 1,834 in 2024, whilst E3Ws emerged from negligible presence to 247 units over the same period. This 155% growth trajectory, though representing only 1.96% market penetration, signals emerging consumer acceptance and market readiness. Geographical distribution patterns reveal concentrated demand in Greater Accra and Ashanti Regions (40% of registrations), alongside significant uptake in Northern regions where motorcycles and tricycles constitute up to 98% of registered vehicles in some areas[10].

Ghana possesses foundational policy architecture through the National Electric Mobility Policy (2023), National Electric Mobility Roadmap, Energy Transition Framework (2022-2070), and Energy Transition Investment Plan projecting USD 110 billion in cumulative e-mobility investment by 2060. However, substantial gaps undermine implementation effectiveness. E2&3Ws remain absent from explicit policy objectives within major frameworks. The Revised National Transport Policy (2020) and Ghana Automotive Development Policy (2019) overlook light electric mobility segments. Commercial motorcycle operations persist in legal ambiguity, with existing bans failing to distinguish between conventional and electric variants.

9.2. Comparative Insights and Strategic Lessons

International experience demonstrates diverse pathways to E2&3W adoption tailored to specific institutional capacities and economic contexts. India's multi-level governance model combining central policy guidance with state-level implementation flexibility offers lessons in coordinating large-scale transitions across diverse geographies.

China's transformative scale, resulted from regulatory mandates rather than fiscal incentives alone, demonstrating how coordinated local government enforcement coupled with favorable vehicle classification (E2Ws as non-motorized vehicles) can accelerate adoption.

Rwanda exemplifies how comprehensive fiscal reform combined with high-level political commitment can drive rapid transition in resource-constrained contexts. Zero import duty, zero VAT, and no excise duty on fully electric vehicles, coupled with industrial electricity tariffs for EV charging and rent-free public land provision for infrastructure development, created highly enabling conditions.

Kenya highlights the potential of private sector-led innovation supported by emerging government facilitation. The formation of EMAK unified industry stakeholders, enabling coordinated policy advocacy that contributed to recent VAT and import duty exemptions. Kenya's approach recognizes that where state fiscal and enforcement capacity is limited, creating enabling conditions through cost reduction and regulatory flexibility may prove more effective than heavy mandates.

9.3. Critical Gaps Requiring Urgent Attention

Policy and Regulatory Frameworks: The absence of E2&3W-specific provisions within major policy instruments creates fundamental uncertainty for investors and operators. Commercial motorcycle operations remain in legal ambiguity, undermining formalization efforts. Road Traffic Regulations (L.I. 2180) require updating to explicitly recognize and differentiate electric variants. Customs classifications need standardization to prevent arbitrary tax assessments.

Fiscal Architecture: Import duties plus VAT, GETFund and NHIL levies erode E2&3W price competitiveness compared to conventional alternatives. This contrasts sharply with Kenya's elimination of import duty and VAT on EVs and Rwanda's comprehensive zero-tax regime. Ghana requires targeted, fiscally sustainable incentives that prioritize affordability for end users whilst supporting market development.

Institutional Coordination: Inter-ministerial coordination remains fragmented despite creation of the Ministry of Energy and Green Transition and Ministry of State for Climate Change and Sustainability. No systematic multi-stakeholder platform comparable to Kenya's EMAK or India's state-level EV promotion cells coordinates government, private sector, and civil society actions. The absence of publicly accessible monitoring dashboards tracking Energy Transition Framework and NDC implementation limits transparency and accountability.

Stakeholder Ecosystem Development: Private sector engagement remains dispersed, lacking the scale and diversity of Kenya's vibrant startup environment or India's large manufacturer ecosystems. Financial sector integration is minimal, with no EV-specific loan products, battery-leasing mechanisms, or insurance packages tailored to E2&3W operations. Commercial operator organizations require structured engagement mechanisms to ensure transition buy-in and benefit distribution.

Infrastructure and Technical Capacity: Ghana possesses no dedicated E2&3W charging infrastructure, established battery swapping networks, or standardized charging protocols. Grid reliability challenges in certain regions compound deployment constraints. Local assembly and maintenance capabilities remain undeveloped, with limited technical capacity and no structured training programmes or certification pathways for EV mechanics. The Ghana Standards Authority has yet to develop safety, performance, and environmental standards specific to light electric vehicles.

Social Inclusion Mechanisms: Cultural barriers to women's participation in transport, particularly in southern Ghana, remain unaddressed by policy. No affirmative mechanisms comparable to India's permit quotas or Rwanda's cooperative models exist. Youth unemployment in the transport sector receives insufficient policy attention despite representing a primary demographic. Rural and peri-urban areas face exclusion from emerging e-mobility opportunities due to infrastructure concentration in Greater Accra.

9.4. Opportunities and Strategic Positioning

Ghana's E2&3W transition presents significant opportunities extending beyond emissions reduction. The sector can generate substantial formal employment through local assembly, component manufacturing, and maintenance networks. Integration with Ghana's Automotive Development Policy and positioning for ECOWAS market access under AfCFTA provisions could establish Ghana as West Africa's E2&3W manufacturing hub, serving a 15-member ECOWAS market of over 400 million people.

Renewable energy integration offers pathways to reduce energy costs and improve reliability. Solar-powered charging hubs in peri-urban and rural areas align with decentralized energy access strategies whilst addressing grid constraints. Battery-as-a-Service models can overcome affordability barriers for low-income operators by converting upfront capital requirements into manageable operational expenses.

Women's economic empowerment through targeted interventions, drawing from Rwanda's cooperative models and India's permit reservation schemes, can address persistent gender disparities in transport sector participation. Youth employment programmes linking technical training with guaranteed placement in e-mobility value chains offer pathways to formalize informal transport work whilst building critical technical capacity.

9.5. Implementation Imperatives

Translating Ghana's E2&3W potential into scaled adoption requires coordinated action across multiple dimensions. Policy development must progress beyond strategic intent to operational frameworks with clear timelines, responsibilities, and resource allocations. E2&3Ws require explicit integration into the National Electric Mobility Policy, Revised National Transport Policy, and Ghana Automotive Development Policy with vehicle-specific targets and implementation mechanisms.

Fiscal reform should prioritize affordability through targeted VAT and import duty reductions on E2&3Ws, batteries, and charging components. Measures must be fiscally sustainable, potentially phasing incentives based on market development milestones. Legal recognition of commercial E2&3W operations requires urgent resolution, drawing from India's e-rickshaw legalization pathway whilst establishing appropriate safety and operational standards.

Institutional coordination demands establishment of a dedicated multi-stakeholder platform modelled on Kenya's EMAK structure, operating under high-level government convening authority. The platform should incorporate government ministries and agencies, private sector manufacturers and service providers, financial institutions, civil society organizations, and end-user representatives including commercial operator associations. Regular coordination meetings, transparent information sharing, and collaborative problem-solving mechanisms are essential.

Infrastructure development must adopt phased, adaptive approaches responsive to market evolution and technological advancement. Pilot programmes in Greater Accra and Ashanti Regions can test charging models, battery swapping viability, and operational frameworks before nationwide scaling. Public-private partnerships leveraging private sector innovation with targeted government support can accelerate deployment whilst managing fiscal constraints. Integration with renewable energy strategies, particularly solar charging hubs, offers opportunities to improve cost-competitiveness and rural accessibility.

Social inclusion requires deliberate, resourced interventions rather than assumption that market forces will deliver equitable outcomes. Gender-responsive financing through microfinance institutions and rural banks, women-only technical training pathways, permit reservation or preferential licensing for women and youth, and support for women-led cooperatives can address structural barriers. Accessibility provisions for persons with disabilities should be embedded in vehicle and infrastructure design standards from inception rather than retrofitted.

9.6. Conclusion

Ghana's E2&3W transition represents more than a technological shift. It is an opportunity to reshape transport sector participation, formalize informal employment, advance gender equality, and demonstrate climate leadership whilst supporting economic development. The sector's current informality, whilst presenting regulatory challenges, also offers flexibility for innovative policy design unconstrained by entrenched interests.

Success depends on coordinated action across government, private sector, financial institutions, civil society, and international development partners. The comparative analysis demonstrates that no single pathway suits all contexts. Ghana must adapt international best practices to its specific institutional capacity, fiscal constraints, political economy dynamics, and socio-cultural contexts whilst leveraging regional cooperation opportunities and international climate finance.

The research establishes a comprehensive evidence base for informed decision-making. Subsequent working papers examining local manufacturing potential, infrastructure requirements, socio-economic impacts, and implementation pathways will provide additional granular analysis supporting strategic planning and investment decisions. Stakeholder validation processes ensure that recommendations reflect practical implementation considerations and diverse perspectives.

Ghana possesses the policy foundations, institutional capacity, market signals, and political will to advance its E2&3W transition. What is required now is coordinated action translating strategic intent into operational reality, guided by evidence, inclusive of marginalized groups, and responsive to emerging opportunities and challenges. The decisions made in the coming years will determine whether Ghana realizes the transformative potential of electric two- and three-wheeler mobility or allows opportunity to pass whilst other countries establish competitive advantages in this critical sector.