



Integrating Electric 2&3 Wheelers into Existing Urban Transport Modes in Developing and Transitional Countries

August 2023

VIETNAM

INTRODUCTION

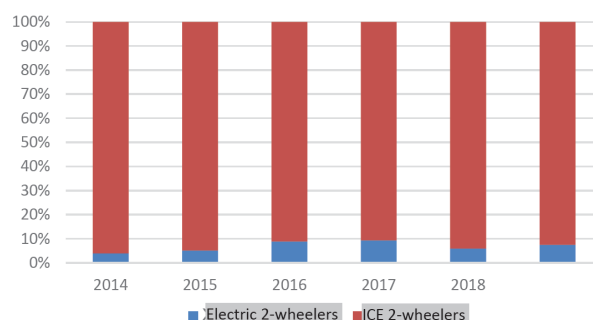
MARKET OVERVIEW

Vietnam has recently emerged as a key player in the Electric Vehicle (EV) industry within the Association of Southeast Asian Nations (ASEAN), especially in the electric two-wheeler (E2W) market. According to the International Council on Clean Transportation (ICCT), the country is the second-largest two-wheeler market in the region accounting for more than 90% of all motorized vehicles. Most of the fleet are internal combustion engine (ICE) vehicles powered by gasoline that generate more than 90% of CO and VOC, and 60% of suspended particles of the total transport modes' emissions.

From 2014 to 2016 and 2017, the growth of electric two-wheelers in Vietnam amounted to about 300%. The majority of these electric motorcycles had lead acid batteries with top speeds of around 50kph, long charging times and relatively shorter ranges of 50 to 70 km. Since the national technical standards (QCVN 75:2018/BGTVT, QCVN 76:2018/BGTVT, QCVN 90:2018/BGTVT and QCVN 91:2018/BGTVT) came into effect in 2018, while the quality of vehicles has improved the growth rate of E2W has slowed due to the higher upfront cost differential of motorcycles powered by lithium-ion batteries. Still, the number of E2Ws in Vietnam is growing, accounting for 8.3% of total two-

wheeler sales in 2020 compared to 4.9% in 2019¹. According to the Vietnam Ministry of Transport (2023), the country has more than 3 million electric two-wheelers (electric bicycles and electric motorbikes) out of a total of 60 million motorcycles on the road. The market share of electric motorcycles in Vietnam has increased from 5.4% in 2019 to 10% in 2021 and will continue to increase in 2022.

Figure I: Share of electric and ICE Two-Wheelers Registered in Vietnam



Source: Vietnam Register

Electric two-wheelers in Vietnam are distributed via three main channels: direct imports by individuals, local distributors importing foreign brands and providing a comprehensive dealership system including maintenance and replacement parts and local assemblers or manufacturers who have established partnerships with foreign suppliers. Prominent electric two-wheeler brands in Vietnam include Anbico, Pega, DKBike, SYM, KYMCO, Giant, Sufat, Dtech, Tsubanme, Takuda, Suzika, and Vinfast, among others.

Table I: Localization Rate of the Electric Two-Wheelers produced in Vietnam

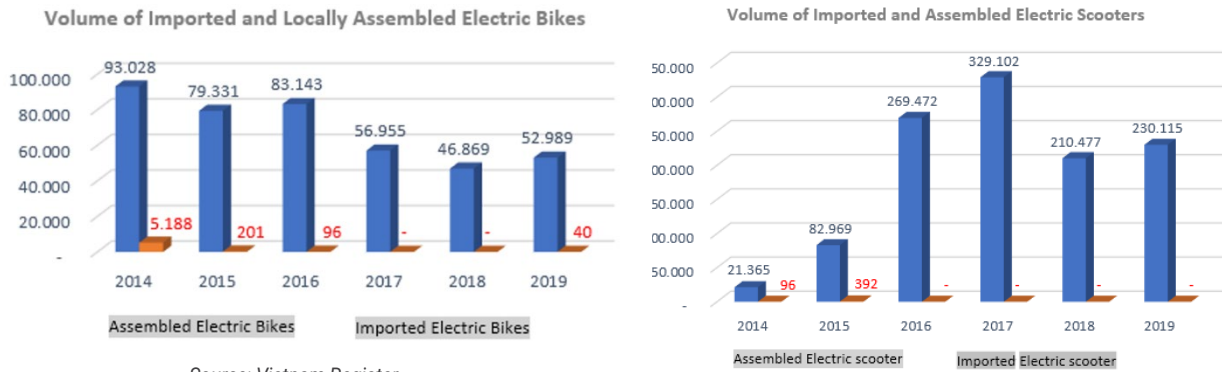
No.	Brand	Localization Rate	Unlocalized Components	Maximum Travel Distance (km)
1	Pega	50% - 70%	Engine, remote control, batteries, and some other devices	80-100
2	DK Bike	45% - 55%	Engine, remote control, batteries, and some other devices	80-100
3	Detech	60% - 65%	Motor, remote control, batteries and some other devices	80-100
4	Sufat	50% - 60%	Motor, remote control, batteries and some other devices	80-100
5	Vinfast	85% - 95%	Motor, remote control, batteries and some other devices	80-120
6	Anbico	>50%	Motor, remote control, batteries and some other devices	50-75

Source: Vietnam Register

While previously, most electric two-wheelers were imported, today, the majority of E2W are domestically manufactured and assembled, with imported vehicles representing less than 10% of the market. Vietnamese manufacturers have actively invested in production facilities, technology, and human resources to improve their production system and product quality, leading to higher availability of locally produced or assembled electric vehicles and electric vehicle components. Some components like electric motors, controllers, batteries, and accumulators are still imported from foreign manufacturers while other components are manufactured locally to increase the localization rate based on product costs. The majority of electric vehicle manufacturers, including Pega and Vinfast, import lithium batteries for their electric two-wheeler production. However, efforts to localize battery production are ongoing by some companies including PLC Manufacturing and Trading Co., Ltd. (Narada Battery) and Legacy Battery Joint Stock Company. Despite this, due to small-scale production, limited technological investment, and a lack of preferential policies to produce EV components the prices for batteries remain high.

¹ ICCT, 2022, <https://theicct.org/wp-content/uploads/2022/03/ldv-asia-using-policy-and-regulation-to-pave-way-for-two-wheeler-electrification-in-vietnam-mar22.pdf>

Figure 2: Number of Imported vs Locally Assembled Electric two wheelers



Another major challenge for the higher uptake of E2Ws, are a limited charging network and battery swapping stations. Most users charge at home but the local E2W manufacturer Vinfast has erected several charging and swapping stations and sells some models with a separate battery rental/swapping arrangement. There are plans to expand the battery charging and swapping stations to include locations such as commercial centers, gas stations, supermarkets, bus stations, public parking spaces, apartment buildings, offices, universities, etc.

From the electricity side, Vietnam has enough capacity for the entire 45 million gasoline two-wheelers to be replaced with electric ones. Analysis conducted for this project, shows that with the average travel distance of each vehicle of about 40km/day, charging these vehicles will consume only about 0.22 – 3,39% of the total electricity demand of Vietnam (depending on different vehicle types and electricity generation scenarios).

E 2&3 WHEELERS TARGET AND POLICY

While at the start of the pilot Vietnam didn't have any e-mobility-specific policies in place, the promotion of EVs now forms a key part of Vietnam's strategy to meet the net-zero emission target by 2050. In July 2022, the Vietnamese government approved the Action Program on Green Energy Transition and Carbon and Methane Emission Reduction in the Transport Sector. The Programme specifies the national objectives geared towards fostering electric vehicle development in two phases:

- Phase I (2022-2030): This phase emphasizes the promotion of production, assembly, import, and use of electric vehicles. The phase also includes the establishment of charging infrastructure to cater to EVs.
- Phase II (2031-2050): This subsequent phase stipulates the phase-out of production, assembly, and import of fossil fuel-based cars, motorcycles, and mopeds for domestic use by the year 2040. Furthermore, by 2050, it mandates that 100% of motorized road vehicles should be powered by electricity. It also outlines the development of a nationwide charging infrastructure system to meet the demands of individuals and businesses.

To achieve these targets, the Vietnamese government has implemented several incentives for electric cars and electric two-wheelers, including reducing registration fees for locally produced vehicles, cutting import tariffs on essential parts and raw materials, and offering direct subsidies to E2W manufacturers. A CO₂-based taxation system is also being considered to incentivize the transition to low- and zero-emission two-wheelers.

COUNTRY PROJECT - VIETNAM

PROJECT SUMMARY

Mainstreaming Electric Mobility in Vietnam

The electric mobility pilot project involved a baseline study, feasibility analysis and technical assessment to compare 90 gasoline scooters and 90 electric scooters, including 50 Honda PCX electric models. 30 of the E2Ws were tested by delivery staff from the Forwarding Service Joint Stock Company (TNT) to transport goods to customers in Hanoi and its suburbs. Services that TNT offer include express shipping cargo shipping, and low-cost shipping. To evaluate the performance of the EVs, the team assessed factors like safety, economy, utility, convenience, and environmental impacts. The findings were used to develop standards and policy recommendations and to increase awareness and promote the use of electric two-wheelers in Vietnam.

City/Country: Hanoi/Vietnam

Timeframe: September 2018 – December 2020

Partners: UNEP, Vietnam University of Transport Technology (UTT), National Traffic Safety Committee, Honda, Forwarding Service Joint Stock Company (TNT)

INTERVENTIONS

In Vietnam, a pilot was conducted comparing 90 ICE vehicles and 90 electric two-wheelers, including 50 PCX electric two-wheelers sponsored by Honda as well as models from HK bike, X men and Vinfast. All two-wheelers, both ICE and electric, were categorized based on their price range (Table 1). The pilot project was designed based on a comprehensive baseline study of the current two-wheeler fleet in Vietnam and its fuel economy. On 28 March 2019, a signing ceremony took place to officially announce the cooperation between the National Traffic Safety Committee, the University of Transport Technology (UTT) and Honda Vietnam for the project “Mainstreaming electric mobility in Vietnam”. As part of the ceremony, 50 e-scooters were handed over to UTT staff and students for pilot and research purposes. By collecting and analyzing real life data on electric motorbikes, the project enables the development of scenarios for introducing E2Ws on a large scale in Vietnam. Before the actual deployment of the two-wheelers, all selected participants underwent safety training. This ensured that they were well-acquainted with the operational aspects of the vehicles and were aware of safety protocols. To monitor and collect data on the usage patterns, routes taken, and distances covered, GPS devices were installed on every two-wheeler and users were asked to provide monthly data and feedback through a detailed questionnaire. This also added an additional layer of safety, allowing for real-time tracking of the vehicles.



Launching Ceremony of Hanoi Demonstration Project

Another 30 electric motorcycles were tested by TNT company, a local delivery company. For the implementation of the pilot, an agreement was signed between the drivers and TNT for borrowing the vehicles. TNT company covered the handover, registration, and insurance for both vehicles and drivers. In addition, an agreement was signed by all pilot partners to comply with Vietnam’s Road Traffic Law to ensure traffic safety and comply with the manufacturer’s terms. UTT in cooperation with Honda provided training courses on the operation of the two-wheelers, battery charging, setting up delivery plans in accordance with the vehicle range, repair and maintenance of the two-wheelers as well as on recording data of electric two-wheelers in the information sheets.

Table 1: Number and brand name of two-wheelers participating in the test

Models		Number	Maker
A. ICE two-wheelers		90	Honda, Yamaha, other
1	Model 1G	10	Honda
2	Model 2G	15	Yamaha, Honda
3	Model 3G	15	Other
4	Model 4G	50	Honda, other
B. Electric two-wheelers		90	HK bike, X men, Vinfast, Honda
1	Model 1E	10	Honda, X men
2	Model 2E	15	HK Bike, X men
3	Model 3E	15	Vinfast
4	Model 4E	50	Honda electric PCX

IMPACTS AND RESULTS

The pilot study participants evaluated their experiences based on six indicators:

- Usability Indicator: Evaluates the functionality of electric two-wheelers.
- Aesthetic Indicator: Assesses the design and appearance of the two-wheelers.
- Safety Indicator: Considers safety factors.
- Convenience Indicator: Reflects user-friendly features and ease of replacing parts.
- Economic Indicators: Analyzes the costs associated with purchasing and operating an electric two-wheeler.
- Environmental Indicator: Measures the environmental impact of electric two-wheelers.

These are some of the main findings of the pilot study:

- User Experience Evaluation:
 - Safety: Topped the list of user priorities, indicating the paramount importance of ensuring user safety in electric mobility solutions.
 - Usability: Came in as the second most valued aspect. Users predominantly prefer electric two-wheelers for short, urban commutes. However, concerns arose about their performance on waterlogged streets or during rainfall.
 - Convenience: While users appreciated the ample storage space on two-wheelers, concerns were voiced about the charging duration and its impact on the vehicle's usability.
 - Economics: Users displayed a keen interest in electric two-wheelers due to their cost savings in the long run.
 - Environmental Impact: This was the least prioritized by users, highlighting the need for increased awareness about the environmental benefits of electric two-wheelers.
- Costs: The energy cost rises with purchase price of the vehicle for both ICE and EV. On average, energy costs of electric two-wheelers are roughly 1/9 to 1/6 of ICE two-wheelers for an equivalent distance.
- Environmental benefits: The CO₂ emissions of EVs are approximately 1/3 of ICE vehicles. These findings underscore the superior fuel efficiency of electric vehicles over their internal combustion counterparts.
- Infrastructure: All participants unanimously expressed the need for enhanced access to charging and battery-swapping stations, emphasizing the importance of infrastructure in promoting electric two-wheelers.

Table 2: Summary results of testing ICE two-wheelers

Model	Model 1G	Model 2G	Model 3G	Model 4G
Distance/day (km)	18.2	24.1	23.4	18.8
Number of fuel filling frequency/week (times)	1.44	1.42	1.3	1
Average fuel cost/1km (VND)	386.8	407.2	509	559.86

Table 3: Summary results of testing electric two-wheelers

Model	Model 1E	Model 2E	Model 3E	Model 4E
Distance/day (km)	16.8	22.6	21.2	19.1
80% full charging time (h)	8	10	7.35	4.5
Number of charging times/week (times)	3.03	2.94	2.56	1.75
Average energy cost/1km (VND)	63.43	60.70	58.16	83.2
Travel distance covered/battery charge (km)	42	57.33	64	60

Table 4: Comparison Results on Economic and Environmental Benefits between E2W and ICE 2W

Fuel consumption			Fuel/Energy cost (VND/km)		CO2 emissions (g/km)	
ICE vehicles (litre/100km)	ICE vehicles (kWh/100km)	Electric vehicles (kWh/100km)	ICE vehicles	Electric vehicles	ICE vehicles	Electric vehicles
2.3	20.7	1.64	491.28	48	53.35	15.06

Notes: One liter of petrol has an energy content of 9 kWh. The CO2 emissions are calculated based on the combined margin emission factor of the Vietnam power grid in 2016.

LESSONS LEARNED

The pilot findings reveal some important challenges in promoting electric two-wheelers in Vietnam, particularly around costs and safety. Many users perceive EVs as expensive due to their high upfront costs, even though their operational costs are lower than ICE vehicles. Additionally, there are safety concerns among users, especially regarding the potential hazards of batteries, such as electric shocks, fires, and their perceived durability. The quality of electric bikes has been a concern in the past, with many low-quality models degrading rapidly after just a year of use. However, since the implementation of Circular No. 41/2013/TT-BGTVT in 2014, the quality of electric motorcycles in Vietnam has been more strictly controlled. Another safety issue is the silence of EVs, which can pose a risk to pedestrians and other drivers, prompting discussions about adding noise-generating devices to these vehicles. While not exclusively linked to electric motorcycles, many students do not adhere to the Law on road traffic, committing violations such as overloading, not wearing helmets, using phones while driving, and zigzagging. The absence of turn signals on many electric bike models further complicates the situation, leading to potential accidents as other drivers cannot anticipate their intended direction.

Another notable observation was the gap in public awareness. Despite the clear environmental advantages of electric two-wheelers, users in the pilot ranked these benefits lower, pointing to a need for increased public education on the subject. The pilot also highlighted the need for a comprehensive charging network where the role of the government is indispensable in providing incentives for its deployment in the country.

RECOMMENDATIONS

Given the insights from the pilot project, several recommendations can be proposed. Firstly, a robust charging infrastructure is paramount, and more incentives need to be put in place to increase investments into charging infrastructure. This will also need to address battery swapping to extend the range of E2Ws. In addition, as electric vehicles gain traction, it's crucial that the energy powering them is clean. Therefore, investments and political leadership in expanding renewable energy capacity should be promoted. Thirdly, financial institutions should be encouraged to offer preferential financing options to lower the upfront cost barrier of electric two-wheelers. Adjusting excise taxes can further incentivize the uptake and manufacturing of electric vehicles within the country.

To address the lack of awareness, comprehensive awareness campaigns are needed to educate the public about the benefits of electric mobility, especially its environmental benefits and energy efficiency. With regard to safety, there is a need to develop and implement regulations specific to electric bike usage to enhance traffic safety management. To ensure the safety and efficiency of these vehicles, increased efforts are needed to harmonize technical standards, aligning them with international benchmarks. Currently, existing standards only cover key requirements for EVs such as motors, batteries, and general EV matters but do not fully reflect other emerging requirements. The project supported the development of Policy Guidelines for Electric 2&3 wheelers for Southeast Asia which are a regional benchmark for the development of E2W standards.

Beyond the pilot scope, Vietnam should foster an environment conducive to both domestic and international investments in electric vehicle production. This includes attracting multinational corporations to establish research and development centers, especially focusing on advancements in battery production and electric vehicle technologies. In addition, efficient

battery management, including recycling strategies, is essential for environmental sustainability. Vietnam currently lacks specific regulations for the disposal and recycling of discarded batteries/accumulators from electric two-wheelers, despite their classification as hazardous waste. With the surge in E2W adoption, this has become a pressing concern. Since January 1, 2015, legal provisions mandate the collection and processing of discarded products like batteries, as per the Prime Minister's Decision No. 50/2013/QĐ-TTg, obliging manufacturers and importers to set up retrieval points for expired or discarded products and coordinate with consumers for their transportation to treatment facilities.

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