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Sustainable Utilisation of Electric Vehicles as a Strategy to Reduce Carbon Emissions

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ABSTRACT

The transition to the use of electric vehicles in Indonesia is underway, in order to reduce the adverse climate. Transport plays an important role in the process of human life, distributing goods and services through conventional vehicles. Conventional vehicles have different fuels from electric vehicles. Reducing carbon emissions through the use of electric vehicles is a top priority to protect the climate. Electric vehicles are currently in the development process to improve energy security which is a special solution to achieve clean and environmentally friendly energy. This research aims to find out how the strategy of using electric vehicles to reduce carbon emissions and improve environmental sustainability. Electric vehicles are proving to be the ultimate solution to achieving a green economy that is more impactful for society as it completely minimizes the output of carbon gas that can damage the environment. The method used in this research is descriptive qualitative and descriptive quantitative method, and the data collection technique uses literature study. In quantitative data collection techniques, the author uses a questionnaire as a parameter to analyze the importance of using electric vehicles to achieve a green economy. The results showed that using electric vehicles can use carbon emissions and can be used as the main solution to replace conventional transport.

Keywords: *Electric Vehicles, Environmental Sustainability, Green Economy*

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INTRODUCTION

Significant climate change and global warming have become major issues and concerns in many parts of the world. The main cause of both is human activities that produce carbon emissions. Excessive carbon emissions are caused by the release of more carbon dioxide than oxygen, as well as the greenhouse effect. In addition, carbon emissions are mainly caused by deforestation (the process of removing forests by changing the land use of forests to non-forests), fuel combustion and industrial activities from factories.

Indonesia is currently in a state of emergency due to toxic air. The main factor that causes it is the dense number of motorised vehicles in the area. Carbon emissions that occur due to the large number of motor vehicles in Indonesia mostly use fuel oil or

petrol. Emissions released by motor vehicles include carbon monoxide, nitrogen oxides, hydro carbon, sulphur dioxide, lead and carbon dioxide (Chandra Zaky Maulana, 2019).

By 2030, Indonesia is committed to a 41% reduction in greenhouse gas emissions and zero greenhouse gas emissions by 2060 in accordance with the 2016 Paris Agreement (Raihan, et al, 2022). According to Subekti (2022), one way out for humans to adapt to climate change is to use electric vehicles. The creation of electric vehicle innovations will make human awareness of the environment increase, so that climate problems can be resolved properly. Electric vehicles have lower pollutant levels when compared to fossil fuel vehicles, diesel or petrol, making it easier to achieve the target of zero greenhouse gas emissions and carbon emissions (Ehrenberger, et al, 2019).

According to Loiseau in Yeboah (2023), electric vehicles have a good impact on achieving a green economy. The green economy programme was established during the UN Conference in Rio de Janeiro in 1992 for the concept of sustainable development. The aim of this concept is to address economic growth and improve environmental sustainability to be in line. One of the innovation programmes developed to achieve a green economy in the transportation sector is the production of electric vehicles. Electric vehicles use battery fuel and are able to reduce carbon dioxide emissions. When viewed from an economic perspective, electric vehicles can be an economical item that is environmentally friendly.

Electric vehicles are an alternative solution to support energy to be clean and environmentally friendly, and reduce gas emissions due to the burning of fossil fuels produced by motorised vehicles. Electric energy is one of the renewable energy sources, so it is abundant and will never run out. Electric vehicles do not produce gas emissions, are practical to use and the sound they produce is not disturbing. Maintenance of electric vehicles is also very easy, unlike other motorised vehicles. So, electric vehicles can be used as a long-term investment, because it only needs to spend a fairly high cost for the initial purchase, but does not require costs for service, and the tax price is lower than motorised vehicles.

This research aims to find out how important the use of electric vehicles is compared to motorised vehicles that use fossil fuels or petrol which can increase carbon gas emissions. The benefits of changing from motorised vehicles to electric vehicles are to reduce the impact of significant climate change and improve air quality.

METHOD

The research method used is descriptive qualitative and descriptive quantitative method. The descriptive qualitative research method aims to describe events that occur in the field, presenting data factually and systematically. Qualitative research is an approach that is not based on statistical work, but qualitative evidence (Lexy J. Moleong, 2007). The analysis obtained from this approach is in the form of words or behaviour, not poured in the form of numbers, but in the form of an explanation of the situation or condition studied in the form of a narrative description (S. Margono, 2003). Meanwhile, the quantitative descriptive method is one of the research methods based on positivism, used

to analyse and examine samples or certain populations, the aim is to test predetermined hypotheses (Sugiyono, 2014). The instrument used in this study uses a questionnaire or questionnaire which can be used as a parameter or reference to determine the quantitative data needed.

The data retrieval technique used was a literature study. This means that the data obtained to write this journal by searching from various sources such as books, international and national journal articles, proceedings, and relevant articles (Pujiastuti, 2019). In addition, the data analysis technique used for this journal uses descriptive qualitative data to find out and describe in detail how strategies in reducing carbon emissions through the use of electric vehicles. The analysis technique used uses sentences that are arranged and then expanded, there are no mathematical calculations to carry out the analysis.

The research conducted is closely related to the policies implemented by the government to maintain clean and new energy, especially in the use of electric vehicles in order to reduce carbon dioxide emissions. The main objective of the research also supports the government to realise Indonesia's green energy, because electric vehicles use electrical energy which is an environmentally friendly energy source. This research also aims to increase public awareness of the importance of using electric vehicles compared to conventional vehicles fuelled by petrol or similar. Hopefully, this research will support the government in implementing the overall use of electric vehicles to achieve clean and sustainable energy.

FINDING AND DISCUSSION

RESULT

We have many findings, both from articles, the internet and literature studies, mentioning that conventional fossil fuel or petrol vehicles can produce carbon gas emissions that are very harmful to the environment, such as not in line with the goals of the government to achieve a green economy. The main solution in solving this problem is to reduce the excessive use of vehicles and start switching to using electric vehicles. We have broken down some of the concerns and focuses of electric vehicles into a questionnaire.

Below is a list of questions from the questionnaire that we distributed to respondents :

	Questions
1	What are the main benefits of utilizing electric vehicles in an environmental context?
2	What are the biggest challenges to mass adoption of electric vehicles?
3	How can the government encourage the adoption of electric vehicles?
4	What must be ensured for electric vehicles to actually reduce carbon emissions?
5	What are the positive impacts of electric vehicles on urban air quality?
6	What is one of the environmental challenges of electric vehicle production?
7	How much will electric vehicles contribute to the global carbon emissions reduction

	target by 2030?
8	How do electric vehicles play a role in a sustainable transportation system?
9	What are the other benefits of using electric vehicles besides reducing carbon emissions?
10	What is the role of battery technology in supporting the sustainable use of electric vehicles?

In our research, we distributed it to 100 respondents to fill out the questionnaire. The reason is that 65 people are considered in terms of distribution of values close to normal, the number of respondents is not too small so as not to provide biased and unobjective research results.

Expectations for the questions presented in the questionnaire are as follows:

1. The main benefit of using electric vehicles in an environmental context is to reduce fossil fuel consumption.
2. The biggest challenge in the mass adoption of electric vehicles is the limitation of battery technology
3. The way the government encourages the adoption of electric vehicles is by providing fiscal incentives such as subsidies and tax breaks
4. The thing that must be ensured so that electric vehicles can really reduce carbon emissions is that charging must be from renewable energy sources
5. The positive impact of electric vehicles on urban air quality is the reduction of air pollution
6. The environmental challenge of electric vehicle production is the production and recycling of batteries which have an impact on the environment
7. The Electric vehicles will contribute to the global carbon emission reduction target by 2030 with a small but significant portion
8. The Electric vehicles play a role in a sustainable transport system by reducing carbon emissions with better energy efficiency
9. The other benefits of using electric vehicles besides reducing carbon emissions are lower operating costs and reduced noise and highways
10. The role of battery technology in supporting the sustainable use of electric vehicles is to improve energy efficiency and mileage.

We sent questionnaires to respondents with an age range between 23 - 40 years old. Most of them gave correct answers regarding the use of electric vehicles. Also, most of the respondents agreed that electric vehicles can reduce carbon gas emissions caused by the effects of fossil fuels or petrol from conventional vehicles. However, we still find some respondents who do not really understand the use of electric vehicles, the details are depicted in the diagram below:

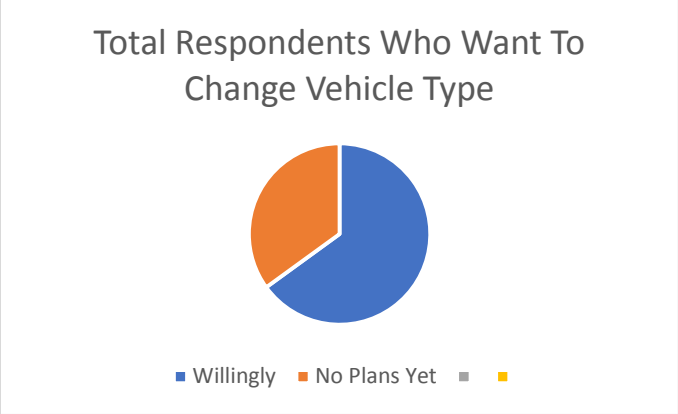

Diagram 1: Total Respondents Who Want To Change Vehicle Type

Based on the diagram above, 65 out of 100 respondents are willing to immediately change their vehicle type to an electric vehicle. While 35 of them still have no plans to make changes to the type of vehicle. In general, the results of filling out the questionnaire by each individual are in line with the implementation of electric vehicle development in Indonesia. However, they are constrained by the expensive cost of purchasing vehicles and battery energy resources for the use of electric vehicles are still difficult to find.

DISCUSSION

Electric vehicles are one of the solutions to the problem of air pollution caused by the exhaust gases of fossil fuel and petrol vehicles. The use of electrical energy will not produce air pollution. Emissions that pollute the air can be calculated based on the inefficiency of burning energy or vehicle engines, especially in the transportation sector that uses a lot of fossil fuels, whereas electric vehicles can be used as an alternative for environmentally friendly transportation (Holmen & Niemer, 2003). There are several initiatives that can be taken by the government, namely tax incentive policy initiatives, efforts to develop electric charging infrastructure and support the procurement of electric vehicles for the general public. Below are details of government initiatives that may encourage the public to purchase electric vehicles :

A. Electric Vehicles Subsidies
   This substance refers to the financial incentives provided by the government to people who buy electric vehicles.
B. Vehicle Tax Deductions
   The government is able to provide tax incentives to people or parties who buy electric vehicles, for example by reducing taxes on electric vehicles.

Electric vehicles are a very important innovation that is provided as environmentally friendly transport, affordable operating costs and does not require a lot of maintenance costs. Based on Presidential Regulation No. 55/2019, Indonesia

encourages the acceleration of the electric vehicle programme. The high level of carbon dioxide in Indonesia is due to the 90% of fossil fuel or petrol vehicles on the road. Other countries can be modelled on Indonesia, which has made the transition from traditional vehicles to electric vehicles through national transport policies (Maghfiroh, Pandyaswargo & Onoda, 2021).

Indonesia's population continues to grow in the field of transport. The development of transport in Indonesia is growing because of the existence of electric vehicles which are considered more environmentally friendly. Electric vehicles are considered environmentally friendly because their main energy source is batteries. Electric vehicles are considered to be able to recognise objects and vehicle behaviour in various conditions so they are considered smarter. The Ministry of Energy and Mineral Resources issued Ministerial Regulation No. 13/2020 on the provision of electricity charging infrastructure for battery-based electric vehicles (Nisa & Susanti, 2023). The main advantage of electric vehicles is that it can charge the battery in a short time because there is a fast charging feature, reduced tax incentives on electric vehicles and charging can use the application so that it is easier for motorists.

The general benefits of electric vehicles are that they reduce air pollution, produce no exhaust emissions, are more affordable to operate and conserve natural resources. Other benefits of electric vehicles help address severe environmental issues and make the air pollution-free. This reduction in air pollution improves air quality as less gas is emitted by fossil fuel or petrol vehicles, especially in urban or more densely populated areas. Electric vehicles also encourage the use of renewable energy sources as they reduce carbon emissions produced by fossil fuel or petrol vehicles. Electric vehicles also enhance the development of environmentally friendly infrastructure in Indonesia, as they are considered to make smart technology and can create energy renewal innovations. In addition, electric vehicles reduce the greenhouse effect and produce clean air that can attract people to use these vehicles.

Green economy development and sustainable development are the main focus of the government. Green economy is a concept of a holistic approach to overcome social, cultural, economic and environmental crises. The presence of substance on green economy is closely related to conceptualisation, implementation, methodology and how people engage in sustainability to alleviate poverty and social conflict as a whole. The implementation process requires changes in culture and lifestyle individually and as a whole. Prosperity for people in future generations can be achieved by protecting economic ecosystems. According to Ali (2022), the principle of creating a green economy includes 5 important aspects, namely:

a. The creation of people's welfare
b. Intergenerational prosperity
c. Preservation of natural resources
d. Investment in natural resources
e. Increased consumption for availability in future generations

Developing countries are very active in supporting the green economy concept to create an economic system that prioritises environmental sustainability and benefits society. The industrial sector plays a very important role in the development of a green economy. The use of fossil fuel and petrol vehicles has increased significantly. In order to support the development of electric vehicles, which are the main solution for producing clean and environmentally friendly energy, the green economy is said to meet the needs of the community (Prianto, 2021).

According to Sudjoko (2021), electric vehicles have great potential to clean up pollution in cities. This development will greatly reduce emissions of pollutants such as carbon gas. There are 3 main factors that contribute greatly to the generation of carbon gas emissions, namely electricity, transport and housing. Based on Presidential Regulation No. 55/2019 on the Acceleration Programme of Battery Electric Vehicles for Road Transport, the government is developing electric vehicles and charging station infrastructure. Electric vehicles have many advantages when compared to fossil fuel or petrol vehicles, for example, higher efficiency due to minimal maintenance costs, do not pollute the environment, do not provide a noise factor, their energy sources come from renewable energy sources, easy maintenance and depend on the latest power.

Electric vehicle innovation is considered capable of realising a green economy, especially in Indonesia. Electric vehicles in Indonesia are starting to develop rapidly. So many car manufacturers are starting to produce and use electricity as fuel. This initiative began when a cooperative relationship between Indonesia and South Korea invested in the development of electric vehicles to achieve a green economy. Investment is the main way to open an electric vehicle company that opens up many jobs (Ali, 2022). According to Mahaputra (2022), the Indonesian people are also interested in the development of electric vehicles. Electric vehicles themselves have high economic value in addition to supporting the green economy. The government and companies must continue to make significant efforts to develop charging stations to make it easier for electric vehicle owners, if electric charging stations are easy to find, then people are increasingly interested in switching to electric vehicles because they feel their existence is strongly supported by the government.

Increasing public awareness and acceptance of electric vehicles can be done by disseminating information and knowledge to the public, such as holding campaign programmes that focus on environmental preservation (Azwari, 2023). There are still many people who still do not understand the development of electric vehicles, how they work and their benefits.

In addition, it is also necessary to consider the impact on the environment. According to Yusof (2013), electric vehicles have a huge impact in reducing carbon emissions caused by fossil fuel or petrol vehicles. Electric vehicles can be used because of electric energy. Electricity is a championed alternative to reduce pollution levels, carbon gas emissions and greenhouse gas emissions. This is because electricity is generated from renewable natural resources, such as water, wind, sun, and geothermal. The use of

renewable natural resources such as solar panels can have an effect on carbon emissions in the transportation sector (Subekti, 2022).

Based on the results of the questionnaire we distributed to respondents, some parties are still not planning to make changes to the type of vehicle because they still do not understand the implementation of electric vehicle development and due to the high purchase price of electric vehicles. It is necessary to share more knowledge about electric vehicles which are expensive to buy, but in terms of maintenance costs are cheaper than fossil fuel or petrol vehicles. Then, for those who are willing to make changes to the type of vehicle, it seems that they really understand how the development and the main uses of the electric vehicle itself.

CONCLUSION

The development of electric vehicles with the aim of carbon gas emission reduction strategies in the field of transport is a major substance for climate change and promoting vehicles in a sustainable manner. Electric vehicles have a very promising solution to reduce carbon gas emissions, reduce pollutants. So many companies are emerging with new innovations for battery production and technology related to electric vehicles to facilitate users in using these vehicles. Companies that make production and investment also open up wide avenues for livelihoods. Since electric vehicles utilise renewable resources, charging them makes users less dependent on fossil fuels. Also, public awareness and interest in the use of electric vehicles is the deciding factor whether in the future everything will change completely from fossil-fuelled vehicles to electric vehicles to achieve a green economy.

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