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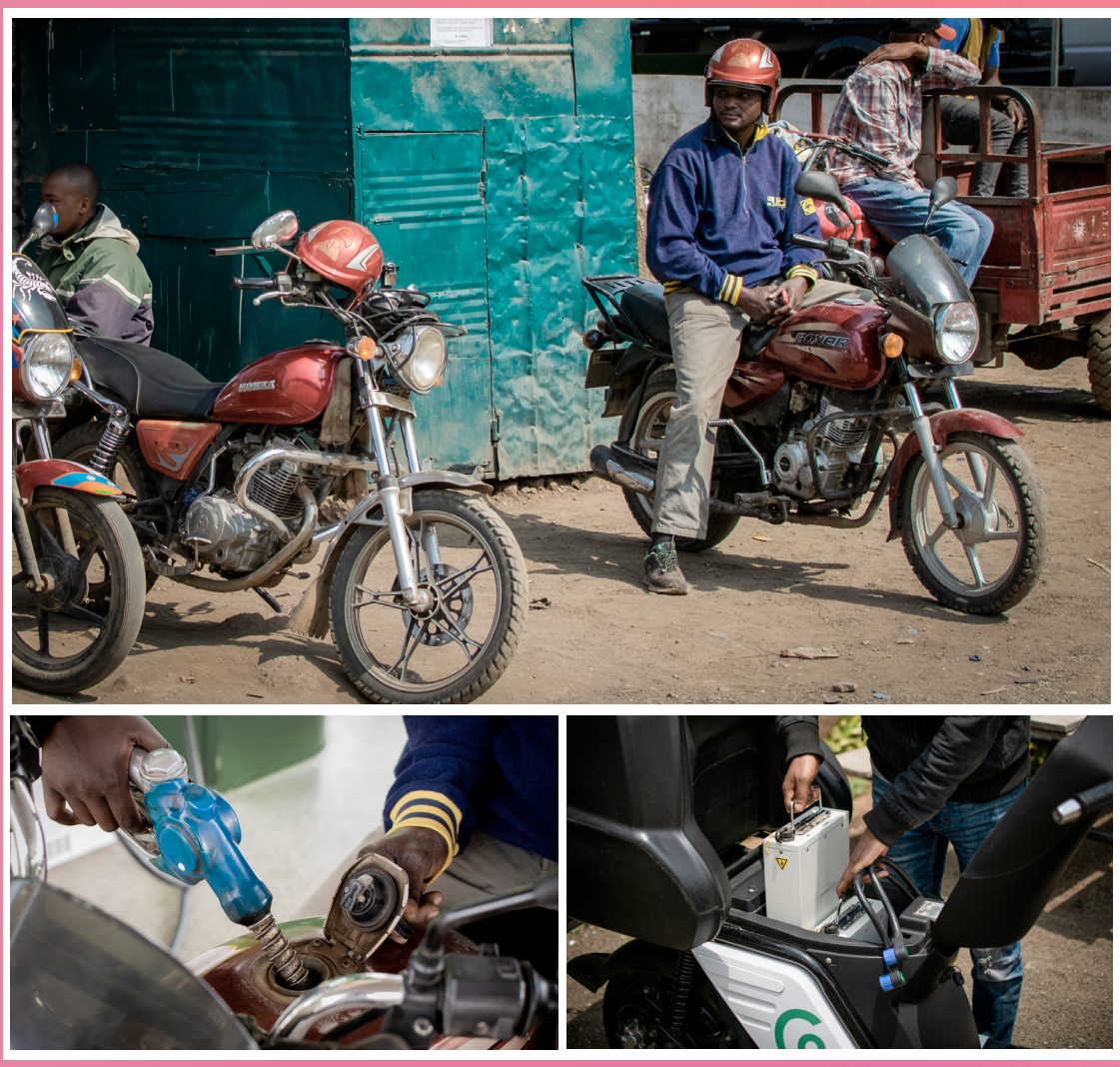
E-Mobility in Tanzania:

BUSINESS AND TECHNICAL INSIGHTS ON PRODUCTIVE USE CASES

Business Models Part 1:
Flat Fee Rental Model for Motorcycle Taxis



Report by Greenfoot & the Access to Energy Institute

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ABOUT GREENFOOT

A Tanzania-based eMobility as a Service startup, Greenfoot is working to transform Africa's local consumer markets through clean mobility, providing local businesses with sustainable, affordable, and efficient transportation solutions powered by 100% electric micro-mobility (2 & 3 Wheelers), digital tools and access to clean energy.

At 47%, Africa is the fastest urbanizing region in the world, estimated to reach an urban population of 1.34 billion people by 2050, but its road and public transport infrastructures are underdeveloped, inefficient and can not keep pace with the growth resulting in congested cities and inefficient movement of goods and people.

Faced with slow-moving, unreliable and expensive transportation solutions, Africans have turned to affordable, mostly petrol-powered motorcycles, but they can be costly to run and also emit huge amounts of pollutants in comparison to cars.

Greenfoot's mission is to lead Africa's transition to clean mobility, empowering local businesses to go green and work more efficiently by providing smart mobility services powered by 100% electric vehicles.

The Access to Energy Institute is supporting Greenfoot with technical and research expertise to analyse the business model's viability to substitute for fuel-powered motorcycles, and help pave the way to a zero-carbon transport economy.

Learn more: www.greenfoot.africa

ABOUT A2EI

The Access to Energy Institute (A2EI) is the first not-for-profit and collaborative research and development institute in the solar off-grid industry. We provide reliable open-source data, as well as on-the-ground research and analysis of clean energy solutions. Additionally, we develop and procure solar system and appliance prototypes and initiate pilot projects – aiming to provide widely scalable sustainable energy access research and solutions as a common good.

Our focus is on productive use appliances which will allow users to earn a stable income, generate jobs and create robust local economic networks. Simultaneously, we concentrate on clean energy solutions with a high potential to mitigate climate change, create a substantial added benefit for the environment, and improve peoples' health.

The A2EI is company agnostic and serves the entire decentralized solar energy sector. Its core resources are a dual A2E Lab structure that combines customer-centred R&D in East and West Africa and engineering expertise in Germany.

Learn more: www.a2ei.org

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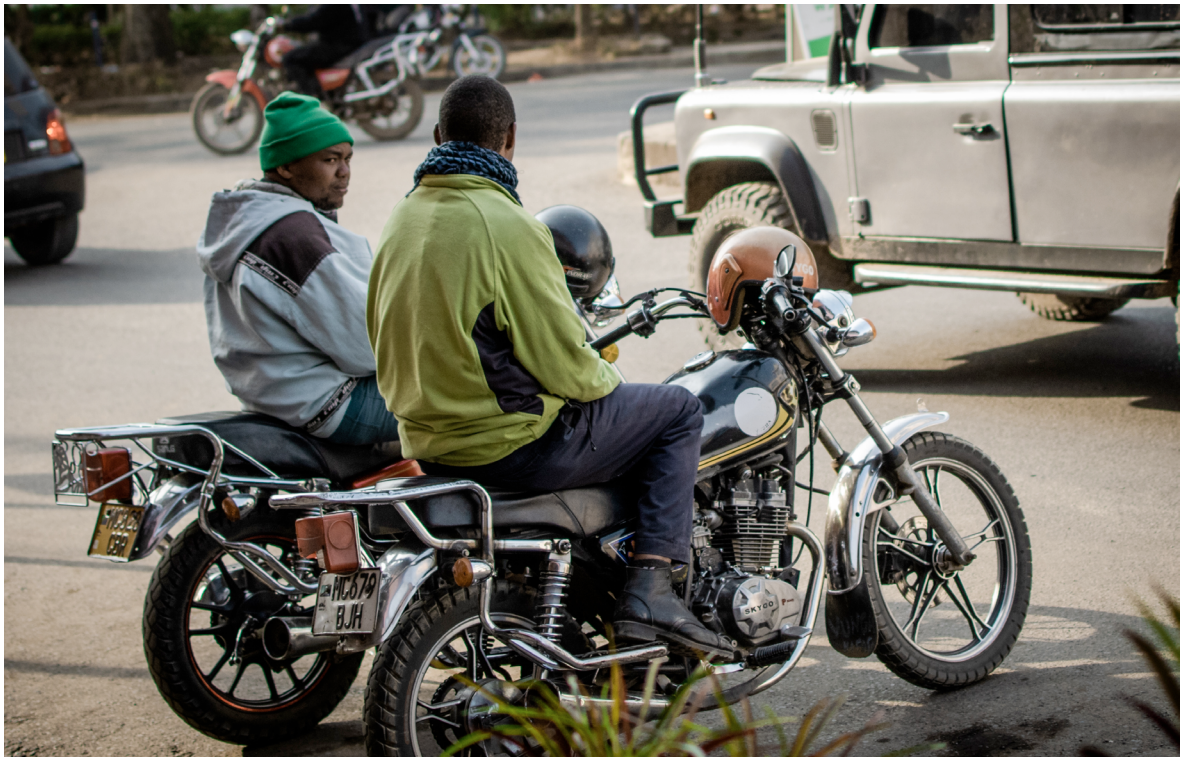
INTRODUCTION

Motorcycles are a common means of transport in both rural and urban areas of Tanzania and their prevalence is growing: 11% of households owned a motorcycle in 2017, up from 4% in 2011 (Tanzania Household Budget Survey 2018).

In this brief paper, we present the existing business cases for a motorcycle to be leased by its owner and operated by a rider as a taxi. Alongside this, we compare it with a business case for electric motorcycles to be leased and operated in the same model.

This research was conducted in collaboration between A2EI, a non-profit organization that promotes the development of clean energy technology in Africa, and Greenfoot, a Tanzanian start-up that provides electric mobility services. Data from this report was collected from interviews with fifteen motorcycle owners and riders and five suppliers and technicians, as well as from Greenfoot's operational data.

The business models and information used in this report are available in spreadsheet format on the A2EI website.



BUSINESS MODEL CONSTRUCTION:
MOTORCYCLE TAXI LEASING AND RENTAL BUSINESSES

BUSINESS MODEL OVERVIEW

Motorcycle taxis, called "boda bodas" in Swahili, are commonly seen throughout Tanzania. Boda bodas typically have designated areas that they are assigned to collect passengers from, resulting in frequent one-way trips from the same location without a return passenger.

In many instances, boda boda riders do not own their motorcycles but instead rent them for a daily rate, due to the high cost of purchasing. The motorcycle owners pay for all but the smallest of maintenance costs and typically own multiple bikes that they rent to the same riders on a recurring basis.

OPERATING ASSUMPTIONS

For the business model, we modeled that the riders travel 68 kilometers per day and earn 17,000 Tsh ($7.33 USD) based on surveys conducted with riders. The riding frequency was modeled at 7 days a week, 50 weeks per year as riders typically work six to seven days per week and take few breaks. In Arusha, the local rental fee for boda boda riders to rent motorcycles is a standard 6,000 Tsh ($2.59) per day.

For the electric motorcycle case, we present a model with a rental fee of 10,000 Tsh ($3.45) per day. The increased rental fee is set to compensate the owner who must invest more in the electric motorcycle over the petrol model.

ENERGY ASSUMPTIONS

Fuel consumption varies based on terrain, bike condition, and driving, but riders interviewed bought an average of two liters of fuel each day at 2,500 Tsh ($1.08) per liter.

For electric bikes, Greenfoot's operational data found that battery packs that had 1.6 kilowatt-hours of usable energy were able to power an electric motorcycle for an average of 40 kilometers. Grid electricity can be used to charge the batteries at a rate of 360 Tsh ($0.16) per kilowatt-hour.

MAINTENANCE ASSUMPTIONS

The majority of maintenance costs are borne by the owner of the motorcycle. The rider is only responsible for very minor repairs (replacing lost nuts and bolts) as well as chain adjustments, which need to be done every 400 kilometers and cost 2,000 Tsh ($0.86).

A full schedule of required maintenance and associated costs for both electric and petrol motorcycles is included at the end of this report. As we chose to model electric motorcycles that are converted from petrol motorcycles, many of the maintenance costs are the same, with the exception of the engine-related items.

EQUIPMENT ASSUMPTIONS

For our model, we priced a new petrol motorcycle at 2.6M Tsh ($1,120), which is in the middle range of models commonly used by boda boda riders. For the electric model, we included the approximate cost of a conversion kit, such as ones that can be found in neighboring Kenya or Uganda and modeled the total cost at 5M Tsh ($2,155).

Assuming regular maintenance, the motorcycle is expected to depreciate by 50% after 4 years. A similar rate was used for the electric motorcycle, which has an expected lifespan of 5 years based on supplier information.

Lastly, a 3% insurance rate was included, which is borne by the motorcycle owner.

BUSINESS MODEL SUMMARY

BUSINESS MODEL TYPE:	Leasing model 1 - Revenue split
BUSINESS MODEL DESCRIPTION:	Flat rental fee paid by the motorbike operator to the owner
MOTORBIKE OWNERSHIP:	Motorbike owner maintains ownership
FUEL COSTS FINANCIER:	Motorbike operator
MAINTANANCE COSTS FINANCIER	Motorbike owner
CONVERSION RATE	$1.00 USD = 2,320 Tsh

BUSINESS MODEL INPUTS (USD)

	INPUT	UNIT	PETROL MOTORBIKE	ELECTRIC MOTORBIKE	REMARKS / DATA SOURCE
#	**OPERATING ASSUMPTIONS (BUSINESS)**				
1	Average km traveled per day	km/day	68	68	Based off of rider surveys
2	Operation days in a week	day/week	7	7	Based off of rider surveys
3	Operation weeks per year	week/year	50	50	Based off of rider surveys
4	Rental/Leasing fee per day	USD/day	$ 2.59	$ 3.45	Based off of rider surveys
	OPERATING ASSUMPTIONS (ENERGY)				
5	Energy cost	USD/L or USD/kWh	$ 1.08	$ 0.16	Based off of local fuel and electricity costs
6	Average fuel consumption per day	L/day or kWh/day	2	0	Based off of rider surveys
7	Average battery pack usable energy storage	kWh/pack	0	2	Based off of Greenfoot operational data
8	Average distance traveled per battery pack	km/pack	0	40	Based off of Greenfoot operational data
9	Energy consumption	Km/L or Km/kWh	34	**25**	Petrol: Based off of rider surveys. Electric: Calculated from Inputs 7, 8
10	Energy cost per Km	USD/km	**$ 0.03**	**$ 0.01**	Calculated from Inputs 9, 5
	REVENUE ASSUMPTIONS				
11	Average Revenue per day	USD/day	$ 7.33	$ 7.33	Based off of rider surveys
12	Average Revenue per Km	USD/km	**$ 0.11**	**$ 0.11**	Calculated from Inputs 1, 11
	MAINTENANCE ASSUMPTIONS				
13	Driver Paid Maintenance Costs	USD/km	$ 0.00	$ 0.00	Paid by rider, see maintenance sheets
14	Frequent maintenance costs	USD/km	$ 0.01	$ 0.00	Paid by owner, see maintenance sheets
15	Long-term maintenance costs	USD/km	$ 0.01	$ 0.00	Paid by owner, see maintenance sheets
16	Lifetime maintenance costs	USD/km	$ 0.00	$ 0.00	Paid by owner, see maintenance sheets
17	Total maintenance costs	USD/km	**$ 0.02**	**$ 0.01**	Calculated from Inputs 13-16
	CAPITAL EQUIPMENT ASSUMPTIONS				
18	CAPEX Cost	USD	$ 1,120.69	$ 2,155.17	Petrol cost based off of average bike cost. Electric bike cost based off of cost for converted bike.
19	CAPEX Life Expectancy	Year(s)	4	5	Based off of supplier interviews
20	Salvage Price as Percentage of CAPEX Cost	%	50%	50%	Based off of owner interviews
21	Insurance Rate	%	3%	4%	Based off of insurance company interviews

UNIT ECONOMICS

Per Km	Unit	Petrol Motorbike	Electric Motorbike
Revenue	USD/km	$ 0.11	$ $0.11
Rental Costs	USD/km	$ 0.04	$ $0.05
Driver Maintenance Costs	USD/km	$ 0.00	$ $0.00
Gross Profit (Driver Profit)	**USD/km**	**$ 0.04**	**$ $0.05**
Other Maintenance Costs	USD/km	$ 0.02	$ $0.01
EBITDA	**USD/km**	**$ 0.02**	**$ $0.04**
CAPEX Depreciation Costs	USD/km	$ 0.01	$ $0.02
EBIT	**USD/km**	**$ 0.01**	**$ $0.02**

Per Day			
Revenue	USD/day	$ 7.39	$ $7.39
Energy Costs	USD/day	$ 2.16	$ $0.42
Rental Costs	USD/day	$ 2.59	$ $3.45
Driver Maintenance Costs	USD/day	$ 0.15	$ $0.15
Gross Profit (Driver Profit)	**USD/day**	**$ 2.50**	$ **$3.37**
Expected Maintenance Costs	USD/day	$ 1.10	$ $0.67
EBITDA	**USD/day**	$ **1.40**	$ **$2.71**
CAPEX Depreciation Costs	USD/day	$ 0.80	$ $1.23
EBIT	**USD/day**	$ **0.60**	$ **$1.48**

Per Week			
Revenue	USD/week	$51.74	$51.74
Energy Costs	USD/week	$15.09	$2.95
Rental Costs	USD/week	$18.10	$24.14
Driver Maintenance Costs	USD/week	$1.03	$1.03
Gross Profit	**USD/week**	**$17.52**	**$23.62**
Expected Maintenance Costs	USD/week	$7.72	$4.66
EBITDA	**USD/week**	**$9.80**	**$18.96**
CAPEX Depreciation Costs	USD/week	$5.60	$8.62
EBIT	**USD/week**	**$4.20**	**$10.34**

OPERATION FINANCIAL SUMMARY

OPERATOR	Petrol Motorbike	Electric Motorbike
Main Revenue (Service Fees)	$ 2,586.96	$ 2,586.96
Other Revenues	$ -	$ -
Total Net Revenue	**$ 2,586.96**	**$ 2,586.96**
Direct Costs - Fuel (Petrol/ Electricity)	$ 754.31	$ 147.72
Gross Profit	**$ 1,832.65**	**$ 2,439.23**
Expenses		
Rental Fee	$ 905.17	$ 1,206.90
Insurance	$ -	$ -
Maintenance		
Driver Paid Maintenance Costs	$ 51.29	$ 51.29
Frequently & Must Do Maintanance		
Long Term Recomended Maintanance		
Motorbike Lifetime Maintanance		
Total Maintenance Costs	$ 51.29	$ 51.29
Other Expenses	$ -	$ -
Motorbike Depreciation (1st Year)	$ -	$ -
Total Expenses	$ 956.47	$ 1,258.19
Earnings Before Taxes	**$ 876.18**	**$ 1,181.04**

OWNER	Petrol Motorbike	Electric Motorbike
Main Revenue (Leasing Fees)	$ 905.17	$ 1,206.90
Other Revenues	$ -	$ -
Total Net Revenue	**$ 905.17**	**$ 1,206.90**
Direct Costs - Fuel (Petrol/ Electricity)	$ -	$ -
Gross Profit	**$ 905.17**	**$ 1,206.90**
Expenses		
Rental Fee	$ -	$ -
Insurance	$ 33.62	$ 86.21
Maintenance		
Driver Paid Maintenance Costs		
Frequently & Must Do Maintanance	$ 156.44	$ 79.50
Long Term Recomended Maintanance	$ 147.98	$ 100.18
Motorbike Lifetime Maintanance	$ 81.51	$ 53.35
Total Maintenance Costs	$ 385.94	$ 233.03
Other Expenses	$ -	$ -
Motorbike Depreciation (1st Year)	$ 140.09	$ 215.52
Total Expenses	$ 559.64	$ 534.76
Earnings Before Taxes	**$ 345.53**	**$ 672.14**

DISCUSSION OF RESULTS

When viewing the unit economics, we find that electric motorcycles have operating energy costs five times less than their petrol equivalents, which is a benefit to the riders who presently spend nearly a third of their daily earnings on fuel. In our modeled scenario, the reduced fuel costs are offset by an increased rental fee, resulting in no net benefit to the rider.

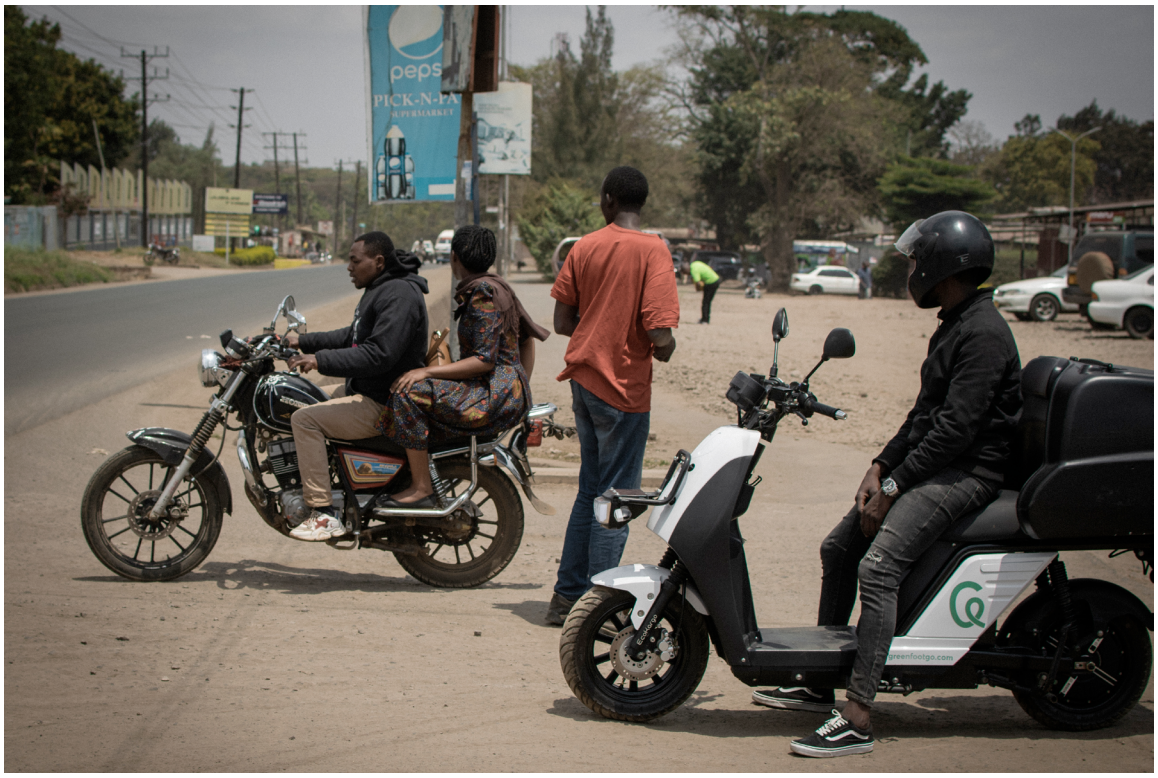
The owner of the motorcycle is expected to save on maintenance costs but have higher depreciation and insurance costs, such that their overall costs are similar. In our modeled scenario, we project higher revenues and a better ROI with electric motorcycles as a result of the increased rental fee.

Overall, the electric motorcycle is shown to be more cost effective than the petrol motorcycle and adjusting the rental fee changes how that benefit is shared between the rider and the owner. At 8,000 Tsh ($3.44) per day rental fee, the rider reaps the total benefit and increases their earnings by 35%. At 10,000 Tsh ($4.31) per day rental fee, the owner reaps the total benefit and increases their earnings by 50%.

CONCLUSIONS

Electric motorcycles are compatible within the existing, local leasing/renting model use by many motorcycle taxis in Tanzania and offer financial incentives for riders and owners to switch. With conversion kits, the same motorcycles can even be used, reducing barriers to adoption. And importantly, since many motorcycle owners already have multiple bikes that they purchase and lease out, it's clear that there are individuals with the financial capacity to pay for a higher cost asset such as an electric motorcycle.

We see a lot of potential for this segment to transition from petrol to electric, as it is familiar to what currently exists but offers better returns. Ultimately, the bike owners are the ones who decide whether or not to make the switch, and more research needs to be done to understand what barriers might prevent them from doing so. From here, we see that these businesses stand to benefit from this change, and so too may the environment.



ANNEX

BUSINESS MODEL INPUTS (TSH)

	INPUT	UNIT	PETROL MOTORBIKE	ELECTRIC MOTORBIKE	REMARKS / DATA SOURCE
#	**OPERATING ASSUMPTIONS (BUSINESS)**				
1	Average km traveled per day	km/day	68	68	Based off of rider surveys
2	Operation days in a week	day/week	7	7	Based off of rider surveys
3	Operation weeks per year	week/year	50	50	Based off of rider surveys
4	Rental/Leasing fee per day	USD/day	6,000	8,000	Based off of rider surveys
	OPERATING ASSUMPTIONS (ENERGY)				
5	Energy cost	USD/L or USD/kWh	2,500	360	Based off of local fuel and electricity costs
6	Average fuel consumption per day	L/day or kWh/day	2	0	Based off of rider surveys
7	Average battery pack usable energy storage	kWh/pack	0	2	Based off of Greenfoot operational data
8	Average distance traveled per battery pack	km/pack	0	40	Based off of Greenfoot operational data
9	Energy consumption	Km/L or Km/kWh	34	**25**	Petrol: Based off of rider surveys. Electric: Calculated from Inputs 7, 8
10	Energy cost per Km	USD/km	**74**	14	Calculated from Inputs 9, 5
	REVENUE ASSUMPTIONS				
11	Average Revenue per day	USD/day	17,000	17,000	Based off of rider surveys
12	Average Revenue per Km	USD/km	**250**	**250**	Calculated from Inputs 1, 11
	MAINTENANCE ASSUMPTIONS				
13	Driver Paid Maintenance Costs	USD/km	5	5	Paid by rider, see maintenance sheets
14	Frequent maintenance costs	USD/km	15	8	Paid by owner, see maintenance sheets
15	Long-term maintenance costs	USD/km	14	10	Paid by owner, see maintenance sheets
16	Lifetime maintenance costs	USD/km	8	5	Paid by owner, see maintenance sheets
17	Total maintenance costs	USD/km	**43**	**23**	Calculated from Inputs 13-16
	CAPITAL EQUIPMENT ASSUMPTIONS				
18	CAPEX Cost	USD	2,600,000	5,000,000	Petrol cost based off of average bike cost. Electric bike cost based off of cost for converted bike.
19	CAPEX Life Expectancy	Year(s)	4	5	Based off of supplier interviews
20	Salvage Price as Percentage of CAPEX Cost	%	50%	50%	Based off of owner interviews
21	Insurance Rate	%	3%	3%	Based off of insurance company interviews

UNIT ECONOMICS

Per Km	Unit	Petrol Motorbike	Electric Motorbike
Revenue	Tsh/km	250	250
Energy Costs	Tsh/km	74	14
Rental Costs	Tsh/km	88	118
Driver Maintenance Costs	Tsh/km	5	5
Gross Profit (Driver Profit)	**Tsh/km**	**83**	**113**
Other Maintenance Costs	Tsh/km	38	23
EBITDA	**Tsh/km**	**46**	**90**
CAPEX Depreciation Costs	Tsh/km	27	42
EBIT	**Tsh/km**	**18**	**48**

Per Day			
Revenue	Tsh/day	17,000	17,000
Energy Costs	Tsh/day	5,000	979
Rental Costs	Tsh/day	6,000	8,000
Driver Maintenance Costs	Tsh/day	340	340
Gross Profit (Driver Profit)	**Tsh/day**	**5,660**	**7,681**
Expected Maintenance Costs	Tsh/day	2,558	1,545
EBITDA	**Tsh/day**	**3,102**	**6,136**
CAPEX Depreciation Costs	Tsh/day	1,857	2,857
EBIT	**Tsh/day**	**1,245**	**3,279**

Per Week			
Revenue	Tsh/week	119,000	119,000
Energy Costs	Tsh/week	35,000	6,854
Rental Costs	Tsh/week	42,000	56,000
Driver Maintenance Costs	Tsh/week	2,380	2,380
Gross Profit	**Tsh/week**	**39,620**	**53,766**
Expected Maintenance Costs	Tsh/week	17,908	10,813
EBITDA	**Tsh/week**	**21,712**	**42,953**
CAPEX Depreciation Costs	Tsh/week	13,000	20,000
EBIT	**Tsh/week**	**8,712**	**22,953**

OPERATION FINANCIAL SUMMARY

OPERATOR	Petrol Motorbike	Electric Motorbike
Main Revenue (Service Fees)	5,950,000.0	5,950,000.0
Other Revenues	-	-
Total Net Revenue	**5,950,000.0**	**5,950,000.0**
Direct Costs - Fuel (Petrol/Electricity)	1,750,000.0	342,720.0
Gross Profit	**4,200,000.0**	**5,607,280.0**
Expenses		
Rental Fee	2,100,000.0	2,800,000.0
Insurance	-	-
Maintenance		
Driver Paid Maintenance Costs	119,000.0	119,000.0
Frequently & Must Do Maintanance		
Long Term Recomended Maintanance		
Motorbike Lifetime Maintanance		
Total Maintenance Costs	119,000.0	119,000.0
Other Expenses	-	-
Motorbike Depreciation (1st Year)	-	-
Total Expenses	2,219,000.0	2,919,000.0
Earnings Before Taxes	**1,981,000.0**	**2,688,280.0**

OWNER	Petrol Motorbike	Electric Motorbike
Main Revenue (Leasing Fees)	2,100,000.0	2,800,000.0
Other Revenues	-	-
Total Net Revenue	2,100,000.0	**2,800,000.0**
Direct Costs - Fuel (Petrol/Electricity)	-	-
Gross Profit	2,100,000.0	**2,800,000.0**
Expenses		
Rental Fee		
Insurance	78,000.0	150,000.0
Maintenance		
Driver Paid Maintenance Costs		
Frequently & Must Do Maintanance	362,950.0	184,450.0
Long Term Recomended Maintanance	343,315.0	232,407.0
Motorbike Lifetime Maintanance	189,110.8	123,779.8
Total Maintenance Costs	895,375.8	540,636.8
Other Expenses	-	-
Motorbike Depreciation (1st Year)	325,000.0	500,000.0
Total Expenses	1,298,375.8	1,190,636.8
Earnings Before Taxes	**801,624.2**	**1,609,363.2**

MAINTANANCE COSTS - PETROL MOTORCYCLE

Maintanance - Electric Motorbike	Recommended Maintanance Mileage (KM)	Avg Maintanance Time Interval (Days)	Cost per Session (Tsh)	Cost Per KM (Tsh/ KM)	Cost Per Day (Tsh)	Remarks/Data Source
Maintenance Performed by Driver				**5**	**340**	
Chain adjustment	400	6	2,000	5.00	340.0	*Recommended every after 5 to 6 days for optimal motorbike performance*
Frequently & Must Do Maintanance/ Replacements				**15**	**1,037**	***Must do maintenance on a monthly basis for a motorbike that runs on a daily basis. Required for the smooth operation of the bike and extended life expectancy.***
Engine Oil Check/Change and Parts Lubrication	2000	29	15,000	7.50	510.0	*Depending on the oil type used, local technicians recommend an oil change between 2000km to 3000km for most locally used brands.*
Bearings Replacements	6000	88	25,000	4.17	283.3	*Needs replacement if bearings are worn out otherwise lubrication is enough*
Brake Shoes Replacement	12000	176	5,000	0.42	28.3	*If maintained, well lasts twice as long as brake pads*
Brake Pads Replacements	6000	88	4,000	0.67	45.3	*Needs frequent replacements in rain season*
Bulbs (Headlights, Indicator Lights, Rear & Brake Lights)	12000	176	30,000	2.50	170.0	*Replacements depends on quality of parts, overall motorbike wiring intergrity and operating conditions, can last longer for high quality parts and better conditions*
Long Term & Recomended Maintanance/ Replacements				**14**	**981**	***Maintenance/replacement frequency largely depends on operating conditions and the quality of original parts. If well maintained some parts can last twice the mileage listed.***
Transmission Set Chain Sprocket Kit	40000	588	25,000	0.63	42.5	*In addition to mileage, also depends on the quality of spare parts used and driving/ operating conditions*
Brake & Clutch Lever Replacement	25000	368	15,000	0.60	40.8	*In addition to mileage, also depends on the quality of spare parts used and driving/ operating conditions*
Clutch plate replacement	15000	221	15,000	1.00	68.0	*In addition to mileage, also depends on the quality of spare parts used and driving/ operating conditions*
Brake Cables Replacement	25000	368	3,500	0.14	9.5	*In addition to mileage, also depends on the quality of spare parts used and driving/ operating conditions*
Tyres Replacement	25000	368	110,000	4.40	299.2	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Shift Lever Replacement	40000	588	20,000	0.50	34.0	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Fenders replacement	25000	368	25,000	1.00	68.0	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Air Filter Replacement	25000	368	500	0.02	1.4	*In addition to mileage, also depends on the quality of the parts used and driving/operating conditions*
Carburetor Replacement	25000	368	3,000	0.12	8.2	*In addition to mileage, also depends on the quality of the parts used and driving/operating conditions*

Maintanance - Electric Motorbike	Recommended Maintanance Mileage (KM)	Avg Maintanance Time Interval (Days)	Cost per Session (Tsh)	Cost Per KM (Tsh/ KM)	Cost Per Day (Tsh)	Remarks/Data Source
Plug and Spark Plug Cap Replacement	25000	368	8,000	0.32	21.8	*In addition to mileage, also depends on the quality of spare parts used and driving/ operating conditions*
Hydraulic damper shock replacement	25000	368	5,000	0.20	13.6	*Depends on the original quality of spare parts used and driving/operating conditions or in a situation of an accident*
Starter Motor Replace	40000	588	20,000	0.50	34.0	*Depends on ignition cycles, as contacts wears off the more the starter is used, also in a situation of prolonged ignition cycles due to weak battery and misfiring engine*
12V Battery Replacement	15000	221	45,000	3.00	204.0	*Depends on charge discharge cycles, frquently replaced for a motorbike that runs daily*
Driver and Passenger seats replacement	25000	368	40,000	1.60	108.8	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Motorbike Horn Replacement	20000	294	8,000	0.40	27.2	*Depends on the original quality of the parts used but can also mulfuction due to short circuting*

Motorbike Lifetime Maintanance/ Replacements				**8**	**540**	***Can or can't be performed throughout the life expectancy of a motorbike, depends if there is a serious malfunction or accident, but can also be done to maintain motorbike value.***
Steering Stem	80000	1176	25,000	0.31	21.3	*Can go without replacement, when it happens it is mostly in a situation of an accident resulting to a bent or broken steering stem*
hydraulic Shock Absorber	80000	1176	45,000	0.56	38.3	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Exhaust Pipe	80000	1176	35,000	0.44	29.8	*Can go without replacement, when it happens it is mostly in a situation of an accident resulting to puctured or broken exhaust pipe*
Master Cylinder Brake Pumps Replacement	50000	735	40,000	0.80	54.4	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Engine overhaul	80000	1176	300,000	3.75	255.0	*Can be performed to restore engine power, but mostly performed before a resale (salvaging a motorbike)*
Head Light	80000	1176	15,000	0.19	12.8	*Can go through life of the motorbike, need replacement in a situation of an accident*
Fuel Tank Cap Replacement	80000	1176	14,000	0.18	11.9	*Need replacement if lost or lost keys*
Brake Pedal Replacement	80000	1176	7,000	0.09	6.0	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Handle Bar Switches	50000	735	25,000	0.50	34.0	*Can go through life of the motorbike, need replacement in a situation of an accident or malfuction*
Plastic Side Covers Replacements	50000	735	15,000	0.30	20.4	*Can go through life of the motorbike, need replacement in a situation of an accident*
Motorbike Rewiring	60000	882	50,000	0.83	56.7	*Need to be performed after a long use replace aged and broken parts and wires, but also to protect electronic parts from short circuting*

MAINTANANCE COSTS - ELECTRIC MOTORCYCLE

Maintanance - Electric Motorbike	Recommended Maintanance Mileage (KM)	Avg Maintanance Time Interval (Days)	Cost per Session (Tsh)	Cost Per KM (Tsh/ KM)	Cost Per Day (Tsh)	Remarks/Data Source
Maintenance Performed by Driver				**5**	**340**	
Chain Adjustment	400	6	2,000	5.00	340.0	*Recommended every after 5 to 6 days for optimal motorbike performance*
Frequently & Must Do Maintanance/Replacements				**8**	**527**	***Must do maintenance on a monthly basis for a motorbike that runs on a daily basis. Required for the smooth operation of the bike and extended life expectancy.***
Moving Parts Lubrication	2000	29	5,000	2.50	170.0	*Depending on the oil type used, local technicians recommend an oil change between 2000km to 3000km for most locally used brands.*
Bearings Replacements	6000	88	25,000	4.17	283.3	*Needs replacement if bearings are worn out otherwise lubrication is enough*
Brake Shoes Replacement	12000	176	5,000	0.42	28.3	*If maintained, well lasts twice as long as brake pads*
Brake Pads Replacements	6000	88	4,000	0.67	45.3	*Needs frequent replacements in rain season*
Bulbs (Headlights, Indicator Lights, Rear & Brake Lights)	12000	176	30,000	2.50	170.0	*Replacements depends on quality of parts, overall motorbike wiring intergrity and operating conditions, can last longer for high quality parts and better conditions*
Long Term & Recomended Maintanance/Replacements				**10**	**664**	***Maintenance/replacement frequency largely depends on operating conditions and the quality of original parts. If well maintained some parts can last twice the mileage listed.***
Transmission Set Chain Sprocket Kit	40000	588	25,000	0.63	42.5	*In addition to mileage, also depends on the quality of spare parts used and driving/operating conditions*
Brake & Clutch Lever Replacement	25000	368	15,000	0.60	40.8	*In addition to mileage, also depends on the quality of spare parts used and driving/operating conditions*
Brake Cables Replacement	25000	368	3,500	0.14	9.5	*In addition to mileage, also depends on the quality of spare parts used and driving/operating conditions*
Tyres Replacement	25000	368	110,000	4.40	299.2	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Fenders replacement	25000	368	25,000	1.00	68.0	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Hydraulic damper shock replacement	25000	368	5,000	0.20	13.6	*Depends on the original quality of spare parts used and driving/operating conditions or in a situation of an accident*
Driver and Passenger seats replacement	25000	368	60,000	2.40	163.2	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Motorbike Horn Replacement	20000	294	8,000	0.40	27.2	*Depends on the original quality of the parts used but can also mulfuction due to short circuting*

Maintanance - Electric Motorbike	Recommended Maintanance Mileage (KM)	Avg Maintanance Time Interval (Days)	Cost per Session (Tsh)	Cost Per KM (Tsh/KM)	Cost Per Day (Tsh)	Remarks/Data Source
Motorbike Lifetime Maintanance/Replacements				**5**	**354**	***These can be performed or not throughout the life expectancy of a motorbike, depends if there is a serious malfunction or accident, can also be done to maintain motorbike value.***
Steering Stem	50000	735	25,000	0.50	34.0	*Can go without replacement, when it happens it is mostly in a situation of an accident resulting to a bent or broken steering stem*
hydraulic Shock Absorber	25000	368	45,000	1.80	122.4	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Head Light	80000	1176	15,000	0.19	12.8	*Can go through life of the motorbike, need replacement in a situation of an accident*
Handle Bar Switches	50000	735	25,000	0.50	34.0	*Can go through life of the motorbike, need replacement in a situation of an accident or malfuction*
Plastic Side Covers Replacements	50000	735	15,000	0.30	20.4	*Can go through life of the motorbike, need replacement in a situation of an accident*
Master Cylinder Brake Pumps Replacement	50000	735	40,000	0.80	54.4	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Brake Pedal Replacement	25000	368	7,000	0.28	19.0	*Depends on the original quality of the parts used and driving/operating conditions or in a situation of an accident*
Motorbike Rewiring	60000	882	50,000	0.83	56.7	*Need to be performed after a long use replace aged and broken parts and wires, but also to protect electronic parts from short circuting*