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Legal review of artificial intelligence-based autopilot electric vehicles in Indonesia

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ABSTRACT

The rise of electric vehicles using AI technology and Autopilot mode has potential benefits and issues in Indonesia's transportation system. These cars are more energy efficient and safe to drive. Yet, the legality of autonomous electric cars is still unclear due to lacking regulations. This article explores the legal concerns of AI-driven electric vehicles, such as safety standards, liability in accidents, and data privacy. This study employs a normative legal research method with legislative and conceptual approaches to analyze various applicable regulations, such as Law Number 22 of 2009 concerning Traffic and Road Transportation and Presidential Regulation Number 55 of 2019 concerning Battery-Based Electric Vehicles. The research findings indicate that despite some rules that can serve as a basis for regulation, there are still legal loopholes that need to be addressed promptly. The government needs to formulate specific regulations covering safety aspects, feasibility tests, and mechanisms of legal responsibility in accidents involving autonomous vehicles. Additionally, user data protection must be reinforced to prevent the misuse of information collected by AI systems. In conclusion, strict regulations are needed to ensure that technological advancements can move forward while safeguarding safety and legal certainty for the public. This research encourages new regulations governing security aspects, legal responsibility, and data protection in AI-based autopilot electric vehicles to address legal gaps in the Road Traffic and Transport Law (LLAJ) and the Electronic Information and Transactions Law (ITE).

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1. Introduction

The advancement of technology in the modern era has brought significant changes in various aspects of human life. One of the most striking innovations is the progress in the field of transportation (Subekti et al., 2024). Technology has enabled humans to create vehicles that are safer, more efficient, and environmentally friendly. Electric cars have become one of the future

transportation solutions that are expected to reduce carbon emissions and dependence on fossil fuels. Moreover, technological advancements have also introduced the concept of vehicles that can operate automatically, known as autonomous vehicles. One of the key technologies supporting the development of autonomous vehicles is Artificial Intelligence (AI), which can process large amounts of data and make real-time decisions. The combination of electric cars with AI technology creates significant opportunities to create a smarter and more efficient transportation system.

Artificial Intelligence (AI) is a branch of computer science that focuses on creating machines or systems capable of performing tasks that typically require human intelligence (Septiyandini et al., 2024). AI refers to the ability of machines to mimic human intelligence (Jarrahi et al., 2022). It encompasses various techniques and methods that enable computers to understand, learn, and make decisions based on data provided. In the context of autonomous vehicles, AI plays a key role in controlling cars automatically without human intervention (Suprobowati & Kalpikajati, 2021). AI technology used in Autopilot mode involves the use of sensors, cameras, radar, and machine learning algorithms to monitor the surrounding environment of the vehicle, identify objects, and make accurate driving decisions. Autopilot mode in AI-based vehicles enables cars to recognize road lanes, detect traffic signs, avoid collisions, and even predict the behavior of other road users. These capabilities make autonomous vehicles safer and more efficient in reducing the risk of accidents and enhancing the driving experience.

Based on the provisions of Article 1 numbers 7, 8, and 9 of Law Number 22 of 2009 concerning Road Traffic and Transportation, vehicles are defined as means of transportation on roads consisting of motorized vehicles and non-motorized vehicles. A motorized vehicle is any vehicle that is driven by mechanical equipment in the form of a machine, except vehicles that run on rails. Meanwhile, non-motorized vehicles are any vehicle driven by human and/or animal power. As time progresses and transportation efficiency improves, motor vehicles have become the preferred choice to meet the needs of society. This includes two-wheeled motor vehicles such as motorcycles and four-wheeled motor vehicles such as cars.

The high population of motor vehicles has prompted manufacturers to continuously innovate, both for two-wheeled and four-wheeled vehicles. One innovation introduced by motor vehicle manufacturers, particularly for four-wheeled vehicles, is the electric car equipped with an Autopilot system. This innovation has been in development for quite some time in the global automotive industry, with various experiments and feasibility tests conducted for road operation. Currently, there are several categories of Autopilot operation systems for four-wheeled vehicles, which will henceforth be referred to as Autopilot cars in this paper (Nusi, 2021).

The Autopilot mode is a primary feature developed in AI-based electric vehicles. This technology enables the vehicle to move autonomously by utilizing complex AI algorithms (Bathla et al., 2022). The Autopilot mode operates by processing data from various sensors installed on the vehicle, such as LiDAR, cameras, and radar, to map the surrounding environment and make real-time decisions (Liu et al., 2020). AI in the Autopilot mode is also capable of learning traffic patterns and other drivers' behaviors to adjust speed, change lanes, or stop automatically (Grigorescu et al., 2020). Implementing the Autopilot mode in electric vehicles brings benefits in reducing driver burden, enhancing fuel efficiency, and decreasing road accidents. This technology also supports the concept of a more environmentally friendly and sustainable future mobility.

Electric vehicles use electric motors and batteries as their primary energy source, offering higher energy efficiency, lower greenhouse gas emissions, and more cost-effective operation compared to conventional fossil-fuel-powered vehicles. However, in Indonesia, their adoption still faces challenges, particularly in terms of legality and regulations related to technical requirements, safety, and road use permits. One advanced feature commonly found in production cars since 2008 is Cruise Control, which allows vehicles to maintain a steady speed

without continuously pressing the accelerator pedal. However, Cruise Control is not an Autopilot system, as the driver still needs to control the direction, speed, and braking. On the other hand, the Autopilot system functions similarly to those in airplanes, where the computer takes full control of the vehicle. In Indonesia, vehicles equipped with Autopilot features, including automatic parking systems, are already available. For instance, Mercedes-Benz introduced the S450L model with this technology in early 2019. Additionally, the American automaker Tesla has brought electric cars with Autopilot systems to the market, such as the Tesla Model X and Model S—one of which is owned by Bambang Soesatyo, Speaker of the Indonesian House of Representatives for the 2014-2019 period.

The presence of Autopilot feature in cars alleviates human tasks (Juliansyah, 2022). Furthermore, another goal in the development of the Autopilot system is to minimize the level of traffic accidents, predominantly caused by the negligence of drivers (Saputra & Sewu, 2023). However, in the event of an undesired incident resulting from the failure of the Autopilot car computer control system, it may have unfavorable consequences for the vehicle owner and other road users.

The regulation of AI-based autonomous vehicles in Indonesia faces major challenges, mainly due to legal loopholes, the absence of road infrastructure standards that support digitization, and the low readiness of autopilot technology. To date, Indonesia does not have a specific legal framework governing autonomous vehicles, although the government has begun testing their integration in the new capital city (Rasdiyanti et al., 2024). In contrast, developed countries such as Germany, the Netherlands and Singapore have established detailed regulations regarding safety, legal responsibility and ethical use of AVs (Suhariyanto et al., 2024; Tran & Le, 2022). Meanwhile, the European Union has established guidelines adopted by many countries, in contrast to Indonesia's slower regulatory pace (Mira-Bonnardel & Couzineau, 2021).

The legality of vehicles, including AI-based electric cars with Autopilot mode, has become an important issue that needs to be addressed by the government and society. Legal regulations governing the use of autonomous vehicles should encompass various aspects, such as safety standards, user data protection, legal liability in case of accidents, and technical requirements for vehicles operating autonomously. In Indonesia, regulations related to electric vehicles have been stipulated in several regulations, such as Presidential Regulation Number 55 of 2019 concerning the Acceleration of Battery-Based Electric Motor Vehicle Programs for Road Transportation (Pambudi & Juwono, 2023). Even so, specific regulations governing the use of AI-based autonomous vehicles still need to be developed to ensure the safety and comfort of road users.

Regulatory laws concerning the legality of AI-based electric vehicles with Autopilot mode remain a significant challenge in Indonesia (Yuniza et al., 2021). The government needs to adopt clear and comprehensive policies to regulate the use of this technology on the roads (Maharani & Sutopo, 2021). Several developed countries have established specific regulations for autonomous vehicles, including public road testing, safety certification, and rules regarding legal responsibility in cases of accidents involving autonomous vehicles. Indonesia must learn from the experiences of these countries to develop regulations that are appropriate for local conditions and societal needs.

The phenomenon of using AI-based electric cars with Autopilot mode in Indonesia demonstrates significant potential in creating a more intelligent and environmentally friendly transportation system. However, without clear and effective regulations, the use of this technology can pose various risks, such as traffic accidents, privacy violations, and legal uncertainties regarding liability in accident cases. Therefore, it is imperative for the government and stakeholders to collaborate in developing regulations that can support the advancement of this technology while also safeguarding the interests of the public and road users.

The development of electric cars based on Artificial Intelligence (AI) with Autopilot mode has made rapid progress in various developed countries (Ma et al., 2020). However, legal

regulations in Indonesia have not comprehensively addressed the aspects of legality, safety, and legal responsibility related to autonomous vehicles. While other countries, such as the United States and the European Union, have implemented clear legal frameworks regarding testing, certification, and use of autonomous vehicles on public roads, regulations in Indonesia are still limited to conventional vehicles without considering the aspects of autonomy and artificial intelligence features in a vehicle. The gap identified in this study highlights the urgent need to examine and formulate adaptive legal policies governing AI-based electric cars, including regulations on safety, legal responsibility in the event of accidents, user data protection, and its impact on the national transportation system. The research is expected to contribute to filling the legal regulatory gaps in Indonesia, while also mitigating potential legal risks that may arise with the rapid growth of autonomous vehicle technology.

With the increasing sales of Autopilot cars in Indonesia, various legal issues have arisen regarding regulations, safety standards, and the legal status of drivers and the Autopilot system itself. Key challenges include whether current regulations can accommodate autonomous vehicles, how the government ensures the safety of road users, and whether drivers in Autopilot mode are still considered legally liable. In addition, further study is needed on whether these AI-based systems can be held liable in the case of accidents. Therefore, in-depth analysis is needed so that the development of autonomous vehicle technology is in line with legal certainty in Indonesia. This research will discuss the legality of artificial intelligence-based electric vehicles with Autopilot mode in Indonesia, especially in the legal aspects and validity of its circulation and its juridical implications.

2. Method

This research uses a normative legal research method, which focuses on the study of laws and regulations, legal principles, and legal doctrines relevant to the use of Artificial Intelligence (AI)-based electric vehicles with Autopilot mode in Indonesia. This normative legal research is conducted using a statute approach and conceptual approach. The statutory approach is carried out by examining various regulations relating to traffic and transportation, motor vehicle safety, and personal data protection, including Law Number 22 of 2009 concerning Road Traffic and Transportation, Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE), and Minister of Transportation Regulations related to vehicle type and feasibility tests. A conceptual approach is taken by analyzing legal concepts related to legal responsibility, data privacy, and driving safety in the context of the development of AI-based autonomous vehicle technology.

In terms of the validity of legal sources, this research refers to legal sources recognized in normative legal research, namely primary legal materials (such as laws and government regulations), secondary legal materials (such as expert opinions, legal journals, and doctrines), and tertiary legal materials (such as legal encyclopedias and legal dictionaries). Given that the law related to autonomous vehicles continues to develop, this research will also pay attention to the development of international regulations, such as UNECE regulations related to autonomous vehicles, so that the resulting analysis remains relevant and up-to-date.

3. Analysis and Results

3.1. Electric vehicle regulation and AI technology in Indonesia

Current regulations in Indonesia do not directly govern electric vehicles based on Artificial Intelligence (AI) with Autopilot systems. Nevertheless, from the Author's research, there are several regulations that can provide insights into aspects that need to be regulated regarding autonomous vehicles, although they do not specifically address them. Law Number 22 of 2009 concerning Road Traffic and Transportation (hereinafter abbreviated as UU LLAJ) defines "car"

as a vehicle that falls under the category of transportation means on public roads (Natalia, 2021). These vehicles are divided into two types: motorized vehicles and non-motorized vehicles (Pamungkas et al., 2020). Cars are classified as motorized vehicles because they are operated using mechanical equipment, such as engines, except for vehicles that run on rails. In this case, to operate a motorized vehicle, one is required to have a Driver's License (SIM) in accordance with applicable regulations. A Driver's License is concrete, personal, and binding, and is only given to individuals who have met the requirements, including passing tests and health examinations conducted by the Indonesian National Police (Polri). Based on Article 57 paragraph (1) of the UU LLAJ states that: "*Every vehicle operated on the Road must be equipped with motorized vehicle equipment.*"

Hence, this regulation focuses more on vehicles driven by humans and does not accommodate the possibility of vehicles that can operate without drivers, such as vehicles equipped with Autopilot systems. This certainly creates legal gaps that need to be addressed immediately.

Furthermore, Law Number 11 of 2008 concerning Electronic Information and Transactions (hereinafter abbreviated as UU ITE), which focuses more on personal data protection, electronic transactions (Hutabarat et al., 2022), and regulations regarding electronic information, does not contain specific provisions to regulate the management of data generated by electric vehicles equipped with artificial intelligence technology in the form of Artificial Intelligence (AI) systems, particularly on vehicles using Autopilot mode.

In general, cars equipped with autopilot technology have similarities with regular cars that don't have this feature. The main difference lies in the autopilot system's ability to take control of the vehicle from the driver when the feature is activated. Autopilot is an additional feature installed in cars, which allows the vehicle to operate independently under certain conditions.

Vehicles operating in Indonesia are also required to undergo road worthiness tests in accordance with the provisions of the UU LLAJ. These worthiness tests consist of type tests and periodic tests. Type tests are conducted on every motorized vehicle, involving physical inspections to ensure vehicles meet technical requirements and are roadworthy. Additionally, research is conducted on the design and engineering of modified vehicles, especially for certain types.

Modification of motorized vehicles, as regulated in the UU LLAJ, includes changes to dimensions, engines, and transport capacity. However, these modifications must be carried out with consideration for traffic safety factors, so as not to disrupt traffic flow or damage road infrastructure. Currently, the presence of cars with autopilot features in Indonesia remains in compliance with existing regulations in the UU LLAJ, as they do not violate established provisions. Autopilot car drivers, in accordance with these regulations, are still required to have a Driver's License (SIM) to operate motorized vehicles.

The ITE Law is actually intended to provide legal protection for rapid technological advances, especially to regulate personal data protection, as stated in Article 26 paragraph (1) of Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE) which states that: "*Unless otherwise stipulated by laws and regulations, the use of any information through electronic media concerning someone's personal data must be carried out with the consent of the person concerned.*"

It can be seen that the article above regulates individual rights over personal data, however, these regulations do not explicitly cover the types of data collected by vehicles with Artificial Intelligence (AI) technology, where AI systems can include very detailed information about driver behavior, road conditions, routes that have been or will be taken by drivers, sensor data, and real-time vehicle situations.

Vehicles with AI-based Autopilot systems rely on various sensors and software to continuously collect and process data during operation (Antonakaki et al., 2024). This data includes information about driver behavior who may be in the vehicle (such as reaction speed to emergency situations), road conditions (such as weather conditions or traffic congestion)

(Zhang, 2024), and vehicle data itself (such as location and technical status of the vehicle). Although this data can be used to improve vehicle efficiency and safety (Xu et al., 2024), the absence of clear regulations regarding how this data is treated, stored, or shared can lead to potential misuse of personal information of drivers or interested third parties (El-Kady, 2025).

In this context, Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE) only touches on certain aspects of personal data collection and utilization through electronic media, without providing specific guidance regarding the context of using Artificial Intelligence (AI) systems in autonomous vehicles that can collect data in large quantities and at high speeds. Article 26 of Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE) states that personal data cannot be collected or processed without consent from the individual concerned, but this consent must be clear, explicit, and well-informed to users (Respati, 2024). This becomes a major challenge if AI system devices in autonomous vehicles can automatically collect data without direct user involvement, making it difficult to ensure whether the collected data has received valid approval from the driver or not.

To address this issue, there needs to be revision or additional provisions in Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE) that are more specific in regulating data collection and use by AI systems in Autopilot-based electric vehicles, to ensure legal certainty for electric car users.

There needs to be regulations governing who has the right to access vehicle data, how this data should be securely managed, and the duration of data storage. Additionally, more detailed regulations regarding users' rights to control or delete personal data collected by autonomous vehicles are also very necessary to provide maximum protection for individual privacy. In this case, the government must consider creating new policies or laws that align with the development of AI-based autonomous vehicle technology, to ensure that data collection and information management still meet the principles of personal data protection contained in Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE).

Another relevant regulation is the Minister of Transportation Regulation (*Permenhub*) Number 74 of 2021 concerning Motor Vehicle Safety Equipment. Although Permenhub regulates general safety standards for vehicles operating on public roads, this regulation still does not accommodate the latest technology such as vehicles with AI technology systems with Autopilot mode. Vehicles using Autopilot technology require more sophisticated safety standards, as the driver's role is replaced by AI systems that can operate independently. Therefore, updates or adjustments to this regulation are needed to ensure that vehicles with Autopilot technology also meet strict safety standards.

The Indonesian government's policy regarding electric vehicles is stated in Presidential Regulation Number 55 of 2019 concerning the Acceleration of Battery Electric Vehicle Programs for Road Transportation. This regulation aims to accelerate the use of battery-based electric vehicles in road transportation in Indonesia. This Presidential Regulation focuses on developing electric vehicles as a solution to reduce carbon emissions and dependence on fossil fuels, in line with Indonesia's efforts to achieve greenhouse gas emission reduction targets. In this regulation, the government views the importance of transforming the transportation sector towards more environmentally friendly vehicles by emphasizing air pollution reduction and energy savings.

Several important points in Presidential Regulation Number 55 of 2019 concerning the Acceleration of Battery Electric Vehicle Programs for Road Transportation include regulating fiscal incentives for electric vehicle producers and consumers, developing supporting infrastructure such as charging stations, and creating regulations that facilitate the implementation of electric vehicles in the Indonesian market. Additionally, this regulation also leads to promoting the use of battery-based electric vehicles as a cleaner and more efficient means of transportation compared to internal combustion engine vehicles. However, although this regulation provides a strong foundation for introducing electric vehicles in Indonesia, Presidential Regulation Number 55 of 2019 concerning the Acceleration of Battery Electric

Vehicle Programs for Road Transportation still has shortcomings in covering new technology, particularly related to AI-based electric vehicles using Autopilot systems. Electric vehicles equipped with autonomous and AI technology, such as Autopilot systems, bring new challenges that are not yet covered in Presidential Regulation Number 55 of 2019.

While these regulations facilitate the development of electric vehicles in general, there are no provisions that explicitly regulate the technical and legal aspects of using electric vehicles equipped with Autopilot systems. AI-based Autopilot systems in electric vehicles require specific regulations related to driving safety, technical testing, and the protection and management of data generated during the journey, such as driver behavior, road conditions, and vehicle position, which are important for vehicle safety and management. This data must be protected from misuse and ensure that users retain control over their personal data. In addition, there are no clear provisions regarding legal liability in the case of accidents or damage involving these vehicles.

More specific regulations regarding the use of autonomous technology in AI-based electric vehicles will also provide a clear legal basis regarding supervision and safety standards that must be met by electric vehicle manufacturers. This is important because without proper policies, the development of AI-based electric vehicle technology can occur faster than the ability of regulations to govern it, which ultimately can create new risks in terms of safety and personal data protection.

3.2. Legal challenges in the implementation of AI-based electric vehicles with autopilot mode

Before Autopilot cars can be used in Indonesia, they must go through several reasoning stages to classify and understand how the autopilot system works on public roads. Cars with autopilot features use AI and various sensors to detect the surrounding environment, make decisions, and control the vehicle without human intervention under certain conditions. This technology includes the use of radar, cameras, and advanced mapping systems that allow cars to adapt to traffic conditions. However, before being allowed to operate widely, it's important to ensure that this technology meets safety standards and regulations applicable in Indonesia.

The government has a crucial role in ensuring security and smooth traffic flow on public roads, including in the operation of vehicles with autopilot systems. This includes supervision of supporting systems used, such as road infrastructure, vehicle communication networks, and safety standards that must be met by autopilot car manufacturers. The government's responsibility in this matter has been regulated in the LLAJ Law which requires all motor vehicles, including those using advanced technologies like autopilot, to undergo feasibility tests before being allowed to operate. Additionally, policies governing legal responsibility in accident cases involving autopilot vehicles also need to be considered for clarity in their legal aspects.

The autopilot system offers various benefits for users and the environment, one of which is fuel efficiency. This technology allows vehicles to control acceleration and deceleration more optimally, making fuel consumption more economical compared to manually driven vehicles. The autopilot system works by adjusting vehicle speed based on traffic conditions and terrain, thus reducing sudden braking and excessive fuel use. With more stable and responsive control, autopilot vehicles also have the potential to reduce carbon emissions, positively impacting the environment and urban air quality (Sudjoko, 2021).

However, behind the various benefits offered, the autopilot system also has challenges and potential risks. One main concern is the safety factor, especially in emergency situations that require quick reactions and complex decision-making. Although the AI system in autopilot cars has been trained to recognize various traffic scenarios, there is still the possibility of errors in detecting objects or responding to unexpected conditions. Additionally, cyber security aspects are also a concern, as AI-based vehicles are vulnerable to cyber attacks that can disrupt vehicle control systems. Therefore, before autopilot vehicles are allowed to operate widely in Indonesia,

a comprehensive study and strict regulations are needed to ensure that this technology is truly safe and provides maximum benefits for society.

In Indonesia, regulations regarding AI-based electric vehicles with Autopilot mode are still very limited and cannot fully accommodate the increasingly rapid development of autonomous vehicle technology. Although Law Number 22 of 2009 concerning Road Traffic and Transportation regulates several matters related to vehicle safety (Wijayanti et al., 2020), such as the driver's obligation to ensure vehicles are roadworthy and meet safety standards, this regulation is not adequate to regulate vehicles fully controlled by AI systems. This Law Number 22 of 2009 means that the driver is responsible for vehicle operations (Tiano, 2023), but in vehicles with Autopilot systems, the driver does not play a direct role in controlling the vehicle. Thus, questions arise about who should be responsible in the event of accidents caused by errors or malfunctions of the Autopilot system.

Regarding motor vehicle safety standards in Indonesia, the government has established regulations governing technical testing and road worthiness. One regulation governing this is Government Regulation No. 55 of 2012 (hereinafter abbreviated as PP No. 55/2012) which requires motor vehicles to undergo periodic testing to ensure the vehicle meets applicable safety standards. In enforcing this rule, the government has also issued further regulations specifically governing motor vehicle type testing procedures.

More detailed regulations regarding motor vehicle type testing are regulated in Minister of Transportation Regulation Number PM 33 of 2018 (Permenhub No. 33/2018). This testing includes evaluation of various vehicle aspects, including vehicle design and engineering, to ensure that every vehicle operating on public roads meets established safety standards. If a vehicle passes this test, it will receive a Type Test Certificate (SUT) and Type Test Registration Certificate (SRUT) as proof that the vehicle has met technical requirements and is roadworthy.

Motor vehicle type testing aims to provide legal certainty regarding compliance with technical standards required for every vehicle operating on public roads. As explained in Article 2 paragraph (1) of Permenhub No. 33/2018, this testing becomes an important instrument in ensuring vehicle safety and roadworthiness. Therefore, all types of vehicles, including electric vehicles with autopilot features, must undergo a series of feasibility tests before being given permission to be widely used on public roads.

In Article 3 paragraph (7) of Permenhub No. 33/2018, motor vehicles are divided into several categories based on type and function. These categories include L1, L2, L4, and L5 for motorcycles, M1 for passenger cars, M2 and M3 for buses, and N1, N2, and N3 for goods vehicles. Additionally, there are categories O1, O2, and O3 covering special vehicles. With this classification, every vehicle falling into a certain category must undergo testing according to its technical characteristics and specifications.

Electric autopilot cars currently circulating in Indonesia generally have a capacity of five passengers, thus falling into category M1, which is motor vehicles used for passenger transportation with a maximum capacity of eight people, including the driver. Based on Article 9 of Permenhub No. 33/2018, every motor vehicle, whether based on conventional or electric engines, must meet technical requirements and be roadworthy before being allowed to operate on public roads. This also applies to electric autopilot cars, which although equipped with artificial intelligence systems, must still go through the same testing procedures as other vehicles.

In addition to general requirements for motor vehicles, regulations also govern special testing for vehicles using electric drive motors. Article 9 paragraph (5) of Permenhub No. 33/2018 states that *electric vehicles that must undergo road worthiness tests include electric motorcycles, electric passenger cars, electric buses, electric goods vehicles, and special electric vehicles.* This testing aims to ensure that electric vehicles can operate safely, both in terms of battery endurance, braking systems, vehicle stability, and compatibility with existing road infrastructure.

Electric cars with autopilot are still in the testing phase and are not yet fully authorized to operate on public roads. Technical tests are required to ensure the safety of the vehicle, especially regarding control, traffic sign detection, and response to emergency situations. While offering efficiency, this technology poses a legal dilemma in the event of an accident due to autopilot system failure, given that the driver is not in control of the vehicle. This requires clear regulations to determine the responsible parties, such as manufacturers, software developers, or other related parties. The Indonesian government needs to draft specific rules to ensure legal clarity on responsibility in the use of autonomous technology.

Furthermore, existing regulations must also consider the management of data generated by AI-based electric vehicles. Vehicles using autonomous technology, especially those with Autopilot systems, can collect very personal and sensitive data. This data includes driver behavior, road conditions, and vehicle situations at certain times. This demands stricter personal data protection provisions, which not only involve data collection by AI devices but also ensure that collected data is not misused and is used only for legitimate purposes and in accordance with applicable legal provisions. In this case, Law Number 11 of 2008 concerning Electronic Information and Transactions (ITE), although regulating personal data protection in general, is not specific enough in regulating data collected by devices such as autonomous vehicles. Therefore, updates or creation of new regulations that are more detailed and cover aspects of data management generated by AI-based electric vehicle technology are needed.

The government also needs to introduce special safety standards governing AI-based electric vehicles, particularly those related to Autopilot systems. In current regulations, Presidential Regulation Number 55 of 2019 concerning the Battery-Based Electric Vehicle Program for Road Transportation only regulates electric vehicles from an environmental perspective, such as reducing carbon emissions and using renewable energy. This regulation does not yet cover technical and safety aspects related to autonomous technology. In fact, to ensure that electric vehicles with Autopilot systems can operate safely, more in-depth and specific regulations regarding how Autopilot systems work in various weather and road conditions are very important. These safety standards must also include testing and certification to ensure that Autopilot systems can function properly and do not endanger drivers or others around the vehicle.

The results of this study indicate that the regulation of artificial intelligence (AI)-based electric vehicles with Autopilot systems in Indonesia is not specific and unable to accommodate the development of autonomous vehicle technology. Law No. 22/2009 on Road Traffic and Transportation (LLAJ) still focuses on the role of human drivers with the obligation to have a Driver's License (SIM) and fulfill roadworthiness tests (Pamungkas et al., 2020), while the aspect of autonomous vehicles without human intervention has not been regulated, creating a legal gap. Law No. 11/2008 on Electronic Information and Transactions (ITE) also only regulates data protection in general without covering specific data generated by AI-based vehicles. This research supports previous findings, such as Zhang (2024), which highlighted the potential risk of data leakage, and Antonakaki et al. (2024), which addresses the technical challenges of autonomous vehicle sensors. Therefore, revisions to the Road Traffic and Transport Law (LLAJ) and the Electronic Information and Transactions Law (ITE) are necessary to encompass legal responsibility in accidents and ensure secure and transparent data management for autonomous vehicle users in Indonesia.

4. Conclusion

The legality of electric vehicles based on Artificial Intelligence (AI) with Autopilot mode in Indonesia is currently experiencing a lack of legal regulation. Despite Indonesia having various regulations governing traffic, vehicle safety, and electric vehicles, there is no specific rule regulating the use of autonomous technology such as the Autopilot system in AI-based electric vehicles. This indicates that the existing regulations are unable to accommodate the advancement of such technology, thus requiring adjustments and updates in the laws

governing electric vehicles, particularly those utilizing Artificial Intelligence (AI) technology. Lawmakers need to formulate specific regulations for AI-based electric vehicles with Autopilot systems, encompassing safety aspects, legal responsibilities, and technical standards to the Indonesian government, and enhance regulations on personal data protection related to electric vehicles utilizing Artificial Intelligence (AI), by governing how personal data is collected, stored, and utilized. An alternative solution is to formulate special regulations regarding Artificial Intelligence (AI)-based electric vehicles with Autopilot mode, covering aspects of safety, legal responsibility, technical standards, and personal data protection. The implementation stages include formulation of regulations, trials and evaluation, gradual implementation with socialization, as well as supervision and law enforcement to ensure compliance with these rules.

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