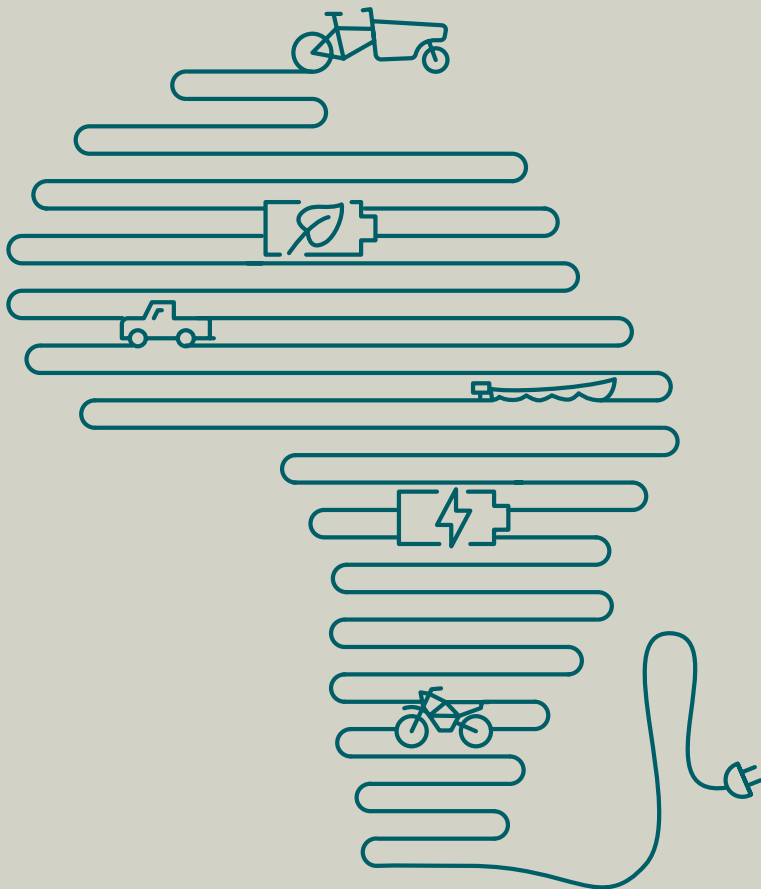


Testing E-Mobility Business Models at WE Hub Victoria Limited in Kenya

Field Report

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List of Abbreviations

BoP _____ Base of the Pyramid

EV _____ Electric Vehicle

GIZ _____ Deutsche Gesellschaft für Internationale Zusammenarbeit

IFRTD _____ International Forum for Rural Transport and Development

1. Introduction

Mobility is the basis for the overall development of a society: it gives the population access to jobs, markets, social facilities, and health care. In addition, mobility itself creates jobs and plays an important role in environmental protection as the mobility sector is one of the main contributors to CO2 emissions. Promoting efficient transportation systems is therefore key and electric mobility offers an innovative and eco-friendly opportunity. But data are rare for such solutions, especially on business models

in rural and peri-urban areas in countries of the global south. Siemens Stiftung and its social enterprise WE! Hub Victoria Ltd (also known as WeTu) have collected business modelling data of leasing models for electric motorbikes in the Lake Victoria Region in Kenya with a focus on customers' acceptance and product utilization. The main findings from operations between March 2021 and October 2021 are summarized in this report.¹

¹ Report consolidated from following reports:

Africon GmbH: E-mobility in Kenya - DEVELOP, TEST AND PUBLISH BUSINESS MODELS FOR E-MOBILITY; 2021 (not public).

International Forum for Rural Transport and Development (IFRTD): Socio-Economic Impact Study into the Potential of E-Mobility for Improved Agricultural Value Chains and Income Opportunities in Lake Victoria Region, Kenya; 2021.

WeTu: Data Collection in Excel, Gender Focus Group Report; 2021 (not published)



2. Background

2.1

WeTu

WeTu is a social, non-profit enterprise providing mobility, power, and water solutions to improve living standards in rural Kenya. Its vision is to open greater opportunities and choice for people through providing products and services that create jobs, improve health, and protect the local environment. WeTu owns and operates seven solar powered hubs and five solar powered smaller style 'satellite' hubs that are located close to Lake Victoria. The hubs offer products and services for solar lighting and charging, safe drinking water, and e-mobility. The e-mobility piloting took place in Homa Bay, with the EV batteries and e-bikes serviced and operated from the WeTu technical centre in Homa Bay.

Figure 1: WeTu Satellite Hub, copyright WeTu Kenya



2.2

Mobility patterns in Homa Bay, Migori and Siaya County

WeTu is operating in three counties: Homa Bay, Migori and Siaya county. The three counties have a combined population of 3,241,569 people and are among the most densely populated areas in Kenya despite being predominantly rural. Only 11% of the population live in urban areas. 43% - 48% of the population live below the poverty line² and the counties suffer from a huge infrastructure deficit. Less than 50% of the roads are paved, and only 30% of the population have access to electricity.³ Motorbikes, 3-wheelers, and boats are important sources of transport in the three counties. An estimated 4,820 motorbikes⁴, 133 3-wheelers mainly used for cargo transport services, and 104 human and cargo boats operate from informal termini located around points of human activity such as transport interchanges or marketplaces.⁵

2 Migori: 43%, Homabay: 48%, Siaya: 47%

3 Development Blueprint for the region developed by Deloitte (2015)

4 4,000 in Homa Bay, 600 in Mbita, 200 in Sori and 20 in Hongo

5 International Forum for Rural Transport and Development (IFRTD): Socio-Economic Impact Study into the Potential of E-Mobility for Improved Agricultural Value Chains and Income Opportunities in Lake Victoria Region, Kenya; 2021.

2.3

User group: Motorbike taxi riders

Socio-economic data⁶ on motorbike riders, locally known as 'boda boda', from the three counties show that 72.5% of the riders own their bikes and 39% acquired them through direct purchase (cash sale). On average, riders have bike related expenses of 350 KES/day and living expenses of 499 KES/day. The expenses for a motorbike are at around 6,000 KES/month and the income through taxi driving is around 75% of the rider's overall income. Motorbike riders further have a disposable budget of about 6,173 KES/month and 29% have active loans running. In general, financing for mobility through financial service providers is well established in the formal and informal markets. Motorbike taxi riders' main challenges are high fuel prices and high fuel consumption of motorbikes. To avoid high expenses for fuel, riders generally like the idea of an e-bike and around 85% of the riders would switch to an electric bike with adequate financial support.⁷ 8% of the riders would be willing to buy the bike

6 International Forum for Rural Transport and Development (IFRTD): Socio-Economic Impact Study into the Potential of E-Mobility for Improved Agricultural Value Chains and Income Opportunities in Lake Victoria Region, Kenya; 2021.

7 However, only 40% would exchange their current bikes for an e-bike.



Figure 2: Motorbike taxi riders at WeTu Mbita Hub, copyright WeTu Kenya

on loan, 30% would prefer purchasing it directly. The remaining 62% of the riders could consequently be willing to rent a bike and are potential customers for a leasing business model. But a general lack of knowledge on and trust in e-mobility, the reliability of batteries, and inadequate charging infrastructure are challenges riders fear about e-mobility.

Findings from the leasing business model

The most common business models in the e-mobility sector are direct purchase (cash), leasing, subscription, and PayGo⁸. These models are complemented with questions around battery charging and swapping models. WeTu and Siemens Stiftung have chosen to test a leasing model to

acknowledge a sharing economy approach suitable for Base of the Pyramid (BoP) clients. After testing different business offers for riders, and based on experiences of rider's expenses on bikes with internal combustion engines (ICE), WeTu developed the following leasing options:

The most popular leasing model was option 2 "flat rate". According to the riders, the battery swapping flat rate helped to overcome the negative perception towards the travel distance per battery. Option 1 "pay per swap" was picked by some riders who mainly use the bikes for delivering goods in town. Option 3 was not picked at all. Riders had to pay a security deposit to lease the bikes. Daily payments were made through mobile money.

⁸ Offering electric bikes for small instalments by usage and by transferring the bike ownership over time

	Option 1: PAY PER SWAP	Option 2: FLAT RATE	Option 3: FLAT RATE
Bike Lease Fee	KES 200	KES 450	KES 320
Payment Days/Week (Bike)	5	5	7
Battery Lease Fee/Swap	KES 70	KES 0	KES 0
Notes	Battery swaps paid for per battery use	Unlimited battery swaps	Unlimited battery swaps

Table 1: Leasing options for e-bikes developed by WeFu.

The demand and number of clients gradually increased over time to seven stable clients in October 2021 (April 2021: two clients). Steady marketing and the provision of separate leasing models appropriate for different customer needs are some reasons that could explain the increasing demand. Additionally, external factors like increasing fuel prices, could be further drivers for the increasing acceptance of e-motorbikes in the Lake Victoria region.

Data on the utilization of e-bikes differ significantly between riders of the two leasing models. Customers using a battery flat rate cover substantially more kilometres per day than riders using the “pay as you swap” leasing option (Table 3). But both groups cover similar kilometres per battery

with riders using the “pay as you swap” model driving slightly more kilometres per battery. This could be due to the costs for this group as they pay per swap and hence try to maximize the utilization of each battery. Data on the power status of the batteries at swapping support this statement: Customers from the “pay as you swap” group drain the batteries more than riders using the battery flat rate. This is also relevant for the lifetime of the batteries. Draining the batteries frequently to zero decreases the potential lifetime of the batteries, while recharging it before the power status falls below 20% has a positive impact on their lifetime. However, both customer groups show learning effects on this issue as the percentage charge at swapping increased over the months in both groups.⁹

⁹ % Charge at swapping of “Pay as you swap” customers: 7% - 25%; % Charge at swapping of Battery flat rate” customers: 10% - 33%

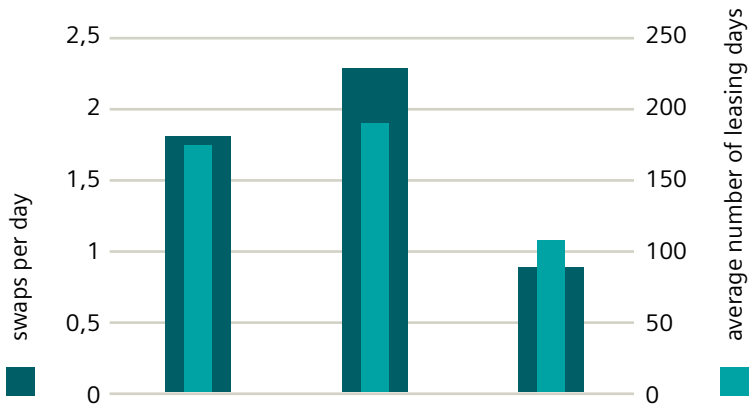


Table 2: Average number of leasing days and swaps per day.

Furthermore, data on the average swaps per customer group shows that “pay as you swap” customers swap significantly less per day than “Battery flat rate” riders (Table 2). Of course, the different payment systems (flat rate – pay as you swap) might explain the deviation. But one can also argue that considering the number of leasing days as well as the kilometres per day per group, customers with a battery flat rate are utilizing the e-bikes more than the other customers. Consequently, the swaps per day are also higher. No matter which group is the predominant customer group, a sufficient charging and swapping infrastructure is crucial to respond to higher swapping demands.

3. Conclusion

Introducing new technologies often has several challenges, especially in rural and peri-urban settings. An appropriate business model is therefore essential to overcome infrastructural and socio-economic barriers. For the Lake Victoria region in Western Kenya, operating a leasing business model for e-bikes between March – October 2021 showed an increase of demand over time. Providing different leasing options appropriate for different needs as well as sensitization and marketing drives, made electric motorbikes a viable alternative solution especially when fuel prices were increasing. But even though the data shows a positive trend for the analysed business model considering “demand” as benchmark, the successful introduction of electric vehicles (EV) requires the adoption of customer’s behaviour. Batteries for motorbikes are more dependent on terrain, gradient of the road, cargo/load carried, and rider’s

riding patterns (e.g., fast acceleration) and require an adoption of the riding behaviour. Additionally, riders with ICE bikes are used to access petrol stations practically everywhere close to active rider stages. Integrating the swapping station stop into the daily routes is different and requires awareness raising on the customers’ side. Technical challenges with e-bikes and volatile EV value chains are further barriers, especially for scaling up the business model. But if the ecosystem is growing and becomes more mature, those challenges can be solved. But therefore, additional testing and data collection is crucial. Data gaps in the technical sphere (batteries, maintenance, value chains), data collection on the target group (and their sub-groups), potential higher income, cost saving through using e-mobility, and gender specific aspects can add value to the debate.

Imprint

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As a non-profit foundation, Siemens Stiftung promotes sustainable social development, which is crucially dependent on access to basic services, high-quality education, and an understanding of culture. To this effect, the foundation's project work supports people in taking the initiative to responsibly address current challenges. Together with partners, Siemens Stiftung develops and implements solutions and programs to support this effort, with technological and social innovation playing a central role. The actions of Siemens Stiftung are impact-oriented and conducted in a transparent manner. The foundation's empowering people. Network connects inventors and entrepreneurs who have developed simple technical solutions, and helps to expand their social impact in developing regions. By initiating new forms of collaboration and technology transfer, it supports its members on their way to scale, replicate and expand. www.siemens-stiftung.org

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