

Awareness and Factors Affecting the Adoption of E-Mobility Solutions among Tricycle Drivers in Tuguegarao City

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Abstract:

The study explores the level of awareness and the factors affecting the adoption of e-mobility solutions among tricycle drivers in Tuguegarao City. The 367 registered tricycle drivers selected at random were the respondents of the study. A structured survey questionnaire was used to gather data on their awareness along six dimensions, namely: electric vehicles, battery technology, charging infrastructure, sustainable mobility, economic opportunities, and policy and regulations. On the other hand, the factors affecting their adoption include acquisition cost, maintenance cost, availability of charging stations, availability of service centers, ease of use, and after-sales support.

The findings showed that the tricycle drivers' awareness of e-mobility solutions was generally low, while all other dimensions were rated "slightly aware." Among the factors affecting their adoption, acquisition cost, maintenance cost, charging infrastructure, service centers, ease of use, and after-sales support were all rated as significant considerations. Such a result suggests that the lack of knowledge continues to hinder readiness for e-mobility adoption, while drivers still acknowledge the importance of cost, infrastructure, and usability. Similarly, age and sex significantly influence the awareness of e-mobility solutions; male and younger drivers show high awareness. Equally, sex and age significantly influence tricycle drivers' awareness of e-mobility solutions, with males and younger drivers showing higher awareness, whereas other profile factors are not significant. Adoption decisions are mainly shaped by sex and educational attainment, emphasizing the need for gender-responsive strategies, inclusive training, and stronger structural support to encourage e-mobility transition. Likewise, the study revealed a statistically significant moderate positive relationship between tricycle drivers' awareness and the factors influencing their decision to adopt e-mobility solutions ($r = .533$, $p = .000$). This denotes that increasing drivers' awareness through education and information campaigns can intensify their readiness and willingness to shift toward sustainable electric mobility.

The study recommends the need to strengthen information campaigns, financial support mechanisms, expansion of infrastructure, and training programs to support the transition to sustainable transport.

Keywords: e-mobility, electric tricycles, awareness, adoption factors, tricycle drivers, sustainable transport

INTRODUCTION

One of the major concerns in global development, particularly in low- and middle-income countries, where informal transport systems dominate daily travel, is the shift toward sustainable urban mobility. Informal transport systems, like tricycles and minibuses, provide transportation services to urban residents; yet, these systems remain largely excluded from the formal transport planning and technological innovation agenda. Integrating electric mobility in informal transport presents both an opportunity and a challenge as the government pursues low-carbon and environmentally friendly sustainable transport.

Tricycles constitute one of the most common forms of public transportation in the Philippines. In Tuguegarao City, these vehicles provide short, flexible, and affordable transportation. However, these vehicles are not in response to the increasing concern of the government about air pollution. Thus, to address this concern, the government enacted the Electric Vehicle Industry Development Act (Republic Act 11697), which promotes the adoption of electric vehicle infrastructure development and regulatory reforms.

Barriers to electric vehicle adoption, such as high acquisition costs, inadequate charging infrastructure, weak after-sales support, and limited access to financing, have been identified by previous studies. These studies focus on technical feasibility and policy frameworks. Simultaneously, awareness levels and decision-making factors of informal transport operators, who are the primary end-users of these technologies, are only a few.

Awareness of electric vehicles, battery technology, charging infrastructure, sustainable mobility, economic opportunities, and policy frameworks may shape the tricycle drivers' readiness to adopt electric tricycles. Considerations such as acquisition cost, maintenance expenses, availability of charging stations and service centers, ease of use, and after-sales support are likely to affect the drivers' adoption behavior.

Hence, this research aimed to assess the tricycle drivers' awareness of e-mobility solutions and to determine the factors affecting their decision to adopt electric mobility in Tuguegarao City.

Statement of the Problem

This study sought to determine the awareness level of tricycle drivers on e-mobility solutions and the factors affecting their decision to adopt electric tricycles in Tuguegarao City.

Specifically, it aimed to answer the following questions:

1. What is the demographic profile of the respondents in terms of:

- 1.1 sex
- 1.2 age
- 1.3 number of years as tricycle driver
- 1.4 average daily income
- 1.5 education
- 1.6 religious affiliation
- 1.7 type of tricycle used

2. What is the awareness level of tricycle drivers on e-mobility solutions in terms of:

- 2.1 Electric Vehicles
- 2.2 Battery Technology
- 2.3 Charging Infrastructure

2.4 Sustainable Mobility

2.5 Economic Opportunities

2.6 Policy and Regulations

3 What are the factors affecting the decision of tricycle drivers in adopting e-mobility solutions in terms of:

3.1 Acquisition Cost

3.2 Maintenance Cost

3.3 Availability of Charging Stations

3.4 Availability of Service Centers

3.5 Ease of Use

3.6 After-Sales Support

4 What policy interventions may be proposed based on the findings of the study?

5 Is there a significant difference in the Level of Awareness of Tricycle Drivers on E-Mobility Solutions when grouped according to profile?

6 Test of Difference in the Factors Affecting the Decision of Tricycle Drivers in Adopting E-Mobility Solutions when grouped according to Profile?

7 Is there a significant relationship between Level of Awareness of Tricycle Drivers and Factors Affecting the Decision of Tricycle Drivers in Adopting E-Mobility Solutions?

METHODOLOGY

Research Design

This study employed a **descriptive–correlational quantitative research design**. The descriptive component determined the awareness level of tricycle drivers on e-mobility solutions and the extent to which various factors influence adoption decisions. The correlational component is used to examine relationships between awareness and adoption factors.

Participants of the Study

The population of the study consisted of all registered and active tricycle drivers under the 37 Tricycle Operators and Drivers' Associations (TODAs) in Tuguegarao City, with a total of 7,832 registered tricycle franchises.

Using Raosoft's sample size calculator with a 95% confidence level and a 5% margin of error, a minimum sample size of **367 respondents** was determined. Simple random sampling was used to select the respondents from the total population.

Research Instrument

The main instrument used in this study is the structured survey questionnaire with two parts. The first measured the level of awareness of tricycle drivers on e-mobility solutions across six dimensions, namely electric vehicles, battery technology, charging infrastructure, sustainable mobility, economic opportunities, and policy and regulations. Meanwhile, the second part assessed the factors affecting adoption by measuring the extent of agreement on acquisition cost, maintenance cost, availability of charging stations, availability of service centers, ease of use, and after-sales support. All items in the questionnaire were rated using a Likert-type scale.

Data Gathering Procedure

The researchers asked permission from the university administration to distribute the questionnaire before collecting the data. Those were collected through the administration of the questionnaire to the tricycle drivers in TODA terminal stations in Tuguegarao City. The researchers explained the study's purpose and eventually obtained informed consent from the participants.

Statistical Treatment of Data

Several statistical tools in the analysis of data were employed in the study. To describe the profile of the respondents, frequency counts and percentages were used, while the weighted mean was utilized to determine the level of awareness of e-mobility solutions and to assess the factors affecting adoption. Additionally, descriptive ratings were applied to interpret the mean scores and provide meaningful qualitative descriptions of the quantitative results.

RESULTS AND DISCUSSION (Quantitative Summary)

I. Profile of the Tricycle Drivers

Table 1.1 Frequency and Percentage Distribution of Respondents according to sex

	Frequency	Percent
Male	384	98.46
Female	6	1.54
Total	390	100.00

Table 1.1 displays the frequency and percentage distribution of respondents according to sex. The result reveals that the majority of the drivers were male, with 384 respondents or 98.46%, while 6 respondents or 1.54% were female. This reveals that tricycle driving is a male-dominated occupation. It is attributed to the demanding nature of work. The minimal number of female drivers suggests that women's participation in this livelihood is limited. This posits that gender disparities exist within the transport system. Hence, providing equal access to training, safety measures, and financial assistance promotes gender equality and economic empowerment among women.

Table 1.2 Frequency and Percentage Distribution of Respondents according to age

	Frequency	Percent
20 and below	4	1.03
21 to 31 years old	36	9.23
32 to 42 years old	91	23.33
43 to 53 years old	164	42.05
54 and above	95	24.36
Total	390	100.00

Table 1.2 shows that 164 respondents were aged 43 to 53, comprising the largest portion, while 4 respondents, or 1.03 %, were aged 20 and below. This indicates that tricycle driving is predominantly composed of middle-aged and older individuals, while younger individuals are less represented in this occupation.

The findings posit that tricycle driving is often a long-term livelihood employment option for those with limited access to formal employment opportunities as they age. Older drivers may remain in this occupation due to limited alternative sources of income, lack of retirement benefits, or insufficient qualifications for other jobs. This finding also implies that tricycle drivers who are aging may face increased physical stress, health risks, and financial vulnerability, especially as their productivity declines over time. Therefore, these drivers must be given social protection, healthcare support, and alternative livelihood or skills training opportunities to help ensure their financial security and well-being.

Table 1.3 Frequency and Percentage Distribution of Respondents in terms of the number of years as a tricycle driver

	Frequency	Percent
5 and below	66	16.92
6 to 10 years	80	20.51
11 to 15 years	86	22.05
16 years and above	158	40.52
Total	390	100.00

Table 1.3 displays the frequency and percentage distribution of respondents in terms of the number of years they have worked as tricycle drivers. The data reveal that the largest group of respondents, with 158 or 40.52%, had been working for 16 years and above, followed by 11 to 15 years of experience by 86 respondents or 22.05%, and those with 6 to 10 years, with 80 respondents or 20.51%. Meanwhile, 66 respondents or 16.92% had been in the occupation for 5 years or less. This indicates that a significant proportion of the respondents have long-term experience in tricycle driving and that they remain in this occupation for long periods rather than considering it as a temporary source of income.

The result indicates that tricycle driving serves as a stable livelihood for respondents because of limited alternative opportunities for employment, especially those with lower educational attainment. Additionally, strong dependence on this occupation for daily financial needs and family support is shown by the high percentage of long- service drivers. Nevertheless, staying in this occupation for a long period may expose them to economic vulnerability, especially in the absence of retirement plans, savings, or social protection. Therefore, there is a need to provide the drivers' financial literacy programs, savings and investment opportunities, and skills development programs to help drivers improve their long-term financial security.

Table 1.4 Frequency and Percentage Distribution of Respondents in terms of average daily Income

	Frequency	Percent
500 and below	207	53.08
501 to 1000	157	40.26
1001 to 1500	24	6.15
1500 and above	2	0.51
Total	390	100.00

Table 1.4 displays the frequency and percentage distribution of respondents in terms of their average daily income. The data show that the majority of tricycle drivers, 207 respondents or 53.08%, earned ₱500 and below per day, while only 2 respondents or 0.51% earned ₱1500 and above. This denotes that most tricycle drivers earn relatively low daily income, with only a small percentage receiving higher earnings.

This finding suggests that many tricycle drivers are financially at risk because their income is insufficient to meet their basic needs, with no opportunity to save for emergency funds. With low income, they may have difficulty investing in vehicle maintenance, healthcare, and even their children's education. The meager number of drivers earning high wages implies unequal earning opportunities among tricycle drivers, which depend on factors like location, passenger demand, and ownership of the tricycle. Hence, there is a need to provide the drivers with opportunities for income modification or expansion, and access to financial support that can help them improve their income stability and financial well-being.

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Table 1.5 Frequency and Percentage Distribution of Respondents in terms of Education

	Frequency	Percent
No schooling	3	0.77
Elementary Undergraduate	20	5.13
Elementary Graduate	22	5.64
High school undergraduate	86	22.05
High school graduate	104	26.67
College undergraduate	81	20.77
College graduate	59	15.13
Vocational course	15	3.85
Total	390	100.00

Table 1.5 poses the frequency and percentage distribution of respondents by educational attainment. The largest group of respondents was high school graduates, with 104 or 26.67%, followed by high school undergraduates with 86 or 22.05%, and college undergraduates with 81 or 20.77%. Additionally, 59 or 15.13% were college graduates, while smaller proportions were elementary graduates (5.64%), elementary undergraduates (5.13%), and those who completed vocational courses (3.85%). Only 3 respondents, or 0.77%, had no schooling. This posits that most tricycle drivers have attained secondary education, while a number have reached college level, though not all completed their degrees.

The result implies that while many respondents attained basic educational qualifications, a significant portion may not have completed higher education, which prevented them from being employed with higher income and better job security. The presence of college undergraduates and graduates in the occupation also suggests that some individuals may have turned to tricycle driving because of limited job opportunities, underemployment, or the need for immediate income. This highlights the issue of employment mismatch and limited employment opportunities in the labor market. Therefore, there is a need to provide skills development, vocational training, and livelihood programs that can enrich their competencies and open opportunities for alternative or additional sources of income in order to improve their quality of life.

Table 1.6 Frequency and Percentage Distribution of Respondents in terms of Religious Affiliation

	Frequency	Percent
Roman Catholic	340	87.18
Non-Catholic	50	12.82
Total	390	100.00

Table 1.6 presents the frequency and percentage distribution of respondents by religious affiliation. It has been revealed that majority of the respondents, with 340 or 87%, were Roman Catholic, while 50 respondents, or 12.82%, were non-Catholic. This indicates that Roman Catholicism is the dominant religious affiliation among the respondents.

This finding implies that religious beliefs and values may play a critical role in shaping the attitudes, behaviors, and daily lives of the respondents, their work ethics, as well as their financial and social interactions. Their participation in community activities and openness to support programs facilitated by religious institutions have been influenced by their religious affiliation. Hence, their religious organization can serve as partners in the implementation of community-based programs such as financial statements and the like.

Table 1.7 Frequency and Percentage Distribution of Respondents in terms of Tricycle Used

	Frequency	Percent
Rented	143	36.67
Owned	247	63.33
Total	390	100.00

Table 1.6 presents the frequency and percentage distribution of respondents in terms of the type of tricycle used. The numbers show that the majority of the respondents, with 247 or 63% are owners of the tricycles; meanwhile, 143 or 36.67% were renting the tricycle they operate. This means that most tricycle drivers have ownership of their vehicles, while a significant portion still depend on rented units to earn a living.

The result suggests that ownership of the vehicle may provide greater financial independence. Drivers who own the units do not need to pay daily rental fees, allowing them to save their earnings. In addition, ownership also delivers long-term economic benefits, for the unit serves as a personal asset. Meanwhile, drivers who rent may experience lower income due to rental expenses, so they have a limited chance to invest. Hence, there is a need for financial assistance programs, opportunities for loans, or cooperative ownership schemes that can help them acquire their own tricycles. Such initiatives may improve their financial security and economic well-being.

II. Awareness on E-Mobility Solutions

Table 2.1: Awareness level of tricycle drivers on e-mobility solutions in terms of Electric Vehicles

	Item Mean	Descriptive Rating
1. I know what an electric vehicle (EV) is and how it operates.	2.54	Aware
2. I can distinguish an EV from a conventional fuel-powered tricycle.	2.46	Slightly Aware
3. I am aware of the advantages of EVs in terms of fuel savings.	2.44	Slightly Aware
4. I am familiar with brands/models of electric tricycles available in the market.	2.10	Slightly Aware
5. I understand the environmental benefits of using EVs.	2.51	Aware
Category Mean	2.41	Slightly Aware

The awareness level of tricycle drivers regarding e-mobility solutions in relation to electronic vehicles is illustrated in Table 1.1. The results suggest that tricycle drivers' degree of awareness regarding e-mobility solutions, specifically electric vehicles (EVs), is classified as "Slightly Aware" with an average score of 2.41. Respondents exhibit moderate awareness of the environmental benefits and the definition of an electric vehicle (EV) (average = 2.54). However, they have extensive gaps in their comprehension of EV-related details, including the ability to differentiate between EVs and fuel-powered tricycles (average = 2.46), the ability to identify fuel savings benefits (average = 2.44), and the knowledge of available brands and models (average = 2.10).

These findings highlight how crucial focused information campaigns and educational programs are for raising awareness and encouraging adoption. Even though EVs have long-term economic and environmental advantages, drivers may be reluctant to make the switch if they don't fully understand them. A more seamless transition to sustainable transportation can be achieved by raising public awareness, coordinating local policies, and involving stakeholders in information dissemination, as stated by the Philippine Department of Energy (2022) and the International Renewable Energy Agency (2023).

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The results imply that it is vital to increase tricycle drivers' knowledge and familiarity with electronic vehicles by giving them training courses, campaigns, and hands-on experience on EV technology to help them become more and get used to electronic vehicles. Increasing awareness can support national e-mobility goals and environmental sustainability by facilitating the transition to cleaner transportation (DOE, 2022; IRENA, 2023).

Table 2.2: Awareness level of tricycle drivers on e-mobility solutions in terms of Battery Technology

	Item Mean	Descriptive Rating
1. I know the types of batteries used in electric tricycles.	2.27	Slightly Aware
2. I am aware of battery lifespan and replacement requirements.	2.29	Slightly Aware
3. I understand the concept of battery charging cycles.	2.28	Slightly Aware
4. I know the factors that affect battery performance.	2.29	Slightly Aware
5. I know the cost of battery replacement.	2.29	Slightly Aware
Category Mean	2.29	Slightly Aware

Table 2.2 shows the awareness levels of tricycle operators regarding e-mobility solutions, in relation to battery technology. All the indicators obtained the mean scores from 2.27 to 2.29, with an overall category mean of 2.29, with a descriptive rating of slightly aware. This divulges a low level of knowledge across all components of battery-related information. Furthermore, the findings the drivers' inability to possess technical knowledge for the proper utilization and maintenance of battery-powered systems.

Low awareness level of tricycle drivers on battery technology has implications for the successful adoption of electric transportation. Among the most critical factors affecting the reliability and long-term cost of owning an electric-powered tricycle are battery performance and maintenance. Limited knowledge on these may lead to poor maintenance practices, leading to battery degradation of the unit. This underscores the need for education and training programs focusing on battery literacy. Collaboration of government agencies and the private sector is much needed to offer technical orientations, hands-on training, and manuals for e-trike use.

Table 2.3 Awareness level of tricycle drivers on e-mobility solutions in terms of Charging Infrastructure

	Item Mean	Descriptive Rating
1. I know where public charging stations are located.	2.06	Slightly Aware
2. I am aware of home charging options for EVs.	2.13	Slightly Aware
3. I understand the charging time required for electric tricycles.	2.14	Slightly Aware
4. I am aware of the costs associated with charging.	2.19	Slightly Aware
5. I am familiar with the safety guidelines for charging.	2.43	Slightly Aware
Category Mean	2.19	Slightly Aware

Table 2.3 shows the awareness level of tricycle drivers on e-mobility solutions in terms of **Charging Infrastructure**. The results divulge that **all indicators** fall under the **"Slightly Aware"** category, with a **mean of 2.19**. This means a limited understanding among tricycle drivers about where and how to charge electric tricycles. Their low awareness acts as a hindrance to e-mobility. The development of accessible, well-marked, and user-friendly charging networks should be the priority of the government and private sectors (IEA, 2024; IRENA, 2023). In addition, **community-based orientation** on how to charge at home, how to estimate charging costs, and safety compliance could help bridge this awareness gap (ADB, 2021).

Table 2.4 Awareness level of tricycle drivers on e-mobility solutions in terms of Sustainable Mobility

	Item Mean	Descriptive Rating
1. I understand how EVs contribute to reducing air pollution.	2.46	Slightly Aware
2. I am aware of the role of EVs in reducing carbon emissions.	2.31	Slightly Aware
3. I recognize EVs as part of sustainable transportation.	2.36	Slightly Aware
4. I am aware of community health benefits offered by EV adoption.	2.44	Slightly Aware
5. I understand the long-term impact of e-mobility on the environment.	2.38	Slightly Aware
Category Mean	2.39	Slightly Aware

Table 2.4 indicates the awareness level of tricycle drivers on e-mobility solutions in terms of **Sustainable Mobility**. All items fall under the descriptive rating “**Slightly Aware**.” The **category mean is 2.39**, signifying a generally low level of understanding among respondents on the environmental and societal benefits of electric vehicles (EVs) as part of sustainable transportation systems.

The low level of awareness among the respondents on the implications of sustainable mobility indicates that they do not perceive the environmental and public health benefits of adopting electric vehicles. This can impede not only individual adoption but also community-wide transitions to cleaner transport systems. Thus, it is imperative to conduct educational and advocacy campaigns focused on environmental impacts, air quality, and health outcomes, particularly in urban transport sectors. Educational institutions, local government units, and non-government units may collaborate to conduct **community-based sustainability workshops, visual awareness materials, and EV pilot programs** that showcase real-world benefits. According to IRENA (2023), IEA (2024), and DENR (2022, increasing knowledge in this area can foster more proactive participation in environmental initiatives and support the Philippines’ national climate goals.

Table 2.5 Awareness level of tricycle drivers on e-mobility solutions in terms of Economic Opportunities

	Item Mean	Descriptive Rating
1. I am aware of the job opportunities related to EV maintenance and operation.	2.13	Slightly Aware
2. I understand how EV adoption can reduce daily operating costs.	2.23	Slightly Aware
3. I am aware of possible government subsidies for EV purchases.	1.87	Slightly Aware
4. I recognize the potential increase in income from using EVs.	1.87	Slightly Aware
5. I am aware of business opportunities in EV-related services.	1.87	Slightly Aware
Category Mean	1.99	Slightly Aware

Table 2.5 shows the awareness level of tricycle drivers on e-mobility solutions in terms of **Economic Opportunities**, indicating a consistently low level of awareness along all indicators, with a **category mean of 1.99, Slightly Aware**, descriptive rating. This signifies that tricycle drivers have a limited understanding of the economic benefits brought by the adoption of electric-powered vehicles.

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The result suggests that tricycle drivers are not well-informed about the **economic and livelihood opportunities** associated with e-mobility. What could slow down the shift to cleaner transportation, especially for the low-income operators who benefit the most, is their lack of awareness of government subsidies, income potential, and entrepreneurial ventures in EV-related services. Therefore, it is imperative to conduct economic literacy campaigns which include EV financing options, job training programs, and government incentives (IEA, 2024; ADB, 2021; UN ESCAP, 2022).

Table 2.6 Tricycle drivers' level of awareness on e-mobility solutions in terms of Economic Opportunities

	Item Mean	Descriptive Rating
1. I am aware of government policies promoting EV use.	1.97	Slightly Aware
2. I know the registration requirements for electric tricycles.	1.91	Slightly Aware
3. I am aware of traffic regulations specific to EVs.	1.95	Slightly Aware
4. I understand any tax incentives for EV adoption.	1.88	Slightly Aware
5. I am aware of penalties for non-compliance with EV regulations.	1.97	Slightly Aware
Category Mean	1.94	Slightly Aware

Table 2.6 displays the awareness level of tricycle drivers on e-mobility solutions in terms of **Policy and Regulatory Framework**, indicating an overall **category mean of 1.94**, corresponding to a *slightly aware descriptive rating*. This shows a generally low level of awareness among drivers regarding the existing policies, laws, and incentives governing electric vehicle (EV) use in the Philippines.

The low level of awareness of policies and regulations among tricycle drivers implies a **communication gap** between policy formulation and implementation at the grassroots level. Without understanding the registration procedures and compliance requirements, adopting the use of electric vehicles may be difficult. Hence, there is a need to enrich the dissemination of information through barangay level orientations. Strengthening **regulatory literacy** among drivers is essential to ensure the safe, legal, and widespread adoption of e-mobility solutions (IEA, 2024; UN ESCAP, 2022; DOE, 2023).

III. Factors affecting the adoption of e-mobility among tricycle drivers

Table 3.1 Factors affecting the adoption of e-mobility among tricycle drivers in terms of Acquisition Cost

	Item Mean	Descriptive Rating
1. The initial purchase price of an electric tricycle influences my decision to adopt it.	2.53	Agree
2. I consider EV financing options before making a purchase.	2.35	Disagree
3. Lower acquisition cost would encourage me to adopt EVs.	2.89	Agree
4. I compare EV prices with fuel-powered tricycles before deciding.	2.78	Agree
Category Mean	2.64	Agree

Table 3.1 displays the factors affecting the adoption of e-mobility among tricycle drivers in terms of acquisition cost. It reveals that acquisition cost is a deciding factor in adopting e-mobility with a category mean of 2.64 (Agree). It means most drivers acknowledge that the financial aspect of buying an electric tricycle directly affects their willingness to transition from the usual units.

The relatively high mean score for the item on lower acquisition cost (2.89 – Agree) indicates that affordability remains a major factor in adopting e-mobility. Similarly, the agreement that drivers

compare EV prices with fuel-powered tricycles (2.78 – Agree) underscores their cost-conscious behavior of carefully weighing the potential savings or expenses before deciding. Meanwhile, the moderate agreement that initial purchase price influences adoption (2.53 – Agree) supports that cost is a major consideration. Meanwhile, the low mean score for financing options (2.35- disagree) suggests that tricycle drivers have limited awareness and access to flexible payment.

Generally, the findings reveal that high acquisition costs remain a barrier to the widespread adoption of e-mobility while recognizing the economic benefits it may serve. For this reason, interventions like subsidies, installment payment plans be implemented to make EV ownership attainable. Without interventions, adoption may remain slow despite being aware of the long-term benefits, such as fuel savings and reduced maintenance costs.

A similar study by Saflor et al (2024), investigating EV adoption barriers in the Philippines, identified vehicle cost as one of the primary impediments alongside charging infrastructure and range anxiety. She added that financial incentives must be coupled with strategies to address infrastructure gaps such as charging stations and operational concerns like range anxiety to influence adoption positively.

Table 3.2 Factors affecting the decision of a tricycle driver in adopting e-mobility in terms of Maintenance Cost

	Item Mean	Descriptive Rating
1. Major consideration in my decision is the cost of maintaining an EV.	2.89	Agree
2. I believe maintenance cost of EVs is lower than traditional tricycles.	2.19	Disagree
3. High maintenance costs discourage me from adopting EVs.	2.68	Agree
4. I consider the availability and price of spare parts when deciding.	2.77	Agree
Category Mean	2.63	Agree

Table 3.2 displays the factors affecting the decision of tricycle drivers to adopt e-mobility by maintenance cost. It indicates that maintenance cost is a vital factor influencing their decision, with a category mean of 2.63 (Agree). The respondents generally recognize that maintenance expenses, availability and price of spare parts, and high maintenance costs, with a mean of 2.89 (agree), 2.77 (agree), and 2.68, respectively, significantly influence their decision. On the other hand, respondents disagreed with the idea that EVs have lower maintenance costs than traditional tricycles (mean = 2.19, Disagree), which shows their lack of awareness of the long-term cost advantages of EV ownership.

These findings denote that while tricycle drivers are highly sensitive to maintenance-related issues, misconceptions about the true cost of EVs may hinder adoption. This boils down to the need for information campaigns highlighting the lower long-term maintenance costs of EVs, as well as ensuring the availability of affordable spare parts and skilled technicians.

Although tricycle drivers see maintenance costs as a key barrier to adopting e-mobility, there's a clear misconception: most disagree that EVs are cheaper to maintain than conventional tricycles, even though real-world data both globally and locally suggests that EVs often require lower routine maintenance. However, they are wary of the potential for expensive repairs, especially for electronic components and batteries.

Table 3.3 Factors affecting the decision of tricycle drivers in adopting e-mobility in terms of Availability of Charging Station

	Item Mean	Descriptive Rating
1. The presence of charging stations affects my	2.89	Agree

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willingness to use EVs.		
2. I prefer EVs only if charging stations are easily accessible.	2.55	Agree
3. Lack of charging stations discourages me from adopting EVs.	2.52	Agree
4. I check the distance to the nearest charging station before deciding.	2.39	Disagree
Category Mean	2.59	Agree

Table 3.3 shows the factors affecting the decision of tricycle drivers in adopting e-mobility in terms of the availability of charging stations. The result indicates that the availability of charging stations is an important factor in adopting e-mobility, with a category mean of 2.59 (Agree). The highest mean score shows that the presence of charging stations strongly affects willingness to use EVs (mean = 2.89, Agree), emphasizing the importance of visible and reliable infrastructure. Drivers also agree that easy accessibility of charging stations and the lack of such facilities, with a mean of 2.55 and 2.52, respectively, directly influence their adoption decisions. Meanwhile, they disagreed on checking the actual distance to the nearest charging station before deciding, with a mean of 2.39. This shows their limited awareness of the existing facilities, or that drivers perceive infrastructure to be generally inadequate. The results imply that tricycle drivers may remain hesitant to shift towards e-mobility despite recognizing its potential benefits, without charging networks.

According to Burra et al. (2024), access to public charging stations promotes EV ownership, principally when combined with workplace and fast charging options. In addition, Saflor et al. (2024) confirms that using artificial networks and structural equation modeling identified availability of charging stations, range anxiety, and vehicle cost as the top barriers to EV adoption in the Philippines. Globally, there is strong evidence showing that environments with denser charging networks experience higher battery electric vehicle adoption rates, according to White et al. (2022). Locally, in the study of Tayo et al. (2022) mentioned that installing a fast-charging solar-powered stations for e-trike directly increase operators' earnings. This shows the real benefits of accessible infrastructures. Initiatives of private sectors in the Philippines such as SM Supermalls and Ayala Malls, helped reduced anxiety and promotes EV adoption (Simiano, 2024).

Hence, in adopting e-mobility, tricycle drivers strongly recognize the importance of charging station availability particularly when infrastructure is visible and convenient. Limited accessibility to charging stations is perceived as a barrier to the use of EVs.

Table 3.4 Factors affecting the decision of a tricycle driver in adopting e-mobility in terms of Availability of Service Center

	Item Mean	Descriptive Rating
1. I am more likely to adopt EVs if service centers are nearby.	2.84	Agree
2. Lack of specialized EV service centers discourages adoption.	2.32	Disagree
3. I consider the quality of service centers before deciding.	2.65	Agree
4. The availability of trained mechanics for EV repair influences my choice.	2.51	Agree
Category Mean	2.58	Agree

Table 3.4 shows the factors affecting the decision of tricycle drivers in adopting e-mobility in terms of the availability of the service center. It reveals that the availability of service centers is an important

factor in adopting e-mobility among the respondents, with a category mean of 2.58 (Agree). They agreed on the following indicators: that they adopt EVs if service centers are near; that they value the quality of service centers; and the availability of trained mechanics with 2.84, 2.65, and 2.51 means. Meanwhile, respondents disagreed that the lack of specialized EV service centers discourages adoption, with a mean of 2.32.

The results imply that the respondents recognize the importance of service infrastructure in their decision to adopt EVs and have insufficient knowledge about the technical requirements of the electric-powered tricycle compared to conventional tricycles. So, to encourage the adoption of EVs, service centers must be made accessible. In addition, interventions like awareness campaigns help the respondents understand EV servicing and its long-term usability.

According to Saflor et al. (2024), inadequate infrastructure is a barrier to the adoption of EVs in the Philippines. On the other hand, Albatayneh (2024) posited that EV maintenance and the availability of service influence adoption. Therefore, service quality and proximity of service centers influence the respondents' openness to adopt e-mobility.

Table 3.5 Factors affecting the decision of the tricycle driver in adopting e-mobility in terms of ease of use

	Item Mean	Descriptive Rating
1. I am more likely to use EVs if they are easy to operate.	2.59	Agree
2. Complex operating systems discourage EV adoption.	2.28	Disagree
3. I prefer EVs that require minimal technical knowledge to use.	2.82	Agree
4. User-friendly design encourages me to adopt EVs.	2.92	Agree
Category Mean	2.65	Agree

Table 3.5 shows the factors affecting the decision of the tricycle driver in adopting e-mobility in terms of ease of use. The finding indicates that ease of use is a factor in the tricycle drivers' decision to adopt e-mobility, with the category mean of 2.65 (agree). They emphasized the importance of user-friendly design and a preference for EVs that require minimal technical skills and knowledge, with means of 2.92 and 2.82, respectively. They also agreed that they would adopt EVs if they were easy to operate, with a mean of 2.59. On the other hand, they disagreed that complex operating systems discourage adoption (mean = 2.28).

The results imply that EVs' ease of use, straightforward controls, and minimal technical demands are crucial in the adoption of electronic mobility. Hence, manufacturers as well as policymakers should conduct training programs and orientation sessions for tricycle drivers to familiarize themselves with EV operation.

This is in accordance with the study of Hussain and Qureshi (2024), which shows that the Technological Acceptance Model (TAM) perceives ease of use as a factor in adopting new technologies, especially when coupled with perceived usefulness.

Table 3.6 Factors affecting the decision of a tricycle driver in adopting e-mobility in terms of After-sales support

	Item Mean	Descriptive Rating
1. Good after-sales support encourages me to adopt EVs.	2.88	Agree
2. Lack of after-sales services discourages adoption.	2.28	Disagree
3. Availability of warranty services influences my decision.	2.77	Agree
4. I prefer brands with reliable after-sales support.	2.55	Agree
Category Mean	2.62	Agree

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Table 3.6 highlights that after-sales support is an important consideration in the adoption of e-mobility among tricycle drivers, with a category mean of 2.62 (Agree). Respondents strongly agreed that good after-sales support encourages adoption (mean = 2.88) and that the availability of warranty services influences their decision (mean = 2.77), showing that reliability and protection against risks are key motivators. They also preferred brands with dependable after-sales support (mean = 2.55, agree), indicating that trust in long-term service strengthens adoption intentions. Interestingly, however, drivers disagreed that the lack of after-sales services discourages adoption (mean = 2.28), which may reflect either a reliance on informal repair networks or limited awareness of the value of formal after-sales programs.

The finding suggests that the confidence of drivers in adopting e-mobility is affected by after-sales infrastructure. Thus, providing accessible warranty coverage, responsive technical assistance, and transparent service policies should be considered by policymakers and manufacturers.

The results of this study are in line with the findings of Sitinjak & Ober (2025), who said that responsive customer support and efficient after-sales services are vital components of service quality that influence consumers' willingness to adopt electric vehicles.

IV. Test of Difference in the Level of Awareness of Tricycle Drivers on E-Mobility Solutions when grouped according to Profile

Table 4. Test of Difference in the Level of Awareness of Tricycle Drivers on E-Mobility Solutions when grouped according to Profile

Profile	Variables	Mean	SD	F-value	p-value	Interpretation
Sex	Male	2.22	0.76	11.959**	0.001	Significant
	Female	1.03	0.05			
	total	2.20	0.77			
age	20 and below	2.77	0.00	4.103**	0.003	Significant
	21 to 31 years old	2.60	0.64			
	32 to 42 years old	2.24	0.81			
	43 to 53 years old	2.16	0.82			
	54 and above	2.05	0.65			
	total	2.20	0.77			
Number of years working as tricycle driver	5 and below	2.33	0.73	2.286	0.078	Not significant
	6 to 10 years	2.29	0.81			
	11 to 15 years	2.23	0.82			
	16 years and above	2.08	0.73			
	Total	2.20	0.77			
Daily income	500 and below	2.12	0.80	2.049	0.107	Not significant
	501 to 1000	2.31	0.77			
	1001 to 1500	2.25	0.36			
	1500 and above	1.83	0.00			
	total	2.20	0.77			
education	No schooling	1.83	0.00	2.651*	0.011	Not significant
	Elementary Undergraduate	2.19	0.48			
	Elementary Graduate	2.67	0.63			
	High school undergraduate	2.23	0.95			
	High school graduate	2.08	0.71			
	College undergraduate	2.30	0.72			
	College graduate	2.20	0.78			
	Vocational course	1.76	0.33			
	Total	2.20	0.77			

religious affiliation	Roman Catholic	2.23	0.74	3.083	0.080	Not significant
	Non-Catholic	2.02	0.93			
	Total	2.20	0.77			
type of tricycle used	Rented	2.24	0.85	.697	0.404	Not significant
	Owned	2.18	0.72			
	Total	2.20	0.77			

**Significant at 0.01 level

*Significant at 0.05 level

The results reveal that the level of awareness of tricycle drivers on e-mobility solutions is influenced by age and sex, while other profile variables do not. In terms of sex, male respondents have a higher awareness level compared to female drivers, with a difference of $p=.001$. This suggests that male respondents may be more exposed to information about e-mobility.

This finding is in accordance with research results on electric mobility adoption, which consistently highlight that awareness and knowledge gaps are often gendered, as men tend to have more access to transport-related technological networks and greater confidence in engaging with innovations (Rai et al., 2025).

Meanwhile, age shows a significant difference with the $p = .003$, with younger drivers aged 20 and below with the highest awareness, with a mean of 2.77, as awareness gradually decreased among older groups. This implies that younger tricycle drivers are more open to learning about e-mobility. Such a result is in accordance with the study of De Dios et al. (2024), who confirm that younger populations tend to be more receptive to new mobility innovations, including electric vehicles, due to higher familiarity with emerging technologies and stronger environmental attitudes.

Meanwhile, years of experience, daily income, educational attainment, religious affiliation, and type of tricycle used are not significant in the level of the drivers' awareness. This indicates that awareness of e-mobility solutions is not strongly dependent on economic standing, tenure in the profession, or ownership structure. These findings are in line with the study of William Davidson (2025), who said that awareness is influenced more by access to information rather than socio-economic characteristics. Hence, to increase e-mobility awareness among tricycle drivers, gender-responsive education strategies and age-sensitive outreach should be prioritized

Table 5. Test of Difference in the Factors Affecting the Decision of Tricycle Drivers in Adopting E-Mobility Solutions when grouped according to Profile

Profile	Variables	Mean	SD	F-value	p-value	Interpretation
Sex	Male	2.34	0.85	9.897**	0.002	Significant
	Female	1.13	0.25			
	total	2.32	0.86			
age	20 and below	2.71	0.00	1.477	0.209	not Significant
	21 to 31 years old	2.46	0.77			
	32 to 42 years old	2.45	0.80			
	43 to 53 years old	2.25	0.91			
	54 and above	2.24	0.86			
	total	2.32	0.86			
Number of years working as tricycle driver	5 and below	2.49	0.81	1.625	0.183	Not significant
	6 to 10 years	2.34	0.82			
	11 to 15 years	2.18	0.98			
	16 years and above	2.32	0.82			
	Total	2.32	0.86			

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Daily income	500 and below	2.28	0.87	.949	0.417	Not significant
	501 to 1000	2.39	0.88			
	1001 to 1500	2.20	0.59			
	1500 and above	2.92	0.00			
	total	2.32	0.86			
education	No schooling	3.00	0.14	6.173**	0.000	significant
	Elementary Undergraduate	1.83	0.43			
	Elementary Graduate	2.34	0.59			
	High school undergraduate	2.11	1.07			
	High school graduate	2.15	0.75			
	College undergraduate	2.74	0.61			
	College graduate	2.40	0.94			
	Vocational course	2.62	0.83			
religious affiliation	Total	2.32	0.86	.047	0.829	Not significant
	Roman Catholic	2.31	0.95			
	Non-Catholic	2.33	0.80			
Sex	Total	2.32	0.86	.024	0.877	Not significant
	Rented	2.31	.95			
	Owned	2.33	.80			

**significant at 0.01 level

The test of difference results indicate that sex and educational attainment significantly influence the factors affecting tricycle drivers' decisions to adopt e-mobility solutions, while other demographic variables do not. Male drivers have a higher mean score of 2.34 compared to female drivers with a mean score of 1.13, with a statistically significant difference of $p = .002$. This implies that male drivers are more influenced by the factors affecting their decision to adopt e-mobility, such as confidence in new transport technologies and perceived usefulness. This finding is supported by Rai et al. (2025), which states that gender differences often shape technology adoption intentions, where attitudes and social norms strongly predict willingness to adopt electric mobility solutions. This suggests that gender-responsive interventions that address specific concerns of female drivers must be designed by program developers and policymakers.

On the other hand, age, years of experience, and daily income were not statistically significant, which implies that these factors do not differentiate drivers' perceptions toward adopting e-mobility. This finding is supported by the studies of De Dios et al. (2024), which emphasized that structural barriers such as high upfront costs, limited infrastructure, etc., often outweigh demographic characteristics in influencing decisions for adopting e-mobility. Hence, different programs regarding adoption should focus less on demographics and more on reducing systemic constraints through financing mechanisms. However, educational attainment showed a significant difference $p = .000$, which indicates that education plays a critical role in shaping adoption perspectives.

Educational attainment, however, showed a significant difference ($p = .000$), indicating that education plays a critical role in shaping adoption perspectives. Drivers with varying educational backgrounds may differ in awareness, understanding, and openness toward e-mobility innovations. Evidence suggests that education and training enhance individuals' ability to evaluate new technologies, increase environmental awareness, and reduce misconceptions about electric mobility (Khan, 2022).

Generally, the results suggest that successful e-mobility adoption among tricycle drivers requires strategies focusing on the inclusion of education and awareness, and the decrease of key structural barriers rather than relying only on demographic characteristics.

Table 4. Relationship between Level of Awareness of Tricycle Drivers and Factors Affecting the Decision of Tricycle Drivers in Adopting E-Mobility Solutions

Level of Awareness of Tricycle Drivers				
	Pearson Correlation	p-value	Decision	Interpretation
Factors Affecting the Decision of Tricycle Drivers in Adopting E-Mobility Solutions	.533**	0.000	Reject Ho	Positively Moderate Correlation
**. Correlation is significant at the 0.01 level (2-tailed).				

Table 4 indicates that there is a significant relationship between the level of awareness of tricycle drivers and the factors affecting their decision to adopt e-mobility solutions. The Pearson correlation coefficient of 0.533 with a p-value of .000 divulges a moderate positive correlation. This implies that as drivers become more aware of e-mobility technologies, the factors influencing their adoption decisions become stronger.

A study by DeDios et al. (2024) confirms that awareness and familiarity reduce uncertainty and increase acceptance of electric vehicles, especially in the development of transport sectors where exposure remains limited.

CONCLUSION

The overall awareness level of tricycle drivers on e-mobility solutions in Tuguegarao City is generally low across all dimensions. Drivers believe that there are some environmental benefits of electric vehicles, but they lack knowledge of battery technology, charging systems, economic incentives, and policy frameworks. On the other hand, the decision of the drivers to adopt e-mobility is influenced by acquisition cost, maintenance expenses, infrastructure availability, ease of use, and after-sales support.

Meanwhile, age and sex significantly influence awareness, while educational attainment affects adoption decisions. The positive relationship between awareness and adoption factors implies that improving their awareness can strengthen readiness to adopt electric mobility. Overall, adoption remains hindered by limited awareness, financial barriers, infrastructure gaps, and insufficient technical support. Thus, transition to e-mobility among tricycle drivers will remain slow and uneven without targeted education, financial assistance, and infrastructure development.

RECOMMENDATIONS

Based on the findings, the following are recommended:

1. Information campaigns to improve drivers' understanding of electric mobility should be conducted by government agencies and local government unit with the transport organizations.
2. Barangay-level information campaigns and technical orientations on EV technology, charging procedures, and battery management should be conducted by government agencies.
3. To reduce the acquisition cost barriers, subsidies, and installment payment schemes, and cooperative financing programs should be strengthened.
4. Through public-private partnerships, charging stations and electric vehicles service centers should be expanded.

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5. User-friendly electric tricycles, clear manuals, warranties, and responsive after-sales support should be designed by manufacturers.
6. Drivers should be informed about government incentives and livelihood opportunities in the mobility sector.
7. To encourage women's participation in the transport sector, initiatives should be developed to ensure equal opportunities in EV-related livelihoods.
8. To help drivers access additional income opportunities and reduce reliance on a single livelihood source, skills training on EV servicing, charging operations, and green transport enterprises should be provided.

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