

THE URGENCY OF REFORMULATING ELECTRIC BICYCLE REGULATION IN INDONESIA: A COMPARATIVE ANALYSIS WITH THE UNITED STATES AND THE EUROPEAN UNION IN REALIZING LEGAL CERTAINTY AND DRIVING SAFETY

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Abstract

The rapid development of electric bicycles has created legal uncertainty in Indonesia due to the absence of specific regulations in Law No. 22/2009 on Road Traffic and Transportation (LLAJ Law). This research aims to analyze the legal status of electric bicycles in Indonesia's legal system, compare domestic regulations with the United States and the European Union, and propose a more comprehensive regulatory reformulation. This research uses a normative legal method with a statutory approach and comparative analysis to identify regulatory gaps. The results show that Indonesia does not yet have a specific classification for electric bicycles, which leads to non-uniformity in law enforcement and uncertainty for users. In contrast, the United States and the European Union have established classifications based on motor power and maximum speed, thus providing greater legal certainty and safety. This research proposes that Indonesia adopt a similar classification system by incorporating technical standards, safety requirements, and registration procedures into the Law on Motor Vehicles. This reformulation will provide legal certainty, improve driving safety, and support sustainable transportation policies.

Key words: Electric bicycle; legal certainty; road safety; regulatory reform; transportation law.

1. Introduction

In recent years, the use of electric bicycles in Indonesia has increased in line with technological developments and public awareness of more environmentally friendly transportation. However, until now, the legal status of electric bicycles is still in a gray area due to the absence of regulations that specifically regulate their classification in Law Number 22 of 2009 concerning Road Traffic and Transportation (LLAJ Law). Electric bicycle regulations in Indonesia are still limited to Minister of Transportation Regulation No. 45/2020, which does not comprehensively regulate safety aspects and the rights and obligations of its users (Puteri, 2024, p. 94). This lack of clarity has an impact on the implementation of policies that are less effective and cause differences in interpretation in various regions. From a legal perspective, this issue is important to study in order to identify regulatory gaps and legal implications, both for electric bicycle users and for law enforcement officials (Nugroho & Pujiyono, 2022, p. 49).

Several previous studies have highlighted the regulatory aspects of electric vehicles, including studies on the regulation of battery-based electric motorized vehicles (KBLBB). For example, research by Maramis (2024) discusses «law enforcement against the use of electric bicycles by minors and how this is still experiencing obstacles due to the lack of clear regulations» (Maramis, 2024, p. 3). On the other hand, a study by Lesmana and Fithry (2023) found that «existing regulations have not been able to provide optimal legal protection for electric bicycle users in traffic» (Lesmana & Fithry, 2023, p. 110). However, these studies are still partial and have not explored in depth the legal status of electric bicycles in the perspective of the national legal system and its regulatory implications. The gap found in previous studies is the lack of comprehensive analysis of comparative law at the national and international levels, as well as the absence of concrete proposals for regulatory reformulation that accommodate aspects of justice and legal certainty. Therefore, this research offers a new contribution by critically discussing the mismatch of current regulations and proposing a more holistic legal approach.

The importance of this research lies in the massive impact of the unclear regulation of electric bicycles, both in terms of traffic safety, public order, and legal certainty for users. In the context of *ius constituendum*, regulations on electric bicycles need serious attention to prevent legal imbalances that result in uncertainty in rule enforcement. Electric vehicles must reflect the principles of legal justice by paying attention to the balance between legal certainty and transportation technology innovation. In addition, the urgency of this research is also related to the development of electric vehicles as part of Indonesia's sustainable energy policy. Without clear regulations, the potential for conflict in the implementation of environmentally friendly transportation policies will be greater, so this research is expected to provide concrete recommendations for policy makers in drafting regulations that are more adaptive and responsive to developments in transportation technology (Subekti, 2022, p. 447).

The legal problem that is the main focus of this research stems from the unclear legal status of electric bicycles in the Indonesian legal system. Until now, there is no regulation that explicitly categorizes electric bicycles as motorized or non-motorized vehicles in Law No. 22/2009 concerning Road Traffic and Transportation. This has various legal implications, especially in terms of legal certainty and protection for electric bicycle users (Putri et al., 2024, p. 775). The mismatch of existing regulations also creates problems in applying the principle of justice, because there is no uniform legal standard in determining the rights and obligations of electric bicycle users on the road.

In the context of comparative law, the regulation of electric bicycles in Indonesia is still far behind some other countries, such as the United States and the European Union, which have specific classifications and rules related to the use of electric bicycles, both in terms of safety, registration, and speed limits (Peng et al., 2024, p. 122). Therefore, this research will also examine how the regulation of electric bicycles in other countries can provide an overview of best practices that can be adapted into the national legal system (Malloci, 2024). Ultimately, this research will attempt to formulate a more ideal and comprehensive regulatory reformulation to accommodate legal certainty for electric bicycle users in Indonesia and realize the principle of justice in their use on the road.

This research aims to provide an in-depth analysis of the legal status of electric bicycles in Indonesia's national legal system. By identifying various weaknesses in the current regulations, this research will explore the impact of regulatory imperfections on legal certainty and protection for electric bicycle users (Aqila Qirina, 2023, p. 101). In addition, this research will compare the regulation of electric bicycles in Indonesia with several other countries, such as the United States and the European Union, in order to find best practices that can be adapted to the national legal context (Pramudya, 2024, p. 2). The results of this analysis will later be used to develop recommendations for a more comprehensive legal policy reformulation, with the aim of creating a legal system that is clearer, fairer, and adaptive to the development of transportation technology in Indonesia

Based on the description above, this research has academic and practical urgency in overcoming the unclear regulation of electric bicycles in Indonesia. With the increasing use of electric bicycles in various cities, a clear legal basis is needed to ensure user safety, traffic order, and legal certainty for all stakeholders. The mismatch between existing regulations and the needs in the field raises the potential for wider legal problems, including imbalances in law enforcement and regulatory conflicts at the regional and national levels. Therefore, this research seeks to contribute to the development of legal policies that are more adaptive and responsive to the dynamics of modern transportation. By analyzing various aspects of regulation, both normatively and comparatively, this research is expected to provide concrete solutions in formulating policy reformulations that are more in line with the principles of justice and legal certainty in Indonesia.

2. Materials and Methods

This research uses normative legal research methods, which aim to review and analyze laws and regulations and legal concepts related to the regulation of electric bicycles in Indonesia. Normative legal research or doctrinal legal research is a research method that focuses on legal materials as the main source in analyzing legal issues (Efendi & Ibrahim, 2018, p. 129).

In this research, the approaches used are statute approach and comparative approach (Marzuki, 2005, p. 93). The statutory approach is used to examine how electric bicycle regulations are regulated in the national legal system, specifically in Law Number 22 of 2009 concerning Road Traffic and Transportation and Minister of Transportation Regulation Number 45 of 2020. Meanwhile, the comparative legal approach is carried out by examining electric bicycle regulations in other countries, such as the United States and the European Union, in order to obtain best practices that can be used as references in reformulating legal policies in Indonesia.

In analyzing electric bicycle regulations, this research refers to the Legal Certainty Theory proposed by Hans Kelsen. Legal certainty theory is used to assess whether current regulations have provided legal clarity for electric bicycle users and the extent to which regulatory discrepancies affect the application of law in the field. Kelsen stated

that legal norms must have clarity, consistency, and can be applied objectively so as not to cause uncertainty in application (Kelsen, 2002, p. 1). In the context of this research, the discrepancy between the LLAJ Law and Minister of Transportation Regulation 45/2020 is the object of analysis in assessing legal certainty for electric bicycle users in Indonesia.

In addition, this research is also based on the Legal Objective Theory proposed by Gustav Radbruch. This theory is used to measure the extent to which electric bicycle regulations fulfill three legal objectives, namely legal certainty, justice, and expediency (Radbruch, 1950, p. 109). In this study, the legal certainty aspect is analyzed based on the imperfections of the current regulations, while legal justice is studied in the context of protecting the rights of electric bicycle users. Meanwhile, legal expediency is studied by looking at the impact of regulations on user safety and the interests of sustainable transportation in Indonesia.

The data source used in this research is secondary data, which consists of primary legal materials, secondary legal materials, and tertiary legal materials (Muhaimin, 2020, p. 101).

1. Primary legal materials include legislation relating to the regulation of electric bicycles, such as:

- Law Number 22 Year 2009 on Road Traffic and Transportation.
- Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives.
- DKI Jakarta Governor Regulation Number 36 of 2022 concerning the Use of Electric Bicycles on Roads.
- Yogyakarta Mayor Regulation Number 71 Year 2022 on the Use of Electric Bicycles.

2. Secondary legal materials include law books, scientific journals, and research articles relevant to the regulation of electric bicycles as well as the theories used in this research.

3. Tertiary legal materials include legal dictionaries, legal encyclopedias, and other documents that support the understanding of legal concepts used in this research.

The analysis technique used in this research is qualitative descriptive analysis, namely by describing and analyzing existing regulations, comparing them with other countries' regulations, and evaluating regulatory discrepancies based on the legal theory used. Soerjono Soekanto and Sri Mamuji, stated that in normative legal research, qualitative descriptive analysis is carried out by explaining, interpreting, and evaluating existing legal rules in order to produce a more comprehensive solution (Soerjono Soekanto & Sri Mamudji, 2003, pp. 13–14).

The results of this research are expected to provide concrete recommendations in reformulating legal policies that are more adaptive and responsive to the development of transportation technology in Indonesia, so that the regulation of electric bicycles can be more in line with the principles of legal certainty, justice, and benefits for the community.

In legal research, the theoretical basis serves as a foothold for analyzing problems and building scientific arguments. The study of electric bicycle regulations in Indonesia can be studied through the perspective of Legal Certainty Theory and Legal Objective Theory. These two theories are relevant in discussing how the regulation of electric bicycles in Indonesia is still in a gray zone and how this regulation should be formulated so that it meets aspects of legal certainty, justice, and benefits for the community.

3. Result

3.1. Criteria for electric bicycles as motorized or non-motorized vehicles based on applicable regulations

In recent years, the increasing use of electric bicycles in Indonesia has raised various legal and policy issues, especially related to legal certainty, safety standards, and the application of different regulations in various regions. Electric bicycles offer a more environmentally friendly and efficient transportation solution, but still face a lack of clarity in national regulations. The absence of a clear legal definition of electric bicycles in Law No. 22/2009 on Road Traffic and Transportation (LLAJ Law) leads to imbalances in the application of the law. The Minister of Transportation Regulation No. 45/2020 does provide some guidelines related to technical specifications and requirements for the use of electric bicycles, but this regulation is still limited and not comprehensive enough to accommodate various aspects of safety and legal certainty for users. As a result, there are different interpretations in the implementation of the regulation at the regional level, which in turn creates uncertainty in law enforcement for officials and road users.

This research aims to examine the legal status of electric bicycles in the national legal system and compare it with regulations in other countries, such as the United States and the European Union. In addition, this research also analyzes the impact of unclear regulations on legal certainty and safety of electric bicycle users. By using a normative approach as well as legislative analysis and comparative law, this research will provide an overview of the weaknesses of the current regulations and propose a clearer and more comprehensive regulatory reformulation. In this discussion, the results of the research will be described systematically, starting from the analysis of regulations in Indonesia, comparison with other countries' regulations, the legal impact of unclear rules, to ideal policy recommendations for the reformulation of electric bicycle regulations in Indonesia.

The legislation in Indonesia that is the basis for the implementation of traffic and road transportation uses Law Number 22 of 2009 concerning Road Traffic and Transportation (LLAJ Law), where the regulation in the context of the classification of electric bicycles is still not clearly regulated. However, technically in Indonesia there is a Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives, which is also a juridical basis for determining criteria related to electric bicycles in Indonesia.

Law No. 22/2009 on Road Traffic and Transportation (LLAJ Law) in this case does not specifically regulate electric bicycles, but references in the LLAJ Law can be a provision to understand the status of electric bicycles, which are currently very massive in use in Indonesia (Maramis, 2024, p. 3). As stated in Chapter VII regarding the types and functions of vehicles Article 47 paragraph (1) of the LLAJ Law, the article states that vehicles consist of Motorized vehicles and non-motorized vehicles (Indonesia, Pemerintah Pusat, 2009c). Article 1 point 8 of the LLAJ Law states the definition of a motorized vehicle itself as «a vehicle driven by mechanical equipment in the form of a machine other than a vehicle that runs on rails» (Indonesia, Pemerintah Pusat, 2009b).

Article 47 paragraph (2) of the LLAJ Law categorizes motor vehicles consisting of motorcycles, passenger cars, buses, freight cars, and special vehicles. So in the context of electric bicycles contained in the LLAJ Law, it is still not clearly regulated, resulting in electric bicycles at the statutory level being in a regulatory gray zone. Article 1 point 9 of the LLAJ Law states that non-motorized vehicles are driven by human and/or animal power. On the one hand, electric bicycles are powered by electric motors and rechargeable batteries, making them similar to motorized vehicles, but they are also equipped with pedals that can also be driven by human power.

Due to the lack of clarity in the LLAJ Law regarding the criteria for electric bicycles, the Ministry of Transportation issued Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives. The existence of the Ministerial Regulation is an important step in regulating the use of electric vehicles in Indonesia, especially electric bicycles. This Ministerial Regulation was established to provide clear definitions and criteria for electric bicycles, as well as various aspects of road use and use in public areas. The definition of an electric bicycle is as stated in Article 1 point 7 of the Ministerial Regulation 45/2020 states that «an electric bicycle is a certain vehicle that has 2 (two) wheels equipped with mechanical equipment in the form of an electric motor» (Indonesia, Kementerian Perhubungan, 2020b).

The Ministerial Regulation 45/2020 categorizes electric bicycles as certain vehicles using an electric motor drive. The Ministerial Regulation also stipulates safety requirements, especially for electric bicycles, which include a headlight, reflector or light reflecting device at the rear position of the electric bicycle, an excellent brake system, a horn or bell, and a maximum speed limit of 25 km/h (twenty kilometers per hour) (Indonesia, Kementerian Perhubungan, 2020a). If examined based on the classification of vehicles, it can be said that electric bicycles are hybrid vehicles that combine energy from electricity and humans (Sujana, 2020). Legal certainty in determining whether electric bicycles can be included in motorized vehicles or non-motorized vehicles, will have legal implications for the legal rights and obligations for each vehicle (Puteri, 2024, pp. 95–97).

There is another definition as mentioned in Article 12 paragraph (1) letter b of Government Regulation Number 55 of 2012 concerning Vehicles, which also mentions the driving motor in motorized vehicles in the form of an electric motor (Indonesia, Pemerintah Pusat, 2012). According to the explanation of the Government Regulation, what is meant by «electric motor» is a drive that uses electricity as its driving force. The definition mentioned in the Government Regulation on Vehicles is one of the technical and roadworthy requirements for motorized vehicles. Therefore, to strengthen the narrative contained in this paper, the meaning or understanding of the engine contained in the conventional motor and the electric motor on the electric bicycle will be explained. Because in an effort to understand and analyze related to electric bicycles, it is necessary to provide an explanation to reinforce the criteria for electric bicycles included in motorized vehicles or non-motorized vehicles (Sударsono, 2020, p. 2).

The engine in a conventional motorcycle and the electric motor found in an electric bicycle have fundamental differences based on how they work and their main components. Conventional motors use internal combustion engines, which operate by burning fossil fuels such as gasoline or diesel. This combustion process produces heat energy which is then converted into mechanical energy to drive the vehicle. The main components of a conventional engine include the piston, cylinder, spark plug, carburetor or fuel injection system, and exhaust system. An electric bicycle uses an electric motor as its driving force, the way an electric motor works is to convert electrical energy into mechanical energy to turn the wheels (Santoso, 2022, p. 37).

Electric vehicles in the context of electric bicycles developed for use in Indonesia itself are Battery-Based Electric Motor Vehicles (KBLBB) or Battery Electric Vehicles (Indonesia, Pemerintah Pusat, 2019). KBLBB is a type of electric vehicle that uses battery technology as a source of electricity to drive motors contained in certain vehicles, one of which is an electric bicycle. KBLBB does not have an internal combustion engine, fuel cell, or fuel tank, so the source that produces energy to be able to drive an electric bicycle is a battery. Therefore, batteries have an important role like fuel in conventional vehicles, technically how KBLBB works in this case is an electric bicycle in simple terms is as follows (Omazaki Group, 2019):

- a. Power is converted from DC (Direct Current) to AC (Alternating Current) batteries

to activate the motor;

- b. The accelerator sends a signal to the control module to adjust the vehicle speed by changing the power frequency from the AC to the motor;
- c. The motor connects and rotates the wheels through gears;
- d. When the brakes are pressed or the electric bike slows down, the motor becomes a generator and produces electricity which is stored back into the battery;

Then based on the criteria for electric bicycles in the LLAJ Law and Permenhub 45 of 2020 that electric bicycles should be categorized as non-motorized vehicles, but in this case electric bicycles have their own category, namely «certain vehicles using electric motor drives. There are similarities between the definitions contained in the LLAJ Law and Permenhub 45 of 2020, namely the definition of Motorized Vehicles in Article 1 number 8 states that motorized vehicles are driven by mechanical equipment in the form of «engines». Meanwhile, Article 1 point 7 of Permenhub 45/2020 states that electric bicycles are also equipped with mechanical equipment in the form of «electric motors». Therefore, the similarities between Motor Vehicles in the LLAJ Law and electric bicycles in Permenhub 45 of 2020 are both driven by mechanical equipment. However, the fundamental difference is the mechanical equipment in the form of an engine in the LLAJ Law and the mechanical equipment in the form of an electric motor in Permenhub 45/2020.

3.2. Implementation of Complete Systematic Land Registration (PTSL) fee determination at the village level

TIn recent years, electric bicycles have become one of the increasingly popular transportation alternatives in various parts of the world, including Indonesia.⁸⁶ However, although electric bicycles and electric motorcycles both use electric power as a source of propulsion, they have significant fundamental differences, both from a technical and legal perspective. an understanding of these differences is very important in the context of reformulating legal arrangements relating to the use of electric bicycles in road traffic and transportation.

One of the innovations in transportation modes, namely electric bicycles, basically does not have too significant a difference with bicycles in general. In Indonesia itself, there are two types of electric bicycles and electric motorbikes, in the use in society today is very massive. However, juridically related to the understanding of the electric motorcycle itself has not been regulated, both in Law Number 22 of 2009 concerning Road Traffic and Transportation and in Regulation of the Minister of Transportation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives.

Before moving on to the condition of electric bicycles from a technical perspective, it is necessary to know in advance juridically related to the meaning or understanding of motorized vehicles, non-motorized vehicles, electric bicycles, and electric motorbikes, in this case the author will describe it in tabular form as follows Table 1.

Table 1. Juridical definition of vehicle

No	Vehicle Type	Definition
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1	Motorized Vehicle	The definition of a motorized vehicle is «any vehicle that is driven by mechanical equipment in the form of a machine other than vehicles that run on rails». Motorized vehicles themselves are mentioned in Article 47 paragraph (2) of the LLAJ Law, consisting of motorcycles, passenger cars, buses, goods cars, and special vehicles.
2	Non-motorized Vehicles	Article 1 point 9 of Law No. 22/2009 on Road Traffic and Transportation states that the definition of non-motorized vehicle is «any vehicle propelled by human and/or animal power». Non-motorized vehicles themselves are mentioned in Article 47 paragraph (4) of the LLAJ Law, consisting of vehicles driven by human power, and vehicles driven by animal power.
3	Electric Bike	Article 1 point 7 of the Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives, states that the definition of an electric bicycle is «a certain vehicle that has 2 (two) wheels equipped with mechanical equipment in the form of an electric motor».

Physically, electric bicycles and electric motorcycles are two types of vehicles that are both based on electric power. However, there are things that distinguish between the two electric vehicles, the author will try to provide an image as an example Table 2.

Table 2. Electric bicycles and electric motorcycles

Image	Description
	The following picture is an electric bicycle, where characteristically an electric bicycle or e-bike is a bicycle equipped with an electric motor as a driving tool and pedals as a pedaling tool for its users (Chisholm & Healy, 2018, p. 128).
	The following picture is an electric motorcycle, characteristically different from an electric bicycle. Where the electric motorcycle is fully driven by an electric motor without requiring pedaling as an additional drive (Chisholm & Healy, 2018, p. 129).

The next thing that makes a difference regarding electric bikes and electric motorcycles is that, for the use of electric motorcycles themselves in Indonesia, there is a legal basis for the use of driving licenses (SIM) that apply to electric motorcycle users. As contained in the Regulation of the Indonesian National Police Number 5 of 2021

concerning the Issuance and Marking of Driver's License. As mentioned in CHAPTER II regarding the issuance of SIM, namely in Article 3 paragraph (2) letter h states that:

«C I driver's license, valid for driving a motor vehicle of motorcycle type with engine cylinder capacity above 250cc (two hundred and fifty centimeters cubic) up to 500cc (five hundred centimeters cubic) or similar motorcycle that uses electricity.»

Then in Article 3 paragraph (2) letter l, it states as follows:

«SIM C II, valid for driving a motorcycle with an engine cylinder capacity above 500cc (five hundred centimeters cubic) or similar motorcycle that uses electric power.»

This means that riders who use electric motorcycles must have at least a C I driver's license to be able to drive and use them on the road. Making a C I driver's license is required to have a C first for 12 months since it was issued. This requirement also applies if you want to upgrade from SIM C I to C II. So, if seen in the context of electric bicycles, then the electric bicycle itself should be included in the category of motorized vehicles, because if viewed juridically in the LLAJ Law, electric bicycles themselves do not have the right position. However, when viewed technically, electric bicycles have two similarities, namely they are both driven by «mechanical equipment» but use electricity as a driving force.

3.3. *Electric bike criteria based on transportation theory*

People in ancient times used transportation tools that were said to be very simple when machines were still not invented, transportation tools such as pedates, delmans, and horses were the means of transportation used for daily community activities. Given the technology of transportation using human and animal power, in terms of cruising ability is still very limited and requires a long period of travel. Since the invention of the steam engine, other motorized vehicles have also developed. Motorized transportation such as motorcycles, cars, and trains are modern means of transportation. The existence of these means of transportation, long distances can be reached in a short time, in addition to transporting goods, can also facilitate humans who have high mobility and provide comfort in travel.

Electric bicycles in the context of transportation theory, especially in transportation law, are a relatively new phenomenon and raise various questions related to the classification and regulations governing electric bicycles. Therefore, with the aim of comprehensively understanding the criteria for electric bicycles, this paper will be analyzed from the perspective of Transportation Theory. First, starting from the definition and characteristics of an electric bicycle, also known as an e-bike, which is a bicycle equipped with an electric motor as a means of propulsion. As explained above about the difference with electric motorcycles, electric bicycles themselves still have pedals that can be used to move them. The main characteristics of an electric bicycle are having an electric motor with a power between 250 watts and 750 watts, a rechargeable battery as an energy source, and a maximum speed of 25 km/h, if referring to Article 3 paragraph (2) of the Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives (Santoso, 2022, p. 69).

Then in the transportation system, vehicles in General Electric bicycles are classified based on several criteria such as the source of propulsion, number of wheels, carrying capacity, and function and intended use. Based on the context of electric bicycles, this poses a challenge in their classification due to their unique characteristics. On the one hand, an electric bicycle has a motor and battery like a motorized vehicle, but on the other hand it still has a pedal and can be operated without electric assistance like a conventional bicycle. Based on this, with regard to criteria based on transportation safety contained in Transportation Theory, in this case the author emphasizes the opinion conveyed by Ahmad Munawar, that safety contained in transportation theory

emphasizes the importance of vehicle and infrastructure design that minimizes the risk of accidents. If drawn juridically, Article 3 paragraph (2) of the Minister of Transportation Regulation Number 45 of 2020 has accommodated several safety aspects, especially for electric bicycles, by requiring them to meet safety requirements such as headlights, reflectors, a functioning brake system, and maximum speed restrictions.

Then the benefits of electric bicycles as a role of transportation as conveyed by Fidel Miro are classified based on the field of human civilization, in the economic field, and in the legal field. If electric bicycles are drawn based on the development of human civilization, then the development of technology can support the interests of the need for adequate, efficient, and easy-to-use transportation.⁹⁵ Then in the economic field, of course, electric bicycles present benefits in terms of moving people from one place to another, in this case of course aiming to provide convenience and equality for goods and services so that the entire region can be guaranteed. Next in the social field, from the convenience offered from electric bicycles, it offers conveniences such as official inter-institutional relationship activities or relationships of a nature such as visiting relatives (Bjerkman et al., 2021, p. 102).

Then if analyzed from the legal field related to the existence of electric bicycles, the importance of regulations governing between transportation users and the government, especially in this case is a regulation that includes safety, the obligation to use electric bicycles on the road, and special lanes that can be passed by electric bicycle users. Based on this, with the development of technology in the transportation sector, in Indonesia, which regulates the use of electric bicycles, currently there is a Regulation of the Minister of Transportation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives. Where regulations at the level of Law Number 22 of 2009 concerning Road Traffic and Transportation should be updated to support an important role in encouraging transportation development.

The characteristics of electric bicycles in terms of Transportation Theory cover various aspects, from technical characteristics to legal implications. So, it can be concluded that in the characteristics of electric bicycles when analyzed from transportation theory, a comprehensive approach is needed to regulate the use of electric bicycles. Existing regulations such as the Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives, have become an initial foundation, but still require further development to accommodate the complexity of electric bicycles in road traffic and transportation. By understanding the criteria for electric bicycles based on Transportation Theory, policymakers can formulate a more comprehensive regulation on the use of electric bicycles in road traffic and transportation. This will ensure that the use of electric bicycles can provide optimal benefits, especially for the community while maintaining traffic safety and order.

The development of technology and information that is increasingly developing in the era of globalization, requires accessibility to technology and information that is broad and evenly distributed, especially in the world of transportation. This is a consequence of the increasing need for access to technological and information developments, by almost every level of society with all backgrounds (Nurdiani, 2017, p. 73). In addition, the existence of electric bicycles must also consider accessibility. The meaning of accessibility is, facilities provided for everyone with the aim of realizing equality and opportunity in all aspects of life. Of course, accessibility itself is not only from one side, namely electric bicycles, but must also include accessibility to infrastructure within the scope of traffic and road transportation. There are 2 (two) types of accessibility, namely, physical and non-physical. Physical accessibility is related to building and environmental infrastructure, in the context of the development and use of electric bicycles, of course, road conditions for both conventional motor vehicle users and electric bicycles must be separated or emphasized lanes that can be passed. Then non-physical accessibility is

related to developing technology, such as the existence of electric bicycles themselves. Of course, the fulfillment of accessibility is the basis of everyone who is built with the aim of creating fair services for all levels of society (Nur et al., 2021, p. 23).

3.4. Analysis of factors affecting the classification of electric bicycles

The classification of electric bicycles as motorized or non-motorized vehicles is not a simple decision. There are various complex factors that interact with each other and influence how electric bicycles should be categorized and regulated in legislation. These factors can be grouped into 3 (three) main categories, namely technical factors, usage factors, and legal and regulatory factors. Analyzing these factors in depth is essential for formulating appropriate regulations, especially for regulating the use of electric bicycles in Indonesia.

Aspects of technical factors in electric bicycles play a central role in determining their classification. Characteristics such as electric motor power, maximum speed, and additional features greatly influence how an electric bicycle can operate and how it should be required in legislation. First there is electric power, which is the most important technical factor affecting the classification of electric bicycles. Electric motor power determines how much assistance the motor provides to the rider, an electric bike with low motor power provides little assistance when pedaling, while an electric bike with higher motor power can provide significant assistance, or even move the bike completely without the need for pedaling.

In many countries, electric motor power limits are used as a key criterion to distinguish electric bicycles from other electric motorcycles or motorized vehicles. One example is in Europe, electric bicycles are generally limited to 250 watts of motor power. Bicycles with motor power above this limit are classified as motorcycles and are subject to stricter regulations, including driver's license, registration, and insurance requirements. In Indonesia, the Minister of Transportation Regulation No. 45/2020 on Certain Vehicles Using Electric Motor Drives, does not set a limit on electric motor power for electric bicycles. This creates ambiguity and potential problems. Electric bicycles with very high motor power can be sold and used without adequate regulation, potentially jeopardizing the safety of electric bicycle users and other road users.

Therefore, it is important to set clear power limits for electric motors, especially for the use of electric bicycles in Indonesia. These limits should consider several factors such as safety standards, as well as supervision and enforcement to ensure that electric bicycles sold and used comply with the set power limits. In addition to the power of the electric motor in an electric bicycle, maximum speed is also an important technical factor affecting the classification of an electric bicycle. The maximum speed in an electric bicycle determines how fast the bicycle can go with the help of an electric motor, an electric bicycle with a high maximum speed can reach speeds similar to a motorcycle, potentially increasing the risk of accidents and endangering the safety of other road users, considering that the electric bicycle itself does not make noise like a conventional motor in general.

The Minister of Transportation Regulation No. 45/2020 has set the maximum speed limit for electric bicycles at 25 km/h, which is in line with international standards in many countries. However, in order for the speed limit on the use of electric bicycles in Indonesia to run regularly, strong supervision and law enforcement are also needed. There needs to be a sustained education and socialization campaign to raise public awareness of the maximum speed limits of electric bicycle use, and the risks associated with violations. Strict enforcement of speed violations is also needed, to provide a deterrent effect and ensure the safety of all road users.

The rapid development of transportation technology has encouraged the

emergence of electric bicycles as an alternative environmentally friendly vehicle. However, in Indonesia, the lack of clarity in the regulation of electric bicycles has caused various legal problems, both in terms of legal certainty, rule enforcement, and protection of road users. Electric bicycles are currently in a gray area in the national legal system because they are not explicitly categorized as motorized or non-motorized vehicles in Law No. 22/2009 on Road Traffic and Transportation (LLAJ Law). As a result, law enforcement officials have difficulty in determining the standard of application of the rules, while electric bicycle users have no clear guidelines regarding their rights and obligations on the road. This uncertainty has the potential to lead to unfairness in the application of the law, especially in cases of traffic violations or accidents involving electric bicycles.

On the other hand, differences in regulations at the regional level further exacerbate inconsistencies in the application of laws regarding electric bicycles. Some regions have enacted local regulations that require electric bicycles to follow the same requirements as motor vehicles, while other regions still treat them like conventional bicycles. This imbalance risks creating conflicts between electric bike users, law enforcement officials, and policy makers. In addition, without clear rules regarding technical requirements, such as speed limits, electric motor specifications, and safety standards, the use of electric bicycles may increase the risk of road accidents. Therefore, a more comprehensive reformulation of legal policies is needed to provide legal certainty, ensure user safety, and create uniformity in the application of rules related to electric bicycles in Indonesia.

3.5. An overview of the vagueness of electric bicycle regulations in the Indonesian regulations

Electric bicycles as part of transportation infrastructure have a strategic role, especially in the development of social and economic activities and various uses for the prosperity of society (Mustakim, 2019, p. 158). The purpose of regulating electric bicycles in Indonesia is to realize justice for all vehicle users and road users, so that security, safety, order, and smoothness of traffic and road transportation can be realized (Indonesia, Pemerintah Pusat, 2009a). In addition, in terms of realizing the mandate of Article 28 D of the 1945 Constitution of the Republic of Indonesia, it states that «everyone has the right to recognition, guarantees, protection and certainty of a fair law and equal treatment before the law».

However, in the context of regulating electric bicycles in Indonesia itself, there is a lack of clarity in the regulation, which has various legal implications that can be said to be very significant. Although currently in force Regulation of the Minister of Transportation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives, there are still several aspects that have not been comprehensively regulated, one example is related to the use of electric bicycles on the highway, resulting in the emergence of juridical consequences arising and needing attention.

One very visible legal implication is the legal uncertainty for electric bicycle users, as mentioned in Chapter A in the previous discussion of this thesis, that Law Number 22 of 2009 concerning Road Traffic and Transportation (LLAJ Law) and Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives (Permenhub 45 of 2020) do not specifically regulate electric bicycles. Meanwhile, Permenhub 45/2020 only regulates the use of electric bicycles in certain areas and lanes, so the unclear regulations can endanger the safety of electric bicycle users and other road users.

There is ambiguity in the regulation of electric bicycles, such as whether they are motorized or non-motorized vehicles. This has implications for the requirements that must be met by electric bicycle users, such as the obligation to have a driver's license (SIM), vehicle registration, and compliance with motor safety standards. The impact of the lack of clarity regarding the regulation of electric bicycles also causes confusion

regarding law enforcement, especially in taking action by the police apparatus. On the one hand, the police are responsible for traffic safety, but on the other hand, there is no clear legal basis to take action against electric bicycle users who violate the rules (Faruq & Ubaidillah, 2024, pp. 4–5).

When referring to the opinion mentioned by Hans Nawiasky regarding the Theory of Formation of Legislation, there are formal gesets or laws, in the context of this writing is Law Number 22 of 2009 concerning Road Traffic and Transportation, as well as *Verordnungen* or autonomous *Satzungen* or implementing rules and autonomous rules which are implementing rules and regulations that are under the law and act as implementing provisions in the law. Law No. 12/2011 on the Formation of Legislation on the principle of clarity of purpose emphasizes the importance of clarity of formulation in the formation of legislation

Regulations regarding the use of electric bicycles are currently regulated more in Ministerial Regulations, while the LLAJ Law as a higher regulatory hierarchy above ministerial regulations, in this case does not provide clear arrangements. Of course, this has legal implications in the form of inconsistencies in the hierarchy of laws and regulations, if it is seen that the LLAJ Law is included in the type and hierarchy of laws and regulations as stated in Article 7 paragraph (1) letter c of Law Number 12/2011 concerning the Formation of Laws and Regulations, while Ministerial Regulations are included in the type of laws and regulations other than those referred to in Article 7 paragraph (1), namely in Article 8 paragraph (1) of Law Number 12/2011 (Indonesia, Pemerintah Pusat, 2011).

Then the legal implications that occur next are not harmonious between the position of Law Number 22 of 2009 concerning Road Traffic and Transportation, with Regional Regulations. Currently in Indonesia there are several regions that have regulated the use of electric bicycles.

From several regions that already have legal products and regulate the use of electric bicycles, several points of analysis related to the Theory of Legislation Formation such as the Hierarchy of Legislation. Regional legal products that regulate the use of electric bicycles must actually be in accordance with the hierarchy of laws and regulations. Hans Nawiasky in his theory, states that Regional Regulations are at the *Verordnung* or *Autonome Satzung* level, in this case it must be in harmony with the regulations above.¹⁰⁸ So in this case, regional regulations that are at *Verordnung* or *Autonome Satzung*, their position is very important in regulating matters that are local and specific. Especially in the context of regulating the use of electric bicycles, regional regulations can regulate aspects such as use zones in certain areas, and special roads that can be used by electric bicycles. Therefore, the author will try to describe in tabular form the contents of regional legal products that have regulated the use of electric bicycles as Table 3.

Table 3. Local law products that regulate electric bicycles

No.	Rule Name	Regulated Matters
1	Governor Regulation of the Special Capital Region of Jakarta Province Number 128 of 2019 concerning Provision of Bicycle Lanes	Article 2 paragraph (1) states that bicycle lanes are reserved for bicycles and electric bicycles.

2	Governor Regulation of the Special Capital Region of Jakarta Province Number 36 of 2022 concerning the Implementation of Bicycle Rental Integrated Mass Public Transportation	Article 4 paragraph (1) regulates the types of bicycle rental facilities, consisting of bicycles and electric bicycles. Article 5 paragraph (2) regulates the Technical Specifications of safety requirements on electric bicycles.
3	Yogyakarta Mayor Regulation Number 71 Year 2022 on the Use of Certain Vehicles Using Electric Motor Drives	Article 2 of this Mayor's Regulation states the scope, including use, requirements, and guidance and supervision
4	Banjarasin Mayor Regulation Number 113 of 2022 concerning Certain Vehicle Areas Using Electric Motor Drives in Banjarasin City	The things regulated in this Mayor's Regulation include, types of vehicles, operating areas, safety requirements, rules for people / entities that rent out electric bicycles, as well as supervision and control.
5	Bantul Regent Regulation Number 37 of 2022 concerning the Use of Certain Vehicles Using Electric Motor Drives	The things regulated in this Regent Regulation include, the type of certain electric motor-driven vehicles, one of which is an electric bicycle, then the safety requirements for electric bicycle users, and the determination of areas that are allowed to use electric bicycles.

Based on the table presented, several regions in Indonesia already have regional legal products that regulate the use of electric bicycles. This can show that there are efforts by local governments to regulate and order the use of electric bicycles in their respective regions, this phenomenon can again be related to the Theory of Legislation Formation, especially the theory put forward by Hans Nawiasky and A. Hamid Attamimi. If based on the context of regulating electric bicycles, regional legal products such as Governor Regulations, Mayor Regulations, and Regent Regulations, in the Hierarchy of Legislation in Indonesia are included in the *verordnung en autonome satzung* group according to Hans Nawiasky and A. Hamid Attamimi, in this case covering from Government Regulations to Regent or Mayor Decrees.

However, legal products made as a form of further elaboration of the Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives, have significant legal implications related to legal certainty. With the existence of regional regulations that specifically regulate the use of electric bicycles, in this case electric bicycle users can have legal certainty regarding their rights and obligations when using electric bicycles in areas that already have legal products and regulate the use of electric bicycles. Then related to law enforcement, with the existence of regional regulations governing the use of electric bicycles, it can facilitate law enforcement officials in monitoring and prosecuting violations of the use of electric bicycles.

Based on this, it should be noted that although some regions have legal products that regulate the use of electric bicycles, there are still several other regions that do not have similar legal products. This can lead to non-uniformity in handling and regulating the use of electric bicycles in Indonesia. In addition, although regional legal products that regulate the use of electric bicycles provide legal certainty in areas that have regulated the use of electric bicycles, there is still a lack of clarity in Law Number 22 of 2009 concerning Road Traffic and Transportation. Because the LLAJ Law itself still does

not specifically regulate the criteria or use of electric bicycles, of course this can cause confusion in the application of the law, especially when problems occur in the form of violations that occur on the highway.

To overcome this, it is necessary to harmonize and synchronize laws and regulations vertically and horizontally. Vertically, there needs to be a stronger legal umbrella at the national level, for example through revising the Road Traffic and Transportation Law or making a special law on electric vehicles. Horizontally, there needs to be coordination between regions to ensure there are no contradictions in regulating electric bicycles, especially for regions with direct borders. Harmonization and synchronization in the context of the Theory of Legislation Formation by Hans Nawiasky and A. Hamid Attamimi, that this is an important stage to ensure that regional legal products remain in harmony with higher regulations and do not cause norm conflicts, also in accordance with Article 7 of Law Number 12 of 2011 concerning the Formation of Legislation regarding the Hierarchy of Legislation (Winata & Musais, 2021, p. 27).

The legal implications related to the regulation of electric bicycles in Indonesia, in this case related to the Theory of Legal Objectives as proposed by Gustav Radbruch, can be analyzed through 3 (three) main aspects, namely Justice, Benefit, and Legal Certainty. Referring to Gustav's opinion related to justice, that the principle of justice at least needs to be prioritized if positive law is contrary to the values of justice, and the value of justice is the material that must be the content of a rule of law (Bernard L. Tanya et al., 2019, p. 117). So, in the context of the regulation of electric bicycles, aspects of justice in regulating electric bicycles such as the provision of special lanes and certain areas for the use of electric bicycles. Of course, this creates justice for electric bicycle users by providing equal space on the road, with the aim of realizing the balance of rights between electric bicycle users and other road users. Regarding the provision of special lanes, it has been regulated in Article 5 paragraph (1) of the Minister of Transportation Regulation Number 45 of 2020 concerning Certain Vehicles Using Electric Motor Drives, further regarding certain areas mentioned in Article 5 paragraph (3) of the Minister of Transportation Regulation includes settlements, car free day, tourist areas, areas around mass public transportation facilities, office areas, and off-road areas. This has also been regulated in several regions that have legal products, especially those that regulate the use of electric bicycles. One example is in the Determination of Areas in Article 12 of Regent Regulation Number 37 of 2022 concerning the Use of Certain Vehicles Using Electric Motor Drives, where regulated electric bicycle operating areas can create a balance between the rights of users of electric bicycles and other road users.

Based on the aspect of expediency, which is part of regulating electric bicycles and also part of Gustav Radbruch's Legal Objective Theory, is an increase in accessibility. Clear regulation of the use of electric bicycles can increase transportation accessibility in various levels of society, including providing benefits for law enforcement in the sense that it can provide legal certainty for the control and supervision of the use of electric bicycles. Then if analyzed based on the aspect of legal certainty in regulating electric bicycles, the regulations from each region provide a class definition regarding the use of electric bicycles and their classification as certain vehicles using electric motor drives. The legal implication is the creation of clarity on the legal status of electric bicycles which facilitates the application and enforcement of the law.

The lack of clarity in regulations regarding the use of electric bicycles on the road poses various legal challenges that result in a lack of uniformity at the regional level. Although some regions have issued regulations that refer to Gustav Radbruch's Purpose of Law, differences in regulation between regions can create legal uncertainty and potential conflicts in implementing the rules (Cahyandari & Hadiyantina, 2022, p. 66). This is even more complex when one region has clear regulations related to electric bicycles, while other regions still do not regulate them. This difference not only makes

it difficult for electric bicycle users to understand their rights and obligations, but also creates obstacles for officials to enforce the law uniformly.

In addition, the rapid development of electric bicycle technology also poses challenges for the existing regulations. Without sufficient legal flexibility, existing regulations can quickly become outdated and unable to optimally accommodate technological innovation. The absence of a national-level legal umbrella in Law No. 22/2009 on Road Traffic and Transportation (LLAJ Law) has led to various legal interpretations regarding the status of electric bicycles in Indonesia (Cahyandari & Hadiyantina, 2022, p. 103). Therefore, education on electric bicycle regulations must be improved, not only for the user community but also for law enforcement officials. Alignment between various regulations, such as Minister of Transportation Regulations, Regional Regulations, and other technical rules, is needed so that electric bicycles can be used safely and lawfully. In this case, a monitoring and evaluation system must be implemented on an ongoing basis to ensure that regulations remain relevant to technological developments and community needs.

In the perspective of J.B.J.M. Ten Berge, as cited by Ridwan HR, law enforcement is not only the responsibility of the legal apparatus, but also of every individual in society (Ridwan, 2006, p. 307). This is in line with the provisions in the LLAJ Law Article 219 paragraph (1) which regulates the development of transportation industry and technology, including safety aspects, vehicle registration, and supporting facilities for law enforcement. Therefore, in the face of the surge in the use of electric bicycles, the law enforcement system must be strengthened to ensure compliance with applicable legal norms, both formally and materially.

In line with Jimly Asshiddiqie's view, law enforcement must ensure that legal norms are not only written in regulations but also effective in implementation in society (Muiz, no year). Therefore, coordination between the community, local government, and law enforcement officials is very important in ensuring that the use of electric bicycles can run in an orderly and safe manner. Thus, the reformulation of electric bicycle regulations must be carried out thoroughly by considering the harmonization of rules at the national and regional levels, and ensuring that the regulations implemented can provide legal certainty for all parties involved.

To overcome the challenges in terms of law enforcement, there are law enforcement strategies that can be offered as follows:

1. Regulatory clarity, a step in improving law enforcement through reformulation of the LLAJ Law and Minister of Transportation Regulation No. 45/2020 to clarify the definition of electric bicycles. Regulations governing electric bicycles must also set clear requirements in the form of limits on electric motor power, maximum speed, and safety requirements for the use of electric bicycles.

2. Increasing the capacity of law enforcement, if referring to Article 219 paragraph (1) letter g of the LLAJ Law, the government must increase the capacity of law enforcement with the aim of enforcing electric bicycle regulations to run optimally. Of course, the government needs to provide facilities in the form of necessary equipment such as speed meters and electric motor power testers.

3. Education and socialization campaigns, in order to create a Culture of Safety and Security of Traffic and Road Transport referring to Article 208 of the LLAJ Law, a continuous education and socialization campaign to increase public awareness of electric bicycle regulations must be evenly distributed to all elements of society, both from various ages and backgrounds and with language that is easy to understand.

4. Cooperation between Traffic Supervisors, in order to carry out maximum law enforcement, it requires cooperation between traffic and road transportation supervisors and the community, of course this is also a mandate from Article 200 paragraph (2) of

the LLAJ Law.

5. Fair law enforcement, law enforcement must be carried out in a fair and non-discriminatory manner, in the context of using electric bicycles, if there are violators, they must explain the violations committed.

6. Effective sanctions are needed to provide a deterrent effect and prevent repeated violations. Sanctions must be commensurate with the offense committed, and consistently enforced.

In the long term, enforcement of violations of electric bicycle use should be part of a broader traffic safety culture. All levels of society must work together to instill traffic safety values. In order to create a strong traffic safety culture, and to reduce the number of crashes and injuries related to the use of electric bicycles, and improve the overall quality of life of the community.

Of course, in the context of this writing, it cannot be separated from the Theory of Legal Objectives put forward by Gustav Radbruch which includes Justice, Benefit, and Legal Certainty. If by considering the principles of justice, usefulness, and legal certainty in the formulation and enforcement of laws against the use of electric bicycles, Indonesia can create a safer, more efficient, and fair transportation system for all road users. The application of Gustav Radbruch's Legal Objective Theory itself certainly reflects fundamental values in society.

In principle, the law was created to provide trust to the community in regulating different interests in order to achieve prosperity. In this context, the community as a legal subject has an important role in creating justice, benefit and legal certainty (Sagama, 2016, p. 24). Legal certainty includes the protection of individuals from government arbitrariness with the existence of general rules, so that people know their rights and obligations (Syahrani, 1999, p. 24). In this case, the law not only functions as a tool to achieve justice or benefit, but also ensures legal certainty with general and objective regulations.

Reformulation of legal arrangements is a necessary step in responding to social change, technology, and community needs. This reformulation aims to synchronize various existing regulations, especially regarding the regulation of electric bicycles. If associated with Gustav Radbruch's Theory of Legal Objectives, legal reformulation of electric bicycles must fulfill three main requirements (Rahardjo, 2000, p. 208):

1. Covers all relevant aspects of positive law, so that it reflects an element of fairness for electric cyclists, other road users, and law enforcement.

2. It should not contain logical contradictions, which means that regulations should not only highlight the negative impacts of electric bicycles but should consider the development of technology and its benefits to society.

3. Have clarity and simplicity in implementation, so as not to cause confusion among users and policy makers.

A scientific review of the regulation of electric bicycles shows that reformulation of the rules in the LLAJ Law is necessary in order to ensure justice and legal certainty. In this case, the law must reflect norms that are oriented towards justice and can function effectively in society. Transportation, as an important aspect of social and economic life, requires clear and comprehensive regulations to create a safe and orderly traffic system (Marye Agung Kusmagi, 2010, p. 40). Therefore, the regulation of electric bicycles needs to be harmonized with broader national rules to avoid conflicts with higher laws.

In practice, the LLAJ Law is still unable to accommodate rapid developments in the world of transportation, including the use of electric bicycles. With the rapid advancement of technology, existing regulations often lag behind the needs of society (Moh. Fadli & Syofyan Hadi, 2023, p. 35). For this reason, reformulation of the LLAJ Law is needed so that the applicable regulations can remain relevant and adaptive to the

times.

In addition, Presidential Regulation No. 55/2019 on the Acceleration of the Battery-Based Electric Motor Vehicle Program has provided support for the development of the electric vehicle industry, including electric bicycles. However, this regulation still focuses more on the industrial aspect, while the legal aspects regarding their use on the highway have not been specifically regulated (Masyarakat Transportasi Indonesia, 2024, p. 16). Therefore, the substance of regulating electric bicycles should be included in the LLAJ Law to provide stronger legal certainty for users and law enforcement.

Currently, the LLAJ Law has been included in the National Legislation Program (Prolegnas) as part of the priority legislative agenda. However, in the revision discourse, there is no indication that regulating electric bicycles is one of the main focuses. This issue is often sidelined by other issues that dominate legislative discussions (Badan Pembinaan Hukum Nasional, 2022). Therefore, a comparison with regulations in other countries, such as the United States and the European Union, is needed to gain a broader perspective on the reformulation of electric bicycle regulations (Chisholm & Healy, 2018, p. 97).

Legal reformulation of electric bicycles in the LLAJ Law must be carried out comprehensively to create regulations that are in line with technological developments, provide legal certainty for users, and ensure justice in their implementation. In addition, alignment with national and international regulations will provide a stronger legal framework for regulating the use of electric bicycles in Indonesia.

The United States has a long history of cycling culture that has evolved from a means of transportation to a way of life. The concept of Bicycle Urbanism, adapted from Rachel Berney's book, encourages the creation of safe and friendly infrastructure for cyclists. Along with technological developments, the United States developed Ebike Laws in 2023 to regulate the use of electric bicycles. Under the US Consumer Product Safety Act, an electric bicycle is defined as a low-speed vehicle with fully operated pedals, under 750 watts of power, and a maximum speed of 32 km/h. Electric bicycles that meet these standards are regulated like regular bicycles, including the durability of the frame, tires, brakes, and electrical system.

Despite federal regulations on electric bicycles, there are currently 39 states in the United States (Arkansas, Arizona, Alabama, Colorado, California, Connecticut, Delaware, Georgia, Florida, Idaho, Indiana, Illinois, Iowa, Louisiana, Kansas, Maine, Michigan, Maryland, Minnesota, Mississippi, Missouri, Nevada, Nebraska, New Jersey, New Hampshire, New Mexico, North Dakota, Ohio, Oklahoma, South Dakota, Tennessee, Utah, Texas, Vermont, Virginia, Washington, Wisconsin, West Virginia, and Wyoming) adopted criteria for 3 classes of electric bicycles, which classes are described as:

- a. Class 1 electric bicycles, which have a maximum speed limit of 20 mph and operate with pedal assistance as they do not have a gas valve for motor power.
- b. Class 2 electric bicycle, having the same maximum speed limitation as class 1, equipped with a main pedal that allows the bicycle to operate without pedaling by human power.
- c. Class 3 electric bicycles are limited edition electric bicycles on pedal assist like class 1, but the highest maximum assist speed is 28 mph.

All three classes of electric bicycles are regulated in a similar way to regular bicycles in the United States in terms of licensing, insurance and registration requirements. In most states in the United States, electric bicycles are allowed to use the same paths as regular bicycles. However, governments have the authority to impose restrictions on the use of electric bicycles on bicycle paths. Therefore, it is important to further elaborate on the electric bicycle regulations in each state in the United States because each state has a different form of track.

Europe also has strict regulations regarding electric bicycles. European Union Directive 2002/24EC, which was later replaced by European Union Directive 168/2013, stipulates that Electrically Pedal Assisted Cycles (EPACs) must have a maximum power of 250-watts and a maximum speed of 25 km/h (European Parliament, Council of the European Union, 2002).

- a. Electric bicycles in Europe are classified into three main types (Engwe, 2023):
- b. Pedelec: A pedal-assist bicycle with 250-watt power and a maximum speed of 25 km/h, no insurance or tax required.
- c. Speed Pedelec: A bike with a maximum speed of 45 km/h and up to 4000 watts of power, requiring a driver's license, tax and insurance.
- d. Throttle-Controlled E-Bikes: A bicycle that operates like an electric motor with a gas system, which is subject to motor vehicle regulations in European countries.

While the general rules are set, each European state has its own policies regarding speed limits, helmet use, bike lanes, and registration and insurance requirements (ENGWE, 2024).

Compared to regulations in the United States and Europe, Indonesia still does not have specific regulations governing the use of electric bicycles in detail. Article 2 paragraph (1) of Presidential Regulation No. 55/2019 on the Acceleration of the Battery-Based Electric Motor Vehicle Program only regulates two-wheeled electric vehicles in general, without a specific classification for electric bicycles. This causes legal uncertainty for electric bicycle users in Indonesia. Currently, there is no legal certainty regarding safety aspects such as standardized helmets, dedicated electric bicycle lanes, speed limits, insurance, and rider age limits. If not immediately reformulated into the LLAJ Law, the use of electric bicycles on public roads will lead to regulatory conflicts that can lead to legal and safety problems. To avoid a legal vacuum, Indonesia should immediately adopt a regulatory approach similar to that in the United States and Europe, classifying electric bicycles based on speed and power, as well as establishing technical regulations related to vehicle specifications and driving safety aspects.

Reformulation of the LLAJ Law is a crucial step in providing legal certainty regarding electric bicycles. This regulation must include:

- a. Definition and classification of electric bikes based on motor power and speed.
- b. Technical and safety requirements, such as mandatory helmet use, speed limits, and safety features such as lights and brakes.
- c. Registration procedures, to facilitate vehicle identification and supervision by law enforcement.
- d. Regulate lanes and areas of use, so as not to endanger other road users.

When associated with Gustav Radbruch's Legal Objective Theory, this regulatory reformulation aims to create justice, benefit, and legal certainty. Clear regulations will provide justice for road users, benefits in the use of electric bicycles as an alternative mode of transportation, and legal certainty in their use on the road.

In addition, harmonization of regulations between the central and local governments is an important step to ensure uniformity of rules regarding electric bicycles. Currently, there are different interpretations in local regulations regarding the use of electric bicycles, potentially creating legal confusion for the public. Therefore, it is necessary to standardize national regulations that cover all aspects, from definitions to rules of use on the road.

Currently, Indonesia lags behind the United States and Europe in regulating electric bicycles. Reformulation of the LLAJ Law must be done immediately to create regulations that are fair, clear, and adaptive to technological developments. This regulation should

include technical standards, registration procedures, safety provisions, and effective monitoring mechanisms. With harmonized regulations between the central and local governments, it is expected that the use of electric bicycles can be more structured and safer for the community.

4. Conclusions

The unclear legal status of electric bicycles in Indonesia's national legal system has caused various problems, including in the aspects of legal certainty, justice, and user safety. Currently, Law No. 22/2009 on Road Traffic and Transportation (LLAJ Law) does not specifically regulate electric bicycles, resulting in ambiguity in the application of the law. Minister of Transportation Regulation No. 45/2020 does provide some guidelines, but it is still not comprehensive enough in determining the classification of electric bicycles and the rights and obligations of their users. When compared to regulations in the United States and Europe, Indonesia is still lagging behind in terms of more specific and adaptive arrangements for the development of transportation technology. Therefore, legal reformulation is needed that not only ensures legal certainty but also guarantees justice for all road users. This reformulation must be able to accommodate technological developments, provide clear guidelines for law enforcement officials, and ensure the safety of electric bicycle users on the road.

The government needs to immediately reformulate the LLAJ Law to accommodate the use of electric bicycles by establishing clear classifications, speed limits, and safety requirements for users. This regulation must also be harmonized with policies at the regional level to avoid legal imbalances in the application of the rules. In addition, there is a need to increase the capacity of law enforcement officials so that they can enforce regulations fairly and consistently. Socialization to the public regarding the rights and obligations in using electric bicycles must also be carried out intensively through various platforms, including social media and educational campaigns. With clearer regulations and better law enforcement, the use of electric bicycles can develop as a safe, efficient, and environmentally friendly transportation solution in Indonesia.

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