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MORALITY BEFORE KNOWLEDGE

Evaluating fiscal incentive policies for battery electric motor vehicles: Pathways to a sustainable transportation ecosystem in DKI Jakarta

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ABSTRACT
Background: This study examines the need for sustainable transportation in DKI Jakarta, focusing on the effectiveness of fiscal incentives for Battery Electric Motor Vehicles (KBLBB), particularly Electric Buses. While prior research indicates that fiscal policies can promote cleaner vehicle technologies, the impact on public transit adoption in Indonesia remains underexplored. **Methods**: A qualitative approach was used, featuring in-depth interviews with stakeholders across government sectors. Data were analyzed thematically to uncover barriers and opportunities related to KBLBB fiscal incentives. **Findings:** Results indicate that limited deployment of Electric Buses is due to barriers such as inadequate infrastructure and insufficient production capacity. Stakeholders expressed that current fiscal incentives are inadequate to drive a significant shift toward electric public transport, revealing a link between perceived incentive effectiveness and adoption willingness. **Conclusion:** The study concludes that stronger fiscal incentives and coordinated policies are essential for developing a sustainable transportation ecosystem in DKI Jakarta, emphasizing the need for collaborative efforts among government entities. **Novelty/Originality of this article:** This research offers new insights into the challenges of implementing fiscal incentives for electric public transportation in Indonesia, highlighting stakeholder perspectives and policy effectiveness not previously addressed in the literature.

KEYWORDS: sustainable transportation; fiscal incentives; electric buses.

1. Introduction

Transportation serves as a primary mode for community mobility and facilitates the movement of agricultural commodities from rural to urban areas. In the 21st century, transportation is crucial not only for economic purposes but also for social aspects, underscoring the importance of access to goods and services and connectivity between communities, institutions, or organizations (Gudmundsson et al., 2015). Jakarta, as the industrial and business hub of Indonesia, has significantly higher road transportation numbers compared to smaller cities, primarily due to its high population mobility.

As shown in Figure 1 the number of motor vehicles in Jakarta continues to increase. Data from the Central Bureau of Statistics (2023) highlights a notable rise, especially in motorbikes, with an addition of 831,000 units from 2018 to 2019, followed by passenger cars (227,000 units), trucks (39,000 units), and buses (2,000 units). By 2022, motorcycles dominated vehicle numbers at 79.17%, followed by passenger cars (17.23%), trucks

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(3.42%), and buses (0.17%). Annually, the number of motor vehicles grows by approximately 1 million units, contributing significantly to traffic congestion in Jakarta.

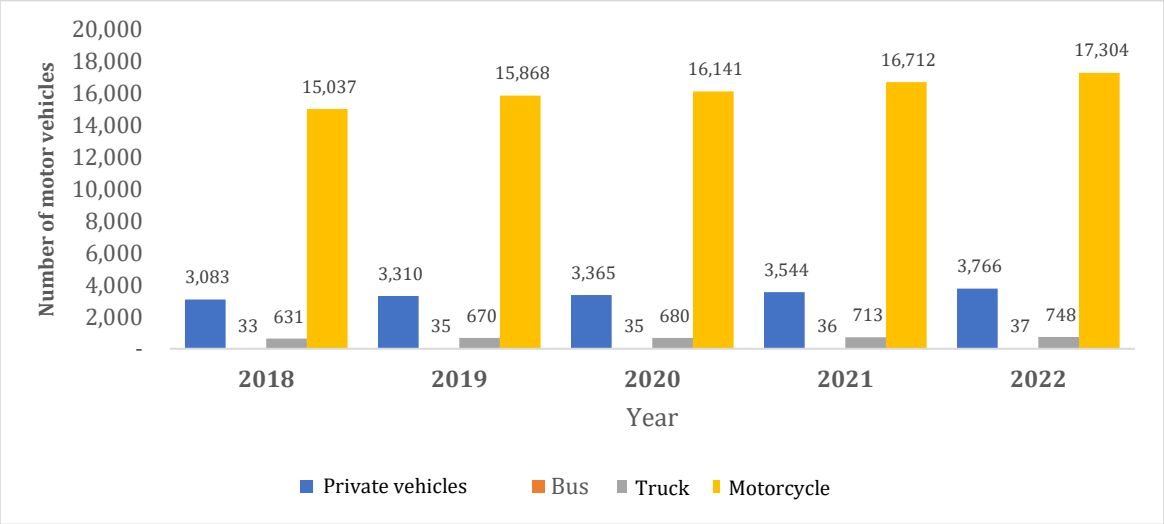


Fig 1. Number of motor vehicles by vehicle type (units) in DKI Jakarta (BPS, 2023)

Congestion has become a major issue, with the Jakarta Metropolitan Police Traffic Unit reporting that up to 22 million vehicles pass through the Greater Jakarta area daily. Although there are only 9 million travelers, each undertakes 2-3 trips per day. Consequently, the average travel time per 10 kilometers in Jakarta has reached 23 minutes and 20 seconds, which is considered normal by the local population. This high traffic density contributes to carbon emissions, negatively impacting air quality. Jakarta often ranks among cities with the worst air quality worldwide. On June 15, 2022, Jakarta recorded the poorest air quality index (AQI) at 188 US AQI, with high PM2.5 concentrations, indicating that air pollution poses a severe public health risk. PM2.5, tiny inhalable particles, poses long-term health risks, including respiratory inflammation and cardiovascular disease (IQAir, 2022).

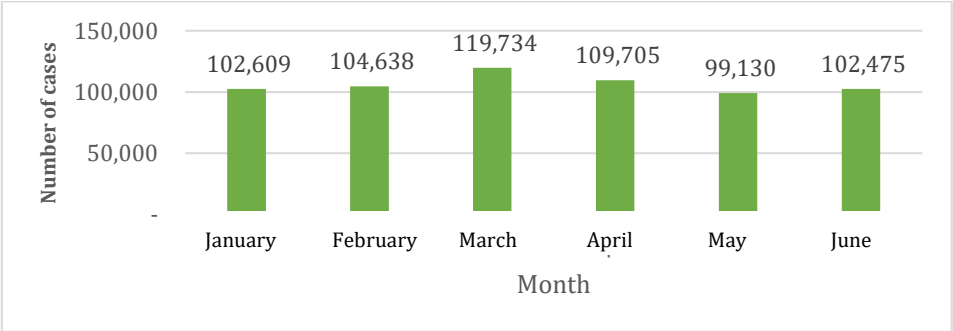


Fig 2. Number of Acute Respiratory Infection Cases in DKI Jakarta (January–June 2023)

The effects of deteriorating air quality are also seen in rising respiratory health issues. Figure 2 shows the number of Acute Respiratory Infections (ISPA) cases in Jakarta, with a peak of 119,734 cases in March 2023. According to the Jakarta Health Agency, there are approximately 100,000 ISPA cases in Jakarta each month, potentially influenced by air pollution, though seasonal factors such as the dry season may also contribute. Concerns over air quality led a group of Jakarta residents to file a lawsuit against the government in 2019, highlighting its failure to manage pollution levels. The Central Jakarta District Court partially granted the lawsuit on September 16, 2021, requiring the government to take steps to improve air quality.

Table 1. Air emission load by sector in DKI Jakarta in 2020

No.	Sector	Emission (Ton)						
		SO_2	NOx	CO	PM_{10}	$PM_{2.5}$	BC	NMVOCs
1.	Energy Industry	1.071	12.244	5.252	660	447	157	352
2.	Industrial Manufacturing	2.637	12.183	3.738	2.989	2.102	799	1.212
3.	Transportation	493	76.793	287.317	5.113	5.257	5.048	198.936
4.	Commercial	14	321	90	7	3	1	64
5.	Residential	41	4.527	1.774	48	33	1	1.407
	Total	4.256	106.068	298.171	8.817	7.842	6.006	201.971

In 2020, the Jakarta Environmental Agency, in collaboration with Vital Strategies, conducted an emissions inventory study. Table 1 reveals that the transportation sector contributes the most emissions across various pollutants, including carbon monoxide (CO), nitrogen oxides (NOx), and PM2.5. CO is a hazardous pollutant that can cause serious health symptoms such as dizziness and shortness of breath (Rizaldi et al., 2022).

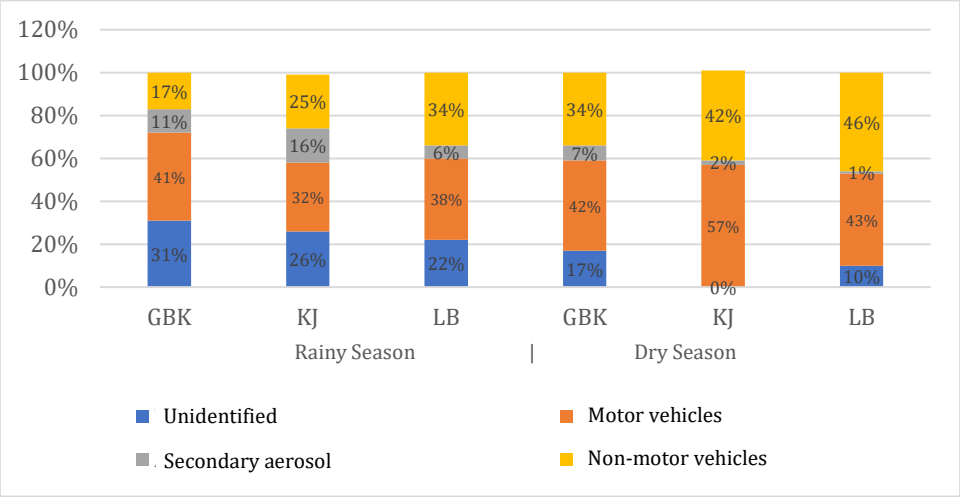


Fig 3. Sources of PM2.5 Concentration Contribution in DKI Jakarta 2019

As illustrated in Figure 3, motor vehicles are the primary source of PM2.5 pollution, which must be controlled to mitigate its harmful effects. The World Health Organization (WHO) emphasizes that PM2.5 exposure can worsen various health conditions, including heart disease and cancer (World Health Organization, 2006). Air quality in Jakarta is a complex issue that necessitates collaboration between the Addressing Jakarta's air quality issues requires a collaborative effort between the government and the community. Proposed solutions include developing and expanding public transportation, providing incentives for public transit users, and implementing penalties for private vehicle use. Furthermore, by adhering to international agreements, such as the Paris Climate Agreement, Jakarta can contribute to global efforts to reduce greenhouse gas emissions, improving air quality and promoting public health in the city.

2. Methods

2.1 Type of research based on research objective

Research types based on objectives can be categorized into three groups aligned with the intended outcomes: exploratory, which explores new areas; descriptive, which depicts social phenomena; and explanatory, which seeks to explain social phenomena. This study falls within the descriptive research category, aiming to detail and provide an in-depth illustration of the implementation of fiscal incentives through tax policies for Battery Electric Motor Vehicles (Electric Buses) in establishing a sustainable transportation

ecosystem in Jakarta (Manzolli et al., 2022). As noted by Neuman (2014), descriptive research is intended to offer a specific portrayal of situations, social settings, and relationships in the research context. Through in-depth interviews with relevant informants—such as the Fiscal Policy Agency, the Ministry of Industry, policy and transportation academics, electric bus providers, public transportation service companies, and NGOs focused on transportation or environmental issues—the researcher will gather comprehensive insights into the effectiveness of this fiscal incentive policy.

2.2 Scope of research

This research is limited to analyzing the effectiveness of fiscal incentive policies for Battery Electric Motor Vehicles (Electric Buses) and sustainable transportation as an applicable concept to address issues in Jakarta. The focus is on the year 2024, excluding longitudinal analysis or comparisons with previous periods. The researcher will identify factors that contribute to the success or failure of the fiscal incentive implementation and its impact on electric bus usage as part of a more environmentally friendly transportation ecosystem. By combining descriptive research and in-depth interviews with various informants, this study is expected to offer a clear depiction of the influence of fiscal incentives on the growth of electric buses and their role in fostering a sustainable transportation ecosystem in Jakarta.

2.3 Informants

The informants in this study are selected based on their direct involvement in relevant policy or industry areas. First, interviews will be conducted with Mr. ARS and Mr. SA from the Fiscal Policy Agency (BKF) to gather information regarding the fiscal incentive scheme for electric buses. Next, from the Ministry of Industry, Mr. A of the Directorate General of Metal, Machinery, Transportation Equipment, and Electronics (ILMATE) will provide insights on the development of the electric vehicle industry. The researcher will also involve policy and transportation academics experienced in this field to gain perspectives on the effect of fiscal incentives on electric buses.

Furthermore, Mr. VBK, Chief of Risk and Compliance Officer at PT VKTR Teknologi Mobilitas Tbk, representing an electric bus provider, will be interviewed to explore the impact of incentives on bus production. Mr. HP from PT Transportasi Jakarta will provide insights into how fiscal incentives affect public transportation services. Finally, Mr. SMTH, a member of the Jakarta Transportation Council's Commission on Tariffs and Funding, will offer a community perspective through interviews with NGOs focusing on transportation and environmental issues. By involving these diverse informants, the research aims to provide a comprehensive overview of the effectiveness of fiscal incentive policies in creating an environmentally friendly, sustainable transportation ecosystem in Jakarta.

3. Results and Discussion

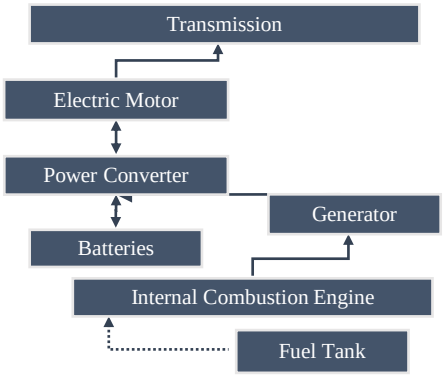
3.1 Electric vehicles (EVs) and their types

Electric Vehicles (EVs) or electric motor vehicles are vehicles powered by motors with electric energy supplied directly to the vehicle or from an external source (Nazaruddin et al., 2019). Electric motor vehicles offer several promising advantages, such as enhancing energy resilience and energy source diversity, promoting economic growth in countries and new industries, and contributing to environmental protection efforts through the reduction of externalities from conventional vehicles (Yong et al., 2015). According to Darabi & Ferdowsi (2011), EVs also provide better performance compared to conventional vehicles with internal combustion engines (ICEVs) due to the more efficient use of power trains and electric motors. Electric vehicles are categorized into three groups based on the degree of

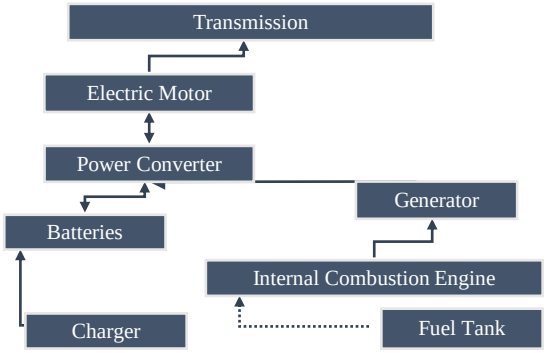
hybridization: Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and Battery Electric Vehicles (BEVs) (Yong et al., 2015).

Electric Vehicles (EVs) are powered by electric motors, utilizing an internal or external energy supply. EVs offer promising advantages, such as improving energy security and resource diversification, promoting economic growth and innovation, and reducing environmental impact by lowering externalities from conventional vehicles (Yong et al., 2015). Darabi & Ferdowsi (2011) note that EVs outperform Internal Combustion Engine Vehicles (ICEVs) due to their more efficient powertrain and electric motor.

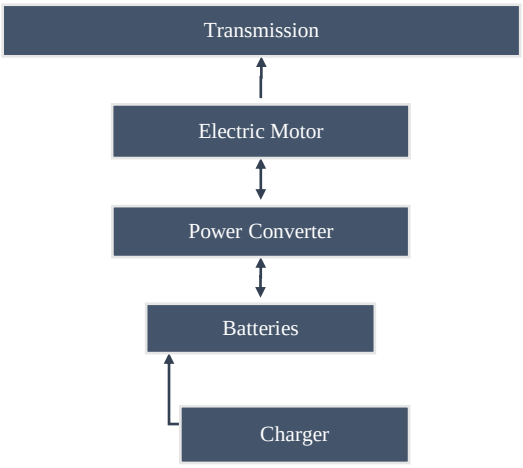
EVs are generally divided into three types based on hybridization levels: Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and Battery Electric Vehicles (BEVs) (Yong et al., 2015). HEVs combine an internal combustion engine with an electric motor but do not support external charging, relying on regenerative braking and the internal engine for battery power. PHEVs, like HEVs, have larger batteries and allow external charging. BEVs, solely battery-powered, operate entirely on electricity, which limits their range but ensures zero emissions, making them ideal for urban environments.



(a) Hybrid Electric Vehicles (HEVs)



(b) Hybrid Electric Vehicles (HEVs)



(c) Battery Electric Vehicle (BEVs)

Fig 4. Power Train Configuration of Electric Vehicles (Yong et al., 2015)

The differences between these types of electric vehicles can be seen through their power trains or propulsion systems. HEVs are powered by a combination of an internal combustion engine, which is typically used in conventional vehicles, and an electric motor. HEVs cannot receive external electricity as a power source. The battery in HEVs is charged by the internal combustion engine or through an energy recovery mechanism via regenerative braking while the vehicle is in motion. This mechanism converts kinetic energy

in HEVs into chemical energy that can be stored in the battery for later use. Similar to HEVs, PHEVs are equipped with larger battery capacities and can be charged via an external electrical source. In addition, BEVs rely entirely on batteries as the vehicle's propulsion system. The electric motor is the sole source of propulsion in BEVs, with the entire propulsion system based on electrical energy and always operating in a discharge mode. With larger battery sizes and capacities, energy charging can occur through regenerative braking while driving and through external electricity when the vehicle is stationary. The fully electric propulsion system directly impacts the vehicle's range based on battery capacity. Generally, BEVs are suitable for urban driving due to their limited electric propulsion range. However, BEVs have advantages such as zero emissions and better vehicle performance.The battery is a key component of electric vehicles, serving as one of the two power sources for HEVs and PHEVs and the sole power source for BEVs. The technology used in electric vehicle batteries has not yet reached its maximum potential, with several obstacles hindering the broader use of electric vehicles. Electric vehicle batteries have relatively low energy density, directly affecting the maximum electric driving range of electric vehicles. Electric vehicle batteries also tend to be more expensive compared to conventional vehicles. Additionally, the public still harbors concerns about battery life cycles and safety features that are not fully understood by the general population. Nevertheless, advancements in electric vehicle battery technology continue to yield improvements in high energy density, high power density, cost-effectiveness, safety, and durability.

Nevertheless, the electrification of motor vehicles represents one approach to addressing the climate challenges faced globally. Electric motor vehicles have their own impacts and are viewed as having significant potential as an alternative to conventional vehicles or ICEVs. Yong et al. (2015) also mention that the development of the electric vehicle industry can lead to economic growth, environmental benefits, and advancements in the power generation system. Economic growth refers to the potential of the power generation industry as a major supplier of electricity for EVs and the reduction in operational costs for electric vehicle owners. While these aspects of economic growth cannot be directly confirmed at this moment, such as with power plants, this factor requires time to adapt or progress until it reaches optimal targets. Additionally, the environmental impact is clearly directed towards electric vehicles known for their zero emissions and eco-friendliness. However, electric vehicles rely on energy from power plants that still produce emissions. To account for these overall emissions, the "wells-to-wheels emissions" method is used to calculate emissions over the vehicle's lifetime, including the energy and materials used to power the vehicle and the direct emissions from the exhaust. Therefore, charging electric vehicles from power plants that use coal and other polluting fuels can result in electric vehicles having higher emissions than ICEVs. Electric vehicles can be non-environmentally friendly if the electricity is sourced from dirty power plants. However, with the increasing adoption of renewable energy sources, this will make the power grid more environmentally friendly with reduced wells-to-wheels emissions. The potential impact of electric vehicles on the power generation industry includes grid harmonization, system reductions, voltage drops, increased electricity demand, stability flow issues, and more. This is because, with the adoption of electric vehicles, the demand and use of electricity automatically increase, prompting the power generation industry to meet these needs. As the adoption of electric vehicles progresses, the power generation industry is also expected to enhance system capabilities and coordinate with various electric vehicle operators to provide charging infrastructure for electric vehicles. Essentially, the electrification of electric vehicles has a vast future, with the hope that supporting industries can also develop in efforts to tackle the climate issues currently at hand.

3.2 Fiscal incentive policies for battery-based electric motor vehicles, including electric buses

The Indonesian government is committed to the Paris Agreement and ratified this international agreement through Law Number 16 of 2016 regarding the Paris Agreement

on the United Nations Framework Convention on Climate Change. Addressing climate change has become one of the government's focuses through the development of various environmentally friendly industrial sectors, such as transportation, utilities including energy and fuel, along with various industries. One of the government's proactive efforts is the electrification of motor vehicles through the emergence of electric vehicle technology. The President of the Republic of Indonesia, Joko Widodo, frequently signs and issues Presidential Regulation Number 55 of 2019 regarding the Acceleration of the Battery-Based Electric Motor Vehicle (KBLBB) Program for Road Transportation, which has been amended by Presidential Regulation Number 79 of 2023 during this period. This regulation states that the acceleration of the KBLBB program for road transportation is conducted through the rapid development of domestic KBLBB industry regulations, provision of incentives, electricity charging infrastructure, and regulation of electricity tariffs for KBLBB, fulfillment of technical provisions for KBLBB, and protection of environmental aspects. This reflects the Indonesian government's desire to address serious public health and environmental issues concerning the negative externalities of industries, including transportation externalities.

The government also encourages the domestic industry's capability to achieve green or environmentally friendly industry standards. President Joko Widodo has expressed his desire for Indonesia's automotive industry to produce and export electric motor vehicles. Not only does this address domestic climate crises, but the Indonesian government is also eginning to encourage domestic industries to maximize their capabilities so that Indonesia can play a significant role in the global electric vehicle supply. Article 5, paragraph (2) of Presidential Regulation No. 55 of 2019 states, "The motorcycle and four-wheeled or more motor vehicle industry and motor vehicle component industry that have obtained industrial business licenses and manufacturing and assembly facilities may participate in the acceleration program for Battery-Based Electric Motor Vehicles for road transportation." This acceleration program focuses on KBLBB and/or KBLBB component industry activities. These industries are also required to establish KBLBB manufacturing facilities domestically, either independently or through production collaborations with other industries.

One key point to note in this policy is the Domestic Component Level (TKDN) that companies must meet. Stated in Article 8, paragraph (1) of Presidential Regulation No. 55 of 2019 as amended by Presidential Regulation No. 79 of 2023, "The Battery-Based Electric Vehicle industry and the Battery-Based Electric Vehicle component industry must prioritize the use of TKDN with the following criteria: a. For two- and/or three-wheeled Battery-Based Electric Vehicles, the level of domestic component usage is as follows:

Based on the applicable regulations, the minimum Domestic Component Level (TKDN) requirements for Battery-Based Electric Vehicles (KBLBB) are set progressively. From 2019 to 2026, a minimum TKDN of 40% must be achieved; from 2027 to 2029, the minimum increases to 60%; and starting from 2030 onwards, it must reach at least 80%. Specifically for four-wheeled or more Battery-Based Electric Vehicles, the requirements are slightly different, where from 2019 to 2021, a minimum TKDN of 35% is required, from 2022 to 2026, a minimum of 40%, from 2027 to 2029, a minimum of 60%, and from 2030 onwards, a minimum of 80%. In line with this regulation, companies intending to manufacture KBLBB or its components, particularly Electric Buses, should refer to Article 8, paragraph (1), point b. It is essential for manufacturers to prioritize meeting the TKDN requirements if they wish to participate in the government’s KBLBB program and benefit from various incentives or facilities available for the procurement of Electric Buses.

Subsequently, Article 9 of Presidential Regulation No. 55 of 2019 states that the production of KBLBB conducted by KBLBB industries is by companies that: a. are established under Indonesian law and operate within the territory of the Unitary State of the Republic of Indonesia; and b. have an industrial business license to assemble or manufacture Battery-Based Electric Vehicles. Meanwhile, the production of KBLBB components conducted by KBLBB component industries is outlined in Article 10, which pertains to companies that a. are established under Indonesian law and operate within the territory of the Unitary State of the Republic of Indonesia; and b. possess an industrial

business license to assemble or manufacture main and/or supporting components for Battery-Based Electric Vehicles in accordance with the provisions of laws and regulations.

Then, Article 11 paragraph (1) of Presidential Regulation No. 55 of 2019 states, "In the event that the Battery-Based Electric Vehicle (KBLBB) component industry is unable to produce main components and/or supporting components for Battery-Based Electric Vehicles, the Battery-Based Electric Vehicle industry may procure components from imports in the form of: a. incompletely knocked down (Incompletely Knock Down/IKD); and/or b. completely knocked down (Completely Knock Down/CKD)." In Article 11 paragraph (2), it continues that if the Battery-Based Electric Vehicle component industry is unable to produce main components and/or supporting components for Battery-Based Electric Vehicles, according to this Presidential Regulation, the Battery-Based Electric Vehicle component industry may procure components from imports in the form of incompletely knocked down (Incompletely Knock Down/IKD). Furthermore, Article 12 paragraph (1) of Presidential Regulation No. 55 of 2019 mentions that the Battery-Based Electric Vehicle industry that will build Battery-Based Electric Vehicle manufacturing facilities domestically may procure Battery-Based Electric Vehicles from imports in a completely built-up (Completely Built-Up/CBU) condition. In Article 12 paragraph (2), it is stated that the imports as referred to may only be conducted within a certain time frame and quantity from the commencement of the construction of Battery-Based Electric Vehicle manufacturing facilities.

This policy also explains about companies in the National Brand Battery-Based Electric Vehicle industry, namely companies: a. that use domestic Battery-Based Electric Vehicle components that meet the Domestic Component Level (TKDN) criteria; b. that invest domestically and can be granted additional fiscal incentives established by the minister responsible for state finance affairs and additional non-fiscal incentives determined by the relevant minister after receiving input from the Coordination Team for the acceleration of the Battery-Based Electric Vehicle program; and c. that conduct research and/or technological innovation in the domestic Battery-Based Electric Vehicle industry (Article 14 of Presidential Regulation No. 55 of 2019). Then, it continues in Article 15 that these National Brand Battery-Based Electric Vehicle industry companies may be granted additional facilities or incentives.

Article 17 of Presidential Regulation No. 55 of 2019 also states that the Central Government and Regional Governments provide incentives in the form of fiscal incentives and non-fiscal incentives to accelerate the Battery-Based Electric Vehicle program for road transportation. Furthermore, Article 19 paragraph (1) details that the fiscal incentives referred to may include: a. import duty incentives for Battery-Based Electric Vehicles in a completely knocked down (Completely Knock Down/CKD) condition, Battery-Based Electric Vehicles in an incompletely knocked down (Incompletely Knock Down/IKD) condition, or main components for a certain quantity and period; b. luxury goods sales tax incentives; c. exemption or reduction of central and regional taxes; d. import duty incentives for machinery, goods, and materials for investment; e. suspension of import duties for exports; f. government-paid import duties for raw materials and/or auxiliary materials used in production processes; g. incentives for building charging station facilities (SPKLU); h. export financing incentives; i. fiscal incentives for research, development, and technological innovation activities as well as vocational training for Battery-Based Electric Vehicle component industries; j. parking fees in locations designated by the Regional Government; k. reduction of electricity charging costs at SPKLU; l. support for financing infrastructure development for SPKLU; m. professional competence certification for human resources in the Battery-Based Electric Vehicle industry; and n. product certification and/or technical standards for Battery-Based Electric Vehicle industries and Battery-Based Electric Vehicle component industries.

Based on the presentation of the policy in Presidential Regulation No. 55 of 2019, the government strives to encourage the Battery-Based Electric Vehicle program as road transportation in response to environmental issues and to promote domestic industries to compete in the global market. This policy is certainly a form of government strategy through

sustainable programs that can guide Indonesia to become a developed country and a model for other countries in terms of the Battery-Based Electric Vehicle industry.

3.3 Analysis of the effectiveness of fiscal incentives policy for battery-based electric motor vehicles, specifically electric buses, in achieving a more environmentally friendly ecosystem through sustainable transportation concepts

In pursuit of the government's vision for a more environmentally friendly ecosystem, the provision of fiscal incentives serves as an initial gateway for the government to introduce the Battery-Based Electric Vehicle (KBLBB) industry to the public. The implementation of this policy in the realm of electric buses opens significant opportunities for domestic industries to independently produce electric buses and ultimately compete in the global market.

> *"Yes, in essence, from the Ministry of Production, we continue to support everything, whether it's private cars or public transportation. Because I believe it is inevitable to replace private cars, they will still exist. We are improving this; even public transportation or private cars are becoming more environmentally friendly..."*(A).

Mr. A, representing the Director General of ILMATE, stated that the provision of incentives for KBLBB is not limited to one category of vehicle; the government also considers the need for electric buses as public transportation. Regarding the transition of the transportation industry to KBLBB, he acknowledged the reality that the existence of private vehicles is unlikely to disappear significantly. Therefore, the government's efforts thus far have focused on encouraging the public to shift from conventional vehicles to electric ones with more renewable and sustainable energy.

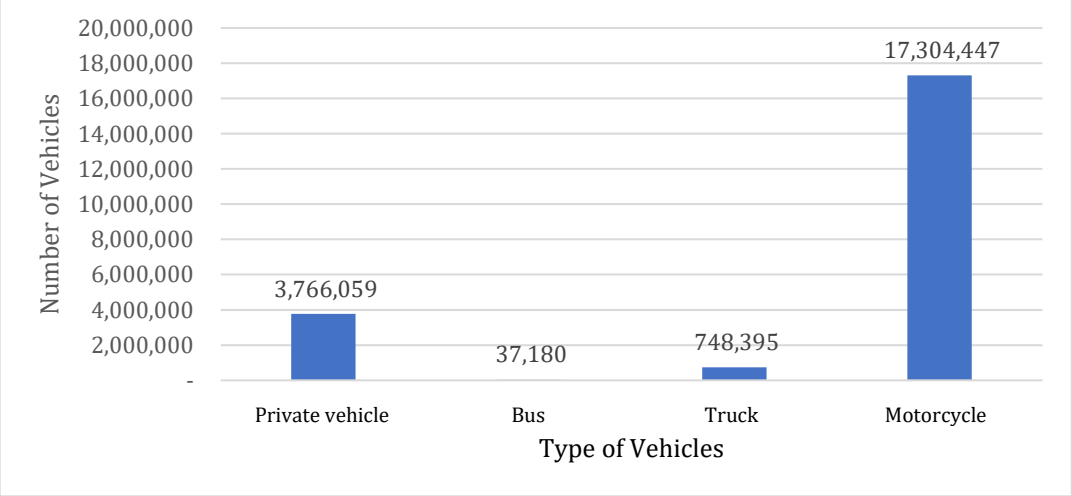


Fig 5. Number of motor vehicles by type in DKI Jakarta in 2022
(Central Bureau of Statistics, 2023)

Figure 5 illustrates the number of motor vehicles categorized by type in DKI Jakarta as recorded by the Central Bureau of Statistics. According to the data, passenger cars and motorcycles as private vehicles dominate at 96%, while commercial vehicles such as buses and trucks account for only 4% of the total number of motor vehicles in DKI Jakarta. There is no denying that private vehicle usage in DKI Jakarta is still very high. In response to this phenomenon, the government continues to issue policies aimed at transitioning from conventional motor vehicles to electric motor vehicles as the most appropriate effort to reduce pollution at present (Pelletier et al., 2019). However, this approach has not fully succeeded in achieving an optimal sustainable transportation ecosystem. One indicator of sustainable transportation is the technological transformation of vehicles, such as the

electrification of circulating motor vehicles currently being pursued by the government. Nevertheless, other indicators of sustainable transportation prioritize public transportation usage and promote healthier lifestyle changes for the community rather than maintaining the massive use of private vehicles.

> "*Yes, in fact, what the Jakarta government has planned is very good. If we look at the roadmap they created in 2019, it is quite impressive. But there is one side of ambition, and one side of realization. It turns out that realizing it has been challenging. Now, from the beginning until today, only 100 buses have circulated in Transjakarta. Looking at their roadmap, by 2024, it should be at least 300. Just meeting that goal is incredibly difficult. What are the obstacles? Sorry to say, goodwill. From Transjakarta's side and the government's side, there hasn't been full agreement to support this to make it a reality. For example, comparing costs between combustion buses in Seoul and electric ones. We all know that over a similar period, say 10 years, electricity should at least be on par. Even if it's not cheaper, it should be comparable to Seoul. Yet, that alone is a monumental challenge to get approved..."* (A).

Mr. VB mentioned that what has been implemented in DKI Jakarta to achieve a sustainable transportation ecosystem is quite commendable. The transportation system provided by Transjakarta is adequate for residents who have needs or activities in DKI Jakarta. Particularly, if the fleet used comprises electric buses, the emissions produced, especially in the DKI Jakarta region, will be minimized. However, the provision of fiscal incentives for KBLBB, especially electric buses, remains insufficient. This refers to Transjakarta's target for a significant procurement of electric bus fleets. Unfortunately, the manufacturers are still struggling to meet the public transportation operators' demands for these transport modes. Electric bus manufacturers face obstacles regarding the incentives offered by the government relative to the benefits to the company itself.

> *"...Our recommendations for the Ministry of Transportation and other governmental bodies are for them to be more astute and cohesive in building a transportation system. The Ministry of Industry may focus on developing the automotive industry, but the Ministry of Transportation should consider ways to reduce congestion, and the Ministry of Environment and Forestry should work on reducing emissions. It is essential to create a unified program. For instance, the Ministry of Industry should not allow industries to produce vehicles with high emissions anymore, or perhaps prohibit the sale of fossil fuel-powered vehicles altogether. The Ministry of Transportation should then develop a better mass transportation roadmap, even if the current one is good, to ensure more integration into remote areas, not just city centers*..." (ST).

Mr. ST, representing the Fiscal Policy Agency, stated that realizing a sustainable transportation ecosystem requires a specific program from the central government. This necessitates harmonization among all levels of government to issue derivative regulations that support the implementation of the sustainable transportation ecosystem. Currently, the provision of fiscal incentives through Presidential Regulation No. 55 of 2019 can be complemented by various derivative regulations to optimally achieve a sustainable transportation ecosystem.

> *"...When creating a mass transport system, we should avoid using wheeled vehicles; instead, it would be more appropriate to utilize systems like MRT that operate above ground. If they are also electric and use cables, that's what our senior colleagues suggest. Why? Because it would be more effective and efficient. Consider a train like KRL that has its dedicated track. This would make implementation easier..."* (ST).

He further added that optimizing public transportation can be achieved by prioritizing the development of transportation services with dedicated routes. Currently in DKI Jakarta,

this includes the Mass Rapid Transit Jakarta (MRT), Integrated Light Rail Transit Jakarta (LRT), and KRL Commuter Line. The consideration for using rail-based public transportation includes dedicated tracks, which create a priority for public transport and generally allow for movement without interference from road traffic. Nonetheless, Transjakarta also provides Bus Rapid Transit (BRT) services with dedicated busway routes. However, this service is occasionally hindered by misuse of the dedicated lanes by private vehicle users, which obstructs public transport. Additionally, Transjakarta offers non-BRT services, such as buses without dedicated routes. These services have more stops and are often closer to destinations. Unfortunately, non-BRT services face significant challenges due to traffic congestion.

Table 2. Indicators of the five transformations supporting the sustainable transportation ecosystem

Indicator	Description
Urban Development Planning	Enhance land use diversity and development density around homes and major activity points
	Promote transit-oriented development (TOD).
	Improve walkability.
Economic Transformation	Transition to high value-added industrialization.
	Develop sustainable urban distribution systems.
Vehicle Transformation	Transformation to more environmentally friendly vehicle technology.
Modal Split	Increase the number of public transport passengers.
	Enhance intermodal connectivity.
Community Lifestyle Transformation	Educate the public on the importance of sustainability principles.
	Promote healthy lifestyles, active transportation, and social capital to initiate paradigm shifts.

(Loo & Tsoi, 2016)

Referring to the concept of The Five Transformations articulated by Loo & Tsoi (2018) in their literature titled "*The sustainable transport pathway: A holistic strategy of Five Transformations*," the indicators within The Five Transformations represent a holistic view that should be considered to achieve a sustainable transportation ecosystem in various regions. Through the indicator of Urban Development Planning, as also mentioned in the in-depth interviews, the government should support city planning that can accommodate various infrastructure to support a sustainable transportation ecosystem, including diverse functional building infrastructure, transportation systems, and pedestrian infrastructure. This becomes a form of optimal land use, considering easier public accessibility.

Additionally, there is the Economic Transformation indicator, where the government can shift industrialization towards high value-added processes and develop sustainable urban distribution systems. A further examination of this aspect will support a maximally sustainable transportation ecosystem in a city by assessing the emissions output generated from all industrial sector activities. It was also noted in the in-depth interviews that commercial vehicles such as trucks also require encouragement from the government in the electrification of motor vehicles. This represents a form of innovation from the manufacturers themselves, considering the significant emissions output from trucks that operate on the highways.

Next, the Vehicle Transformation indicator discusses the transition to using vehicles with more environmentally friendly technologies. As we commonly know, the transportation sector is widely recognized by the public as the largest contributor to pollution in a region or city. Based on the results of the in-depth interviews conducted in this research, the form of vehicle electrification is actively pursued by the government to encourage the transition from conventional vehicles to electric vehicles through.

4. Conclusions

The government's efforts to establish an eco-friendlier transportation ecosystem are being pursued through fiscal incentives for electric buses, as stipulated in Presidential Regulation Number 55 of 2019. This policy aims to drive the government's commitment to fostering a greener ecosystem by introducing and supporting the domestic Battery Electric Vehicle (KBLBB) industry. Through this initiative, the industry is expected to progress toward self-sustained production and eventually compete on a global scale. However, to fully realize the sustainable transportation concept, it is essential for the government to implement a targeted program focusing on public transportation infrastructure, aligned with the holistic approach outlined in the Five Transformations. The current policy has not yet met all indicators within the Five Transformations framework necessary to establish a truly sustainable transportation ecosystem. Therefore, it is recommended that the government introduce large-scale policies dedicated to the production, provision, and utilization of public transportation to meet these indicators. Prioritizing public transportation would also reflect the government's neutrality in addressing prevalent issues and meeting public needs, benefiting a broader demographic spectrum. This sustainable transportation ecosystem could, in turn, reinforce the government's commitment to reducing greenhouse gas emissions by 2030 in line with The Paris Agreement.

In light of this study, several recommendations are proposed. First, the Indonesian government should refine the fiscal incentives available to electric bus manufacturers, particularly regarding CKD import duties and meeting TKDN criteria. These adjustments are necessary to make the fiscal incentives beneficial for both manufacturers and public transport operators. To date, electric bus manufacturers have reported limited gains and inadequate policy appeal from the existing fiscal incentives. The current fiscal incentives have not significantly motivated electric bus manufacturers to maximize production, which is essential for meeting public transportation demands and supporting a self-sustaining KBLBB industry capable of competing in the global market.

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