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INTERNATIONAL CLIMATE INITIATIVE (IKI)

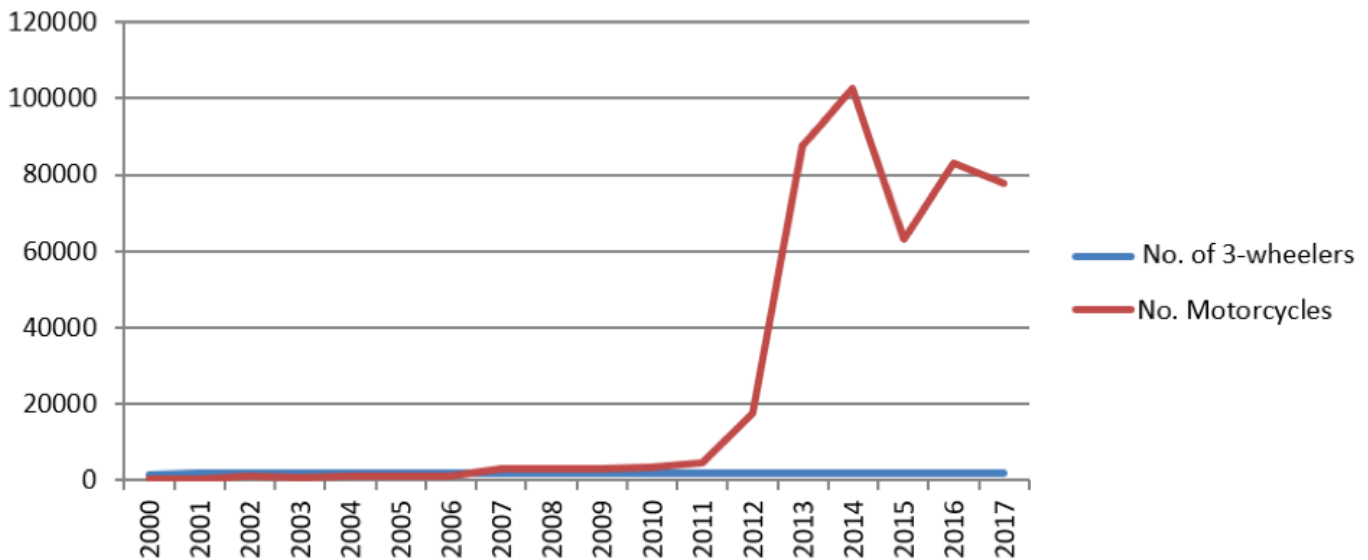


Background

Two and three-wheelers are the fastest growing transport mode in many low and middle-income countries including Uganda where their annual registration constitutes about 74% of all vehicle registrations.

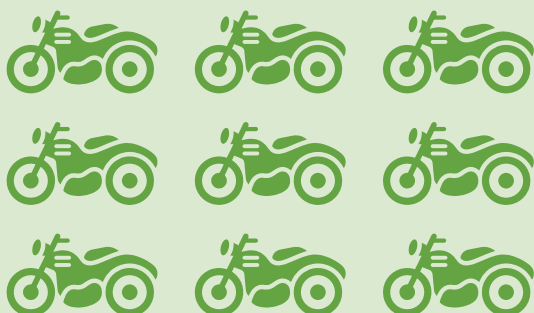
2-wheeler annual registrations have rapidly increased from 229 units per annum in 2000 to over 80,000 units in 2017. The technology of these motorcycles has over time changed from two stroke engines to four stroke internal combustion engine motorcycles and from a reliance on used 2 wheelers to newly imported or units assembled in Uganda.

Figure 1: Imports of 3 wheelers and Motorcycles in Uganda (2000-2018)



In 2017, there were a total of 455,408 motorcycles in the country of which over 99.9% used petrol as their fuel. These motorcycles are predominantly used for commercial purpose as taxis commonly known as “*boda boda*”. Being a major source of employment for the youth who constitute the majority of the population in Uganda, the growth of the motorcycles is expected to continue to rise in the coming years.

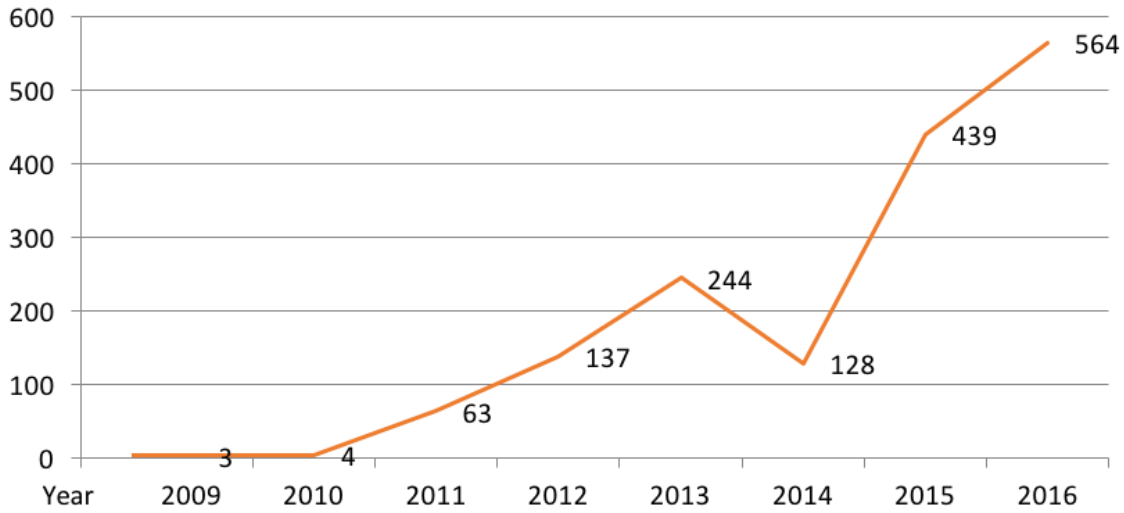
Three wheelers have also significantly grown (figure 2) moving from an annual registration of 1 unit in 2006 to over 564 units in 2017. This represents a growth rate of over 150% during the period.



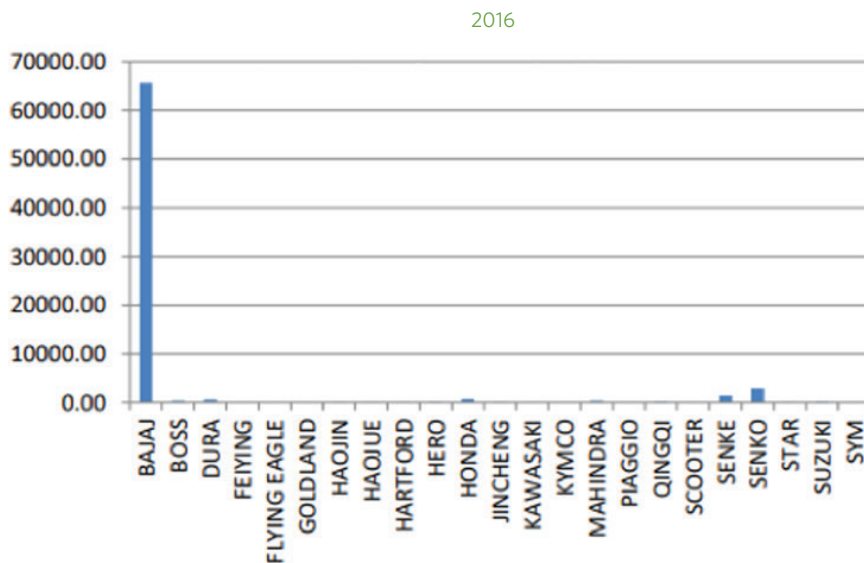
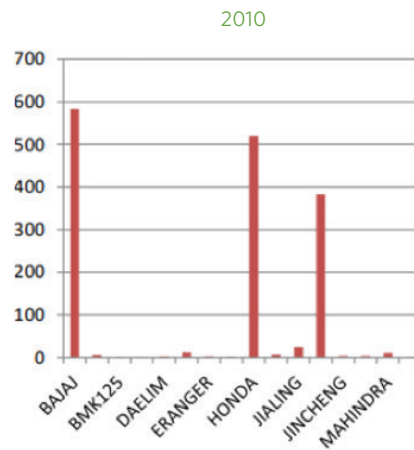
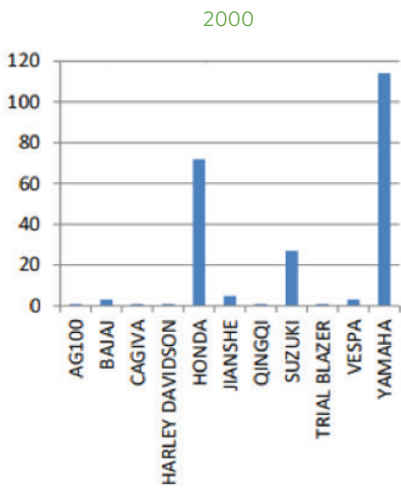
**455,408
motorcycles**

were in Uganda as of
2017, with over 99.9%
using petrol as their fuel

Figure 2: 3-wheeler importation in Uganda (2006-2017)



The brand of the motorcycles imported into the country has also changed over time as demonstrated in the graphs below:

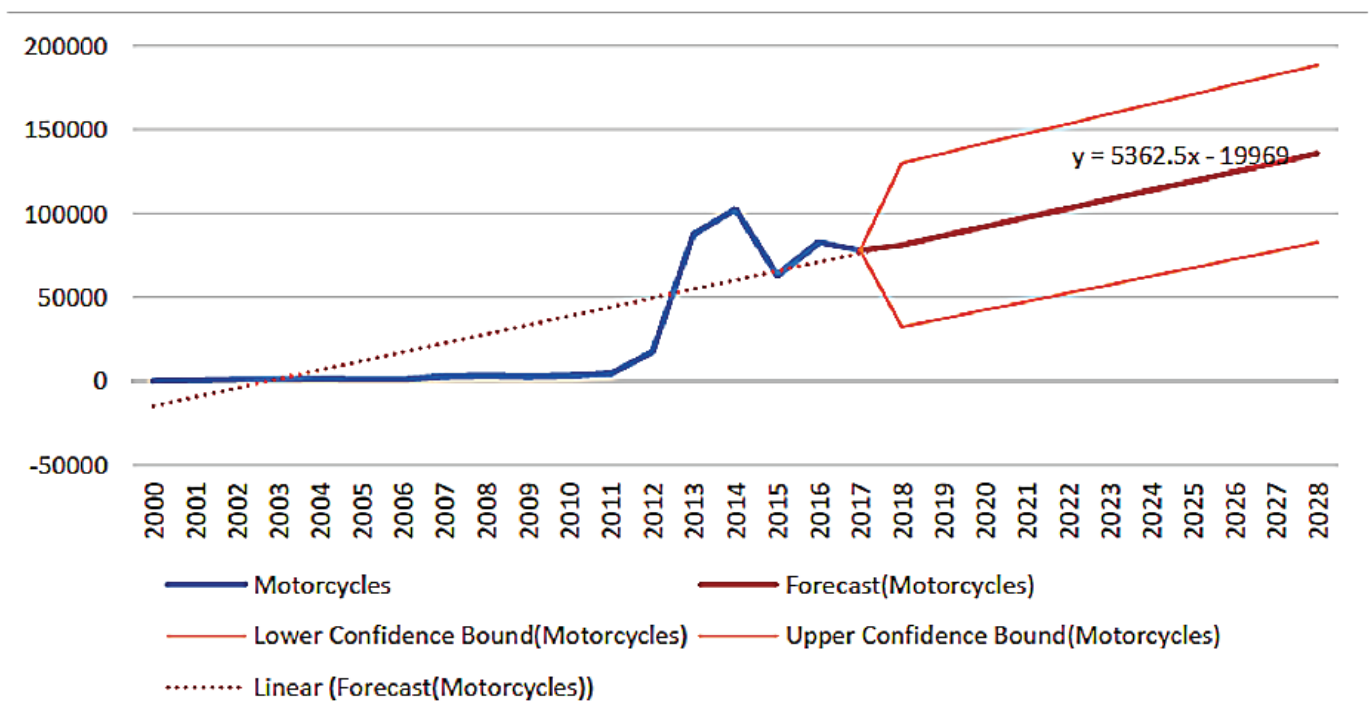


Since 2014, UNEP has through the Global Fuel Economy Initiative (GFEI <https://www.globalfueleconomy.org/>) partnered with the Ministry of Energy and Mineral Development (MEMD) and the Makerere University to analyze vehicles imported into the country, including 2&3 wheeler motorcycles.

This baseline assessment and trends, has been critical to inform stakeholders on strategies towards cleaner and more efficient vehicles, and impacts of switching 2&3 wheelers to electric modes. Some of the findings of these studies and recommendations are included in this brochure.

If the prevailing 2-wheeler registration trends are to remain, the motorcycles are projected to reach an annual import of more than 1.5M units by 2030 (See figure 3 below).

Figure 3: Growth projections for motorcycles



Although in the early years, most of the motorcycles imported into the country were used two stroke internal combustion engine motorcycles, today, most of the motorcycles in the market are 4-stroke motorcycles.

However, despite the choice of engine, internal combustion motorcycles are a significant contributor to harmful air pollutants including small particulate matter (PM) as well as increased pedestrian injuries and fatalities. Some of the health impacts of PM emissions from vehicles and motorcycles are coughs; eye, nose and throat irritation; allergies; reduced lung capacity and fatigue; increased risk of cardiovascular diseases, resulting in heart attacks and premature deaths.

Figure 4: Air pollution and climate emissions comparisons for light vehicles

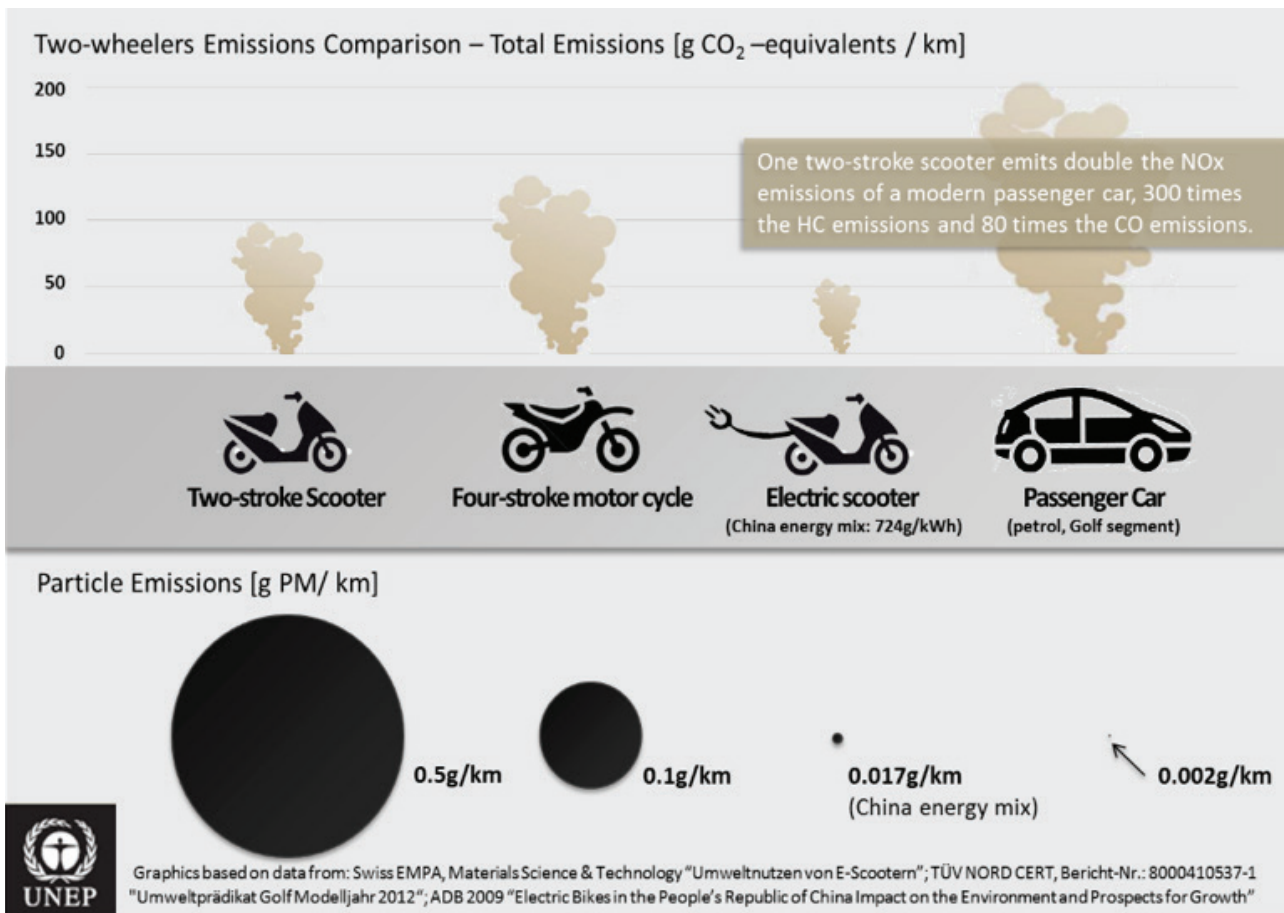
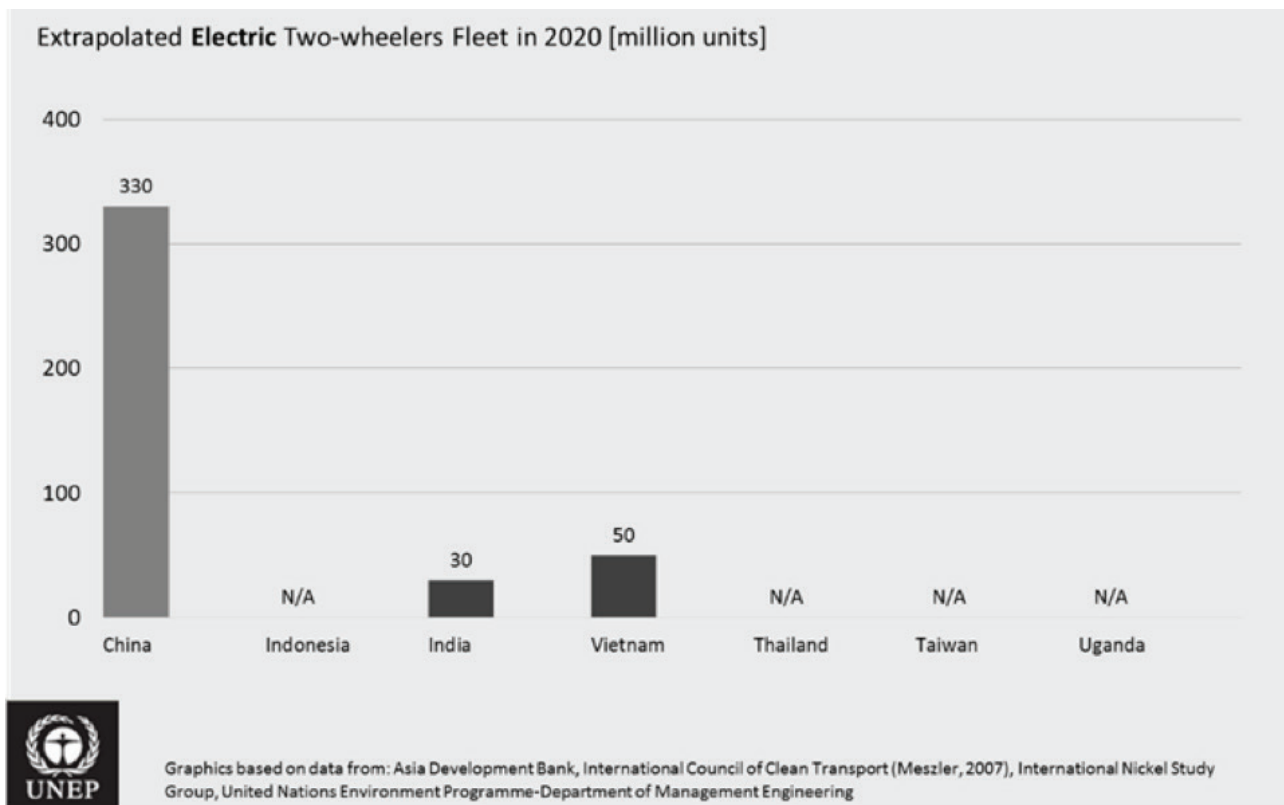


Figure 5: Electric two-wheeler fleets in select countries



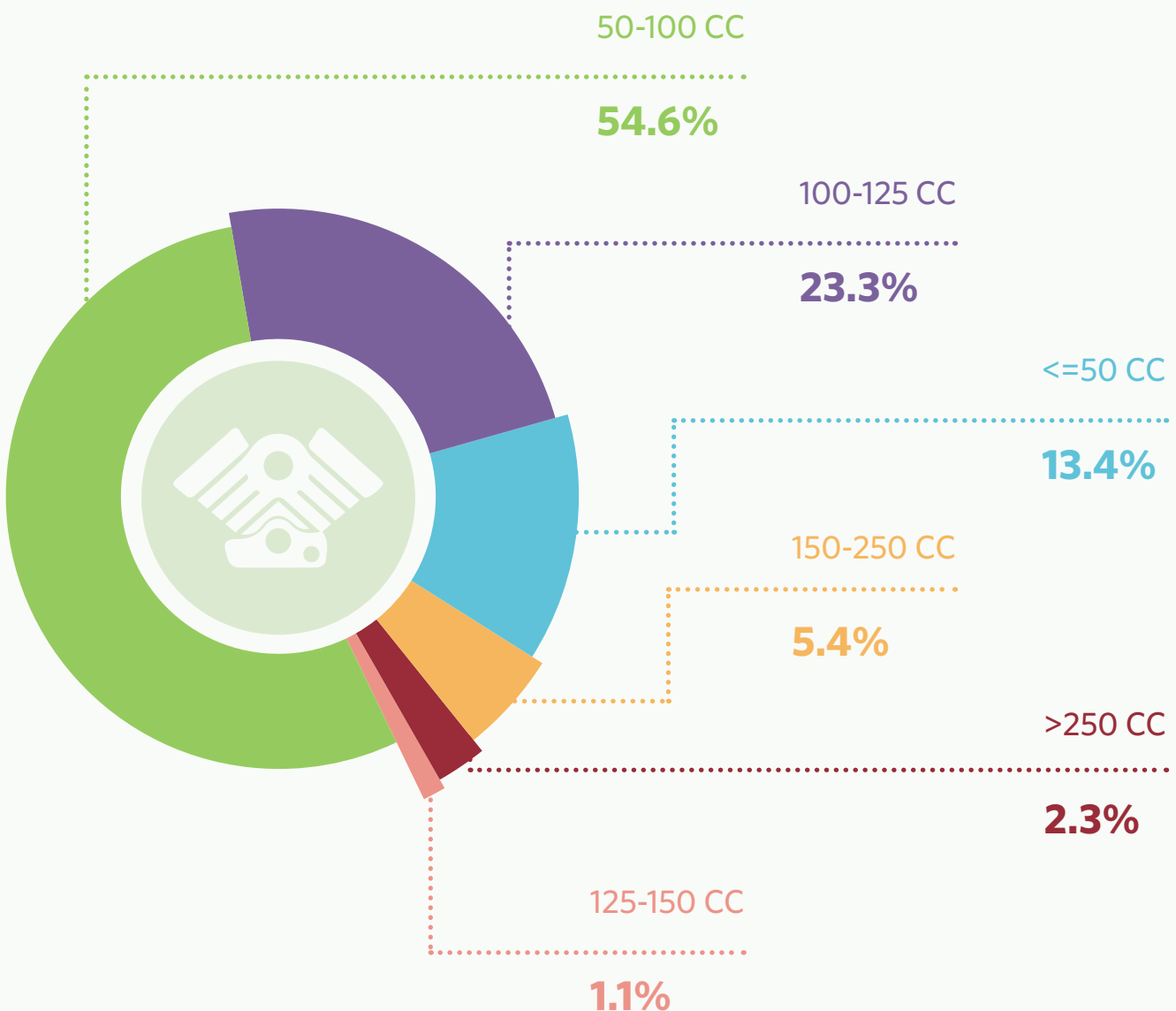
As illustrated in figure 4 above, the PM emissions from a two-stroke motorcycle are over ten times those of an electric one, per kilometre travelled. Motorcycles are also a major source of carbon dioxide emissions.

Measures to reduce urban air pollution and climate change mitigation will therefore need to include shifting to low emission motorcycles, preferably through switching to electric modes. Today, there are about 500 million electric 2&3 wheeler motorcycles, mainly in China, India, and other Asian countries (Figure 5).

Since most of the 2&3 wheelers imported into the country originate from these countries and the technology is already readily available, incentives to promote the import and/or local assembly or manufacture of electric 2&3 wheelers will support reduction of harmful emissions, create green jobs and provide additional demand to abundant and locally available clean renewable energy.

There has been a general preference for motorcycles with engine capacity between 50-100cc with about 54.6% registered. This could explain the improvement in the fuel economy of the 2 wheelers. As mentioned before, there is also a preference for petrol motorcycles.

Figure 6: Distribution of engine capacity in 2 wheelers in Uganda
(Computed from URA data, 2018)



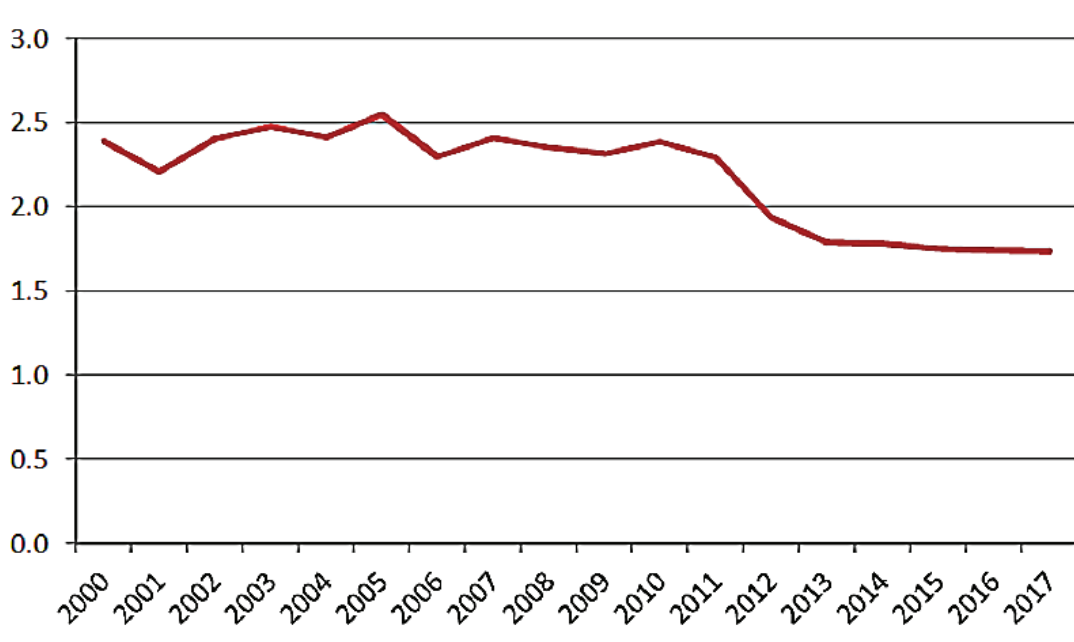
As at 2017, 99.9% of the of 455,408 motorcycles registered in the country had petrol engines. Since the fuel economy is related to the engine capacities as shown in figure 7 below, Uganda’s fuel economy has improved over the years as most of the petrol motorcycles have an average engine capacity of between 50-100CC.

Figure 7: Fuel Economy of Petrol Engines of 2 Wheelers

Engine CC	AV.FE (L/100km)	AV CO2
<= 50	1.7	40.2
50-100	1.7	39.0
100-125	2.2	51.8
125-150	2.5	57.5
150-250	3.3	75.8
>250	4.8	111.4

From the study by Makerere University on fuel economy and electric mobility readiness for Uganda, since the year 2000, fuel economy of 2 wheelers has improved from 2.4 liters/100km in 2000 to 1.7 litres/100km in 2017 (See figure 8 below). A complete switch to electric modes would however be more beneficial to the operators and the country.

Figure 8: Average fuel economy of for 2 wheelers in Uganda (2000-2017)



As part of the project an electricity demand projection for electric 2& 3 wheelers in Uganda showed that there would be about 1 million two-wheelers in Uganda by 2020. A complete transition of the entire 1 million units ICE fleet to electric would result in a daily charging requirement of about 200MW which would be met comfortably by the excess generation capacity of 307MW as of December 2018.



Coupled with the fact that the power generation is largely renewable, introduction of electric mobility would provide significant CO2 emissions reduction in the transport sector. As of 2018, power generation was dominated by large hydro power 65% (635 MW) and thermal power 14% (139MW) as shown in figure 9. Other largely renewable power sources included small hydro's, co-generation, solar and hybrid.

Figure 9: Fuel Economy of Petrol Engines of 2 Wheelers

Energy Source	Capacity (MW)
Large Hydros	635
Thermal Power	139
Small Hydros	82.94
Co-generation	96.2
Solar	20.1
Hybrid	1.6

In addition, Isimba Hydroelectric Power Station producing an additional 183.2 megawatts was added to the grid in 2019. The Karuma Hydroelectric Power Station, a 600 MW hydroelectric power project is also anticipated to be commissioned soon, further increasing to the renewable energy produced in the country. This extra capacity and other additional power plants can support the additional demand from electric mobility.

Advancing electric mobility in Uganda is anchored in among others the Energy Policy (2002), Renewable Energy Policy (2007), Electricity Act (1999), Electricity Connection Strategy (2018-2027), Renewable Energy Feed in Tariff Guidelines, Uganda National Climate Change Policy (2015), National Transport Master Plan 2008-2023, the National Environment Act and the National Development Plan III.

There still exists significant gaps to spur the growth of electric mobility including but not limited to a specific electric mobility policy, standards, financing options, fiscal and non-fiscal incentives for electric vehicle importation and possible future manufacturing, and increased information and public awareness.

Demonstration Project

The electric 2-wheeler demonstration for Uganda is supported by the BMU-IKI project “Integrating electric 2 & 3-wheelers into existing urban transport systems in developing countries” as part of UNEP’s Global Electric Mobility Programme.

It is a 6-country project implemented in Kenya, Ethiopia/Burundi, Philippines, Thailand, Uganda and Vietnam. The aim is to inform decisionmakers and other stakeholders on policy, technical, economic and financial barriers and opportunities to the uptake of electric mobility

In addition, 50 electric 2 wheelers were donated by TAILG to run demonstrations for different use cases between April 2021 and April 2022. The motorcycles were donated to 5 partners as follows: **International University of East Africa (IUEA)** a university based in Kampala, Central Uganda where bikes are used for logistics and movement for university researchers; **Clean Air Initiative Africa (CAIA)**, an NGO based in Kampala (Central Uganda) and Mbarara (Western Uganda) where bikes are used by researchers and for office transport;

Green Mobility, a company based in Kampala, Central Uganda dealing with public transport, courier services, logistics where the units are used largely for courier and logistic services; **Lulu Fish Farms** a fish farm in the Jinja, Eastern Uganda where the units are used for movement within the farm and **Pearl Rice Co Ltd** a rice farm in Busembatya, Eastern Uganda where the units are used to run farm errands.

The pilot was launched at a high-level event in April 2021 and served as the beginning of an electric mobility revolution in Uganda. The objectives of the pilot were to demonstrate electric 2-wheelers and provide a proof of concept for the technology, to test appropriateness of the units for different use cases and to create awareness on electric mobility. The results of the pilot will be published in 2022.





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