

UNEP Electric Motorcycle Pilot Project for Kenya

Data Analysis and Policy Recommendations Kenya



Energy and emissions background

- ▶ In Kenya the road sub-sector was responsible for 12.09 MtCO₂ e out of a total of X MtCo₂ emitted in Kenya in the year 2019 out of a total of 18.3 MtCO₂
- ▶ Kenya's NDC has the target of reducing 3.46 MtCO₂ e emissions by 2030 against a 21 MtCO₂e baseline
- ▶ Annual emissions in 2030 should not exceed 17.54 MtCO₂e
- ▶ Renewables provided 92.3% of Kenya's electricity generation in 2020.
- ▶ Kenya has an installed capacity of 3,321MW against a peak demand of 2,149MW, dropping to about 1,100MW at night.

Transport Background

- The transport sector is responsible for more than one quarter of energy related Greenhouse Gas (GHG) emissions worldwide
- The Paris Declaration on Electro-Mobility and Climate Change and Call to Action sets a global deployment target for electric 2- and 3-wheelers in 2030 exceeding 400 million units (UNFCCC, 2015b).
- In Kenya, 2&3 wheeler vehicle segments are the largest share of the vehicle fleet registered with a share of 48%.
- The number of newly registered motorcycles rose by 15.6 per cent from 246,705 units in 2020 to 285,203 units in 2021
- An estimated over *1 million* motorcycle taxi (Boda boda) operators sector's annual earnings are estimated at 357 billion shillings (\$3.3 billion)
- Transitioning this sector to electric will also make a huge difference in the pockets of the owners of the bikes as well as the riders.

Evs - Kenya

- ▶ A recent study found that current power infrastructure is strong enough to support the switch to electric of 100% of two-wheeler vehicles in Nairobi.
- ▶ Further, the power infrastructure can fully support a similar switch of a good percentage Nairobi's private and commercial fleets, of one million
- ▶ There are 1,350 electric vehicles (EVs) registered in Kenya as of February 2023
- ▶ Motorcycles take up almost half the share at 844, three-wheelers stand at 153, and motor vehicles (Saloons-5, Station Wagons-167, double cabins-3, vans-5, buses-3, lorries-3) at 186.
- ▶ In the National Energy Efficiency and Conservation Strategy 2020, Kenya set a target to have 5% annual vehicle registrations being electric by 2025
- ▶ By May 2021, there were at least 18 E-Mobility companies of which the majority fall under the two and three wheeler segments

Project Background

- ▶ United Nations Environment Programme (UNEP) is implementing the Sustainable Low Emissions Transport project
- ▶ The project aims to promote a global transition to no and low emissions mobility for improved air quality and climate change mitigation.
- ▶ This project is supporting demonstration pilots of electric 2&3 wheelers as well as developing policies in Ethiopia, Kenya, Uganda, Philippines, Thailand & Viet Nam to foster the transition to electric mobility.

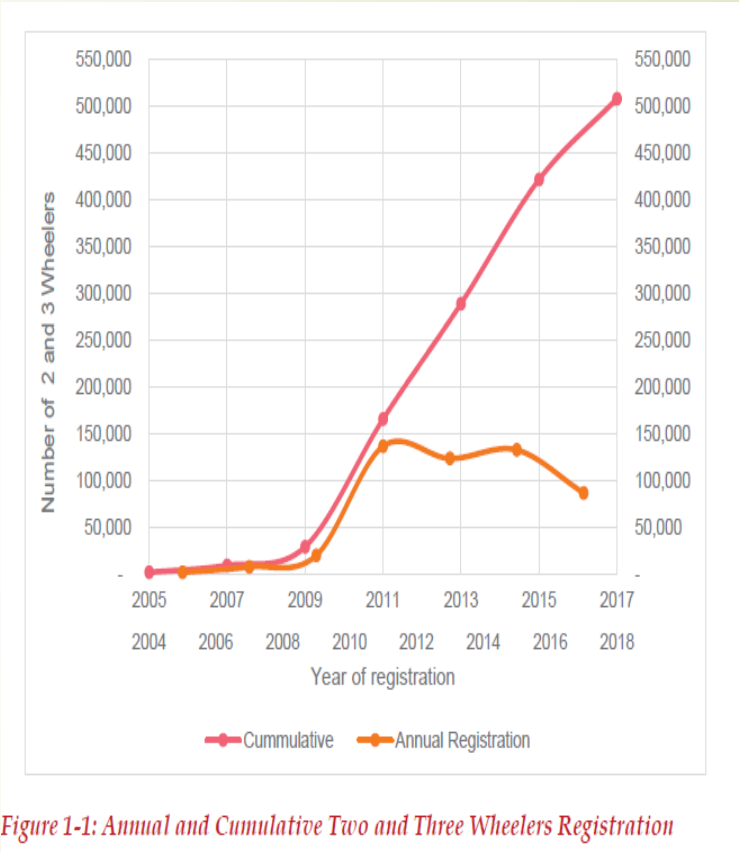


Figure 1-1: Annual and Cumulative Two and Three Wheelers Registration

Expected deliverables/Activities



- Arrange for delivery of electric motorcycles from SSSC Limited to pilot partners in Kenya and Uganda.
- Technical training sessions
- Assembly and disassembly of electric motorcycles
- Safety protocols for riding and handling electric motorcycles
- Launch of electric motorcycles pilots in Kenya and Uganda working together with the pilot partners.
- Data collection and analysis

Introducing the project/Project set up



- ▶ Duration: April 2021 -Feb 2022
- ▶ Focus: proof of concept for e 2 wheelers and awareness creation
- ▶ Supported by: Project funded by the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- ▶ Shenzhen Shenling Car Company Limited (SSCC) – Manufacturers of Tail G e-motorcycles
- ▶ Developing electric mobility baseline led by EPRA
- ▶ The demonstration projects are implemented through logistical support from *Sustainable Transport Africa*

Implementing partners:

- ▶ **United Nations Environmental Programme (UNEP)**
- ▶ **Shenzhen Shenling Car Company Limited (SSCC)**
- ▶ **Kenya Power and Lighting Company (KPLC)**
- ▶ **Kisumu County Government (KCG)**
- ▶ **Kenya Forestry Service**
- ▶ **Powerhive**
- ▶ **Pilot partner – Uganda (CAIA)**
 - ▶ International University of East Africa
 - ▶ Ntuha
 - ▶ SafeBoda
 - ▶ Bodawerk
 - ▶ Baylor Uganda



Technical specs - the pilot bike

- **TAILG Model : TDQG91Z**
- **Lithium Battery 72V50Ah**
- **Signal Voltage – 12V**
- **Claimed range – 100km**
- **Claimed Max Speed – 75 km/h**
- **Brakes – discs front and rear**
- **Charger – 72V 3A**
- **Charging time – 3 to 8 hrs**
- **Loading capacity – 2 persons**
- **Some units had hub mounted motors while others had center mounted motors**
- **Price – USD 1,550 FOB Shenzhen**



Counterpart ICE bike

➤ Yamaha DT 125

Engine - 123cc 2
stroke single cylinder
Fuel tank – 10 litres
Power – 11KW
Top speed – 110
km/h
Weight - 107 kg *with
oil and a full fuel
tank
Price (KES) – 588,370
Fuel consumption –
30km per l
Range – 300km











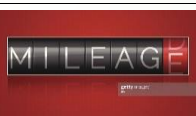



➤ Bajaj BM150

Engine – 145cc 4 stroke single
cylinder air cooled
Fuel tank – 11 litres
Power – 8.8KW
Top speed – 94 km/h
Weight - 123 kg *with oil and
a full fuel tank
Price (KES) – 144,490
Fuel consumption – 49km per
l
Range – 539km



Data collection

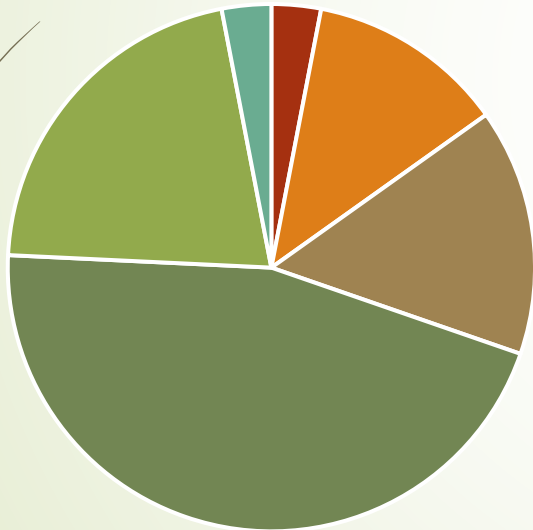
Implementing Partner	Kisumu County (A subnational county government) 
Use Case	Units used by city inspectorate to carry out routine monitoring and by community workers
 Time Period	May 2021 – Mar 2022
Electric Bikes received	15
Data received from	12 units
 Total Mileage covered	52,953Km 3,412Km (individual bike – 1/11/21 – Seme)
 Longest recorded Trip	45 Km
 Maximum weight carried (including rider)	177Kg
 Maximum Speed recorded	68Km/hr

Implementing Partner	Kenya Power (a national power company)  utility
Use Case	Units used by meter readers distributed mainly in Kiambu , Nakuru, Kajiado and Nairobi counties.
 Time Period	June -Oct 2021
Electric Bikes received	13
Data received from	12 units
 Total Mileage covered	31,413Km 5,561Km (individual bike – 21/3/22 – Githungo)
 Longest Trip	70 Km (Whatsapp message 21/6/21)
 Maximum weight carried	118Kg
 Maximum Speed recorded	78Km/hr (Whatsapp message 21/6/21)

Range

KCG

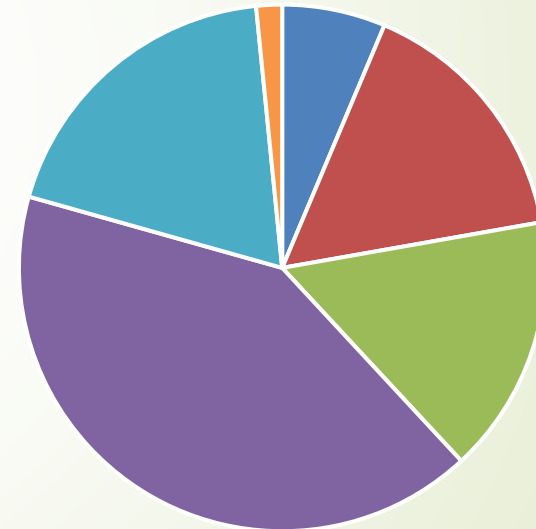
Range kms



0 to 10 10 to 20 20 to 30 30 to 40 40 to 50 50 to 60

KPLC

Range kms



0-10 10-20 20-30 30-40 40-50 50-60

Challenges / Benefits



KFS

Major challenges:

- Long charging time
- Electrical system faults

Major benefits

- Silence of patrolling
- Fuel cost savings



KCG

Major challenges:

- Long charging time
- Low speed

Major benefits

- Fuel cost savings



Kenya Power

KPLC

Major challenges:

- Long charging time
- Limited travel range for this use case

Major benefits

- Fuel cost savings
- Suitable business case – electricity distributor

Results

- 27 monitored motorcycles
- Kisumu - Approx total distance covered - 52,952kms.
- KPLC - Approx total distance covered - 31,413 kms.
- Karura - Approx total distance covered - 790 kms.
- Total distance – 85,155 kms
- Energy Used – 4,087 KWh
- Emissions abated – 6,629 kgs of CO₂
- It is a viable technology



Costs comparison

- **Yamaha DT125** - 1,000kms @30km/l – Total spend – **KES 4,290.**
- **Baja BM150** - 1,000kms @49km/l –Total spend – **KES 2,653.**
- **Electric motorcycle** – **KES 1,200** to travel 1,000km
- Saving against Yamaha of KES 4,290 – 1,200 = **KES 3,090** per 1,000 kms
- **Kisumu Pilot Savings** - Approx total distance of 52,952kms. Saving thus far is - **KES 163,621**
- **KPLC Pilot Savings** – Approx total distance of 31,413 kms. Saving thus far is - **KES 97,066**
- **Net fuel cost savings (inc Karura) - KES 263,128 (USD 2,288)**

Gaps identified

- Clearance of bikes
- Checks on state of health of batteries
- Electronic and battery faults
- Safety
- Range
- Speed

Recommendations

- ▶ Range extension by providing a charging solution
- ▶ Battery management
- ▶ Swappable batteries and a network of swapping infrastructure to increase range.
- ▶ Fast chargers
- ▶ Further reduction of electricity costs for better competitiveness
- ▶ Capacity building – maintenance (particularly electronics) training, rider training, local assembly (SKD/CKD), Manufacturing.
- ▶ Tracking for data collection and data analysis tools – software and programs that collect and analyse tracking and battery data.
- ▶ Robust motorcycles
- ▶ **Maintenance** – Parts that are interchangeable with locally available fast moving parts
- ▶ Safety
- ▶ More public relations and awareness

General Policy Guidelines

- **Pilot Projects and Stakeholder Forums** - to test the right financing, provide local experience and build the necessary capacities
- National governmental ministries and agencies as well as think tanks and NGOs could play a big role in promotion of e-mobility.
- International support can help countries act early
- Need to categorise different types of electric two wheelers - electric motorcycles, slower electric scooters and electric bicycles.
- Potential reduction in the use of scarce foreign exchange for fuel importation for the transport sector
- Promotion of Solar Power Energy and other renewable energy forms
- Policy reforms to support low-cost imports of electric motorcycles.
- Waivers on acquisition tax, excise tax, parking fees and tolls, as well as waivers on access restrictions.

General Policy Guidelines

- ▶ Leverage additional capital for lending to EV financing programs
- ▶ Developing standards for electrical motorcycles – electronic, electrical and battery failure occurred in our pilot.
- ▶ Spare parts need to be easily accessible or interchangeable with those of common ICE motorcycles
- ▶ Interoperability of batteries – the market has 72V, 60V, 48V and 42V
- ▶ National and local governments must support the deployment of charging infrastructure including battery swapping.
- ▶ Electricity market that is open to producers and resellers and responsive to the opportunities and needs of EV charging
- ▶ Legislation and infrastructure for e-waste management
- ▶ Encourage re-use of the batteries in second life applications
- ▶ Vehicle scrapping schemes

General Policy Guidelines

- ▶ Local assembly and / or manufacture of electric motorcycles
- ▶ Develop indigenous electric motorcycles
- ▶ Significant levels of local content in assembly or manufacture
- ▶ Training and retraining schemes developed to help workers adjust to new roles and industries (e.g. Colleges, TVET)
- ▶ **Safety** – Mechanical, Electrical, shock prevention
- ▶ **Environmental Robustness** – tropical rain, flood fording, shocks, vibrations, drop test
- ▶ **High voltage** warnings in the inner parts of the motorcycle.
- ▶ **Battery tests** – shorting, overcharging, over-discharging, high charge current
- ▶ **Operator age requirement** – driver licence at 16 or 18 years?

THANK YOU

