

Analysis Impact of Electric Vehicles on the Environment

Dicky Wahyu Eko Saputra, Dani F. Brilianti

Politeknik Keselamatan Transportasi Jalan Tegal Indonesia

ABSTRACT

Many people use conventional vehicles because they cause a lot of air pollution which makes the air polluted. That is why electric vehicles are made that can reduce air pollution. These electric vehicles use lithium batteries which do not emit carbon monoxide which can pollute the environment. . therefore, the Indonesian government is intensively conducting outreach among the public so that they can buy electric vehicles to better protect the environment and not be contaminated by pollution caused by conventional vehicles. The primary goal of this study is to analyze the impact of electric vehicles (evs) on environmental pollution, with a focus on the role of evs in mitigating air pollution caused by conventional vehicles. Specifically, the study aims to consider the environmental benefits of shifting from conventional vehicles to electric vehicles evaluate the potential reduction in greenhouse gas emissions by introducing electric vehicles. assess the Indonesian government's efforts and policies in promoting the spread of electric vehicles and understand the effectiveness of evs in raising public awareness. This study uses a mixed-method approach, combining quantitative and qualitative data. The primary methods include: literature review: reviewing existing research on ev emissions, the impact of battery production, and government policies regarding ev adoption. data analysis: analyzing air pollution data from traditional vehicle exhausts and comparing it with emissions data from electric vehicles, including life-cycle analysis of lithium batteries. surveys/interviews: conducting surveys or interviews with current ev users and potential ev buyers in Indonesia to gather opinions, perceptions, and concerns regarding evs. policy analysis: reviewing Indonesian government policies and evaluating incentives, subsidies, and other efforts to encourage ev adoption.

Keywords: *Electric vehicles, Environment, air pollution*

Corresponding author

Name: *Dicky Wahyu E. Saputra*

Email: *dickywahyu2301@gmail.com*

INTRODUCTION

The quick mechanical and innovative advancement around the world has driven to an expanded dependence on routine vehicles fueled by inside combustion motors. These vehicles, fueled by gasoline or diesel, are a major donor to discuss contamination, transmitting nursery gasses like carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter. Such outflows play a critical part in worldwide warming and unfavorable wellbeing impacts due to destitute discuss quality. This natural

and open wellbeing emergency has heightens the hunt for elective, more feasible modes of transportation.(Kapustina,2023)

In reaction to these natural challenges, electric vehicles (EVs) have developed as a promising arrangement. Fueled by electric engines and lithium-ion batteries, EVs create zero tailpipe emanations, making them an appealing elective to customary vehicles. By utilizing power as their essential source of control, EVs diminish the reliance on fossil fills and altogether minimize discuss toxins. Recognizing the potential of EVs to moderate contamination, the Indonesian government has effectively empowered the selection of electric vehicles. Through motivations, open outreach, and instructive campaigns, the government looks for to advance EVs as a down to earth and maintainable transportation alternative for diminishing discuss contamination and preserving natural wellbeing. This paper looks at the natural affect of electric vehicles, centering on their potential to diminish discuss contamination compared to conventional vehicles. It investigates the benefits of EVs, the challenges related with their usage, and the part of administrative bolster in quickening their selection. (Izakova, 2023)

The quick pace of mechanical progression and mechanical development universally has altogether expanded dependence on customary vehicles fueled by inside combustion motors (Frosts). These vehicles, which run overwhelmingly on gasoline or diesel, are among the biggest supporters to natural contamination. They discharge destructive emanations, counting nursery gasses like carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxides (NO_x), and particulate matter. These poisons not as it were worsen worldwide warming but moreover debase discuss quality, posturing serious wellbeing dangers to the populace. Concurring to Kapustina (2023), the broad utilize of ICE vehicles has contributed to an disturbing rise in natural and open wellbeing emergencies. This squeezing concern has quickened endeavors to discover elective and more feasible modes of transportation to relieve such unfavorable impacts.

Among the various developments tending to this issue, electric vehicles (EVs) have developed as a promising arrangement. Not at all like their ICE partners, EVs are fueled by electric engines and lithium-ion batteries, which produce zero tailpipe outflows. This essential characteristic makes them an appealing elective for combating contamination and decreasing the reliance on fossil powers. By leveraging power as their essential vitality source, EVs play a basic part in altogether minimizing discuss poisons, in this way contributing to a cleaner environment.

The potential of EVs to revolutionize the transportation segment is obvious, but their broad appropriation depends on overcoming certain financial, innovative, and infrastructural boundaries. Governments around the world have recognized the benefits of transitioning to electric versatility and are actualizing different measures to back this move. For occasion, in Indonesia, the government has propelled comprehensive methodologies to advance EV appropriation. These incorporate motivations for buyers, such as assess breaks and appropriations, as well as open outreach campaigns pointed at teaching the people almost the preferences of EVs. Furthermore, activities to create strong charging framework and energize the interest of private divisions are picking up

force. These endeavors adjust with the nation's broader objective of decreasing emanations, combating climate alter, and protecting open wellbeing.

Electric vehicles offer various points of interest, but they are not without challenges. One of the foremost striking benefits of EVs is their capacity to decrease nursery gas emanations and other hurtful toxins essentially. Conventional ICE vehicles radiate CO₂ and other poisonous substances amid combustion, which contribute to brown haze, respiratory illnesses, and worldwide warming. Then again, EVs create no coordinate outflows, and when fueled by renewable vitality sources like sun based or wind, their natural affect is definitely minimized. Be that as it may, challenges such as the natural taken a toll of battery generation, constrained charging framework, and tall introductory costs can ruin the move. Izakova (2023) highlights the significance of administrative bolster and worldwide participation in overcoming these boundaries to encourage the move to economical transportation.

This paper looks at the natural affect of electric vehicles with a center on their potential to diminish discuss contamination compared to conventional ICE vehicles. It investigates the benefits of EVs, the challenges related with their execution, and the significant part of government directions and motivating forces in quickening their appropriation. By understanding the complexities of this move, policymakers, producers, and consumers can work collectively to make a greener and more economical future.

All inclusive, EV appropriation has been developing consistently, with numerous nations setting yearning targets for staging out ICE vehicles. Countries like Norway, the Netherlands, and China are driving the charge, illustrating that government mediation, combined with shopper mindfulness, can make noteworthy shifts in transportation patterns. Indonesia, in spite of its developing economy status, has taken striking steps to grasp EVs as portion of its feasible advancement objectives. The victory of these measures will depend on adjusting natural needs with financial substances, guaranteeing that the benefits of EVs reach all fragments of society.

As the world faces an heightening climate emergency, the part of feasible transportation cannot be exaggerated. Electric vehicles, as a cleaner and more proficient elective to conventional cars, offer a way forward that adjusts with worldwide endeavors to diminish outflows and combat climate alter. This think about looks for to supply a comprehensive understanding of EVs' natural benefits and challenges, laying the basis for assist dialogs on the transformative potential of electric versatility.

The raising climate emergency and falling apart discuss quality have drawn worldwide consideration to the natural affect of transportation. Conventional vehicles fueled by inner combustion motors (Frosts) rule the transportation segment, contributing altogether to nursery gas outflows and urban discuss contamination. These outflows compound climate alter whereas posturing extreme wellbeing dangers, such as respiratory and cardiovascular infections, due to delayed introduction to destitute discuss quality. The World Wellbeing Organization (WHO) recognizes discuss contamination as one of the driving causes of untimely passings all inclusive, advance emphasizing the require for cleaner options. As Kapustina (2023) underscores, this double natural and

open wellbeing challenge requests quick, economical arrangements to moderate its antagonistic impacts.

Electric vehicles (EVs) have risen as a basic development in tending to these natural challenges. Not at all like ICE vehicles, EVs depend on electric engines fueled by rechargeable batteries, such as lithium-ion, which deliver zero tailpipe emanations. This starkly differentiates ordinary vehicles positions EVs as a foundation of present day endeavors to diminish discuss contamination, moderate worldwide warming, and move toward feasible urban versatility. Moreover, EVs adjust with broader natural objectives, especially when coordinates with renewable vitality sources. By tackling sun powered, wind, or hydroelectric control for reviving, the lifecycle emanations of EVs can be essentially minimized, making them an essential component of worldwide climate methodologies.

The appropriation of EVs, in any case, isn't without its challenges. Key obstructions incorporate the tall forthright costs of electric vehicles, constrained charging framework, and the natural affect of battery generation and transfer. Whereas EVs guarantee long-term natural benefits, the extraction of crude materials for batteries, such as lithium, cobalt, and nickel, raises concerns approximately asset maintainability and biological harm. Besides, the need of a comprehensive charging organize in numerous districts disheartens broad selection, especially in creating countries like Indonesia, where framework improvement is still in advance. In spite of these challenges, the Indonesian government has illustrated a commitment to advancing EVs through a run of activities, counting endowments, assess motivations, and open instruction campaigns pointed at raising mindfulness almost the benefits of electric portability.

In expansion to natural and wellbeing benefits, EVs offer financial openings that can fortify development and mechanical development. The advancement of EV fabricating, battery generation, and charging framework has the potential to form occupations and pull in ventures, especially in rising markets. Indonesia, with its copious saves of nickel, a basic component in lithium-ion batteries, is well-positioned to become a worldwide pioneer within the EV supply chain. By leveraging these assets and cultivating organizations with worldwide partners, the country can quicken its move to a low-carbon economy whereas improving its competitive edge within the worldwide showcase.

Worldwide patterns too highlight the developing energy behind EV appropriation. Nations such as Norway and the Netherlands have actualized driven arrangements to stage out ICE vehicles, setting an case for others to take after. These countries illustrate that comprehensive government back, coupled with buyer mindfulness, can drive noteworthy shifts in transportation propensities. Additionally, Indonesia's endeavors to grasp EVs as portion of its economical advancement objectives reflect a broader worldwide development toward cleaner and more proficient transportation frameworks. The victory of these activities will depend on collaborative endeavors between governments, private segments, and buyers to address financial, mechanical, and social boundaries to EV selection.

This paper investigates the natural suggestions of electric vehicles, centering on their potential to decrease air pollution compared to conventional ICE vehicles. By looking at the benefits and challenges of EV implementation, as well as the part of government arrangements and motivations, the paper inquires about points to supply a all-encompassing understanding of the transformative potential of electric mobility. In a period of fast urbanization and industrialization, the move to sustainable transportation frameworks is basic for guaranteeing a cleaner, more beneficial, and more impartial future for all.

METHOD

This study is a systematic literature review conducted to investigate the impact of electric vehicles on electricity infrastructure and grids. The research methodology involves searching, selecting, and analyzing relevant articles from various sources. The search for articles was conducted using scientific journal databases such as Google and Google Scholar. Keywords used included "electric vehicle innovation," "battery technology," "electric vehicle charging," and "challenges in the application of electric vehicles." Relevant articles published within a specific time period, such as the last five years, were selected for inclusion in this literature review. After going through a selection process involving quality and relevance assessment, a number of articles that were in line with the objectives of this study were selected. These articles were then analyzed in depth to extract key findings related to innovation in electric vehicles. In addition, the researcher also took data from BPS regarding the increase in motorized vehicles in Indonesia. Data from these articles are used to support and develop the theoretical framework in this journal.

FINDING AND DISCUSSION

The current vitality request within the transportation segment appears a critical hazard of deficiency. Vitality request for transportation in Indonesia is nearly on standard with industry, but the sector's reliance on petroleum fills (BBM) makes it exceptionally powerless to vitality deficiencies. The transportation division will confront deficiencies in the event that it as it were depends on customary fills and biomass. Not at all like other divisions, the transportation segment is exceedingly subordinate on certain sorts of vitality or fills, and has particular utilization and framework characteristics. Information from the Central Measurements Organization shows an increment within the utilize of motorized vehicles in Indonesia between 2019 and 2021. The biggest increment happened in bikes, taken after by traveler cars, cargo cars, and buses. The current vitality request within the transportation segment appears a critical hazard of deficiency. Vitality request for transportation in Indonesia is nearly on standard with industry, but the sector's reliance on petroleum fills (BBM) makes it exceptionally powerless to vitality deficiencies. The transportation division will confront deficiencies in the event that it as it were depends on customary fills and biomass. Not at all like other divisions, the transportation segment is exceedingly subordinate on certain sorts of vitality or fills, and has particular utilization

and framework characteristics. Information from the Central Measurements Organization shows an increment within the utilize of motorized vehicles in Indonesia between 2019 and 2021. The biggest increment happened in bikes, taken after by traveler cars, cargo cars, and buses.

Table 1: Development of Number of motor Vehicle by Type (Unit)

Type Vehicle	2019	2020	2021
Motorized			
Car Passenger	15592419	15797746	16413348
Bus Car	231569	233261	237566
Car Goods	502188	5083405	5199261
Bicycle Motor	112771136	115023039	120042298

Source: BPS,2023

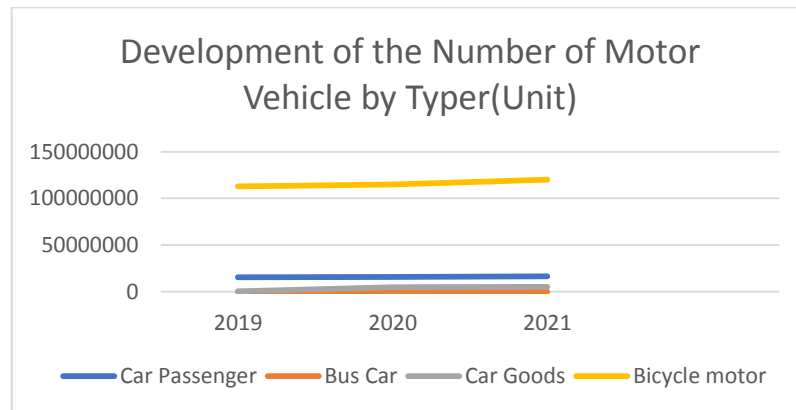


Figure 1: Unit

The aim of this study is to forecast future electricity demand, taking into account the possible transition of energy consumption in the transport sector from petroleum-based to electricity-based energy sources. The trend in the use of electric vehicles shows a significant increase, especially in the number of cars since 2010. Hybrid cars are followed by battery cars, and currently about 80% of electric cars are concentrated in countries such as the United States, China, Japan, the Netherlands and Norway. Electricity consumption in the transport sector involves various aspects related to the availability of electricity on the grid, such as the reliability of energy supply, the infrastructure of battery charging stations and affordability for the general public. As the role of the energy sector in improving economic activity and national resilience is very important, energy management must be carried out in a planned, economical, integrated and sustainable manner. Energy subsidies place a heavy burden on the national economy and hinder physical and social development. For this reason, from the end of December 2014, subsidies on gasoline (premium) were abolished or reduced, and subsidies on automotive

diesel fuel were fixed at Rs. 1,000 per liter. This measure was enacted by Presidential Regulation No. 191/2014, followed by ESDM Regulation No. 04/2015 and ESDM Ministerial Decree No. 0135/K/12/MEM/2015. The electricity subsidy policy was also reduced by abolishing electricity subsidies for 12 tariff groups, as stipulated in ESDM Regulation 31/2014. The tariff groups include domestic (1,300 VA), commercial (6,600 VA), industrial (200 kVA), government (6,600 VA), low-voltage street lighting and special services. With the removal of fuel and power subsidies, energy subsidies have been reduced from 315 to 119 trillion rupees in 2014, 1 trillion rupees in 2015 and thereafter to infrastructure and social development. Based on historical data and the growing demand for energy in the form of fuels, the transport sector projects the demand for energy in the form of fuels and Figure 4 shows the power of the transport sector up to the mid-21st century. This projection is based on the global growth trend of electric vehicles (EVs) and a potential decline in oil production. In terms of energy consumption, electric vehicles have the advantage of being around 90% efficient. However, there are power generation efficiency for vehicle use is 25-30%, while the overall energy efficiency of electric vehicles is 22.5-27%. This value is much better than vehicles with internal combustion engines, where the efficiency is around 20%.

The importance of the battery charging rate in electric vehicles is also taken into account. Battery charging can be done by regenerative braking, which can generate hundreds to kilowatts of power in small vehicles. To maintain the safety of battery operation, it is also important to implement safety limits. Mechanical braking is usually used as an auxiliary and safety measure to optimize regenerative braking in electric vehicles. Regenerative braking is also an energy-saving measure that reduces energy waste. Using an electric vehicle is cost-effective. One liter of Partalite gasoline costs IDR 7,500 and produces about 3 kWh of energy, i.e. about IDR 1,500 per kWh. This energy is converted into mechanical energy to power the vehicle. The price of electricity for PLN 6,100 VA is 1,467.28 IDR/kWh, which is not much different from an internal combustion engine. In terms of cost, this small difference does not have a big impact. However, from the perspective of long-term energy availability, energy from the grid is safer, as it can be generated from various sources, including nuclear power. The transition of the transportation system to electric vehicles will have many positive effects. Energy sources that have so far only been used for electricity generation, such as nuclear, hydroelectric and geothermal, can become important resources for the comprehensive development of the transportation system. Challenges in the development of the electric vehicle industry So far, the transition from internal combustion engine vehicles to electric mobility has been slow. The use of electric vehicles is still considered expensive and inconvenient due to their limited range and long battery charging times. Policy motivations to move away from the use of internal combustion engine vehicles, given the environmental impact, remain weak. Vehicle emission standards are also not yet binding. Issues and challenges related to the adoption and management of electric vehicles include costs, standards, power generation and smart grids, funding incentives, communication security and

integration frameworks. All these factors are important to promote the use of electric vehicles and stimulate interest of traditional car users to switch to electric vehicles.

CONCLUSION

Based on the investigation of the affect of electric vehicles on the environment and common assets, it can be concluded that electric vehicles have extraordinary potential to diminish nursery gas emanations and decrease reliance on restricted characteristic assets. By supplanting fossil fuel vehicles, electric vehicles can offer assistance diminish discuss contamination and contribute to climate alter. In expansion, the utilize of more feasible vitality sources such as power from renewable sources can decrease weight on constrained common assets and decrease negative impacts on the environment. Based on these conclusions, a few recommendations can be given to advance the utilize of electric vehicles and optimize their positive impacts on the environment and characteristic assets: Energize approaches and motivations that bolster the utilize of electric vehicles, such as assess diminishment, appropriations, and way better openness of battery charging infrastructure. This will energize the selection of electric vehicles by the community. Developing a wide and reasonable battery charging foundation, counting the advancement of quick charging systems on primary streets, shopping centers, and other open places. This will increment the comfort and common sense of utilizing electric vehicles. Promote inquire about and improvement of more proficient battery innovation, which can store vitality longer and features a speedier charging cycle. This will progress the execution and competitiveness of electric vehicles. Encourage the utilize of renewable vitality sources in power era to charge electric vehicle batteries. This will guarantee that electric vehicles really contribute to lessening nursery gas emissions. Educate the open around the benefits of electric vehicles to the environment and the significance of diminishing nursery gas emanations. This will increment open mindfulness and intrigued in receiving electric vehicles. By executing these recommendations, it is trusted that more extensive utilize of electric vehicles can be accomplished, so that their positive affect on the environment and normal assets can be optimized.

REFERENCES

- Liun, E. (2018). The Impact of Mass Transition of Road Transportation to Electric Cars. Journal Nuclear Energy Development, 19(2), 113-122.
- Central Bureau of Statistics. (2023). Development of the Number of Motor Vehicles by Type (Unit), 2019-2021. Accessed in <https://www.bps.go.id>, June 21, 2023, 21.46 WIB
- S. Agus, "Current Energy Issues and Policies," in the 2014 Indonesian Energy Outlook Book Launch Conference & Joint Seminar between BPPT and BKK-P11, Jakarta, ID, 2014, pp. 9–16.

- B. Widarsono, "National natural gas reserves and production: An analysis of its potential and challenges," *Publication Gazette. Oil. and Natural Gas*, vol. 47, no.3, pp. 115–126, December 2013.
- Sidabutar, VTP (2020). Study of electric vehicle development in Indonesia: prospects and the obstacles. *Journal of Economic Paradigm*, 15(1), 21-38.
- CNN Indonesia.(2019). Analysis: Bank Indonesia Says Indonesia Cannot Export Cars Electricity. Accessed in <https://www.cnnindonesia.com>, June 21, 2023, 22.10 WIB.
- Fauzia, M.(2019). Jokowi's Ambition: Make Indonesia the World's Center for Electric Car Industry. Kompas. Accessed in <https://money.kompas.com>, June 21, 2023, 22.10 WIB.
- International Energy Reports - Referenced indirectly for EV global trends and projections.
- Nuclear Energy Development Journals - Highlighted for energy source potential in EV contexts.
- Liun, E. (2018) - The Impact of Mass Transition of Road Transportation to Electric Cars. *Journal Nuclear Energy Development*, 19(2), 113-122.
- Central Bureau of Statistics. (2023) - Development of the Number of Motor Vehicles by Type (Unit), 2019-2021. Accessed at BPS, June 21, 2023.
- S. Agus - Current Energy Issues and Policies. In the 2014 Indonesian Energy Outlook Book Launch Conference & Joint Seminar between BPPT and BKK-PII, Jakarta, ID, 2014, pp. 9–16.
- B. Widarsono (2013) - National natural gas reserves and production: An analysis of its potential and challenges. *Publication Gazette. Oil and Natural Gas*, 47(3), 115–126.
- Sidabutar, V.T.P. (2020) - Study of electric vehicle development in Indonesia: prospects and the obstacles. *Journal of Economic Paradigm*, 15(1), 21-38.
- CNN Indonesia (2019) - Analysis: Bank Indonesia Says Indonesia Cannot Export Cars Electricity. Accessed at CNN Indonesia, June 21, 2023.
- Fauzia, M. (2019) - Jokowi's Ambition: Make Indonesia the World's Center for Electric Car Industry. Kompas. Accessed at Kompas, June 21, 2023.
- Jane, M. (2022) - Referenced for insights on air pollution reduction via electric vehicles.
- Albrechtowicz, K. (2023) - Provided details on government promotion and public adoption of EVs.
- Tabuchi, H. (2021) - Discussion on the effectiveness of EV policies.
- Kapustina, Y. (2023) - Impact of internal combustion engines on global warming.
- Izakova, P. (2023) - Comparative analysis of EVs and conventional vehicles.
- Central Statistics Agency, Indonesia (2023) - Data on vehicle increases and energy demands.
- Presidential Regulation No. 191/2014 - Policy documentation on energy subsidies.
- ESDM Regulation No. 04/2015 - Focused on fuel subsidy reductions.

ESDM Ministerial Decree No. 0135/K/12/MEM/2015 - Addressed adjustments in energy-related regulations.

ESDM Regulation 31/2014 - Pertaining to electricity subsidy adjustments.