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Kenya's E-mobility Training Needs and Skills Gap Survey Report

Assessment of the training needs and skills for acceleration of e-mobility transition in Kenya.

Implemented by

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Project Background

Electric mobility has been prioritized as a key mitigation action in Kenya. This technology is, however, still relatively new, translating to limited experience with it. On this basis therefore, technical expertise and technicians to address assembly as well as operations and maintenance is limited. The regulatory environment is aligned with the deployment of internal combustion engine vehicles.

The Federal Ministry of Economic Cooperation and Development (BMZ) commissioned the 'Promotion of electromobility in Kenya' project to strengthen competencies and capacities for an enabling framework and market development for enhanced electric mobility uptake. The project seeks to address inadequacies in the systematic introduction of climate-friendly electric mobility applications and the lack of necessary capacities for key players in the sector.

This will be achieved through 4 components:

1. developing strategies, standards and regulations,
2. training, knowledge sharing and stakeholder coordination,
3. support for pilot applications and dissemination of Electric mobility activities and
4. supporting the introduction of electric buses in the Bus Rapid Transport system project.

This study focuses on pillar two of the project.

About Changing Transport

We enable the rapid development of zero emissions transport systems to shape a liveable and just future. GIZ works on changing transport towards a sustainable pathway and facilitating climate actions in mobility. We support decision-makers in emerging and developing countries through training and consulting services, as well as by connecting stakeholders. Our ultimate goal is zero-emission transport. You can learn more about our projects on www.changing-transport.org.

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Abbreviations and Acronyms

AC : Alternating Current
AMT : Automotive Mechatronics Technician
ABT : Automotive Battery Technician
AUM : Automotive and Mobility
AUT : Automotive Technician
AVERC : Africa Vocational Education Researchers and Consultants
BEEM : Build on Strengths, Eliminate Weaknesses, Exploit Opportunities, Minimize Threats
BEV : Battery Electric Vehicle
BMZ : Federal Ministry for Economic Cooperation and Development (Germany)
BRT : Bus Rapid Transit
CBET : Competency-Based Education and Training
DKTI : German Climate Technology Initiative
EMAK : Electric Mobility Association of Kenya
EV : Electric Vehicle
EVSE : Electric Vehicle Supply Equipment
GHG : Greenhouse Gas
GIZ : Deutsche Gesellschaft für Internationale Zusammenarbeit
HEV : Hybrid Electric Vehicle
ICE : Internal Combustion Engine
ICT : Information and Communications Technology
IKI : International Climate Initiative
KNQA : Kenya National Qualifications Authority
KNQF : Kenya National Qualifications Framework
MC : Motorcycle Technician
MITI : Ministry of Investments, Trade and Industry
NDC : Nationally Determined Contribution
NITA : National Industrial Training Authority
NMT : Non-Motorised Transport
PHEV : Plug-in Hybrid Electric Vehicle
PLWD : Persons Living With Disability
PWD : Persons with Disability
SDG : Sustainable Development Goals
SDoT : State Department of Transport
SEFA : Sustainable Energy Fund for Africa
SPV : Solar Photovoltaic Technician
SWOT : Strengths, Weaknesses, Opportunities, Threats
TAM : Technical Assessment Methodology
TTI : Technical Training Institute
TVET : Technical and Vocational Education and Training
TVETA : Technical and Vocational Education and Training Authority
CDACC : Curriculum Development, Assessment and Certification Council
UNEP : United Nations Environment Programme
ZEV : Zero Emission Vehicle

Foreword

The *Promotion of Electric Mobility (E-mobility) in Kenya Skills Gap Survey Report* presents a timely and practical overview of the workforce development needs within Kenya's emerging e-mobility sector. Developed with input from government agencies, industry stakeholders, training institutions, and development partners, the report reflects a shared commitment to building a skilled workforce capable of supporting Kenya's transition to sustainable transportation.

E-mobility offers Kenya significant opportunities to address pressing environmental, economic, and urban mobility challenges. Shifting from fossil-fuel vehicles to electric alternatives can improve air quality, reduce dependence on imported fuels, and contribute to climate resilience. Recognizing this potential, the Government of Kenya launched the Draft National E-Mobility Policy in March 2024, providing a clear framework for integrating electric vehicles into the country's transport systems.

This vision aligns with Kenya's broader environmental agenda, as articulated in the National Climate Change Action Plan (2018 - 2022) and (2023 - 2027). The growth of the e-mobility sector presents new opportunities for inclusive employment, particularly for Persons with Disabilities, women, and youth. Inclusive participation is not only a matter of equity—it is essential for innovation and sustainable development.

The report highlights critical gaps in technical knowledge, practical training, and institutional capacity. It recommends adopting a modular, competency-based training approach tailored to industry needs. The use of short-term certification programs (micro-credentials) will help learners gain targeted, job-ready skills efficiently.

This publication serves as a call to action for deeper collaboration between the government, training providers, employers, and regulators. A coordinated effort will ensure the development of a workforce prepared to support the sector's rapid growth. With the right investments in skills and partnerships, Kenya is well positioned to lead in clean, inclusive, and future-ready mobility.

Mr. Mohamed Daghar, CBS,
The Principal Secretary,
State Department for Transport,

Foreword

It gives me great pleasure to present this E-Mobility Training Needs Analysis Report and the accompanying recommendation for a modular dual TVET training curriculum for Levels 5 and 6 of the Kenya National Qualifications Framework (KNQF). This important milestone aligns with the Government of Kenya's broader vision for sustainable industrialization, green growth, and youth empowerment as outlined in the Kenya Vision 2030 and the Bottom-Up Economic Transformation Agenda (BETA).

The transition towards e-mobility is not merely a technological shift; it represents a bold step towards addressing climate change, enhancing environmental sustainability, and creating inclusive economic opportunities. This report identifies the critical green and technical skills required to support a robust e-mobility ecosystem, and recommends a gender-responsive, industry-linked modular curriculum to equip our TVET graduates for this transformation.

Incorporating the TVET Gender Mainstreaming Policy, the proposed training approach prioritizes the participation of youth and women, empowering them with cutting-edge competencies and entrepreneurial skills necessary to thrive in emerging green sectors. Greening TVET is at the heart of our curricula reform agenda—positioning our institutions not only as training hubs but as catalysts of change for a greener economy. The integration of green skills into our training pathways supports Kenya's commitment to a low-carbon, climate-resilient economy, while also enhancing employability and self-reliance among learners.

We acknowledge with deep gratitude the unwavering support of the German Government through GIZ, whose over 60 years of partnership with the Kenyan Government has been instrumental in advancing skills development. This collaboration has played a pivotal role in building TVET capacity, promoting dual training models, and reinforcing industry-TVET linkages.

E-mobility presents a unique opportunity—not just for economic growth—but for transformational change in the lives of Kenyan youth and women. Let us seize this moment to change the narrative, to equip our people with the tools they need to shape a sustainable future, and to ensure that no one is left behind in our journey towards inclusive and green industrialization.

Dr. Esther Thaara Muoria, PhD ,
The Principal Secretary, of the State Department for Technical, Vocational Education and Training (TVET), Ministry of Education

Foreword

Electric mobility is a cornerstone of Kenya's transition toward low-carbon, sustainable transport and a key contributor to national climate and development goals. While progress has been made in policy and market development, the success of e-mobility depends fundamentally on the availability of a skilled and adaptable workforce. The Kenya E-Mobility Training Needs and Skills Gap Survey Report responds to this need by providing timely, evidence-based insights into the competencies required to support the sector's growth.

Commissioned under the Promotion of E-Mobility in Kenya project on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), this study directly supports GIZ's sector priorities in climate action, sustainable transport, and Technical and Vocational Education and Training (TVET). The report focuses on the project's capacity-building pillar, identifying critical skills gaps across the e-mobility value chain and proposing practical, competency-based solutions aligned with Kenya's CBET framework and the Kenya National Qualifications Framework (KNQF).

The report underscores the importance of modular training pathways, dual training models, and strong collaboration between industry and training institutions to ensure labour-market relevance. By emphasizing upskilling, reskilling, and recognition of prior learning, it supports GIZ's commitment to inclusive, demand-driven skills development that prepares workers for emerging green technologies while strengthening institutional capacity.

Equally important is the report's focus on inclusion. The deliberate integration of women, youth, and persons with disabilities into e-mobility skills development reflects GIZ's belief that a just and equitable transition is essential for sustainable growth. Through partnerships with government, the private sector, and training institutions, this report provides a clear roadmap for building a future-ready workforce that can accelerate Kenya's transition to clean, inclusive, and resilient mobility.

Bodo Immink
Country Director
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Kenya

Acknowledgements

We would especially like to express our sincere gratitude to all individuals and institutions whose contributions made the Promotion of E-mobility in Kenya Skills Gap Survey Report a success. This work reflects the collective commitment of partners across government, industry, training institutions, and civil society, all working towards a shared goal of transforming Kenya's transport sector through e-mobility.

Our appreciation goes to the GIZ Promotion of E-Mobility Project for their steadfast technical and logistical support throughout the study. We also recognize the Ministry of Transport and Roads, other key government departments, and Technical and Vocational Education and Training (TVET) institutions for their invaluable input during data collection, consultations, and validation. Their cooperation ensured alignment with national policy goals and training priorities. We also thank the Electric Mobility Association of Kenya (EMAK) and other private sector partners for their candid perspectives, practical insights, and ongoing collaboration in building an inclusive e-mobility ecosystem.

We are especially grateful to the trainers, trainees, and current workers in the e-mobility sector who shared their experiences and participated in interviews, focus groups discussions and surveys. Their voices helped us identify critical skills needs and training gaps. We further acknowledge participants of the stakeholder forum and validation conference for their thoughtful feedback, which enhanced the depth and relevance of this report. Finally, we commend the Africa Vocational Education Researchers and Consultants (AVERC) team for their dedication in coordinating the process and ensuring wide engagement from all stakeholders. Your professionalism and attention to detail were instrumental in delivering this report. To every contributor, your efforts have brought us one step closer to a clean, efficient, and skilled transport sector for Kenya.

Executive Summary

Kenya has placed e-mobility at the centre of its efforts to reduce greenhouse gas emissions from the transport sector, as outlined in its updated Nationally Determined Contributions (NDCs). In support of this goal, on behalf of the German Ministry for Economic Cooperation and Development (BMZ) the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), through the German Climate Technology Initiative (DKTI), implements the “Promotion of E-mobility in Kenya” project. The project is anchored on four pillars: Policy and Enabling Frameworks, Capacity Building, Piloting R&D Projects, and groundwork for the electrification of the Bus Rapid Transit (BRT) Line-3 in Nairobi. This Assessment was undertaken under the capacity-building pillar to evaluate workforce preparedness and guide the development of industry-responsive, competency-based training.

Despite growing interest, the e-mobility sector in Kenya faces several challenges. These include limited skilled personnel, lack of training e-mobility curricula for level 4 to 6, weak enforcement of standards, and low participation of women and Persons with Disabilities (PWDs). However, opportunities such as increasing investments in charging infrastructure and strong government support present a favorable environment for workforce development.

The assessment followed the Competency-Based Education and Training (CBET) framework and drew lessons from Kenya competency-based assessment policy and guidelines of 2019 best practices. It also used the Technology Acceptance Model (TAM) to understand workers' readiness to adopt new technologies.

Kenya's e-mobility skills sector was categorized into four areas: Electric Vehicle (EV) Fabrication and Assembly, Usage and Maintenance, Charging Systems, and Afterlife Management. A Strength Weakness, Opportunity and Threats (SWOT) was analyzed against where to Build on the strength, Eliminate the weakness, Exploit the opportunities and Minimize threats (BEEM) helped identify gaps and opportunities. Stakeholders endorsed a dual approach developing stand-alone modular curricula at Kenya National Qualificaton Framework (KNQF) Levels 5 and 6 while integrating EV units into existing automotive programs to expand reach and address the sector's diverse needs.

The assessment adopted a structured, mixed-methods approach combining desk review, stakeholder consultations, surveys, and interviews with key actors in the e-mobility sector. Stakeholder forums and field visits ensured inclusivity and contextual relevance. Activities followed a sequenced milestone framework from roadmap approval, tool development, data collection, to final dissemination. The methodology was aligned with the CBET framework and included participatory validation to guarantee quality assurance and national alignment.

Analysis of existing KNQF-aligned automotive training programs revealed significant gaps in EV-specific content such as battery systems, diagnostics, high-voltage safety, and EV infrastructure. Programs like Motorcycle Mechanics and Automotive Mechatronics offered strong foundations but lacked modules in e-mobility. Curriculum enhancements are needed at all levels from integrating basic EV units into Level 4 to developing stand-alone modules at Levels 5 and 6. Nairobi National Polytechnic was one of the few institutions offering hybrid-inclusive programs. The review underlined the urgent need for responsive, industry-aligned curricula reform.

The e-mobility skills gap in Kenya is significant, cutting across battery technologies, compliance training, EV diagnostics, and emerging roles in software and smart systems. Women and PWDs remain underrepresented, and youth engagement is critical given the dominance of workers aged 26–35. Industry stakeholders emphasized the importance of competency-based, modular curricula customized for artisans, youth, women, and in-company trainers. There is a growing demand for dual training models, Continuous Professional Development (CPD) programs, and workplace-based learning. Curricula must also incorporate non-technical roles, sustainability, and circular economy practices to meet future mobility needs.

The report outlines eleven strategic recommendations backed by action points, targeting gaps identified during the study. These include curriculum development, capacity building, inclusion, certification, dual training, and institutional strengthening. Recommendations are aimed at fostering partnerships among government, industry, and academia to ensure sustainability.

Key recommendations include:

- Develop stand-alone EV curricula at KNQF Levels 5 and 6.
- Create sector-specific qualifications for artisans at KNQF Levels 3 and 4.
- Integrate e-mobility content into automotive training.
- Launch Training of Trainers (ToT) programs focused on EV systems.
- Support RPL and modular certification for current e-mobility workers.
- Establish EV Centres of Excellence in selected institutions.
- Promote gender and disability inclusion across all programs.
- Institutionalize dual training combining classroom and workplace learning.
- Incorporate regulatory and environmental modules in every course.
- Build the capacity of in-company trainers and mentors.

The success of e-mobility in Kenya depends on more than technological readiness it requires a skilled, inclusive, and future-focused workforce. This Training Needs Assessment (TNA) provides a solid foundation for curriculum reforms, institutional capacity-building, and industry collaboration. Through the implementation of the outlined strategic directions, Kenya can position itself as a regional leader in e-mobility while generating employment, improving urban air quality, and promoting equitable access to technical education.

CHAPTER 1: CONTEXTUAL ANALYSIS

Introduction

This chapter provides a contextual analysis of the e-mobility Skill gap analysis. This was undertaken to support the development and implementation of an e-mobility training module in Kenya. It outlines the background and objectives of the assessment, examines the structure of the Kenyan TVET system and reviews relevant policy and regulatory frameworks. The chapter also highlights key TVET agencies involved in the rollout of e-mobility programs.It further details the CBET curriculum development and approval process and presents an overview of the current electric vehicle context in Kenya. This analysis sets the foundation for aligning the training intervention with national priorities and industry demands.

Background

E-mobility presents significant opportunities for innovation and growth across multiple domains, including public transport, freight logistics, and two- and three-wheeler mobility. However, sector development is constrained by challenges including but not limited to charging infrastructure, regulatory gaps and a shortage of specialized technical skills (SEFA and UNEP, 2022). This assessment was undertaken in response to the identified gaps, with a specific focus on analyzing market needs and defining the technical skills required for the EV sector. It seeks to inform targeted skills development efforts aligned with Kenya's CBET framework, thereby equipping the workforce to effectively support and sustain the growth of the e-mobility sector.

This study assesses the need for a stand-alone e-mobility curriculum or the creation of add-on modules, focusing on electric vehicles;

a. two-wheeler,
b. three-wheeler,
c. four wheelers,
d. electric boats,
e. charging infrastructure,
f. wheel power chair

This work builds on the 2016 Kenya-Germany agreement on Sustainable Economic Development, emphasizing youth employment through strengthened TVET systems (GIZ, 2023). A structured Roadmap for E-Mobility Skills Gap Analysis was developed to guide the identification of critical skills shortages and inform training program design. The assessment involved collaboration with stakeholders engaged in GIZ-supported e-mobility initiatives and employed online surveys, telephone interviews, field visits in Nairobi and review of institutional reports.

Electric vehicles (EVs), unlike internal combustion engine (ICE) vehicles, operate using electric motors and advanced high-voltage systems. Although EVs have fewer moving parts and are mechanically simpler, they introduce new challenges in assembly, diagnostics, repair, and maintenance—areas that demand specialized technical expertise. In response, several initiatives in Kenya are focused on building local capacity in EV servicing and support.

A document authored by Macharia Stephen, dated April 16, 2024, highlights that Africa New Energy Vehicles (AfricaNEV), in partnership with Advanced Mobility and with support from GIZ Kenya, has launched a hands-on training program to strengthen local technicians' skills-particularly in diagnostics and repair. Similarly, Mabeya Ratemo, in a February 14, 2025 post on LinkedIn titled Bridging the Skills Gap: Unlocking Kenya's E-Mobility Future Through Charging Infrastructure and Workforce Development, outlines the broader talent shortfall in Kenya's EV sector. He emphasizes the importance of incorporating EV-specific modules into Technical and Vocational Education and Training (TVET) curricula. Complementing these efforts, NobleProg Kenya now offers structured training programs tailored to equip technicians with the competencies needed to work safely and effectively with modern EV systems.

Objectives of the Training Needs Assessment

General Objective

To assess the skills requirements and training gaps within Kenya's e-mobility value chain and provide guidance for the development of an industry-responsive curriculum aligned with the CBET framework.

Specific Objectives

- To identify current skills gaps within the e-mobility sector, with a focus on electric vehicles
- To review and analyze existing automotive curricula and labour market needs in order to highlight areas for curriculum enhancement or the development of new training modules.
- To support the design of a modular e-mobility curriculum either as an add-on to existing programs or as a standalone aligned with CBET standards and TVET CDACC guidelines.
- To provide evidence-based insights to assist policymakers and regulatory bodies in shaping strategies for e-mobility education and workforce development.
- To strengthen collaboration among training institutions, industry stakeholders, and government agencies to foster a coordinated approach to e-mobility skills advancement.
- To promote inclusivity in e-mobility training programs by ensuring the participation of women, youth and marginalized groups in skills development initiatives.

1.4 Kenyan TVET System Context

This section provides an overview of Kenya's TVET system by highlighting the policy and regulatory framework that governs skills development in the country. It outlines the key TVET agencies involved in supporting the implementation of the e-mobility training module, detailing their specific roles and mandates. The section also explains the CBET curriculum development and approval process as applied to the e-mobility module. Finally, it presents how the e-mobility module is aligned with the KNQF Levels 3 to 6, demonstrating how training pathways correspond to actual job roles and competencies required across the hydrogen value chain. Together, these components provide a comprehensive understanding of the structural, institutional, and curricular context in which Kenya's emerging green skills training programs are being developed and delivered.

1.4.1 Kenya TVET Policy and Regulatory Framework

This study refers to relevant TVET policies and regulatory frameworks, which inform the recommendations and action points outlined in this report. The development of e-mobility training programs will be guided by these existing policies and regulations, which support the design and accreditation of competency-based, industry-driven curricula that are inclusive, responsive, and aligned with national qualification standards.

Figure 1: Kenya TVET Policy and Regulatory Framework

The table below outlines the key policies and regulatory instruments informing e-mobility skills development and training in Kenya.

Table 1: provisions and Relevance of TVET Policy and Regulatory

	Regulatory Framework	Provision	Relevance to E-Mobility Skills Development	Key Performance Indicators (KPIs)
1	TVET Act, 2013	Establishes TVETA to oversee accreditation, licensing, and quality assurance in TVET institutions and programs.	Requires e-mobility curricula to be approved by TVETA and delivered in registered institutions; supports CBET implementation, Recognition of Prior Learning (RPL), and development of Centres of Excellence.	Approved e-mobility curricula; Number of accredited e-mobility training institutions.
2	CBET Policy Framework, 2018	Guides competency-based education aligned with occupational and industry standards.	Ensures e-mobility modules follow CBET principles - industry involvement, modular design, practical learning outcomes, and competency-based assessments.	Number of CBET-aligned e-mobility programs; Number of certified trainers.
3	RPL Policy Framework, 2020	Facilitates recognition of skills acquired through informal and non-formal learning pathways.	Enables experienced technicians to access e-mobility training without duplicating prior learning, increasing access for underserved groups.	Number of e-mobility trainees admitted through RPL; Number of certified RPL assessors.
4	Dual Training Policy, 2025	Integrates classroom-based instruction with structured industry-based training.	Facilitates industry attachment opportunities within the EV sector (e.g., assemblers, battery services, charging operators).	% of trainees placed in industry; Number of active e-mobility industry partnerships.
5	KNQF Act No. 22 of 2014	Provides a unified framework for developing, assessing, and recognizing national qualifications.	Ensures e-mobility modules are aligned with KNQF Levels and registered for formal recognition and certification.	Number of e-mobility modules mapped to KNQF; Number of learners certified under KNQF-aligned programs.

	Regulatory Framework	Provision	Relevance to E-Mobility Skills Development	Key Performance Indicators (KPIs)
6	Model Gender Mainstreaming Policy, 2022	Promotes equal access and participation for women and marginalized groups in TVET.	Encourages inclusive design and delivery of e-mobility training; addresses gender gaps through outreach, mentorship, and targeted financial support.	Gender parity in enrolment; Number of scholarships awarded to female trainees.
7	Industrial Training Act (Cap. 237)	Establishes NITA and provides legal grounds for industrial training, standards, and assessments.	Supports apprenticeships and workplace-based learning in e-mobility-related sectors in collaboration with registered employers.	Number of industrial attachment slots for e-mobility; Number of employer training partnerships.

1.4.2 TVET Agencies in Kenya

The successful development and delivery of e-mobility training in Kenya depends on the coordinated efforts of national TVET agencies, each with specific mandates under existing laws and policies. The State Department for TVET (SD-TVET) leads by formulating policies, overseeing the national rollout of the e-mobility module, and deploying certified trainers to TVET institutions and Centres of Excellence (CoEs). The Technical and Vocational Education and Training Authority (TVETA) approves the e-mobility curriculum, accredits institutions and ensures they meet quality standards.

The Curriculum Development Assessment and Certification Council (CDACC) supports the design, validation, and certification of the competency-based e-mobility curriculum. In parallel, the Kenya National Qualifications Authority (KNQA) aligns the module to the KNQF Levels 3–6, ensuring national and international recognition. Lastly, the National Industrial Training Authority (NITA) facilitates hands-on industrial training, approves industrial curricula, and administers practical assessments. Together, these agencies ensure a coherent, high-quality and nationally recognized e-mobility training framework.

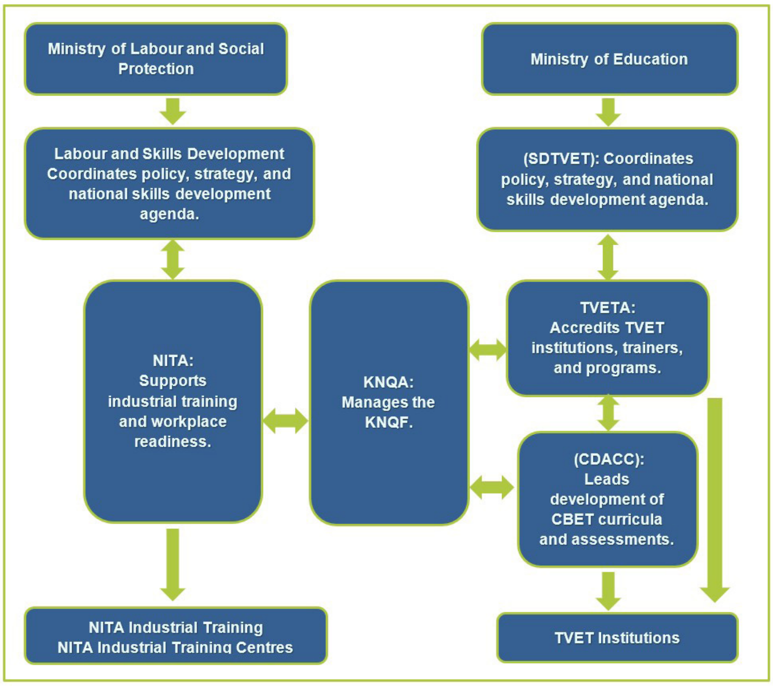


Figure 2: TVET Agencies in Kenya

1.4.3 Kenya CBET Curriculum Development Process

Kenya's CBET system adopts a structured, outcome-oriented approach to curriculum development, with a strong emphasis on occupational relevance and industry participation. The process ensures that trainees acquire practical competencies aligned with labor market needs. In the context of e-mobility, the curriculum development process follows national standards and is led by CDACC in partnership with TVETA, relevant sectoral stakeholders (e.g., EV manufacturers, charging station operators), and development partners. Figure 3: Proposed CBET Curriculum Development Process for E-Mobility

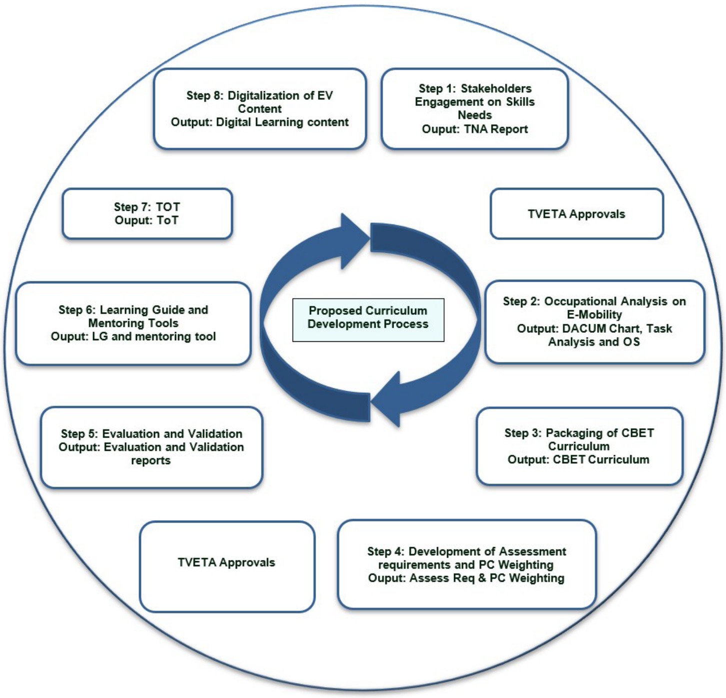


Figure 3: Kenya CBET Curriculum Development Process

1.4.4 Alignment of Automotive Courses with KNQF Levels

The KNQF is a national system that sets clear standards for various levels of education, skills, and competencies. It ensures that qualifications awarded by training institutions are comparable and aligned with the needs of the labor market. As a result, the KNQF serves as a benchmark for developing, assessing, and certifying training programs. Aligning the e-mobility training module with the KNQF ensures that learners receive nationally recognized, industry-relevant qualifications.

In Kenya, TVET CDACC currently offers qualifications in the automotive sector from KNQF Level 3 to Level 6 as illustrated in table 2 below. These programs form the backbone of vocational automotive training and offer a strong foundation for integrating e-mobility content.

Table 2: List of Existing Automotive OS by CDACC

	Occupational Standards & Related Curriculum	KNQF Level
	Automotive Mechatronics Technology	6
	Automotive Engineering	6
	Autobody Technology (Dual)	6
	Solar PV Installation Technician	6
	Automotive Engineering	5
	Automotive Technology	4
	Motorcycle Mechanics	4
	Automotive Mechanics	3
	Motorcycle Mechanics	3

Building on this existing structure, the e-mobility training module is purposefully designed to align with KNQF Levels 3 to 6, offering a progressive learning pathway that corresponds to real-world job roles within the e-mobility and green hydrogen value chains.

Level 3 focuses on practical, hands-on skills for technicians performing routine operational tasks. Currently, Level 3 programs in Automotive Mechanics and Motorcycle Mechanics emphasize internal combustion technologies. An equivalent Level 3 program in e-mobility could focus on the safe operation and basic servicing of electric vehicles and their systems.

Level 4 introduces more specialized technical training for skilled trades. Existing Level 4 programs include Automotive Technology and Motorcycle Mechanics, which currently center on internal combustion engines. This level presents a key opportunity to develop curricula for the operation and maintenance of electric two- and three-wheelers, bridging the gap between conventional and electric vehicle technologies.

Level 5 is tailored for advanced technical roles that demand both theoretical understanding and problem-solving capabilities. The current Level 5 curriculum in Automotive Engineering remains largely focused on traditional engine systems. Expanding this to include electric vehicle diagnostics and systems integration would equip learners for higher-value roles in the e-mobility sector.

Level 6 prepares learners for leadership, supervisory, and specialized technical positions. Existing Level 6 qualifications—such as Automotive Engineering, Automotive Mechatronics, Solar PV Installation, and Autobody Technology—offer strong platforms to incorporate advanced EV systems, battery management technologies, and the integration of e-mobility with renewable energy solutions.

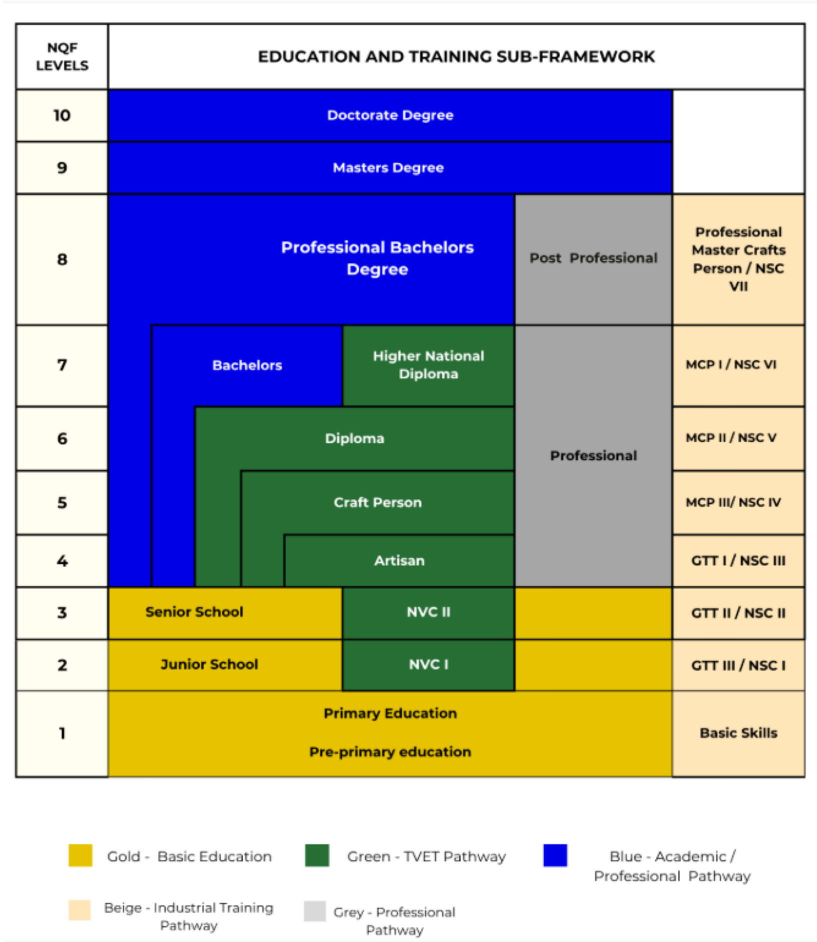


Figure 4: KNQF Source: KNQA, 2024

By aligning the e-mobility module with KNQF Levels 3 to 6, the program establishes a structured, scalable approach to workforce development in Kenya's transition to sustainable transportation. It ensures learners gain relevant skills and qualifications that align with the future demands of the automotive and renewable energy sectors

1.5 Overview of the Electric Vehicle Ecosystem in Kenya

E-mobility is changing Kenya's transport sector by introducing cleaner and more sustainable alternatives to vehicles powered by internal combustion engines. Supporting this development requires a complete EV system that includes production, distribution, daily use, maintenance, and proper end-of-life handling.This structure closely aligns with the e-mobility framework presented in the Republic of Rwanda E-Mobility Skills Snapshot, which outlines the foundational components necessary for a functional and inclusive e-mobility environment (Republic of Rwanda, 2024). In the Kenyan context, the sector comprises four key pillars: EV Fabrication and Assembly, EV Usage and Maintenance, EV Charging Systems, and EV Afterlife Management, as discussed below.

EV Fabrication and Assembly:

This stage involves the design and local manufacturing of various EV types, including:

- Electric buses

- Electric cars
- Electric three-wheelers
- Electric two-wheelers
- Electric wheelchairs and power chairs
- Electric boats

It represents a high-skill area requiring competencies in mechanical, electrical, and manufacturing engineering, particularly in low-emission vehicle technologies.

EV Sales and Aftersales Services:

EV sales cover both imported and locally assembled vehicles, including options such as leasing electric buses. Aftersales services play a vital role in long-term EV adoption and user satisfaction, covering:

- Warranty and spare parts supply
- Battery diagnostics, maintenance, and replacement
- Software diagnostics and updates
- Charging support
- Customer training and financial services

Skills required span technical servicing, customer engagement, diagnostics, and EV system integration.

EV Charging Infrastructure and System:

This domain is critical for infrastructure readiness and user confidence. It includes:

- **Charging Infrastructure**: Design, installation, maintenance, renewable energy integration, and grid interfacing, with adherence to safety and regulatory standards
- **Charging Station Operations**: Management, monitoring, customer service, and business operations
- **Battery Technology Management**: Diagnostics, component repair, safety risk management, system maintenance, and end-of-life recycling

This area calls for specialized technical training in energy systems, power electronics, and compliance frameworks.

EV Driving

- EV driving encompasses:
- Private vehicle use
- Commercial applications
- Fleet operations

Driver training and licensing programs will need to be tailored for EV-specific performance, safety protocols, and efficient driving practices.

EV Afterlife Management:

As part of the circular economy, this component emphasizes sustainability and environmental compliance. It involves:
Battery recycling and repurposing

- Retrofitting of vehicles
- Safe battery disposal and environmental standards
- Reuse of electronic and mechanical components

These processes require both technical expertise and awareness of environmental regulations and circular design principles.

The flowchart figure 5 below illustrates a conceptual overview of the EV system in Kenya, outlining the key components and interlinked value chains that support the adoption, deployment, and sustainability of e-mobility. The colours used have no technical meaning but for appearance and enhance visibility. It identifies core functional areas where workforce capacity is critical and where targeted skills development is required to ensure a successful transition to e-mobility.

The EV value chain illustrated shows skill gaps across technical, operational, and support functions. This highlights the urgent need to align training programs with real-world demands through Kenya's CBET framework. Areas such as battery technology, charging systems, EV repair and maintenance, and sustainable afterlife practices should be prioritized in curriculum development and capacity-building efforts.

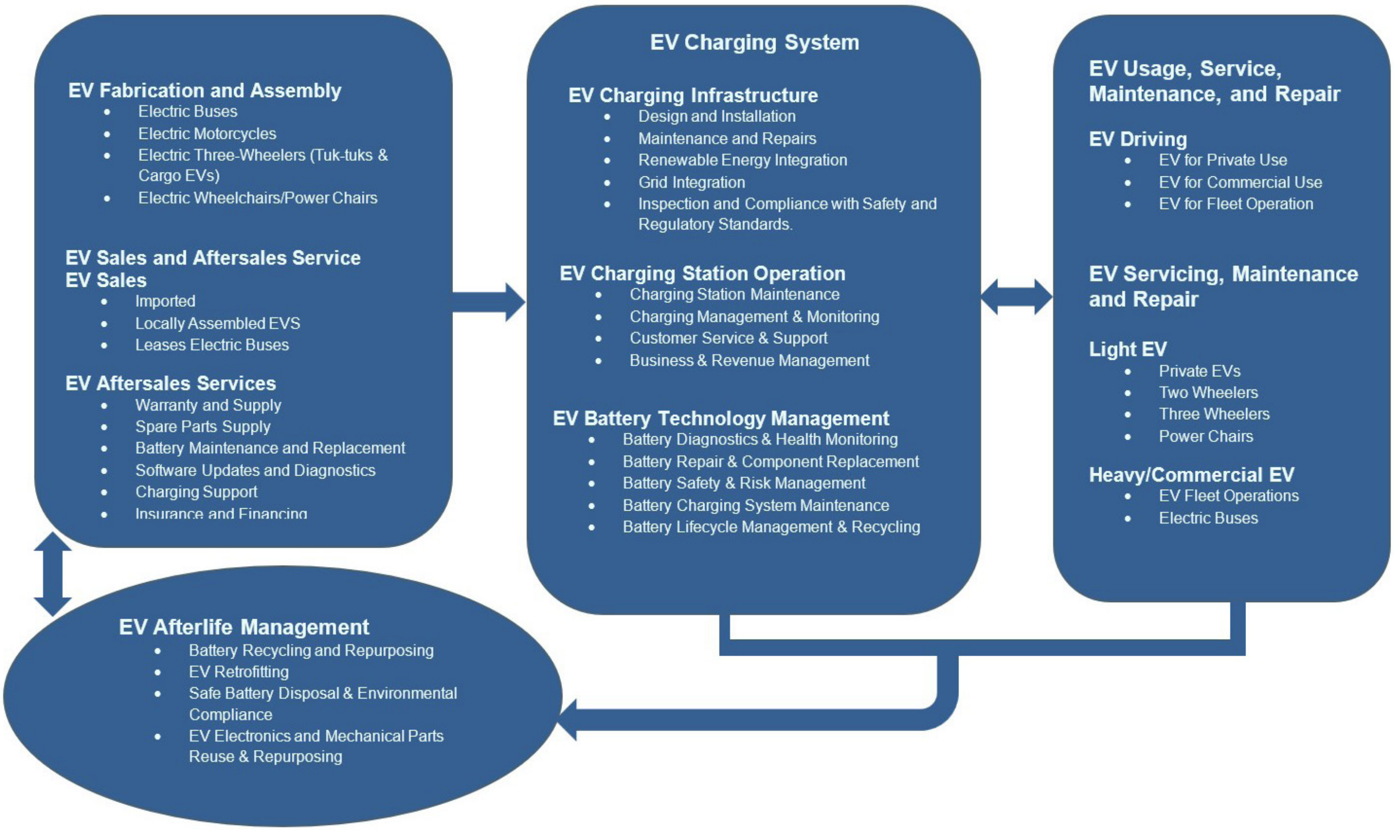


Figure 5: EV Conceptual Clarity

CHAPTER 2: METHODOLOGY

2.0 Introduction

This assessment adopted a structured approach combining both qualitative and quantitative methods to provide an analysis of skills gaps in Kenya's growing e-mobility sector. Key activities involved stakeholder identification and engagement, development and validation of data collection tools, administration of surveys and interviews, data processing and analysis, and the dissemination of findings. Throughout the process, we ensured that activities remained aligned with project objectives and the CBET framework.

2.1 Assessment Approach

This study employed multi-method assessment approach that combined qualitative and quantitative methods to gather data from diverse sources, including policy, industry, and training institutions. The three primary methods used in the assessment are as illustrated in figure 6 that shows the interconnected structure of the process. It highlights how each method, **desk review**, **stakeholder consultations**, and **field-based data collection** feeds into the central goal of identifying training needs for Kenya's evolving e-mobility context. Arrows indicate the flow of information and the integration of data sources, reinforcing a holistic and evidence-driven foundation for curriculum design and policy recommendations.

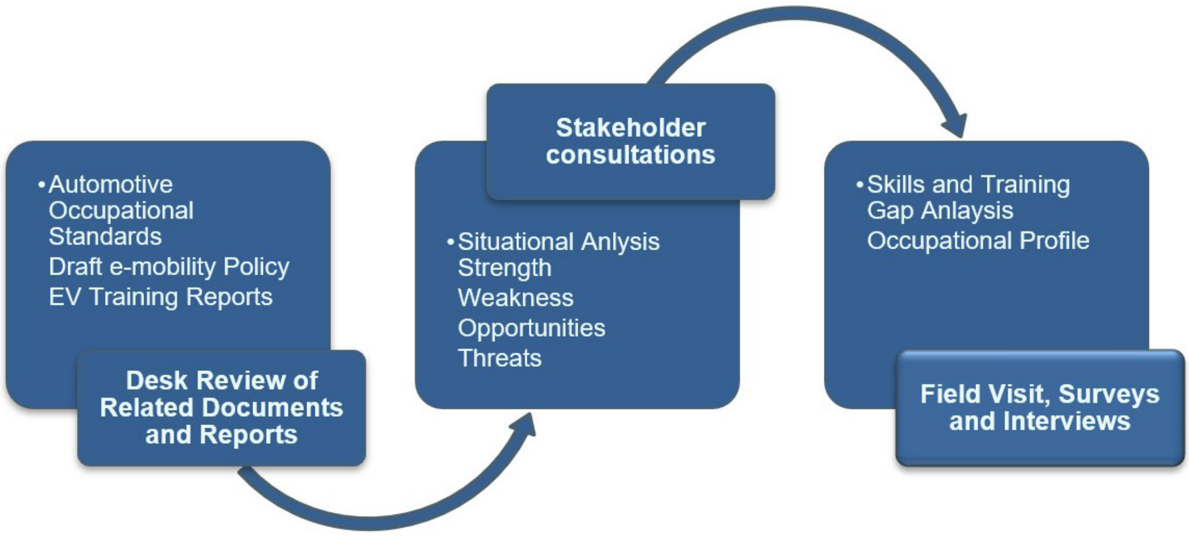


Figure 6: Assessment Methods

Desk Review: A thorough review was conducted on existing Automotive Occupational Standards developed by TVET CDACC, as well as relevant government policies, industry reports, and academic studies. This provided a foundational understanding of the regulatory environment, technological trends, and existing training gaps in the e-mobility space.

Stakeholder Consultations: Targeted engagements were held with key stakeholders, including policymakers, industry leaders, trainers, and trainees as per the table presented. These consultations offered valuable insights into current and emerging workforce demands, institutional readiness, and perspectives on curriculum development.

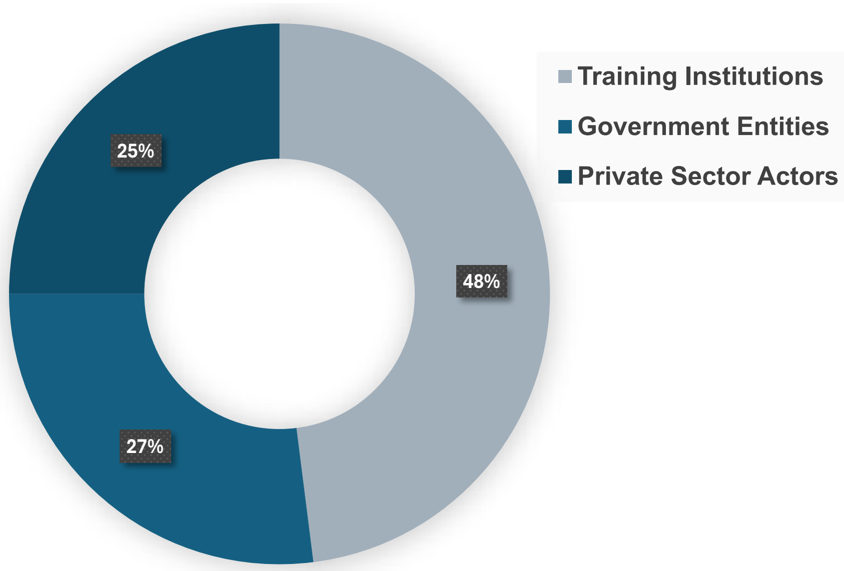
Table 3: Stakeholders Mapping

	Training institution	E-mobility Enterprises	Government Institutions
a.	Nairobi National Polytechnic	E-mobility Association of Kenya	1. Ministry of Roads and Transport
b.	Thika TTI	Advanced Mobility	2. Ministry of Education, state department of TVET
c.	Wote TTI	Eurasia	3. Ministry of Energy and Petroleum
d.	PC Kinyanjui TTI	E-bee	4. Ministry of Investments Trade and Industry
e.	Kenya Coast National Polytechnic	Africa E mobility Alliance	5. Kenya National Qualification Authority
f.	Kenyatta University	Ampersand	6. TVETA
g.	Technical University of Mombasa	Drive Electric	7. TVET-CDACC

Field Visits, Surveys, and Interviews: Data collection included structured surveys and interviews with EV manufacturers, charging station operators, and fleet operators. While some in-person visits were made, most interactions were facilitated through online platforms, ensuring broader reach and participation. We had an interactive moment with the following industries;

- Kenya Vehicle manufactures (KVM) that was doing the assembling of EV vehicles
- BasiGo Company that was operating a fleet of electric vehicles along the major routes in Nairobi
- National Industrial Training Authority that had just piloted a curriculum in e-mobility
- Linccell Technology-Electric wheelchair enterprise

2.2 Target Population



This assessment engaged key stakeholders in Kenya's e-mobility system, including TVET institutions, EV training providers, private sector companies, government agencies, development partners, NGOs, and CBOs. It also included current automotive trainees and recent graduates from four institutions: PC Kinyanjui TTI, Nairobi National Polytechnic, Wote TTI, and Thika TTI. Training institutions formed the largest respondent group (48%), followed by government entities (27%) and private sector actors (25%). Most trainees were pursuing Automotive Technology Level 5 or 6. The findings highlight the urgent need for a formal e-mobility curriculum to address rising industry demand and training gaps.

2.3 Methods of Analysis

This study applied three complementary methods to guide the review and development of the EV curriculum. The first involved **analyzing the existing Automotive Occupational Standards (OS)** to assess how well they address both current and emerging competencies, with a focus on structure, content, and alignment to industry practices. The second method was a **situational analysis**, which examined the broader context of automotive training and the transition toward e-mobility including policy direction, market trends, and institutional capacity. The third was the **analysis of skills gaps**, aimed at identifying missing or underrepresented practical and knowledge-based competencies required for work in the EV sector. These methods formed the basis of this assessment and further curriculum design by highlighting what to retain, what to update, and what new competencies need to be introduced.

2.3.1 Analyzing of Existing Automotive OS

The analysis in this study was organized into three parts to support the development of an EV curriculum that is relevant, practical, and aligned with industry needs.
The three parts area;

a. Analysis against the Criteria set as per CBET core Principles
b. Alignment of Automotive OS with E-Mobility Duties
c. Mapping of Basic and Common Units Across Automotive Curricula

In the first part, the Occupational Standards (OS) were reviewed using a checklist based on the core principles of CBET, as shown in **Annex 2**. Each standard was assessed for its alignment with CBET principles, as articulated in regional and international frameworks (African Union Development Agency–NEPAD, 2021; ILO, 2020; UNESCO-UNEVOC, 2020; Commonwealth of Learning, 2020; World Bank, 2022; OECD, 2021). These principles provide a benchmark for assessing the suitability and adaptability of existing automotive standards to emerging e-mobility needs. This helped determine whether the existing standards follow key CBET requirements such as being industry-driven, modular, and outcome-based. The results from this review will guide how the EV curriculum is packaged ensuring alignment with current training quality standards.

Second part, assessed the alignment of the current Automotive OS with tasks and duties to E-Mobility industry duties using a checklist in **Annex 3**. This helped identify skills that are missing or not fully addressed in current training programs, such as battery technology and safety procedures for high-voltage systems. These findings supported decisions on whether to create a **separate EV module** or to include **additional EV content** within existing programs.

Third part, involved undertaking a comparison of basic and common units across different automotive training programs to identify what is already shared and where there may be gaps or duplication. This mapping helped in selecting units that can be reused in the EV curriculum so that only EV-specific content needs to be developed separately. This avoids repetition and supports a more efficient structure.

Together, these three types of analysis provided a solid foundation for shaping an EV curriculum that builds on what already exists, fills important gaps, and responds to the needs of modern vehicle technology.

2.3.2 Method of Situational Analysis

The situational analysis was carried out using a qualitative approach, integrating stakeholder engagement and direct industry observation to assess the current status and future requirements of skills development in Kenya's e-mobility sector. This process was structured around the SWOT-BEEM Matrix, which served as the core analytical tool for synthesizing data and framing strategic insights.

- **SWOT** (Strength's '**S**', Weaknesses '**W**', Opportunities '**O**', Threats '**T**'): Identified systemic and institutional factors influencing the current and future training landscape.
- **BEEM** (Build on Strength '**B**', Eliminate weakness '**E**', Exploit the Opportunity '**E**', Minimise Threat '**M**'.

The methodology comprised the following components:

Stakeholders' Consultative Forum

A consultative forum was held on 25th March 2025 at Movenpick Hotel, Nairobi, bringing together a diverse group of stakeholders including:

a. Government representatives
b. Industry leaders
c. Training institutions
d. Development partners
e. Civil society organizations

Through facilitated discussions and thematic group work, stakeholders shared insights on the current status, challenges, and opportunities in the e-mobility sector. Contributions focused on workforce capabilities, policy alignment, institutional readiness, and demand-side requirements

Industry Visits and Field Insights

Targeted field visits were conducted to leading actors within Kenya's e-mobility industry such as electric vehicle assemblers, battery manufacturers, and training centers. These visits aimed to:

a. Observe practical skill requirements and gaps
b. Validate stakeholder claims with on-the-ground realities
c. Capture real-time workforce needs and innovations

2.3.3 Method of Analyzing Skills Gap

The methodology adopted for identifying and analyzing skills gaps in Kenya's e-mobility sector followed a **Mixed-Methods Skills Gap Analysis** approach. This method integrates qualitative insights and quantitative data to develop a comprehensive understanding of workforce readiness and industry demand.

The analysis was informed by the following components:

a. **Consultative Stakeholder Forums:** Structured group discussions were held with players in the e-mobility sector, including assemblers, service providers, training institutions, and regulatory agencies. These forums provided insights into skill needs, hiring preferences, and operational challenges faced by the sector.

b. **Literature Review:** A targeted review of training programs and curricula offered by public and private institutions in Kenya was conducted. This included an assessment of ongoing training initiatives and Manufacturers manual and donor-led initiatives.

c. **Industry Surveys and Interviews:** A structured survey was administered to a sample of 12 industry stakeholders to quantify skill priorities using a Likert scale. In-depth interviews were also conducted with representatives from key organizations, including **KVM**, the **Rural Electrification and Renewable Energy Corporation (REREC)**, and several private sector EV firms. These interviews helped validate survey responses and provided contextual understanding of the practical workforce challenges.

This blended approach allowed for triangulation of data across sources, helping to surface both current skills gaps and emerging trends in Kenya's e-mobility workforce landscape.

3.0 Introduction

This chapter presents an in-depth analysis of Kenya's e-mobility training and workforce readiness. Section 3.1 evaluates existing automotive occupational standards against emerging EV competencies. Section 3.2 explores the current state of training through SWOT-BEEM analysis. Section 3.3 focuses on inclusion of women, youth, and persons with disabilities. Finally, section 3.4 identifies key skills gaps and proposes a curriculum development strategy based on industry needs, thematic skill areas, and performance alignment with KNQF levels

3.1 Analysis of Existing Automotive Occupational Standards

The analysis of existing automotive occupational standards involved a comprehensive evaluation of multiple key areas. First, the extent to which current automotive curricula align with CBET core principles was assessed, ensuring that the programs promote practical, outcomes-driven learning.

Next, the analysis focused on the alignment between existing OS and e-mobility job duties, where EV tasks were clearly identified and mapped against the corresponding courses. This mapping exercise revealed significant e-mobility skills gaps, highlighting competencies that are either underrepresented or completely absent in the current training structure. Finally, the review included a mapping of Basic and Common Units across various automotive curricula to assess content consistency, redundancy, and integration potential, with the aim of streamlining future curriculum enhancement and harmonization efforts.

3.1.1 Analysis for Curricula Against CBET Core Principles

The review of existing TVET CDACC automotive occupational standards was conducted against the core principles of CBET as discussed in chapter two and results obtained using checklist tool Annex 2. The analysis aimed to identify strengths, gaps, and areas for adaptation in response to e-mobility sector. The table 4 below shows the findings;

Table 4: Alignment of Automotive OS with CBET Principles

CBET Principle	Auto Mecha-tronics L6	Auto Eng. L6	Auto-body (Dual) L6	Solar PV Tech L6	Auto Eng. L4	Auto Tech L5	Motor-cycle Mech. L4	Auto Mech. L3	Motor-cycle Mech. L3
Industry-Driven Standards	✓✓	✓	✓✓	✓	✓	✓	✓	✓	✓
Outcome-Based Learning	✓	✓	✓	✓	✓	✓	✓	✓	✓
Modular Structure	X	X	X	X	✓	✓	✓	✓	✓
Recognition of Prior Learning (RPL)	X	X	X	X	✓	✓	✓	✓	✓
Quality Assurance and Certification	✓	✓	✓	✓	✓	✓	✓	✓	✓

Lifelong Learning Orientation	✓	✓	✓	✓	✓	✓	✓	✓	✓
Assessment for Learning & Competence	✓	✓	✓	✓	✓	✓	✓	✓	✓

Key:

✓✓ = Strong alignment with best practice (e.g., dual training)
✓ = Meets CBET criteria
X = Not yet implemented

The interpretation of the findings from table 4 above shows strong alignment of CBET principles across the existing automotive programs in several areas:

- Industry-driven standards, outcome-based learning, quality assurance, lifelong learning and competence-based assessment are well-integrated across the existing automotive programs, indicating consistency with CBET goals and relevance to labor market needs.
- Modular structures are currently implemented only in Levels 3, 4 and 5 However, TVET CDACC is actively working to ensure that modularization is extended to level 6 as well, aiming to enhance accessibility, progression pathways, and lifelong learning opportunities.
- Recognition of Prior Learning (RPL) is applied in lower-level programs but is absent in Level 6, restricting upward mobility for experienced trainees. These gaps suggest the need to extend modularization and RPL across all levels to enhance accessibility, flexibility, and career progression - particularly important for expanding into emerging sectors like e-mobility.

3.1.2 Alignment of Automotive OS with E-Mobility Duties

To assess how well existing Automotive Training Programs align with the competency requirements of the e-mobility industry, a checklist tool was developed and is presented in Annex 3. The curriculum analysis was guided by recognized international references, including Electric Vehicle Fundamentals: Body of Knowledge (SME, 2024), the Electric Vehicle Skills Mapping Report under the Promotion of Low Carbon Urban Transport Systems in the Philippines (Lopez, 2020), and the standards developed by the Technical Education and Skills Development Authority (TESDA), particularly the Battery Electric Vehicle Servicing framework (TESDA, 2018).

The findings are summarised in table 5 and 6 below, that shows that **EV-related competencies are mostly missing** from the current TVET programs:

- Only *Automotive Mechatronics Level 6* includes a few relevant competencies, such as *EV rechargeable battery repair* and *low-voltage electrical systems maintenance*.
- *Low-voltage maintenance* is also covered in some Level 4 and Level 3 programs, likely reflecting overlap with conventional automotive electrical systems.
- *Mechanical EV system maintenance* appears in all programs, indicating this area is already integrated and shares similarities with existing mechanical training.

All other critical EV competencies such as *high-voltage system maintenance, EV charging infrastructure, battery swapping, advanced EV driving, electronics, HVAC systems, compliance assessment*, and *specialized EV applications* (e.g., electric boats, wheelchairs, and two/three-wheelers) are not covered in any of the reviewed curricula.

The integration of EV competencies into existing automotive training programs is crucial in preparing a workforce that can meet the demands of the evolving mobility sector. **Table 5** below presents an analysis of the integration of key EV-related competencies across various automotive training courses. A **tick (✓)** indicates that the specific competency is **integrated** within the course curriculum, while an **'X'** symbol denotes that the competency is **not integrated.** **Table 6**, developed based on the findings from Table X, highlights the skills gaps present in the existing automotive programs. It identifies the specific areas where current training offerings lack sufficient coverage of EV technologies, thereby informing curriculum development and upskilling priorities.

Table 5: Analysis Against EV Job Tasks to be Performed

EV Competency	Auto Mechatronics L6	Auto Eng. L6	Auto-body (Dual) L6	Solar PV Tech L6	Auto Eng. L4	Auto Tech L4	Motorcycle Mech. L4	Auto Mech. L3	Motorcycle Mech. L3
Perform EV Rechargeable Battery Repair and Maintenance	✓	x	x	x	x	x	x	x	x
Install and Maintain EV Charging System and Infrastructure	x	x	x	x	x	x	x	x	x
Carry-Out EV Battery Charging and Swapping Station Equipment Operation	x	x	x	x	x	x	x	x	x
Carry-out Advance Driving for Electric Vehicles	x	x	x	x	x	x	x	x	x
Maintain and Repair EV Low Voltage Electrical Systems	✓	✓	x	x	✓	✓	✓	✓	✓
Maintain and Repair EV High Voltage Electrical Systems	x	x	x	x	x	x	x	x	x
Maintain and Repair Mechanical Electric Vehicle Systems	✓	✓	✓	✓	✓	✓	✓	✓	✓
Manage Electric Vehicle Electronics System	x	x	x	x	x	x	x	x	x
Assemble EV Components and Systems	x	x	x	x	x	x	x	x	x
Perform Assembly, Repair, and Maintenance of Electric Two- and Three-Wheelers	x	x	x	x	x	x	x	x	x
Assembly and Maintain Electric Wheelchairs	x	x	x	x	x	x	x	x	x
Perform Electric Boat Propulsion Systems Installations, Operations, and Maintenance	x	x	x	x	x	x	x	x	x
Conduct Compliance Assessments for Safety Standards in E-mobility	x	x	x	x	x	x	x	x	x

Table 6: E-Mobility Skills Gaps in Existing Automotive Course

	Automotive Program	Skills Gaps Identified:
1.	Automotive Mechatronics Technician – KNQF Level 6	• Insufficient coverage of full EV systems such as battery control units, drive motors, and EV diagnostics. • Limited focus on software integration and EV-specific sensor technologies.
2.	Automotive Technician – KNQF Level 5	• Absence of content on electric drivetrains, motors, controllers, battery systems, and EV-specific tools. • Limited competencies in EV diagnostics, CAN communication, and high-voltage safety practices
3.	Automotive Technician – KNQF Level 6	• Limited training in EV subsystems such as inverters, battery management systems, and regenerative braking technologies. • Inadequate skills in EV control software, system diagnostics, and integration of EV components.
4.	Solar PV Installation Technician – KNQF Level 6	• Missing content on EV charging infrastructure, solar-powered EV systems and DC fast charging protocols. • No integration of energy storage solutions for EV applications.
5.	Autobody Technician – KNQF Level 6	• EV structural fabrication: No training on battery enclosures, lightweight frames, or EV bus body design. • Integration of EV components: Missing skills in fitting motors, controllers, and wiring for electric wheelchairs and vehicles.
6.	Motorcycle Mechanics – KNQF Level 4	• Insufficient exposure to electric propulsion technologies, including battery systems, electronic controllers, and charging infrastructure. • Limited competencies in diagnosing faults in electric drive trains and managing high- and low-voltage electrical safety requirements.

3.1.3 Basic and Common Units Mapping Across Automotive Curricula

To guide curriculum enhancement for e-mobility, a **comparative matrix** (see Table 7 below) was developed to map the **basic and common units of competency** shared across multiple TVET qualifications. The matrix illustrates how foundational units are consistently structured across KNQF Levels 3 to 6, providing a strong basis for harmonizing future curricula.

The symbol 'x' highlights the distribution of basic and common units as follows:

- Level 3 – Automotive Mechanics (AUM): Basic and common units indicating entry-level competencies.
- Level 4 – Motorcycle Mechanics (MC) and Automotive Technology (AUT): Foundational units, reflecting technical progression.
- Level 5 – Automotive Technology (AUT): showing specialization at mid-level.
- Level 6 – Solar PV Installation (SPV), Automotive Mechatronics (AMT), Autobody Technology (ABT), and Automotive Technology (AUT): Advanced units, indicating higher-order skills and integration with emerging technologies.

This shared structure across qualifications demonstrates a coherent CBET framework. By adapting these existing units particularly the basic and common units Kenya can efficiently develop a scalable, inclusive, and industry-aligned EV curriculum, while remaining compliant with TVETA and TVET CDACC standards.

The matrix serves to emphasize that many of the basic and common units already exist within current curricula and can be adopted when designing new EV-related programs. This approach promotes efficiency, consistency and continuity in curriculum development.

Table 7: Structure Analysis of Basic and Common Units

Unit of Competency	KNQF LEVEL							
	AUM L3	AUM L4	MC L4	AUT L4	AUT L5	SPV L6	AMT L6	ABT L6	AUT L6
Basic Units of Competency Level 3	X								
Common Units of Competency Level 3	X								
Basic Units of Competency Level 4		x	x	x					
Common Units of Competency Level 4		x	x	x					
Basic Units of Competency Level 5					X				
Common Units of Competency Level 5					x				
Basic Units of Competency Level 6						x	x	x	x
Common Units of Competency Level 6						X	X	X	x

Strategic Direction Based on Analysis of Existing Automotive Courses

To enhance decision-making on curriculum reform, industry engagement, and standards development as Kenya prepares its workforce for the transition to e-mobility, the following strategic direction and options are proposed to inform the recommendations. These are based on the findings from the analysis of existing occupational standards and curriculum gaps.

Table 8: Strategic Direction Based on Analysis of Existing Automotive Courses

Strategic Direction:	**To support Kenya's transition to e-mobility, automotive training must remain relevant by integrating EV -related skills into existing programs. Curricula should be competency-based, modular, and aligned with the KNQF. A key focus is enriching current automotive courses-especially at KNQF Levels 5 and 6—by embedding core e-mobility concepts such as EV safety, battery systems, and diagnostics. This integration must respect the notional hour limits set by KNQA to avoid curriculum overload. The approach promotes upskilling, preserves trainee continuity, and enables institutions to modernize training without replacing established programs.**	
Strategic Options		
Strategic Option	**Description**	**Curriculum Development considerations**
Option 1: Create Sector-Specific EV Qualifications at KNQF Levels 3 and 4	Introduce qualifications tailored to priority e-mobility sub-sectors such as two/three-wheelers, EV boats, battery systems, and mobility devices	- Design sector-specific units and skill sets for each niche area - Ensure practical, job-role-based training with industry input
Option 2: Integrate E-Mobility Content into Existing Automotive Curricula	Embed key e-mobility concepts into existing automotive programs without replacing full curricula, especially at KNQF Levels 5 and 6	- Identify relevant content areas (e.g. EV safety, systems, diagnostics) - Integrate into existing modules through curriculum revision - Maintain alignment with KNQF and CBET principles

Option 3: Adapt Existing Basic and Common Units	Use shared TVET units as foundational building blocks for EV qualifications to ensure efficiency and scalability	- Identify and adapt relevant units across Levels 3–6 - Integrate EV themes and technologies where appropriate - Ensure compliance with CDACC and KNQF frameworks

3.2 Situational Analysis for E-Mobility Training and Skills Development

This section presents a contextual analysis of the current landscape of e-mobility training and skills development in Kenya. It begins with a SWOT analysis, identifying key internal strengths and weaknesses, as well as external opportunities and threats shaping the sector. This is followed by an examination of the training background of the existing e-mobility workforce, highlighting the diverse pathways through which workers have acquired their skills and the notable gaps in formal education and practical training.

Further, the section explores the regulatory and compliance requirements critical to the safe and effective practice of e-mobility, emphasizing the competencies now demanded by industry standards.

The analysis concludes with a strategic direction focused on building a skilled, adaptable, and future-ready workforce to support Kenya's e-mobility transition. This strategy is guided by insights from the strengths, weaknesses, opportunities, and threats (SWOT) analysis and the broader environmental considerations outlined in Build on Strengths, Eliminate Weaknesses, Exploit Opportunities, and Minimize Threats (BEEM) approach

3.2.1 SWOT-BEEM Analysis

Figure 7: SWOT-BEEM Analysis

The transition to e-mobility in Kenya not only offers significant opportunities but also presents notable challenges for training and skills development within the automotive sector. The situational analysis highlights key strengths, weaknesses, opportunities, and threats influencing the growth of EV skills development in Kenya. It is complemented by strategies to Build on Strengths, Eliminate Weaknesses, Exploit Opportunities, and Minimize Threats approach, providing a clear framework for enhancing training programs and curriculum design.

This analysis is presented through a SWOT-BEEM matrix, summarizing stakeholder perspectives and experiences gathered during a Stakeholders' Consultative Forum held on 25th March 2025 at Mövenpick Hotel, Nairobi. It also incorporates additional insights from industry visits to key players in Kenya's evolving e-mobility ecosystem.

Together, these findings provide a comprehensive understanding of the current landscape and inform the strategic considerations needed to develop a skilled, future-ready workforce to support Kenya's transition to sustainable e-mobility.

Table 9: SWOT-BEEM Analysis

SWOT – Training & Skills Development in E-Mobility	BEEM – Curriculum, Training, and Skills Development Strategies
[S]: Strengths – Existing advantages in EV training: • Established TVET institutions with CBET training capacity in Automotive course • Growing interest in green skills and sustainable mobility • Government support for CBET supported by TVET CDACC, TVETA and NITA • industry players willing to collaborate on skills development, supported by Dual Training Policy and Apprentice schemes by industrial Act	**[B]: How to Build on Strengths**: • Integrate EV maintenance, diagnostics, and battery technology into existing automotive training programs. • Develop a stand-alone industry-driven EV training curricula aligned with CBET principles. • Strengthen partnerships between TVET institutions and EV companies for internships and apprenticeships. • Upgrade training infrastructure to include EV labs, simulators, and digital learning tools.
[W]: Weaknesses – Challenges in EV training & skills development: • Inadequate trained trainers in EV technology on hands-on skills • Limited access to EVs, diagnostic tools, and training equipment in institutions • No standardized certification for EV skills in Kenya • Slow adaptation of TVET curricula to include EV-specific competencies	**[E]: How to Eliminate Weaknesses**: • Train and certify instructors on EV technology through Train-the-Trainer programs. • Partner with industry and government to subsidize EV training equipment and tools (dual training). • Develop a national EV skills certification framework aligned with industry needs. • Establish dedicated EV training centers of excellence with hands-on learning components.
[O]: Opportunities – Growth potential in EV training: • High demand for skilled EV technicians, engineers, and fleet operators • Expansion of online and blended learning for technical skills • Potential to become a regional hub for EV skills training in East Africa • Increased private sector interest in workforce development for EV adoption	**[E]: How to Exploit Opportunities**: • Establish specialized EV training programs targeting different skill levels (artisan, technicians). • Apply digital learning platforms for remote and self-paced EV training. • Promote Kenya as an EV training hub by collaborating with regional institutions. • Align skills training with global best practices to enhance employability in the EV sector.
[T]: Threats – Risks to EV training & skills development: • Resistance from ICE vehicle mechanics reluctant to transition to EV skills • Limited funding for EV training program implementation • Slow uptake of EVs in the market, affecting training demand	**[M]: How to Minimize Threats**: • Introduce upskilling programs and incentives for ICE mechanics to transition into EV repair. • Advocate for government and donor funding to support EV skills development. • Promote public awareness on the benefits of EVs to increase adoption and training demand.

3.2.2 Current Training Background of the E-Mobility Workforce

As part of this study, a total of **37 graduates** from automotive training programs across Kenya were interviewed to understand the current training background of the e-mobility workforce. The findings, illustrated in the accompanying chart, show that:

- 19 respondents (50%) had attained a university-level education,
- 14 respondents (38%) held TVET qualifications, and
- 4 respondents (12%) had acquired their skills through workplace-based learning, particularly on-the-job training.

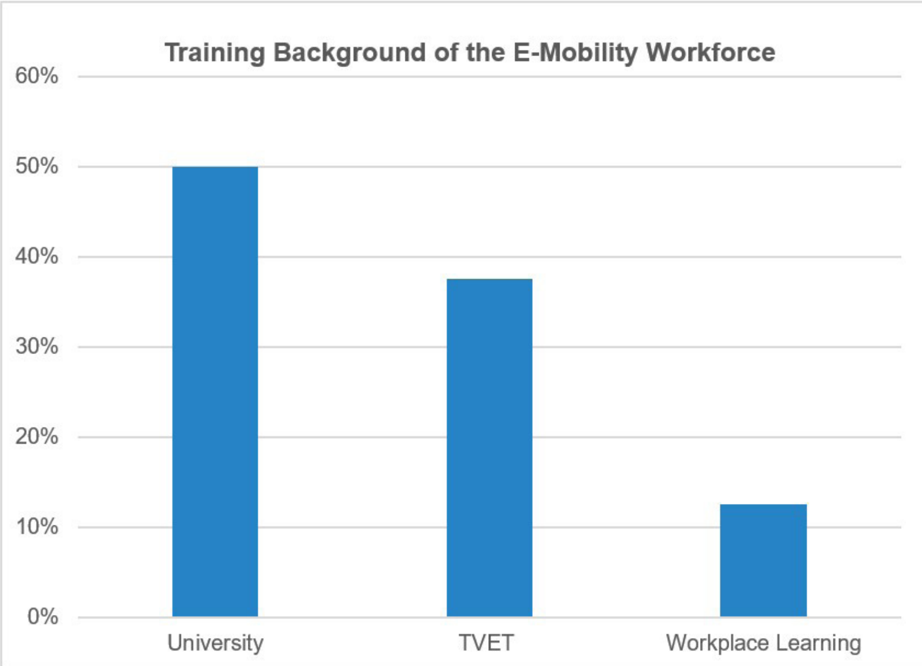


Figure 8: Training Background of the E-Mobility Workforce

Notably, individuals with university-level education indicated that e-mobility was not covered in their formal curriculum, and they had to acquire most EV-related knowledge through workplace exposure. A similar experience was reported by those with TVET qualifications, who also noted the absence of EV content in their training programs. These findings show a significant skills gap in e-mobility training, despite the presence of a growing and diverse workforce in the automotive sector. This highlights the need for curriculum reform to incorporate electric vehicle technologies across all levels of training.

During interviews with employers and industry representatives, a consistent theme emerged: while TVET graduates are generally well-equipped in internal combustion engine (ICE) competencies, they lack hands-on skills and foundational understanding of electric vehicle systems.
One industry manager noted:

> *"Most of the graduates we receive are competent with engines, transmissions, and diagnostics for diesel and petrol vehicles. But when it comes to electric vehicles, even the basics like battery management systems or regenerative braking, they're completely unfamiliar. We often have to retrain them from scratch."*
>
> **—Workshop Manager, Nairobi-based EV Fleet Operator**

To begin addressing this gap, key institutions like the **National Industrial Training Authority (NITA)** have initiated efforts to build trainer capacity in e-mobility. NITA is currently conducting a **five-day hands-on training program** aimed at equipping TVET trainers with **introductory knowledge and practical exposure** to EV technologies.

According to an interview with a NITA industrial training officer, the program is designed to familiarize trainers with industry-relevant EV systems, providing them with direct experience through practical sessions. This approach ensures that trainers can better integrate foundational EV concepts into their teaching and begin bridging the skills gap within technical training institutions.

In addition to NITA, private sectors like eBee Africa, WE! Hub, and MojaEV Kenya already offer internal training, highlighting the urgency for national, flexible training models. These findings are supported by the Youth Skills for E-Mobility, (2024) Report on Assessment of Skills and Knowledge Gaps Among Youths in E-Mobility, which stresses the need for industry-aligned training to equip young professionals for Kenya's growing e-mobility sector. This calls for a structured e-mobility reskilling through Continuous Professional Development (CPD) programs and workplace-based training.

3.2.3 Current Compliance and Regulatory Skills Requirement in E-Mobility

Figure 9: Cover page of Draft National E-Mobility Policy

Kenya's commitment to climate action is firmly embedded in the **National Climate Change Action Plan (2018–2022) and (2023 - 2027)** (KIPPRA, 2024). These commitments have catalyzed reforms across the transport sector to align with low-emission development goals. Key initiatives include updating the vehicle registration system to accommodate EVs, tightening importation standards, revising vehicle age limits, and developing electric vehicle standards (Wambugu, Kipkirui, Kamiri, Romano, & Maranga, 2021) steps that form the foundation of Kenya's emerging e-mobility regulatory ecosystem.

The **Draft National E-Mobility Policy (2024),** spearheaded by the Ministry of Roads and Transport, aims to position Kenya as a continental leader in e-mobility. Its mission is to guide the country toward a sustainable, efficient, and inclusive transport system powered by clean energy. Policy objectives include establishing a comprehensive legal framework, promoting local EV manufacturing and assembly, and strengthening technical skills across the e-mobility value chain.

This evolving landscape demands a strong focus on **compliance, safety, and environmental standards.** Stakeholders consulted through field visits, forums, and online surveys consistently emphasized the need for EV-specific training in these areas. Key technical skills highlighted include:

- Battery optimization and hazardous waste handling
- Regulatory compliance in emissions and recycling
- Environmental and electrical safety protocols
- Inspection and certification standards for EV infrastructure and components

Public and private sector actors including government ministries, development agencies, NGOs, and industry play complementary roles in policy formulation, infrastructure development, advocacy, and capacity building. Support for local manufacturing and technician training is growing, but more structured pathways are needed to **develop regulatory-aligned competencies.**

Ultimately, aligning Kenya's technical workforce with its regulatory ambitions is essential for achieving a safe, competitive, and sustainable e-mobility transition. Targeted compliance training and curriculum integration are key enablers of this shift.

3.2.4 Strategic Direction: Building a Skilled Workforce for Kenya's E-Mobility Transition

The **Situational Analysis** and stakeholder inputs, summarized in **Table 5: SWOT-BEEM Skills Gap Analysis**, highlight key strengths, gaps, opportunities, and risks in EV skills development. Based on these insights, the following strategic direction and options were formulated to guide the development of EV program. These strategies aim at bridging the current gaps in EV training, enhance institutional capacity, and prepare a workforce capable of supporting Kenya's transition to sustainable e-mobility.

Table 10:Strategic Direction: Building a Skilled Workforce for Kenya's E-Mobility Transition

Strategic Directon	**To support Kenya's transition to sustainable e-mobility, training and skills development must address current gaps while building on what is already working. This includes:** ■ Strengthening the capacity of automotive trainers in EV technologies ■ Planning for the upskilling and reskilling of the existing workforce ■ Improving training facilities and tools ■ Establishing EV Centres of Excellence ■ Ensuring that training programs follow regulatory and safety standards **These priorities will help create a skilled workforce that meets the needs of Kenya's growing e-mobility sector.**	
Strategic Options		
Strategic Option	**Description**	**EV Curriculum Development Considerations**
Option 1: Build Institutional Capacity for EV Training	Prepare TVET institutions to deliver EV programs by training instructors and improving training infrastructure	■ Set up EV labs, simulators, and diagnostic equipment ■ Roll out a national Train-the-Trainer program in EV technologies ■ Establish well-equipped EV Centres of Excellence in key regions
Option 2: Strengthen Industry Partnerships and Expand Upskilling Opportunities	Work with industry to offer hands-on training and provide current workers with pathways into the EV sector	■ Introduce dual training and apprenticeship programs with EV companies ■ Offer bridging courses for ICE mechanics, including upskilling, reskilling, and certification through Recognition of Prior Learning (RPL) ■ Promote access for underrepresented groups such as women and pWD
Option 3: Develop EV Curriculum Focused on Safety and Regulations	Create EV training programs that reflect safety, compliance, and current technology needs	■ Develop modules covering regulatory compliance, environmental safety, and emissions standards ■ Include practical training on battery repair, repurposing, and recycling ■ Ensure alignment with national and international EV standards

3.3 Women, Youth and Person with Disability

Kenya's e-mobility sector presents a transformative opportunity not only for sustainable transport but also for inclusive workforce development. Women, youth, and persons with disabilities (PWDs) remain underrepresented in technical education and green economy sectors, yet their participation is critical to achieving equitable and comprehensive growth. This section examines the current status, barriers, and opportunities for inclusion across these three priority groups. Drawing from national reports, institutional data, and stakeholder insights, it outlines targeted strategies to close gaps in access, training, and retention through a gender- and equity-responsive approach to curriculum and program design.

3.3.1 Women in E-Mobility

Women currently account for 40% of Kenya's e-mobility workforce, compared to 60% male participation as highlighted in the 2024 UNEP Baseline Report on Gender and E-mobility. Data collected in this study from **trainers and trainees** in automotive training institutions shows that for every ten male trainees, there are approximately **three female trainees**. While this ratio reflects low participation, it compares favorably with other engineering courses, where female enrolment is often absent.

The **automotive sector, therefore, presents a strategic entry point for increasing women's participation in technical fields**.

A trainer from an institution offering **Autobody Technology** noted:

"We still have very few female trainees in automotive courses, but those enrolled especially in Autobody are doing just as well as their male counterparts. What we need now are strategies to increase their access and support their participation."

A female trainee added:

"I enjoy working with tools and machines. At first, people were surprised to see a woman in this class, but now I feel accepted. Automotive is okay for us—we just need more support."

According to the Team Leader of **Green Women Accelerator**,

"Women in e-mobility have great potential for growth—all they need is accelerated training and empowerment to get there."

This insight highlights a critical gap in the sector: while opportunities exist, many women face structural barriers to entry and advancement. Addressing these calls for deliberate efforts to design training programs that are not only technically relevant but also accessible and supportive to women across different stages of their careers.

Thus, automotive seems to have an opportunity for more women inclusion. While modest progress has been made, this remains below the 50:50 gender balance recommended by the National Gender and Equality Commission (NGEC, 2025). According to P4G partnership, 2023 outlines specific barriers that women in e-mobility face this includes; limited access to technical training, socio-cultural perceptions, and low awareness of green transport careers.

Encouragingly, women perform the same technical roles as men. Women in E-Mobility (GIZ-Kenya, 2025) co created by the Flone Initiative with support frm GIZ project of promotion of e-mobility in Kenya are helping bridge the gap through training, mentorship, and leadership support, promoting a more inclusive sector (PROGRAM JUSTIFICATION, 2025).

To create a more gender-inclusive environment, institutions must adopt deliberate **access and participation strategies**, including:

- **Recruitment of female instructors**, who serve as visible role models and mentors
- **Training for instructors on gender-sensitive teaching methods**, addressing **unconscious bias**, inclusive classroom practices, and supportive learning environments
- **Outreach and awareness campaigns** to challenge stereotypes and promote automotive careers to young women

In addition to structural changes, these strategies will help normalize women's presence in automotive workshops and enhance their retention and performance in e-mobility programs.

3.3.2 Assessment of Training Needs for Persons with Disabilities (PWDs)

Figure 10: Image of Persons with Disabilities (PWDs) in e-mobility

The e-mobility sector offers meaningful opportunities for the inclusion and empowerment of Persons with Disabilities (PWDs). However, current participation—especially in technical training and roles—remains limited. A review of trainees enrolled in Automotive Technology Level 5 and 6 across four selected institutions revealed that none had encountered a fellow student with a disability pursuing the course.

This finding aligns with the Support Needs Assessment Report for PWD by the Kenya National Bureau of Statistics (KNBS, 2023), which outlines the systemic challenges that PWDs face in accessing vocational and technical training. The report underscores the need to eliminate barriers physical, institutional, and attitudinal—that continue to restrict PWD participation in technical education, including within the emerging e-mobility sector.

Despite the underrepresentation in formal training, PWDs are contributing to the sector in areas such as electric wheelchair innovation, customer support, fleet management, and software application. Their involvement in core technical positions remains very low, highlighting the need for inclusive curriculum reforms and accessible learning environments.

3.3.3 Youth in E-mobility

According to the **2023 Siemens Stiftung report**, *Unlocking the Growth Potential of Kenya's E-Mobility Sector*, the industry employed approximately **1,350 people** across diverse functions—ranging from engineering and assembly to operations and customer service. The 1093 of workers in Kenya's e-mobility (e-mobility) sector fall within the age bracket of 26–35 years, accounting for 81% of the workforce. Those aged 36–49 years (176) make up 13%, while only81 (6%) are aged 50 years and above. This strong representation of youth in the sector provides key insights into current workforce dynamics and future potential.

The 26–35 age bracket aligns closely with the typical entry age into the labour market, indicating that e-mobility is increasingly attracting young professionals. This generation is generally more open to technology, innovation, and green solutions—making them well-positioned to drive the adoption and growth of new mobility technologies.

Investing in e-mobility training at this formative stage of workforce entry can help create a pipeline of well-trained, future-ready professionals, and strengthen Kenya's position as a regional leader in sustainable transport solutions.

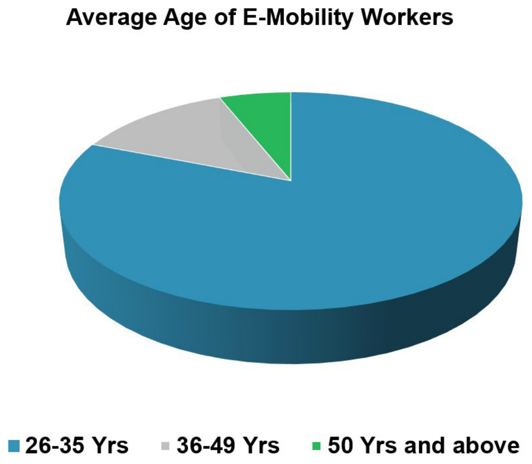


Figure 11:Average Age of E-Mobility Workers

Insights from trainers and trainees shows that despite the high participation of young adults, many of these individuals are already engaged in part-time or full-time work, making it difficult for them to attend conventional, full-day classes.

> *"Most of our trainees are working in garages or small EV start-ups. They want options like evening, online, or blended classes so they can learn without leaving their jobs,"*

noted one instructor from a Nairobi-based training institution.

A male trainee added:

> *"I'm interested in more than just mechanical skills I'd like to learn about EV software, diagnostics, and smart technology. That's where things are heading."*

These insights point to a clear need to modernize training delivery and content to meet the expectations and schedules of a younger, tech-savvy workforce.

Industry interviews indicated a strong need to **nurture young workers through structured mentorship**:

> *"Young people are eager, but they lack mentors. We've seen real value in dual training models where industry veterans work closely with trainees,"*

shared a technical lead from a local EV company.

This aligns with global research showing that **mentorship improves retention, performance, and leadership development** in vocational sectors (ILO, 2020; UNESCO-UNEVOC, 2021).

3.3.4 Strategic Direction: Promoting Inclusion of Women, Youth, and Persons with Disabilities in E-Mobility Training

Table 11: Strategic Direction: Promoting Inclusion of Women, Youth, and PWD in EV

Strategic Direction	**Current automotive training programs show low participation of women, youth, and persons with disabilities (PWDs) in technical roles. As Kenya shifts to e-mobility, there is a clear need to make training more inclusive. The strategy is to design programs that improve access, support learning, and create fair opportunities. This includes outreach to underrepresented groups, adapting training materials and tools, providing bridging and foundation courses, ensuring accessibility in training facilities, and building links with industry for internships and jobs. These actions will help build a diverse and skilled workforce for Kenya's e-mobility sector.**	
Strategic Option	**Description**	**Curriculum and Training Considerations**
Option 1: Adapt EV Curriculum for Inclusive Participation	Review and revise EV curricula to remove barriers and encourage participation of women, youth, and PWDs	• Use inclusive language and gender-sensitive examples in training materials • Integrate Universal Design for Learning (UDL) principles • Include diverse role models and success stories in course content
Option 2: Introduce Accelerated Training Programs	Develop short, focused EV training courses to support faster entry into the workforce for underrepresented groups	• Design intensive, practical modules on basic EV systems, battery care, and diagnostics • Offer flexible delivery schedules to suit different learner needs • Partner with youth, women, and disability organizations for outreach and recruitment • Align programs with national certification to ensure recognition
Option 3: Promote Accessible and Safe Training Environments	Upgrade training facilities to ensure physical and instructional accessibility	• Ensure availability of ramps, adapted tools, and inclusive signage • Provide safety gear suitable for women and learners with disabilities • Train instructors on inclusive pedagogy and safety considerations
Option 4: Strengthen Industry Linkages for Inclusive Pathways	Build partnerships to create inclusive work-based learning and employment opportunities	• Collaborate with employers to offer internships and apprenticeships targeting women, youth, and PWDs • Encourage inclusive hiring and mentorship practices • Recognize employers who support inclusive training and employment

3.4 Skills Gap Analysis

This section provides a detailed review of the current skills gaps in Kenya's e-mobility sector, aimed at guiding the development of relevant and responsive training programs. It begins by examining whether e-mobility competencies should be integrated as add-ons to existing automotive curricula or developed as a stand-alone training pathway, depending on the required level of depth and specialization.

It then presents an industry demand assessment, identifying the most critical occupational skills, which informs Strategic Direction 3 (Table 6) — the development of a structured e-mobility curriculum framework that reflects employer needs and hiring priorities.

Following this, a thematic analysis categorizes the priority skills into four core focus areas: EV Fabrication and Assembly, EV Usage and Maintenance, EV Charging Systems, and EV Afterlife Management. These focus areas underpin Strategic Direction 6 (Table 12), which outlines the design of a cooperative dual training model, blending classroom instruction with practical, industry-based learning. This analysis also informed the development of detailed performance statements across KNQF levels, presented in the Annex.

3.4.1 E-Mobility Curriculum Determination: Add-On or Stand-Alone

As Kenya transitions toward sustainable mobility solutions, a key consideration for training institutions is how best to structure e-mobility training. As Kenya advances its agenda for sustainable transport, training institutions and industry stakeholders are faced with a critical decision: should e-mobility (e-mobility) training be embedded within existing automotive programs as an *add-on*, or should it be offered as a *stand-alone modular curriculum*?

This question lies at the heart of skills development planning, especially as the country prepares a workforce capable of supporting the emerging EV system.

A skills gap analysis conducted among TVET institutions revealed a relatively balanced perspective:

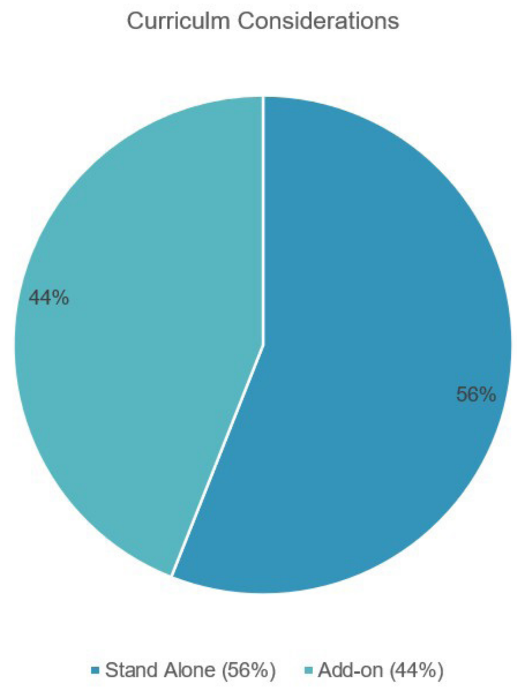


Figure 12: Curriculum Considerations

- **56% of respondents favored a stand-alone modular curriculum**, emphasizing the need for focused training and specialization.
- **44% supported the add-on model**, citing cost-effectiveness and ease of integration into current programs.

From qualitative consultations, **industry players strongly leaned toward the stand-alone approach**, particularly for roles involving advanced systems and safety-critical operations. The rationale is to produce specialists with a deep understanding of EV components, diagnostics, and maintenance protocols-skills that are difficult to develop through brief add-on modules.

"For electric two- nd three-wheelers, we need technicians who are not just familiar with the vehicles, but who deeply understand battery dynamics, power control, and motor integration. A full course dedicated to this segment is necessary."

— Interview 003-

"When it comes to electric buses, there is no room for trial and error. We need well-trained professionals who understand EV architecture, high-voltage safety, and thermal management. This cannot be covered adequately through add-ons."

— Interview 007-KVM

The "add-on" model helps trainees learn basic EV skills like safety and simple diagnostics. However, a stand-alone course gives trainees a chance to study EV systems in more detail. This approach is already being used in Kenya through NITA's new Electric Vehicle Assistant Technician Level 3 program, which is ready for piloting. Since there is no national EV training plan yet, private groups like Advanced Mobility are filling the gap by offering focused EV training.

Other countries show that stand-alone EV training works well. In Germany, RWTH Aachen University offers a full course on battery-powered vehicles (RWTH Aachen University, n.d). The course covers everything from design to building EV systems. Additionally, through its International Academy, it provides **modular short courses** in areas like Advanced Driver Assistance Systems (ADAS), which serve as specialized add-ons for professionals already in the automotive sector. In India, the Automotive Research Association of India (ARAI) runs short , stand-alone EV courses that focus on battery safety, power systems, and cooling (Automotive Research Association of India, 2023). These are supplemented by a range of modular, add-on e-learning units spanning EV architecture, BMS, charging infrastructure, and high-voltage safety—enabling technicians to upskill without committing to full-length programs. In Uganda, Makerere University started a full EV skills program to prepare technicians for electric buses and motorcycles, working with Kiira Motors and UNDP (Makerere University, 2024).

Global examples demonstrate that stand-alone EV courses effectively equip learners with specialized skills aligned to industry needs and emerging job roles. In parallel, many institutions also offer add-on modules that build foundational EV knowledge within existing automotive programs. These approaches are not mutually exclusive but rather complementary enabling both full qualification pathways and flexible upskilling opportunities.

For Kenya, introducing a comprehensive stand-alone EV curriculum at KNQF Levels 5 and 6 would address the current skills gap and support the transition to e-mobility. While stand-alone programs offer in-depth, focused training, add-on modules provide a basic route for working professionals and students to acquire targeted EV competencies without committing to full-length programs.

Most automotive training programs in Kenya focus on internal combustion engine (ICE) technologies. Apart from the **Automotive Mechatronics course at Nairobi National Polytechnic,** which includes limited hybrid content, **EV systems are largely missing** from existing curricula. This presents a skills gap that must be addressed to align training with industry trends and emerging mobility needs.

Two curriculum development approaches were considered:

- **Integrating EV content as add-on units** to current programs
- **Developing a stand-alone modular EV curriculum**

Each approach has its own strengths and challenges, as summarized below:

Table 12:Pros and Cons of EV Curriculum Development Options

Approach	Pros	Cons
Add-on to Existing Programs	- Cost-effective and uses current infrastructure - Enables gradual skill development - Easier to roll out	- Limited depth due to time constraints - May not fully equip learners for EV-specific roles - Risk of superficial coverage
Stand-alone Modular Curriculum	- Comprehensive and focused EV training - Aligns with industry certification - Clear progression pathways	- Requires significant resources - Needs new labs and trainers - Longer development time

Based on this analysis, the **stand-alone modular curriculum** is better suited for developing full EV competencies. However, the **add-on option** remains useful for quickly enhancing general awareness and upskilling learners within existing programs.

Table 13: Strategic Direction: Development of an E-Mobility Curriculum Framework

Strategic Direction	**Develop a national E-Mobility Curriculum Framework to meet the rising demand for e-mobility skills and align Kenya's training system with global trends in sustainable transport. The framework will include the development of stand-alone, modular, competency-based curricula for key occupational levels and promote a dual training model that combines classroom instruction with hands-on industry experience.** **It will also support the upskilling, reskilling, and certification of the existing workforce through Recognition of Prior Learning (RPL), ensuring no one is left behind in the transition. Additionally, the strategy will focus on building the capacity of in-company trainers and master craftspersons to deliver high-quality, industry-relevant EV training.**	
Strategic Option		
Strategic Option	**Description**	**EV Curriculum Development Considerations**
Option 1: Develop Stand-Alone Modular Curricula at KNQF Levels 5 and 6	Create comprehensive, competency-based EV training programs for mid-level technicians and specialists	• Cover diagnostics, assembly, maintenance, battery systems, systems integration, and high-voltage safety • Include elective modules for niche applications (e.g., EV boats, mobility devices)
Option 2: Develop Sector-Specific Qualifications at KNQF Levels 3 and 4	Design practical qualifications targeting artisans and MSME workers in the informal and formal sectors	• Focus on EV maintenance for two- and three-wheelers, boats, and electric wheelchairs • Use flexible, modular formats suitable for entry-level learners • Emphasize hands-on training to enhance employability
Option 3: Upskill, Reskill, and Certify the Existing Workforce	Provide pathways for current workers to gain EV skills and formal recognition through CPD and RPL	• Develop short EV refresher courses and modular CPD programs • Establish RPL assessment tools aligned with national standards • Target ICE mechanics, technicians, and auto electricians for transition support
Option 4: Build the Capacity of In-Company Trainers and Master Craftspersons	Strengthen the ability of workplace-based trainers to deliver practical, up-to-date EV instruction	• Create EV-specific training-of-trainers (ToT) programs • Develop toolkits and guidelines for in-company EV training • Partner with industry associations and employers to institutionalize mentorship and knowledge transfer

3.4.2 Industry Demand Assessment on Occupational Skills

Table 10 presents the results of a descriptive analysis involving a sample of 12 industry stakeholders, who were asked to identify the most critical skills they would consider when hiring an e-mobility technician. Respondents evaluated each skill using a **5-point Likert scale**, where:

- **1 = Very Unlikely**
- **2 = Unlikely**
- **3 = Neutral**
- **4 = Likely**
- **5 = Extremely Likely**

Higher mean scores therefore indicate skills that are more likely to be prioritized by employers in the e-mobility industry.

Table 14: Descriptive Statistics, Critical Aspects if you were to Hire

	Skill Area	Mean (Likert 1-5)	Std. Deviation
1.	Maintain and Repair Electric Vehicle low Voltage Electrical Systems	4.90	0.263
2.	Repair and Maintain Electric Vehicle Rechargeable Battery	4.85	0.218
3.	Maintain and Repair Electric Vehicle low Voltage Electrical Systems	4.75	0.318
4.	Assemble and repair Electric Two- and Three-Wheelers	4.62	0.518
5.	Assemble EV Components and Systems Installation and Integration (Assembly of EV)	4.62	0.518
6.	Carry-out EV Battery Charging Station maintenance and Operation	4.37	0.518
7.	Repair and Maintain EV Electronics System	4.25	0.463
8.	Install and Maintain EV Charging System and Infrastructure	3.90	0.518
9.	Repair and Maintain Heating Ventilation and Air Conditioning (HVAC) EV Systems	3.75	0.463
10.	Perform Advanced Driving for Electric Vehicles	3.62	0.518
11.	Perform E-Mobility Compliance and Safety Standards	3.5	0.535
12.	Repair and Maintain EV Mechanical Systems	3.37	0.518
13.	Carry out E-Mobility Competency Based Training	2.75	0.463
14.	Assemble and repair Electric Wheelchairs	2.70	0.354

The findings from the this study show a pattern in the skills most valued by industry stakeholders in the e-mobility sector. Leading the list is the ability to **maintain and repair low voltage electrical systems**, with a mean score of **4.90**. This skill is considered essential across all EV types, forming the backbone of electrical diagnostics and control functions. It was repeatedly emphasized during the stakeholder workshop that without this foundational competence, technicians would struggle to engage meaningfully in EV servicing and maintenance.

Closely following are the skills to **repair and maintain rechargeable batteries** (4.85) and **high voltage systems** (4.75). These were highlighted in the group discussions as critical to both safety and performance, given the high risks and energy loads associated with EV battery packs. Stakeholders noted that as battery-related incidents rise with increased EV usage, demand for battery specialists will continue to grow, particularly for roles involving diagnostics, cell replacement, and repurposing.

Skills related to **assembly and repair of electric two- and three-wheelers** and **EV systems integration** both received strong support (mean score of **4.62**). These findings are particularly relevant in the Kenyan context, where the local market for electric motorcycles and tuk-tuks is expanding rapidly. Participants in the stakeholder forum observed that light e-mobility is not only the most accessible entry point for low-income users but also a promising source of local manufacturing jobs.

Further down the list, but still well regarded, are competencies in **EV charging station maintenance** (4.37), **repair of EV electronics** (4.25), and **installation of EV charging infrastructure** (3.90). These areas were discussed as essential for ensuring reliability and safety across the charging network. Several companies shared their efforts in training technicians for charger installation and software troubleshooting.

Repair and maintenance of HVAC systems (3.75) and **advanced driving for electric vehicles** (3.62) received moderate ratings. These skills are seen as supplementary and important but often acquired through additional training or gained on the job. **Compliance with safety standards** (3.50) also fell in this range, with many stakeholders noting that internal protocols and partner led training often reinforce such requirements.

At the lower end, **mechanical system repair** (3.37), **competency-based training delivery** (2.75), and **wheelchair assembly and repair** (2.70) were considered less critical by most respondents. While these roles remain important in specific contexts, such as technical education and assistive mobility, they are not central to the current industry hiring priorities. Stakeholders agreed that while these skills matter, the focus remains on electrical and battery-related competencies for now.

In addition to technical skills, **open discussions during the stakeholder meeting** underscored a growing need for talent in **digital and software-based roles**. These roles support advanced EV functions such as predictive maintenance, energy optimization, and smart fleet management. Other emerging needs include **sales agents**, **urban transport planners**, and **regulatory officers**, who help bridge the technical, customer, and policy aspects of Kenya's e-mobility transition.

The analysis supports the broader role that **private sector companies are playing in bridging the e-mobility skills gap** and actively shaping Kenya's electric transport landscape. The top-rated skills identified in the survey align closely with those being emphasized in emerging training programs. Companies are not only innovating in areas like **local EV assembly** (Siemens Stiftung, 2024), **charging infrastructure deployment** (P4G Partnerships, 2025), and **technical training delivery** (WTS Foundation, 2025), but also fostering job creation across the e-mobility value chain. These contributions reflect a growing commitment to building a skilled workforce that can support the sector's long-term growth and sustainability.

3.4.3 Thematic Analysis of Priority Skills in Kenya's E-Mobility Sector

The findings of this study confirm that skills required in Kenya's e-mobility industry can be grouped into four thematic categories reflecting key pillars of the ecosystem as outlined in Figure 1.0: EV Fabrication and Assembly, EV Usage and Maintenance, EV Charging Systems, and EV Afterlife Management. These themes provide a practical lens through which to interpret the mean scores reported in Table 10 and help identify where targeted investment in training, curriculum design, and workforce development is most needed.

EV Fabrication and Assembly

This category aligns with the EV Fabrication and Assembly pillar, which includes electric buses, motorcycles, tuk-tuks, and electric wheelchairs. While only a limited number of enterprises in Kenya are currently engaged in local EV manufacturing, This study findings indicate growing demand for roles in this area particularly for light e-mobility.
Skills such as Assemble and Repair of Electric Two- and Three-Wheelers and EV Systems Integration both received a mean score of 4.62, suggesting industry recognition of their relevance, particularly in light of the expanding boda-boda and tuk-tuk market. However, stakeholder discussions revealed that most technicians involved in assembly still come from traditional mechanical or automotive backgrounds, with limited formal exposure to electric drivetrains, battery integration, and digital control systems.

This skills gap shows weak institutional preparedness in this category. A promising model is BasiGo's collaboration with Kenya Vehicle Manufacturers (KVM), which has not only accelerated EV bus assembly but also advanced gender inclusion in technical roles. Still, most current training is facilitated by Original Equipment Manufacturers (OEMs) and international partners, with minimal involvement from local institutions highlighting the need for structured local capacity-building initiatives.

EVs usage, Maintenance and Repair

This theme corresponds to the EV Usage and Aftersales Services pillar and emerged as the strongest skills area in the survey. Core competencies such as:

- Maintain and Repair Low Voltage Electrical Systems (Mean = 4.90),
- Repair Rechargeable Batteries (4.85),
- Repair High Voltage Systems (4.75),
- Repair EV Electronics (4.25)

were rated as the most critical by employers. These skills form the foundation of diagnostics, safety, and efficient operation of EVs and are essential to supporting end users, managing warranty claims, and ensuring vehicle reliability.

However, discussions with stakeholders pointed to persistent gaps in diagnostic software, electronic control systems, and high-voltage safety issues. These areas are not well-covered in conventional automotive training programs. Industry participants emphasized the urgency of establishing structured certification pathways for EV service technicians, especially in areas such as insulation testing, thermal management, and software diagnostics—skills that are increasingly vital in both private and fleet maintenance environments.

EV Charging Infrastructure and System

This theme falls under the EV Charging Infrastructure and System pillar of the e-mobility ecosystem. The ability to install and maintain charging stations is foundational to user trust and wider EV adoption. In the survey, Charging Station Maintenance (Mean = 4.37) and Charging System Installation (3.90) were both moderately rated, reflecting a growing need—but also limited readiness.

Stakeholders noted that traditional electrician training programs in Kenya are not adequately equipping technicians with the knowledge needed for DC fast charging systems, smart grid interfacing, or renewable energy integration. As a result, most technicians currently learn these systems informally or through equipment-specific training provided by foreign partners. This approach leads to inconsistent quality and raises concerns over safety, regulatory compliance, and consumer protection.

As of 2023, Kenya still lacks a national certification framework for EV charging system technicians (EHS Insight, 2023). Stakeholders stressed the importance of developing formal training standards and accreditation mechanisms to support safe and scalable infrastructure deployment.

EV Afterlife Management

This theme cuts across two pillars: EV Afterlife Management and EV Usage, especially in relation to battery care, reuse, and circular economy practices. Although Battery Repair and Maintenance received one of the highest ratings in the survey (Mean = 4.85), insights from parallel TNA show significant capacity gaps in Battery Management Systems (BMS), lithium-ion safety, and second-life applications, with some roles scoring as low as 1.20 in broader analyses.

There is limited awareness among technicians about safe handling of end-of-life batteries, recycling protocols, and thermal risk mitigation—all of which are crucial as Kenya scales up EV usage. Stakeholder dialogue pointed to an urgent need for specialized training in battery diagnostics, refurbishment, and sustainable disposal, particularly as regulations on environmental compliance begin to tighten.

This thematic analysis confirms that workforce development in Kenya's e-mobility sector is progressing, but unevenly across pillars. Maintenance and repair competencies are clearly prioritized, while assembly, charging systems, and battery afterlife management require more focused investment and institutional support. The alignment between the findings in Table 10 and the ecosystem model presented in Figure 1.0 provides a useful structure for policy, training, and curriculum design aimed at developing a workforce capable of supporting a safe, inclusive, and locally driven transition to e-mobility.

Table 15: Strategic Direction: Designing a Cooperative Dual Training E-Mobility Curriculum

Strategic Direction 6	**Emphasizes the development of a dual training e-mobility curriculum that aligns with real industry needs. The strategy applies strong industry-academia collaboration and organizes critical technical roles around four key pillars of the e-mobility system.**	
Strategic Option	Thematic Area	Focus Competencies
1. Establish Dual Training Partnerships	Industry-Academia Integration	Partner with private sector firms and regulatory bodies (e.g., NITA, TVETA) to co-develop cooperative curriculum modules. Implement dual training models that blend theoretical classroom learning with hands-on, in-plant experience.
2. Develop Skills in EV Fabrication and Assembly	EV Fabrication and Assembly	- Assemble EV Components and Systems - Perform Assembly, Repair, and Maintenance of Electric Two- and Three-Wheelers - Assembly and Maintenance of Electric Wheelchairs - Perform Electric Boat Propulsion Systems Installations, Operations, and Maintenance
3. Strengthen EV Usage and Maintenance Competencies	EV Usage and Maintenance	- Maintain and Repair Low Voltage Electrical Systems - Maintain and Repair High Voltage Electrical Systems - Maintain and Repair Mechanical EV Systems - Manage Electric Vehicle Electronics System - Maintain and Repair EV HVAC Systems - Carry-out Advanced Driving for Electric Vehicles
4. Expand Training in EV Charging Systems	EV Charging Systems	- Install and Maintain EV Charging System and Infrastructure - Carry-Out EV Battery Charging and Swapping Station Equipment Operation
5. Build Capacity for EV Afterlife Management	EV Afterlife Management & Compliance	- Perform EV Rechargeable Battery Repair and Maintenance - Conduct Compliance Assessments for Safety Standards in E-mobility

CHAPTER 4: RECOMMENDATIONS & ACTION POINTS

4.0 Introduction

This chapter presents strategic recommendations to guide the development of a responsive and inclusive e-mobility (e-mobility) training system for Kenya. The recommendations are based on the findings of the skills and training needs analysis, stakeholder consultations, labour market demands, and reference to international best practices. They are organized into eleven strategic directions, focusing on curriculum development, workforce readiness, and the long-term growth of the e-mobility sector.

4.1 Develop Stand-Alone Modular Curricula for EV Systems at K-L 5 and 6

One of the key recommendations that takes a center stage in this report was the unanimous concurrence of developing a Stand-Alone Curriculum to support training in the emobility sector. A stand-alone curriculum refers to an independent e-mobility, a stand-alone curriculum. It allows trainees to specialize in EV systems without diverting into traditional internal combustion engine technologies. Developing modular, stand-alone curricula at KNQF Levels 5 and 6 is important towards preparing mid-level technicians and technologists with specialized EV, knowledge and skills.

Strategic Objective:	**Develop and implement stand-alone competency-based, modular curricula at KNQF Levels 5 and 6 to produce skilled EV systems specialists' technicians.**
Action Points:	▪ Design competency-based modular courses covering EV diagnostics, battery technologies, electric drivetrains, and high-voltage safety protocols. ▪ Align the curriculum content with local industry requirements and global best practices to ensure relevance and employability. ▪ Pilot the curricula with selected institutions and validate through consultations with industry, regulatory bodies, and professional associations.

4.2 Create Sector-Specific Qualifications at KNQF Levels 3 and 4

Sector-specific qualifications are designed to equip artisans with specialized technical skills in distinct areas of the e-mobility sector. These include EV motorcycle repair, electric three-wheeler maintenance, electric wheelchair servicing, EV boat propulsion systems, and battery management. Developing such targeted qualifications at KNQF Levels 3 and 4 will provide hands-on, job-ready competencies, promote employment, and support the growth of Kenya's e-mobility ecosystem.

Strategic Objective:	**Develop sector-specific qualifications at KNQF Levels 3 and 4 to prepare artisans and technicians for specialized roles in e-mobility.**
Action Points:	▪ Design qualifications tailored to specific sectors such as EV two-wheeler maintenance, three-wheeler repair, electric wheelchair servicing, EV propulsion boats, and battery system management. ▪ Embed practical, competency-based assessments to validate the readiness of trainees for real-world tasks. ▪ Engage industry stakeholders during curriculum development to ensure alignment with operational demands and technology trends.

4.3 Integrate E-Mobility Units into Existing Automotive Standards

Integration refers to the process of incorporating new content into an existing curriculum to enhance its relevance without replacing the entire program. In this case, it involves embedding key e-mobility concepts into current automotive training programs, such as those for automotive technicians at KNQF Levels 5 and 6. This ensures that trainees acquire essential knowledge and skills in electric vehicle systems while building on their core automotive competencies.

Strategic Objective:	**Embed foundational e-mobility knowledge, skills, and competencies into existing automotive occupational standards.**
Action Points:	▪ Introduce modules on EV fundamentals, operational principles, and safety protocols. ▪ Update curricula incrementally to reflect technological advancements in e-mobility. ▪ Build the capacity of current automotive instructors to deliver EV-related content effectively.

4.4 Strengthen the Capacity of Trainers in E-Mobility

Developing a competent and future-oriented training workforce for e-mobility requires deliberate reskilling, upskilling, and retooling of automotive TVET trainers. Building a robust pool of Trainer of Trainers (ToT) is vital for scaling EV training across the country. This must combine classroom instruction with hands-on industry experience. Efforts should also focus on increasing the number of women trainers to ensure inclusive, gender-responsive teaching and equitable representation in technical fields.

Strategic Objective:	**Develop an industry-anchored ToT framework to enhance the technical and instructional capacity of EV trainers, with a focus on inclusivity and practical competence.**
Action Points:	▪ Implement a national ToT program covering EV systems, diagnostics, and high-voltage safety. ▪ Facilitate structured industry collaboration to expose trainers to real-world technologies and work environments. ▪ Actively recruit and mentor women into ToT programs to foster inclusive training environments.

4.5 Up-Skill, Re-Skill, and Certify the Existing Workforce through RPL

The existing workforce includes individuals already working in the automotive sector who are no longer in school and continue to build their skills through on-the-job training. As the industry transitions to e-mobility, it is important to equip these workers with updated competencies through structured learning opportunities. In addition to training, there is also a need to assess and formally certify workers who have already gained relevant skills through experience. Recognition of Prior Learning (RPL) provides a pathway for such individuals to be acknowledged and certified, enhancing their employability and mobility within the sector.

Strategic Objective:	**Implement targeted upskilling, reskilling, and certification programs through Continuous Professional Development (CPD), apprenticeships, and Recognition of Prior Learning (RPL).**
Action Points:	▪ Strengthen workplace-based apprenticeship opportunities in collaboration with industry partners. ▪ Develop short, flexible, and modular certification programs aligned with emerging EV technologies. ▪ Establish a Recognition of Prior Learning (RPL) framework to assess and certify experienced workers with informal or non-formal EV skills.

4.6 Establish E-Mobility Centres of Excellence

Centres of Excellence (CoEs) play a vital role in advancing innovation, research, and high-level technical training in the e-mobility sector. Establishing CoEs will help standardize quality training, support curriculum development, and serve as hubs for testing new technologies. These centres will also strengthen collaboration between training institutions, industry, and policymakers, ensuring that skills development is aligned with technological trends and labour market needs.

According to the TVET Standards 06:2023 establishing a Centre of Excellence in TVET requires a critical focus on specialized training and instructional structures. A key requirement is the identification and development of a specialized training focus area that allows the institution to tailor its curriculum and build competency around specific industry needs. Institutions must employ highly qualified and competent training staff who possess relevant academic qualifications and substantial experience in their respective technical fields. (TVET Authority, 2023).

Continuous professional development of staff through effective training programs to keep them abreast with the current trends in the training. Such initiatives ensure that trainers remain current with technological trends, pedagogical advances, and shifts in industry practices. This reinforces a culture of excellence and innovation, positioning the Centre as a suitable hub for conducting both training and research. These foundational requirements; specialization, qualified personnel, and continuous capacity-building form the backbone of a successful Centre of Excellence in TVET training (TVET Authority, 2023).

Strategic Objective:	**Establish and operationalize E-Mobility Centres of Excellence to serve as national hubs for advanced skills training, research, and innovation.**
Action Points:	▪ Upgrade selected institutions with specialized EV infrastructure and equipment. ▪ Partner with industry to support internships, mentorship, and knowledge transfer. ▪ Create innovation labs focused on green mobility technologies and solutions.

4.7 Promote Inclusion of Women, Youth and PWDs in E-Mobility Training

Inclusive training is essential to ensure equal participation of women and persons with disabilities in the e-mobility sector. Social and structural barriers often limit their access to technical fields. Training programs should be designed to be accessible, flexible, and supportive. Institutions, industry, and government must work together to integrate inclusion in curriculum design, delivery, and support services, thereby broadening the skilled workforce and promoting equitable participation in the sector.

Strategic Objective:	**Embed gender and disability inclusion principles in curriculum design, delivery, and access strategies.**
Action Points:	▪ Integrate inclusive content, gender-sensitive language, and leadership modules into training programs. ▪ Provide scholarships, flexible schedules, and support services such as childcare to increase women's participation. ▪ Develop accessible learning materials and integrate assistive technologies to support learners with disabilities. ▪ Build the capacity of instructors to deliver inclusive and gender-responsive training.

4.8 Design and Implement a Cooperative Dual Training Model

Building on lessons from the ongoing dual training programs supported by GIZ, a key achievement has been the ability of trainees to acquire practical, hands-on skills in actual work environments. This real-world exposure strengthens the link between theory and practice, making learning more relevant and applicable. The dual training approach, supported by national policy, offers a structured pathway to align training with industry needs, enhance employability, and produce job-ready graduates for the e-mobility sector.

Strategic Objective:	**Establish dual training programs that integrate classroom instruction with structured industry-based learning for the EV curriculum at KNQF Levels 5 and 6.**
Action Points:	▪ Develop curricula with clearly defined on-the-job training components in EV servicing, battery systems, and electronics. ▪ Build partnerships with EV companies, workshops, and fleet operators to host trainees. ▪ Encourage training institutions to adopt and institutionalize the dual TVET model.

4.9 Embed Compliance and Regulatory Training in E-Mobility Programs

As e-mobility continues to grow in Kenya, there is a need to ensure that workers understand the rules and safety guidelines that govern the sector. This includes handling of high-voltage systems, safe battery disposal, and protection of the environment. Including compliance and regulatory training in e-mobility programs helps promote safe practices, meet legal requirements, and support sustainable development. Short courses can also be offered to officers already working in related fields.

Strategic Objective:	**Include regulatory, safety, and environmental standards in all e-mobility training programs, including Continuous Professional Development (CPD) for relevant officers.**
Action Points:	■ Develop training content on battery recycling, hazardous materials, and environmental protection. ■ Work with regulatory agencies to ensure the training is up to date. ■ Encourage the use of circular economy practices in EV operations.

4.10 Build Capacity of In-Company Trainers and Master Craftsperson

In-company trainers and master craftsperson play a key role in shaping the skills of trainees through hands-on learning in real work environments. Their expertise and mentorship are essential in transferring practical knowledge, reinforcing safety practices, and promoting quality workmanship in the e-mobility sector. Strengthening their capacity in pedagogy, andragogy, and mentorship ensures effective workplace learning and helps bridge the gap between theory and practice in EV training.

Strategic Objective:	**Enhance the instructional, mentorship, and technical delivery skills of in-company trainers and master craftsperson to support effective workplace learning in the e-mobility sector.**
Action Points:	■ Develop a structured EV training manual tailored for in-company trainers and master crafts persons. ■ Organize regular training workshops on workplace instruction, mentorship, and adult learning techniques. ■ Establish a recognition and support system to motivate and retain skilled workplace trainers.

4.11 Establish E-Mobility Sector Skills Advisory Committee

To ensure industry-led alignment, sustainability, and responsive training in the e-mobility sector, it is critical to establish a dedicated E-Mobility Sector Skills Advisory Committee. This committee will provide a structured platform for continuous dialogue between training institutions, government bodies, industry players, and regulatory agencies. It will offer guidance on curriculum development, labour market trends, technological shifts and quality assurance in e-mobility training.

Strategic Objective:	**Establish a national E-Mobility Sector Skills Advisory Committee to guide the coordination, quality, and industry relevance of e-mobility training in Kenya.**
Action Points:	■ Formally constitute a multi-stakeholder advisory committee with representation from public and private sectors, training institutions, employer organizations, and development partners. ■ Define clear terms of reference including skills forecasting, curriculum review, internship facilitation, and policy advisory roles. ■ Facilitate regular meetings and reporting mechanisms to inform national skills development strategies in the evolving e-mobility space. ■ Align the committee's work with the Kenya National Qualifications Framework (KNQF) and existing skills development policies for coherence and sustainability.

4.12 Conclusion

The successful adoption of e-mobility in Kenya depends not only on infrastructure and technology, but also on the availability of a skilled, competent, adaptable, and inclusive workforce. This chapter has outlined eleven strategic recommendations to strengthen the country's e-mobility training system. The focus areas include the development of stand-alone and sector-specific curricula, integration of EV units into existing programs, and structured upskilling and certification for the current workforce—including through Recognition of Prior Learning (RPL).

The recommendations further emphasize the importance of inclusive approaches that promote gender equity and support persons with disabilities, the strengthening of dual training models for workplace learning, and the establishment of Centres of Excellence as hubs for advanced skills development and innovation. Equally important is the need to build the capacity of trainers, in-company mentors and master craftspersons to ensure quality delivery of training across all settings.

By implementing these strategic directions, and through collaboration among government, training institutions, industry stakeholders, and development partners, Kenya will be well-positioned to develop a future-ready workforce capable of supporting and sustaining the transition to e-mobility.

REFERENCES

ACE College Canada. (n.d). EV Charging Technician Program. Retrieved from ACE Community college: https://acecollegecanada.com/electric-vehicle-ev-charging-technician-program/

Automotive Research Association of India. (2023). EcoGears. Retrieved from ARAI announces 3-day EV training program on energy storage systems in collaboration with IESA: https://ecogears.in/arai-announces-3-day-ev-training-program-on-energy-storage-system-collaborating-with-iesa/

Autotech Training. (2025). Retrieved from TRAINING SOLUTIONS FOR ADDRESSING THE SKILLS GAP: https://autotechtraining.co.uk/

Bohnsack, R., Pinkse, J., & Kolk, A. (2014). Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles. Research Policy, 43(2), 284-300. doi: https://doi.org/10.1016/j.respol.2013.10.014

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. JSTOR, MIS Quarterly, 13(3), 319-340. doi:https://doi.org/10.2307/249008

Davis, F. D., & Granic, A. (2024). The Technology Acceptance Model: 30 Years of TAM. Springer International Publishing.

DRIVES project. (2020). Skill needs and gaps in the automotive sector. Retrieved from https://project-drives.eu/Media/Publications/19/Publications_19_20210202_2313.pdf

GIZ. (2023). Establishing Dual Vocational Education and Training In Kenya: Promoting Youth Employemnt and Vocatonal Training in Kenya. Nairobi: GIZ-Kenya. Retrieved from https://www.giz.de/en/worldwide/127300.html

GIZ-Kenya. (2025, March 12). Changing Transport . Retrieved from changing-transport.org: https:// changing-transport.org/project/promotion-of-electric-mobility-in-kenya/#:~:text=Funded%20by%20 the%20German%20Federal%20Ministry%20for%20Economic,development%20for%20enhanced%20electric%20mobility%20uptake%20on%20Kenya.

GIZ-New Delhi. (2021). Training Needs Assessment For Electric buses in India Volume 1-Identification of Training Needs. New Delhi: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Guney, B. (2024). Development and evaluation of students' practice skills in vocational and technical education of electric vehicles. Black Sea Journal of Engineering and Science, 7(4), 724-735. doi: https://doi.org/10.34248/bsengineering.1460086

Hyundai Motor Company. (2022, 7 19). HMCPe. Retrieved from Maintenance in the Era of Electrified Vehicles: Hyundai Electric Vehicle Master Certification Program: https://www.hyundaimotorgroup.com/story/CONT0000000000043580

Jones, A. (2022). Adapting to Electric Vehicel Technology: Challenges and Opportunities . Journal of Automotive Technology, 15(3), 45-48.

Kenya National E-Mobility Policy. (2024). Draft National E-Mobility Policy, Kenya. Nairobi: Ministry of Roads and transport. Retrieved from https://transport.go.ke/sites/default/files/Draft%20National%20e-Mobility%20Policy_For%20Circulation%2027.03.2024.pdf

KIPPRA. (2017). National Climate Change Action Plan 2018-2022. Nairobi: Kenya Insitute for Public Policy Research and Analysis. Retrieved from https://repository.kippra.or.ke/items/4d15a38d-7b8d-4f6b-b43f-46f4adef837e/full

KNBS. (2023). Kenya National Bureau of Statistics: Support Needs Assessment Report for Persons with Disabilities and Their Primary Caregivers. Nairobi. Retrieved from https://www.knbs.or.ke/reports/support-needs-assessment-report-for-persons-with-disabilities-and-their-primary-caregivers/

Lopez, N. S. (2020). Promotion of Low Carbon Urban Transport Systems in the Philippines (LCT) Project: Electric Vehicle Skills Mapping Report. Philippines: Department of Transportation .

Mabeya, R. (2025, Jan 29). Bridging the Skills Gap: Unlocking Kenya's E-Mobility Future Through Charging Infrastructure and Workforce Development. Retrieved February 14, 2025, from LinkedIn: https://www.linkedin.com/pulse/bridging-skills-gap-unlocking-kenyas-e-mobility-future-ratemo-mabeya-9s83f

Macharia, S. (2024, April 16). Sustainable Energy Fund for Africa (SEFA) and United Nations Environment Programme (UNEP). Retrieved March 18, 2025, from AUTONEWS: https://aakenyaautonews.co.ke/kenyas-electric-vehicle-capacity-soars-as-technicians-receive-specialized-training-in-nairobi/

Makerere University. (2024, October 25). Makerere University. Retrieved from Makerere University Innovation Pod launches e-mobility skilling programme: https://news.mak.ac.ug/2024/10/makerere-university-innovation-pod-launches-electric-mobility-skilling-programme/

NGEC. (2025). The National Gender and Equality Commission (NGEC): Promote Gender Equality and Freedom from Discrimination in Accordance with Article 27 of the Constitution. Nairobi: The National Gender and Equality Commission (NGEC). Retrieved from https://www.ngeckenya.org/about/15/www.unwomen.org/

NobleProg kenya. (n.d.). Retrieved 2025, from EV Maintenance and Troubleshooting for Technicians Training Course: https://www.nobleprog.co.ke/cc/evmtt

P4G Partnerships. (2025). Driving Change: Scaling Kenya's EV Industry Through Capacity Building and Ecosystem Development. Retrieved from P4G Partnerships: https://p4gpartnerships.org/sites/default/files/2025-04/25_A4_P4G_Kenya%20EVs%20case%20study_v4.pdf

PROGRAM JUSTIFICATION. (2025). Retrieved from FLONE INITIATIVE: https://floneinitiative.org/Programs/women-in-e-mobility/

Republic of Rwanda. (2024). e-Mobility Skills Snapshot. Kigali: Republic or Rwanda, Ministry of Public Services and labour. Retrieved from https://lmis.rw/media/resources/e-mobility_SKILLS_SNAPSHOT_2024.pdf

RWTH Aachen University. (n.d). RWTH International Academy. Retrieved from Certificate course – Battery Electrified Vehicle: https://www.academy.rwth-aachen.de/en/programs/certificate-courses/detail/certificate-course-battery-electrified-vehicle

SEFA and UNEP. (2022). E-mobility Development in Africa: Guidelines for Policymakers, Sustainable Energy Fund for Africa (SEFA) and United Nations Environment Programme (UNEP). New york: SEFA and UNEP. Retrieved from https://www.unep.org/resources/factsheet/global-electric-mobility-programme-brochure

Siemens Stiftung. (2024). Unlocking The Growth Potential of Kenya's E-Mobility Sector. Retrieved from Siemens Stiftung: https://www.siemens-stiftung.org/wp-content/uploads/2030/09/studie-unlocking-the-growth-potential-of-Kenya-E-Mobility-Sector.pdf-1.pdf

SME. (2024). Electric Vehicle Fundamentals (EVF): Body of Knowledge 2024/2025. Retrieved from https://www.sme.org/globalassets/sme.org/training/certifications/electric-vehicle/evf/electric-vehicle-body-of-knowledge.pdf

Smith, B. (2023). The Cost and Complexity of EV Maintenance: A Barier to Adoption? Automotive Engineering Review, 18(2), 102-115.

TATA Power Skills Development Institute. (n.d). TPSDI. (2.-S. P. Charging, Producer) Retrieved from Future Green Energy: https://www.tpsdi.com/courses-for-corporates/CorporateCourseDetails/10035/Solar-PV-for-Electric-Vehicle-Charging

TESDA. (2018). Competency Standard: Battery Electric Vehicle Servicing (PUV) Level II. The Technical Education and Skills Development Authority.

Tesla. (2025). Careers in Automotive. Retrieved from TESLA: https://www.tesla.com/careers

Venkatesh, V., & Davis, F. D. (2000, Feb 1). A Theoretical Extension of the Technology Acceptance Model: Four Longitudinal Field Studies. INFORMS Analytics Collections. doi:https://doi.org/10.1287/mnsc.46.2.186.11926

Wambugu, A., Kipkirui, J., Kamiri, F., Romano, F., & Maranga, I. (2021). Electric Vehicel Standards in Kenya: Draft Summary Report. Nairobi: State Department for Transport.

WTS Foundation. (2025). E-Mobility Course in Kenya. Retrieved from WTS Foundation: https://wts.foundation/courses/kenya/e-mobility/

Youth Skills for E-Mobility. (2024). Report on Assessment of Skills and Knowledge Gaps Among Youths in E-Mobility. Nairobi, Kenya.

Ogur Eric Okoth (2023): “TVET, economy and sustainable development.” International Journal of Vocational and Technical Education Review, Vol. 15(2), pp. 12-17.

E-mobility Association of kenya (EMAK, 2024) Electrifying Kenya’s Transportation Sector Fiscal Benefits and Policy Measures to Promote E-mobility. Downloads – E-Mobility Association of Kenya

2012 Qualification Pack Electric Vehicle Maintenance Technician Automotive Skills Development Council || 153, Gr Floor, Okhla Industrial Area, Phase – III, Leela Building,New Delhi – 110020

African Union Development Agency–NEPAD. (2021). Continental Strategy for TVET: Towards the Harmonisation of TVET Qualifications in Africa. https://www.nepad.org

ILO. (2020). Skills for a Resilient Youth: TVET in the Post-COVID-19 World. International Labour Organization. https://www.ilo.org

UNESCO-UNEVOC. (2020). Trends in TVET Policy and Practice: Policy Brief. https://unevoc.unesco.org

Commonwealth of Learning. (2020). Guidelines for the Development of Competency-Based Training Materials. https://www.col.org

World Bank. (2022). Building Skills for Economic Growth and Competitiveness in Africa: A TVET Strategy. https://www.worldbank.org

OECD. (2021). Recognition of Non-formal and Informal Learning – Policy Responses and Good Practices. https://www.oecd.org

Annex 1:

EV Job Role and Performance Statement for EV Curriculum

Table 16: Duty A: Perform EV Rechargeable Battery Repair and Maintenance

DUTY A: Repair and Maintain Electric Vehicle rechargeable Battery Job Role: EV Battery Repair and Maintenance Technician	
Tasks	**Performance Assessment**
Inspect EV Battery Components	Identify types of EV batteries and chemistry basics
	Process the EV battery technology lithium optimization options
	Identify EV Battery components including cells, modules, BMS and Cooling mechanisms
	Assesses the condition of battery terminals, wiring, and connectors for wear or corrosion.
	Conducts voltage, capacity, and thermal analysis to determine battery efficiency.
	Documents findings and recommends necessary actions for battery optimization.
	Safe handle an EV battery
Maintain EV Battery	Identify methods of maintaining an EV Battery
	Cleans battery terminals and connectors to prevent corrosion.
	Ensures proper insulation and sealing of battery components.
	Measure the state of charge
	Carry out periodic inspection for physical damage
	Conduct charging test
	Conduct discharge test
	Carry out load testing
	Store EV battery
Carry out EV battery Diagnosis	Uses diagnostic tools to check battery performance and detect faults.
	Read battery parameters
	Interpret the parameters
	Analyzes error codes from the battery management system (BMS) to identify issues.
	Conducts load tests to evaluate battery capacity and efficiency.
	Reports diagnostic results and recommends necessary repairs or replacements.
Develop Knowledge on EV Fuel Cell Systems as an Emerging Technology	Identifies key components of a fuel cell system
	Explores global advancements in fuel cell technology and their potential applications in EVs.
	Illustrate how hydrogen is used in fuel cells
Analyze Battery Performance and Lifecycle	Track state of health/state of charge
	Recycle and disposal EV battery
	Identify battery charging behaviour

DUTY A: Repair and Maintain Electric Vehicle rechargeable Battery **Job Role: EV Battery Repair and Maintenance Technician**	
Tasks	**Performance Assessment**
Perform State of Charge Battery Calibration	Select tools to use
	Open battery compartments
	Inspect the cells physical damage
	Measure voltage and internal resistance
	Perform repeated cycles of charging and discharge of the cells
	Program battery Management system
Performing Quality Control Checks on the Battery	Confirm Software updates & functionality
	Conduct Charge test and Discharge test
	Conduct physical check
	Conduct electrical inspection
	Check on connectivity (Telemetric test)
Manage EV Battery Systems	Apply Principles of battery technologies, including Lithium-ion and solid-state systems
	Analyze EV battery packs and modules for efficiency and performance
	Implement battery management systems (BMS) to optimize cell balancing and thermal control
	Evaluate the performance and lifespan of EV batteries using diagnostic techniques
	Develop strategies for battery recycling and second-life applications

Table 17:DUTY B: Install and Maintain EV Charging System and Infrastructure

DUTY B: Install and Maintain EV Charging Technologies/Charging System and Infrastructure **Job Role: Charging infrastructure Maintenance Technician** **EV Charging Equipment Installer Technician**	
Tasks	**Performance Assessment**
Set up Charging Infrastructure	Identify protection devices (circuit breakers, surge, emergency shut down
	Identify EV supply equipment
	Identify infrastructure and installation hardware
	Identify communication and network system
	Identify connectors and cables
Implement and Analyze EV Charging Systems	Identify types of charging systems (AC/DC)
	undertake cable charging levels (level 1, 2, DC fast charging)
	Carry-out battery swapping
	Perform wireless charging and inductive charging
	Implement AC and DC charging standards
	Analyze performance of different charging technologies
	Apply the concept of vehicle to grid (V2G) and vehicle to home (V2H)
Carry-Out Routine Inspection of the Charging Infrastructure	Select appropriate check sheet
	Conduct visual, functional and safety checks
	Make adjustment as necessary
	Document routine inspection works

DUTY B: Install and Maintain EV Charging Technologies/Charging System and Infrastructure **Job Role: Charging infrastructure Maintenance Technician** **EV Charging Equipment Installer Technician**	
Tasks	**Performance Assessment**
Troubleshoot EV Battery Charging System	Identify the defective system
	Conduct visual, functional and safety checks
	Check continuity/resistance and voltage of the system
	Identify faulty electrical components/wiring
	Document troubleshooting works
Perform Quality Control of an EV Battery Charging Infrastructure	Inspect Charging System Components
	Verify System Performance Parameters
	Confirm functionality, safety compliance, and regulatory requirements.
	Document and Report Quality Control Findings
Design and Deploy EV Charging Infrastructure	Design EV charging networks for residential, commercial and public spaces
	Implement charging station hardware and software
	Analyze the impact of charging infrastructure on the power grid
	Select site for EV charging station
	Deploy EV Charging software

Table 18: DUTY C: Carry-Out EV Battery Charging Equipment Operation

DUTY C: Carry out EV Battery Charging and Swapping Station Equipment Operation **Job Role: Charging Station Attendant** **Charging Station Service technician**	
Task	**Performance Assessment**
Assist Customers in Operating EV Charging Stations	Communicate the charging process to customers
	Guide customers to connect and disconnect charging cables
	Provide guidance on payment methods and station usage.
	Assist customers with troubleshooting basic operational issues.
Monitor Charging Station Functionality and Report Faults	Check charging equipment for operational status.
	Identify and report system errors or malfunctions promptly.
	Report major technical issues to service technicians
	Confirm station software and display screens are functioning correctly
Maintain Cleanliness and Safety at The Charging Station	Keep the charging area clean and free from obstructions.
	Ensure proper cable management to prevent tripping hazards.
	Monitor for any hazardous conditions and reports them immediately.
	Enforce safety regulations and station guidelines.
Provide Basic Troubleshooting Support for Users	Assist customers in resolving minor issues such as card reader malfunctions
	Guide users on resetting the charging session if needed.
	Identify if a problem is user-related or requires technical intervention.
	Refer unresolved technical issues to the service technician.
Process Payments and Maintain Transaction Records	Process cashless payments through station interfaces.
	Issue digital or printed receipts upon request.
	Log all transactions for reconciliation and reporting.
	Report any payment discrepancies or system failures.

DUTY C: Carry out EV Battery Charging and Swapping Station Equipment Operation
Job Role: Charging Station Attendant
Charging Station Service technician

Task	Performance Assessment
Conduct Routine Inspection and Maintenance of Charging Units	Perform scheduled diagnostic tests on charging units.
	Inspect cables, connectors, and other hardware for wear and tear
	Update firmware and software as required.
	Ensure all components meet operational standards.
Ensure Compliance with Safety and Regulatory Standards	Adhere to national electrical and safety codes during maintenance and installation
	Use personal protective equipment (PPE) as required
	Ensure proper grounding and insulation of electrical components.
	Report and rectifies any non-compliance issues
Document Maintenance Activities and Service Reports	Record details of inspections, repairs, and replacements
	Maintain an updated service history for each charging unit.
	Submit reports to the relevant authorities or station management.
	Provide recommendations for preventive maintenance.
Inspect and Clean EV Charging Components	Inspect charging connectors, cooling vents, and cable housings for dust and debris buildup.
	Blow out dust and remove obstructions from vents and cooling systems.
	Wipe down charging screens, connectors, and other touchpoints for cleanliness and hygiene.
	Report any visible damage or wear detected during the inspection.
Service Cooling Systems in EV Charging Stations	Inspect cooling systems, including fans, radiators, and liquid cooling units, for proper operation.
	Clean cooling vents and air filters to ensure unrestricted airflow.
	Check coolant levels in liquid-cooled charging systems and refills or replaces coolant as needed.
	Identify and report leaks, blockages, or unusual heat buildup for further maintenance.
Lubricate EV Charging Components	Identify EV charging components that require lubrication,
	Apply appropriate lubrication to moving or contact-based parts as required.
	Use manufacturer-recommended lubricants to avoid damage or electrical conductivity issues.
	Ensure all vents and cooling systems are free of debris and obstruction.
	Document lubrication schedules and reports any abnormalities.

Table 19: Duty D: Carry-out Advance Driving for Electric Vehicles

Duty D: Carry-out Advance Driving for Electric Vehicles **Job Role: Advance Electric Vehicle Driver**	
Tasks	**Performance Assessment**
Inspect Oil Levels and Cooling System Before Driving	Check coolant levels in the battery and motor cooling system
	Verify lubrication levels in moving components
	Inspect cooling fans and air vents for blockages or malfunctions.
	Report any leaks, low fluid levels, or abnormal temperatures before starting the vehicle.
Navigate and Use EV Charging Infrastructure	Identify different types of EV chargers and their compatibility with the vehicle.
	Plan routes considering charging station locations and charging times.
	Follow correct procedures for plugging in and unplugging from charging stations.
	Troubleshoot basic charging issues and follows safety protocols.
Operate an EV Efficiently	Adjust driving techniques to maximize battery efficiency and range.
	Use regenerative braking effectively to optimize energy recovery.
	Monitor real-time energy consumption through the vehicle's dashboard.
	Adapt acceleration and deceleration strategies for smooth EV operation.
Apply Advanced Safety Measures for EV Driving	Recognize and responds to EV-specific warning signals and alerts.
	Maintain proper vehicle handling under different driving conditions.
	Follow emergency procedures for EV-related incidents, such as battery overheating or system failure.
	Adhere to traffic regulations and defensive driving techniques for EVs.
Manage EV Performance in Various Driving Conditions	Adjust driving style for urban, highway, and off-road conditions.
	Use eco-driving modes and settings to optimize performance
	Adapt to weather-related challenges affecting EV operation, such as extreme temperatures and water.
	Evaluate the impact of load and passenger weight on EV efficiency.

Table 20: DUTY E: Maintain and Repair EV Low Voltage Electrical Systems

DUTY E: Maintain and Repair Electric Vehicle Low Voltage Electrical Systems **Job Role: Electric vehicle Low voltage electrical systems technician**	
Tasks	**Performance Assessment**
Identify Low Voltage Electrical Components in an Electric Vehicle	Identify low voltage electrical components in an electric vehicle
	Interpret manufacturer manuals and wiring diagrams to locate low voltage components.
	Use appropriate personal protective equipment (PPE) and follow safety procedures when handling electrical components.
	Inspect electrical components for visible signs of wear, corrosion, or damage.
	Verify component functionality using appropriate diagnostic tools (e.g., multimeter, scan tools).
Maintain Low Voltage Electrical Components in an Electric Vehicle	Perform routine inspections on low voltage electrical components to ensure functionality and safety.
	Clean electrical terminals and connectors to prevent corrosion and improve conductivity.
	Replace worn-out or damaged components such as fuses, relays, and connectors as per manufacturer guidelines.
	Ensure proper cable routing and secure connections to prevent short circuits or loose contacts.
	Update software and firmware for low voltage electronic control units (ECUs)

DUTY E: Maintain and Repair Electric Vehicle Low Voltage Electrical Systems **Job Role: Electric vehicle Low voltage electrical systems technician**	
Tasks	**Performance Assessment**
Troubleshoot Low Voltage Electrical Components in an Electric Vehicle	Gather information on the reported issue through customer feedback or onboard diagnostics.
	Interpret electrical schematics and use diagnostic tools to identify faults in the low voltage system.
	Perform voltage, resistance, and continuity tests on electrical components and circuits.
	Identify common low voltage system faults such as blown fuses, corroded connectors, damaged wiring, and malfunctioning sensors.
	Document diagnostic findings and recommend corrective actions based on troubleshooting results
Maintain Low Voltage Electrical Components in an Electric Vehicle	Perform routine inspections on low voltage electrical components to ensure functionality and safety.
	Clean electrical terminals and connectors to prevent corrosion and improve conductivity.
	Replace worn-out or damaged components such as fuses, relays, and connectors as per manufacturer guidelines.
	Ensure proper cable routing and secure connections to prevent short circuits or loose contacts.
	Update software and firmware for low voltage electronic control units (ECUs)
Repair Low Voltage Electrical Components in an Electric Vehicle	Identify and isolate faulty low voltage electrical components using test equipment.
	Replace or repair damaged wiring, terminals, and connectors following industry standards.
	Reassemble and secure components correctly to restore the system's integrity.
	Test repaired components to confirm proper operation and compliance with specifications.
	Maintain documentation of repairs performed, including replaced parts and test results.

Table 21:Duty F: Maintain and Repair EV High Voltage Electrical Systems

Duty: Maintain and Repair EV High Voltage Electrical Systems **Job Role: Electric vehicle High Voltage Electrical Systems Technician**	
Tasks	**Performance Assessment**
Ensure Safety and Compliance in High Voltage Electrical Systems	Follow manufacturer guidelines and industry regulations for handling high-voltage systems.
	Use appropriate personal protective equipment (PPE) such as insulated gloves, face shields, and High Voltage-rated tools.
	Deactivate and isolate the high-voltage system before performing any maintenance or repairs.
	Identify and follow lockout/tagout (LOTO) procedures to prevent accidental re-energization.
	Perform voltage verification using approved test equipment to confirm a de-energized state.
	Ensure compliance with workplace and environmental regulations related to high-voltage system maintenance and disposal.

Duty: Maintain and Repair EV High Voltage Electrical Systems **Job Role: Electric vehicle High Voltage Electrical Systems Technician**	
Tasks	**Performance Assessment**
Identify High Voltage Electrical Components in an Electric Vehicle	Identify high-voltage components, including the high-voltage battery pack, inverter, DC-DC converter, electric motor, power distribution unit (PDU), and charging system.
	Interpret vehicle schematics and wiring diagrams to locate high-voltage components.
	Identify safety markings, labels, and high-voltage cables (typically orange) to distinguish them from low-voltage systems.
	Interpret the function of each high-voltage component in relation to vehicle operation and energy flow.
	Verify the integrity and insulation of high-voltage components using diagnostic tools.
Maintain High Voltage Electrical Components in an Electric Vehicle	Inspect high-voltage connectors, cables, and insulation for wear, damage, or corrosion.
	Clean high-voltage components and ensure proper ventilation to prevent overheating.
	Perform battery health checks, including state of charge (SoC) and state of health (SoH) assessments.
	Verify and calibrate thermal management systems to ensure optimal performance.
	Update software and firmware for high-voltage electronic control units (ECUs) as per manufacturer specifications.
	Document maintenance activities, including test results and component conditions.
Troubleshoot High Voltage Electrical Components in an Electric Vehicle	Use onboard diagnostics (OBD) and manufacturer-specific scan tools to retrieve fault codes related to high-voltage systems.
	Conduct voltage, resistance, and insulation resistance tests to identify potential faults.
	Diagnose common high-voltage system issues such as battery degradation, thermal management failures, inverter malfunctions, and charging system errors.
	Analyze data from high-voltage sensors and control modules to pinpoint issues.
	Apply systematic troubleshooting procedures to isolate and confirm component failures.
	Prepare a detailed fault report with recommended corrective actions.
Repair or Replace High Voltage Electrical Components in an Electric Vehicle	Remove and replace faulty high-voltage components following manufacturer guidelines.
	Repair or replace high-voltage cables, connectors, and insulation while ensuring compliance with electrical safety standards.
	Reassemble and secure high-voltage components to restore the system’s integrity.
	Perform post-repair testing to verify component functionality and system safety.
	Conduct a final high-voltage system inspection and reset any relevant fault codes.
	Maintain records of repairs, including component replacements, test results, and compliance checks.

Table 22: Duty G: Maintain and Repair Mechanical Electric Vehicle Systems

DUTY G: Maintain and Repair Mechanical Electric Vehicle Systems **Job Role: Mechanical Electric Vehicle Systems Technician**	
Tasks	**Performance Assessment**
Maintain and Repair the Suspension System	Inspect suspension components, including bushes, springs, shock absorbers, pneumatic bellows, struts, and swing arms for wear or damage.
	Use diagnostic tools to identify suspension system faults and assess component functionality.
	Safely remove any faulty suspension component following manufacturer guidelines.
	Replace defective components with precision to restore optimal performance.
	Diagnose and resolve electronic suspension faults using appropriate tools and software.
	Interpret suspension system schematics and adjust components accurately to ensure proper alignment and stability.
	Conduct a final inspection and test the suspension system to verify performance and safety compliance.
Maintain and Repair the Braking System	Inspect braking system components, including the master cylinder, brake pads, calipers, shoes, drums, air cylinders, brake pedals, and ABS system.
	Utilize diagnostic tools to troubleshoot faults in brake-by-wire, ABS, Traction Control System (TCS), and Electronic Stability Control (ESC).
	Repair and calibrate electronic braking components such as ABS, TCS, and ESC to manufacturer specifications.
	Inspect brake pads, rotors, and calipers for wear and damage.
	Repair conventional braking system components, ensuring they meet safety and performance standards.
	Properly document all repairs and maintenance activities for record-keeping and compliance.
	Test the braking system post-repair to ensure proper functionality and responsiveness.
	Flush and top up brake fluid using the appropriate type
Maintain and Repair the Steering System	Safely de-energize and isolate high-voltage components when working on steer-by-wire systems.
	Use appropriate personal protective equipment (PPE) when handling electronic steering components.
	Utilize diagnostic tools to identify faults in hydraulic, electric, or steer-by-wire systems.
	Accurately interpret diagnostic codes and sensor data to determine root causes of steering issues.
	Remove and install steering system components such as motors, sensors, and control modules following correct procedures.
	Align steering components correctly to ensure precise handling and stability.
	Conduct post-repair tests to confirm steering system functionality.
	Identify and eliminate abnormal noises, vibrations, or excessive steering play.
	Properly document all diagnostic findings, repairs, and calibrations performed.

DUTY G: Maintain and Repair Mechanical Electric Vehicle Systems Job Role: Mechanical Electric Vehicle Systems Technician	
Tasks	**Performance Assessment**
Maintain and Repair the Vehicle Transmission System and Gearboxes	Inspect transmission system components, including gears, bearings, shafts, and clutches, for wear or damage.
	Diagnose faults in automatic, manual, and electric vehicle transmissions using specialized diagnostic tools.
	Remove and replace damaged transmission components, ensuring proper alignment and fitment.
	Perform lubrication and cooling system maintenance for the transmission to ensure optimal performance.
	Adjust and calibrate the transmission control module (TCM) for smooth gear transitions in electric vehicles.
	Test drive the vehicle to assess transmission performance and detect abnormal noises or shifting issues.
	Perform software updates and reprogramming for electronically controlled transmission systems.
	Document all repairs, calibrations, and maintenance activities related to the transmission system.

Table 23: Duty H: Manage Electric Vehicle Electronics System

Duty: Manage Electric Vehicle Electronics System Job Role: Electric Vehicle Electronics Technician	
Task	**Performance Assessment**
Ensure Adherence to Safety Procedures	Follow strict safety protocols when working with high-voltage electrical systems to prevent hazards.
	Implement Lockout/Tagout (LOTO) procedures to prevent accidental system activation.
	Use specialized safety equipment and personal protective equipment (PPE) when handling high-voltage components.
	Demonstrate a thorough understanding of electrical safety regulations and industry best practices.
	Safely discharge high-voltage systems before performing maintenance or repair work.
	Conduct risk assessments before performing diagnostics or repairs on EV electronics.
Test and Calibrate Power Electronics Systems	Conduct performance tests on power electronic systems to verify efficiency and reliability.
	Calibrate sensors and control units, including the Motor Control Unit (MCU), Vehicle Control Unit (VCU), and Battery Management System (BMS) to ensure optimal operation.
	Verify the accuracy of voltage, current, and temperature sensors in power electronic circuits.
	Perform real-time data analysis using diagnostic software and tools
	Ensure proper communication between components via Controller Area Network (CAN) buses.

Duty: Manage Electric Vehicle Electronics System
Job Role: Electric Vehicle Electronics Technician

Task	Performance Assessment
Diagnose and Troubleshoot Power Electronic Components	Use advanced diagnostic tools to identify faults in high-voltage systems, including inverters, DC-DC converters, and onboard chargers.
	Analyze electrical schematics, software data, and fault codes to pinpoint the root cause of issues.
	Diagnose and resolve Battery Management System (BMS) issues affecting charging, discharging, and thermal regulation.
	Troubleshoot communication errors within power electronics systems, including faults in the CAN bus network.
	Identify and rectify Thermal Management System (TMS) malfunctions affecting power electronics efficiency.
Maintain and Repair Power Electronic Components	Perform preventive maintenance on power electronic components, ensuring they function within manufacturer specifications
	Diagnose and repair faulty components, including inverters, DC-DC converters, onboard chargers, and Power Distribution Units (PDUs).
	Replace faulty components including inverters, DC-DC converters and charging modules
	Work with high-voltage battery systems while strictly adhering to established safety protocols.
	Ensure quality workmanship, ensuring reliability and durable repairs
	Conduct post-repair testing and verification to confirm system performance and compliance
Update software and firmware	Update software and firmware in power electronic control units including MCU, VCU, BMS, and TMS.
	Diagnose and resolve software-related issues affecting power electronics performance.
	Ensure compatibility between software and hardware.
	Conduct quality control checks post-update to verify system stability and compliance with manufacturer standards.
	Document all software updates, calibration adjustments, and firmware changes for future reference.

Table 24: DUTY I: Maintain and Repair Heating and Air Conditioning EV Systems

DUTY: Maintain and Repair Heating Ventilation and Air Conditioning EV Systems **Job Roles: EV HVAC system service technician**	
Task	**Performance Assessment**
Install the Heating, Ventilation, and Air Conditioning (HVAC) System	Install HVAC units, ductwork, and high-voltage connections in electric vehicles.
	Connect refrigerant lines, electrical wiring, and control modules.
	Perform refrigerant leak tests
Inspect EV HVAC systems	Diagnose and resolve issues in electric compressors, heat pumps, and cabin heating/cooling systems.
	Handle refrigerants safely and ensure proper recovery, recycling, and disposal in compliance with environmental regulations.
Maintain EV heating system	Identify preventive maintenance methods for electric vehicle heating systems
	Ensure proper connection, insulation, and thermal regulation of EV heating system components.
	Test the functionality of heating system components, including PTC heaters, heat exchangers, and coolant-based heating systems.
	Replace or repair faulty heating system components, ensuring compatibility with high-voltage electric powertrains.
Maintain the EV Air Conditioning (AC) System	Identify preventive maintenance strategies for EV AC system
	Ensure secure connections, insulation, and proper refrigerant flow within the AC system.
	Test the functionality of key AC system components, including the compressor, condenser, evaporator, expansion valve, and cabin cooling vents.
	Replace or repair defective AC system components, ensuring adherence to high-voltage safety protocols.
Troubleshoot EV HVAC system components	Identify defective components, including the compressor, condenser, expansion valve, and harness connections
	Conduct visual, functional, and safety inspections to detect malfunctions.
	Check continuity /resistance and voltage of the HVAC electrical circuits
	Identify faulty EV HVAC components (both electrical and mechanical)
	Document all diagnostic findings, test results, and necessary repairs to ensure traceability.
Inspect EV HVAC electrical components	Select the appropriate checklist and diagnostic tools for HVAC electrical inspections.
	Conduct thorough inspections following the selected checklist and manufacturer guidelines.
	Perform functionality tests on electrical components, including sensors, relays, control modules, and wiring harnesses.
	Document findings, test outcomes, and recommended corrective actions.

Table 25: DUTY J: Assemble EV Components and Systems

DUTY: Assemble EV components and systems **Job Profile: Electric Vehicle Assembly Technician**	
Task	**Performance Assessment**
Prepare for EV Component Installation	Interpret technical drawings, schematics, and assembly instructions to determine installation requirements.
	Verify the availability and condition of required EV components, tools, and safety equipment.
	Ensure the work area is clean, organized, and complies with workplace safety standards.
	Conduct a pre-installation inspection of the bus chassis and mounting points for compatibility with EV components.
Install High-Voltage Battery Systems	Position and secure the battery packs according to manufacturer specifications and safety guidelines.
	Connect high-voltage cables and cooling systems, ensuring proper insulation and secure fastening.
	Verify battery integration with the vehicle's energy management system.
	Follow all safety protocols for handling high-voltage components.
Install and Integrate Electric Propulsion System	Mount the electric motor, transmission, and associated power electronics in designated locations.
	Connect power cables, control wiring, and sensors according to electrical diagrams.
	Ensure proper alignment and torque settings for mechanical connections.
	Perform preliminary testing to confirm system integrity and proper operation.
Install Auxiliary Electrical Systems	Install and wire auxiliary systems such as charging ports, DC-DC converters, and onboard diagnostics.
	Ensure proper grounding and insulation of electrical connections.
	Test auxiliary systems for functionality and adherence to performance standards.
	Troubleshoot and resolve wiring or connection issues as needed.
Conduct System Testing and Quality Assurance	Perform initial power-up procedures and check for system faults or warnings
	Run diagnostic tests to verify the functionality of installed components.
	Document test results and report any deviations from expected performance.
	Ensure compliance with safety, regulatory, and manufacturer requirements before final assembly approval.
	Connecting and testing auxiliary systems, such as lighting, climate control, and passenger information displays
	Performing functional tests of electrical and mechanical systems
	Documenting assembly processes and quality control checks

Table 26: DUTY K: Perform Assembly and Repair of Electric 2& 3 Wheelers

DUTY: Perform assembly, repair, and maintenance of electric two- and three-wheelers
Job Profile: Electric Two- and Three-Wheeler Operator
Electric Two-and Three-Wheeler maintenance and repair technicians

Task	Performance Assessment
Prepare for Assembly, Repair, and Maintenance Work	Review technical manuals, schematics, and assembly instructions to determine work requirements.
	Ensure the availability of required tools, spare parts, and safety equipment before starting work.
	Conduct pre-work inspections to assess the condition of vehicle components.
	Follow workplace safety procedures, including proper handling of electrical and mechanical components.
Assemble Electric Two- and Three-Wheelers	Install the chassis, body panels, and frame components according to manufacturer specifications.
	Mount and securely fasten key electrical components, including battery packs, motors, controllers, and wiring harnesses.
	Connect electrical and electronic systems, ensuring proper insulation and secure fittings.
	Perform initial functional tests to verify proper system integration and assembly quality.
Diagnose and Repair Electrical Systems	Use diagnostic tools and software to identify faults in the battery, motor, controller, and wiring systems.
	Troubleshoot electrical issues such as voltage fluctuations, short circuits, or faulty connections.
	Replace or repair defective electrical components while ensuring compatibility and system integrity.
	Verify system functionality through post-repair testing and calibration.
Maintain Battery and Charging Systems	Inspect battery health, charge levels, and overall performance using appropriate testing tools.
	Perform preventive maintenance, including cleaning terminals, balancing cells, and checking for leaks or swelling.
	Ensure proper installation and operation of battery management systems (BMS).
	Troubleshoot charging issues and ensure charging stations comply with safety standards.
Diagnose and Repair Mechanical Systems	Inspect and service key mechanical components, including brakes, suspension, and transmission systems.
	Adjust, repair, or replace worn-out mechanical parts to maintain optimal performance.
	Ensure proper alignment, torque settings, and lubrication of moving components.
	Conduct post-repair test rides to verify stability, handling, and performance.
Conduct Preventive and Scheduled Maintenance	Develop and follow a maintenance schedule based on manufacturer recommendations.
	Perform routine checks on electrical, mechanical, and safety systems.
	Record maintenance activities, including inspections, repairs, and component replacements.
	Advise users on best practices for prolonging battery life and overall vehicle efficiency.

DUTY: Perform assembly, repair, and maintenance of electric two- and three-wheelers
Job Profile: Electric Two- and Three-Wheeler Operator
Electric Two-and Three-Wheeler maintenance and repair technicians

Task	Performance Assessment
Ensure Safety and Compliance	Follow safety protocols for handling high-voltage systems and hazardous materials.
	Ensure all repairs and modifications meet industry standards and manufacturer guidelines.
	Dispose of damaged or non-repairable components according to environmental regulations
	Stay updated on advancements in electric vehicle technology and best practices for maintenance.
Quality control	Conducting quality checks to verify that assembled components meet specifications
	Identify and reporting defects or malfunctions
	Ensuring adherence to quality standards and tolerances

Table 27: DUTY L: Assembly and Maintain Electric Wheelchairs

Duty: Assembly and Maintenance of Electric Wheelchairs for Persons with Disabilities
Job Role: Electric Wheelchair Assembly and Maintenance Technician

Task	Performance Assessment
Apply Fundamentals of Electric Wheelchair	Classify Electric Wheelchair Types Based on Environmental Suitability (center-wheel, front-wheel, and rear-wheel drive electric wheelchairs)
	Identify and Describe Key Components and features of an Electric Wheelchair
	Develop a detailed flowchart of Power Transmission Process in an Electric Wheelchair
	Evaluate Recent Innovations in Electric Wheelchair Technology
	Identify key safety regulations, accessibility requirements, and user protection guidelines applicable to electric wheelchair design and operation.
	Develop a Routine Maintenance Plan for Electric Wheelchair Users
	Perform a Safety Inspection and Risk Assessment on an Electric Wheelchair
Assemble Electric Wheelchair Components	Installs motors, battery systems, and electronic controllers according to manufacturer specifications.
	Fits structural components, including the frame, seating, and adjustable armrests.
	Connects and secures wiring harnesses for motor control and battery management.
	Performs initial functionality tests to verify proper assembly and alignment.
Perform Routine Maintenance on Electric Wheelchairs	Inspects battery levels and charging systems to ensure optimal power supply.
	Checks and lubricates moving parts such as wheels, axles, and motor bearings.
	Tests joystick controls and braking systems for proper responsiveness.
	Identifies and replaces worn-out or faulty components to maintain wheelchair safety.
Diagnose and Troubleshoot Electric Wheelchair Issues	Identifies common electrical faults, such as battery failures or wiring issues.
	Uses diagnostic tools to assess motor efficiency and controller functionality.
	Resolves software or calibration issues affecting wheelchair movement.
	Advises users on proper wheelchair handling and minor troubleshooting techniques.
Customize Wheelchairs for User Comfort and Accessibility	Adjusts seat height, armrests, and footrests to meet individual user needs.
	Installs additional support features, such as headrests or specialized cushions.
	Programs speed settings and sensitivity levels based on user preferences.
	Ensures compliance with accessibility standards for enhanced mobility.

Duty: Assembly and Maintenance of Electric Wheelchairs for Persons with Disabilities Job Role: Electric Wheelchair Assembly and Maintenance Technician	
Implement Greening Aspects in Assembly and Maintenance of Electric Wheelchairs	Implement a waste management system for proper disposal of old batteries, electronic components, and worn-out parts.
	Encourage modular wheelchair designs that allow easy part replacement instead of full disposal.
	Use biodegradable lubricants for wheel and axle maintenance instead of petroleum-based products.
	Develop battery recycling or disposal management programs to reduce toxic waste from lead-acid and lithium-ion batteries.

Table 28: DUTY M: Perform Electric Boat Propulsion Systems Operations

Duty: Perform Electric Boat Propulsion Systems Installations, Operations, and Maintenance Job Role: Electric Boat Propulsion Systems Technician	
Task	**Performance Assessment**
Install Electric Propulsion System Components	Identify and interpret technical specifications for electric propulsion systems.
	Safely install electric motors, controllers, and battery systems in accordance with manufacturer guidelines.
	Ensure secure and watertight electrical connections for marine environments.
	Test and verify component alignment and functionality after installation.
Perform Routine Operation and Monitoring of Electric Boat Systems	Conduct pre-operation checks including battery levels, system status, and safety indicators.
	Operate electric boat systems within designated safety and efficiency parameters.
	Monitor real-time data from control panels and onboard diagnostics systems.
	Document and report system performance for trip logs and maintenance planning.
Maintain and Troubleshoot Electric Boat Powertrain	Perform scheduled inspections and maintenance of motors, battery packs, and controllers.
	Diagnose and isolate faults using appropriate diagnostic tools and techniques.
	Repair or replace faulty components in line with standard marine safety procedures.
	Maintain accurate service records and follow environmental disposal practices.
Navigate and Operate Electric Boats Safely in Waterways	Apply knowledge of maritime navigation rules and local waterway regulations.
	Operate the electric boat safely under various weather and water conditions.
	Perform emergency procedures including docking, anchoring, and recovery drills.
	Ensure passenger safety through proper briefings, life jacket use, and onboard safety protocols.

Table 29:DUTY N: Conduct Compliance Assessments for Safety Standards in EV

Duty: Conduct Compliance Assessment for Safety Standards in E-Mobility **Job Role: EV Safety Standards and Compliance Officer**	
Task	**Performance Assessment**
Identify and Apply Safety Standards for Electric Motor Vehicles	Identify key safety standards applicable to electric motor vehicles
	Interpret legal requirements related to high-voltage systems, battery safety, and crash protection
	Ensure compliance with national and international regulations for electric vehicle operation and maintenance
Assess Battery Safety and Risk Mitigation	Inspect electric vehicle batteries for compliance with safety standards
	Evaluate battery performance under different environmental conditions (temperature, humidity, and impact resistance).
	Apply safety measures to prevent thermal runaway, short circuits, and overcharging hazards.
Ensure Electrical and High-Voltage System Safety	Identify risks associated with high-voltage electric vehicle systems and implement safety precautions.
	Test insulation resistance and grounding in compliance with ISO
	Verify proper functioning of charging systems
Evaluate Fire and Thermal Management Systems	Examine fire suppression systems in electric vehicles
	Test thermal management systems to prevent overheating and ensure battery cooling efficiency.
	Implement emergency response procedures for electric vehicle fire hazards.
Ensure Safe Charging and Grid Integration	Verify safe operation of charging infrastructure
	Inspect and test vehicle-to-grid (V2G) compatibility and wireless charging safety
	Identify potential risks in EV charging stations, including electrical faults and overload hazards.
Promote Environmental and Sustainability Compliance	Ensure electric vehicle components comply with RoHS and End-of-Life Vehicle (ELV) directives.
	Conduct environmental impact assessments based on ISO 14040 and 14044 life cycle standards.
	Implement proper disposal and recycling practices for EV batteries and electronic components.

Annex 2:

Checklist of Existing Automative program Against CBET Principals

Core Principle	Evaluation Questions	Yes/No
1. Industry-Driven Standards	1.1 Was the OS developed with documented input from industry stakeholders?	
	1.2 Is there evidence of industry participation in curriculum design or delivery (e.g., dual training)?	
	1.3 Does the OS align with current industry standards and practices?	
2. Outcome-Based Learning	2.1 Are the intended learning outcomes stated as observable and measurable competencies?	
	2.2 Does the curriculum focus on what learners can do rather than just what they know?	
	2.3 Are assessments aligned with the required performance outcomes?	
3. Modular Structure	3.1 Is the OS divided into clear units or modules of competency?	
	3.2 Can these modules be taught and assessed independently?	
	3.3 Does the structure allow flexible entry and exit for learners?	
4. Recognition of Prior Learning (RPL)	4.1 Are there formal processes to recognize learning gained through informal or non-formal experiences?	
	4.2 Can learners receive credit or exemption based on prior demonstrated competencies?	
	4.3 Are RPL tools (e.g., portfolios, assessment guides) used in practice?	
5. Quality Assurance and Certification	5.1 Is certification based on full demonstration of required competencies?	
	5.2 Are the assessment processes standardized and transparent?	
	5.3 Is there external or independent validation of assessments?	
6. Lifelong Learning Orientation	6.1 Does the OS support continuing education, upskilling, or reskilling opportunities?	
	6.2 Is the curriculum adaptable to emerging technologies or industry changes?	
	6.3 Are there clear pathways for further learning or career progression?	
7. Assessment for Learning and Competence	7.1 Are assessments criterion-referenced (based on standards, not compared to other learners)?	
	7.2 Are learners assessed through practical tasks in realistic or simulated work environments?	
	7.3 Is there evidence of ongoing (formative) and final (summative) assessment throughout the training?	

Annex 3:

Checklist for EV Competency Evaluation

EV Competency	Q1: Is practical skill training provided in current OS? (Yes/No)	Q2: Is relevant knowledge content included in current OS? (Yes/No)	Existing Automotive OS	Skills Gap Identified
Perform EV Rechargeable Battery Repair and Maintenance	☐ Yes ☐ No	☐ Yes ☐ No		
Install and Maintain EV Charging System and Infrastructure	☐ Yes ☐ No	☐ Yes ☐ No		
Carry-Out EV Battery Charging and Swapping Station Equipment Operation	☐ Yes ☐ No	☐ Yes ☐ No		
Carry-out Advance Driving for Electric Vehicles	☐ Yes ☐ No	☐ Yes ☐ No		
Maintain and Repair EV Low Voltage Electrical Systems	☐ Yes ☐ No	☐ Yes ☐ No		
Maintain and Repair EV High Voltage Electrical Systems	☐ Yes ☐ No	☐ Yes ☐ No		
Maintain and Repair Mechanical Electric Vehicle Systems	☐ Yes ☐ No	☐ Yes ☐ No		
Manage Electric Vehicle Electronics System	☐ Yes ☐ No	☐ Yes ☐ No		
Maintain and Repair Heating Ventilation and Air Conditioning EV Systems	☐ Yes ☐ No	☐ Yes ☐ No		
Assemble EV Components and Systems	☐ Yes ☐ No	☐ Yes ☐ No		
Perform Assembly, Repair, and Maintenance of Electric Two- and Three-Wheelers	☐ Yes ☐ No	☐ Yes ☐ No		
Assemble and Maintain Electric Wheelchairs	☐ Yes ☐ No	☐ Yes ☐ No		
Perform Electric Boat Propulsion Systems Installations, Operations, and Maintenance	☐ Yes ☐ No	☐ Yes ☐ No		
Conduct Compliance Assessments for Safety Standards in E-mobility	☐ Yes ☐ No	☐ Yes ☐ No		

Annex 4:

Data Collection Survey Tool-Industry

PROMOTION OF ELECTRC MOBILITY IN KENYA SKILLS GAP SURVEY

Electric Vehicles Workforce Data Collection Form

Welcome, and thank you for participating in this survey. Your insights are to better understand e-mobility training needs that will guide the development of a relevant and responsive Competence Based Education and training (CBET) curriculum.

This assignment is being implemented by GIZ's promotion of e-mobility project in Kenya.

For any clarification, please get in touch with Dr. S. Ikinya 0725745166 or Pius Wathome on pius.wathome@giz.de

Survey Consent and Confidentiality Statement

Purpose: This survey aims to gather information for a Training Needs Assessment.

Voluntary Participation: Participation is voluntary, and you can withdraw at any time without penalty.

Confidentiality: Your responses will remain confidential, and all data will be anonymized for analysis and reporting.

Use of Data: Your data will be used solely for understanding e-mobility training needs that will guide the development of a relevant and responsive CBET curriculum and securely stored.

Consent: By completing this survey, you consent to participate under these terms.

For questions, Dr. S. Ikinya 0725745166 or Pius Wathome on pius.wathome@giz.de

Survey Consent and Confidentiality Statement

I agree to participate ☐ | I do not agree to participate ☐

Hello, kindly what is your preferred name in this Survey

Which sector do you represent?

SECTION A: Training Institution/EV Training Agency/ EV Training Consultants

1. Name of Institution: ______________________________

2. Tell us brief about Name of Institution: in relation to EV trainings (such as who is your target, what aspects do you train, certification body)

3. Category: (Tick where applicable)

    a. TVET National Polytechnic

    b. TVET TTI/TVC

    c. University TVET Institute

    d. University

    e. Private Training Company/EV Consultants

    f. Industrial Training Centre

    g. Others

4. What are the critical occupations/tasks within the e-mobility ecosystem that are essential for Kenya's workforce

5. Should an e-mobility curriculum be developed as an add-on to existing programs or as a stand-alone modular curriculum

6. E-mobility curriculum be developed as an add-on to existing programs

7. E-mobility curriculum be developed as a stand-alone modular curriculum

8. How many trainees with Disability (PWD) are undertaking Automotive Courses Yes

9. Rate female trainees in each group of 10 male trainees on a scale of 1 to 10 at you organization

SECTION B: PRIVATE SECTOR, INDUSTRY IN E-MOBILITY

10. Name of Enterprise/Organization: ____

11. What is the number of Male workers in EV and the Number of Female workers in EV tasks within

12. Do female workers perform the same tasks as male workers (Yes/No)

13. Rate the number of female workers on a scale of 1 to 10 for every 10 male workers in automotive at

14. Which EV tasks/Jobs are predominantly assigned to female workers

15. Which EV tasks/Jobs are predominantly assigned to male workers

16. What is the average age of e-mobility workers at

    ☐ 25 years and below

    ☐ 26 – 35 years

    ☐ 36 – 49 years

    ☐ 50 years and above

17. What is the highest level of education among e-mobility workforce

- ☐ Bachelor's Degree
- ☐ Vocational/Technical Training
- ☐ Apprenticeship/On-the-Job Training/Workplace-Based Learning

18. How did your workers __ Name of Enterprise/Organization: acquire e-mobility (EV) skills? (State whether formal or informal, and provide details of who offered training, for how long, when and where)

19. List the various (EV), e-mobility job roles available

20. What are the critical occupations and tasks within the e-mobility ecosystem that are essential for Kenya's workforce?

21. If __ Name of Enterprise/Organization was to hire a TVET graduate in EV, which of the following duties would you like them to effectively perform

a. Repair and Maintain Electric Vehicle Rechargeable Battery

b. Install and Maintain EV Charging System and Infrastructure

c. Carry-out EV Battery Charging Station maintenance and Operation

d. Perform Advanced Driving for Electric Vehicles

e. Maintain and Repair Electric Vehicle Low Voltage Electrical Systems

f. Maintain and Repair Electric Vehicle High Voltage Electrical Systems

g. Repair and Maintain EV Mechanical Systems

h. Repair and Maintain EV Electronics System

i. Repair and Maintain Heating Ventilation and Air Conditioning (HVAC) EV Systems

j. Assemble EV Components and Systems Installation and Integration (Assembly of EV)

k. Assemble and repair Electric Two- and Three-Wheelers

l. Assemble and repair Electric Wheelchairs

m. Perform E-Mobility Compliance and Safety Standards

n. Carry out E-Mobility Competency Based Training

SECTION C: GOVERNMENT, MINISTRY, AGENCIES, DEVELOPMENT PARTNERS, CONSULTANTS, NGOS

22. Name of Organization/Agency: ____________________________

23. Type of Organization: (Tick where applicable)

24. Government Ministry

- ☐ Government Agency
- ☐ Development Partner
- ☐ Consultant
- ☐ NGO

- ☐ Other (Specify) _______________

25. Kindly share with us the name of your organization? is currently doing within the E-mobility (e.g., policy development, funding, research, training, regulation, infrastructure development, advocacy, Support etc):

26. What technical skills are required for the EV sector in Kenya today, from your experience?

SECTON D: Importance Level of Duties and Task in EV

27. Duties in E-Mobility Sector

a. For each duty listed below, indicate the level of importance for each task by ticking the appropriate box. You may also add more tasks or duties as needed.

S.No	Duty Item	Very Important	Important	Not Important	
	Duty A: Repair and Maintain Electric Vehicle Rechargeable Battery				
	Duty B: Install and Maintain EV Charging Technologies/Charging System and Infrastructure				
	Duty C: Carry-out EV Battery Charging Station Equipment maintenance and Operation				
	Duty D: Perform Advanced Driving for Electric Vehicles				
	Duty E: Maintain, Repair, and Service Electric Vehicle Low Voltage Electrical Systems				
	Duty F: Maintain, Repair, and Service Electric Vehicle High Voltage Electrical Systems				
	Duty G: Repair and Maintain EV Mechanical Systems				
	Duty H: Repair and Maintain EV Electronics System				
	Duty I: Repair and Maintain Heating Ventilation and Air Conditioning (HVAC) EV Systems				
	Duty J: Carry-out EV Components and Systems Installation and Integration (Assembly of EV)				
	Duty K: Carry-out Electric Two- and Three-Wheelers Assembly, Repair, and Maintenance				
	Duty L: Carry-out Electric Wheelchairs Assembly, Repair and Maintenance				
	Duty M: Perform E-Mobility Compliance and Safety Standards				

b. Based on the list of duties provided above, please suggest any improvements to specific duties and recommend any additional duties that should be considered.

28. Job Titles and Job roles

a. Select FIVE Key E-Mobility job titles or roles in Kenya

- ☐ EV Battery Maintenance artisan
- ☐ EV Battery Repair and Maintenance Technician
- ☐ EV Charging Infrastructure Technician
- ☐ EV Systems Installation and Maintenance Technician
- ☐ EV Charging Station Operator
- ☐ EV Charging Maintenance Technician

- ☐ Advanced Electric Vehicle Driver
- ☐ EV Low Voltage Technician
- ☐ EV High Voltage Technician
- ☐ Mechanical Electric Vehicle Systems Technician
- ☐ EV Electronics Technician
- ☐ EV HVAC System Service Technician
- ☐ Electric Vehicle Assembly Technician
- ☐ Electric Two- and Three-Wheeler Assembly Operator Technician
- ☐ Electric Two-and Three-Wheeler Maintenance and Repair Technicians
- ☐ Electric Wheelchair Assembly and Maintenance Technician
- ☐ EV Safety Standards and Compliance Officer
- ☐ Electric Vehicle Sales Associate
- ☐ Electric Vehicle Operations Assistant

b. Specify one job in E-Mobility that is critical in curriculum development. List specific activities or tasks associated with the job

29. Participation of Women in E-Mobility

a. From your experience, how are women currently participating in the e-mobility sector in Kenya?

b. What opportunities exist to enhance women's engagement across various roles within the e-mobility value chain (e.g., technical, operational, policy, entrepreneurship)?

c. Can you share any best practices or initiatives that have successfully supported women's inclusion in the e-mobility sector, either in Kenya or from other contexts?

30. Participation of Persons with Disability in E-Mobility

a. From your experience, how are Persons with Disabilities currently involved in the e-mobility sector in Kenya?

b. What inclusive strategies or design considerations can help ensure that e-mobility solutions are accessible to PWD, both as users and as professionals in the sector?

c. Are there any notable examples or initiatives that promote the active participation of PWD in the development, operation, or policymaking aspects of e-mobility?

Please share with us any other information relevant in curriculum development.

Thank you for taking the time to complete this survey. Your insights are invaluable in helping us understand the current landscape and identify key training needs to support Curriculum Development Process in E-Mobility

Annex 5:

Data Collection Survey Tool-Trainees

AUTOMOTIVE TRAINEES

PROMOTION OF ELECTRC MOBILITY IN KENYA SKILLS GAP SURVEY

Electric Vehicles Workforce Data Collection Form

Welcome, and thank you for participating in this survey. Your valuable insights will inform the identification of e-mobility training needs and support the development of a relevant and responsive CBET curriculum

This assignment is being implemented by GIZ's promotion of e-mobility project in Kenya.

For any clarification, please get in touch with

Dr. S. Ikinya 0725745166 or Pius Wathome on pius.wathome@giz.de

Survey Consent and Confidentiality Statement

Purpose: This survey aims to gather information for a Training Needs Assessment.

Voluntary Participation: Participation is voluntary, and you can withdraw at any time without penalty.

Confidentiality: Your responses will remain confidential, and all data will be anonymized for analysis and reporting.

Use of Data: Your data will be used solely for understanding e-mobility training needs that will guide the development of a relevant and responsive CBET curriculum and securely stored.

Consent: By completing this survey, you consent to participate under these terms. For questions, Dr. S. Ikinya 0725745166 or Pius Wathome on pius.wathome@giz.de

Survey Consent and Confidentiality Statement

I agree to participate ☐ I do not agree to participate ☐

1. Hello, kindly what is your preferred name in this Survey
2. NAME) are you currently a student/trainee or have you completed your training in Automotive?

SECTION A: TRAINEE

3. (Name) What is the name of your Institution where you are currently undertaking Automotive course: ______________________________

4. Category: (Tick where applicable)
   - ☐ TVET National Polytechnic
   - ☐ TVET TTI/TVC
   - ☐ University TVET Institute
   - ☐ University
   - ☐ Private Training Company/EV Consultants
   - ☐ NITA- Industrial Training Centre
   - ☐ Training in industry/OnJob Training
5. What is the name of the Automotive course and state the Level.
6. How long does your course take?
7. What is your age
   - ☐ 25 years and below
   - ☐ 26 – 35 years
   - ☐ 36 – 49 years
   - ☐ 50 years and above
8. (Name) What is your gender? Male/ Female/ I would rather not say
9. How many trainees with Disability (PWD) are undertaking Automotive Courses in your institution?
10. Rate female trainees in each group of 10 male trainees on a scale of 1 to 10 at your Institution

SECTION B: COMPLETED/WORKING/DEFERRED OR OTHERWISE

11. Name of training institution you attended: ________________________________
12. What was the name of the Automotive course and state the level: ……………………
13. How long did the course take:
14. Category: (Tick where applicable)
    - ☐ TVET National Polytechnic
    - ☐ TVET TTI/TVC
    - ☐ University TVET Institute
    - ☐ University
    - ☐ Private Training Company/EV Consultants

- ☐ NITA- Industrial Training Centre
- ☐ Training in industry/OnJob Training

15. What is your age
    - ☐ 25 years and below
    - ☐ 26 – 35 years
    - ☐ 36 – 49 years
    - ☐ 50 years and above
16. What is your gender? Male/ Female/ I would rather not say
17. What are you currently doing with the Automotive skills acquired?
    - ☐ Employed
    - ☐ Self employed
    - ☐ Others
18. Have you acquired any Electric Vehicle skills?
    - ☐ Yes
    - ☐ No
19. Which of the following duties can you perform with minimal supervision.
    - ☐ Repair and Maintain Electric Vehicle Rechargeable Battery
    - ☐ Install and Maintain EV Charging System and Infrastructure
    - ☐ Repair and Maintain Electric Vehicle Rechargeable Battery
    - ☐ Install and Maintain EV Charging System and Infrastructure
    - ☐ Assemble EV Lithium battery
    - ☐ Carry-out EV Battery Charging Station maintenance and Operation
    - ☐ Perform Advanced Driving for Electric Vehicles
    - ☐ Maintain and Repair Electric Vehicle Low Voltage Electrical Systems
    - ☐ Maintain and Repair Electric Vehicle High Voltage Electrical Systems
    - ☐ Repair and Maintain EV Mechanical Systems
    - ☐ Repair and Maintain EV Electronics System
    - ☐ Repair and Maintain Heating Ventilation and Air Conditioning (HVAC) EV Systems
    - ☐ Assemble EV Components and Systems Installation and Integration (Assembly of EV)
    - ☐ Assemble and repair Electric Two- and Three-Wheelers
    - ☐ Assemble and repair Electric Wheelchairs
    - ☐ Perform E-Mobility Compliance and Safety Standards

☐ Carry out E-Mobility Competency Based Training

SECTON D: IMPORTANCE LEVEL OF DUTIES AND TASK IN EV

20. For each duty listed below, Tick how you have acquired the duties listed

S. No	Duty Item	Not Acquired	Acquired through on job training	Acquired through school training	
	Duty A: Repair and Maintain Electric Vehicle Rechargeable Battery				
	Duty B: Install and Maintain EV Charging Technologies/Charging System and Infrastructure				
	Duty C: Carry-out EV Battery Charging Station Equipment maintenance and Operation				
	Duty D: Perform Advanced Driving for Electric Vehicles				
	Duty E: Maintain, Repair, and Service Electric Vehicle Low Voltage Electrical Systems				
	Duty F: Maintain, Repair, and Service Electric Vehicle High Voltage Electrical Systems				
	Duty G: Repair and Maintain EV Mechanical Systems				
	Duty H: Repair and Maintain EV Electronics System				
	Duty I: Repair and Maintain Heating Ventilation and Air Conditioning (HVAC) EV Systems				
	Duty J: Carry-out EV Components and Systems Installation and Integration (Assembly of EV)				
	Duty K: Carry-out Electric Two- and Three-Wheelers Assembly, Repair, and Maintenance				
	Duty L: Carry-out Electric Wheelchairs Assembly, Repair and Maintenance				
	Duty M: Perform E-Mobility Compliance and Safety Standards				

21. Have you come across individuals working in any of the following e-mobility roles or job titles (either during your training, internship, industry visits, or in your community)? Please tick all that apply.

☐ EV Battery Maintenance artisan

☐ EV Battery Repair and Maintenance Technician

☐ EV Charging Infrastructure Technician

☐ EV Systems Installation and Maintenance Technician

☐ EV Charging Station Operator

☐ EV Charging Maintenance Technician

☐ Advanced Electric Vehicle Driver

☐ EV Low Voltage Technician

☐ EV High Voltage Technician

☐ Mechanical Electric Vehicle Systems Technician

- ☐ EV Electronics Technician
- ☐ EV HVAC System Service Technician
- ☐ Electric Vehicle Assembly Technician
- ☐ Electric Two- and Three-Wheeler Assembly Operator Technician
- ☐ Electric Two-and Three-Wheeler Maintenance and Repair Technicians
- ☐ Electric Wheelchair Assembly and Maintenance Technician
- ☐ EV Safety Standards and Compliance Officer
- ☐ Electric Vehicle Sales Associate
- ☐ Electric Vehicle Operations Assistant

SECTON E: TRAINEE LEVEL OF PRACTICAL APPLICATION, CRITICAL THINKING, AND REAL-WORLD PROBLEM-SOLVING ACROSS EV DUTIES

(NB: The correct Answers are only to guide the question developer)

Duty A – Repair and Maintain Electric Vehicle Rechargeable Battery

22. During a routine inspection, a technician notices that one module in a lithium-ion battery pack is heating up faster than others. What should be the technician's immediate action?

    a. A. Continue charging and monitor closely

    b. B. Replace the entire battery pack

    c. C. Isolate the faulty module and run diagnostic tests

    d. D. Reduce the charging current to balance the modules

    ☑ Correct Answer: C

Duty B – Install and Maintain EV Charging Technologies/System

23. You're setting up a Level 2 charging station in a parking lot with limited grid access. What factor is MOST critical in selecting the charging unit?

    a. Colour of the charging unit

    b. Compatibility with local EV models

    c. Internet connectivity features

    d. D. Availability of solar backup

    ☑ Correct Answer: B

Duty C – EV Battery Charging Station Equipment Maintenance

24. While performing maintenance, the charging station unexpectedly shuts down during a session. Which step should you take FIRST to troubleshoot the issue?

    a. Restart the station remotely

    b. Check the power supply circuit breaker

    c. Update the firmware

d. Inform the customer and resume charging manually

✅ **Correct Answer: B**

Duty D – Advanced Driving for Electric Vehicles

25. While driving an EV in hilly terrain, which approach helps conserve battery power the most?

    a. Accelerating before each incline

    b. Shifting to neutral on descents

    c. Engaging regenerative braking on slopes

    d. Turning off climate control systems

    ✅ **Correct Answer: C**

Duty E – Low Voltage Electrical Systems Service

26. An EV's dashboard lights flicker when the headlights are turned on. What is the MOST likely cause?

    a. High-voltage system failure

    b. Faulty headlight switch

    c. Weak 12V auxiliary battery

    d. Software glitch in ECU

    ✅ **Correct Answer: C**

Duty F – High Voltage Electrical Systems Service

27. A high-voltage connector is showing signs of corrosion. What's the correct procedure before cleaning or replacing it?

    a. Spray anti-rust solution directly on the connector

    b. Isolate and discharge the high-voltage system

    c. Tap gently to remove debris

    d. Cover the connector with electrical tape

    ✅ **Correct Answer: B**

Duty G – EV Mechanical Systems Maintenance

28. After a long-distance trip, an EV customer complains about a grinding noise during deceleration. What's your FIRST diagnostic step?

    a. Check the HVAC system

    b. Test the drive mode settings

    c. Inspect the regenerative braking system and brake pads

    d. Lubricate the steering components

    ✅ **Correct Answer: C**

Duty H – EV Electronics System Maintenance

29. An EV has intermittent issues with dashboard display and error lights. What tool would best support root

cause analysis?

a. Thermal imager

b. OBD-II diagnostic scanner

c. Digital torque wrench

d. Ultrasonic sensor tester

✅ Correct Answer: B

Duty I – HVAC System Maintenance in EVs

30. You're servicing an EV's HVAC system that uses a heat pump. What could cause poor cabin heating despite a functioning compressor?

a. Faulty windshield defroster

b. Blocked air filters only

c. Low refrigerant or sensor failure

d. Blown headlight fuse

✅ Correct Answer: C

Duty M – E-Mobility Compliance and Safety Standards

31. You are assembling EV components in a workshop. How do you ensure compliance with high-voltage safety protocols?

a. Wearing steel-capped shoes

b. Using insulated tools and lock-out tag-out procedures

c. Disconnecting only the 12V system

d. Keeping safety gloves in your toolbox

✅ Correct Answer: B

Duty J – EV Components and Systems Installation and Integration (Assembly of EV)

32. During final assembly of an EV, the motor fails to communicate with the inverter. What is the MOST likely reason and your first troubleshooting action?

a. Battery pack voltage is too low – recharge the battery

b. Communication wiring harness may be loose – inspect CAN bus connections

c. Motor controller is overheating – install a cooling fan

d. Tyres are not balanced – check wheel alignment

✅ Correct Answer: B

Duty K – Electric Two- and Three-Wheelers Assembly, Repair, and Maintenance

33. A customer brings in an electric two-wheeler that loses power when climbing hills. What should you inspect FIRST?

a. Chain lubrication level

b. Tire pressure

c. Motor output and battery load performance under stress

d. Handlebars for alignment

✅ **Correct Answer: C**

Duty L – Electric Wheelchairs Assembly, Repair, and Maintenance

34. While assembling a powered wheelchair, you notice the joystick controls are non-responsive during testing. What is the most appropriate troubleshooting step?

a. Replace the joystick immediately

b. Check battery connection and verify controller settings

c. Inflate the rear wheels

d. Test the lighting system

✅ **Correct Answer: B**

SECTON F: PARTICIPATION OF WOMEN AND PWD IN E-MOBILITY

35. Participation of Women in E-Mobility and Persons with Disability in E-Mobility

a. From your experience, how are women currently participating in the e-mobility sector in Kenya?

b. What opportunities exist to enhance women's engagement across various roles within the e-mobility value chain (e.g., technical, operational, policy, entrepreneurship)?

c. From your experience, how are Persons with Disabilities currently involved in the e-mobility sector in Kenya?

d. What inclusive strategies or design considerations can help ensure that e-mobility solutions are accessible to PWD, both as users and as professionals in the sector?

36. Should an e-mobility curriculum be developed as an add-on to existing programs or as a stand-alone modular curriculum

a. E-mobility curriculum be developed as an add-on to existing programs

b. E-mobility curriculum be developed as a stand-alone modular curriculum

37. Please share with us any other information relevant in curriculum development.

Thank you for taking the time to complete this survey. Your insights are invaluable in helping us understand the current landscape and identify key training needs to support Curriculum Development Process in E-Mobility

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