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Green Transportation Policy In Indonesia and Its Future Challenges

Emil Adly[*1], Siti Khairunnissa [2], Boy Laksamana[3]
[1] *National Central University, Taoyuan, Taiwan, ROC*
[2,3] *Universitas Sumatera Utara, Medan, Indonesia*
*Corresponding Author: *Sitikhairunnissa@usu.ac.id*

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ABSTRACT

Green transportation policies in Indonesia have shown positive progress in reducing the environmental impact of the transportation sector. However, there are still major challenges that need to be overcome to achieve sustainable development goals in transportation. Limited infrastructure, the high cost of green vehicles, and the level of public awareness that needs to be increased are the main focus of this effort. The government needs to expand infrastructure, particularly in building electric vehicle charging stations across Indonesia, to support wider adoption of green vehicles. Active support from the private sector is also important in accelerating the development of environmentally friendly transportation technologies. In addition, consistent and sustainable policy development will provide certainty to investors and industry players to invest in green technology. The high initial cost of green vehicles is a major barrier for consumers. Therefore, appropriate fiscal incentives and subsidies are needed to make green vehicles more affordable and increase their attractiveness in the market. Raising public awareness about the long-term benefits of green transportation is also a crucial strategy through effective education campaigns. With strong collaboration between the government, the private sector, and the active participation of the public, Indonesia can overcome these challenges and achieve green transformation.

Keyword: Green Transportation Policy, Indonesia, Future Challenges

ABSTRAK

Kebijakan transportasi hijau di Indonesia telah menunjukkan kemajuan positif dalam mengurangi dampak lingkungan dari sektor transportasi. Meskipun demikian, masih ada tantangan besar yang perlu diatasi untuk mencapai tujuan pembangunan berkelanjutan dalam transportasi. Infrastruktur yang terbatas, biaya tinggi untuk kendaraan ramah lingkungan, dan tingkat kesadaran masyarakat yang perlu ditingkatkan menjadi fokus utama dalam upaya ini. Pemerintah perlu melakukan ekspansi infrastruktur, khususnya dalam membangun stasiun pengisian kendaraan listrik di seluruh Indonesia, untuk mendukung adopsi kendaraan hijau secara lebih luas. Dukungan aktif dari sektor swasta juga penting dalam mempercepat pengembangan teknologi transportasi yang ramah lingkungan. Selain itu, pengembangan kebijakan yang konsisten dan berkelanjutan akan memberikan kepastian kepada investor dan pelaku industri untuk berinvestasi dalam teknologi hijau. Biaya awal yang tinggi untuk kendaraan ramah lingkungan menjadi hambatan utama bagi konsumen. Oleh karena itu, diperlukan insentif fiskal dan subsidi yang tepat untuk membuat kendaraan hijau lebih terjangkau dan meningkatkan daya tariknya di pasar. Peningkatan kesadaran masyarakat tentang manfaat jangka panjang dari transportasi hijau juga menjadi strategi krusial melalui kampanye edukasi yang efektif. Dengan kolaborasi yang kuat antara pemerintah, sektor swasta, dan partisipasi aktif masyarakat, Indonesia dapat mengatasi tantangan ini dan mencapai transformasi menuju sistem transportasi yang lebih berkelanjutan dan ramah lingkungan. Langkah ini tidak hanya akan membawa dampak positif terhadap lingkungan, tetapi juga meningkatkan kualitas hidup masyarakat secara keseluruhan di masa depan.

Keyword: Kebijakan Transportasi Hijau, Indonesia Dan Tantangan Masa Depan

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1. Introduction

Green transportation is a major concern in this modern era, where environmental sustainability and public health are a global focus. In Indonesia, efforts to reduce the negative impact of transportation on the environment are increasingly urgent, with a strong push to adopt environmentally friendly transportation solutions. Steps towards green transportation not only reduce carbon emissions but also promote more efficient and sustainable mobility for the entire community.

Furthermore, the implementation of green transportation policies in Indonesia faces various challenges that need to be overcome to achieve long-term success. From limited infrastructure to high dependence on fossil fuels, as well as the necessary changes in public behavior, these are all part of the complexity of transforming to a more sustainable transport system. With strong commitment and cross-sector cooperation, Indonesia can accelerate the steps towards a greener and more sustainable transportation future.

To date the number of motor vehicles throughout Indonesia has reached more than 20 million of which 60% are motorcycles while population growth for cars is around 3-4% and motorcycles more than 4% per year (Ministry of Transportation). According to the latest data from Gaikindo, the growth of the new vehicle sales market for four-wheelers rose by almost 25% in 2003. Meanwhile, the growth of the motorcycle sales market increased by almost 35% in 2003. Seeing these problems, it has become a necessity for the motor vehicle industry in Indonesia to immediately create environmentally friendly and fuel-efficient motor vehicles in the future[1]

Transportation has the meaning of moving, moving, transporting, or transferring an object from one place to another, where in this other place the object is more useful or can be useful for certain purposes[2] . Transportation is important in a system because without transportation the relationship between one place and another is not well realized[3] . Hurst (1974) suggests that inter-regional interaction is reflected in the condition of transportation facilities and the flow of people, goods and services.[4]

Green transportation is an appropriate approach to support the preservation of Indonesia's natural environment. *Green* transportation is a system of movement and connectivity within an urban area (GBCI, 2013). Green transportation is also one of the eight aspects of a "green city", namely: Green planning & designing;, Green open space, Green waste, Green transportation, Green water, Green energy; Green building, Green community. Green transportation is generally a method used to create transportation that does not produce greenhouse gases. By using this method, it can create mass transportation that is environmentally friendly and can reduce the number of private vehicles on the road. This method also has other positive impacts, namely reducing accidents, reducing fuel use, and saving costs. Therefore, the concept of green transportation should be applied more in Indonesia.

Countries such as the Netherlands, Japan, and Korea have long been implementing green transportation. Indonesia itself has begun to implement green transportation as an alternative to vehicles in general, one example is the Jakarta MRT. MRT Jakarta or known as MRTJ is a mass transportation tool that has just officially operated on March 24, 2019. MRT is a mass transportation tool based on electrical energy so that it can reduce the number of vehicles on the road and reduce the use of fuel. Reduced fuel use can reduce the amount of CO2 emissions produced by vehicles in general, this can not only cut operational costs but can also help preserve the environment from the dangers of CO2 which causes the greenhouse effect. Other cities are also expected to implement green transportation as an effort to protect our environment. Of course, we hope that green transportation can be implemented throughout Indonesia, but in reality, implementing green transportation such as the MRT requires a lot of time and money.[5]

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[1] Dessy Gusnita, Green Transport: Environmentally Friendly Transportation and its Contribution in Reducing Air Pollution, Aerospace News, 11(2), 2010, pp. 67

[2] Fidel Miro, *Transportation Planning.* Jakarta: Erlangga, 2002, pp.65

[3] R. Bintarto, *Geography of Cities,* Introduction, First Printing. Spring, Jakarta, 1997, pp.4

[4] E. Hurst, Transportation Geography: Comments and Readings. New York,. United States. McGraw-Hill, 1974, pp. 12

[5] Shafa Lazuardi, Green Transportation as a Smart Solution to Protect the Environment, accessed from https://kumparan.com/shafa-lazuardi/transportasi-hijau-sebagai-solusi-cerdas-untuk-menjaga- lingkungan-1wW0afXj9Ig/full

Green transportation brings many benefits to both society and the environment. One of the applications is mass transportation in Indonesia, the MRT. MRT, which uses electricity as its main energy, can reduce the amount of CO2 emissions and greenhouse effect. Although the manufacture of MRT is costly, time consuming, and can increase the amount of construction waste. These are not factors that can hinder the implementation of green transportation in Indonesia. If we compare the benefits and drawbacks, we can see that *green transportation* will be beneficial in the long run. Apart from that, the main factor supporting the success of this project is how the public responds to it. It is unfortunate if the facilities and infrastructure to support this environmental conservation movement are already available, but people are still indifferent. Therefore, in addition to paying attention to transportation facilities, the government must also pay attention to the community's response to these changes.

The green economy is one of the development agendas in the RPJP 2025-2045 and/or RPJMN 2025-2029 mandating the reduction of carbon emissions. One of the efforts to realize this vision can be done through the support of green transportation development. Based on data from IQAir (2019), land transportation modes are recorded as contributing 91% of total greenhouse gas emissions in the transportation sector. Green transportation policies have been listed in the nawacita on the 4th mission, namely achieving a sustainable living environment. The mission is further detailed in the strategic plan at the Ministry of Transportation, namely increasing the quality of sustainable transportation. GHG mitigation action policy in the Ministry of Transportation is implemented through KM. 8 Year 2023 related to GHG mitigation actions. The action is divided into 4 sub-sectors, namely the land sub-sector (such as the use of battery-based electric motor vehicles (KLBB) and charging station facilities), the marine sub-sector (such as the use of low-carbon fuels), and the air sub-sector (such as carbon offsetting and reduction schemes) and the railway sub-sector (such as the use of double track trains, revitalization, and reactivation). The urgency of the green economy is the threat of climate change which has a significant impact on sustainable development. One of the efforts to support the green economy is through accelerating the battery-based electric motor vehicle (KBLBB) program for road transportation.

The economic impacts of accelerating the battery-based electric motor vehicle (KBLBB) program for road transportation include: (a) Decreasing fuel imports and encouraging the domestic KBLBB industry which has an effect on reducing the burden on the trade balance, (b) decreasing the conventional market and increasing the electric vehicle market which provides added value and positive impacts on labor. TKDN must be increased so that benefits and added value can be optimized, (c) the impact on GDP and employment of the transition depends on the Domestic Component Level of Battery Electric Vehicles (TKDN BEV). If the TKDN BEV is only 40%, then a leapfrog or multipathway transition will have a negative impact on the national economy and labor. If the TKDN of BEV reaches 60% or more, both leapfrog and multi-pathway transition models will have a positive impact. The positive impact of the transition to BEVs on the component industry and the economy will also be greater if Indonesia not only focuses on developing the battery industry, but also develops other BEV component industries. In addition to the development of KBLBB, Perum DAMRI started to convert diesel buses to electric buses. However, DAMRI experienced various challenges in implementing the electric bus conversion, including: (1) the high price of electric buses, and there are no incentives for procuring green energy buses, (2) derivative policies related to electric buses have not been well coordinated, (3) the need for incentives for the difference between vehicle prices and Rp / km tariffs, (4) the application of TKDN limits on certain projects, (5) government policies that favor the interests of public transportation have not been seen, (6) the government has not fully provided infrastructure so that if carried out by operators it will be very burdensome, and (7) the uneven distribution of charging infrastructure. Despite the challenges faced, there is great potential for success in the commitment to reduce greenhouse gas (GHG) emissions in the transportation sector. One of the key factors in achieving this success is the positive attitude and active participation of the community. With the awareness of the importance of environmental protection and nature preservation, and the adoption of environmentally friendly green transportation programs, we have a great opportunity to achieve the targets that have been set. With cooperation and collaboration between the

government, the community, and the private sector, we can create a cleaner and more sustainable future for Indonesia.[6]

The construction of Electric Vehicle Charging Stations (SPKLU) in various strategic locations across Indonesia has a very significant impact in supporting the adoption of electric vehicles in the country. With the widespread presence of SPKLUs, electric vehicle owners will feel more confident to adopt this environmentally-friendly technology, as they can easily recharge their vehicles at various places. This not only expands the reach of electric vehicles, but also alleviates concerns regarding mileage and availability of charging infrastructure. In addition, the construction of SPKLUs will create local jobs in the construction, operation, and maintenance of these stations, as well as encourage investment in electric vehicle technology and other related infrastructure. As such, it not only contributes to reducing greenhouse gas emissions and improving air quality, but also has the potential to strengthen local economies and promote sustainable development in Indonesia.

2. Research Method

The type of research used is normative juridical research . Normative juridical research is also called "doctrinal research that analyzes the law both written in books and decided by judges through court proceedings." The nature of this research is descriptive analytical, which means that "from this research it is hoped that a detailed and systematic description of the problems to be studied will be obtained." This research analyzes and presents facts systematically so that they can be more easily understood and concluded. This research analyzes and presents facts systematically so that they can be more easily understood and concluded." Analysis is carried out based on the description, facts obtained and will be carried out carefully how to answer the problem in concluding a solution as an answer to the problem.

3. Result and Discussion

The Indonesian government plays an important role in supporting the rise of electric mobility through its regulations and programs. Key stakeholders at the national level, led by the Coordinating Ministry for Maritime Affairs and Investment, are at the forefront of advancing electric mobility. Each ministry has its own role to play. For example, the Ministry of Transportation is tasked with developing regulations governing the legality and roadworthiness of battery-based electric motor vehicles (KBLBB).The Indonesian government has also recently established an Enhanced Nationally Determined Contribution (Enhanced NDC) that is aligned with the Paris Agreement. The Enhanced NDC sets higher targets for emissions reductions, both for unconditional targets and conditional targets with international support. The direction of development of the transportation sector in general is set out in the National Long-Term Development Plan (RPJPN) and the National Medium-Term Development Plan (RPJMN) for 2020-2024 prepared by the Ministry of National Development Planning/National Development Planning Agency (Bappenas). The plans indicate the need for the development of an effective, efficient, affordable, environmentally friendly, and sustainable transportation system that aims to save 30% of current energy consumption, and encourage the development of an electric-powered transportation sector which is one of Indonesia's main sectors.

According to the Ministry of Public Works, a green city is a concept of a well-planned, environmentally friendly city that utilizes resources. Effectively and efficiently which can later create prosperity for the population. In order to support the concept of green cities, the government has created a program in the form of the Green City Development Program (P2KH) which refers to the City / Regency RTRW in Indonesia. In realizing a green city, it requires support and involvement from other parties. Some of these attributes include:[7]

1. Creating *green transportation by* developing sustainable transportation systems (e.g. bicycle lanes, pedestrian paths, and public transportation) requires the support and contribution of the transportation

[6] Green Transportation Development to Support Sustainable Economy in Indonesia, accessed from https://deputi3.ekon.go.id/berita/view_by_id/58

[7] IS. Ernawi, Green City Movement: Responding to Climate Change and Environmental Preservation. *Online Bulletin of Spatial Planning*. Edition 2, 2012, pp. 4-

sector.

2. In an effort to realize *green waste in the* form of efforts to apply the 3R principle (*reduce* or reduce waste, *recycle* or develop recycling processes, and *recycle* or increase the added value of waste) requires involvement and support from the residential development sector.
3. In an effort to realize *green water*, namely utilizing water resources efficiently, support and involvement from the settlement development sector is needed.
4. In an effort to realize *green building*, namely the provision of energy-efficient buildings, support and involvement from the settlement development sector is needed.

The government is encouraging the use of electric buses and other renewable energy-based public transportation as a measure to reduce dependence on private vehicles and reduce the negative impact of transportation on the environment. This plan includes several important stages. First, the development of infrastructure that supports the operation of electric buses, including the construction of charging stations and dedicated lanes. Second, procurement of more electric buses each year to replace conventional fossil-fueled buses. Third, training for operators and public awareness on the benefits of electric vehicles. Fourth, the development of policies that support the use of electric buses, including incentives for operators and users. Fifth, continuous evaluation and monitoring of the program's performance to ensure the achievement of the desired goals.

The purpose of the electric bus program in promoting environmentally friendly public transportation is to reduce the negative impacts caused by conventional transportation on public health and the environment. The program's main objective is to use electric bus technology to reduce greenhouse gas emissions and air pollution generated by fossil fuel vehicles. By adopting electric buses, it is expected to reduce the level of air pollution in urban areas, contributing to the overall improvement of air quality and health of city residents. In addition, the program also aims to create a cleaner and healthier urban environment for its residents. By promoting the use of electric buses, the government seeks to stimulate a change in transportation patterns towards a more sustainable and efficient system. This will not only reduce adverse environmental impacts, but also improve the accessibility of public transportation and offer a greener alternative to the public.[8]

The electric bus program in promoting environmentally friendly public transportation has the main objective of reducing air pollution as well as carbon monoxide (CO) and carbon dioxide (CO2) emissions produced by fossil fuel-powered vehicles. By using renewable energy, electric buses help reduce the impact of climate change and improve air quality in cities. In addition, electric buses also increase passenger comfort by providing a more efficient and effective service than conventional buses. The program also focuses on expanding the accessibility of public transportation in previously underserved areas. Thus, the use of electric buses not only has an impact on reducing greenhouse gas emissions, but also increases transportation efficiency and comfort for users of public transportation services. Overall, this program is an important step in the effort to maintain a clean and healthy environment and towards a more sustainable public transportation system in the future.[9]

The Ministry of Transportation itself, stated by the Minister of Transportation Budi Karya Sumadi, has encouraged the acceleration of the use of electric buses for public transportation in urban areas at the Sustainable E-Mobility Event organized by ITDP Indonesia. The Minister of Transportation stated his commitment to reduce greenhouse gas emissions by adopting low-emission transportation technology, along with the implementation of Presidential Regulation No. 79 of 2023 which accelerates the battery-based electric vehicle program. Despite facing challenges such as local government commitment and infrastructure

[8] Gigih Gustomo & Samsudin Anis, Strength analysis of MD12E electric bus body frame of Mobil Anak Bangsa Limited Company by finite element method. *JMEL: Journal of Mechanical Engineering, 9*(1), 2020, p.16

[9] R. Z. Akbar, I. Haryanto, &G. D. Haryadi, Turning Stability Analysis of Medium Electric Bus with Variation of Speed and Road Condition. Journal of Mechanical Engineering, 2021 https://ejournal3.undip.ac.id/index.php/jtm/article/view/35783

availability, the Minister of Transportation is optimistic that cooperation between the Central Government and local governments will encourage environmentally friendly public transportation in the future.[10]

The government is actively encouraging the use of electric buses and other renewable energy-based public transportation as a measure to reduce dependence on private vehicles. This move aims to tackle air pollution and reduce greenhouse gas emissions caused by fossil fuel-based transportation. By expanding the network of electric buses and green public transportation, the government hopes to improve public transportation accessibility for the public, minimize congestion, and create a cleaner and healthier urban environment. This move is also expected to support the transition to more sustainable transportation overall.

Key factors in electric vehicles include bus specifications, energy consumption, battery size, charging strategy, and grid capacity. Unlike conventional buses, electric buses require an integrated system taking into account the daily distance travelled, route topography, potential locations for charging infrastructure development, and battery technology. In developing a transition strategy to electric buses, planning is required that takes into account existing resources and recognizes the need for other resources. A general methodology related to electric bus implementation planning was used in developing an electric bus implementation strategy in Jakarta, Medan, and Bandung.

The mileage of an electric vehicle is influenced by its energy efficiency and battery capacity although it can vary depending on various factors, including weather and climate, auxiliary power loads, route characteristics, bus weight, and battery condition degradation. In estimating bus mileage, one aspect of consideration is the actual usable capacity of the battery, which will be lower than the rated battery capacity due to various restrictions. These limitations are the need to maintain battery health by minimizing the depth of discharge (DoD) limit, ensuring safety by setting the maximum state of charge (SoC), ensuring flexible operation with backup power requirements, and considering battery capacity at the end of its life. The minimum SoC limit for electric vehicle operation, usually around 20%-30%, also needs to be set to maintain battery health and vehicle performance, prevent range anxiety, and ensure transportation reliability. Other aspects to consider in planning include the battery degradation rate and shifting vehicles with high battery degradation to shorter daily distances.[11]

Programs to raise public awareness about the benefits of green transport and how it contributes to the environment are essential in supporting the adoption and sustainability of sustainable transport. Some steps that can be taken include:

1. Public Education and Campaign
   Conduct information and education campaigns to convey the benefits of using green transportation such as electric buses, electric bicycles, or other renewable energy- based vehicles. This campaign can be conducted through mass media, social media, and direct activities such as seminars or workshops.
2. Counseling and Training
   Conduct outreach and training programs for the general public on how to use and maintain green vehicles, and the benefits to the environment and personal health. This could include demonstrations on usage, battery charging, or vehicle maintenance.
3. Collaboration with Private Sector
   Work with green vehicle manufacturers and transportation service providers to organize promotional events, special discounts, or vehicle trials for the public to experience the benefits first-hand.
4. Incentives and Subsidies
   Provide incentives or subsidies for the purchase of green vehicles, use of public transportation, or investment in renewable energy charging infrastructure. This can encourage people to switch to more environmentally friendly transportation alternatives.

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[10] Ministry of Transportation of the Republic of Indonesia, Minister of Transportation Encourage Acceleration of Electric Bus Use in Urban Areas, accessed from https://www.dephub.go.id/post/read/menteri-perhubungan-dorong-percepatan-penggunaan-bus-listrik-di- perkotaan

[11] Institute for Transportation & Development Policy, *Electrification for the Future: The State and Challenges of Electric Bus Adoption for Public Transportation in Indonesia,* ITDP Indonesia, Jakarta, 2023, pp. 49

5. Provision of Information and Digital Platforms
   Create a digital platform that provides information on green transportation routes, SPKLU locations, and other public transportation services. This can help improve convenience and ease of access for green transportation users.

The adoption of stricter emission standards for motor vehicles and periodic inspections are crucial steps in the government's efforts to reduce air pollution and improve air quality in cities. By adopting stricter emission standards, such as maximum limits for nitrogen dioxide (NO2), carbon monoxide (CO), and fine particulate matter (PM2.5), the government aims to limit the amount of pollutants released by vehicles. Periodic inspections are an effective means of ensuring that vehicles comply with the set emission standards. The procedure involves a thorough examination of engine components, emission systems, and other pollution control devices, ensuring that vehicles do not exceed permitted emission limits. The benefits of this measure include reduced emissions that are detrimental to public health, improved urban air quality, compliance with stricter environmental regulations, and encouragement for the automotive industry to innovate in the development of more environmentally friendly vehicle technologies.

While there has been progress in the development of Public Electric Vehicle Charging Stations (SPKLU), substantial investment is still needed to expand the electric vehicle charging infrastructure network, especially in remote areas. Remote areas often have their own challenges in infrastructure accessibility, including infrastructure for electric vehicles that require the installation of sufficient and reliable charging stations. This investment is important to ensure that electric vehicle owners across Indonesia can easily access the charging facilities needed to keep their vehicles mobile. In addition, the development of this infrastructure will help accelerate the adoption of electric vehicles by reducing concerns related to travel distance and availability of charging facilities. Joint efforts between the government, private sector, and communities are key to addressing these challenges and building a supportive infrastructure for a cleaner and more sustainable transportation future in Indonesia.

The high initial cost of electric vehicles and other green technologies is a major barrier to mass adoption among consumers. While electric vehicles offer long-term benefits such as reduced operating costs and low carbon emissions, higher initial costs are often a major obstacle for consumers considering switching from conventional vehicles. In order to encourage wider adoption, strategic measures such as the development of financial incentives, affordable financing, and subsidies are needed to help reduce the cost of purchasing electric vehicles. In addition, public education and awareness about the long-term benefits of these investments is also critical to changing perceptions and increasing consumer interest in green vehicles.

Further efforts are needed to increase public understanding and awareness of the benefits of green transportation and the need to participate in its use. A better understanding of the benefits of green transportation, such as reduced greenhouse gas emissions, improved air quality, and long-term operational cost savings, can change consumer attitudes and behaviors in choosing vehicles and transportation modes. Effective educational campaigns, including easily accessible information on green vehicle technologies, the financial benefits of using electric vehicles, and their positive impact on the environment, need to be improved. In addition, it is important to engage the public in an open dialogue about the challenges and opportunities in adopting green transportation. This can be done through workshops, seminars, social media campaigns, and direct community outreach programs. Support from the government and private sector in providing incentives, subsidies, and supportive infrastructure will also play a key role in changing people's mindset and behavior regarding green transportation. Through these joint efforts, it is hoped that public awareness of the benefits of green transportation will increase, which in turn will support the growth of electric vehicle adoption and sustainable transportation in the future.

Consistent policy implementation over time is essential to provide certainty for investors and industry players in building infrastructure and developing green transportation technologies. Consistent policies create a stable and predictable environment for long-term investment in sustainable transportation. This includes policies on fiscal incentives, subsidies for the development of electric vehicle charging infrastructure, and regulations that support the adoption of green vehicles. With the certainty provided by consistent policies,

investors and industry players can better plan their investments, improve operational efficiency, and reduce risks associated with sudden policy changes. In addition, consistent policies also help create a more stable and attractive market for technological innovations in green transportation, such as the development of more efficient batteries or electric vehicles with greater range. Governments need to commit to maintaining and developing policies that support green transportation on an ongoing basis, with a wide range of stakeholders involved in the decision-making process to ensure that policies reflect market needs and provide the right incentives for a shift towards greener transportation.

4. Conclusion

Green transportation policies in Indonesia have shown positive progress in reducing the environmental impact of the transportation sector. However, major challenges ahead, such as limited infrastructure, high cost of green vehicles, and increased public awareness, require strong commitment from the government, active support from the private sector, and active participation from the public to achieve sustainable development goals in transportation. The expansion of infrastructure, especially electric vehicle charging stations across Indonesia, is a crucial step to support the adoption of green vehicles. Investment in this infrastructure not only increases the accessibility of electric vehicles, but also opens up opportunities for technology development and innovation in the transportation sector. In addition, consistent and sustainable policy development will provide certainty to investors and industry players to invest in green transportation technology.

The high initial cost of green vehicles such as electric vehicles is often a major deterrent for consumers. Therefore, the government needs to consider various fiscal incentives and subsidies to stimulate demand and make green vehicles more affordable for the public. Public awareness about the long-term benefits of green transportation also needs to be raised through effective education campaigns and better accessibility of information. With a joint commitment from all relevant parties, Indonesia can overcome these challenges and accelerate the transition to a more sustainable and environmentally friendly transportation system. This will not only bring significant environmental benefits, but also improve people's overall quality of life in the future.

References

Burhan Ashshofa, *Legal Research Methods*, Jakarta: Bhineka Cipta, 2008

Dessy Gusnita, Green Transport: Environmentally Friendly Transportation and Its Contribution to Reducing Air Pollution, Aerospace News, 11(2), 2010.

E. Hurst, Transportation Geography: Comments a nd Readings. New York,. United States. McGraw-Hill, 1974

Fidel Miro, *Transportation Planning.* Jakarta: Erlangga, 2002.

Gigih Gustomo & Samsudin Anis, Strength analysis of MD12E electric bus body frame of Mobil Anak Bangsa Limited Company by finite element method. *JMEL: Journal of Mechanical Engineering, 9*(1), 2020

Green Transportation Development to Support Sustainable Economy in Indonesia, accessed from https://deputi3.ekon.go.id/berita/view_by_id/58

Institute for Transportation & Development Policy, *Electrification for the Future: The State and Challenges of Electric Bus Adoption for Public Transportation in Indonesia,* ITDP Indonesia, Jakarta, 2023.

Irawan Soehartono, *Social Research Methods A Research Technique for Other Social Welfare Fields*, Bandung: Remaja Rosda Karya, 1999

IS. Ernawi, Green City Movement: Responding to Climate Change and Environmental Preservation. *Spatial Planning Online Bulletin*. Edition 2, 2012

Ministry of Transportation of the Republic of Indonesia, Minister of Transportation Encourages Acceleration of Electric Bus Use in Urban Areas, accessed from https://www.dephub.go.id/post/read/menteri-perhubungan-dorong- percepatan-penggunaan-bus-listrik-di-perkotaan

R. Bintarto, *Urban Geography, An* Introduction, First Printing. Spring, Jakarta, 1997

R. Z. Akbar, I. Haryanto, &G. D. Haryadi, Turning Stability Analysis of Medium Electric Bus with Variation of Speed and Road Condition. Journal of Mechanical Engineering, 2021

Shafa Lazuardi, Green Transportation as a Smart Solution to Protect the Environment, accessed from https://kumparan.com/shafa-lazuardi/transportasi-hijau- sebagai-solusi-cerdas-untuk-menjaga-lingkungan-1wW0afXj9Ig/full

Soerjono Soekanto and Sri Mamudji, *Normative Legal Research, A Brief Overview,* (Jakarta: PT Raja Grafindo Persada, 1985), p.13.