National Electric Vehicles Policy Framework

The United Republic of Tanzania
Ministry of Transport

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Acknowledgements

This report is produced as part of the UN Climate Technology Centre and Network (CTCN) technical assistance entitled “Developing a National Framework for deploying and scaling up e-mobility (EM) in Tanzania”. This project is requested by the Ministry of Transport of Tanzania through the Tanzania Commission of Science and Technology (COSTECH). The project is implemented by Siemens AG in collaboration with Innovex.

Partners on the project:

Consultant:

Executive Summary

1. Tanzania is largely dependent on imported fossil and unrefined biomass fuels for economic and transport activities. Due to its rapid urbanization and increasing individual motorization, traffic congestion and air pollution have increased alongside GHG emissions. To address those issues, the Tanzania Commission for Science and Technology (COSTECH), in coordination with the main beneficiaries, Ministry of Energy, Ministry of Transport, and Vice President's Office (VPO) sought technical assistance support from the UN Climate Technology Centre and Network (CTCN). The overall objective of the technical assistance (TA) is to develop a national E-Mobility program and its implementation framework for deployment and scaling-up of electric transportation systems.

2. The assignment was implemented through four phases with each phase building on the other:

   I. Inception, Baselining, and EV Market Assessment: This phase involves establishing a baseline understanding of the current state of E-Mobility in Tanzania, assessing market readiness, and identifying potential barriers and opportunities.

   II. National EV Policy Framework: This phase focuses on crafting policies that will guide the development and implementation of E-Mobility. It draws from international best practices, analyzing successful strategies from countries like Germany, Norway, Chile, China, and Egypt.

   III. Development of EV Implementation Framework and Business Models: This phase aims to create practical frameworks and business models that support the deployment and scaling-up of electric vehicles (EVs) and related infrastructure.

   IV. Capacity Building and Awareness Creation: The final phase emphasizes the importance of building local expertise and public awareness to ensure the successful adoption and integration of E-Mobility solutions.

3. This report is the result of the second phase – the National Electric Vehicle Policy Framework - detailing the strategic objectives and policy recommendations necessary for promoting E-Mobility in Tanzania. Drawing from international best practices in countries like Germany, Norway, Chile, China, and Egypt, it offers insights into scaling up electric vehicles (EVs) and e-buses.

4. Key recommendations are organized into four pillars, each addressing a critical aspect of the E-Mobility transition:

Pillar 1: Localization and Manufacturing

- Capacity Building: This includes enhancing local skills and expertise across all sectors related to E-Mobility, from manufacturing to maintenance. This entails partnerships with international companies to transfer knowledge and technology.
- Establishment of EV Manufacturing and Assembly Lines: It is suggested that the government establishes a fund to facilitate the setup of manufacturing and assembly lines

for EVs in Tanzania. This initiative aims to reduce reliance on imports and stimulate local industry.

- Incentives for Local Manufacturers: The report advocates for providing financial incentives to local manufacturers to encourage investment in the E-Mobility sector. This includes tax breaks and subsidies to support the development of a domestic EV industry.

Pillar 2: Scaling Up EVs and E-Buses

- Financial Incentives: The government should introduce financial incentives for the purchase of new EVs and retrofitting existing internal combustion engine vehicles. This includes reduced import tariffs and subsidies for consumers and businesses.
- Electricity Pricing and Non-Financial Incentives: Recommendations include offering discounted electricity rates for EV charging and implementing non-financial incentives, such as priority access to low-emission zones and designated parking slots for EVs.
- Public Awareness Campaigns: To increase public acceptance and awareness of the benefits of EVs, it is important to conduct extensive promotional campaigns highlighting environmental and economic advantages.

Pillar 3: Synergy with Renewable Energy Sources (RES) and GHG Reduction

- Shift to Renewable Energy: Shifting investments from conventional power generation to renewable energy source in order to align the growth of the EV market with clean energy initiatives, thereby reducing GHG emissions.
- Incentives for Fleet Operators: Financial incentives should be provided to fleet operators and public transport providers to encourage the adoption of EVs. This includes support for the installation of renewable energy systems and emissions monitoring.

Pillar 4: Charging Infrastructure Development

- Infrastructure Investment: A key recommendation is the development of a robust and reliable charging infrastructure network. This includes upgrading the national grid, installing public charging stations, and ensuring that the infrastructure can support the growing number of EVs.
- Regulations and Standards: The report advises establishing clear regulations for charging tariffs, technical standards for chargers, and ensuring interoperability between different charging networks. These measures are crucial for creating a user-friendly and efficient charging experience.
- Encouraging Private Investment: The government should offer incentives to international charge point operators (CPOs) and local businesses to invest in charging infrastructure. This could include tax incentives and grants to offset the initial setup costs.

The document concludes with a summary of the recommended policies and a strategic roadmap for implementing E-Mobility in Tanzania. This roadmap provides a comprehensive guide for policymakers, stakeholders, and investors, outlining the steps needed to achieve a sustainable and scalable E-Mobility ecosystem.

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Abbreviations

BEV	Battery Electric Vehicle
BEB	Battery Electric Bus
CAPEX	Capital Expenditure
COSTECH	Commission for Science and Technology
CTCN	Climate Technology Center and Network
CPO	Charging Point Operator
DTI	Department of Trade and Industry
DSO	Distribution System Operator
DisCos	Distribution Companies
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
EWURA	Energy and Water Utilities Regulatory Authority
FCB	Fuel Cell Bus
FCEV	Fuel Cell Electric Vehicle
GoO	Guarantee of Origin
GHG	Greenhouse Gases
HEV	Hybrid Electric Vehicle
ICE	Internal Combustion Engine
IPAP	Industry Policy Action Plan
KWh	Kilowatt hour
LEZ	Low Emission Zone
LV	Low Voltage
MV	Medium Voltage
MoWT	Ministry of Works and Technology
MoEST	Ministry of Education, Science, and Technology
MoF	Ministry of Finance
MoU	Memorandum of Understanding
MoIT	Ministry of Industry and Trade
NDC	Nationally Determined Contributions
NDE	National Designated Entity
NMT	Non-motorized Transport
NGO	Non-governmental Organization
OEM	Original Equipment Manufacturer
PWG	Policy Working Group
PHEV	Plug-in Hybrid Electric Vehicle
PHEB	Plug-in Hybrid Electric Bus
PPP	Public Private Partnerships
RE	Renewable Energy
RES	Renewable Energy Sources
R&D	Research and Development
TBS	Tanzania Bureau of Standards
TCO	Total Cost of Ownership
TSO	Transmission System Operator
TRA	Tanzania Revenue Authority
TanRoads	Tanzania National Roads Agency
TARURA	Tanzania Rural and Urban Roads Agency
TANESCO	Tanzania Electric Supply Company Ltd
VAT	Value-added Tax
VPO	Vise President
V2X	Vehicle to X
2W	Two Wheelers
3W	Three Wheelers

1 Introduction and Context

1.1 Background and Problem Statement

5. Tanzania is largely dependent on imported fossil and unrefined biomass fuels for economic and transport activities. Due to its rapid urbanization and increasing individual motorization, traffic congestion and air pollution have increased alongside GHG emissions. **Dar es Salaam is the second-fastest growing city worldwide[1], where public transport depends on 2-wheelers, 3-wheelers and a large fleet of privately-owned minibuses.** Electric mobility (E-Mobility) has been recognized as a viable and attractive option that can create jobs, reduce energy imports, and spur green growth. In line with its National Transport Policy,[2] which envisions improving the transport sector's efficiency, cost-effectiveness, accessibility and environmental degradation, **Tanzania sought seeking technical assistance (TA) for the development of an E-Mobility program and implementation framework**. The country has implemented policies and strategies to promote renewable energy technologies in various sectors of the economy. However, there has been no specific initiative or effort directly targeting E-Mobility.

1.2 Report Structure

6. The report is structured as follows:

- ***Part 1: Introduction and Context***: This section serves as an introductory part of the report, presenting an overview of the project and its background. It outlines the objectives, significance, and purpose of the project, providing the necessary context for the subsequent sections that delve into the specific aspects of the report.
- ***Part 2: Tanzanian Context and Market Assessment:*** This gives relevant background to the reader about Tanzania and its situation regarding e-mobility and related sectors, esp. the transport sector and the electricity supply.
- ***Part 3: Transformational Demand:*** This section aims to outline the demand on transformation towards policies and regulations enable uptake of e-mobility by framing Tanzania's objectives and international examples for the introduction of e-mobility.
- ***Part 4: Policy recommendations:*** This section provides a recommended set of policies. The policies were selected by the consultant and evaluated by the Policy Working Group (PWG) of Tanzania for the National e-mobility framework.
- ***Part 5:* Summary:** This section summarizes the results of the National Electric Vehicle Framework and gives an outlook on the upcoming activities.

[1] https://www.nationalgeographic.com/environment/article/tanzanian-city-may-soon-be-one-of-the-worlds-most-populous
[2] http://www.tzonline.org/pdf/nationaltransportpolicy2.pdf

2 Tanzanian Context and Market Assessment

2.1 Global Context of Transport Electrification

7. The Electrification of transport fleets is radically transforming the transport sector and automotive industry, where it is set to continue growing until mass-market adoption is achieved. **In 2022, over 10 million EVs were sold, accounting for 14% of all new cars sold, up from 9% and 5% in 2021 and 2020 respectively**. The global market is driven mainly by China, Europe, and the United States of America. Currently, China accounts for more than half of EVs globally and already surpassed their 2025 target for new energy vehicle sales. Europe with an over 15% increase in electric car sales in 2022 is the second largest EV market, while the United States is the third largest EV market witnessing a 55% increase in EV sales in 2022 (International Energy Agency, IEA, 2023). The market is expected to continuously grow with EVs expected to overtake ICEs by 2047, see Figure 2-1.

8. The ambitious growth in the global EV market is driven by a combination of the following factors:

   - **Strategic drivers**: Over the past decade, the increasing global awareness of climate change has created a spill-effect of increased interest in electric vehicles. Coupled with the combinations of pull measures in favour of EVs (e.g., purchase subsidies, vehicle purchases, and registration tax rebates) and push measures against ICE vehicles (e.g., tightened tailpipe CO2 standards), world sales of EVs, especially in the United States, China, and Europe, have been boosted considerably (International Energy Agency, IEA, 2021);

   - **Technical drivers:** Continuing declines in battery costs and the widespread availability of electric vehicle models provide make the electric vehicle market increasingly attractive in the coming decades. According to BNEF's annual survey of battery prices, the weighted average cost of a car battery fell 13% in 2020 compared to 2019, currently holding at approximately 132 $US / kWh.[3] Examples can be found of battery prices reaching 100 $US / kWh, at which point EV price parity with traditional combustion engine vehicles can be achieved[4].

   - **Economic drivers:** The continued increase in electric vehicle range and more accessible charging infrastructure have combined to make the use of EVs more appealing. The average driving range of new BEVs per charging has reportedly increased from 200 km in 2015 to 350 km in the last five years, with even greater changes expected in the coming years due to further technological advances. Though regionally diverse, public

[3] https://about.bnef.com/blog/lithium-ion-battery-pack-prices-hit-record-low-of-139-kwh

[4] BNEF (2020) Battery Pack Prices Cited Below $100/kWh for the First Time in 2020, While Market Average Sits at $137/kWh. Available at https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/

infrastructure has also been increasing alongside EV uptake, with total charger units reaching 1.3 million in 2020, including approximately 30% classified as fast chargers (International Energy Agency, IEA, 2021).

9. Understanding the global impetus for E-Mobility integration is crucial, yet recognizing the local factors is paramount, as these are what will shape a country's EV adoption trajectory. While E-Mobility's journey commenced in various countries nearly a decade ago, the market remains nascent and open to newcomers. Adapting existing power and grid infrastructures to support EV and Electric Bus (EB) adoption demands significant technical and regulatory modifications. Effective coordination in network planning and regulatory alignment are essential. With a robust national strategy and comprehensive implementation plan, Tanzania has the potential to lead E-Mobility adoption across Africa.

10. Electrifying the transport and automotive sectors promises long-term benefits, including reduced carbon emissions, decreased pollution leading to better health outcomes, lower fuel costs, savings on fossil fuel imports, green job creation, and more.

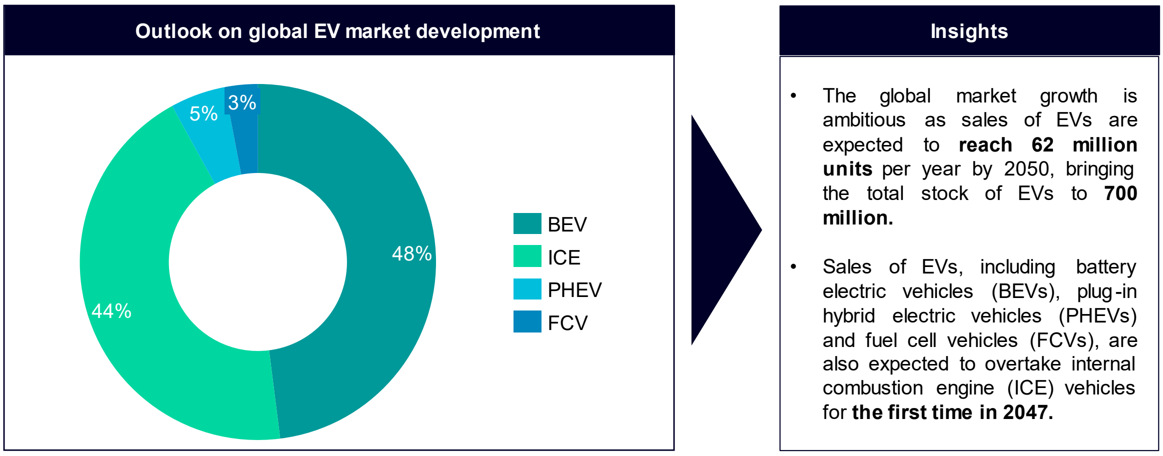

Figure 2-1 New vehicle sales by type in 2050. (**Source:** Siemens own figure using publicly available information).

2.2 Country Information

11. Tanzania is a country in Eastern Africa, bordered by Kenya and Uganda to the North, Rwanda, Burundi and the Democratic Republic of Congo to the West and Zambia, Malawi, and Mozambique to the South. The eastern border of Tanzania lies in the Indian Ocean, having a total coastline of 1,424 km. Tanzania is the 2nd most populated country in East Africa after Ethiopia in 2022 with an estimated population of 61.74 million and with a current population growth of 3.2% is projected to reach over 100 million people in 2040, see (Tanzania National Bureau of Statistics, 2022).

12. **About 97% of the population live in Tanzania mainland while the remaining 3% are in Zanzibar**. However, the population density varies significantly across the country, usually high in cities and low in rural communities.

- **Dodoma** region in which the capital city is located currently has over 3 million people and with a population growth of 3.9% in 2022, is projected to be over 4.6 million inhabitants in 2040.
- **Dar es Salaam** on the other hand is the major commercial and the most populated city with over 5 million inhabitants. With a population growth of 2.1% in 2022, the population of Dar es Salaam is projected to reach 7.6 million in 2040.
- With a population over 3.6 million inhabitants, **Mwanza** is currently the second largest urban settlement in Tanzania after the city of Dar es Salaam with a population growth of 2.9% in 2022. It is projected to be the most populated city in Tanzania in 2040 with an estimated population of 8.4 million people (Tanzania National Bureau of Statistics, 2022).

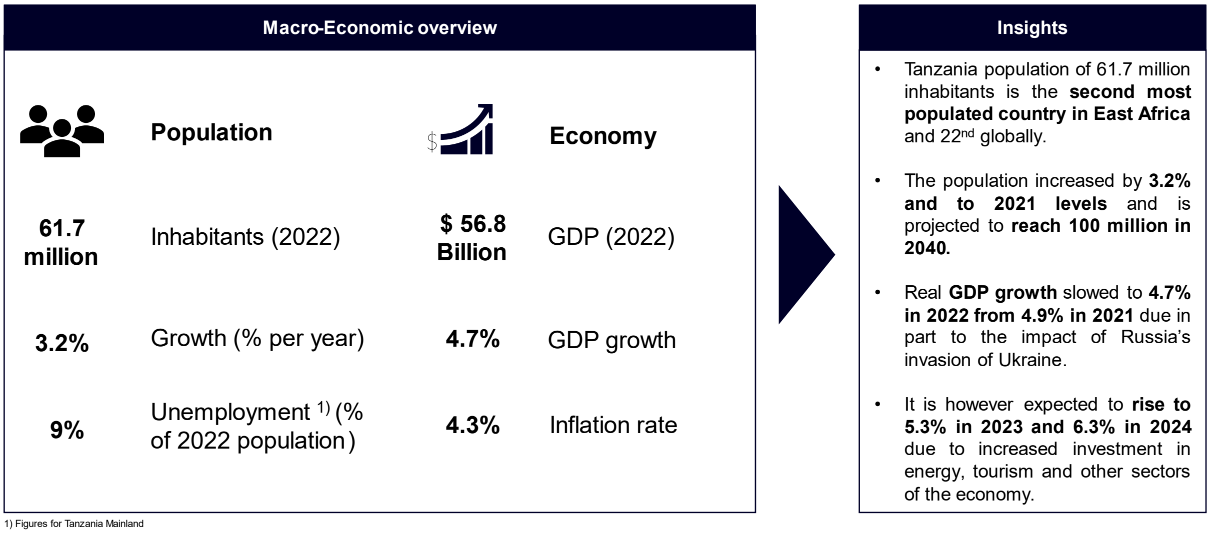

Figure 2-2 Tanzania macroeconomic overview (**Source:** Siemens own figure using publicly available information).

13. **The GDP of Tanzania witnessed a 4.7% increase in 2022 mainly driven by activities in Agriculture, mining of mineral deposits, construction, and manufacturing**. In absolute values, the country´s GDP increased to 141.8 trillion shillings ($US 56.8 billion[5]) in 2022 from135.5 trillion shillings ($US 54.2 billion) in 2021. The GDP growth was a result of Government measures to contain the impact of the war in Ukraine through strategic investment in energy, water, health, education, roads, railways, and airports infrastructure; increased production of minerals particularly coal, gypsum, salt, diamonds, limestone, and copper; and increased tourism activities. Overall, the GDP per capita increased to $US 1,229 in 2022 compared to $US 1,173 in 2021 (Ministry of Finance, 2023). Figure 2-3 highlights the annual growth in the GDP per capita, showing a steady recovery from the devasting economic impact of the COVID-19 global pandemic.

[5] Assuming an exchange rate of 1 $US equivalent to 2500 TZS.

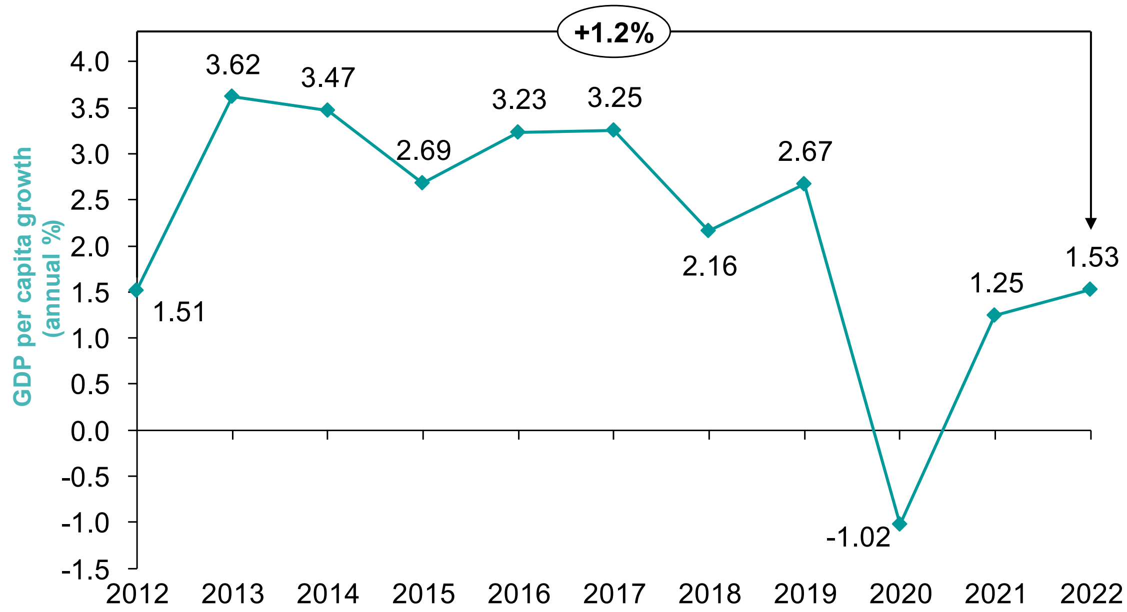

Figure 2-3 Annual % GDP per capita growth in Tanzania (**Source:** Siemens' own figure using publicly available information from the World Bank[6])

14. With a growing economy projected to uplift many of its people from poverty, Tanzania is positioned well to adopt cleaner technologies in both energy and transportation.

2.2.1 Transport sector

15. The Tanzanian Transport sector is crucial to the socio-economic development of the country as it improves accessibility to market, strengthens market competition, promotes trade and export, tourism, increases government revenue and creates job opportunities especially for youths**. The transport sector systems in Tanzania consist of surface (roads and railways), air, sea, and inland waterways, contributing ~ 6.7% to the GDP in 2022**. Geographically, Tanzania occupies a total surface area of 947,300 Sq.km, comprising of 885,800 km^2 landmass and 61,500 km^2 of water bodies. Road transport is the most dominant mode of transport in the country and government at different levels have continued to invest in road infrastructure to drive socio-economic development in line with Tanzanian´s Vision 2025.[7]

16. **The total road network has doubled in the last two decades, increasing from 85,000 km in 2003 to 181,191 km in 2022 of which 20% are national roads (trucks and regional) and the remaining 80% are classified as district roads (collector, feeder, and urban roads)** (Ministry of Finance, 2023). The development and maintenance of roads in Tanzania are undertaken by two major agencies:

   – **Trunk and Regional Roads** - Tanzania National Roads Agency (TANROADS), under the Ministry of Works and Transport (Works).

[6] More information: https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG
[7] http://www.tzonline.org/pdf/theTanzaniadevelopmentvision.pdf

– **District Roads (Collector, Feeder and Community Roads)** - Tanzania Rural and Urban Roads Agency (TARURA), under the Ministry of Presidents' Office, Regional Administration and Local Governments (PORALG).

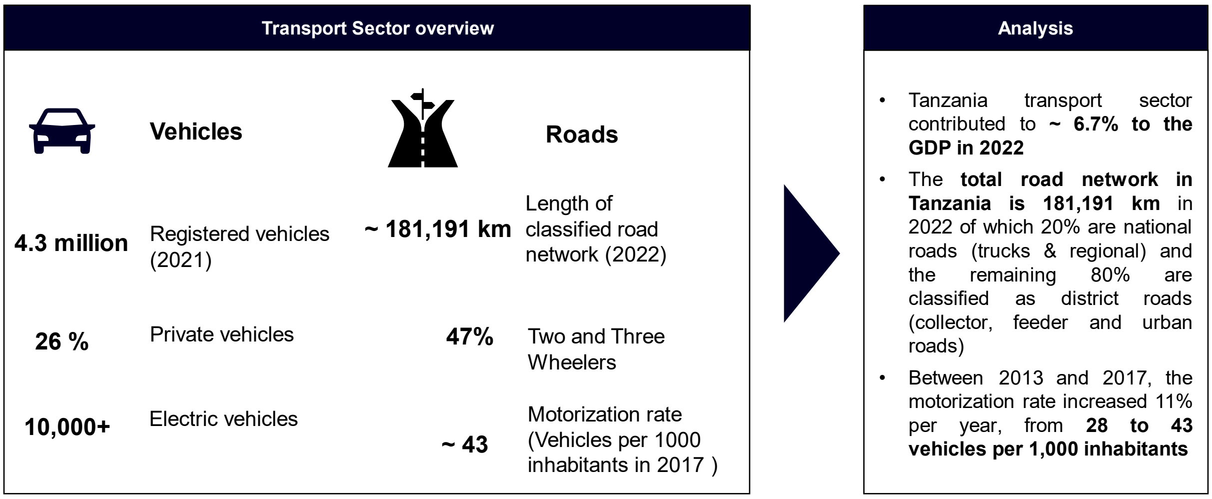

Figure 2-4 Tanzania transport sector overview (**Source:** Siemens own figure using publicly available information).

17. The Tanzanian Ministry of Transport published the **National Transport Policy** in 2003, with the aim to enhance the supporting role of the transport sector in social and economic development of the public and private sectors (Ministry of Communications and Transport, 2003). It seeks to promote private sector involvement in infrastructure development and service provision under a regulated environment.

18. The Tanzanian Revenue Authority (TRA),[8] the agency responsible for registration of vehicles in Tanzania reports that the total vehicle stock has more than doubled in the last six years, growing from 1.9 million in 2015 to 4.3 million in 2021 and projected to reach 8 million in 2030. **The 2-wheelers (Motorcycles and Mopeds) account for ~45% of the total vehicle stock, followed by private passenger vehicles/cars (27.4%), Light passenger vehicles/Minibuses[9] (17.25%) and three-wheelers at 3.15%** (Tanzania Ministry of Works and Transport, 2021). Boda bodas which account for majority of the motorcycles in Tanzania play critical roles in moving passengers and goods from downtown Dar es Salaam and other cities across Tanzania to remote villages given their ability to navigate through rough and muddy pathways and tight traffic jams. While majority of the motorcycles operate offline picking up passengers at loading stations (Kijiwe), others have joined hailing apps such as Uber, Bolt, Piki, Nibebe, etc. 3-wheelers (Bajajis and Guta) also play an important role in public transport across cities and communities in Tanzania. While Bajajis are designed to move up to four passengers and light goods at a time, Gutas are cargo tuktuks and typically have open truck beds in the back to carry a variety of goods from markets to end-use customers (Africa E-Mobility Alliance (AfEMA), 2023).

19. Public transport with buses comprises mostly of privately owned Daladala and the state-owned bus rapid transit buses (BRT). The Dar es Salaam BRT system funded by the World Bank and the

[8] https://www.tra.go.tz/
[9] These set of vehicles have the capacity to convey less than 12 persons.

African Development Bank (ADB), is planned to be implemented in six phases which will be integrated as one system with a total of 154.4km[10].

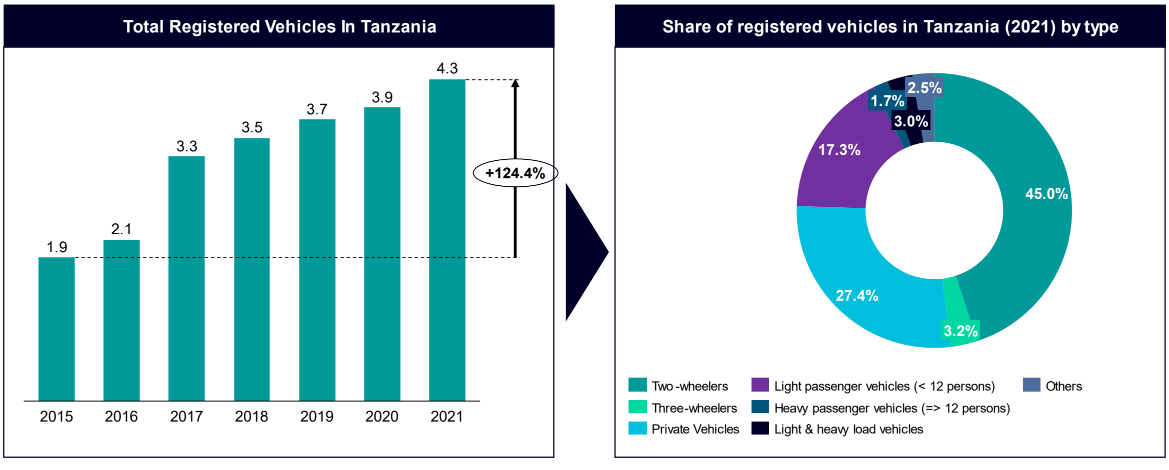

Figure 2-5 Total vehicle stock and their share in Tanzania (**Source:** Siemens own figure based on available data from **(Tanzania Ministry of Works and Transport, 2021)**).

20. EVs are not yet popular in Tanzania for residential car owners and there are currently no set targets or policies for the transport sector concerning the deployment of EVs. However, the research conducted by AfEMA[11] suggests that current E-Mobility deployment is being driven by private companies ranging from two to three wheelers to four-wheelers for tourist activities.

21. For instance, about 10,000 2W/3Ws are currently operating in Tanzania for personal users and delivery drivers. Companies such as eMo, Boda-boda, Greenfoot, Sinoray and Linkall are providing e-2Ws, while Tri and Sinoray are in the 3W market with DIT Company, SESECOM and Elico on the edge of entering the market.

22. E-Motion Africa is a company that currently provides electric 4-Wheelers. About 30 four-wheelers are reported to be in operation in Tanzania with E-Motion focusing on open-top safari vehicles. Kaypee Motors is another company that prototyped a small electric flat-bed truck in Dar es Salaam in 2022 but is yet to offer their trucks commercially[12]. There are currently no known E-Bus providers in Tanzania even though E-motion Africa already indicated interest to retrofit ICE buses (Africa E-Mobility Alliance (AfEMA), 2023).

23. As far as the outlook for the EV market is concerned, insights from local stakeholders indicate a continued growth in the number of EVs in the country especially two- and three-wheelers as well as high-end safari 4-wheelers for the tourism sector in Tanzania[13]. A challenge that was noted during the physical mission in Tanzania was the fact that some EVs are already operating on the streets but are not regulated under the current traffic act. A coordinated E-Mobility

[10] https://www.thegpsc.org/sites/gpsc/files/partnerdocs/dar_es_salaam_brt_system_and_improvements_through_tod_final-_abidjan.pdf
[11] https://www.africaema.org/
[12] https://newscentral.africa/tanzanian-cartoonist-unveils-locally-made-electric-car/
[13] Based on interview of private sector stakeholders during the physical mission in Dar es Salaam (23-25 Janauray 2024).

strategy with action items covering different EV market segments is therefore crucial to drive the overall development of the EV ecosystem in the country.

EV category	Total stock	Annual sales
2 & 3-Wheelers	10,000	3,000
4W / LDW	30	2
Buses	N/A	N/A

Figure 2-6 Current EV stock in Tanzania. (**Source:** Siemens own figure based on available data from **(Africa E-Mobility Alliance (AfEMA), 2023)**).

2.2.2 Energy sector

24. **Tanzania currently has installed electricity generation capacity of 1.73 GW, generating 9 TWh in 2022**. Out of the electricity generated, 8,907.6 GWh were produced through the national grid, 6.7 GWh from off-grid sources and 150.6 GWh imported from Uganda and Zambia. Figure 2-7 shows that electricity generation in Tanzania is majorly driven by hydro, gas, and biomass.

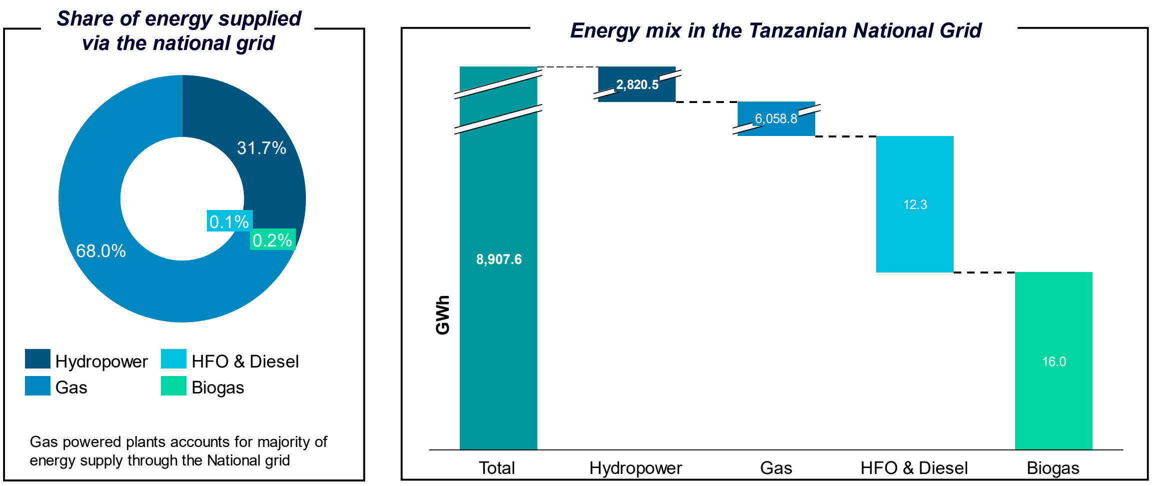

Figure 2-7 Energy mix in the Tanzanian National grid in 2022 (**Source:** Siemens' own figure using publicly available data)

25. Despite increased investment in the power sector, the World Bank reports that only ~43% of Tanzanians currently have access to grid electricity[14]. The country has set an ambitious target of connecting **50% of households to grid electricity in 2025** and **achieve 100% universal access to modern energy by 2030**. This implies a corresponding increase in the overall energy demand, with projected peak demand of 2,677MW and 12,854 MW in 2025 and 2040 respectively, up from 1,425 MW in 2020. To meet the forecasted demand, the country requires a total installed generation capacity of 3,966 MW in the short term, 12,257 MW in the medium and 20,200.6 MW in the long term. The Ministry of Energy published the **Power System Master Plan (PMSP) 2020**[15] that evaluated the **short term** (2020 – 2024), **medium term** (2025 - 2034) and **long term** (2035 - 2044) in terms of generation and transmission capacity expansion for Tanzania (Ministry of Energy, Tanzania , 2020).

26. With identified potentials of 670 MWp solar PV, 1GW of Wind power, 5 GW of Geothermal energy and 927.5 GWyr of Nuclear energy, Tanzania has the potential to meet majority of its energy needs while meetings its National Determined Contribution (NDC) targets.

27. The PMSP indicates power generation mix which varies over the planning period and by 2044 the generation mix consist of 5,690.4 MW (28.15%) of hydro; 6,700 MW (33.18%) of natural gas; 5,300 MW (26.24%) of coal; 800 MW (3.96%) of wind; 715MW (3.54%) of solar; and 995 MW (4.93%) of geothermal of power generation.

28. The Tanzanian energy sector involves different stakeholders with roles ranging from policy and regulatory framework to electricity generation, transmission, and distribution. Policy and regulatory frameworks such as **National Electricity Policy 2015**,[16] **the Energy and Water Utilities Regulatory Authority Act 2001**,[17] **the Electricity Act 2008**,[18] and **Electricity (General) Regulations GN 63**[19] guide the Tanzanian power sector.

29. Figure 2-8 illustrates the stakeholder interaction in the Tanzanian power sector, where the Ministry of Energy formulates policy while the Energy and Water Utilities Regulatory Authority (EWURA)[20] is responsible for developing regulations and monitoring their effective implementation by all relevant stakeholders. Tanzania Electric Supply Company (TANESCO),[21] a vertically integrated company, owns and operates the main grid and has a monopoly over power transmission and distribution of electricity generated from its own facilities as well as from Independent Power Producers (IPPs). Additionally, the Rural Energy Agency (REA)[22] supports small power producers (SPPs) and stand-alone providers operating mostly in rural areas in Tanzania (International Renewable Energy Agency (IRENA), 2017).

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14 https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=TZ
15 https://www.nishati.go.tz/uploads/documents/en-1638532283-PSMP%202020%20UPDATE%20FINAL%20signed.pdf
16 https://www.nishati.go.tz/uploads/documents/en-1622283004-National%20Energy%20Policy%20(NEP),%202015.pdf
17 https://www.maji.go.tz/uploads/publications/en1547639669-EWURA%20Act%20No.%2011-2001.pdf
18 https://www.nishati.go.tz/uploads/documents/en-1622015360-Electricity_Act_2008.pdf
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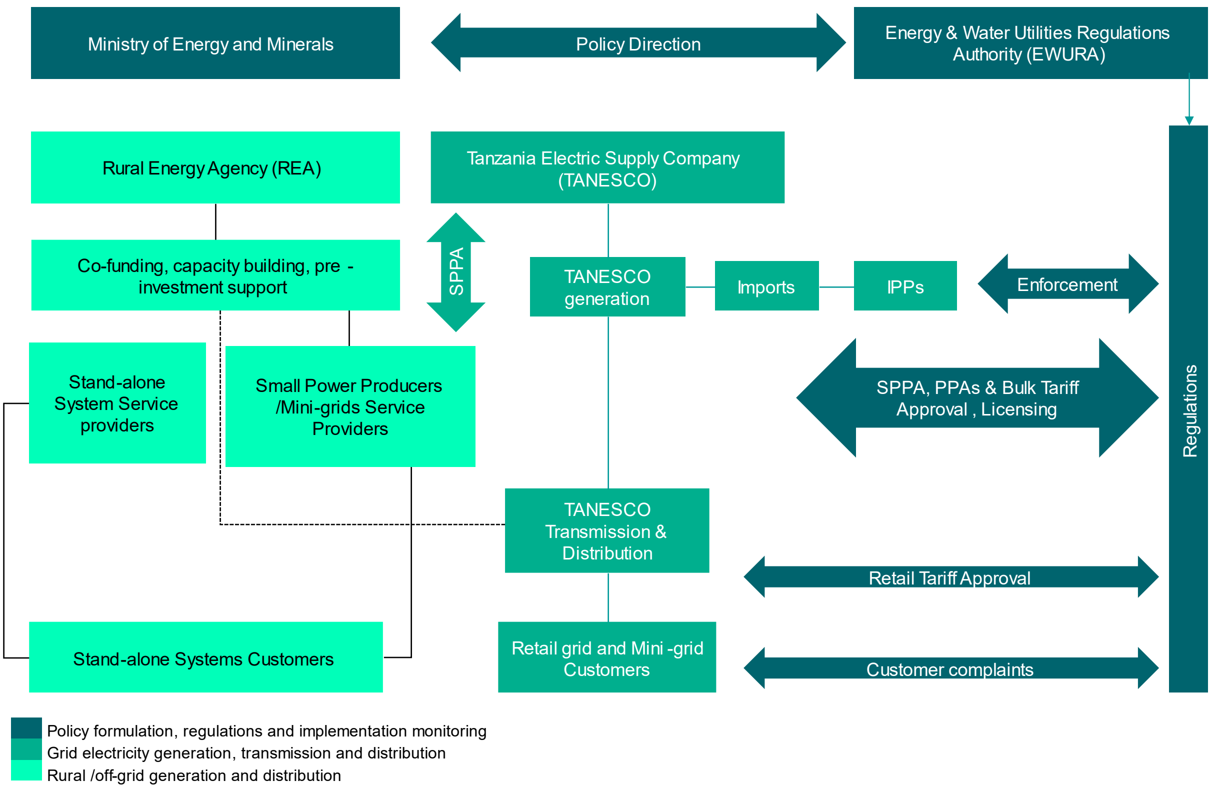


Figure 2-8 Stakeholders and their levels of interaction in the Tanzanian electricity market. (**Source:** Siemens own figure).

2.2.3 Education, Research and Local Workforce

30. To achieve its vision of human and social development, the second pillar of Tanzania Vision 2025,[23] the government has been investing in the advancement of its society's education and skillsets, with a specific focus on technical and vocational training.

31. In 2022 population aged 15-35 marked a share on the population of 34.4 percent and labor force population aged 15-64 years was around 53.4 percent. The unemployment rate in Tanzania was around 9 percent in 2021 over all ages and on 12.6 percent for the group aged 15-35 years. In this age group, the **unemployment rate for female youths is 16.7 percent and twice as much as for male youths** (8.3 percent). Most of the women and girls working, operate as own account workers or contribute family workers, and therefore are in vulnerable employment relationships with insecure loans and dependency from men. W**omen are also underrepresented in leadership and decision-making.** The reason for those gender gaps are institutional and structural constraints, gender-insensitive political parties, gender gaps in laws and policies and a lack of capacity and necessary skills among women, due to gender inequalities of the past (United Republic of Tanzania, 2021).

32. School enrollment in secondary education increased from 2015 to 2021 by 14.3 percent to 39 percent[24]. **Despite this progress, Tanzania ranks rather low in the World Bank's Human**

[23] http://www.tzonline.org/pdf/theTanzaniadevelopmentvision.pdf
[24] https://blogs.worldbank.org/opendata/latest-tanzanian-national-panel-survey-shows-progress-education

Capital Index (HCI) with 0.39 and ranks in the so called "Bottom Group"[25]. Enrollment of boys and girls in secondary education has equalized - 2022 the number of girls (1,476,369) was even slightly higher than the number of boys (1,347,219) enrolled (Ministry of Finance, 2023).

33. Despite gaps in the overall education, based on findings of the first physical mission, it was evident from discussions and a visit to a private subsidiary of Dar es Salaam Institute of Technology (DIT)[26], that **Tanzania is home to promising ventures for EV manufacturing**. The companies for 2- and 3-wheelers are currently in a start-up stage and have pilot vehicles in the fields. The manufacturing or retrofitting of 3-wheelers by TRi for example is done as one-by-one manufacturing in cooperation with DIT Company. Exemplary of the workshops of DIT in shown in figure below.

34. **Four (4) private sector companies are already active in or planning to enter the BEV manufacturing market**. These companies, i.e., TRi,[27] E-Motion (Hanspaul),[28] Ekoglobe[29] and AG Energies[30] were part of the physical mission 23-25 January 2024, which took place Dar Es Salam, and directly participated at the kick-off workshop of the policy working group.

35. The market for electric 2- and 3-wheelers in Tanzania as well as Africa seems to have high potential as motorization rates are increasing within Africa (UNCTAD, 2023). It is expected that those companies started in Tanzania face strong competition from China and other African countries. A fast increase of maturity is crucial in that stage. **A regulatory framework supporting the uptake of E-Mobility in Tanzania would support the development of the companies by reducing effort for licensing of vehicles and reducing legal risks for potential operators**.

Figure 2-9 DIT vehicle manufacturing facilities. (**Source:** Siemens).

[25] https://www.worldbank.org/en/publication/human-capital#Index
[26] https://www.dit.ac.tz/
[27] https://www.growtri.io/
[28] https://e-motion.africa/about/
[29] https://ekoglobe.co.tz/
[30] https://agenergies.co.tz/

3 Transformational Demand

1. This chapter points out the strategic targets and pillars for the e-mobility promotional strategy in Tanzania. International best practice and lessons learned from developed and developing countries, which successfully upscaled their EV stock, serve Tanzania to define their fields of activities in policies and regulations

3.1 Objectives framing the introduction of e-mobility in Tanzania

36. A key driver behind the National Electric Vehicles Policy Framework comes from the realization of the National Determined Contribution of Tanzania.[31] There, Tanzania targets to reduce 30 - 35% greenhouse gases relative to the Business-As-Usual (BAU) scenario by 2030, which leads to a reduction of 138 - 153 million tons of Carbon dioxide equivalent (MtCO2e)-gross emissions over all sectors, in which **the transport sector is declared as a priority mitigation sector**. Next to this objective, are the supporting objectives from the society, the economy, and the administration of Tanzania, wherein e-mobility typically contributes.

37. Objectives for society can mainly be categorized into health, prosperity, and equality. e-mobility can reduce emissions which directly affect health, e.g., SO_x and NO_x. A further impact on the society is affordability. **If EVs or electric transport led to a reduction of costs for mobility and transport, an increasing share of the population will be able to use mobility and improve their access on education, jobs, medical treatment, goods and authorities**, which should further result in the increase of prosperity and equality within society.

38. The **economic impact** is expressed mainly in a reduction of costs for transport and mobility. Further, it is targeted, that some parts of the e-mobility value chain can be stimulated, e.g., the mining of regional available raw materials like graphite, copper and nickel and other parts of the value chain can be localised in the future, e.g., battery manufacturing and vehicle assembly. Both expectations on the value chain would also directly contribute to objectives of the society by increasing income and prosperity. **Further economic impact could be achieved by decreasing dependencies of fuel imports by charging EVs with electricity from local renewable energies.**

39. Last, the administration aspects follow certain objectives with the implementation of e-mobility. As there are constraints in public spendings, investments and incentives for e-mobility and the required infrastructure must be affordable. **New regulations, which come with the implementation needs to be compatible with existing strategies and regulation**.

3.2 The four pillars of Tanzania's National EV Policy Framework

2. The introduction and adoption of e-mobility in a Tanzania implies the introduction of new technologies, an eco-system including roles and responsibilities, standards and regulations

[31] Nationally Determined Contribution

which will require extensive support to be sufficiently competitive with existing technologies. The governmental support offered usually comes in the form of promotional mechanisms.

3. The amount and nature of support that other countries provide vary significantly and usually correlates to the overall motivations that drive the deployment of e-mobility in such countries, i.e., the drivers and motivation.

4. Understanding the drivers / motives is key prior to developing the corresponding policies and regulatory framework. Tanzania intends to drive e-mobility and the prevention of CO2 emissions with full engagement and therefore wants to learn about the drivers and motives behind the adoption of e-mobility from successful examples worldwide. Adopting policies from one region / country, without accounting for the local context and constraints, will likely result in various challenges, and potentially failure in the implementation, given the fundamental differences and the unique operational conditions of each region / country / city.

5. Based on the drivers of international best practice and the local context, Tanzania defines four strategic pillars of policies in which it will pursue e-mobility (see Figure 3-1):

- **Pillar-1:** Localize EV technology and deepen local manufacturing
- **Pillar-2:** Scale-up Passenger EVs and E-buses
- **Pillar-3:** Synergize with RES and reduce GHGs
- **Pillar-4:** Enable the Charging Infrastructure

6.

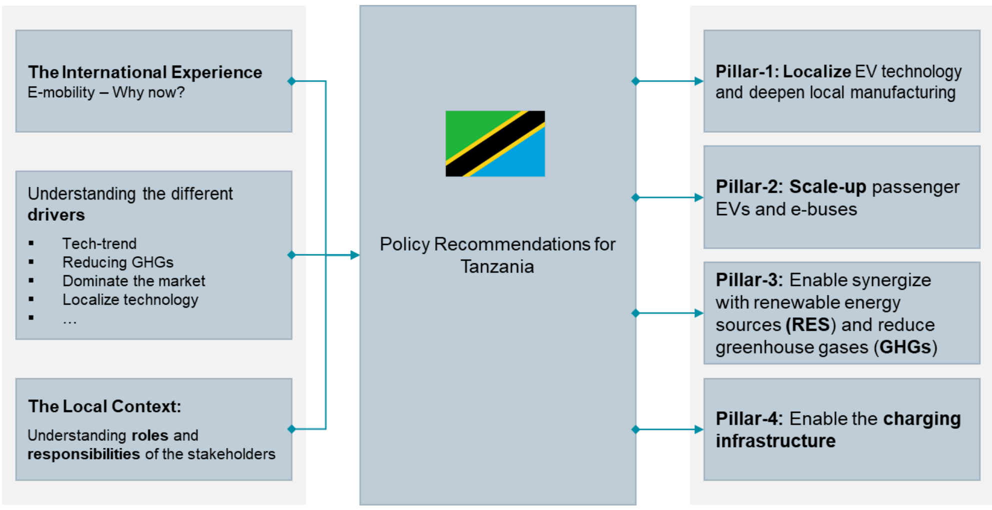


Figure 3-1 Approach to develop the e-mobility policy recommendations

3.3 International best practice in scaling-up e-mobility

7. In understanding the motivations, promotional and incentivizing measures adopted by different countries to establish and expand their e-mobility markets, the following countries have been chosen to serve as examples as they represent distinct EV adoption journeys due to their different geographical locations, economic situation, and social circumstances. The respective

governments and relevant authorities have opted for different incentivizing mechanisms that ultimately serve the same purpose; hence this review shall give the relevant authorities in Egypt some of the well-renowned international best practices and the relevant lessons learnt. The examples represent the countries with some of the largest market stock, namely, China, Norway and Germany.

3.3.1 Pillar-1: Localize EV technology and deepen local manufacturing

3.3.1.1 China

8. China in the early millennium developed a clear national vision strategy for EVs in a bid to jump-start its auto industry with electric vehicles, reduce its urban pollution (e.g., NO_x), and lower its dependence on oil.

1 Considering its competitive advantages and unique mobility needs, China established high-level industrial plans with clear-set targets that formed the backbone for policy continuity in driving the EV growth over the decades.

2 As a result, China has rapidly created the world´s largest electric vehicle market (> 100 electric vehicle manufacture), accounting for half of the global electric cars and more than 90% of the e-buses and trucks (ICCT, 2021a).

3 Mass production of EVs was one of the major market accelerators since it increased EV affordability, contributing to a quick growth in consumer demand. The government supported the establishment of the new market by defining a clear regulatory framework, and by encouraging research and development to accelerate EV technology development.

9. **Figure 3-2** Historical development of China's electric vehicle industry (Source: illustrates the four major stages of China's EV development by highlighting the key national strategies and plans that collectively defined the electric vehicle growth path and the concrete policies of three types - pilot programs, incentives, and regulations - that drove the market in the past decade.

10.

- EV purchase incentives;
- Free license plate for EVs in Shanghai & Beijing;
- Reduced electricity charging rates;
- Permitting EVs to use bus lanes;
- Refunding paid maintenance cost (once per year);
- Providing two charging stations to be used at home/work

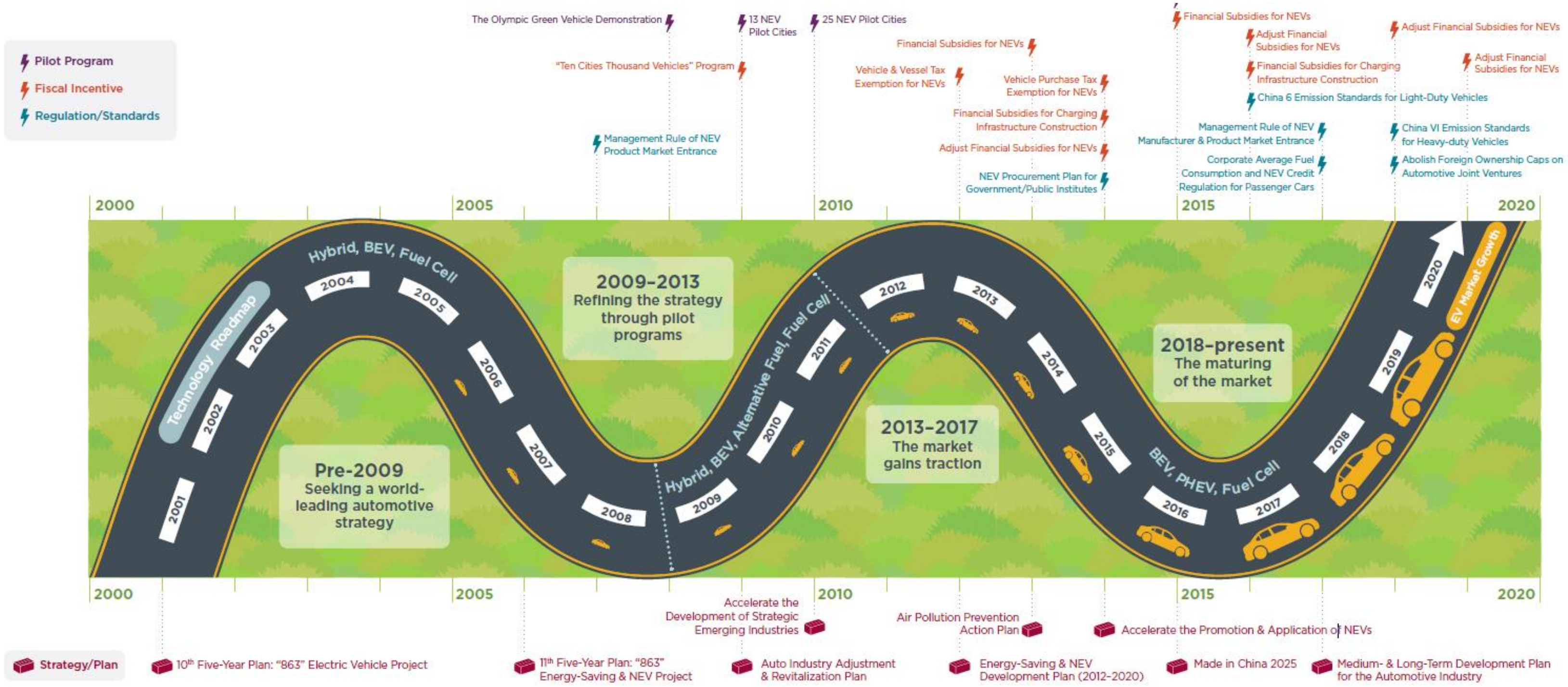


Figure 3-2 Historical development of China's electric vehicle industry (Source: **(ICCT, 2021a)**

3.3.1.2 Egypt

11. Egypt has been witnessing an increasing amount of interest towards the e-mobility sector in recent years. From around 2017, multiple studies were undertaken to explore different aspects related to the topic, and in **2018**, growing interest was beginning to translate into action as the first electric vehicle charging station was commissioned that year and also the following decrees were passed which supported the initial development of the Egyptian e-mobility market:

- Ministry of Trade and Industry (MoTI) Decree (255/2018) defining the regulation of used imported cars in Egypt, hence strongly encouraging the use of EVs in the country.
- Presidential Decree (419/2018) exempting the importers of electric vehicles from the typically paid custom duties. Importing used cars in Egypt is not permitted, according to Egyptian regulation, but in hopes of encouraging the use of electric vehicles, an exception was made.

12. In **2019**, The Ministry of Military Production announced Egypt's e-mobility Strategy to manufacture and promote the use of EVs in Egypt. The Strategy focuses on the following three goals:

- **Strengthen local manufacturing**, taking into consideration all types of EVs in addition to batteries and charging stations.
- **Set the charging infrastructure**, by facilitating the installation of publicly and privately-owned charging addition as well as improving the LV and MV distribution grid to accommodate the additional capacity.
- **Rehabilitate existing fleet**, which includes the continuous substitution of buses and vehicles that have been operational for more than 20 years with vehicles fueled by compressed natural gas and eventually electricity.

13. The Strategy aims to deliver its vision over the span of three phases, in which each phase focuses on a set of objectives building on one another:

- **Phase 1 (2019-2024)** aims to encourage the advancement of EV use, local manufacturing, and research and development on the topic.
- **Phase 2 (2025-2030)** aims to extend the role of local manufacturing and increase research and development.
- **Phase 3 (2030-2040)** aims to master all technological aspects of EV manufacturing and to expand in the export market with superb quality of output.

14. As of **2021**, the state-owned El-Nasr Automotive Company (NASCO) signed an MoU with Dongfeng Automobile Co., Ltd. to introduce Nasr E70, Egypt's first locally manufactured EV. To encourage the uptake of locally manufactured vehicles, MoTI cancelled Degree 255/2018 and effectively banned the imports of used EVs. There are an estimated **300 electric vehicles** in Egypt (Enterprise, 2021).

15. E-buses are also of interest in Egypt, whereby in 2018 an e-bus pilot project with 15 battery electric busses was implemented in the City of Alexandria. Along the same lines, the Cairo Transport Authority (CTA) launched a two-vehicle pilot BEBs while a private bus operator launched a single vehicle pilot.

3.3.1.3 India

India launched its **National Electric Mobility Mission Plan (NEMMP) 2020 in 2013**. India turned early into the direction of e-mobility with actions towards vehicle adoption, creation of charging infrastructure and establishing local vehicle and component manufacturing. Though, **electric cars make only 1.3% in new vehicles sales in 2022[32] and electric 2-wheelers 6% in 2-wheeler sales in 2023[33]**. The current target is set to 30% electric vehicles in new vehicle sales in 2030.

India is pushing electric vehicles in vehicle adoption and vehicle manufacturing. Second is pushed by a Phased Manufacturing Programme (PMP). One key measure of the program is the **increase of import duties on complete build vehicles and certain parts of electric vehicles** in 2021. Therefore, India increased its import **duties on complete-build-up electric Buses and Trucks from 25% to 50% and semi-knocked-down electric 2-Wheelers from 15% - 25%**. Further it increased import duties on individual key-parts as lithium-ion cells, battery packs and electronic components.[34]

3.3.2 Pillar-2: Scale-up Passenger EVs and E-buses

3.3.2.1 Chile

16. The economic development that Chile witnessed since of the past century, led to increased number of private vehicles and high levels of air pollution in urban dwellings. By the early 1990s, the city of Santiago was one of the most polluted cities in Latin America (Galarza, S., 2021).

- The Chilean government in a bid to address the high level of air pollution in Santiago and improve the quality of life for the urban population, introduced numerous policies and regulatory frameworks to curb vehicular emissions and electrify public transport through deployment of e-buses.
- In line with their commitment to the Paris Agreement of 2015, Chile is committed to reduce its CO_2 emissions per GDP by 30% below their 2007 levels in 2030 through its Nationally Determined Contributions (NDCs).
- In addition, the Chilean government announced a plan to completely phase out coal by 2040 and aim toward carbon neutrality by 2050 (World Bank, 2020)

[32] India Briefing

[33] TheEconomicTimes

[34] E-AMRIT

17. The National Electromobility Strategy developed in 2017 outlines the short- and medium-term actions that Chile would take to **achieve 100% electrification of the entire bus fleet by 2040** and 60% private passenger vehicles by 2050. The action plan includes the development of policy and regulation, prioritizing public transport, and supporting the initial uptake of e-mobility.

18. Various stakeholders both on national and municipal levels are in place to implement policy frameworks, regulations, and incentives to achieve mass adoption of e-mobility, especially e-buses in cities in the medium to long-term as shown in Figure 3-3.

19. On a city level, municipal government in Santiago defined an environmental plan and its goals: the Pollution Prevention and Decontamination Plan for the Metropolitan Region (PPDA by its Spanish initials). The general objective of the plan is to protect the health of citizens in the region, especially children, the elderly, and those suffering from respiratory diseases. The PPDA aims to

- put greater emphasis on emissions controls through technological upgrades (including restrictions on old vehicles);
- the creation of low-emissions zones; and
- Provide incentives to purchase hybrid and electric vehicle

3.3.2.2 China

20. The Chinese national government in 2009 began to establish comprehensive policies that cover the promotion, adoption, operation and purchasing subsidies, tax reduction and safety supervision of e-buses, see (GIZ, 2020) and (Lu, L. , Xue, L. , & Zhou, W., 2018). These policies are the foundation for the effective promotion of e-buses in China. Various governmental departments are responsible for the development and promotion of EVs at both national and city levels.

21. Similarly, policy support from provincial, and municipal governments has accelerated the deployment of e-buses in various cities such as Beijing, Shanghai, Nanjing, Guangzhou, Shenzhen, and Zhengzhou, considered as e-bus champions. The local policies focus on:

- e-buses should constitute a higher proportion of bus fleet in central urban areas,
- continuous local subsidies to bus operators to acquire new e-buses, and
- local policies to accelerate the deployment of e-bus charging infrastructure.

22. In the past decade, China has implemented various policies to accelerate the mass adoption of e-buses in cities such as Beijing, Tianjin, and Hebei (Jing-Jin-Ji), Shanghai, Shanxi, Jiangsu, Zhejiang, Shandong, Guangdong, and Hainan, among others.

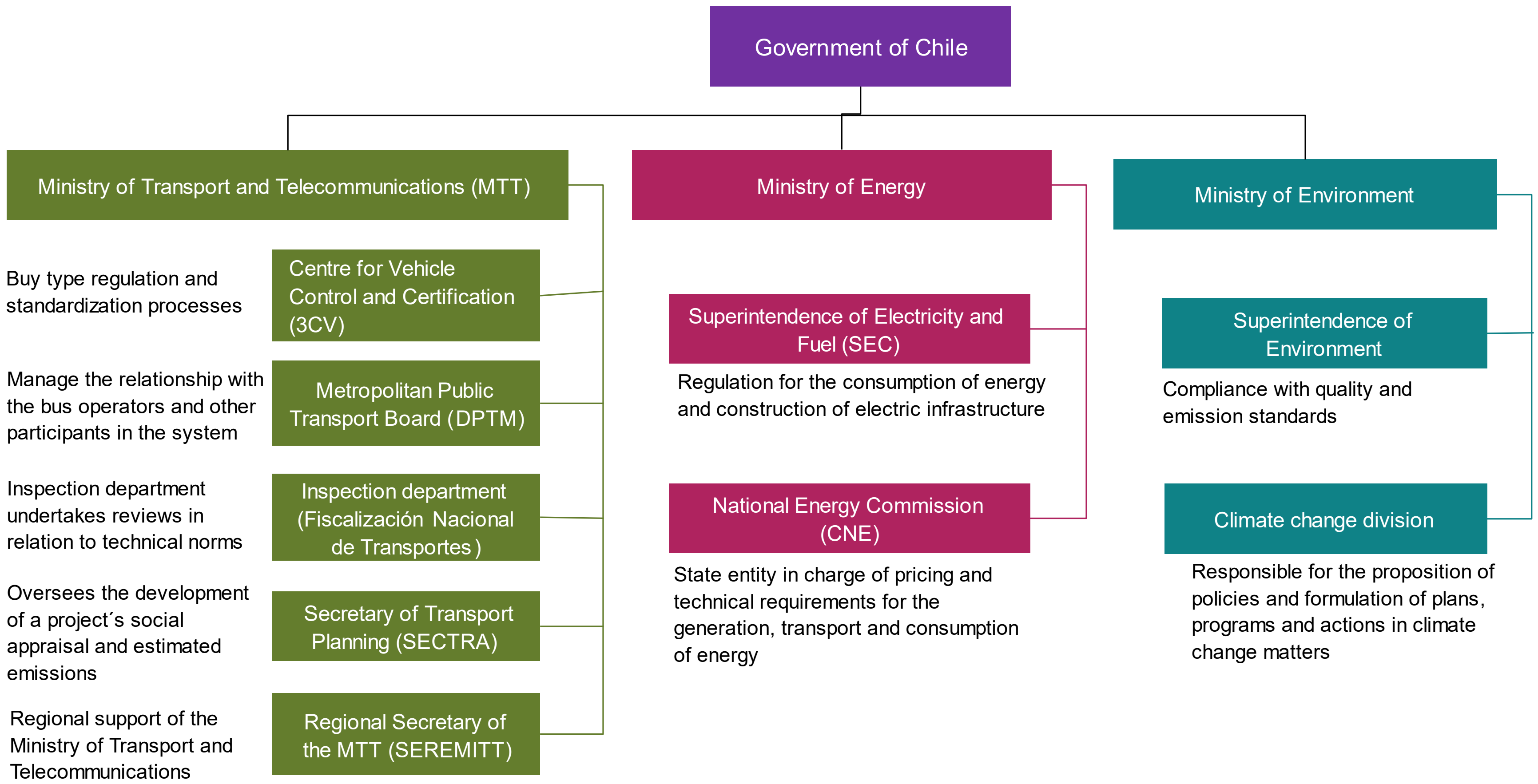


Figure 3-3 Stakeholder interaction in the mass deployment of e-buses in Chile (Source: Siemens' own figure adapted from **(World Bank, 2020)**)

3.3.3 Pillar-3: Synergize with RES and reduce GHGs

3.3.3.1 South Africa

23. South Africa has recently demonstrated a clear interest in ramping up its EV stock, with the Department of Trade and Industry (DTI) leading the journey to EV adoption by setting initiatives supporting the growth of consumer demand as well as the required charging infrastructure. In 2015, South Africa set a target of having 20% HEV vehicles by 2030 in addition to having 2.9 million EVs on the road by 2050.

24. One of the main programs in the country is the United Nations Industrial Development Organization's (UNIDO) project South Africa Low Carbon Transport Project, which is funded by the Global Environment Facility. The project includes the following two components (Urban Electric Mobility Initiative (UEMI), 2018):

- **Component 1**:
  - Improvement of Policy and regulatory frameworks for EV manufacturing and use,
  - Improvement of Non-motorized transport (NMT), and
  - Capacity and awareness of personnel in relevant institutions
- **Component 2**:
  - Promotion of NMT and public transport in the City of Johannesburg and eThekwini municipality,
  - Development and demonstration of the supporting infrastructure for EVs

25. The DTI's seemingly top priority in pursuing a national EV program is to satisfy its *Industry Policy Action Plan* (IPAP) which represents the country's effort to secure carbon mitigation in production across all sectors of the South African economy. Since emissions from the transport sector in South Africa account for 10.8% of the country's total greenhouse gas (GHG) emissions, and since electrification of transport is viewed as a key facilitator for decarbonization of the transport sector, the government of South Africa is seeking the national introduction of EVs (Urban Electric Mobility Initiative (UEMI), 2018).

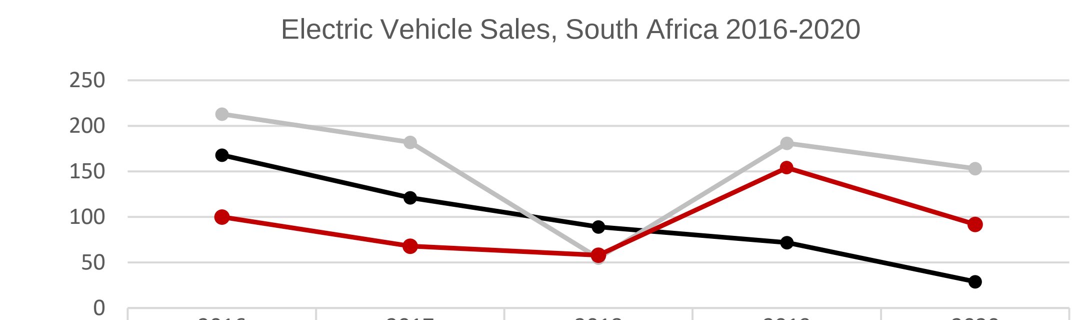
26. In terms of regulatory incentives, the government launched the Electric Vehicle Industry Roadmap in 2013, led by DTI. The roadmap proposes incentives for vehicle manufactures to locally produce EVs. The incentive offered is a 35% reimbursement of the production cost over a period of three years. To qualify for this cash-back, manufacturers have to produce at least 5,000 EVs. In the same year, the technology Innovation Agency (TIA) launched the *uYilo e-mobility Technology Innovation Programme* aiming to create a collaborative environment for entrepreneurs, academic persons, equipment manufacturers, technology companies, and science companies to contribute towards the development of South Africa's EV ecosystem (Green Cape, 2021).

27. More recently in 2018, South Africa's Department of Transport (DoT) became involved in supporting the green mobility sector by developing the Green Transport Strategy (GTS). This strategy has the vision of reducing GHG emissions from the transport sector by 5% by 2050.

The strategy's specific plan to promote substantial EV uptake includes undertaking the following actions, in conjunction with DTI (South Africa Department of Transport, 2018):

- Work with local research institutions to conduct research on EV batteries;
- Work with all relevant parties to set annual targets for EV uptake in the Government fleet, and monitor the local manufacturing of cars in line with the IPAP;
- Introduce the conversion of old technology vehicles (with high emission factors) to be retrofitter with EV technology;
- Consider providing incentives related to using local resources in the manufacturing of machineries or components.
- Assist in establishing and developing local OEMs.

28. Based on the government's targets, initiatives, and programs, several key market players i.e., OEMs, service providers in the e-mobility value chain, and local banks were inclined to take steps towards being active in South Africa's developing market such as installing their EV charging stations, officially launching their EV in the country and selling it, rolling out green financing mechanisms for EVs,...In spite of that, the EV passenger car sales in the country remain significantly outnumbered by ICE vehicle sales. South Africa's current charging infrastructure is ahead of the demand with around 250 publicly accessible charging stations and approximately 1000 EVs (PHEVs and BEVs) (Green Cape, 2021).



	2016	2017	2018	2019	2020
PHEV	168	121	89	72	29
HEV	213	182	55	181	153
BEV	100	68	58	154	92

Figure 3-4 South Africa's PHEV, HEV, BEV Sales 2016-2020 (Source: Siemens' own chart based on data from **(South Africa's Department of Trade, Industry and Competition, 2021)**)

3.3.4 Pillar-4: Enable the Charging Infrastructure

3.3.4.1 Germany

29. Germany has been witnessing steady progress towards the adoption of electric vehicles, with the support of the federal government. Officially, the government had set a goal of having 1 million EVs on the road by 2020 and allocated EUR 2 billion to support the introductions via research in battery technologies, support for the development of improved technologies for

EVs, support for standardization project, and support for research and development of intelligent supply networks. In 2010, the federal government introduced the German National Platform for Electric Mobility ("Nationale Plattform Elektromobilität") which is an advisory body to the government that assembles key stakeholders for e-mobility e.g., vehicle manufacturers, component suppliers, energy companies, scientists, professional associations and civil society (German Trade & Invest, n.d.).

30. The government also aims to only approve zero-emission passenger vehicles beginning from the year 2030 (The Globe and Mail, 2016), and has also announced that starting from 2050, all sold passenger vehicles shall be electric vehicles (International Council on Clean Transportation (icct), 2020). Such definitive targets ensure the actualization of the country's e-mobility vision and compel car manufacturing companies to plan for their futures accordingly.

31. Aiming to maintain its position as a global leader in the automotive industry, the federal government has been keen to speed up the developments in the e-mobility market. In 2016, the government opted for a market incentive package containing investment plans of about EUR 1 billion. This package focuses on three (3) measures with a financial impact (Federal Ministry for Economic Affairs and Energy, n.d.):

- Temporary **purchase incentives**: a purchase grant, up to EUR 4,000 referred to as the environmental bonus and is paid towards new vehicles with a listing price up to EUR 60,000. Additional incentives include ownership tax benefits, company tax benefits, access to bus lanes, free parking and reserved parking spots (EC European Alternative Fuels Observatory, n.d.)
- **Expansion of the charging infrastructure**: the federal government provided EUR 200 million towards expanding the charging infrastructure for rapid charging and EUR 100 for normal charging.
- **Purchase of EVs by public authorities**: the government set a target for the Federation's vehicle fleet to consist of at least 20% electric vehicles in the future.
- **Regulation of charging infrastructure in existing and new buildings**

32. Supplementary support mechanisms to facilitate the advancement of the e-mobility market include:

- Establishing **uniform charging and payment standards** to regulate the establishment of the infrastructure for alternative fuels and to unify authentication and payment at charging stations.
    - For this purpose, in 2016, the government passed the *Charging Station Ordeal* which provides clear and binding rules on socket standards and basic requirements for the instalment and operation of public EV charging stations.
    - In a similar manner, in 2017, the Bundesrat sanctioned the Ordinance amending Charging station Ordinance II which allows EV owners to charge their vehicles and pay at all publicly accessible charging stations using a common web-based payment system, or in cash or by credit card.

- Strengthening **legal certainty** and security of investment
    - Establish preconditions for grid charges to be reduced where EVs are used to support the grid, consequently reducing the cost of charging.
    - Passing the necessary regulations to ensure fair competition between charging infrastructure developers and minimizing the authority of energy legislation on charging infrastructure operators.
- Additional promotional mechanisms the government has used includes exempting EVs from the annual circulation tax for the first ten years beginning from the date of the car's first registration.

3.3.4.2 Norway

33. The Nordic e-mobility market has been undergoing significant developments over the past decade and in 2020, Norway became the first country in the world where EV sales superseded ICE vehicles. Norway began its e-mobility journey early in the late 1990's with a slow growth mainly due to supply constraints (Hannisdahl, 2013). Around 2010-2012 when automotive companies were able to offer mass market EVs for a suitable quality and quantity, market growth was apparent, as indicated herein in Figure 3-5.

34. As of 2020, Norway's EV fleet equates approximately 320,000 vehicles, while its charging infrastructure includes around 19,000 public charging points. This explosive market growth is primarily owned to the governmental political decision, in line with its ambitious green targets, to rely on electrified modes of transport and cut reliance on fossil fuels following the 2010s oil crisis.

35. A major market accelerator was also the heavy taxes imposed on ICE cars. Upon import, cars are taxed based on their weight, CO_2 emissions and motor effect in addition to 25% VAT. BEV and FCEV, on the other hand, are completely exempt from import taxes and VAT. Other incentivizing measures adopted in the country to accelerate the adoption BEVs and FCEVs include (Hannisdahl, 2013):

- Authorization to utilize excess capacity in bus lanes, which is convenient during rush hours;
- Complete exemptions on road tolls in Norwegian roads;
- 50% taxable benefit if the car is used as a company car;
- Free parking in all publicly owned parking spaces, and a large number or reserved EV parking spaces;
- Government granted around EUR 6.5 million in 2009 to accelerate the construction of charging points. This grant resulted in around 2,000 new charging points across the country.

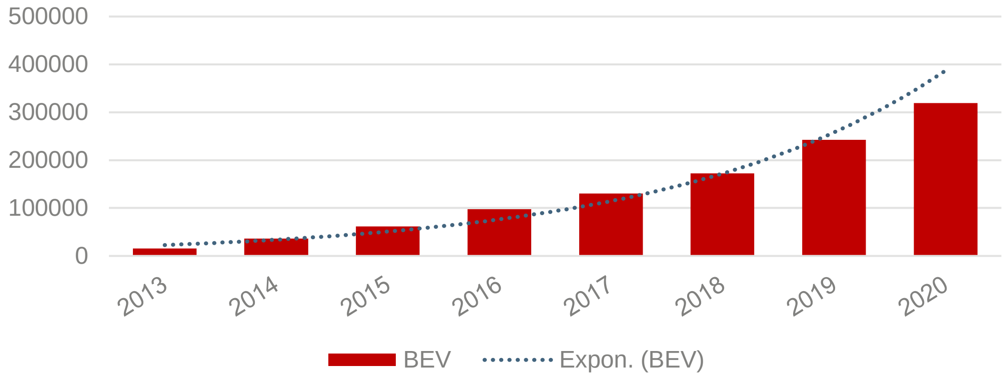


Figure 3-5 Norway's total fleet of battery EV 2010-2020 (Source: Siemens' own chart based on data from the European Alternative Fuels Observatory)

4 Policy Recommendations

36. With an understanding of the different drivers behind the adoption of e-mobility, the local context in Tanzania covering its involved stakeholders and existing incentives and initiative in place, the policy recommendations can be proposed. Four pillars were identified, aligned with the findings from the gap analysis. Those pillars are

- **Pillar-1:** Localize EV technology and deepen local manufacturing
- **Pillar-2:** Scale-up Passenger EVs and E-buses
- **Pillar-3:** Synergize with RES and reduce GHGs
- **Pillar-4:** Enable the Charging Infrastructure

Figure 4-1 gives an overview on all suggested policies on a coherent roadmap.

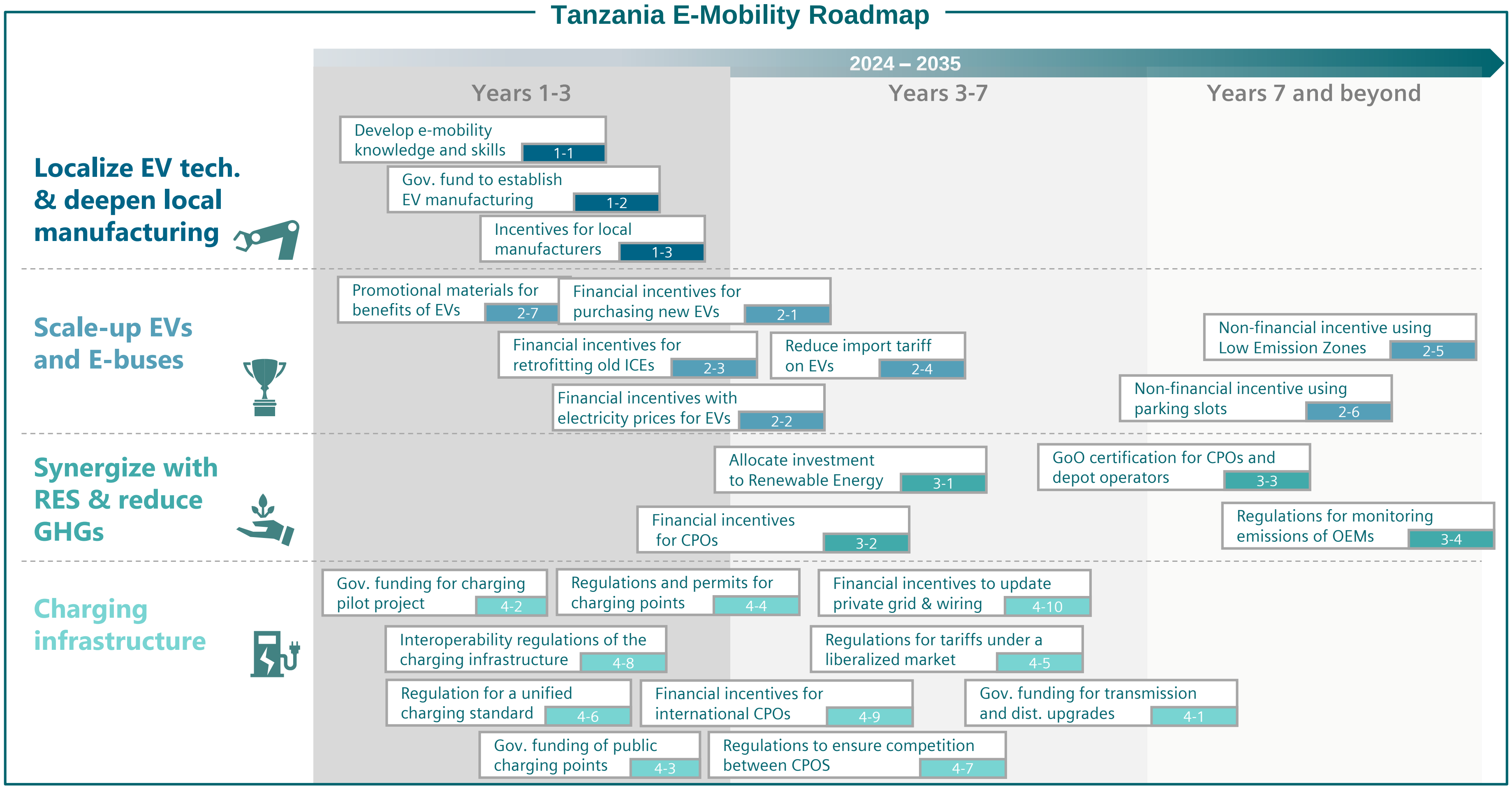


Figure 4-1 Tanzania's e-mobility roadmap for policy implementation in the next ten year

4.1 Pillar-1: Localize EV technology and deepen local manufacturing

Pillar-1 focuses on EV technology and local value creation.

4.1.1 Pillar 1-1: Develop electric mobility knowledge and skills of local workforce through capacity building

Type of Intervention	Importance Rating	Suggested Responsibility
Capacity building	5/5	MoWT, MoEST and COSTECH

Context

One of the major limitations in the current market is the lack (even non-existence) of qualified local workforce. This can raise skepticism across owners of ICEs and fleet operators, whether a transition to EV is worth it since there is a lack of assurance / trust from the owners about the capacities of existing maintenance centers to adequately maintain their vehicles.

Action Items

- ✓ On the short-term, MoWT, together with COSTECH, should develop comprehensive training programs for technical institutions and a curriculum for BSc program at public universities. Initiatives can include:
  - ❖ Technical and vocational training programs

    This includes certificate and diploma programs in EV maintenance, retrofitting, charging infrastructure installation, and battery recycling. Hands-on training is also crucial to ensure exposure to EV technologies, this would entail local industries to partner with international EV manufacturers to offer such apprenticeships.

    Internationally recognized certifications in e-mobility technologies would enhance local workforce employability and guarantee that they meet global standards.
  - ❖ University Curriculum development

    BSc programs such as Electric and Electronic Engineering may include specializations in EV systems, Computer Science and Software Engineering specialization may offer courses on EV software systems, and if there is a Renewable Energy and Sustainability program, it could include courses on the integration of RES with EV charging infrastructure and grid management. Students could also be encouraged to conduct research on topics related to EV such as new battery technologies and impact of charging infrastructure on grid stability.
  - ❖ Online and blended learning

    This includes utilizing online platforms for continuous professional development
- ✓ MoWT should establish collaboration agreements with international EV manufacturers to ensure training of enough candidates takes place abroad, at the factories of the manufacturers.
- ✓ On the medium- to long-term, a training center should be established, owned by MoWT, acting as a regional center of excellence. The process would start immediately with the business, operational, and financial plans, in addition to the communication strategy.

4.1.2 Pillar 1-2: Government fund to transfer and establish EV manufacturing / assembly lines from experienced EV manufacturer

Type of Intervention	Importance Rating	Suggested Responsibility
Tendering	5/5	COSTECH, VPO, MoWT, and MoF

Context

Local manufacturing might add value especially for vehicles, which are based on a simple design, with a comparable short value chain, e.g., 2-wheelers and 3-wheelers. The manufacturing of more sophisticated vehicles (like state of the art 4-wheelers) seems unrealistic in short-term.

Instead of manufacturing new vehicles, the replacement of worn-out batteries from imported used vehicles might be value creation with a certain potential for the future. Also, battery recycling might be a suitable step in the value chain for Tanzania as it is an operation which requires more manual work and as it is expected that many vehicles may find the end of their lifetime in Tanzania.

Action Items

- ✓ Establishing or retrofitting existing assembly plants for EVs aims to increase the share of the local component, create more jobs, and potentially reduce EV purchase prices given the low wages in Tanzania compared to international markets.
- ✓ Seek partnership with an EV manufacturer to locally assemble the first Tanzanian EVs through factories state-owned or in public-private partnership. The negotiations need to start immediately on the short-term, through competitive tendering to ensure fair competition and allowing further market players to showcase their offerings.

4.1.3 Pillar 1-3: Incentives for local manufacturers from the private sector

Type of Intervention	Importance Rating	Suggested Responsibility
Incentives	5/5	COSTECH and VPO

Context

Encourage supply and demand for locally manufactured EVs is needed to ensure active participation of the private sector in this pillar.

Action Items

- ✓ Lump-sum incentives of, for example, the first 100,000 locally manufactured / assembled vehicles.
- ✓ MoF could seek support from development banks to provide soft loans and grant agreements for manufacturers active in the local market.

4.2 Pillar-2: Scale-up EVs and E-buses

Pillar-2 addresses the phase of introduction of e-mobility in Tanzania and provides policies to scale-up EVs and E-buses.

4.2.1 Pillar 2-1: Financial incentives for purchasing new EVs

Type of Intervention	Importance Rating	Suggested Responsibility
Subsidies	3/5	MoF, TRA and City Councils
Context		
With the inevitable decommissioning of aging vehicles, incentives for purchasing EVs could encourage cosumers and fleet operators to increase share of passenger vehicles and e-buses within their fleets.		
Action Items		
✓ Since Tanzania does not provide direct subsidies to private people for EV purchases; instead, subsidies would rather be provided in the way of supported bank loans. Then the suggested responsible entities should push for banks to provide such loans.		

4.2.2 Pillar 2-2: Financial incentives with electricity price for charging EVs

Type of Intervention	Importance Rating	Suggested Responsibility
Incentive	3/5	Energy and Water Utilities Regulatory Authority (EWURA) and MoF
Context		
This incentive, in contrast to the EV purchase incentive (focused on reducing the CAPEX) aims to provide attractive operational conditions for fleet operators. Furthermore, to guarantee competitiveness of the price, it should ensure that the diesel and natural gas prices are also increased in the medium-term. It is clear from international experiences that steep rises in diesel and CNG prices will be politically difficult and met with customer dissatisfaction, particularly over the short-term.		
Action Items		
✓ Launch incentive that would introduce a special, discounted, and attractive tariff price for charging passenger EVs at home and public locations, and for e-buses at bus depots and terminal stations.		

4.2.3 Pillar 2-3: Financial incentives for retrofitting old ICES

Type of Intervention	Importance Rating	Suggested Responsibility
Incentive	2/5	Energy and Water Utilities Regulatory Authority (EWURA) and MoF
Context		
As previously discussed, second-hand vehicles imports are very common in Tanzania. These vehicles are ICE vehicles that do not pass emission standards in the country exporting them. To introduce e-mobility nationally, EVs should be cost-competitive with the imported second-hand ICE vehicles which would be very difficult since the ICE vehicles may cost as little as USD 1000. Considering that the Government of Tanzania aims to create new jobs via e-mobility adoption, local manufacturing of EVs may be the suitable path to take. However, even though locally manufactured EVs would be cheaper to purchase than an imported new EV, they will still not be sufficiently cost-competitive with the imported second-hand ICEs. Based on that, EV retrofitting		

would be the most convenient and suitable option for accelerating e-mobility adoption in Tanzania, which needs to be supported through financial incentives.
Action Items
✓ MoWT and MoF need to introduce financial incentives to support EV retrofitting.

4.2.4 Pillar 2-4: Import tariff on EVs

Type of Intervention	Importance Rating	Suggested Responsibility
Incentive	2/5	MoWT, MoE and MoF
Context		
Tanzania can abolish the import tariff on EVs immediately on the short-term, then gradually increasing it on the medium-term. Here the aim is oriented towards decreasing the total prices for new EVs in comparison to their ICE counterparts (gasoline or diesel); consequently, consumers and bus fleet operators, alike will be more attracted towards purchasing EVs, rather than waiting for the technology to become eventually cheaper on the medium- and long-terms. Instead of abolishing / reducing import tariff on EVs, Tanzania could raise the import tax placed on second-hand vehicles and diesel buses to push the consumers and operators away from purchasing those types. Furthermore, import tariffs can be placed on new vehicles, that emit emissions above a pre-determined level, can help to prevent consumers and fleet operators from purchasing diesel and gasoline powered vehicles.		
Action Items		
✓ Increasing tariffs on ICEs is not feasible because of the low buying power of the population. A balance between import and local manufacturing is required. Decreasing import tariffs on EVs might be helpful. ✓ Different treatment for 2-, 3-, and 4-wheelers might be required since 2- and 3-wheelers are usually bought new, while 4-wheelers are bought used.		

4.2.5 Pillar 2-5: Non-financial incentives using Low / No Emission Zones

Type of Intervention	Importance Rating	Suggested Responsibility
Non-financial Incentive	1/5	VPO, Department of Environment and City Councils
Context		
Low / no emission zones (LEZ) are typical schemes under which restrictions on polluting vehicles are imposed within a certain demarcated zone, such as an entire city, a specific central business district or a historical area. Cities in which LEZs have been implemented have reported a noticeable increase in air quality. Vehicles within LEZs are intended to be restricted, during certain periods of the day, to vehicles that emit below a certain CO_2 level (possible using EVs). LEZs are basically non-monetary benefits, however, it can be considered as a financial incentive if EVs are not charged for entry, whereas the ICEs ones operating using diesel are; here, if ICEs buses are charged, then Tanzania should introduce measures in which those buses are charged according to their emissions.		
Action Items		

✓ This is a low-priority initiative. Rough plans are already in place for Dar es Salaam as part of a Vision 2050.

4.2.6 Pillar 2-6: Non-financial incentives using designated parking slots

Type of Intervention	Importance Rating	Suggested Responsibility
Non-financial Incentive	1/5	City Councils
Context		
Provide for preferential parking places in congested areas as well as malls and other multistorey car parks for EVs. These places should be in sought after locations, such as close to mall entrances, that only EVs are able to use. Furthermore, these parking places could command no parking fee (if applicable). Users of ICEs vehicles who park in such spaces are fined for improper use. These parking places may additionally have facilities for charging. With regards to buses, the local municipality should dedicate parking spots in terminal stops with no parking fee (dedicated for opportunity charging of the bus). Other bus fleet operators utilizing those spots need to be fined, or even negate their licenses for improper use.		
Action Items		
✓ This is a low-priority initiative. Most EVs are 2W, which are not bound to parking spots. Parking in places like airports or malls can have exemptions for certain types of number plates (government, diplomats, etc.). Maybe EVs could be included in that exemption.		

4.2.7 Pillar 2-7: Promotional materials regarding benefits of EVs

Type of Intervention	Importance Rating	Suggested Responsibility
Strategy	4/5	COSTECH and MoWT
Context		
Campaigns to educate the public about the benefits of EVs in general could take away prejudices on e-mobility. These campaigns could be expanded through mass media campaigns, organized lectures for the public and within schools, and steer political speeches to encourage the positive marketing and branding of adopting an EV.		
Action Items		
✓ COSTECH, jointly with MoWT can develop a communication strategy to educate the public about the benefits of EVs in general and e-buses. ✓ With the rising awareness, NGOs and local communities can push consumers and fleet operators, through bilateral dialogue, to shift towards replacing their running fleets with ones that are electrified given their benefits in improving urban air quality and enhancing the quality of transport services.		

4.3 Pillar-3: Synergize with RES and reduce GHGs

Pillar-3 focuses on the deployment of renewable energies for e-mobility and environmental aspects.

4.3.1 Pillar 3-1: Allocate investment from conventional power plants to RE

Type of Intervention	Importance Rating	Suggested Responsibility
Strategy	3/5	MoE and EWURA

Context

To reduce the CO2 emissions of electric vehicles in Tanzania and the transport sector in general, Tanzania could further increase the share of renewable energies in its power mix to reduce its emission factor per kWh electricity.

The Ministry of Energy is currently finalizing the National Renewable Energy Strategy with an aim to diversify the mix of renewable energy in the energy sector. In addition to hydroelectric power, the strategy will promote solar, wind, and geothermal energy sources. One of the draft's targets is the widespread application of renewable energy for e-mobility charging stations, which is promoted and supported by June 2030.

To support renewable energies even further, future investments could be shifted from conventional power plants to renewable energies.

Action Items

- ✓ Increasing the share of renewable energies is already a priority of the MoE.
- ✓ Current efforts should be continued and extended.

4.3.2 Pillar 3-2: Financial incentives for CPOs and depot operators

Type of Intervention	Importance Rating	Suggested Responsibility
Policy	2/5	MoE, EWURA and MoF

Context

To relief the grid and energy demand requirements, Tanzania could provide financial invectives for charge point operators (CPOs) and depot operators who commission solar rooftop PV together with their charging stations. This measure might relief public investment budgets and speed up EV ramp-up due to independence from public generation and grid expansion.

Action Items

- ✓ Provide financial invectives for charging point operators (CPOs) and depot operators who commission solar rooftop PV together with their charging stations.

4.3.3 Pillar 3-3: Initiate the regulation for guarantee of origin (GoO) certification for CPOs and depot operators

Type of Intervention	Importance Rating	Suggested Responsibility
Policy	2/5	EWURA and TANESCO

Context

The Guarantee of Origin (GoO) certificate is a tradable commodity that represents a claim to the environmental benefits associated with RE generation. GoOs are traded electronically in the voluntary market for renewable energy certificates and are not tied to the physical delivery of electricity. Many multiple corporations are obliged from their HQs to meet sustainability targets, i.e., ensure that the purchased power originated from

RES, which can be achieved using GoO certificates. Implementing the GoO scheme in Tanzania in the short-term and incentivizing CPOs to purchase GoO to ensure that their customers are powered using RE sources should increase demand for RE on the short-, to medium-term.
GoOs might further promote the demand for renewable electricity and reduce CO2 emissions in the transport sector. Therefore, they could incentivize the deployment of renewable energies compared to conventional sources. More suitable policies for CPOs (Charge Point Operators) might have a larger impact on investment in charging infrastructure than pure incentives alone.

Action Items

- ✓ CO2 trading is ongoing in municipalities in Tanzania, coordinated by the VPO. There is ongoing debate on how locals could be involved as currently, it's mostly the business of foreign companies.
- ✓ Implementing a GoO scheme to incentivize CPOs to purchase GoO from renewable energies.

4.3.4 Pillar 3-4: Regulations for monitoring emissions of OEMs

Type of Intervention	Importance Rating	Suggested Responsibility
Policy	2/5	MoE and EWURA

Context

Introduce tight emissions targets for car manufacturers for future sale of their vehicles. Either per single vehicle or for all vehicles of one brand sold per year (like in Germany). A similar concept is applied in the EU through the EU CO_2 emission performance standards for cars and vans. The targets would be binding, and OEMs would be fined per ICE vehicle registered over the emissions limit.
Also, CO2 tracking for corporate cars, like practice in South Africa, ensures that companies adhere to their CO2 emission limits. Underperformers and overperformers could trade residual emission certificates to manage their carbon footprints effectively.

Action Items

- ✓ Implementing restrictions for CO2 emissions for future car sales.
- ✓ Implementing a monitoring system and fines.

4.4 Pillar-4: Charging Infrastructure

Pillar-4 focuses on the uptake of charging infrastructure in Tanzania as it is crucial for potential buyers of EVs to invest in a reliable technology.

4.4.1 Pillar 4-1: Government Funding for Transmission and Distribution Upgrades

Type of Intervention	Importance Rating	Suggested Responsibility
Funding for Infrastructure	3/5	MoF and Development Banks

Context

Upgrades on the transmission and distribution systems across the utility grid will be required in the long-term to ensure that EV charging does not overload the grid both the system operation and node levels, which could eventually slow the market growth.

The upgrades should not only cover the assets (grid equipment), but also consider the human capital, where the design engineers at the DisCos need to be trained on deploying grid planning on the LV and MV levels, using specialized software tools, e.g., PSS®/E or Power-Factory in their gird planning activities to minimize human error and maximize optimization opportunities.

Action Items

- ✓ Consider the impact of e-mobility and renewable energies to replacement and expansion strategies of transmission and distribution grids.
- ✓ Train key resources in the system operators on the impact of e-mobility and renewable energies to power systems.
- ✓ Consider to align with development banks to acquire funds aiming to upgrade the network bottlenecks.

4.4.2 Pillar 4-2: Government funding for charging demonstration project (Pilot)

Type of Intervention	Importance Rating	Suggested Responsibility
Financial Incentive	2/5	COSTECH

Context

To reduce the economic risk taken by fleet operators who are early adopters of electrified modes of transport, the government may provide funding for further support.

An example would include a demonstration e-mobility project that provides valuable lessons on operational requirements for successful and scalable e-mobility in Tanzania; this would include replacing for example 1000 ICE passenger vehicles with BEVs to assess the viability of the technology to be tested through this project.

Action Items

- ✓ Government's funding for early adopter should be provided.
- ✓ Past experiences with pilot schemes in Tanzania had mixed results.
- ✓ Schemes need to be close to local requirements.

4.4.3 Pillar 4-3: Government Funding of public charging points

Type of Intervention	Importance Rating	Suggested Responsibility
Financial Incentive	3/5	MoF and MoWT

Context

Lump sum amounts per station might motivate CPOs in establishing, for example, the first 2,000 charging stations distributed throughout the country. Municipalities could provide charging capabilities throughout designated parking areas by installing government-funded public charging points. Similar to international experience (for the case of passenger EVs), once electrified modes of transport become more common these points can be handed over to the private sector, i.e., charging point operators (CPOs), creating a competitive market for charging.

Action Items

- ✓ Provide direct funding of charging infrastructure.
- ✓ Establish supported loans in cooperation with banks.

4.4.4 Pillar 4-4: Regulations and permits for charging points

Type of Intervention	Importance Rating	Suggested Responsibility
Planning	4/5	MoWT, TARURA and City Councils

Context

The international experience shows that markets that have introduced EVs have often experienced delays in installing charging infrastructure due to lack of permitting and planning permission. Examples are permission for grid connection or expansions for buildings, particularly in brown fields, i.e., the charging infrastructure building code is an important policy to accelerate the upscaling of the market.

A strategically designed building code on charging infrastructure allows capacity mapping of the MV and LV networks in ways to improve system utilization in areas where energy is not constrained and increases overall installation costs. International experience states, that installation of chargers in new buildings can bring down charger installation costs by 75% or more compared to installing chargers during a building retrofit.

Action Items

- ✓ The ramp-up of charging infrastructure needs to be planed based on capacity of MV and LV networks.
- ✓ Areas which have sufficient grid capacities and upcoming development measures should be incentivized to integrate charging infrastructure directly in initial construction phase.
- ✓ A way to steer installation of charging infrastructure in new buildings is the integration of it in the countrywide or local building code.

4.4.5 Pillar 4-5: Regulations for tariff under a liberalized market

Type of Intervention	Importance Rating	Suggested Responsibility
Regulation	4/5	EWURA and MoF

Context

Separated and intelligent metering applications help to establish incentivized EV charging tariffs. With the help of smart metering, dynamic EV charging tariffs could be used to foster the overall ramp-up of e-mobility, but also to avoid charging peaks during the day.

Short-term, Tanzania could collect specific data on how on charging behavior, which in turn supports in proper planning for future charging infrastructure.

On the medium- and long-terms, avoidance of charging peaks might gain importance and the grid operators might incentivize especially fleet operators to balance the charging of their fleets overnight, that the utility grid is not overloaded.
Action Items ✓ Smart metering should be prioritized, especially for commercial charging stations and fleet depots. ✓ Tariffs for public charging could be regulated to avoid excessively gouging by charging station operators.

4.4.6 Pillar 4-6: Regulations to adopt of a unified charging standard

Type of Intervention	**Importance Rating**	**Suggested Responsibility**
Planning & Regulation	3/5	MoWT, TBS and COSTECH
Context An alignment of charging standards between vehicle OEMs and charging station OEMs can eliminate the need to install chargers with several different plug types. This could reduce the overall cost for charging infrastructure. Tanzania should adopt the type-2 European standards with respect to the charging infrastructure. If collaboration is sought with Chinese or US OEMs, which are adopting a different standard, converters will be required, creating challenges on the utility grid (power quality) and additional cost on the EV owners.		
Action Items ✓ Tanzania could initiate a platform for the country to develop a relationship with charging station OEMs to develop aligned standards for plug types. ✓ The supported plug types should reflect Tanzania's vehicle and vehicle import strategies.		

4.4.7 Pillar 4-7: Impose regulations to ensure competition between CPOs

Type of Intervention	**Importance Rating**	**Suggested Responsibility**
Planning & Regulation	3/5	MoE and MoWT
Context Most leading countries in e-mobility established competitive markets for charge point operators. An example for a competitive CPO market can be found in Rwanda. Those markets are usually coordinated technically and economically to ensure fair competition and transparency for end-customers.		
Action Items ✓ Tanzania should decide on market design for charge point operators and mobility service providers. ✓ Necessary regulations should be established early to avoid monopolistic market development and ensure trust of the end-customer.		

4.4.8 Pillar 4-8: Enforce interoperability regulations of the charging infrastructure

Type of Intervention	**Importance Rating**	**Suggested Responsibility**

Planning & Regulation	4/5	MoWT, TBS

Context

An interoperable system is key to ensuring an easy access to use the public charging infra-structure. This also makes EVs more attractive to consumers and fleet operators, since they do not need to worry about whether they will be able to use charging points in terminals operated by other CPOs.

Action Items

- ✓ Tanzania needs to find a balance between liberal market development and minimum requirements.

4.4.9 Pillar 4-9: Financial incentives for international CPOs

Type of Intervention	Importance Rating	Suggested Responsibility
Incentives	2/5	MoF and MoWT

Context

CPOs in developed markets do operate across different regions multiple geographies, bringing many years of experiences working within this sector. Incentivizing international CPOs for activities in Tanzania could accelerate establishing of charging infrastructure and settle general experience on the uptake of e-mobility in Tanzania

Action Items

- ✓ Tanzania could offer incentives and attractive operational conditions on the medium- and long-term for international charge point operators.

4.4.10 Pillar 4-10: Financial incentives to update private grid or private wiring

Type of Intervention	Importance Rating	Suggested Responsibility
Incentive	4/5	MoE and MoF

Context

Owners of real-estate (e.g. public parking grounds, shopping centers, trade fairs, etc.) often have spaces to host public charging infrastructure, which are attractive for EV drivers.

However, in certain cases, the private grid or wiring installation might not have the capabilities to carry charging infrastructure and upgrades would be necessary. Necessary upgrades of private grid or wiring installations impacts the business case of the charging business and might prevent the real-estate owner from leveraging the full potential of its location.

Incentives for upgrades of private grids and wiring beyond charging stations could enable such investments to be done and charge point installations to be realized.

Action Items

- ✓ Incentivize expansions of wiring and electrical installations for charging infrastructure in private real-estates which could offer public or half-public charging.

5 Summary

Tanzania targets in its National Determined Contribution to reduce 30 - 35% greenhouse gases relative to the Business-As-Usual (BAU) scenario by 2030, which leads to a reduction of 138 - 153 million tons of Carbon dioxide equivalent (MtCO2e)-gross emissions over all sectors, in which **the transport sector is declared as a priority mitigation sector**. [35] As the reduction of transport and logistics is not an option for Tanzania, the country sets on the reduction of specific emissions and the introduction of e-mobility. E-mobility is known to emit less greenhouse gases, if the powering electricity is generated with renewable energy sources

37. The introduction and adoption of e-mobility in a Tanzania implies the introduction of new technologies, an eco-system including roles and responsibilities, standards and regulations which will require extensive support to be sufficiently competitive with existing technologies. The governmental support offered usually comes in the form of administrational, technical and economical standards and promotional mechanisms set as policies. To ensure that policies work most efficient, Tanzania decided to create a comprehensive **National E-mobility Policy Framework**. This framework will be based on four strategic pillars:

- **Pillar-1:** Localize EV technology and deepen local manufacturing
- **Pillar-2:** Scale-up Passenger EVs and E-buses
- **Pillar-3:** Synergize with RES and reduce GHGs
- **Pillar-4:** Enable the Charging Infrastructure

Each pillar includes a set of respective policies. The selected policies are based on international best practice. A designated group of experts from public sector, academia and private sector reviewed and selected international proven measures and adapted them to local context. Finally, the **National Electric Vehicles Policy Framework** has been exposed to four weeks of National Stakeholder Consultation phase and finally a one-day National Stakeholder Consultation workshop.

[35] Nationally Determined Contribution

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