Journal of Education and Government ISSN 2986-5131
Volume 1 Number 4, November 2023 (pages 193-202)
https://journal.wiyatapublisher.or.id/index.php/e-gov

ANALYSIS OF THE GOVERNMENT'S ROLE IN FACILITATING THE BATTERY-BASED ELECTRIC MOTOR VEHICLE INDUSTRY FOR ROAD TRANSPORTATION

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ABSTRACT

Study discusses the government's efforts to overcome the problem of climate change that is occurring in Indonesia by utilizing electric vehicles. It is felt that climate change is a concern for all countries in the world. This is caused by human effectiveness factors or naturally changing climate. The study method used in this study is to carry out a SWOT analysis which aims to formulate a strategy to increase the market for the use of electric vehicles so that it can overcome the problem of climate change in Indonesia. The data collection technique used in this study is literature study and literature from previous studies . The results of the study explain that the government has made various efforts to reduce carbon emissions and increase the use of electric vehicles by issuing policies in the form of presidential regulations and presidential instructions. And based on the results of the SWOT analysis, the use of electric vehicles has the potential to replace conventional vehicles in overcoming climate change in Indonesia .

Keywords: *Climate Change, Electric Vehicles*

INTRODUCTION

Global warming and climate change have recently become a concern for all countries in the world. This causes environmental conditions to become damaged. Global warming is a natural phenomenon characterized by an increase in the average temperature of the atmosphere, oceans and earth. Alternative energy is urgently needed to overcome and reduce carbon emissions to create environmentally friendly conditions. Carbon emissions are considered to be the main cause of global warming which results in climate change. Based on reports from the IPCC (*Intergovernmental Panel on Climate Change*) It is explained that human activities produce a lot of carbon emissions, thus causing the formation of greenhouse gases in the atmosphere. The content of the formation of greenhouse gases causes the earth's temperature to increase.

Human activities directly and indirectly cause changes in climate and the composition of the global atomosphere and are also caused by natural climate variations studied in recent times (IPCC 2007). *The* greenhouse gas effect is also a factor in climate change. The Ministry of the Environment (2012) explains that greenhouse gas content consists of various gas compounds including: CO_2 , CH_4 , N_2O, HFC_S , PFC_S , SF_6 . Of

all these gas compounds, the greenhouse gases that are most abundant in it are CO_2, CH_4, and N_2O. and CO^2 is the most abundant gas compound in the atmosphere (Ministry of the Environment, 2012).

Based on these problems, electric vehicles are expected to be a solution to the problem of air pollution in urban areas. The aim of developing electric vehicles is to reduce pollutant emissions (CO, NO_x, HC, SO_2, and PM) which greatly influence environmental pollution. There are 3 problems that occur in components that produce CO^2 which influence the high total emissions, including the electricity sector (42%), transportation (23%), and housing (6%). Based on these problems, the government has made efforts to develop the use of electric vehicles and increase the number of charging stations *based* on Presidential Regulation no. 55/2019. Electric vehicles have advantages compared to conventional vehicles in overcoming air pollution and greenhouse gas emissions. Electric vehicles are vehicles with *zero* emissions which are a solution to the problem of carbon emissions, especially in urban areas, which are expected to be able to solve the problem of climate change in Indonesia . The Battery-Based Electric Motor Vehicle Program is a government program to realize the implementation of the use of electric vehicles in Indonesia which is expected to help the government program to save energy costs and reduce the need to import fuel, as environmentally friendly vehicles so that they become a solution to reduce emissions in Indonesia.

A strategy to encourage development by caring for the environment, *Sustainable Development Goals* (SDGs) is a program that is a strategy to overcome climate change. The government's plan to reduce CO_2 emissions is targeted at around 29% - 41% in 2030, so it is necessary to use electric vehicles which are environmentally friendly technology. Electric cars are an alternative in the transportation sector which has recently become the second largest producer of carbon emissions, so that the *Sustainable Development Goals* (SDGs) program in Indonesia can be realized.

Based on the discussion above, the author is interested in discussing the problem of climate change with a solution through the use of electric vehicles. This study aims to determine how to control climate change in Indonesia through the use of electric vehicles.

LITERATURE REVIEW

1. Climate change

Geographical, topographical and astronomical locations influence the climatic conditions in a country. Climate can determine the weather and conditions in the atmosphere itself over a certain period of time . Climate is the main factor in weather changes both daily and monthly. Climate can be defined as a weather condition in a certain area (Handoko, 1995). In an ecosystem there is a climate which is one of the components and is interconnected by the life of living creatures , climate is also closely related to the weather conditions in a place over a very long period of time (Husairi, 2008). An anomaly is a climate condition at a certain time.

In a scientific definition , climate is a combination of time and the physical conditions of the atmosphere,

so that geographic conditions in an area influence climate conditions. Meanwhile, weather is a condition of the atmospheric environment in a certain area that is temporary. (Imran, 2019). According to Law number 32 of 2009 article 1 concerning environmental protection and management, it is explained that human activities directly and indirectly have an influence on climate change, resulting in changes in the composition of the atmosphere globally and changing natural climate conditions within a certain period (Ministry LHK, 2020). This condition occurs marked by significant changes in climate, rainfall, air temperature over a long period of up to millions of years , or can occur due to an increase in the content of carbon monoxide produced and other gases in the atmosphere , this condition can cause temperature the air on earth is hot or this effect is often referred to as the greenhouse gas effect. (Dewarani, 2019).

Indonesia is known for its rich natural resources, but the level of environmental damage is quite significant. The cause of climate change in Indonesia occurs because there is environmental damage caused by human activities such as urbanization, deforestation or industrialization. Natural activities can also influence climate change such as shifts in the earth's plates, volcanic activity, and El (Julismin, 2013). Weather conditions that change erratically or increase the earth's temperature, changes in rainfall, changes in the physical conditions of the atmosphere that last for a long period of time are often referred to as climate change. Climate change has a direct impact on sectors of human life and has a negative impact on human activities (Nurhayati et al., 2020).

2. Electric Vehicles

In 2015, the carbon dioxide content in the atmosphere reached 400.26 ppm which was caused by the use of fossil fuels (Abas et al., 2015). The producer of carbon emissions in the transportation sector is the second largest producer of carbon emissions because it uses fossil fuels which cause greenhouse gas effects . Energy consumed by the transportation sector was 27.6 % of total energy use in the world and 92.6% based on the amount of oil product use in 2013 . In addition, carbon monoxide produced by the transportation sector is 22.9% of total carbon emissions worldwide . Based on this, there is a need for sustainable development of energy resources which aims to slow down climate change. The transition from fossil fuel energy to the latest alternative energy needs support from the world community. This can motivate researchers to design and produce cars by looking for new alternative resources such as electricity due to the increasingly limited availability of fossil fuels.

Building an electric car industrial center is a plan by the Indonesian government in an effort to accelerate the energy transition by downstreaming the nickel industry as a material for *lithium batteries* which are the main component in electric cars. The nickel export policy is regulated in Minister of Trade Regulation Number 1 of 2017 concerning Provisions for the Export of Mining Products Processing and refining results were tightened , so that in December 2019, nickel content

below 1.7% was not allowed to be re-exported (Sidabutar, 2020).

In order to reduce carbon emissions, an environmentally friendly vehicle with low emissions is needed, so that it can control climate change resulting from global warming . The use of electric vehicles has been applied in various European countries, China and the United States (Nur & Kurniawan, 2021). The impact of climate change can be felt recently. With the increase in global average temperature reaching 1°C , this has an influence on the increase in the occurrence of natural disasters. In Indonesia, there have been frequent disasters in the last ten years. Global warming is caused by greenhouse gas emissions, so that in the *Paris Agreement* several countries are trying to minimize greenhouse gas emissions in accordance with the specified targets (F. Saputra & Ali, 2022).

3. Sustainable Economic Development

The concept of sustainable development is not only about fulfilling human needs, but must also pay attention to the state of the environment. This effort is to control the environment in the future so that it is livable in the future. Activities to fulfill needs such as land development and inter-community business need to be reviewed within the concept of sustainable development. This concept occurred in two revolutions, the first in the 1960s to the 1970s and in 1987 there was a second revolution by the Norwegian Minister Gro Harlem Brundtland who led the revolution in the concept of sustainable development (Suparmoko, 2020) . Economic, social and environmental development as well as legal and governance pillars are the 3 main pillars that serve as goals in sustainable development. An unsustainable economy creates a crisis for government governance caused by natural resource and environmental crises. (Satria, 2020). If economic development does not pay attention to ecological aspects, it can certainly have a significant impact on environmental damage . The *ecological modernization* approach is an effort that combines economic development linked to ecological aspects with the aim of reducing environmental pollution through technological transition, improving market and economic development based on ecological aspects and preserving social values including their implementation. Examples of ecological modernization efforts are the implementation of *car free* days, anti-plastic bags, and *earth hour outreach.*

Efficient management of natural resources by paying attention to ecological aspects and environmentally friendly technology is an aspect that is implemented in implementing sustainable development . The pros and cons of society greatly influence the implementation of a sustainable economy with the support of rich natural resources or already qualified human resources in carrying out sustainable development, legal certainty, and increased awareness or participation of the community regarding the environment. In a sustainable economy, there are several principles that must be implemented to

make this happen, such as: mobility, emission limitations, safety and comfort, habitat, natural resources, accessibility, efficiency, and community participation . These principles are grouped into several aspects such as economic, social and environmental which aim to minimize the occurrence of air pollution, man-made natural disasters and environmental damage.

Sustainable economic development with an Indonesian aspect is economic development that focuses on community welfare, benefits producers and consumers by minimizing negative impacts on the environment . Indonesia is known as an agricultural country that seeks to utilize agricultural land with the value or goal of sustainable development, such as planting similar plants on one land, applying fertilizer for soil fertility, intercropping crops, and rotating crop types to maintain plant fertility.

METHOD

The study method used is the SWOT Analysis approach (*Strengths, Weaknesses, Opportunities, Thefts).* SWOT analysis is a systematic analysis approach of various factors to form a strategy (Kurniasih et al., 2021). This analysis uses logic and thought to optimize strengths and opportunities, on the one hand minimizing threats and weaknesses. The author presents the following SWOT analysis diagram below as follows:

Figure 1. SWOT analysis
Source: Marimin (2007, p59)

The explanation regarding the image above can be explained as follows:

a) Quadrant I position shows a very favorable situation, because this situation has strengths and these opportunities are utilized for aggressive growth strategies.
b) Quadrant II position shows a situation faced by threats but on the one hand there are internal strengths, so taking advantage of long-term opportunities is the right strategy for diversification (product/market).
c) Quadrant III position indicates a situation with great opportunities, but internal problems are being faced. The right strategy to deal with this situation is to minimize internal problems that occur in order to master market opportunities.
d) Quadrant IV position indicates a quite difficult situation, because this situation is faced with various threats and has internal problems.

RESULTS AND DISCUSSION

1. Government Policy in Reducing Carbon Emissions

Climate change has recently become a problem of considerable concern in Indonesia. The government is trying to combat this condition in order to preserve the environment and overcome climate change through the

National Action Plan for Reducing Greenhouse Gas Emissions (RANGRK) program. This program was implemented in 2011 on the legal basis of Presidential Regulation of the Republic of Indonesia Number 61 of 2011 . In 2014 the government attempted to combat climate change in Indonesia by releasing the National Action Plan for Climate Change Adaptation (RAN-API) . The government also has a national mission with international parties in *the Kyoto Protocol* which is planning a strategy in the energy sector through the creation of *greenhouses* which also include maximizing electric energy vehicles as a solution to reducing carbon emission pollution in the transportation sector.

At the 2015 Climate Change Summit held in Paris, the target for reducing emissions by 29% was discussed from *business as usual* . The emission reduction target of more than 80% is targeted at the forestry and peatland sectors as a planning target for reducing greenhouse gas emissions until 2020. Reducing emissions based on energy-based activities such as the transportation, industrial and energy use sectors using household activities is the target for reducing emissions in in 2030 . The land-based sector has an emissions reduction target of around 40% and the energy-based sector has an emissions reduction target of around 60%. This step is in accordance with planning for sustainable economic growth by improving community welfare, so that over time society begins to develop and switch to environmentally friendly energy. This emission reduction step has become the government's plan in the 2015-2019 RPJMN with the achievement of reducing emissions in various sectors so that it can realize the implementation of the Green Economy.

2. Government Policy Regarding the Use of Electric Vehicles

The government has also made efforts to increase the use of electric vehicles through Presidential Instruction Number 7 of 2022 concerning the Use of Battery Electric Vehicles *as* Operational Service Vehicles and Individual Service Vehicles for Central Government and Regional Government Agencies. This press instruction was implemented to emphasize the acceleration of the implementation of the program for the use of electric-powered official vehicles aimed at agency leaders at various levels such as ministers, prosecutors, TNI, Police, regional heads (governors, mayors or regents), and others.

This press instruction is implemented within the government. These electric vehicles can be purchased through cash, rental or assembling conventional vehicles into battery-powered electric vehicles. Other regulations are also being prepared by the government. The Ministry of Finance also changed the provisions for sales tax on luxury goods (PPnBM) for *battery electric vehicles* (BEV) at 0% and for *hybrid electric vehicles* (HEV) at a rate of around 5% to 7%. It is hoped that these efforts will encourage interest in switching from conventional vehicles to electric vehicles.

3. Nickel as Raw Material for Electric Car Batteries

In electric vehicles, the battery is the most important component of an electric vehicle, because the battery is

useful as a source of all current in the electrical system, as a reservoir for electrical energy and as a supplier of electric current to the starter system so that the vehicle engine can be started. Apart from that, the battery is also useful for turning on other components such as lights, horn, wipers and other components. (Indah, et al., 2019). The type of battery that is often used in electric-powered vehicles is the *Lithium* type battery , because this battery can accommodate high electrical energy, with a high *open circuit potential voltage,* relatively fast *charging , low self-discharge* , and is environmentally friendly . An example of this type of *lithium* battery is *lithium polymer* (Prasetyo, et al., 2020). Based on the explanation above, the need for nickel is of course very much needed for batteries, and Indonesia's role is very important in the global nickel industry. With the large nickel deposits in Indonesia , electric vehicle battery manufacturers want to build a smelter factory in Indonesia . However, the battery industry itself has to rely on nickel catherite due to the scarcity of nickel sulfide.

In making lithium-ion batteries (LIBs), nickel is needed so that they can be used in electric vehicles . LIBs have several types , including *Lithium Nickel Cobalt Aluminum* (LiNiCoAlO2/NCA) and *Lithium Nickel Manganse Cobalt* Oxide (LiNiMnCoO2/NMC). with the difference being in the chemistry of the cathode.

Currently, many people want to switch from conventional vehicles to electric vehicles . Because electric cars are considered to have many advantages and high efficiency, are environmentally friendly, and have other alternative energy sources, the vibration or engine noise produced is very low, and easy to maintain. The battery is the main component so that the electric car can be used (Mambak, et al, 2017). In 2010-2019, the need for lithium-ion (li-ion) batteries continued to increase from a production base of 19 Gigawatt hours (GWh) with a production capacity of 30 GWh to 60 GWh with a production capacity of 285 GWh. Li-ion batteries have several types consisting of LTO (*lithium tithanate*), LFP (*lithium phosphate*), LMO (*Lithium Manganesse*), NMC (*lithium nickel manganese cobalt*), LCO (*lithium cobalt oxide*), or NCA (*lithium nickel aluminum oxide*).

4. SWOT Analysis of Electric Car Implementation

Utilization of electric vehicle technology will be analyzed using SWOT analysis. This is a reference for developing a strategy aimed at increasing the market for electric vehicles, so that it can overcome the problem of climate change in Indonesia. SWOT analysis This is aimed at understanding the internal and external factors of the implementation of electric cars in Indonesia with the following explanation:

a. *Strengths* (strength)

- Environmentally friendly, because it does not emit CO^2 and CO gas.
- Easy maintenance and more cost-effective to maintain.

- The sound or vibration produced by the engine is small, so the cabin of an electric car is quieter and quieter.
- In one charge it can cover a distance of hundreds of kilometers.

b. *Weaknesses* _

- Electric vehicles are more expensive than conventional vehicles.
- *Charging* an electric battery takes quite a long time, so it is not efficient in terms of time.
- *Charging stations* are still limited, so they are difficult to find.
- Batteries are expensive to replace due to damage.

c. *Opportunities* _

- Optimize the reduction of air and noise pollution
- Reducing dependence on petroleum, which is in increasingly short supply by relying on nickel resources.
- Business opportunities for electric vehicles are increasingly needed and increasing.
- The development of the use of electric cars is supported by the government.

d. *Thearts* (threats)

- Electric vehicles are much more expensive.
- The range of use of the battery is still limited.
- Lack of information to the public has resulted in rejection of the use of electric vehicles.
- Large state investments are needed for the construction/development of electric vehicles.

CONCLUSION

The environment is an important aspect that needs to be paid attention to by both society and the government. Because this is one of the goals of creating sustainable development, including reducing carbon emissions which is a causal factor in climate change that is currently occurring in Indonesia. Based on the results of the discussion in above, the use of electric vehicles is one solution to overcome climate change occurring in Indonesia and help overcome air pollution in urban areas. Electric vehicles are considered suitable for overcoming the problem of climate change in Indonesia. To reduce greenhouse gas emissions in Indonesia , electric vehicles are a solution to this problem in the transportation sector.

BIBLIOGRAPHY

Abas, N., Kalair, A., Khan, N., 2015. Review of fossil fuels and future energy technologies. Futures 69, 31–49.

Dewarani, S. (2019). Get to Know Green House Gases Closer. P2kLH DLHK DIY.

Dewi Kurniasih, YR, & Nuadhawati, R. (2021). Analysis Techniques. Bandung, West Java: Alphabeta.

Fahmi, I., & Ali, H. (2022). Determination Of Career Planning and Decision Making: Analysis Of Communication Skills, Motivation and Experience (Literature Review Human Resource Management). Dynasty International Journal of Management Science, 3(5), 823–835.

Handoko. (1995). Basic Climatology. Jaya Library World.

Husairi, A. (2008). An Increasingly Uncertain Climate. CV Arya Duta.

Imran, M. (2019). The Influence of Climate on Building Architectural Forms and Materials. RADIAL STT Bina Truna Gorontalo, 1(1).

Indah., Rumiasih., Carlos., Firmansyah. (2019). Analysis of Determining Battery Capacity and Charging in Electric Cars. Elektra Journal, 4 (2), 29 – 37.

Intergovernmental Panel on Climate Change. (2007). Climate Change 2007, Synthesis Report. ISBN 92-9169-122-4. Retrieved from https://www.ipcc.ch/report/ar4/syr/.

Julismin. (2013). Impact of Climate Change in Indonesia. Geography Journal, 5(1). https://doi.org/https://dio.org/10.24114/jg.v5i1.8083

Ministry of Environment and Forestry (2020). Strategic Plan of the Director General for Climate Change Control 2020-2024. Ministry of Environment and Forestry.

Ministry of Environment and Forestry. (2019). 2018 Statistics of the Directorate General of Climate Change Control. Directorate General of Climate Change Control. http://ditjenppi.menlhk.go.id.

Ministry of Environment and Forestry. (2020). Strategic Plan 2020-2024. Directorate General of Pollution and Environmental Damage Control. Accessed at https://www.menlhk.go.id/.

Mom & Bambang. (2017). Forecasting Lead Acid Battery Capacity in Electric Cars Based on Levenberg Marquardt Neural Network. Scientific Technology 2017 scale, 2: 112-117.

Nur, AI, & Kurniawan, AD (2021). Future Projections of Electric Vehicles in Indonesia: Analysis of Regulatory Perspectives and Controlling the Impact of Sustainable Climate Change. Indonesian Environmental Law Journal, 7(2), 197–220. https://doi.org/10.38011/jhli.v7i2.260

Nurhayati, D., Dhokhikah, Y., & Mandala, M. (2020). Community Perceptions and Adaptation Strategies to Climate Change in the Southeast Asia Region. Protection, 1(1), 39–44.

Presidential Regulation no. 55 of 2019. (2019). Regarding the Acceleration of the Battery Electric Vehicle Program for Road Transportation.

Prasetyo. (2020). State of charge estimation of lithium polymer battery using back propagation neural network. Integration Journal, 12(2), 144-149

Satria, A. (2020). Sustainable Development 2045 Response to Prof. Emil Salim. In A. Nalang, Vidya; Anggraini, Rika; Samedi; Bakhtiar, Irfan; Liman, Puspa; Syarifullah. Muhammad; Baihaqi (Ed.), 90 Years Prof. Emil Salim Sustainable Development: Towards Indonesia's Foundation in 2045

(1st ed., p. 67). KEHATI Foundation.

Sidabutar, VTP (2020). Study of electric vehicle development in Indonesia: prospects and obstacles. Journal of Economic Paradigms, 15(1), 21–38.

Suparmoko, M. (2020). The Concept of Sustainable Development in National and Regional Development Planning. Journal of Economics and Management, 9(1), 39–50.