UNLOCKING URBAN MOBILITY OPPORTUNITIES THROUGH ELECTRIFICATION

RECOMMENDATIONS FOR REINFORCING THE FIVE THEMATIC AREAS OF THE PHILIPPINE URBAN MOBILITY PROGRAMME (PUMP) THROUGH ELECTRIC MOBILITY

PHILIPPINES

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Project

SOLUTIONSPlus - Integrating Urban Electric Mobility Solutions in the Context of the Paris Agreement, the Sustainable Development Goals and the New Urban Agenda

About this report

This report provides key recommendations for reinforcing the five thematic areas of the Philippine Urban Mobility Programme (PUMP) through electric mobility.

Title

Unlocking urban mobility opportunities through electrification

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Executive Summary

The Philippine Urban Mobility Programme (PUMP) is the framework for Philippines to support efforts towards improving and enhancing urban mobility. The PUMP envisions to create "***people-oriented cities empowered by efficient, dignified, and sustainable mobility***", and will address social, environmental, and economic issues of mobility. The PUMP outlined actions across five thematic areas: non-motorized transport, public transport (i.e., public utility vehicles), urban freight, travel demand management, and transit-oriented development.

Since the program's inception, there have been developments in transport in the Philippines which includes the introduction of policies and programs that support the electrification of the transport sector. The Philippines considers electric mobility as an environmentally sustainable technology that will support the attainment of the country's Nationally Determined Contribution (NDC) targets. As such, the report explores opportunities for electric mobility in enhancing the activities and interventions across the PUMP thematic areas.

Efforts to support non-motorized transport (i.e., walking and cycling) has picked up especially during quarantine restrictions. During that period, several government and non-government agencies have released policies, infused funding for non-motorized transport, crafted policy and guidance documents, generated baseline information (i.e., counts), and constructed relevant infrastructure. As such, electric bicycles and other electric micromobility options have picked up because of its convenience and affordability. However, regulation and inconsistency across policies presents a barrier for consumers to consider using light electric vehicles. Overall, the paper identifies an opportunity for LEVs to support the NMT and urban freight area as it can support NMT modal shift and provide an alternative for food and delivery services.

Public transport electrification is still in its early stages. However, earlier demonstrations supported by development partners of electric jeepneys commenced in 2006. These demonstrations found to benefit both benefit drivers and operators by lowering operating costs compared with conventional ICE vehicles. More recently, electric public transport is becoming available through government programs like the Davao Bus Project and e-trike projects across the Philippines. However, the high initial acquisition costs for the vehicle and charging infrastructure remains the most significant barrier for public transport electrification. Policies on the use of electric public transport also need to evolve as the requirements for its operation may be different from conventional transport modes using ICEs. Nevertheless, electrification of the public transport sector aligns with the country's transport modernization programme, which is a key intervention in the PUMP.

Electrification can also support the PUMP's aspiration of increasing freight efficiency and reducing emissions from the sector. The paper identified that small and medium enterprises are keen in transitioning towards green logistics by subsidizing electric vehicle purchases with cost saving from outbound logistics. Furthermore, there is a significant potential for electric 2- and 3-wheelers to support parcel and food delivery services as demonstrated in several projects in the Philippines. As such, the PUMP can expand the freight thematic area to also include delivery services as an opportunity for intervention.

Travel demand management and transit-oriented development are identified as future PUMP activity areas, with implementation targeted to start in 2027. Electric mobility can reinforce existing travel demand management strategies like the vehicle volume reduction program and remote work and learning arrangements. Although TOD in the PUMP is focused on railway projects, the strategic location of charging infrastructure and mobility hubs can be guided by recent policy frameworks.

Electric mobility showcases actions that can accelerate the achievement of thematic targets of the Philippine Urban Mobility Programme. Each type of electric vehicle – two-wheels, three-wheels, quads, PUVs, buses – present potential emission reductions, lower operating costs and enhanced operational benefits when adoption is increased. However, a key opportunity for the government is to incentivize users or adopters of electric vehicles to further push the adoption of energy efficient vehicles.

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01

Introduction

Urban mobility plays a key role in delivering national objectives under the Paris Agreement, the Sustainable Development Goals, and the New Urban Agenda. Governments need a strong national policy framework that will navigate the complexity of urban mobility systems and enable the shift to low-carbon mobility and the take-up of innovative vehicle technologies and mobility services. Hence, these institutions are key in shaping urban mobility policy through planning and implementing relevant policies and securing investment or appropriating funds for infrastructure.

This report revisits the national urban mobility programme of the Philippines, aptly called the Philippine Urban Mobility Programme (PUMP). It investigates opportunities for electric mobility to enhance the five thematic areas in the programme. The document outlines the lessons and experiences obtained while implementing the demonstration activities of the SOLUTIONSplus living labs. The report then integrates the findings into the national policy framework, supporting the transition towards a sustainable mobility system.

The co-development processes in the SOLUTIONSplus living labs will highlight policy, regulatory, fiscal, and operational issues that could inform relevant urban mobility documents, including:

a. **The National Urban Mobility Plan** as a strategic framework to structure sustainable urban mobility and coordinating mechanisms within the government;
b. **National Urban Mobility Policies** as concrete measures for sustainable urban mobility; and
c. **National Urban Mobility Investment Programs** to deliver on the objectives and priorities outlined in the NUMP and specify investments from the national level to assist cities in delivering on their individual Sustainable Urban Mobility Plans (SUMPs).

The report presents recommendations for the policy dialogue and local implementation in the respective country.

1.1 Objective and Structure of the Paper

The SOLUTIONSplus project aims to **develop relevant proposals to support the implementation of the National Urban Mobility Programme (NUMP). The report summarises the learnings from urban demonstrations and reflects on regulatory, fiscal and planning policy issues.**

While the SOLUTIONSplus living lab is focusing on innovations in urban electric mobility, this needs to be embedded into a wider framework at the local and national level to maximise synergies of policy objectives and provide a favourable operating environment for the rapid take-up of fit-for-purpose sustainable mobility solutions.

The report aims to **advise national-level decision-makers, particularly the Department of Transportation, on pursuing the objectives of PUMP through enhanced actions on electric mobility.**

02

Context: Integrating electric mobility within a wider urban mobility transition

To adopt innovative e-mobility solutions, it is important to understand the needs and opportunities of key players in the sector, including industry, mobility service providers, infrastructure developers, local and national policy makers and transport users. Essential building blocks for the transition to sustainable mobility include a complementary package of measures form the local and national levels that provide a framework for the transformative change, including planning, infrastructure, fiscal, regulatory, and information measures.

A transition to a systemic approach has the potential to unlock trillions of dollars in cost savings from a whole-society perspective. More sustainable travel patterns can generate substantial further complementary benefits, transforming cities into more liveable and economically efficient centres.

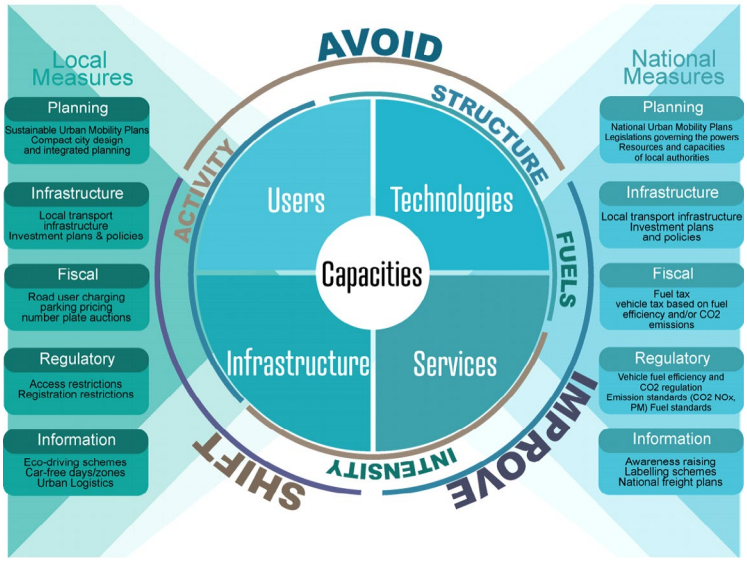
Policy interventions to foster the electrification of the sector can help achieve various objectives, such as air quality improvements and reductions in GHG emissions. However, addressing all key objectives, including access to safe roads and liveable cities for all, requires a much broader package of measures. Linking and packaging policies is also a key tool to generate synergies between different measures and to align different players.

Electric mobility needs to be embedded within an overarching approach consisting of several levels of intervention that shape not just vehicle technology but also mobility patterns and urban form. So, how can we adopt such an approach in practice? An integrated approach includes:

- **Technologies:** In terms of EV technologies, there should be a clear focus on drastically downsizing vehicle size and power, fostering resource and energy efficiency, and boosting cost-effectiveness. This counters the trend of the last few decades towards bigger, faster and more powerful cars, which has eradicated almost all efficiency gains in powertrain technologies. Only then will the electrification of the entire vehicle fleet be viable and affordable. In addition, EV concepts should be designed for shared use-cases, further fostering access and affordability.

Systematic approach for sustainable mobility

FIGURE 1



Other technological innovations, such as automation, should complement public transport systems, and avoid competition with non-motorised transport. This is vital to the viability of public transport services and encourages healthy and active mobility. Automation could play an important role in providing on-demand mobility services in rural areas where traditional public transport options are not viable.

- **Infrastructure:** Providing access for all to high-quality public transport services, as well as infrastructure for walking and cycling, is a vital part of a systemic approach to sustainable mobility. To enable this, compact city development can help with mixed-use, polycentric structures and short travel distances. A comprehensive network of charging solutions and reliable availability of charging points is crucial for a systemic change to drive a shift to EVs. An extensive charging network can also support EV operations and complement an inter-connected transport network.
- **Services:** Access to mobility services such as shared and ride-hailing services is another important element of sustainable mobility. Services should be harmonised across available mobility services to encourage the use of the most efficient option. Furthermore, service improvements should also consider the social impacts of electric mobility transition, particularly, formal and informal transport workers.
- **Users:** Users of the transport system should have access to transparent information about the cost, time, safety and other relevant aspects of different available mobility solutions and vehicles. To further guide consumer choices, differentiated pricing should favour more efficient modes and vehicles. Regulation of vehicle standards and technologies could ensure that consumers have sufficient access to safe and efficient vehicles.

There is a general assumption that the transformation towards sustainability in the transport sector will be very costly. While the shift towards more sustainable mobility infrastructure, services, and vehicle technologies will require innovation and investment, the overall benefits and savings far outweigh the costs. A sustainable mobility future will require only a fraction of the costs and resources needed today. Achieving this, however, will require a systemic change and a shift from an individual perspective towards mobility as a product, to a societal perspective towards mobility as a service. The analysis presented in this report will reflect on these aspects and provide targeted recommendations for each individual national policy environment.

03

NUMP development in the Philippines

The Philippine Urban Mobility Programme (PUMP) supports and operationalizes the National Transport Policy, guiding transport system development in the Philippines. PUMP envisions a mobility system that addresses transport-related issues in society (inclusive mobility), the environment (air quality and health), and the economy (affordability).

The PUMP proposes a strategic, action-oriented framework for sustainable urban mobility, supported by social, environmental, and economic objectives to be attained through five thematic areas:

1) walking/cycling

2) public transport

3) urban freight

4) travel demand management

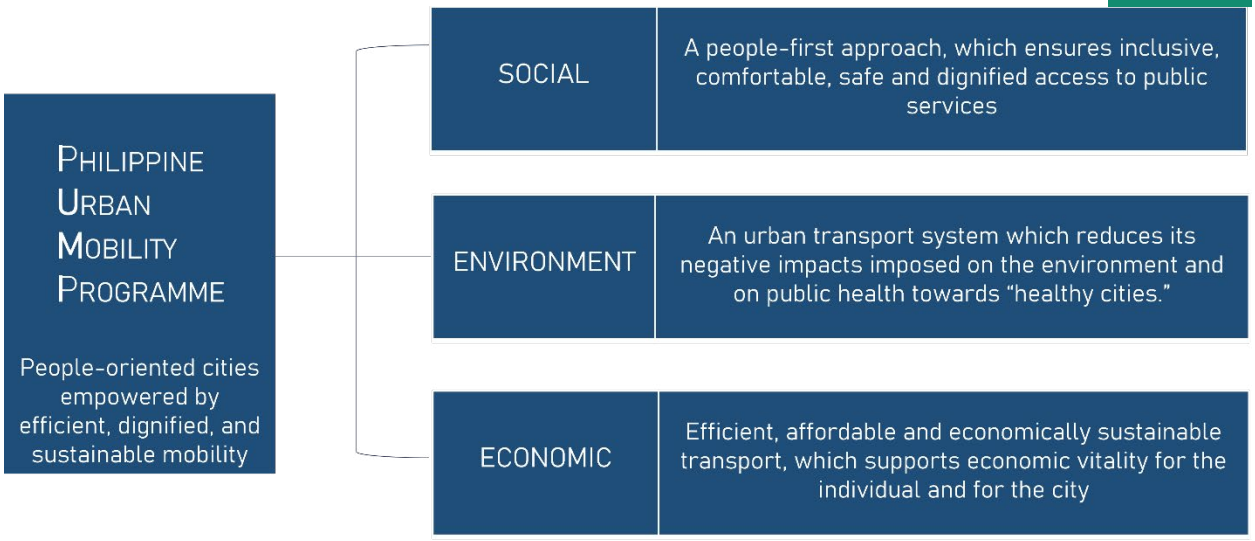
5) transit-oriented development

At the time of PUMP's development, the government's main program for public transport was the Public Utility Vehicle Modernization Program (PUVMP). As a result, the objectives consider the main initiative carried out by the national government and evolve based on the need for effective urban mobility policies. The current version includes a timeline of activities extending up to 2030, with internal phasing within the five thematic areas.

The PUMP also prescribes a monitoring and reporting plan, which identifies relevant data to track the progress of initiatives against standard indicators. Local governments can also support the data collection by using or transmitting relevant information from their Local Public Transport Route Plan (LPTRP).

The PUMP vision and transport-related issues it aims to address

FIGURE 2



The PUMP's implementation is grouped according to several phases (), wherein the short (2019-2022) and medium term (2023-2026) activities cover the implementation of activities for non-motorised transport and urban freight transport.

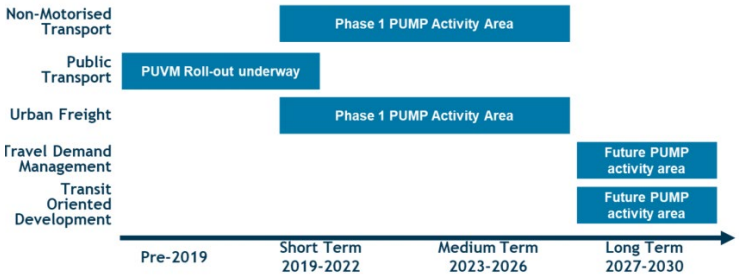


FIGURE 3

Phased implementation of the PUMP

3.1 Recent developments in the NUMP thematic areas

3.1.1 Non-motorized and active transport

The PUMP aims to "**increase the attractiveness of active travel through increased provision of walking and cycling infrastructure, enabling a shift from motorised transport modes of travel and thereby reducing carbon emissions**." However, the PUMP identified several challenges and developments that support non-motorized transport (Table 1). These challenges typically focus on the lack of policy, technical capacity, and funding availability.

A significant thrust towards the promotion of non-motorized transport, particularly cycling, occurred during the implementation of quarantine restrictions from 2020 to 2021. During that time, government mandated the cessation of mass transport operations for public health and safety. The lack of transport services during the pandemic led to a dependence on non-motorized transport modes, especially for essential workers (Xu and Mayuga, 2022). As such, the DOTr embarked on a program aimed at developing a cycling network totalling 2,400 kilometers by 2028 (Philstar 2023).

Challenges and developments on identified interventions under the NMT thematic area of the PUMP

TABLE 1

Challenges	Immediate Steps (number of years) and Development/status quo	Longer-Term Steps (timeline) Recommended Improvement
Lack of national policy	Pass national policy	
Limited data	Collect data to enable planning	
Limited staffing	Increase staff in government agencies (e.g., DOTr and LGUs) for active transport planning	
Limited focus during planning	Increase focus on NMT in the planning process	
Lack of political support	Gather political support	
Insufficient funding	Establish continued ring-fenced funding for NMT projects in HUCs	
Limited planning and design guidance		Develop NMT guidance to ensure appropriate and high-quality projects
Lack of enabling laws		Pass laws which enable and promote NMT
Discouraging behaviour		Tackle behaviors which discourage NMT
Lack of (technical) skills related to NMT planning		Train existing and future staff

Modified from the Philippine Urban Mobility Programme

Philippine guidelines with mandates on Non-Motorized Transport

The government also developed relevant policies to complement their cycling infrastructure program. These policies align with the National Transport Policy and its Implementing Rules and Regulations (IRR), wherein the highest priority shall be given to the development of non-motorized transport infrastructure. The following guidelines outline the mandates for non-motorized transport:

Development organizations supported the crafting of planning documents for NMT infrastructure development. In July 2023, the DOTr turned over copies of the Bike Lane Master Plan, supported by the UNDP LCT project, for bike lanes in Metro Manila, Metro Cebu, and Metro Davao to respective local government units. Other efforts for non-motorized transport also target the improvement of walking conditions (Table 2).

TABLE 2

Policy Document	Salient points
Department of Public Works and Highways (DPWH) Department Order 88, series of 2020 (DO 88-2020). **Guidelines on Design of Bicycle Facilities along National Roads**	Provides a uniform design of bicycle facilities to support the needs and safe access requirement of cyclists and other road users. The Department Order mandates the provision of cycling facilities for all DPWH projects including new road and bridge construction, road or bridge widening, construction of bypass roads, and others.
Department of Health (DOH) Local Health System Playbook for Active Transport	Supporting local governments with ready-to-use tools to build active transport facilities.
Joint Administrative Order (JAO) 2020-001. **Guidelines on the Proper Use and Promotion of Active Transport During and After the COVID-19 Pandemic"**	Together with the Department of Health, Department of Transportation, Department of the Interior and Local Government, and the Department of Public Works and Highways, JAO 2020-001 promotes active transport during and after the COVID-19 pandemic. The order provides not only active transport infrastructure requirements but also public health standards for active transport users.
Department of Interior and Local Government (DILG) Memorandum Circular (MC) 2020-100. **Guidelines for the establishment of a network of cycling lanes and walking paths to support people's mobility**.	Provides local government units the guidance to undertake actions in the establishment of a network of cycling lanes and walking paths. It also developed a monitoring sheet for local governments regarding the establishment of active transport infrastructure.
Republic Act 11494. **Bayanihan to Recover as One Act**	Provides government funding to support the development of 500 kilometrs of bike lanes in urban areas (Metro Manila, Metro Cebu, and Metro Davao)

TABLE 3

Recent street pedestrianization efforts in the Philippines

Location	Pedestrianization efforts
Valenzuela City	Fatima Avenue pedestrianization opened in June 2022 (PhilStar, 2022)
Quezon City	Green, Open, Renewable, Access (GORA) lane in 2021, which aims to promote pedestrian corridors (PNA, 2021)
Manila City	Pedestrianization of General Luna Street in Intramuros by the Intramuros Administration, reported in 2024 (Intramuros Administration, 2024)

Since the reopening of the economy, bicycle lanes have become controversial among stakeholders. On one hand, bicycle lanes are critical for the safety of vulnerable road users (e.g., cyclists and pedestrians). On the other hand, some view that protected cycling infrastructure reduces road space and its capacity. Motorcycles and other vehicles frequently encroach on cycling infrastructure, particularly unprotected cycle lanes along major thoroughfares. In other areas, officials or private land developers

transformed cycling infrastructure from protected into shared due to the low demand or traffic volume of these facilities. Some cities have completely removed protected cycling infrastructure in favor of "traffic decongestion" and "road capacity restoration" (Flores, 2023; de Santos, 2023).

Several local studies have documented the uptake of cycling as a viable transport mode in urban areas Surveys have indicated bicycle ownership in Filipino households ranging from 23% (SWS 2023). to 77% (Tacadao and Villena, 2021). The survey also showed that bicycle ownership comes second to motorcycles (37%) but more than three- and four-wheeled vehicles (10% and 6%, respectively) (SWS 2023). The Philippine Development Plan 2023-2028 (NEDA 2023) also introduced the success indicator "percentage of cycling households," expressing the national goal that 36% of total Philippine households will be cycling households by 2028.

3.1.2 Public transport

The PUMP identifies the Public Utility Vehicle Modernization Programme[1] (PUVMP) as the key intervention to **deliver the necessary reforms in the public transport sector**. The activities focus on transitioning to a more formal transport service that includes the consolidation of transport operations and supporting the transition and use of more energy-efficient and environment-friendly transport fleets.

The PUVMP has the following 10 different components:

1. Regulatory Reform
2. Local Public Transport Route Planning
3. Route Rationalization
4. Fleet Modernization
5. Industry Consolidation
6. Financing
7. Vehicle Useful Life
8. Initial Implementation
9. Social Support
10. Communication

As of January 2023, the program attained the following accomplishments:

- 68% (1,069) compliance of LGUs in developing their local public transport route plans.
- 74.75% of the PUJ and UVE have been consolidated, and 84.46% of the total bus and minibus have likewise consolidated, resulting in a total consolidation rate of 76.47%.
- There are 10,917 operational modern units all over the Philippines.

Government financing has been instrumental in the transition to modern vehicles. Latest information (Department of Transportation, 2023) reveals that both Landbank and the Development Bank of the Philippines have released equity subsidies amounting to P729 Million (equivalent to 4,659 units), while private financing institutions have released P133.3M (equivalent to 313 PUV units).

Transport stakeholders contest the implementation of the program, particularly the industry consolidation component, which requires operators to consolidate into a single juridical entity to be granted a transport franchise and access government financing to replace their existing vehicles. In effect, transport groups conducted transport strikes, which led to multiple changes in the deadline for consolidation[2].

Aside from this, the government implemented several programs aimed at improving public transport services, in the Philippines, especially in major urban areas. One example is the *EDSA Bus Carousel* which was not defined as a priority intervention under the PUMP. The EDSA Bus Carousel transformed bus operations along the Epifanio delos Santos Avenue (EDSA) during the pandemic. The new system grouped transport operators into a single consortium and required buses to serve the route along a dedicated median lane. The implementation also coincided with the Service Contracting Program (SCP) and the government offered free rides during a limited period. In effect, passengers welcomed the new service and the average daily ridership reached 389,579 passengers in 2022 (Luna, 2022). Other mass transport projects include building additional rail lines

1. The Department of Transportation renamed the PUVMP into the Public Transport Modernization Programme (PTMP)

2. Philippine President Ferdinand Marcos, Jr. approved the extension of an earlier deadline of December 31, 2023 to April 30, 2024 amidst transport strikes by jeepney groups.

in Metro Manila and other BRT lines in urban areas in the Philippines (e.g., Davao Bus Project, Cebu BRT and Iloilo BRT[3]).

3.1.3 Urban freight

The PUMP objective for the urban freight theme is to "**increase freight efficiency through a package of complementary measures which support freight operators in the modernisation of both the fleet and logistical operations**."

Challenges and identified activities under the urban freight thematic area

The PUMP identified five key challenges in increasing freight efficiency and actions toward sustainable urban freight.

3. Feasibility study stage

Central to addressing the challenges in the urban freight theme is an enabling policy that will support both modernisation and produce mitigation actions. A recent project[4] supported the national government in exploring decarbonisation pathways for freight transport. The pathways included three scenarios: baseline, green fleet, and seamless intermodality. The latter two scenarios explore the potential of a more energy-efficient freight transport fleet (i.e., trucks and vessels) and improved port operations (e.g., increase port capacity, decrease dwell times, and promote asset

4. National study on decarbonizing pathways for freight transport under the sustainable infrastructure programme in Asia (SIPA-T) project

TABLE 4

Challenges	Immediate Steps	Longer-Term Steps
1. Lack of freight data 2. Insufficient policy framework 3. Lack of appropriate vehicle standards 4. Fragmented industry structure 5. Skills gap	1. Develop freight data collection mechanism 2. Develop and implement vehicle standards 3. Establish inter-agency council on freight modernisation 4. Establish national freight operator dialogue forum 5. Restrict age or technology of imported used vehicles	1. Support consolidation and professionalisation of freight sector 2. Establish a Motor Vehicle Inspection System 3. Promote and assess modern fleet pioneers 4. Explore scrappage and buyback programmes 5. Develop vehicle modernisation incentive regime

Modified from Philippine Urban Mobility Programme

sharing). These scenarios could lead to a reduction of emissions from the sector by as much as 61% and 22%, respectively, by 2050.

The study also recommended the following:

- For road freight
  - Follow international best practices in adopting fuel economy standards
  - Identify use cases for early adoption of zero-emission (ZE) trucks and incentivise fleet conversions
  - Promote private investments in charging infrastructure for depot-based vehicles
- Sea freight
  - Promote differentiated port fees depending on environmental performance
  - Invest in Port capacity expansions
- Logistics and digitalization
  - Streamline and digitalize processes
  - Incentivize and enable asset sharing

3.1.4 Travel demand management

In the PUMP, travel demand management (TDM) aims to (1) **reduce and disincentivize private vehicle travel, and (2) shift demand to mass transit modes through incentives**. TDM policies enumerated in the PUMP include telecommuting, parking policies, vehicle taxation, and congestion charging. The PUMP identifies TDM as a "future PUMP activity area." Hence, the proponents have yet to determine the challenges and actions for this theme.

The Philippine government recently enacted several policies to promote telecommuting, both in government and private settings. The (Business Process Outsourcing) BPO sector is a particular case of success in telecommuting policy: firms in economic zones have been allowed to adopt up to

100% work-from-home arrangements and still enjoy tax incentives (PIA, 2023). The DOLE also released a revised IRR (Department Order 237, s. 2022) of the Philippine Telecommuting Act (RA 11165). One provision of the revised IRR states that "work performed in an alternative workplace shall be considered as work performed in the regular workplace." The "regular workplace" is the principal place provided by the employer, while the "alternative workplace" is any location is performed at a location away from the principal place.

Other than this, mayors in Metro Manila and the Metropolitan Manila Development Authority, approved the **5-year Comprehensive Traffic Management Plan for Metro Manila** in November 2022 (Ong, 2022). The plan, formulated together with the Japan International Cooperation Agency (JICA), includes strategies such as enhancing the Metro Manila Intelligent Transport System. The Metro Manila Intelligent Transport System includes a (1) congestion charging system that uses Automatic Number Plate Recognition cameras to identify and charge road users and the (2) traffic modelling of land use impacts to guide policies and regulations on transport (MMDA, 2021).

The Congressional Policy and Budget Research Department (2023) recommended the following policies and regulatory frameworks to address digital connectivity gaps in the Philippines:

1. Incorporating satellite internet in the Free Internet Access in Public Places Program
2. Strengthening LGU financial assistance programs
3. Encouraging public-private partnerships
4. Allowing the entry of more players through easing regulations
5. Ensuring consumer access

3.1.5 Transit-oriented development

The PUMP recognizes the development of transit-oriented development (TOD) policies as assurance that transport and land use are linked. Like TDM, the PUMP identifies TOD as a "future PUMP activity area" and have yet to identify the challenges and actions. However, a TOD action identified in the PUMP is the "implementation of TOD policy in railway projects."

Recent government efforts to promote transit-oriented development are typically aligned with major transport infrastructure development like the North-South Commuter Railway (JICA 2015) and some regional master plans like the Metro CDO Sustainable Urban Infrastructure Development Plan (CPRCMI 2020). Furthermore, the Bases Conversion and Development Authority (BCDA) also signed a technical cooperation agreement with the Japan International Cooperation Agency (JICA) to promote TODs, including the Mero Manila Subway Project (PNA, 2023).

The Philippine government, through the Department of Human Settlements and Urban Development, developed a Transit-Oriented Development Policy Framework. The goal of this framework is to "mainstream [TOD] in national and local land use planning and implemented in major urban areas in the Philippines" by 2028. The release of the TOD Policy Framework mandates local government units to mainstream TOD projects into their planning processes, particularly in land use planning. Furthermore, the DHSUD and the DOTr are working together to harmonize TOD-related initiatives (Pineda, 2023). The new framework is an opportunity for TOD to extend beyond major mass transit infrastructure projects and explore TOD opportunities within cities and municipalities.

04

Developments in electric mobility in the Philippines

The Philippine government has enacted and implemented several policy instruments to support the transition of the transport sector towards electric mobility. These instruments outline the country's ambitions and mechanisms to support EV adoption and transition.

- **Republic Act 11697 or the Electric Vehicle Industry Development Act (EVIDA)**, which aims to create an enabling environment for the country's EV industry. This law also set a target of 5% EV share, supports the envisioned reduction of reliance on the use of petrol for the transportation sector and the development of electric vehicles, as well as options for micromobility.

  - **Comprehensive Roadmap for Electric Vehicle Industry (CREVI)**, which is the national plan for the EV industry emphasized EV adoption targets for different market segments (e.g., corporate and government fleets, public transport operators, industrial, and commercial fleets). The roadmap focuses on the development of EV charging stations, manufacturing, research and development, and human resources development for the EV local EV industry.

  - **Electric Vehicle Incentive Strategy (EVIS)** aims to support and increase the country's EV manufacturing competitiveness by providing incentives to jumpstart the EV supply chain and explore the viability of subsidies to increase market demand.

The transition to electric mobility is also identified in the Philippine's National Transport Policy, wherein e-vehicles are considered an environmentally sustainable technology that can contribute to the reduction of transport emissions.

4.1 Institutional arrangements

Several national government agencies have a role in supporting the electric mobility aspirations of the country. The Department of Energy (DOE) is the primary agency responsible on the promotion and adoption of EVs and supporting infrastructure such as EV charging stations. Additionally, the Department of Transportation is responsible for demand generation, regulation, and registration of EVs including their integration to the public transportation system through its modernization program. The EVIDA, therefore, outlines potential opportunities for electric mobility to support the transport system. The table below outlines the mandates of other government agencies according to the EVIDA law.

Government agency stakeholders in electric vehicle industry development, their roles and responsibilities.

TABLE 5

Agency	Roles and Responsibilities
Department of Energy	• Primarily responsible in the promotion and adoption of EVs and development of charging stations • Craft and implement of regulations and strategies to develop the charging infrastructure including standards, its use, and operation • Maintain the database for all electric mobility related statistics and information (i.e., EV charging stations) in the country and is specifically mandated to introduce minimum energy efficiency standards for EVs supplied to the market • Develop and update the CREVI
Energy Regulatory Commission	• Exclusive jurisdiction over all matters pertaining to charging service rate setting • Develop rules and requirements for self-generating charging stations and centralized vehicle-to-grid facilities
Department of Transportation	• Jurisdiction over matters related to the EV demand generation, regulation, and registration component of the CREVI • Introduce mechanisms and implement the minimum energy standards and other EV standards crafted by DOE and DTI, respectively • Promulgate uniform and streamlined policies, rules, and requirements for the registration and franchising of EVs • Include EVs in the PUVMP • Conduct capacity-building activities for affected PUV operators and drivers • Establish and maintain an online monitoring platform for the condition of EVs
Department of Trade and Industry	• Jurisdiction over the manufacturing and EV and equipment supply component of the CREVI • Crafting and implementation of the EV incentive strategy • EV industry human resource development (in coordination with TESDA and CHED) • Development and introduction of quality and safety of the vehicles and related devices
Department of Public Works and Highways	• Mandated to introduce complementing regulations on the installation of chargers in buildings, establishments, and other locations.
Department of Environment and Natural Resources	• Develop and implement relevant plans and regulations for the proper disposal and management of used EV batteries.
Department of Science and Technology	• Mandated to lead the research and development component of CREVI in close coordination with DTI and other NGA's
Local Government Units	• Support the DOTr in its EV demand generation program and DOE in its efforts to develop the EV charging infrastructure • Identify green routes and reflect these in their respective Local Public Transport Route Plan (LPTRP)

4.2 Status of electric mobility in the Philippines

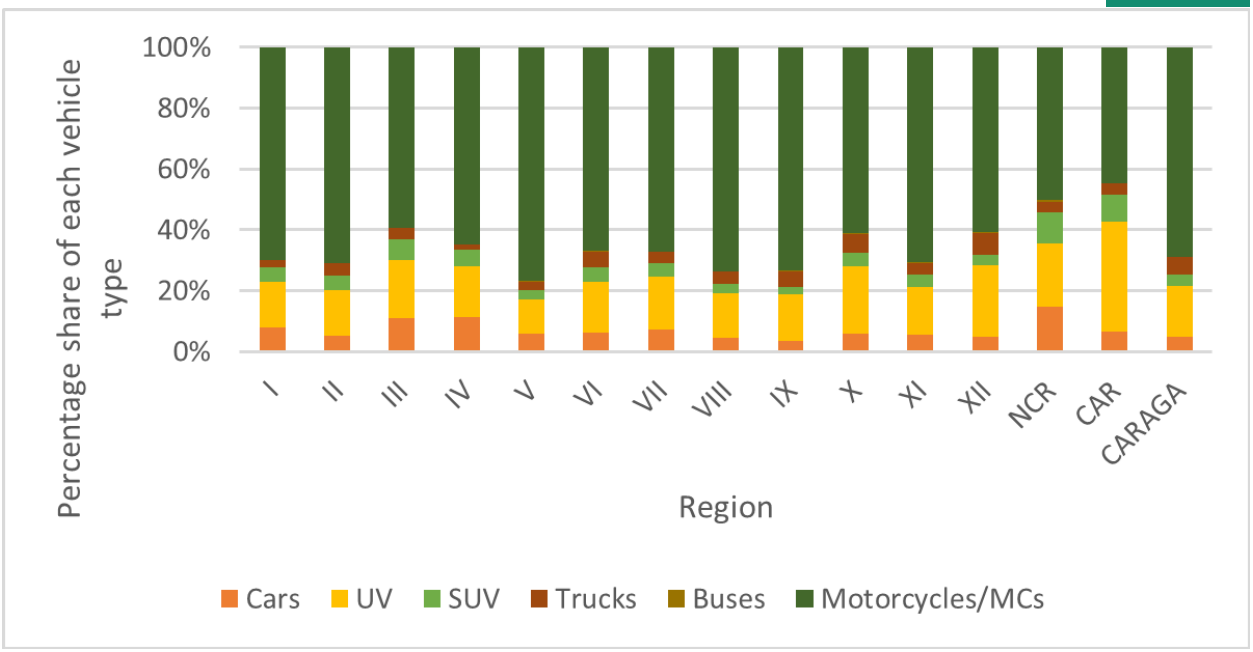
Electric vehicle shares in the country continue to grow as recent data indicated a ten-fold growth (from 2022) in EV sales, albeit hybrid EV-dominated. There is, however, a dominance of the two- and three-wheeler market segment for battery electric vehicles. The dominance of the two-wheeler and three-wheeler modes is consistent with trends of vehicle choice across the Philippines. That is, the figure below highlights the significant market share of motorcycles and tricycles.

Vehicle registrations in the country are still evolving to include other EV models. As such, the registration data may not accurately reflect the number of EVs in the country, particularly electric bicycles, which are becoming more common on Philippine roads. Surveys of distributors reveal a major discrepancy in registration statistics, wherein some have shared obtaining an annual sale of about 7,000 units within Metro Manila[5].

5. Clean Air Asia (2022). Electric two- and three-wheeler development in the Philippines.

Vehicle market share in the Philippines, by region, 2021 (LTO)

FIGURE 4



4.3 Charging infrastructure and standards

The DOE released a Department Circular regarding the accreditation of EV Charging Stations (EVCS). The circular specifies installation requirements for EVCS to harmonize and develop a common understanding on charging protocol. The Circular classifies EVCS into 6 classes (Section 16):
The DOE maps the locations of charging stations and releases it to the pubic through their website. Recent data shows that charging infrastructure continues to expand, particularly in urban areas, with 563 charging points (from 338 as of January 2023). The latest information shows that battery swapping stations are more common, followed by AC charging stations. Battery swapping stations are common for public transport and motorcycle applications, while AC charging stations are mostly installed in malls and private areas to lower the risk of indoor fires (EVCS Mode 4, section 17.4). Government institutions in Metro Manila have also installed charging stations in their respective offices, although these are limited to specific EVs.

Classes of Electric Vehicle Charging Stations (EVCS)

TABLE 6

EVCS Classification	Description
EVCS Mode 1	Connection of an EV to a standard socket-outlet of an AC supply network
EVCS Mode 2	Connection of an EV to a standard socket-outlet of an AC supply network wit ha control system for the protection against electric shock placed between the plug and the EV
EVCS Mode 3	Connection of an EV to an AC EVCS permanently connected to an AC supply network with a control system that extends from the AC EVCS to the EV
EVCS Mode 4	Connection of an EV to an AC or DC supply network utilizing DC EVCS with a control system that extends from the DC EVCS to the EV
Battery Swapping Stations	EVCS facility which allows EV users to exchange a near empty discharged battery with a fully charged battery which also includes any replacement made for a charged battery
Other EVCS Mode	Connection of an EV that are unclassified under the above modes. Includes modes for emerging technologies

Source: DOE DC 2023-05-0011

TABLE 7

Government institutions in Metro Manila with EVCS

Institutions with EV charging stations (Metro Manila)	Uses of charging stations
Pasig City Hall	Eight (8) stations for charging electric 3-wheelers of city-owned units and informal public transport
MMDA Office, Pasig City	For e-bikes and e-scooters only
Parts of the QC Solar Electric Vehicle Charging Network: Electrical and Electronics Engineering Building in UP Diliman, Department of Public Order and Safety Building in QC City Hall Compound, and the Environmental Building at Barangay Payatas	For light electric vehicles

Sources: MMDA, UP Diliman Information Office

Similar interventions from the government and the private sector aim to develop the country's EV charging network. The Department of Science and Technology has developed CharM (or Charging in Minutes), an EV charging system for commercial use that can fully charge EVs in 30 minutes. CharM is being deployed in SM Supermalls charging stations. In February 2023, DOST-IX also approved a grant worth P1.86M to support the deployment of CharM in Dapitan City, as part of the LGU's "Smart City" initiative (Garcia, 2023). Meanwhile, Solarius EV Charging plans to set up 180 destination chargers across Luzon by the end of 2023. Additionally, the ADB also provided a $20M loan to Wyntron Inc. to make EV charging equipment in the Philippines (ADB 2023). The loan supports the production capacity expansion of Wyntron in the Cavite Industrial Park.

These efforts support the adoption EV targets of 1.74 million and 6.30 million electric vehicles under the business-as-usual and clean energy scenarios, respectively.

4.4 Philippine e-mobility roadmap

The Comprehensive Roadmap for Electric Vehicle Industry (CREVI) is the Philippines' development plan for the EV industry. The CREVI sets annual adoption targets for various EV market segments (i.e., sedan, SUV, tricycle, motorcycle and bus) and EV types (i.e., hybrid electric vehicles, battery electric vehicles, plug-in hybrid vehicles). The roadmap has two scenarios – business-as-usual and clean energy, which mandates the re-fleeting of at least 50% of ICE vehicles.

EV adoption targets (Comprehensive Roadmap of the Electric Vehicle Industry)

TABLE 8

Business-as-usual scenario	Short term (2023-2028)	Medium term (2029-2034)	Long term (2035-2040)
Cars			
HEV	81,500	49,000	36,600
PHEV	13,600	24,600	36,600
BEV	13,600	123,000	219,400
Tricycles (BEV)	37,500	71,000	103,400
Motorcycles (BEV)	164,900	311,800	454,400
Bus (BEV)	600	1,200	1,800
EV Charging Stations	7,300	14,000	20,400
Clean Energy Scenario	**Short term (2023-2028)**	**Medium term (2029-2034)**	**Long term (2035-2040)**
Cars			
HEV	415,000	234,000	107,000
PHEV	69,000	80,000	107,000
BEV	69,000	327,000	641,000
Tricycles (BEV)	419,000	262,000	223,000
Motorcycles (BEV)	1,800,000	947,000	922,000
Bus (BEV)	2,200	1,500	1,600
EV Charging Stations	66,500	41,800	39,800

Ambitions for local manufacturing to support EV transition also continues to grow. The latest data from DOE show the following manufacturing statistics for 2023:

- 7 local electric tricycle producers and assemblers
- 256 local companies cater to domestic automotive market
- 330 vehicle parts and components production
- 8 local battery manufacturers

Despite this, the CREVI identifies battery storage and EV manufacturing as critical research and development areas. Furthermore, exploring the use of local and indigenous materials is expressed as a research and development thrust.

4.5 Financing and funding opportunities for e-mobility transition

Various opportunities exist to fund the e-mobility transition in the country, including government-initiated financing programs and support from international organisations. Locally, the EVIDA law's implementing rules and regulations (IRR) also has specific clauses to mandate the support for EV adoption.

The Land Bank of the Philippines and the Development Bank of the Philippines provide financing support PUVMP through the Special Environment-Friendly and Efficiently Driven (SPEED) Jeepney Program amounting to P10B worth of available loans. DBP's Program Assistance to Support Alternative Driving Approaches (PASADA) aims to give a total of P1.5B worth of assistance through its 5% equity, 6% interest, and 7-year repayment period mechanism.

Incentives specified in the EVIDA-IRR

TABLE 9

Section	Description
Section 27 (Manufacturing Incentives)	The Board of Investments (BOI), in coordination with the DOTr and DOE shall issue guidelines for the endorsement of fiscal incentives for the manufacture and assembly of EVs, EVCS, batteries, and parts and components, establishment and operations of EVCS and other related support infrastructure
Section 28 (EV Incentive Strategy or EVIS)	Supporting the manufacturing component of the CREVI, the strategy aims to narrow the cost gap between EVs and traditional motor vehicles and shift the local traditional motor vehicle industry to EVs, provide non-fiscal support to attract EV and EV parts manufacturing, electronic parts and other strategic components (e.g., batteries, EVCS, and testing facilities), set targets within eight years from the promulgation of the EVIS.
Section 29 (Incentives for importation)	Provides tax exemption for the importation of completely-built units (CBU), which may be suspended by the Department of Finance (DOF), upon recommendation of the DTI, in the case of imported electric jeepneys and tricycles. The DOE and DTI, in coordination with DOTR shall endorse fiscal incentives to advance their mandates under Sections 11 and 13 of the EVIDA.
Section 30 (Fiscal incentives for utilization)	Provides discounts of 30% and 15% for motor vehicle user's charge of battery electric vehicles and hybrid electric vehicles, respectively. The discounts are available for eight (8) years from the effectivity of EVIDA.
Section 31 (Non-fiscal incentives for EV users)	Provides non-fiscal incentives such as priority registration, exemption from the number coding scheme, expeditious processing for franchises to operate including its renewal for PUV operators, and availment of TESDA training programs.
Section 32 (Non-fiscal incentives for EV manufacturers and importers)	Provides expeditious processing on importation of parts and components for the manufacture and assembly of EVs by EV manufacturers and importers. The DOE and DOTr shall issue guidelines for the certification of those in the EV industry to advance their mandates under Sections 11 and 13 of the EVIDA.
Section 33 (Allowance for foreign national experts)	The Department of Labor and Employment and Professional Regulation Commissions shall provide guidance in allowing expert foreign nationals to be employed under a technology transfer agreement in the EV industry.
Section 34 (Financial assistance)	Provide concessional financial packages for entities engaged in the activities in the EV industry and preferential interest rates and payment scheme on consumer loans for acquiring EVs and EVCS.

The DOTr grants a Php 280,000 equity subsidy[6] for existing PUV operators with valid franchises. DOTr reports in June 2023 that LBP and DBP have approved loans for 7,128 PUV units worth P15.6B and released equity subsidy for 4,659 PUV units worth P729M. DOTr also reports that private financing institutions have released equity subsidy for 313 PUV units worth P133.3M. In March 2023, the DOTr returned P1.2B of PUVMP subsidy fund to the National Treasury (DOTr presentation, 2023).

6. Department of Transportation (2023). Department Order No. 2023-018 provides a graduated equity subsidy of P280,000 for Class 2/3/4 vehicles and P210,000 for Class 1 vehicles.

Similarly, several financing institutions also support the Philippines in implementing various electric mobility projects.

Sunio and Mendejar (2022) also listed how local financing institutions (i.e., banks) support cooperatives in modernizing their vehicle fleets. However, there is no indication yet if local banks will support private financing for EVs.

Potential sources of funding for e-mobility projects

TABLE 10

Potential sources of Funding for e-mobility Projects	
National Government	• PUV modernization program (e.g., Landbank SPEED PUV Program, DBP PASADA Financing Program)
Other stakeholders (Private financing)	• China Bank Savings Auto Loan for the electric-powered cars • Maybank Philippines offers financing for the Jetour Ice Cream EV (Roces, 2023)

Financing Institutions for Philippine Electric Mobility Projects

TABLE 11

Project	Funder	Instrument	Amount
Davao Public Transport Modernization Project	Asian Development Bank	Technical Assistance and Loan	1 billion dollars
Cebu Bus Rapid Transit Project	World Bank, French Development Agency, Clean Technology Fund, Philippine Government	Counterpart financing (PH)	116 million dollars, 50.89 million euros, 25 million dollars, 30 million dollars
Wyntron EV Charging Equipment	Asian Development Bank	-	20 million dollars

05

Integrating electric mobility in the thematic areas of the NUMP

The section outlines the different opportunities to integrate electric mobility in the thematic areas of the PUMP. The sections integrate studies and outcomes of projects, and demonstration activities to establish the potential opportunities to support the attainment of the NUMP.

5.1 Non-motorised transport

The document outlines opportunities for electric mobility to support the targets for non-motorized transport in the PUMP. The section focuses on efforts on electric bicycle use and other electric micromobility options as key to the attainment of the country's NMT goals and evaluates the policies covering the use of light electric vehicles.

5.1.1 Pilots of light electric vehicles in local governments

A notable case study is the pilot of electric quadricycles in Pasig City. The City of Pasig has been implementing various sustainable mobility initiatives. Their programs include activities to promote walking, cycling, and use of light electric vehicles such as personal mobility devices or electric kick scooters. The demo in Pasig focuses on electric quadricycles, which falls under Category L6 of the Administrative Order, allowing its operation on all roads except highways and except on bike lanes due to their higher speeds. However, Pasig City has identified certain gaps in furthering its urban mobility agenda.

5.1.2 Sharing platforms for e-bike and micromobility

The EV roadmap of the Philippines, known as CREVI, indicates strong support towards light electric vehicles, particularly on the supply-side. Below is an excerpt of the specific action plans identified in the roadmap to improve the competitiveness of the local EV industry of the country.

The private sector in the country has also been actively initiating the support for increased adoption of sharing systems for light electric vehicles. As an example, a partnership between Globe Groups' 917 Ventures and Ayala Corp has introduced Gogoro Smartscooters and battery-swapping. The station is located at the Globe Tower in Bonifacio Global City.

The Philippine Micromobility Market is forecasted to be worth $13.9M by 2030, with a cumulative annual growth rate of 158.6% from 2020, dominated by e-mopeds (Prescient & Strategic Intelligence, 2021). Major players include Grab Holdings Inc., Merida & Centurion Germany GmbH, StreetWheels Philippines, Segway Inc., Vmoto Limited, Kwang Yang Motor Co. Ltd., Niu Technologies, Ningbo Kaabo Technology Co. Ltd., Moovr PH, Ningbo MYWAY Intelligent Technology Co. Ltd., and Giant Manufacturing Co. Ltd. As of September 2023, the following e-bike or micromobility sharing platforms operate in the Philippines.

Name of Platform or Service Provider	Description
Moovr PH	• Metro-Manila-based bike and e-scooter sharing company • Service coverage: Bonifacio Global City and Makati CBD
Gogoro Smartscooters	• Gogoro Inc. in partnership with Globe Groups' 917 Ventures and Ayala Corp • Station is located at Globe Tower, Bonifacio Global City
Tipaklong Sustainable Mobility Corporation (Started in June 2020, incorporated in April 2021)	• Offers weekly and monthly bike and scooter rentals • Launched community partner program in December 2020 • Current fleet size of 230 bikes and 24 scooters

Sources: Tipaklong Facebook page, Manila Times, Moovr PH

5.1.3 Challenges and issues in NMT-related electric mobility

The EVIDA expresses the Philippine policy to "develop electric vehicle options for micromobility (Section 2b of EVIDA)." However, several issues surrounding the use and regulation of light electric vehicles for private purposes.

In 2021, the Land Transportation Office issued Administrative Order No. 2021-039, which stipulates the classification, registration, and operation of all types of electric vehicles. The administrative order allows personal mobility scooters along private roads (e.g., gated communities), pedestrian walkways, and bicycle lanes or on similar lanes designated by the local government, while electric kick scooters are allowed on bicycle lanes and other roads designated by the local government. Electric bicycles or those running at or below 25 kph (Category L1a) are permitted on bicycle lanes or other roads designated by the local government and can pass national roads for the purpose of crossing.

A common challenge city officials face is the regulation of 2-wheeler use especially for commuters that cross administrative boundaries, especially in metropolitan regions like Metro Manila. This means that electric kick scooters may be permitted in one city, wherein appropriate infrastructure is available, but may be prohibited in a city that lacks proper infrastructure for its use. Nevertheless, local government agencies agree that the current policy framework can serve as a catalyst for light electric vehicle usage.

5.1.4 Local manufacturing for electric 2- and 3-wheelers

Electric tricycles are the focus of the local manufacturing and assembly of electric vehicles in the Philippines. As of 2023, there are 7 local e-trike manufacturers and assemblers (DOE). The following are local manufacturers of electric 2- and 3-wheelers in the Philippines.

Name	Description
Partnership of Integrated Micro-Electronics Inc. (Philippine-based of subsidiary of Ayala Corporation) and Zero Motorcycles (California-based company)	High-powered e-bike manufacturing plant in Laguna that is expected to generate annual sales worth P3.5B and employ at least 200 workers (Camus, 2023)
Elaia Green Vehicles (Website)	•Manufactures e-trikes equipped with a 5kw Toyota motor and controller, LTO-certified with a maximum of 30 degrees climbing angle •Trikes are rolled-out in Antipolo •Also invested in building a network of charging stations •Partnered with City Savings Bank for motorcycle and e-trike loans
GerWeiss Motors	Local manufacturer of the electric bicycles used in Boracay (Source)

Sources: Inquirer.net, GerWeiss Motors, electrichybridvehicletechnology.com

5.2 Public transport

Public transport in the Philippines primarily consists of jeepneys, buses, trains, tricycles, taxis and TNVS, and motorcycle taxis. Among the DOTr programs that have GHG emissions reduction, 90% is expected to be from public transport such as Bus Rapid Transit projects, PUVMP, and Railway Projects with the remaining 10% from the Motor Vehicle Inspection System Program. However, it was only recent that the modernization programme included electric vehicles into the suite of modern vehicles.

PUV fleet electrification is still in the early stages, with unreliable power systems and lack of charging stations being contributory factors. A 2023 study found that Filipinos are constrained to buy EVs because of challenges to charge their EVs at home and the high costs associated with the installation of home chargers (Deloitte 2023). Of the respondents in the Deloitte study, 26% expect to rely on on-street public charging stations. Range anxiety remains a critical barrier to EV adoption (Ha and Manongdo 2021). These issues are apart from the current bottlenecks in the modernization program (i.e., formation of public transport route plans, industry consolidation, and fleet financing).

To enable mainstreaming of electrification into local public transport routing, it is recommended that the DOTr include the planning and identification of green routes[7] in their capacity-building programs for local public transport route planning.

7. Green routes refer to public transportation routes identified and designated in the Local Public Transport Route Plans (LPTRP) and Route Rationalization Plans (RRPs) and approved by the DOTr and the Land Transportation Franchising and Regulatory Board (LTFRB) to be exclusively traversed by electric public utility vehicles (PUVs).

Key lessons learned from General Santos experience

- Include building knowledge on cooperative structures and management in capacity building of LTFRB and DOTr
- RA 9520 (Philippine Cooperative Code) allows cooperatives to import without taxes, which the Public Transport Alliance of General Santos leveraged.
- Important topics for training transport cooperatives: fleet management, vehicle maintenance, financial management
- Information and education campaigns re: inevitability of modernization for jeepneys to compete with other transport modes, specifications and design options of vehicles

There are reports (Tojo Motors) that PUV cooperatives in the following local governments have set up their own charging stations: Butuan City, Taytay (Rizal), Kidapawan City. Furthermore, several projects are underway in using electric PUVs in major cities in the Philippines. The following sub-sections describe efforts in electrifying public transport in the Philippines.

5.2.1 Buses

Several efforts adopting electric buses for public transport. The Davao Public Transportation Modernization Project aims to modernize the public bus transport system in Davao City through vehicle and technology modernization. The system includes modern electric buses and Euro-5 standard diesel buses, designated bus lanes, and an intelligent transport system. Philippine news outlets reported on June 2023 that the Asian Development Bank has approved a $1B loan for the deployment of electric bus fleets under the Davao Public Transportation Modernization Project (DPTMP). The Project, projected to start by late 2024, is expected to serve more than 800,000 passengers daily and deploy nearly 400 electric buses[8]. The DOTr expressed their intent in replicating the DPTMP for other high-capacity transit services.

8 The projected GHG mitigation potential of the e-bus deployment is 140,000 tCO_2e/year

The Quezon City Government is exploring the use of electric buses in their Public Transport Augmentation Programs. Launched in December 2020, the program serves eight routes that existing PUJs do not serve. The services are currently free under the city's QCity Bus Ordinance[9], signed last June 2023.

5.2.2 Jeepneys

Several deployments on the viability of electric jeepneys demonstrate the potential of electric vehicles in the Philippines. The recent study of ICSC tracks several milestones of e-jeep deployments in the Philippines.

9 Ordinance No. SP-3184, S-2023, otherwise known as the QCity Bus Ordinance

E-jeep deployment milestones (ICSC, 2024)

TABLE 12

Deployment	Description
Bacolod (2006)	The e-Jeepney Ventures project in Bacolod City launched in December 2006, aiming for full commercial operations by December 2008 with a goal of 100 e-jeepneys in three years. The e-jeepneys were powered by batteries charged via a biogas-fueled power plant using organic waste. Income incentives were provided to partners, such as drivers and equipment suppliers, to adopt cleaner technologies. Expected environmental benefits included an annual reduction of 43,450 MT of CO2 emissions, decreased air pollutants, reduced groundwater contamination, and improved public health. The January 2007 business plan indicated an initial investment requirement of EUR 620,000 for six e-jeepneys, a charging depot, a power plant, and other operating expenses. One of the key challenges experienced in the Bacolod deployment of e-jeepneys is the absence of a valid franchise that will legalize its operation.
Makati (2007)	In Makati City, the pilot phase of an electric vehicle (EV) project was restarted due to challenges faced in the original Bacolod City area. The Makati pilot involved deploying locally manufactured EVs, establishing official routes, creating a formal franchise, setting up charging stations, and implementing a battery-swapping scheme. Although the biodigester component was initially part of the plan, it was eventually abandoned due to various issues. Makati also introduced a salary-based arrangement for e-jeepney drivers as part of the project.
Puerto Princesa (2008)	Expansion of efforts from Bacolod and Makati in Puerto Princesa.

Ateneo Re-charge (2013)	Project RE-charge, launched at Ateneo de Manila University (AdMU) in February 2013, aimed to promote sustainable and eco-friendly transportation within the campus. It introduced e-jeepneys and solar-powered charging stations as part of the university's commitment to address traffic issues and enhance mobility. Its objective was to establish a functional fleet of e-jeepneys powered by solar photovoltaic (PV) charging stations. By integrating electric public transport, renewable energy generation, and charging infrastructure, it provided clean transportation for students while serving as a model for other campuses and neighboring communities. Operating within the AdMU premises allowed the project to avoid regulatory challenges related to franchises. With administrative backing, the project started with two e-jeepneys primarily serving AdMU students. Convenient charging infrastructure and parking facilities were readily available on campus.
Tacloban (2014)	Super Typhoon Yolanda (Haiyan) severely impacted Tacloban City in November 2013, rendering 95% of the city's public transport fleet inoperative. In response, the RE-charge Leyte project was initiated, focusing on integrating renewable energy systems with public transportation. The project aimed to integrate key elements from the original CFCP/e-jeepney project, including a fleet of e-jeepneys and a solar PV system for charging stations. Launched in July 2014, the initial phase of the project included 7 e-jeepney units and a a battery-swapping facility powered by a 10-kW solar PV system.

The Low Carbon Transport project[10] turned over electric vehicles and charging hubs to the project beneficiaries from the city governments of Pasig, Baguio, Santa Rosa, and Iloilo, as well as three transport cooperatives in Baguio, Iloilo and General Santos City.

Aside from these deployments, there are also electric jeepneys that are already operating under various financing and operating schemes. The ICSC evaluated transport services using electric jeepneys and evaluated their economic performance against traditional ICE jeepneys. The table below outlines the comparisons of economic performance based on surveys from transport cooperatives. The assessments show an increased benefit of e-jeepney users resulting from lower operating costs.

10. The Low Carbon Transport project is a joint initiative of the Department of Transportation and the UNDP, funded by the Global Environment Facility

Economic assessment of transport cooperatives that operate electric public utility vehicles (ICSC, 2024)

TABLE 13

	Lagao Drivers Operators Transport Cooperative (LADOTRANSCO)	Metro Gensan Transport Cooperative (MGTC)
Income Patterns	• A 178% increase in income for e-jeepneys has been observed from 2020 to 2022 • E-jeepneys consistently achieve higher net income per unit compared to Euro IV units, despite having lower gross income.	• Income from transport of the cooperative had a significant increase in 2021 with 87.59% of MGTC's total income • In 2022, the transport income surged higher to 93.81% of the total income
Operational Expenses	• The operational costs of e-jeepneys are significantly lower given their lower average expenses per unit. • The operational expenses of e-jeepneys only accounts for 40% of their total expenses compared to 71% of Euro 1V jeepneys given the high costs and volatility of fuel compared to electricity	• E-jeepneys require low maintenance costs and minimal administration costs • The expenses for administrative activities within the cooperative are minimal when operating an e-jeepney

Service Contracting Program	• Participated in 2021 and 2022 • Experienced a significant increase (almost double) in net income per unit for e-jeepneys after joining the program	• A significant growth in gross income has been observed after participating in the service contracting program in 2021.
Revenue	• Despite the parallel increase in total expenses and gross income, the cooperative managed to maintain profitability each year. • The net income of the cooperative has been sufficient in financing the operational expenses and loan payments.	• The profitability margin of the cooperative increased due to the service contracting program. • In 2022, a minimal decrease in net income has been observed, but still maintained to rise above expenses. • Gross income is higher than expenses from 2020-2023, highlighting the cooperative's profitability.

The private sector also deployed electric public transport services in major metropolitan areas in the Philippines. For example, the COMET buses of GET Philippines operate services in Metro Manila, Cebu City, Lipa City, Iloilo City, Davao City and Cagayan de Oro City. The routes in Metro Manila connect townships and malls in the cities of Quezon, Paranaque, Makati, Taguig and Pasig (e.g., SM Fairview to SM Megamall, with stops in SM Novaliches, SM North Edsa, SM Araneta City Cubao, and The Podium, San Lorenzo Place Mall in Makati City to McKinley Hill in Taguig City, Merville in Paranaque City to Makati CBD, and Bridgetowne (located in Quezon City and Pasig City)).

5.2.3 Three-wheelers (Tricycles)

Affordable electric 3-wheelers are being used in communities as replacements for tricycles and pedicabs. However, in areas with challenging terrains like Romblon (personal conversation with Romblon local official), affordable electric 3-wheelers are unable to satisfy the needs of the riding public. Further, the disappointment of locals also transfers to new electric 3-wheelers. Regulation is also an issue, as e-trikes operate without proper franchises and are driven by unlicensed drivers, unlike tricycles which are granted franchises by local government units (Consultations for Abad et al., 2023, unpublished). On the other hand, city governments express interest in transitioning to electric tricycles (e.g., General Santos City, Manila City, Pasig City, Iloilo City) and integrating them into transportation planning through green routes for electric tricycles[11]. Universities are also working with local government units in pilot projects for electric tricycles and even converted electric tricycles (e.g., Cagayan State University[12]).

There are cities in the Philippines with ordinances related to the operation of e-trikes. A 2015 article reports that the City Government of Bacoor granted free franchises to e-tricycle operators. LTFRB MC 2019-44 also allowed e-trikes in tourist transport services within tourism areas, with the DOT or TIEZA as endorsers of franchise applications. However, a key consideration for tricycle operations is their restriction to operate on national highways.

5.2.4 Transport Network Vehicle Services

The electrification of transport network vehicle services is also an opportunity that can be incentivized. Grab Philippines, for example, besides being a platform for booking car rides in major cities, also provides a platform for booking tricycles in the provinces of Albay, Pangasinan, Bataan, Negros Oriental and Pampanga. Engaging Grab Philippines to incentivize

11. The City Council of Quezon City passed Resolution 9203, series of 2023, urging the Quezon City Green Transport Office to identify and designate green routes for electric tricycles.

12. Cagayan State University worked with the City Government of Tugeugarao in the pilot of e-trikes for personnel of the government regional center (Cagayan State University, 2021). Cagayan State University also brought these locally-produced e-trikes and their c-trikes (converted electric tricycles) to Iloilo City in 2023 (Cagayan State University, 2023).

their contractors to shift to electric vehicles can be a strategy to prove the feasibility of an electrified public transport system. NAKTO Phlippines reports that Grab delivery personnel are already shifting to e-bicycles. Foodpanda also reported in 2022 that across Asia, 1 in 5 of their riders use zero-emission modes of delivery.

5.2.5 Local manufacturers of electric jeepneys

The following are examples of local manufacturers of e-jeepneys.

- Global Electric Transportation' COMET electric minibuses are being tested in LGUs like Baguio City and Cebu City
- Tojo Motors and EVAP developed a 23-seater electric jeepney prototype
- Francisco Motors also plans to manufacture e-jeepneys with built-in ramps.
- Envirotech Vehicles is locating a manufacturing plant in Clark

5.2.6 Local government subsidy for electric transport

- Gen San Special Support Fund Ordinance
  - The City Government of General Santos supports PUV modernization by providing financial assistance to PUV cooperatives. Through the Special Support Fund Ordinance, transport service cooperatives and corporations are eligible for P100,000 grant for every modern or low-emission PUV (personal communication). Monitoring meetings of the City on PUV operators also provided a platform for consistent communication (Gaspay and Salison, 2024)

- Manila City e-trike livelihood program
  - The City of Manila's e-trike livelihood program has benefited 280 drivers as of 2023. The e-trike system includes four charging stations for free public use. The city also trained 20 people on the maintenance and repair of e-trike units with the e-trike manufacturer (Abad et al., 2023).

5.2.7 Challenges and issues in the electrification of Philippine public transport

Several challenges hinder the transition to electric PUVs in the Philippines. Like the transition to modern PUVs, a key barrier to public transport electrification is the high initial investment costs to support vehicle acquisition and charging infrastructure set-up. Electric public transport vehicles may be competitive in terms of operational costs (i.e., lower electricity costs versus diesel fuel prices). However, these would also require additional human resource development to upskill staff that will support the fleet management, repair, and maintenance. The successful EV deployment in General Santos requested support due to additional employment generation from their EV operations. The cooperative also requested trainings on financial management to enhance their capacity to manage their cooperative's finances. Lastly, issues related to battery waste need to be addressed to tackle issues relating to environmental waste.

Another barrier to the modernization of PUV fleets is the slow formulation and approval of Local Public Transport Route Plans (LPTRP). LPTRPs are required for the application of Certificates of Public Convenience (CPCs). With this issue, the LTFRB issued MC 2023-18, which provides for an Alternative Certification for cooperatives and corporations in LGUs without approved LPTRPs to help with their applications in government financial institutions.

5.3 Urban freight

The findings from the study underscore the efforts of the private sector towards sustainable freight interventions. Small and medium enterprises (SMEs) in the Philippines have been found to adopt green logistics already (Hernandez et al. 2022). Philippine SMEs prefer access to freight options that offer routes with cheaper costs. Cost savings from outbound logistics are used to subsidize electric vehicle purchase programs for individuals engaged in delivery services. Several logistics companies in the Philippines

commenced their vehicle electrification programs. These are shown in the table below.

TABLE 14
Private-led efforts on freight transport electrification

Company	Key initiatives
DHL	• Started in Jan 2022 • Expanded in 2023 • 13 vans and 5 motorcycles • DHL Group's global target of 60% electrification of vehicles by 2030
Mober	• As of 2023, has added 16 electric vans and 4 electric trucks to its traditional fleet (CarGuide), plans to deploy 100 EVs by end of 2023. • In 2021, IKEA has partnered with Mober for last mile electric vehicle delivery.
Gogoro Inc.	• Initially intended for last-mile delivery
Agila Logistics and Delivery Express	• Introduced electric vehicle cargo tricycles to its fleet • 3 electric vehicle tricycles, with goal of 50% fleet electrification by end of 2024

5.3.1 Challenges and issues in the electrification of Philippine urban freight

National agencies have a difficulty obtaining data from urban freight operators because of concerns about market-sensitive information. The Department of Energy (DOE) has a mechanism to monitor fuel consumption through Republic Act 11285, known as the Energy Efficiency and Conservation Act. However, Section 19 requires an annual energy consumption of at least 500,000 kWh. Thus, the Act does not include fleets that do not meet the minimum threshold.

To address these limitations, the Climate Change Commission (CCC) considers two separate mechanisms (online consultation, 2023). The first is to expand the existing Executive Order 174, s. 2014 to include the Securities and Exchange Commission (SEC). The SEC would then require all publicly listed companies to report their GHG inventories. The second mechanism will be through the proposed Senate Bill on Low Carbon Economy (SB 1992, 19th Congress of the Republic of the Philippines), which will implement a carbon cap-and-trade system that incorporates accurate monitoring of CO_2 or CO_2e emissions.

5.4 Travel demand management

In 2018, the Metro Manila Council established high-occupancy vehicle (HOV) lanes along EDSA. These HOV lanes imposed a "driver-only" ban along EDSA during weekday rush hours of 7-10AM and 6-9PM. The scheme was suspended following a Senate Resolution urging its recall for lack of public consultation, difficulty in implementation, and empirical evidence to support the traffic benefits of the measure[13]. To avoid similar opposition, future congestion charging strategies must ensure public consultation and strong evidence. Since congestion charging has the potential to increase VKT, it may offset CO2-emission reductions (UNESCAP 2022).

Electric mobility can indirectly influence travel demand management. For example, electric personal mobility devices provide efficient options for short-distance travel needs of remote workers and learners.

13. The measure would affect 70% of motor vehicles that use EDSA.

TABLE 15

Potential TDM strategies and intersections with e-mobility

TDM strategy options	How electric mobility can reinforce TDM strategy
Congestion charging	Incentives for e-vehicles and hybrids are positive reinforcements for using vehicles with lower emissions. In the Philippines, e-vehicles and hybrids are exempted from the vehicular volume reduction program ("number coding").
Remote work and learning	Electric personal mobility devices provide efficient options for short-distance travel needs of remote workers and learners.
Low emissions zones	The implementation of low emissions zones can promote the shift towards low emission vehicles or electric vehicles by charging vehicles that do not meet minimum emissions standards. In the case of Shenzhen, China, "green logistics zones" supported the adoption of electric commercial vehicles and other zero-emissions freight vehicles.

5.5 Transit-oriented development

In the context of electric mobility, transit-oriented development can take the form of planning communities around green routes and EV charging station networks, besides the conventional mass transport projects of trains and buses.

The pursuit of transit-oriented development in the Philippines can be reinforced by electric mobility through the strategic location of charging infrastructure and mobility hubs.

Proximity-based planning (e.g., "15-minute city") is also a strategy. The DHSUD TOD policy framework also identifies land value capture as a strategy for financing socialized housing and urban development projects in TOD areas. Land value capture can be used to support financing transport programs like the PUV modernization program (i.e., refleeting of transport modes to electric vehicles). Furthermore, micromobility can also complement TOD efforts by increasing mobility for short-distance travels.

06

Unlocking opportunities for sustainable electric mobility adoption

The CREVI summarizes barriers to EV market adoption and their significance across different vehicle segments (i.e., motorcycle, tricycle, cars, vans, jeepney, buses). These barriers, when addressed, can make significant headway in EV adoption in multiple vehicle segments. Currently, a key barrier for the adoption of EV is the high total investment and an underdeveloped charging network. These financing and infrastructure concerns slow down wide-scale market adoption, particularly for public transportation use[14].

14 Transport service entities need to finance the high upfront costs of the vehicles and charging station set-up in their respective terminals.

Public confidence in EV technology also needs to be strengthened by showcasing its capabilities and benefits over conventional ICE vehicles. The issue can be addressed not only by awareness-raising efforts, but also developing a reliable after-sales service for EVs. Growing confidence on EV technologies may also reduce the risks that are associated in accessing financing support, especially from private financing (i.e., private banks).

Identified barriers to EV adoption (CREVI, 2023)

TABLE 16

Barrier group	Contributing barrier
Market development	- Higher total investment - Negative technology reputation - Technology scepticism - Doubts in technical support availability
Technical support	- High costs of spare parts because of low demand - Limited financial capacity of local EV suppliers to stock large volumes of spare parts
Financing	- Market has high financial risk - Lack of familiarity with global financing services and practices for EVs
Charging and battery swapping services	- Lack of third-party service providers - Varying technical requirements for batteries and charging
Battery disposal	- Knowledge in battery recycling technology - Limited volume of disposal capability to support commercial investments - Standards and regulations for EV battery reuse

Derived from CREVI 2023 (DOE 2023)

The concept document also identified several barriers to corresponding NUMP themes underscored in several studies. The table below focuses on the themes that are within the short- to medium-term implementation of the NUMP (non-motorized transport, public transport, and urban freight). The key barriers outlined in the table include the need for financing support, policy and program development, infrastructure, and capacity-development.

Barriers to integrating electric mobility to NUMP themes

TABLE 17

NUMP Theme	Barriers
Non-motorized transport	Low funding priority of non-motorized transport, evidenced by decreased funding in 2022 and 2023 vs 2021 (Tanganco et al., 2023) Clear policy and guidance on the use of LEVs
Public Transport	Guno et al., (2021) - Higher investment and operational costs of e-jeepneys vs traditional jeepneys - Availability of charging stations Consumer awareness on the electric transport modes Capacity-development activities for transport planning using electric passenger transport modes
Urban Freight	Focus of government on rail freight and logistics infrastructure Development of national policies or strategies focusing on freight transport

Defining and expanding transport infrastructure that will allow LEV[15] use will be critical in its uptake and adoption. Several recent policy changes from varying agencies have led to confusion among transport stakeholders. A clear and united policy direction from all levels of government will support the uptake of EV and the micromobility needs especially to those traversing short distances. The table below outlines key policies about LEV operation and its regulation. A key message of these policies is the requirement of registering LEVs when used along public highways. In Metro Manila, several LEVs are not allowed to traverse national roads and thoroughfares but provides exceptions if these LEVs traverse established bike lanes. In the end, local governments can plan segregated lanes for electric vehicles or designate types of roads where LEVs and other electric 2- or 3-wheelers can traverse within their jurisdictions. However, planners should also look after the safety considerations for mixing LEV and bicycle traffic as the speed differences may increase incidences of traffic accidents.

15. RA 11697 (EVIDA law) defines light electric vehicles as EVs (e.g., electric scooters, electric bicycles, electric personal transport, and other similar vehicles) weighing less than fifty kilograms (50 kg)

Providing **clarity about the use of LEVs will also unlock opportunities for electrification of the food or parcel delivery services** (e.g., Lalamove, Grab, Foodpanda) can use these vehicles especially in urban residential areas. A previous demonstration activity deployed electric bicycles for parcel deliveries in partnership with PHLPost (Philippine Postal Corporation). These electric bicycles were favorable especially in navigating narrow streets and roads in residential areas. The city government used these vehicles during the pandemic quarantine restrictions for delivering relief goods to households.

E-bikes donated to PHLPost Pasig for delivery services (Source: Clean Air Asia)

FIGURE 5

Light electric vehicles are known to lower barriers of NMT use and can motivate people to cycle across wider social groups[16]. Furthermore, **demonstration activities** [17] have been found to shift behavior towards e-bike use. That is, after a 2- to 4-week demonstration, the inclination toward purchasing an e-bike increased, while those using a conventional bike retained using their bikes.

16. Rérat, P. (2021). The rise of the e-bike: Towards an extension of the practice of cycling? **Mobilities**, 16(3), 423-439. https://doi.org/10.1080/17450101.2021.1897236

17. Fyhri, A., Heinen, E., Fearnley, N., & Sundfør, H. B. (2017). A push to cycling—exploring the e-bike's role in overcoming barriers to bicycle use with a survey and an intervention study. *Electricity Journal, 30*(3), 45-52. https://doi.org/10.1080/15568318.2017.1302526

Policies on LEV use and registration

TABLE 18

Policy	Relevant details about LEV use
DOTr Department Order 2020-14 (2020)	• Allows the use of LMVs[18] and PMDs weighing **not more than 100 kg** to use bicycle lanes. • Recommends maximum speed on these lanes as 25 km/hr
Republic Act 11697 or EVIDA Law (2022)	• Shall be for exclusive private use shall not be required to register with the DOTr and its attached agencies • Provide segregated lanes for light electric vehicles in all major local and national roads, in coordination with the DPWH: Provided, That such lanes may be integrated with bicycle lanes

LTO Administrative Order 2021-039 (May 2021)	• For safety and public policy, certain electric vehicles may not be allowed to operate along particular roads. Sections 3 and 4, states:
	  ○ Allowed personal mobility scooter, electric kick scooter, category L1a, L1b, L2a, and L2b to operate along private and barangay roads
	  ○ Category L1 and L2 may cross national roads
	  ○ Personal mobility scooter, electric kick scooter, L1a, and L2a, may use bicycle lanes

LTO Administrative Order VDM-2024-044 (February 2024)	• Deletes Sections 3 and 4 of LTO AO 2021-039 and amended to require the registration of all electric vehicles used and operated in public highways[19]. EVs used in private roads shall not be required to register with LTO.
MMDA Resolution 24-002 (February 2024)	• Prohibits e-bikes, e-trikes, and other electric vehicles defined in Sections 2.5 to 2.8, and 2.10 of LTO AO 2021-039 (i.e., electric mobility scooter, Category L1, L2, L4, and L5) from plying, traversing, or navigating in national roads and thoroughfares. • The enforcement will remain in place until the local government units have established a special lane for unrestricted e-trikes in the identified thoroughfares. • The vehicles identified in the resolution may cross the portion of national roads and thoroughfares
MMDA Memorandum Circular 4 (March 2024)	• Provides exception to light electric vehicles traversing established bike lanes on identified roads pursuant to RA 11697
DILG Memorandum Circular 2024-047 (April 2024)	• Reiterates section 11 of EVIDA law on the roles of LGUs, including, provide segregated lanes for light electric vehicles in all major local and national roads, in coordination with the DPWH

18. DILG MC 2020-100 defines light mobility vehicles (LMV) as electronic or non-motorized vehicles weighing not more than 100 kgs.
19. Public highways shall mean every public thoroughfare, public boulevard, driveway, avenue, park, and alley, but shall not include roadway upon grounds owned by private persons, colleges, universities, or other similar institutions defined under RA 4136

LTO Memorandum Circular VDM 2024-2637 (April 2024)	• Provides guidelines on the registration of all types of light electric vehicles
	• Lists the coverage and restriction of operation of LEVs:
	  ○ LEVs do not need to be registered with the LTO if exclusively used for private roads or those to be operated on roads not constructed or maintained by the government
	  ○ LEVs on public highways must be registered and operated by drivers bearing a valid driver's license
	• MMDA or LGUs may designate types of roads where LEVs and other 2 or 3 electric wheelers can traverse in their area of jurisdiction

However, acquisition costs may also remain a significant barrier for light electric vehicle use. Entities may support **deploying bike sharing systems using e-bikes or e-scooters**. An example is the e-mopeds and e-bikes deployed through the SOLUTIONSPlus project in Hanoi, Vietnam. The demonstration aims to connect the 2-kilometer distance between the Van Khe BRT station and AEON Mall (Ha Dong) that is currently operated by diesel-run vans. The bike sharing program uses an app, V-share for booking the 2-wheelers. Electric vehicles can also support bike-sharing operations like the e-quad deployed to support Tipaklong's bike sharing system in a university in Los Baños. At the same time, government can continue providing fiscal mechanisms that will support the lowering of EV acquisition costs. Examples of this fiscal policies include the modification of Executive Order No. 12 which reduces the duties of e-motorcycles and e-bicycles from the Most Favored Nation (MFN) to zero until 2028. Other opportunities will be the development of incentive strategies that will further support the local manufacturing of electric vehicles, including, two-wheelers.

High capital costs are a common barrier hindering the electrification of public transport modes. In this case, transport service entities (TSE) would have to explore alternative financing sources. Government should explore financing instruments that would **lower the investment costs for electric public transport**. Additional support may be required in setting up charging infrastructure in depots, which also contributes to the initial investment costs. Despite electric public transport being more attractive in the long-term as modelled by its total cost of ownership, TSEs do not have access to significant capital to fund for their e-mobility transition. Other **government fiscal incentives (e.g., EVIS, EO12, CREATE) or loan instruments that favor cleaner transport modes will also be an opportunity to support EV use for public transport**. Additionally,

E-quad initially deployed for the SOLUTIONSPlus project in Pasig City with a trailer for bikes used in Tipaklong's bike sharing system in UPLB

FIGURE 6

TSEs can provide support in service contract programs, which enabled some operators to reinvest their resources to transit operations because of the additional income derived from service contracting[20].

Integrating e-mobility policies to the transport modernization program will support attaining the targets of the public transport thematic areas. Electric vehicles, having no tailpipe emissions, are more favorable than their ICE counterparts in terms of environmental benefits. However, the government has yet to release relevant policies that will include EVs into the transport modernization programme. The EVIDA identifies that the Department of Transportation shall outline the enabling policies for *green routes*. After releasing the policy (i.e., department order), the government will undertake capacity enhancement activities for the proper transport planning using electric vehicles. Increasing the capacity of local government planners will be critical because they will be key in determining which transport route or services will be considered as *green routes*.

Electrification of tricycle services will address emissions from three-wheeler modes in the Philippines. Tricycle services is a critical transport mode, which accounts for more than a tenth of total vehicle registrations in the Philippines but responsible to more than a fifth of the total greenhouse gas (GHG) emissions[21]. Without interventions, the emissions from this mode will grow to about 30% by 2050. The NUMP, as well as the country's NDC commitments, did not include three wheelers to their GHG mitigation plans. Including the adoption of electric three-wheelers used for public transport has a potential to significantly contribute to the mitigation targets in the NUMP. One of the major demonstrations of electric three-wheelers in the country was the ADB e-trike project estimated a target mitigation around 1.37 $MtCO_2e$. Since then, several cities have deployed e-trikes for public transport use. However, cities still require technical and financial support that will sustain and scale-up their e-trike ambitions[22].

The development of an extensive charging network is vital to support electric vehicle use. Currently, charging infrastructure development in the country is led by private entities. As a result, many of these charging stations are available at private parking lots (i.e., mall parking areas). The sporadic locations of charging networks can limit the range of EVs. This may also be the case for electric public transport services, which may need to return to their depots to access a charging station. Governments must improve access and address potential shortages in charging points. An opportunity lies in **integrating planning for charging infrastructure to support local land use development.** Charging infrastructure may by strategically located in areas or opportunities that are accessible within walking distance. The approach would require an extensive review of local land use and transport plans but will benefit both public and private transport modes requiring access to charging points.

Developing policies that favor the use of zero emissions transport will be an enabler for EV adoption and improve energy efficiency of the transport sector. One opportunity is the implementation of DOE's vehicle fuel economy labelling program (VFELP), which supports consumer decision-making towards purchasing energy efficient vehicle. However, work needs to be done to **link energy-efficient programs with fiscal policies to support the transition towards cleaner vehicles.** Efforts like the *feebate* scheme in New Zealand led to the adoption of cleaner vehicles by imposing taxes and rebates depending on the vehicle's energy performance rating. Similar schemes may also lower the cost barriers of EVs and encourage its widespread adoption among vehicle segments.

Other programs like *low emissions zones*

20. Institute for Climate and Sustainable Cities. (2024). *Enabling policy and governance environment for e-vehicle adoption and integration in public transport*. Retrieved from https://icsc.ngo/portfolio-items/enabling-policy-and-governance-environment-for-e-vehicle-adoption-and-integration-in-public-transport/

21. In Carbon dioxide equivalent

22. Clean Air Asia. (2024). Advancing electric vehicle adoption in the Philippines through policy integration. Retrieved from https://cleanairasia.org/sites/default/files/2024-03/Advancing%20Electric%20Vehicle%20Adoption%20in%20the%20Philippines%20through%20Policy%20Integration.pdf

(LEZ) serve as an opportunity to shift towards EV by restricting entry of more polluting vehicles. LEZs can support the modal shift from private vehicles to more sustainable transport modes and the shift to alternative fuel vehicles (i.e., plug-in hybrid electric vehicles)[23]. Similar LEZ efforts target the transition to the use of zero-emitting vehicles for freight and deliver services (see Shenzhen, China zero-emission freight zones and Santa Monica, California zero emission delivery zone pilot[24]). However, **complementary measures, like installing charging stations, are necessary to encourage the transition to zero emission vehicles** (EVs).

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Rérat, P. (2021). The rise of the e-bike: Towards an extension of the practice of cycling? **Mobilities**, 16(3), 423-439. https://doi.org/10.1080/17450101.2021.1897236

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