



## E-BIKE USERS IN LAOAG CITY, ILOCOS NORTE

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**Abstract—** This study explored the awareness of electric bike (e-bike) users regarding traffic rules and regulations in Laoag City, Philippines. As e-bikes gained popularity for their environmental benefits, concerns about road safety and compliance with traffic laws emerged. This study identified factors influencing e-bike use, their level of awareness regarding the traffic rules and regulations and assessed the challenges that traffic enforcers faced in enforcing the rules. This study employed a mixed research methodology and an explanatory design. Data was collected from 107 e-bike users and 34 traffic enforcers through survey questionnaires and follow-up interviews. The study was conducted in Brgy. 1 San Lorenzo, Brgy. 2 Santa Joaquina, Brgy. 6 San Agustin, Brgy. 8 San Vicente, Brgy. 10 San Jose, Brgy. 18 San Quirino, Brgy. 21 San Pedro, Brgy. 23 San Matias, Brgy. 25 Santa Cayatana, and Brgy. 29 Santo Tomas, Laoag City, Ilocos Norte.

Findings revealed that a key motivator for drivers choosing e-bikes was their desire to contribute to environmental protection, with 72.89% of respondents citing this factor. The researchers concluded that the level of awareness of e-bike users regarding traffic rules and regulations was inadequate, particularly regarding the requirement that only those holding a motorcycle license were permitted to operate an e-bike, which garnered 3.04% awareness. Regarding the challenges faced by traffic enforcers in enforcing traffic rules and regulations for e-bike users, the study showed that many e-bike users were unfamiliar with basic road rules. It was revealed that traffic enforcers frequently encountered e-bike users who did not know how to cross intersections safely.

Based on the data gathered, the researchers recommended the following: First, e-bike users should familiarize themselves with existing traffic rules and regulations, particularly those pertaining to e-bikes. Next, the Land Transportation Office may consider mandating

that e-bike users complete a safety seminar before obtaining an e-bike. Finally, the Traffic Division and Data

Center College of the Philippines- College of Criminal Justice Education may consider posting the informative video presentation created by the researchers through their social media platforms.

*Keywords: E-Bike, Traffic Rules and Regulations, Traffic Enforcer, E-Bike User, Traffic Wise*

### I. Introduction

In today's fast-paced and environmentally conscious world, the use of electric bikes has gained significant popularity as a sustainable mode of transportation. However, alongside the rising popularity of electronic bikes comes the pressing need to address concerns related to traffic safety and regulatory compliance among e-bike users.

Globally, the adoption of e-bikes has soared, driven by factors such as increasing urbanization, environmental consciousness, and advancements in battery technology. As cities worldwide grapple with traffic congestion and air pollution, e-bikes offer a promising solution for promoting sustainable mobility (Zhou et al., 2023). However, the integration of e-bikes into existing transportation systems brings about challenges related to road safety, particularly concerning e-bike users understanding and adherence to traffic regulations.

At the national level, many countries are witnessing a surge in e-bike sales and usage, prompting governments to enact legislation and regulations governing their operation. While regulations vary across jurisdictions, common concerns include the classification of e-bikes, licensing requirements, speed limits, and rules pertaining to bike lanes and shared pathways (Wahl, 2023). Despite these efforts, there remains a lack of comprehensive data on e-bike riders' awareness of traffic rules and their compliance behavior.

Locally, within specific urban environments, the dynamics of e-bike usage and traffic interactions may vary significantly. Factors such as infrastructure design, traffic density, cultural norms, and enforcement practices influence riders' behavior and perception of traffic regulations (Zhu,

2021). Understanding the local context is crucial for devising targeted interventions to improve e-bike users' awareness and promote safer road behavior.

The main goal of this study is to evaluate how well e-bike users understand traffic rules and regulations. The research will identify the gaps and factors affecting e-bike users' behavior to help improve and develop strategies to enhance the traffic safety for e-bike users. Additionally, the study will explore the demographics of the respondents, their awareness of traffic laws, reasons for choosing e-bikes, and the challenges traffic enforcers face in regulating e-bike usage.

#### **A. Background of the Study**

Electric bikes (e-bikes) have been increasingly popular in recent years as a handy and ecologically responsible means of transportation. E-bikes combine the benefits of traditional bicycles and motorized vehicles, giving consumers greater mobility while minimizing the environmental effect of travel. However, with the rapid rise in e-bike usage, questions have been raised about users' understanding of traffic rules and regulations. Gou et al., (2017) stated that, as e-bike usage and fatal accidents have increased in recent years, researchers have become more aware of the safety risks. Previous research found that e-bike crashes were more serious than bicycle or motor-related crashes.

According to Chander (2019), he gathered data from the National Electronic Injury Surveillance System (NEISS) of the US Consumer Product Safety Commission was used to collect data on injuries involving all three types of vehicles from 2000 to 2017. E-bike injuries were also more than three times as likely to involve a collision with a pedestrian than either scooter or conventional bike injuries and 130,797 accidents involving powered scooters were among the more than 245 million injuries reported during the study period, or 5.3 per 10,000 injuries treated in U.S. emergency rooms and 3,075 injuries from e-bikes were reported. And the highest percentage of e-bike accident victims were those between the ages of 18 and 44 and 45 to 64.

In Metro Manila of the year 2023, there were 907 e-bikes, e-trike, and e-scooter related accidents compared to 309 accidents in 2019. Numerous videos circulating on the internet depict collisions involving e-bikes and e-trikes, some even featuring minors driving with their peers. On April 15, 2024, the Metro Manila Development Authority (MMDA) implemented a ban on e-bikes, e-trikes, and similar vehicles on approximately 20 major roads in Metro Manila. Lu (2024), a review of MMDA's data by the Move as One Coalition (MAOC) found that only 2.05% of road crashes were from bike, e-bike, and pedicab accidents. Meanwhile, Statistics data in 2023 showed that 1.66% of road accidents were caused by light electric vehicles (Guison, 2024).

Additionally, according to Carrasco (2023), a prominent newscast issued a news article stating that electric bike (e-bike) crashes in Metro Manila totaled 556, with Quezon City having the highest number of such incidents, about 100. As a result, Laqui (2024), the Land Transportation Office (LTO) recommended mandatory e-bike registration,

stating that only registered e-bikes should be permitted to use public roads.

As for the E-bike market in Laoag City it has witnessed a significant upsurge in popularity, with multiple retailers contributing to the escalating demand. Some E-bike retailers in Laoag City estimated that they sold over 146 E-bikes in the year 2024. These figures indicate a consistent demand for E-bikes in Laoag City, driven by their convenience, affordability, and eco-friendly nature.

As a criminology student and a future law enforcer, understanding the importance of traffic rules awareness is crucial, as it directly ties into the broader concepts of public safety, law enforcement, and social order. Traffic regulations are designed not only to prevent accidents but also to reduce the likelihood of criminal behavior on the roads, such as reckless driving, and hit-and-run incidents. A lack of awareness or disregard for these rules often leads to dangerous situations, resulting in injuries or fatalities. By promoting traffic law education, we can contribute to creating safer communities, as well as a more efficient criminal justice system that can better address the consequences of traffic violations and their link to broader societal issues like negligence and criminal intent.

Despite the growing popularity of electric bikes as an eco-friendly mode of transportation, there is a notable research gap in understanding the level of traffic rules and regulations awareness among electric bike users. Existing studies have predominantly focused on the safety, efficiency, and environmental benefits of electric bikes, while little attention has been given to the users' knowledge and adherence to traffic laws. This gap is critical because a lack of awareness can lead to increased accidents and conflicts on the road, undermining the potential benefits of electric bikes. Addressing this gap by evaluating the traffic rule awareness among electric bike users can inform better regulatory policies and educational programs, ultimately enhancing road safety and promoting responsible riding practices.

#### **B. Statement of the Problem**

The main purpose of this research was to determine the awareness among E-bike users regarding traffic rules and regulations. This research attempted to shed light to numerous queries with regard to the problem, especially, it aimed to answer the following questions:

1. What are the factors that affect the decision of drivers to use E-Bike?
2. What is the level of awareness of E-bike users on traffic rules and regulation?
3. What are the challenges faced by traffic enforcers in enforcing traffic rules and regulation to E-bike Users?

#### **C. Theoretical Framework**

It serves as a road map that guides the research process by providing a foundation for understanding the relationships between variables and concept.

##### *Human Factors Theory*

In accident causation suggests that accidents happen due to human error or behavior, and that typically these can be attributed to factors such as skill deficiencies, violations of rules or procedures, poor decision-making, and lack of situational awareness (Milligan,2007).

It emphasizes the fundamental role of human behavior, cognition, and perception in influencing traffic rule awareness and compliance among electric bike users. This theory posits that individual characteristics, such as attention span, reaction time, and decision-making processes, significantly impact how e-bike users interpret and follow traffic regulations. By considering human limitations and capabilities, researchers can identify cognitive biases and potential cognitive overload that may hinder electric bike users from fully comprehending and adhering to traffic rules.

*Theory of Reasoned Action*

It predicts behavioral intentions as a function of attitudes and subjective norms. There are three important components of the theory of reasoned action which are beliefs, attitudes, and intentions. Beliefs usually describe the probability that a person thinks some action will cause a certain outcome; attitudes concern whether or not someone thinks that outcome is favorable or unfavorable; and intention is the way that someone intends to behave in response to beliefs and attitudes (Nickerson, 2023).

The theory suggests that e-bike users’ attitudes towards following traffic rules, such as their perception of the importance of compliance and the benefits of adhering to regulations, can influence their intention to comply with these rules. Additionally, subjective norms, including the opinions of significant others and societal expectations regarding traffic rule adherence, can also play a role in shaping e-bike users’ behavioral intentions.

*Social Learning Theory*

Albert Bandura, proposed that learning occurs through observation, imitation, and modeling and is influenced by factors such as attention, motivation, attitudes, and emotions. The theory suggests that learning occurs because people observe the consequences of other people’s behaviors.

Social Learning Theory is intricately linked to the awareness of e-bike users in traffic rules and regulations due to its emphasis on how individuals learn and adopt behaviors through observation and social interactions. E-bike users, like other road users, observe and imitate the behaviors of cyclists, motorists, and pedestrians, shaping their own actions based on these observations. Role models and peer influence play a significant role in influencing e-bike users’ awareness, as they may emulate safe practices demonstrated by others. Social norms and media messages further contribute to e-bike users’ understanding of traffic rules, as they conform to societal expectations and are influenced by educational campaigns and safety messages. By applying Social Learning Theory to the study of e-bike users, researchers can uncover the social dynamics that influence their awareness of traffic rules, informing the development of interventions and policies to promote safer riding practices and compliance with regulations (Cherry, 2022).

**D. Conceptual Framework**

The model used in this study was the IPOO model, which consists of four main parts: Input, Process, Output, and Outcome. This model is an extension of the traditional Input-Process-Output (IPO) model. It provides a structured way to capture and visualize all the inputs, outputs, outcomes, and process steps needed to transform inputs into outputs (Feldman, 2024).

The input included the variables being studied, such as the level of awareness of traffic rules and regulations among e-bike users, factors influencing drivers' decisions to use e-bikes, and the challenges faced by enforcers in enforcing traffic rules and regulations for e-bike users.

The process explained how the variables were examined to assess and analyze the level of awareness, decision factors, and enforcement challenges among respondents. This involved using survey questionnaires and conducting interviews with e-bike users and traffic enforcers. The output was an informative video posted on social media to promote knowledge and awareness of traffic rules and regulations. This video, titled "E-bike Mo, Kaalaman Ko!" highlighted important traffic rules and regulations, proper e-bike usage, and responsible e-bike ownership. The goal was to improve public knowledge and awareness about road safety and security.

The outcome could include increased and enhanced knowledge and awareness regarding traffic rules and regulations, leading to changes in behavior. These changes could include improved compliance with rules, safer riding practices, or more effective enforcement, ultimately aiming to prevent traffic-related incidents.

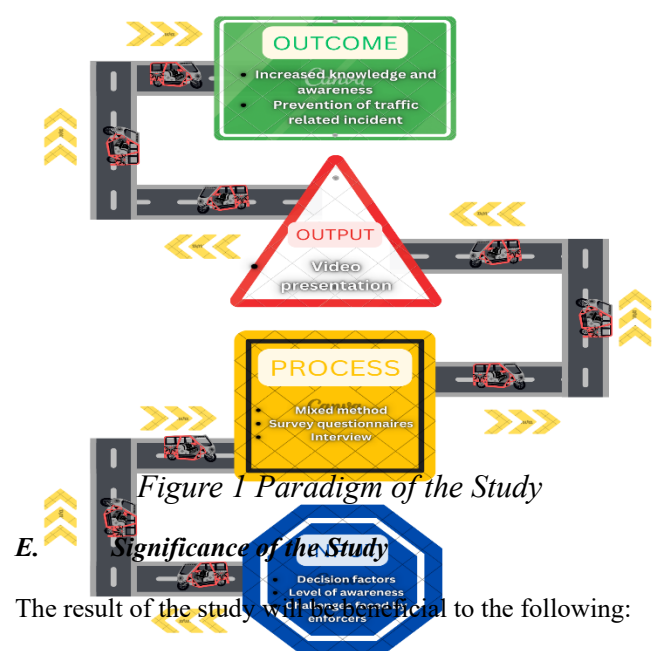


Figure 1 Paradigm of the Study

E. The result of the study was significant and beneficial to the following:

- Electric Bike Users. User may enhance their safety while riding, reducing the risk of accidents. Access education to become more responsible e-bike users, enabling them

to create safer and more harmonious environment for all road users.

- Transportation Authorities. Understanding the awareness levels of electric bike users regarding traffic rules and regulations can help transportation authorities in designing better policies and regulations tailored to this specific group of road users. It can also aid in improving safety measures and infrastructure for electric bike users.
- Electric Bike Manufacturers and Sellers. Insights from the study can inform electric bike manufacturers and sellers about the areas where riders may lack awareness, enabling them to develop educational materials or incorporate features into their products that promote safe and responsible riding practices.
- Traffic Safety Organizations. Organizations focused on traffic safety can utilize the findings to create targeted educational campaigns aimed at improving awareness among electric bike users about traffic rules and regulations, ultimately reducing the number of accidents and promoting safer road behavior.
- Insurance Companies. Insurance companies may find value in the study's insights to adjust their policies and premiums based on the risk factors associated with electric bike users who may have lower awareness levels of traffic rules and regulations.
- Future researchers. Researchers in the fields of transportation, urban planning, and public health may find the study's findings useful for further investigation into the behaviors and needs of electric bike users, contributing to a broader understanding of sustainable transportation options and their implications for society.

#### **F. Scope and Delimitation of the Study**

The study aimed to assess the awareness levels of electric bike users regarding traffic rules and regulations, determine the factors influencing drivers' choice to use e-bikes and identify challenges faced by the traffic enforcers with e-bike users.

This study delimited only to traffic enforcers and E-bike users in Laoag City, excluding other types of electric vehicles or conventional bicycles, which may have exhibited different patterns of traffic rule awareness. This study was not intended to provide definite answers or extend its scope beyond the selected population for this investigation. As a result, the outcomes of this study might not be applicable to similar studies because of differences in population, instruments, and research design utilized. This research was conducted throughout the second semester of the academic year 2023-2024 and the first semester of the academic year 2024-2025.

#### **G. Definition of Terms**

In this study, the following terms are defined operationally:

- Bike. It is a two (2) wheeled and three (3) wheeled bicycle that can be powered by electricity.
- Electric Bike User. It is an individual who operates the electric bicycle also known as e-bike.
- Traffic Wise. It refers of being knowledgeable and aware of traffic rules and regulation.

- Traffic. It refers to movement of electric bicycle on the road or public highway.
- Traffic Rules and Regulations. It is a law made by the government to guide and keep safe the road.

### **I. REVIEW OF RELATED LITARATURES AND STUDIES**

This chapter presents a comprehensive review of existing research relevant to this study, highlighting the significance of the work and providing essential context for a deeper understanding of the topic.

#### **Republic Act 4136**

*Section 35. Restriction as to speed.*

Any person driving a motor vehicle on a highway shall drive the same at a careful and prudent speed, not greater nor less than is reasonable and proper, having due regard for the traffic, the width of the highway, and of any other condition then and there existing; and no person shall drive any motor vehicle upon a highway at such a speed as to endanger the life, limb and property of any person, nor at a speed greater than will permit him to bring the vehicle to a stop within the assured clear distance ahead.

Subject to the provisions of the preceding paragraph, the rate of speed of any motor vehicle shall not exceed the following:

The rates of speed herein above prescribed shall not apply to the following:

- (1) A physician or his driver when the former responds to emergency calls;
- (2) The driver of a hospital ambulance on the way to and from the place of accident or other emergency;
- (3) Any driver bringing a wounded or sick person for emergency treatment to a hospital, clinic, or any other similar place;
- (4) The driver of a motor vehicle belonging to the Armed Forces while in use for official purposes in times of riot, insurrection or invasion;
- (5) The driver of a vehicle, when he or his passengers are in pursuit of a criminal;
- (6) A law-enforcement officer who is trying to overtake a violator of traffic laws; and
- (7) The driver officially operating a motor vehicle of any fire department, provided that exemption shall not be construed to allow unless or unnecessary fast driving of drivers aforementioned.

*Section 37. Driving on right side of highway.*

Unless a different course of action is required in the interest of the safety and the security of life, person or property, or because of unreasonable difficulty of operation in compliance herewith, every person operating a motor vehicle or an animal-drawn vehicle on a highway shall pass to the right when meeting persons or vehicles coming toward him, and to the left when overtaking persons or vehicles going the same direction, and when turning to the left in going from one highway to another, every vehicle shall be

conducted to the right of the center of the intersection of the highway.

*Section 38. Classification of highways.*

Public highways shall be properly classified for traffic purposes by the provincial board, municipal board or city council having jurisdiction over them, and said provincial board, municipal board or city council shall provide appropriate signs therefor, subject to the approval of the Commissioner. It shall be the duty of every provincial, city and municipal secretary to certify to the Commissioner the names, locations, and limits of all "through streets" designated as such by the provincial board, municipal board or council.

*Section 39. Overtaking a vehicle.*

The driver of any motor vehicle overtaking another vehicle proceeding in the same direction shall pass at a safe distance to the left thereof, and shall not again drive to the right side of the highway until safety clear of such overtaken vehicle except that on a highway, within a business or residential district, having two or more lanes for the movement of traffic in one direction, the driver of a vehicle may overtake and pass another vehicle on the right. Nothing in this section shall be construed to prohibit a driver overtaking and passing, upon the right, another vehicle which is making or about to make a left turn.

*Section 40. Driver to give way to overtaking vehicle.*

The driver of a vehicle about to be overtaken and passed by another vehicle approaching from the rear shall give way to the overtaking vehicle on suitable and audible signal being given by the driver of the overtaking vehicle, and shall not increase the speed of his vehicle until completely passed by the overtaking vehicle.

*Section 41. Restrictions on overtaking and passing.*

The driver of a vehicle shall not drive to the left side of the center line of a highway in overtaking or passing another vehicle proceeding in the same direction, unless such left side is clearly visible, and is free of oncoming traffic for a sufficient distance ahead to permit such overtaking or passing to be made in safety.

The driver of a vehicle shall not overtake or pass another vehicle proceeding in the same direction, when approaching the crest of a grade, not upon a curve in the highway, where the driver's view along the highway is obstructed within a distance of five hundred feet ahead, except on a highway having two or more lanes for movement of traffic in one direction where the driver of a vehicle may overtake or pass another vehicle: Provided, That on a highway within a business or residential district, having two or more lanes for movement of traffic in one direction, the driver of a vehicle may overtake or pass another vehicle on the right.

The driver of a vehicle shall not overtake or pass any other vehicle proceeding in the same direction, at any railway grade crossing, not at any intersection of highways unless

such intersection or crossing is controlled by traffic signal, or unless permitted to do so by a watchman or a peace officer, except on a highway having two or more lanes for movement of traffic in one direction where the driver of a vehicle may overtake or pass another vehicle on the right. Nothing in this section shall be construed to prohibit a driver overtaking or passing upon the right another vehicle which is making or about to make a left turn.

The driver of a vehicle shall not overtake or pass, or attempt to pass, any other vehicle, proceeding in the same direction, between any points indicated by the placing of official temporary warning or caution signs indicating that men are working on the highway.

The driver of a vehicle shall not overtake or pass, or attempt to overtake or pass, any other vehicle proceeding in the same direction in any "no-passing or overtaking zone."

*Section 42. Right of way.*

When two vehicles approach or enter an intersection at approximately the same time, the driver of the vehicle on the left shall yield the right of way to the vehicle on the right, except as otherwise hereinafter provided. The driver of any vehicle traveling at an unlawful speed shall forfeit any right of way which he might otherwise have hereunder.

The driver of a vehicle approaching but not having entered an intersection, shall yield the right of way to a vehicle within such intersection or turning therein to the left across the line of travel of such first-mentioned vehicle, provided the driver of the vehicle turning left has given a plainly visible signal of intention to turn as required in this Act.

The driver of any vehicle upon a highway within a business or residential district shall yield the right of way to a pedestrian crossing such highway within a crosswalk, except at intersections where the movement of traffic is being regulated by a peace officer or by traffic signal. Every pedestrian crossing a highway within a business or residential district, at any point other than a crosswalk shall yield the right of way to vehicles upon the highway.

The driver of a vehicle upon a highway shall bring to a full stop such vehicle before traversing any "through highway" or railroad crossing: Provided, that when it is apparent that no hazard exists, the vehicle may be slowed down to five miles per hour instead of bringing it to a full stop.

*Section 43. Exception to the right of way rule.*

The driver of a vehicle entering a highway from a private road or drive shall yield the right of way to all vehicles approaching on such highway.

The driver of a vehicle upon a highway shall yield the right of way to police or fire department vehicles and ambulances when such vehicles are operated on official business and the drivers thereof sound audible signal of their approach.

The driver of a vehicle entering a "through highway" or a "stop intersection" shall yield the right of way to all vehicles approaching to either direction on such "through highway": Provided, That nothing in this subsection shall be construed as relieving the driver of any vehicle being operated on a "through highway" from the duty of driving with due regard for the safety of vehicles entering such "through highway" nor as protecting the said driver from the consequence of an arbitrary exercise off such right of way.

#### *Section 44. Signals on starting, stopping or turning.*

The driver of any vehicle upon a highway, before starting, stopping or turning from a direct line, shall first see that such movement can be made in safety, and if any pedestrian may be affected by such movement, shall give a clearly audible signal by sounding the horn, and whenever the operation of any other vehicle approaching or following may be affected by such movement, shall give a signal plainly visible to the driver of such other vehicles of the intention to make such movement.

The signal herein required shall be given by means of extending the hand and arm beyond the left side of the vehicle, or by an approved mechanical or electrical signal device.

#### *Section 45. Turning at intersections.*

The drive of a vehicle intending to run to the right at an intersection shall approach such intersection in the lane for traffic nearest to the right-hand side of the highway and, in turning, shall keep as close as possible to the right-hand curb or edge of the highway.

The driver of a vehicle intending to turn to the left shall approach such intersection in the lane for traffic to the right of and nearest to the center line of the highway, and, in turning, shall pass to the left of the center of the intersection, except that, upon highways laned for traffic and upon one-way highways, a left turn shall be made from the left lane of traffic in the direction in which the vehicle is proceeding.

For the purpose of this section, the center of the intersection shall mean the meeting point of the medial lines of the highways intersecting one another, except when it is occupied by a monument, grass plot or any permanent structure, other than traffic control device.

#### *Section 46. Parking prohibited in specified places.*

No driver shall park a vehicle, or permit it to stand, whether attended or unattended, upon a highway in any of the following places:

- Within an intersection
- On a crosswalk
- Within six meters of the intersection of curb lines.
- Within four meters of the driveway entrance to and fire station.
- Within four meters of fire hydrant
- In front of a private driveway
- On the roadway side of any vehicle stopped or parked at the curb or edge of the highway; and

- At any place where official signs have been erected prohibiting parking.

#### *Section 47. Parked vehicle.*

Whenever a motor vehicle is parked unattended on any highway, the driver thereof must turn off the ignition switch and stop the motor and notch effectively the hand brake.

### **Administrative Order No. 2021-039**

## **SECTION 3. TYPE, CATEGORY OF ELECTRIC VEHICLES**

### *3.3. Category L1a - Capable of propelling the unit up to a maximum speed of 25 km/hr.*

The operation shall be limited within barangay local roads only. It can pass national roads and other type of roads for purposes of crossing only when the road/lane it is allowed to traverse is divided by the former. They may be operated on bicycle lanes and similar lanes designated by proper authorities. Driver/rider of this vehicle is required to wear a protective helmet similar to those designed for bicycle riders, when driven on the road. These shall not be used for public transport purposes. Driver's license and registration are not required.

### *3.4 Category L1b - Capable of propelling the unit to maximum of 26 to 50 km/hr.*

The operation of these vehicles may be allowed to go beyond barangay roads to cover other local roads provided that it will take the outermost part of the road close to the edge. It can pass main thoroughfares and national roads for purposes of crossing only when the road it is allowed to traverse is divided by the former and shall yield the right of way to all oncoming traffic that constitute an immediate hazard. Drivers/riders of these units are required to wear motorcycle protective helmet. This type shall not be used for public transport purposes due to their lighter construction. Driver's license and registration are not required.

### *3.5 Category L2a - Capable of propelling the unit up to a maximum speed of 25 km/hr.*

The operation shall be limited within or along private and barangay roads only. It can pass main thoroughfares and national road and other type of roads for purposes of crossing only when the road/lane it is allowed to traverse is divided by the former and shall yield the right of way to all oncoming traffic that constitute an immediate hazard. They may be operated on bicycle lanes considering their limited speed. Drivers/riders of this vehicle are required to wear protective helmet, similar to those designed for bicycle riders, when driven on the road. They shall not be used for public transport purposes. Driver's license and registration are not required.

### *3.6. Category L2b - Capable of propelling the unit to a maximum speed of 26 to 50 km/hr.*

The operation of these vehicles may be allowed to go beyond barangay roads to cover other local roads provided that it will take the outermost part of the road close to the



edge. It can pass main thoroughfares and national roads for purposes of crossing only when the road it is allowed to traverse is divided by the former and shall yield the right of way to all oncoming traffic that constitute an immediate hazard. Drivers/riders of these units are required to wear motorcycle protective helmet. This type shall not be used for public transport purposes due to their lighter construction. Driver's license and registration are required.

### 3.8. Category L4 and LS Electric Vehicle (e-Tricycle/Three Wheeled Vehicle)

The Operation of these vehicles may be allowed to go beyond barangay roads to cover other local roads and tertiary national roads and the driver is a bearer of appropriate driver's license. It can pass main thoroughfares and national roads for purposes of crossing only when the road it is allowed to traverse is divided by the former and shall yield the right of way to all oncoming traffic that constitute an immediate hazard. Concerned local Government Units (LGUs) may authorized these types of vehicles, whether private or "for hire", to traverse national highways or main thoroughfares thru the passage of an ordinance but shall be constrained to the outermost lane/part of the highway. Both are prohibited along limited access highways. Similar to a regular motorcycle-tricycle, helmet is not required.

## Section 5. Requirements for classification and initial registration of new model electric vehicle

To ensure compliance to the standards prescribed above and for proper classification pursuant to Section 5 of Republic Act No. 8794, all manufacturers, assemblers and/or importers of electric vehicles shall, not later than three (3) months prior to the introduction of any new model in the market, submit the specifications of such model to the LTO which shall determine the classification and the rate of MVUC which the new model shall fall.

The requirements for classification of new model electric vehicle and initial registration shall be in accordance with the requirements per existing policies, rules and regulations on the registration of motor vehicles except for emission requisites.

### 5.1. Requirements for Classification

1. Letter-request for classification
2. Specification of the electric vehicle
3. Photos of the vehicle submitted for classification
4. Motor Vehicle Inspection Report from LTO Motor Vehicle Inspection Center (MVIC)

### 5.2. Requirements for Initial Registration

1. Original Sales Invoice
2. Certificate of Stock Reported (CSR)  
Note: Certificate of Payment/Certification for component/s from the Bureau of Customs (BOC) is required prior to the application for CSR
3. Original PNP-HPG MV Clearance
4. Appropriate Insurance Certificate of Cover

## SECTION 6. Plate and special lane for registration and recording

6.1. Plates and stickers of electric vehicles shall follow the specifications to be adopted by the LTO.

The LTO shall designate special lanes for the registration of electric vehicles from the effectivity of this Order. In offices where designation of special lanes is not feasible, electric vehicle transactions shall be assigned at Senior Citizen/PWD lanes.

### City Ordinance No. 2020-45

*SECTION 2. – Scope.* - The provisions of this ordinance shall control, as far as they apply, the operation of motor vehicles – private or public, animal drawn vehicles and bicycles – including electric bikes, and the conduct of pedestrians.

*SECTION 11.-* All calesas and electric bikes used or operated within the City must register with the City Treasurer's Office for the current year in accordance with existing ordinances, rules and regulations.

*SECTION 12.-* Number plates, preparation and issuance of - The City Treasurer's Office shall cause the number plates to be prepared and issued to the owner's of calesas and electric bikes registered and recorded in the City Treasurer's Office under this Code, for a reasonable fee, provided, that the fee shall be subject to the approval of the Sangguniang Panlungsod.

### *Factors Affecting Adoption of Electric Bikes Shared in India*

Factors affecting the decision to use electric bikes for transportation include attitudinal factors such as green attitudes, perceived green value, and loyalty. With growing environmental awareness, there is a shift from petrol to electric vehicles. Studies show that these vehicles reduce carbon footprints and energy consumption.

This study used quantitative research method and incorporated to a Likert scale questions covering various factors related to electric bike services. Hypotheses were formulated to analyze the relationships between these factors and the level of satisfaction experienced by consumers of electric bike services.

The analysis can be seen that the surveyed population predominantly comprises individuals aged between 18 to 35, primarily students pursuing higher education or working professionals with annual incomes ranging from 1 to 30 lakhs. The gender ratio among respondents stood at 7:3, with 93% owning two-wheelers and 9% owning electric bikes, indicating a clear preference for electric vehicles. While 55% of respondents are accustomed to using electric bikes, 31% still prefer petrol-powered alternatives (Yadav, 2020).

*Awareness, riding behaviors, and legislative attitudes toward electric bikes among two types of road users:*

In this study it examined the knowledge, bicycling behavior, and policy perceptions of two major groups of road users of electric bikes (e-bikes) in Tianjin, China. Since the use of e-bikes is rapidly growing as means of transport, it is important to know how different users of e-bikes and other conventional road users perceive and behave on the road and to allow for improvement of road safety and establishment of proper legal norms.

The research employed a cross-sectional investigation comprising two components: a cross-sectional community-based field survey and Face-to-face structured interviews were conducted.

A participating study showed that despite the lower correct awareness rates of e-bike violation behaviors as compared to other road users e bike riders seem more inclined towards safety gear like helmet. On the other hand, the correct behavior of e-bike operators was not as effective as their perception of various malignant violation behaviors. Recognized, legal requirements for the use of e-bikes were seen as less onerous; respondents indicated they were in favour of developing legislation that is applicable to e-bike use, such as wearing helmets. Such outcomes should signal that there is a need to implement auditory public campaigns in a bid to improve e-bike users' awareness of traffic regulations in a bid to reduce the number of cases of accidents due to reckless use of the machines. (Wang Z et al., 2019).

#### ***Risk Riding Behaviors of Urban E-Bikes: A Literature Review***

E-bikes have become popular in China due to their low price, convenience, and flexibility. In 2017, the number of e-bikes in China was 250 million, with output of 30.97 million and export value of \$1.44 billion. However, the rapid growth of e-bikes also poses safety problems. E-bikes are vulnerable groups on the road, with more serious accident risks due to their fast speed. In 2015, the number of e-bike accidents was 8.2 times larger than bicycle and 5.4 times larger than pedestrian accidents. Hospitalization records show that one-third of e-bike users were seriously injured. The number of e-bike accidents increased by 71.52% in five years, with deaths increasing by 71.52%. Cities like Guangzhou, Shenzhen, Wenzhou, and Fuzhou have banned or restricted the use of e-bikes due to the frequent occurrence and severity of accidents. National laws and regulations aim to restrain illegal behaviors, such as Article 70 of the road traffic safety law.

Data collection for risky riding behavior of e-bikes is mainly done through questionnaire survey methods and video collection methods. About 17% of Swiss e-bike riders have experienced traffic accidents, with accidents mainly involving slipping, falling, and slipping. In Tianjin, 74.2% of e-bike riders believe helmets are necessary, while 54.7% think windshield installation is wrong. They proposed a logical framework to evaluate abnormal driving behavior, designing the Driving Behavior Questionnaire (DBQ) to distinguish three types of behavior: error behavior, failure behavior, and irregularity behavior.

E-bike traffic accidents are common, with over 90% caused by risky riding behaviors. This includes illegal lane

occupation, over-speeding, running red lights, and obstructing traffic flow. Studying e-bike risky behavior is crucial to prevent accidents and ensure safety. Previous research on traffic accident characteristics and causes of e-bike risky behavior has three deficiencies. Quantitative analysis using the theory of coupling characteristics of various scenarios is needed to understand the degree of danger in these situations. Effective interventions and the coupling effect of various combinations can help eliminate accident risk and ensure traffic safety (Yang et al, 2019).

#### ***Evolution of Road Safety Standards. The Patel Firm***

The processes that have occurred for such transport means can be considered to be a critical stage of evolving road safety standards, especially due to the continuous growth in the number of road transport vehicles.

The investigation made by The Patel Firm included excerpts from historical and governmental records, including National Highway Traffic Safety Administration and information provided by a nonprofit organization, the American Automobile Association, among others to present the timeline dedicated to safety milestones. Through the analysis of the early advances in the field, including an understanding of traffic signalization, speed limiting devices, seat belts, protective helmets for motor cyclists, drunk driving laws, inflatable vehicular restraints or airbags, and automobiles equipped with child safety seats, the study sought to draw out the evolution of road safety measures over time.

As evidenced by the safety milestones highlighted in the study, there has been tremendous progress in ensuring that only safe road standards are employed in order to achieve the main goal of saving lives and reducing on road accidents. It has therefore credited the change in traffic control as having helped in the reduction of fatalities while at the same time improving safety on the roads from the use of traffic signals and the regulation of speed limits among other factors. In sum, the study presents smart progression of the road safety rules and subsequent endeavor to provide better safety for motorists and road users in general ( Sorich, E., 2023).

#### ***Road Traffic History - Before the Streets got Swamped. Auto evolution***

This article describing the captivating story of road traffic before the present days' confusion, focuses on the development of the rules and norms of traffic that influenced the regulation of moving on the streets. From early steam rail transport to locomotive red flag necessities moving down to license plates and traffic signals, a look through history gives an understanding of early traffic regulation and precautionary measures required before and during times of transport.

Looking at the article, it shows how traffic legislation has evolved over the years first starting with the Locomotive on Highways Act in 1861 in the UK where weight was restricted, speed limits placed and the infamous red flag needed for vehicles. Some amendments made in the future were the Locomotive Act of 1865, and the Emancipation Act of 1896 when the classification of vehicles and the speeds were introduced. License plates were



introduced and the driver licenses added to the formal means of identification and control of most vehicles on the roads.

The historical evolution of traffic laws demonstrates the progressive development of traffic regulation from basic forms to the hierarchy it currently holds. Acquisition of license plates, driver licenses, and installation of traffic lights are among the tremendous milestones that set standards of road safety as well as addressing the issue of accountability amongst drivers. All in all, as the article, this is a somewhat longing, but rather informative read regarding the beginnings of modern traffic management and eternal striving to make roads safer and more efficient (Patrascu, 2019).

### ***Motives, perceptions and experiences of electric bicycle owners and implications for health, well-being and mobility***

The rise of electrically assisted pedal cycles, or e-bikes, is significantly influencing mobility patterns, with a notable emphasis on the pedal-assisted type known as pedelecs which are prevalent in Europe. These e-bikes, which require the users to pedal and are regulated up to 250 W and 25 km/h, are suitable for cycle paths and could potentially replace car journeys, thus reducing traffic congestion and urban pollution.

This study used qualitative research method that draw on evidence from interviews with e-bike owners through opportunity sampling — posting advertisements on noticeboards in public places and using social media and Interviews were digitally audio-recorded and transcribed for analysis using the qualitative analysis data.

The result gives an impact that e-bike adoption significantly decreased the reliance on conventional bicycles, cars, and public transport among participants, with a majority using e-bikes predominantly for their weekly activities. Despite the barriers, participants acknowledged the benefits of e-bikes in terms of increased travel efficiency and physical activity, underscoring the need for targeted interventions to address these technological, social, and environmental issues to enhance e-bike adoption and usage.

The study highlights the rising popularity of e-bikes across Europe, identifying them as a viable solution for enhancing non-car-based travel and promoting physical activity, despite technological, social, and environmental barriers. It emphasizes the need for targeted policies, infrastructure improvements, and societal acceptance to maximize the potential of e-bikes in contributing to low-carbon transportation and public health (Jones et al., 2016).

### ***LTO Holds Dialogues to Formulate Regulations on E-bikes***

The Land Transportation Office (LTO) is currently engaged in a series of dialogues and consultations with diverse stakeholders to develop guidelines and regulations concerning e-bikes and other unregistered electric vehicles (e-vehicles). Under the guidance of Transportation Secretary and LTO Chief Assistant Secretary emphasized critical considerations such as the potential requirement for registration of e-vehicles and the necessity for drivers to hold valid licenses.

Moreover, the LTO's recent interactions with public transport associations and e-bike organizations have unveiled some concerns, including revenue decline within the public transport sector due to the increased usage of e-trikes for short-distance trips and the prevalent disregard for traffic regulations by e-bike and e-trike users. Assistant Secretary underscored the agency's commitment to formulating pertinent guidelines that not only uphold the principles of local autonomy, particularly in alignment with the ordinances and regulations established by various Local Government Units (LGUs), but also account for existing laws endorsing the ownership and utility of e-vehicles. The Metro Manila Council, mandating the prohibition of e-bikes on primary thoroughfares across the National Capital Region (NCR) commencing in April. Additionally, NCR LGUs are poised to impose a requirement necessitating drivers of e-vehicles and tricycles to possess valid driver's licenses (Dela Cruz, 2024)

### ***LTO readying guidelines regulating e-bikes***

The analogue for electric vehicles in the Philippines is the Land Transportation Office, LTO, which is currently in the developing stage the rules that will govern the utilization of such devices as e-bikes and e-trikes on the roads and highways. More measures being planned for implementation will make it compulsory for all electric vehicles to be registered with the LTO and operated exclusively by persons with valid licenses when on the highways.

The LTO's implementation plan can be found in the Administrative Order VDM-2024-044: The Novelty of Light Electric Vehicles and penalties for infractions of rules governing the operation of the same. It gives a direction for the registration of the electric vehicles and also fines and impulse for the operation of the unregistered e-vehicles on roads and highways.

The LTO order which has just come out represents a concrete move towards the continued control of the usage of e-bikes and e-trikes within the Philippines. Through implementation of registration measures as well as punitive measures to those EVs not registered, LTO seeks to improve road safety and correlatively, responsibility among EV owners. The changes in Republic Act 4136 and RA 10054 (Helmet Law) which are among the discussed government responses, suggest that the government is open to modifying policies as the transport terrain continues to transform in various ways. (Cabrera, 2024).

### ***MMDA vows clearer guidelines on e-bikes, e-trikes restriction***

The debate surrounding the integration of e-bikes and e-trikes onto Metro Manila roadways underscores the complex intersection of infrastructure development, policy implementation, and economic considerations. It concerns regarding the limited road space and the presence of car dealerships along major thoroughfares like EDSA highlight the intricate balancing act required to accommodate diverse modes of transportation within a bustling urban landscape. Addressing these problems requires a comprehensive strategy that prioritizes sustainable mobility solutions while mitigating potential disruptions to established businesses and daily commuters.

The MMDA's stance on awaiting improvements in mass transportation infrastructure before expanding road sharing initiatives indicates a forward-thinking perspective focused on long-term urban livability. By recognizing the interconnected nature of transportation, urban planning, and economic activities, there is a clear acknowledgment of the need for coordinated efforts to create a more inclusive and sustainable transit ecosystem.

### **Things to know about e-bike, e-trike restriction in Metro Manila**

The usage of e-bikes and e-trikes in Metro Manila has debated that the MMDA's recent circular allowing them on roads with bike lanes. However, concerns linger over the fragmented bike lane network, leading to possible violations and safety risks for users.

This article discusses the challenges for e-bike and e-trike users due to the disjointed bike lane system in Metro Manila. The MMDA's restrictions lack sufficient infrastructure support, raising doubts about their effectiveness. Critics, including PARA - Advocates for Inclusive Transport, call for prioritizing commuters' mobility needs over punitive measures for electric light vehicle users. The e-bike will be restricted on national roads.

The MMDA's regulations on e-bikes and e-trikes expose broader issues in urban mobility and sustainable transportation in Metro Manila. The growing demand for alternative transportation amidst worsening congestion challenges the government to blend regulatory actions with infrastructure development for all road users' safety and convenience.

### **Electric Bicycles Versus Traditional Motorcycles: An In-Depth Comparison of Performance**

The increasing interest in e-bikes has led to more brands and models being introduced by both established and upstart bicycle manufacturers. Manufacturers are working to advance battery technology, motor efficiency, design, and overall performance. This research may be beneficial to economic, consumer preference, and government laws and regulations.

This study used quantitative research method and incorporated to a Likert scale through survey questionnaire used to gather data for analysis.

**Table 1 Respondents of the Study**

Barangay	Number of E-bike Users
Brgy. 1 San Lorenzo	17
Brgy. 2 Santa Joaquina	10
Brgy. 6 San Agustin	10
Brgy. 8 San Vincent	10
Brgy. 10 San Jose	10
Brgy. 18 San Quirino	10
Brgy. 21 San Pedro	10
Brgy. 23 San Matias	10
Brgy. 25 Santa Cayetana	10
Brgy. 29 Santo Tomas	10
Traffic Enforcers within Laoag City	34
<b>TOTAL POPULATION</b>	<b>141</b>

The study found significant differences between electric bicycles and traditional motorcycles in terms of

energy efficiency, charging time, and overall performance. Electric bicycles had higher energy efficiency, citing their environmental benefits. Traditional motorcycles had higher charging time and overall performance, with a mean score of 3.28 for charging time and 3.42 for overall performance. This was due to their quicker refueling time and overall performance exceeding expectations. The results were based on participants' responses to a survey. However, both vehicles still cannot replace traditional motorcycles in terms of range, charging time, power output, battery life, durability, safety features, and overall performance. Further development is needed to increase user interest in electric bicycles (Acapuyan et al, 20223).

## **II. METHODOLOGY**

This chapter presents the research method, design, population and locale of the study, data gathering tool, data gathering procedure, and treatment of data.

### *A. Research Methodology and Design*

A mixed research methodology was employed in this study. It combines and integrates qualitative and quantitative research methods in a single research study (Johnson & Schoonenboom, 2017). This integration allows for a more comprehensive analysis, enabling researchers to contextualize their findings, enhance the credibility of their results through triangulation, and provide a richer understanding of the research problem.

An explanatory design was also employed in this study. Explanatory design is a way to connect ideas to understand cause and effect (Skidmore & Kowalcyk, 2023). By triangulating data from multiple sources, such as surveys, interviews, and observations, the study aimed to enhance the validity and reliability of its findings. This provided a more holistic and nuanced understanding of the factors at play in the context of electric bike usage and traffic regulations.

### *B. Population and Locale of the Study*

There were two (2) groups of respondents in this study, the E-bike users and traffic enforcers. The study was conducted at Brgy. 1 San Lorenzo, Brgy. 2 Santa Joaquina, Brgy. 6 San Agustin, Brgy. 8 San Vicent, Brgy. 10 San Jose, Brgy.18 San Quirino, Brgy. 21 San Pedro, Brgy. 23 San Matias, Brgy.25 Santa Cayetana, and Brgy. 29 Santo Tomas, Laoag City, Ilocos Norte since this location are considered as points where highways converge, the center of Laoag City, and popular routes for e-bikes. The respondents consisted of one hundred seven (107) E-bike users and thirty-four (34) total population of traffic enforcers. The researchers used Slovin's formula to gather the population of E-bikes based on the several resellers we asked for their sales in the year 2024.

A Slovin's formula is a random sampling technique used to calculate the sample size needed to achieve a certain confidence interval when sampling a population. The respondents of this study were selected by using the convenience sampling. A convenience sampling was used in research to identify potential respondents through choosing the sample depending on the accessibility of the sample to the researchers.

### C. Data Gathering Tool

A survey questionnaire and an interview guide were used to conduct this study. The interview guide helped the researchers clarify their questionnaire responses. The researchers used a recording device to record the statements of the participants. A recording device captures and stores sound for later playback or analysis.

The researchers developed a survey questionnaire with inquiries about the factors that affect the drivers using e-bike, their level of awareness, and the problems faced by the traffic enforcers. This questionnaire was checked by the research adviser and validated by the Chief of Traffic Division, Head of Land Transportation Office, and Head of PNP-HPG, Laoag City.

### D. Data Gathering Procedure

Before conducting the study, the researchers obtained a letter of validation from their research advisor and submitted it to the traffic division. This letter included copies of City Ordinance No. 2020-045, and R.A. 4136 to establish a basis for the research instruments. After reviewing these legal documents, the researchers formulated a survey questionnaire and an interview guide as the primary data collection instruments. A pilot test was conducted to validate the instruments before the actual data gathering. Each question in the questionnaire and interview guide was validated by a panel of experts knowledgeable in the relevant field. Following this validation, the researchers administered the approved instruments.

The researchers first obtained informed consent from each respondent to ensure their willingness to participate in the survey. Upon receiving respondents' approval via informed consent, the researchers distributed the questionnaires. After the respondents completed the questionnaires, the researchers conducted interviews based on the questionnaire responses. Upon completion of the questionnaires and interviews, the data were tallied, tabulated, statistically treated, analyzed, and interpreted.

### E. Treatment of Data

The study employed a mixed-method approach to analyze data, combining statistical analysis for quantitative data and thematic analysis for qualitative data. In statistical analysis quantitative data was collected through survey questionnaires in which frequency distributions, percentages and weighted means were calculated to determine the decision factors and level of awareness among e-bike users and to assess the enforcement challenges by traffic enforcers among drivers.

To interpret the weighted mean scores in problem 2 and 3, the researchers established the following scale:

Numerical Value	Range	Descriptive Interpretation	Verbal Interpretation
4	3.26-4.00	Fully Aware	E-bike user possesses proficiency and knowledge about traffic rules and regulations.
3	2.51-3.25	Aware	E-bike user can understand traffic rules and regulations.
2	1.76-2.50	Not Aware	E-bike user is only familiar with the traffic rules and regulations.
1	1.00-1.75	Fully Not Aware	E-bike user has absolutely no knowledge about traffic rules and regulations.

Numerical Value	Range	Descriptive Interpretation	Verbal Interpretation
4	3.26-4.00	Always	Problems are encountered daily in the enforcement of traffic rules and regulations.
3	2.51-3.25	Often	Problems encountered in the enforcement of traffic rules and regulations twice or thrice a week among E-bike users.
2	1.76-2.50	Rarely	Problems encountered in the enforcement of traffic rules and regulations once a week among E-bike users.
1	1.00-1.75	Never	Problems are never encountered in the enforcement of traffic rules and regulations among E-bike users.

A thematic analysis was used to analyze open-ended responses and qualitative data gathered from interviews in which all responses were transcribed and read thoroughly to gain a comprehensive understanding of the content and the findings were synthesized and presented with supporting quotes from participants to provide contextual understanding. By comparing the mean scores to the interpretive scale, the researchers were able to assess the overall level of knowledge and compliance with the traffic rules and regulations among the two target groups: E-bike users and traffic enforcers.

### F. Ethical Consideration

In conducting this research privacy and confidentiality of all participants were strictly upheld. Informed consent was obtained from each participant, outlining the purpose of the study, their rights, and the voluntary nature of their participation. Participants had their right to withdraw from the study at any time without penalty. Data collected was anonymized and stored securely to protect the identity of participants. Any potential risks to participants' well-being were minimized, and appropriate measures were taken to ensure their safety and comfort throughout the research process.

## III. PRESENTATION, INTERPRETATION, AND ANALYSIS OF DATA

This chapter presents, analyzes, and interprets the data gathered from respondents and participants. This study explores the factors that affect the decision of drivers to use e-bike, the level of awareness of e-bike users on traffic rules and regulation, and the challenges faced by traffic enforcers in enforcing traffic rules and regulation to e-bike users. Factors Affecting the Decision of Drivers to Use E-Bike This section revealed the results of the factors that affected the decision of drivers to use e-bike in terms of contributing to environmental protection, being not gasoline or diesel-based, reducing air pollution, cost effectiveness, commuting, battery life, reducing carbon emissions, speed capabilities, weather conditions, safety features, maintenance, and cultural and social acceptance.

**Table 2 Factors Affecting the Decision of Drivers to Use E-Bike**

Item/Factor	Frequency	Percentage	Rank
1. Contribute to environmental protection.	78	72.89	1
2. Not a gasoline-or-diesel-based motorized vehicle	71	66.35	2
3. Convenience for commuting	66	61.68	3
4. Battery life limitations	50	46.72	6.5
5. Speed and acceleration capabilities.	42	39.25	11
6. Weather conditions	50	46.72	6.5
7. Safety features	49	45.79	10
8. Cultural and social acceptance	50	46.72	6.5
9. Advantageous in terrain or topography	51	47.66	5
10. No law prohibiting the of e-bike without a license.	50	46.72	6.5
11. Repair and maintenance services	52	48.59	4

Table 2 reveals that the first-ranked factor that influenced the respondents' decision to use e-bikes was the contribution to environmental protection, which garnered 72.89%. This was followed by the second-ranked factor, which is not being gasoline or diesel-based, with 66.35%. The convenience for commuting or short-distance travel, with a percentage of 61.68. is the third-ranked factor in the list.

The fourth-ranked factor was the repair and maintenance services, with a percentage of 48.59. The respondents were also influenced by the impact of terrain, with 47.88%, which is the fifth-ranked factor. Moreover, the respondents were influenced by the cultural and social acceptance with 46.72%, battery life limitations (46.72%), weather condition (46.72%), and the fact that there is no law prohibiting driving an e-bike without a license (46.72%), which are the sixth to ninth ranked factor.

Furthermore, the respondents were also persuaded by the safety features of the e-bike, which is the seventh-ranked factor, with 45.79% of respondents identifying it. The last-ranked factor was the speed and acceleration capabilities, which gained 39.25%.

The result of the finding was supported by the statement of Participant 2, male, e-bike users for ten months, and resident of Brgy. 1 San Lorenzo, Laoag City, mentioned that:

“Basar ti pinagkitak ket awan ti makitak nga asok nga rumwar dita e-bike, ngem no adda man, bassit lang. Kumpara met iti sabali nga pagluganan ket permi nakaas-asok ken nakabangbangsit pay, makapaperdi ti salun-at. Iti electric bike ket de-chargeable iso mayat nga makatulong para kanyak ken para iti aglawlaw tayo”

(Based on my observation, I haven't seen any smoke coming from the e-bike, and even if there is, it's minimal. Compared to other modes of transportation that constantly emit smoke and are noisy, they are harmful to health. The electric bike is rechargeable, which is a great help to us and to our environment)

Participant 6, female, e-bike users for five months, and resident of Brgy. 6 San Agustin, Laoag City also added that:

“Iti gamin e-bike ket sustainable para ti environment tayo ken makatulong iti nasayaat nga pinagbiag para iti napintas nga kalidad. Detoy ket kasapulam lang iti kuryente nga mangpacharge kanyana tapno agandar. Haan na masapol

dagita langisen. Kase ti langis ket meysa nga mangpaperdi ti aglawlaw.”

(The e-bike was sustainable for our environment and it would promote healthy lifestyle in our community. This only needs electricity to charge it, so it can run. It doesn't need oil, which is one of the things that pollutes the environment)

Participant 13, female, e-bike users for five months, and resident of Brgy 2 Santa Joaquina, Laoag City, affirmed that:

“Ti ebike gamin ket makatulong iti pinagbaba polusyon kasi haan kailangan ti gasolinan, as a result napintas ti angot ti aglawlaw, makapabang-ar ti rikna.”

(The e-bike helps reduce pollution because it doesn't need gasoline. As a result, the air is cleaner and it feels refreshing.)

Furthermore, Participant 14, female, e-bike users for two years, and resident of Brgy 23 San Matias, Laoag City, stated that:

“Dagita daduma nga motor ket permit tagari ti tambutso da. Ti e-bike ket haan natagari, haan nga makaperdi ti lapayag.”

(Other motor vehicles have very loud exhausts. E-bikes, on the other hand, are quiet and don't produce any noise pollution.)

Lastly the Participant 60 female, e-bike users for five months, and resident of Brgy 2 Santa Joaquina, Laoag City, explained that:

“Kuryente la kasapulan na, haan na kasapulan ti uray ana man nga gasolina. Iso na engganyo nak nga gimatang kase awan maited na nga madi nga angin, awan maanglab ti tattao nga madi nga asok”

(It only needs electricity, not gasoline. I bought it because it doesn't emit harmful gases, so people won't inhale harmful smoke).

E-bikes contribute to cleaner air, reducing greenhouse gas emissions and harmful pollutants from gasoline vehicles; this improved air quality directly translates to better respiratory health, a key component of public health. The reduction in noise pollution further contributes to a more peaceful and healthier environment. This contributes to a higher quality of life, which is another facet of environmental health, encompassing the social and psychological well-being of individuals within their environment.

By using electricity, often sourced from renewable energy, e-bikes significantly reduce greenhouse gas emissions, contributing to cleaner air and combating climate change. Furthermore, the quiet operation of e-bikes contributes to a more peaceful soundscape, further enhancing their eco-friendly attributes. The cumulative effect of widespread e-bike adoption could significantly improve air quality in urban areas, leading to substantial a more pleasant living environment.

Using e-bikes reduces air pollution, improving the quality of the air we breathe. Air pollution is a significant

problem, and using e-bikes can help to reduce it. E-bikes offer a sustainable and eco-friendly alternative to other vehicles, contributing to cleaner air quality. As cities worldwide grapple with traffic congestion and air pollution, e-bikes offer a promising solution for promoting sustainable mobility (Zhou et al, 2023). Climate change is a pressing issue, and the use of e-bikes can help address it. As the planet warms and weather patterns become more extreme, e-bikes offer a sustainable and resilient mode of transportation, and contribute to a cleaner environment.

These vehicles are powered by batteries and therefore do not emit any pollutants into our air. Further, electric bikes are lightweight and aerodynamic, so they require much less energy to travel long distances than a traditional car. This means that fewer fossil fuels are used for transportation, and more of these resources can be kept in the ground for future generations (Garcia, 2023). Moreover, E-bikes will emit no pollutants into the atmosphere. It also reduces air contaminants that cause smog and other air pollution, which are a major issue in urban environments and have a significant impact on local habitats (Wal, 2023). Furthermore, factors affecting the decision to use electric bikes for transportation include attitudinal factors such as green attitudes, perceived green value, and loyalty. With growing environmental awareness, there is a shift from petrol to electric vehicles, particularly affordable and space-efficient electric three-wheelers. Studies show that these vehicles reduce carbon footprints and energy consumption (Yadav, 2020).

### Level of Awareness of E-bike Users on Traffic Rules and Regulation

This section presents data gathered on the level of awareness of e-bike users on the traffic rules and regulations. This data serves as a foundation for understanding the gaps in knowledge that may exist among the e-bike users within Laoag City. By analyzing this data gathered, stakeholders can implement more effective educational initiatives and policy measures aimed at enhancing the traffic safety of e-bike users. Ultimately, a better-informed e-bike user community can lead to safer streets for everyone.

Table 3 Level of Awareness of E-bike Users on Traffic Rules and Regulation (n=107)

Table 3 shows that the level of awareness of e-bike users regarding the wear of “high-visibility reflective vests and luminous-colored garments” from 6 PM to 6 AM obtained with a highest mean of 3.73 as interpreted as fully aware. Followed by coming out of side streets or driveways with precaution obtained a mean of 3.47 as interpreted as fully aware. The proper lane usage on roads obtained a mean of 3.44 as interpreted as fully aware. Moreover, the respondents were fully aware of the equipment required for safe riding,

and under the influence of alcohol or drugs had both obtained a mean of 3.42.

Item/ Factor	$\bar{x}$	Interpretation
Proper lane usage on roads.	3.44	Fully Aware
Equipment required for safe riding.	3.42	Fully Aware
Prohibited to drive in the inner line when operating slow vehicles.	3.29	Fully Aware
Laws concerning riding in e-bike lanes.	3.19	Aware
Regulations regarding carrying passengers.	3.20	Aware
Using electronic devices while riding.	3.33	Fully Aware
Requirements for proper lighting on your e-bikes.	3.41	Fully Aware
Regulations pertaining to riding on sidewalks.	3.12	Aware
Under the influence of alcohol or drugs.	3.42	Fully Aware
Only those persons who are holders of a license to operate a motorcycle shall be allowed to operate an electric or e-bike.	3.04	Aware
No parking shall be allowed on either side of the shoulder along national roads.	3.25	Aware
Coming out of side streets or driveways with precaution.	3.47	Fully Aware
Slow vehicles cause an Obstruction of Traffic.	3.29	Fully Aware
E-bike user must wear “high-visibility reflective vest and luminous-colored garments” from 6 PM to 6 AM.	3.73	Fully Aware
<b>Composite mean</b>	<b>3.32</b>	<b>Fully Aware</b>

*Legends:*

Value	Range	Descriptive Interpretation	Verbal Interpretation
4	3.26-4.00	Fully Aware	E-bike user possesses proficiency and knowledge about traffic rules and regulations.
3	2.51-3.25	Aware	E-bike user can understand traffic rules and regulations.
2	1.76-2.50	Not Aware	E-bike user are only familiar with the traffic rules and regulations.
1	1.00-1.75	Fully Not Aware	E-bike user has absolutely no knowledge about traffic rules and regulations.

Furthermore, the requirements for proper lighting on e-bikes gained a mean of 3.41 interpreted as fully aware. Followed by the prohibited to drive in the inner line when operating slow vehicles, and slow vehicles cause an obstruction of traffic had obtained a mean of 3.29 as they interpreted as fully aware. The respondents are aware about no parking shall be allowed on either side of the shoulder along national roads had obtained the mean of 3.25. The regulations regarding carrying passengers had obtained a mean of 3.20 interpreted as aware. Followed by laws concerning riding in -bike lanes which obtained 3.19 interpreted as aware. Regulations pertaining to riding on sidewalks obtained a mean of 3.12 interpreted as aware. Lastly, only those persons who are holders of a license to operate a motorcycle shall be allowed to operate an electric or e-bike obtained the lowest mean of 3.04 interpreted as aware.

It can be gleaned from the 3.1 table that the level of awareness that e-bike users have possesses proficiency and knowledge about traffic rules and regulations, as evident on the composite mean of 3.32 (fully aware).

Among the sixteen (16) categories, the highest weighted mean, which gained 3.73 was the wearing of high visibility reflective vest and luminous-colored garments from 6 PM to 6 AM. Followed by coming out of side streets or driveways without precaution, with a weighted mean with 3.47. On the contrary, the lowest weighted mean which garnered 3.04, was the only those persons who are holders of a license to operate a motorcycle shall be allowed to operate an electric or e-bike.

These are supported by the statements Participant 2, male, e-bike users for ten months, and resident of Brgy. 1 San Lorenzo, Laoag City, mentioned that:

“Kadeta nga banag ket awan met pay gamin mangmanggeg ko wenna nangibaga kanyak nga masapol gayam ti lisensya na. Bago nak gamin gimatang ti e-bike, ado gamin makitkitak nga ubbing nga agug-ugor. Iso kunak mayat garud ti e-bike

tapno mauggor met tay annak ko ken kaanakak no mapan da agbasa”

(In that matter I was not yet informed or advised that a license was indeed necessary. I had recently purchased an e-bike, as I had seen many children using them, as for my family and children it was sustainable transportation).

Moreover, the Participant 13 female, e-bike users for five months, and resident of Brgy 2 Santa Joaquina, Laoag City, declared that:

“Makitkitak ngamin ditoy ayan mi nga uray ubing nu kaya na agmanehon usaren nan isu ti kunak haan kasapulan ti lisensya nga agmanehon ti ebike”

(I observed that in our barangay, even the young ones and assumed that it was not necessary to have license to operate an e-bike.)

The Participant 24, female, e-bike users for 2 years, and resident of Brgy. 1 San Lorenzo, Laoag City, affirmed that:

“Idi nag- inquire nak iti e-bike, haan met required nga ag undergo kam seminar. Ken awan met inbagbaga dagitay naggatangak ti e-bike nga kailangan dapat naka license ti aguggor”

(I inquired about the e-bike and learned that a seminar was not required. Additionally, those sellers did not state that a license was necessary.)

Moreover, Participant 55 female, e-bike users for three months, resident of Brgy 1 San Lorenzo, Laoag City, said that:

“Awan met madamdag ko manipud naalak detoy e-bike ko. Ngem no adda man kasta a ket willing nak met nga sumurot. Tapno in case man nga adda aksidente a ket adda maipakitak, kaslang kumbaga adda assurance ko.”

(I didn't hear anything about this e-bike even before I bought it. However, if necessary, I'm willing to comply. So that in case of an accident, I have something to show, like I have assurance).

It shows that they are fully aware of the wearing of reflective vests, which garnered the highest weighted mean with 3.72. Since in the year 2023, the Ilocos Norte police implemented a Provincial Order No. 046-2023, which covers electric bicycle or e-bikes, tricycles, “kurong-kurong” (makeshift sidecar) and farm machinery, will be in force between 6 PM to 6AM daily and when visibility is poor due to bad weather. Because of this ordinance, drivers are familiar with this which has significantly impacted driving practices in the province. Hence, e-bike users are more aware of that simple rule compare to the other basic rules and regulations on roads. However, it also reveals that the users have a little knowledge that only those persons who are holders of a license to operate a motorcycle shall be allowed to operate an electric or e-bike. Based on City Ordinance No. 2020-045 Section 14, only those persons who are holders of a license to operate a motorcycle shall be allowed to operate an electric or e-bike.

The Social learning theory occurs through observation, imitation, and modeling and is influenced by factors such as attention, motivation, attitudes, and emotions. The E-bike users had observed that within the community through the others e-bike users are not fully aware that those holders of license should be allowed to drive e-bike.

The lack of dissemination of policy would affect the awareness of e-bike users on the existing traffic rules and regulation within the locality. The lack of dissemination of policy is a critical barrier to effective implementation. Clear, concise, and accessible communication is essential to ensure that e-bike users understand the policy's requirements and timeless. Without effective dissemination, even well-designed policies can fail to achieve their objectives. This indicates a need for public awareness campaigns that focus more on e-bike-specific laws that encompass the traffic rules and regulations within the locality.

According to the City Ordinance 2020-45, laws relating to electric bikes emphasize the necessity of proper regulations and adherence measures. Effective communication strategies are critical for ensuring that e-bike users understand the traffic rules and regulation. It indicates that when policy information is not effectively disseminated, users are at a heightened risk of violating traffic laws (Lawson et al., 2020). Effective interventions and the coupling effect of various combinations can help eliminate accident risk and ensure traffic safety (Yang et al, 2019).

### **Challenges faced by traffic enforcers in enforcing traffic rules and regulation to E-bike users**

Table 4 presents data gathered on the challenges faced by the traffic enforcer in enforcing traffic rules and regulation to the E-bike users in terms of the speed limits, resources on the traffic rules and regulation, responding accidents, appropriate penalties of e-bikes violation such as right of way, intersection and safety gears with proper lighting of the e-bike.

Table 4 Challenges faced by traffic enforcers in enforcing traffic rules and regulation to E-bike users (n=34)



### Disregarded Traffic Rules and Regulations

Disregard means a behavior of an individual that shows no any interest in someone or something. Disregarded traffic rules and regulation is simply a lack of understanding or knowledge. People may not fully comprehend the rules and regulations or may be unaware of the consequences of violating them. In some cases, individuals may even believe that they are above the law or that the rules do not apply to them (Buzz et al., 2021)

In this study, a disregarded traffic rules and regulation is defined as e-bike users neglecting or ignoring the traffic rules and regulations as it focuses on the careless, reckless driving and intentionally crossover intersection disregarding City Ordinance of Laoag City, Ilocos Norte. These are supported by the statement of Participants 1, male, a traffic enforcer, 39 years old and has been in service for ten years, affirmed that:

“Aginkukuna da laeng, haan da maawatan ti one-way road, derderesto da latta. Aglalo no national road, patarayen da latta pati intersection uray adda pay dadduma nga road users.”

(They simply assert that they do not understand one-way roads and they just went straight. This is especially common on national roads, where they fail to yield at intersections even in the presence of other road users.)  
The Participant 14, male, a traffic enforcer, 28 years old and has been service for three years, asserted that:

“Kanayon dat adda tenga, haan da ammo appaigid aglalo ket slow vehicle da. Sumrek da latta uray one way. Narigat da talaga tumawid or agkilo inti intersection a haan da ammo dagiti basic rules, kaslang no sinu umuna agkillo that may cause traffic”

(There were instances where e-bike users, unaware of traffic rules while operating slow-moving vehicle. They often entered one-way streets. They struggled to navigate intersections, often unaware of basic rules, such as who had the right of way that may cause traffic congestion)  
Moreover, Participant 30, male, a traffic enforcer, 59 years old and has been in service for eight years, claimed that:

“Dagiti ebike users ket isuda pay ti natured lumasat intersection awan buteng da.”

(The e-bike user was not afraid to crossover intersection where they often failed to yield.)

Table 4 presents the factors that the respondents encountered in enforcing traffic rules and regulation was crossover in intersection obtained the highest mean of 3.61 followed by clearer guidelines on e-bike parking which obtained a mean of 3.5. The awareness of e-bike users on traffic rules obtained 3.41 weighted mean.

Moreover, the difficulty to enforce speed limits gained a mean of 3.35. The appropriate penalties for e-bike violations obtained a mean of 3.23. The enforcement of safety gear regulation obtained a mean of 3.20. The frequent

Item/ Factor	$\bar{x}$	Interpretation
Enforce speed limits	3.35	Always
Awareness of e-bike users on traffic laws	3.41	Always
Lack of adequate resources for educating e-bike users	3.00	Often
Hard to respond accident involving e-bike	2.67	Often
Monitoring e-bike usage in non-vehicle areas such pedestrian zones	2.73	Often
Appropriate penalties for e-bike violations	3.23	Always
Frequently misunderstand right-of-way rules in traffic situations	3.14	Often
Enforcing safety gear regulation	3.20	Often
Existing traffic signs and signals is accommodated	2.88	Often
Clearer guidelines on e-bike parking	3.5	Often
Do not know how to properly crossover intersection	3.61	Always
<b>Composite mean</b>	<b>3.15</b>	<b>Often</b>

#### Legends:

Value	Range	Descriptive Interpretation	Verbal Interpretation
4	3.26-4.00	Always	Problems are encountered daily in the enforcement of traffic rules and regulations among E-bike users.
3	2.51-3.25	Often	Problems encountered twice or thrice a week in the enforcement of traffic rules and regulations among E-bike users.
2	1.76-2.50	Rarely	Problems encountered once a week in the enforcement of traffic rules and regulations among E-bike users.
1	1.00-1.75	Never	Problem never encountered in the enforcement of traffic rules and regulations among E-bike users.

misunderstanding of right-of-way rules in traffic situation gained a mean of 3.14. The lack of adequate resources for educating e-bike users obtained a mean of 3.00.

Furthermore, existing traffic signs and signals gained a mean of 2.88. Monitoring e-bike usage in non-vehicle areas such pedestrian zones obtained a mean of 2.73. Hard to respond accident involving e-bike, which obtained the lowest mean of 2.67.

It can be gleaned from the 4.1 table that enforcing traffic rules and regulations among e-bike users had a problem encountered by traffic enforcers twice or thrice a week, as reflected by the composite mean of 3.15 as interpreted as often.

Among the (12) categories, the highest weighted mean that gained 3.61 was e-bike users does not know to crossover in intersection. It implies that potential need for clearer signage and traffic management solutions at intersections to aid users who may be inexperienced. Followed by clearer guidelines on e-bike parking to prevent obstruction in highway, with a weighted mean of 3.5. In contrast, the lowest weighted mean of 2.67 was the accidents involving e-bikes are harder to respond than other type of traditional bicycles.

The following themes were arrived to support the findings:

The e-bike users must navigate traffic rules and regulation, particularly when crossing intersections, to ensure their safety and other road users. Understanding right-of-way rules is essential, especially at congested intersection. E-bike users should utilize designated bike lanes as much as available and they must also be prepared to merge into traffic congestion safely.

Furthermore, proper signaling and awareness are crucial when making turns as many accidents occur during those maneuvers.

According to Yang et al, 2019, disregard policy would e-bike users might cause traffic accidents that are common, with over 90% caused by risky riding behaviors. This includes illegal lane occupation, over-speeding, running red lights, and obstructing traffic flow. In 2015, the number of e-bike accidents was 8.2 times larger than bicycle and 5.4 times larger than pedestrian accidents. Hospitalization records show that one-third of e-bike users were seriously injured. The number of e-bike accidents increased by 71.52% in five years, with deaths increasing by 71.52%.

### **Absence of E-bike Ordinance**

Absence of E-bike ordinance it means lack of understanding and knowledge of the community about awareness of the laws and regulations that apply in the e-bikes (Himawan et al., 2023)

In this study, absence of an e-bike ordinance refers to a lack of established guidelines or regulations pertaining to the traffic rules and regulation within the locality. These are supported by the statements Participants 4, male, a traffic enforcer, 26 years old and has been in service eleven months, stated that:

“Awan gamin paglintegan ken nasayaat nga ordinances tapno ammo da agdisiplina.”

(There is no law or ordinances that make e-bike users become discipline on the roads)

The Participant 17, male, a traffic enforcer, 40 years old and has been service for ten years, claimed that:

“Narigat ikkan ti violations ti E-bike kase awan met pay napintas nga ordinance ti E-bike. Uray man adda guidelines, haan dan to met la surotan no dida ammo ta guidelines.”

(It was challenging to enforce violations related to e-bikes due to lack of clear ordinance. Although guidelines existed, they not consistently followed)

Lastly, Participant 25, male, a traffic enforcer, 41 years old and has been in service for ten years, disclosed that:

“Ti e-bike ket para barangay haan nga natin roads. Agkurang iti implementation ti LTO, awan violation a maited kadakuada, ket saan nga mabalin nga ticketan no saan nga iyuray ti tao a makin bagi.”

(Those e-bikes are only good for the barangay, not on national roads. There was a lack of implementation from LTO, and no

violations were issued to them; they could not be ticketed if the driver was not present).

The Human factory theory posits individual characteristics, such as attention span, reaction time, and decision-making processes, significantly impact how e-bike users interpret and follow traffic regulations. This indicates that although e-bike users are fully aware of various traffic laws and regulations, there are significant knowledge gaps in their practical skills and safe riding practices, especially when it comes to navigating intersections. This is supported by the statements of the participants emphasizing the lack of adherence to even basic traffic rules, such as yielding and navigating one-way lines and highway intersections.

According to Smith and Brown (2020), argued that ineffective law enforcement and unclear guidelines contribute to increased unsafe practices among e-bike users. The absence of e-bike ordinance of the traffic rules and regulations can lead to confusion regarding the safe riding practices of e-bike users and other road users. It indicates a significant gap in e-bike users' awareness, as stated by the participants who observed a lack of discipline among e-bike users and challenges in enforcing the existing regulations.

The result of the study shows that some of the e-bike users are exhibits reluctance when navigating intersections where enforcement of traffic regulations by authorities is challenged by those encounters. This hesitation can be attributed primarily to two key factors: first, a notable lack of resources that hinders e-bike users from acquiring essential knowledge related to safety awareness, and second, the extensive presence of aggressive driving behaviors exhibited by e-bike users. The absence of adequate educational resources contributes to a deficit in understanding the rules of the road, which in turn affects the confidence and decision-making abilities of e-bike users. Consequently, many of these individuals may feel uncomfortable or unsafe when attempting to cross intersections, particularly in scenarios where there is a perceived risk stemming from the unpredictable nature of vehicular accidents. Additionally, the study was similar result of Xu et al., (2011) advocated enhancing user safety education and training by highlighting the importance of road safety in order to intentionally increase safety awareness and avoid unsafe riding behavior.

## **IV. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS**

This chapter presents a summary of the findings from Chapter 4, where conclusions and recommendations were developed based on the data gathered and analyzed. The chapter begins by reviewing the key findings of the study, highlighting the most significant results. It then proceeds to present the conclusions drawn from the data. Finally, the chapter outlines recommendations for future research and practice, based on the insights gained from the study.

### *A. Summary*

From a thorough analysis of the data and results obtained, the most significant factor that affected the decision of drivers to use E-Bikes was the contribution to environmental protection, which gained 72.89%. On the

other hand, speed and acceleration capabilities of e-bikes were the least considered factor, garnering the lowest rank with 39.25%.

Regarding the level of awareness of E-bike users on traffic rules and regulations, the wearing of high visibility reflective vest and luminous-colored garments from 6 PM to 6 AM, received the highest weighted mean with 3.72. However, the awareness regarding those persons who are holders of a license to operate a motorcycle shall be allowed to operate e-bike, garnered the lowest weighted mean (3.04). Moreover, regarding the challenges faced by traffic enforcers in enforcing traffic rules and regulation to E-bike users, it was revealed that they always encountered e-bike users who did not know how to crossover at intersection, which gained the highest weighted mean with 3.61. As for the lack of adequate resources for educating e-bike users about safe and lawful riding practices, the problems encountered by the traffic enforcers twice or thrice a week in the enforcement of traffic rules and regulations among E-bike users gained the lowest weighted mean with 2.6.

### B. Conclusions

Based on the findings of the study, the following conclusions were drawn:

The desire to contribute to environmental protection is a key motivator for drivers for choosing e-bikes, demonstrating a growing awareness of the impact of transportation choices on the environment. This shift towards sustainable mobility represents a powerful force to for positive change, reflecting a collective commitment to a healthier and cleaner environment.

The data gathered shows that e-bike users are knowledgeable about traffic rules and regulations, particularly regarding visible safety measures. However, they are less informed about other specific regulations that require full attention.

The perceived level of awareness among e-bike users regarding traffic rules and regulations and the actual on-road behaviors that traffic law enforcement encountered present a significant contradiction. This contradiction highlights the difficulties that traffic enforcers faced in enforcing traffic rules and regulations.

### C. Recommendation

The researchers recommend the following based on the data gathered.

- It is advisable for e-bike users to familiarize themselves existing traffic rules and regulation, particularly those pertaining to e-bikes, to increase their awareness
- The Traffic Division and Data Center College of the Philippines-College of Criminal Justice Education may post the informative video presentation through social media platforms titled “E-bike mo, Kaalaman ko”, which would help raise awareness of traffic rules and regulation among e-bike users.
- The Land Transportation Office may mandate that e-bike users go through seminars before obtaining an e-bike, in

order to gain a basic knowledge of traffic rules and regulation, eventually decrease the road accidents.

- The sellers and other transportation authorities may adopt the informative video presentation to build a comprehensive strategy that will help and guide the e-bike users for acquiring electric bike to emphasize safety practices and ensure they understand the basic traffic rules on the road.
- Future researchers may conduct a study with a wider scope to enhance the results of this study.

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