Analyzing the Connection Between Community and Environmental Well-Being and the Sustainability of Electric Vehicle (EV) Bus Programming

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Abstract: This study main goal is to investigate how the Electric Vehicle (EV) Bus Program affects sustainability, community well-being, and the environment. Three important criteria are assessed in the study: community well-being, environmental effect, and sustainability. 117 of the questionnaires that the researcher gathered were thought to be valuable for study. The study found a strong and positive relationship between environmental effect and sustainability factors. Furthermore, the study demonstrated a high correlation between sustainability and community well-being. These findings highlight the importance of maintaining the sustainability of the Electric Vehicles (EV) Bus Program and provide insightful information about the key factors.

1. Introduction

With fossil fuels accounting for more than 90% of its energy needs, the transportation sector is a significant contributor to global carbon emissions. Consequently, governments across the globe are putting up plans to attain net-zero emissions, with an emphasis on energy efficiency, renewable energy, and electric and hybrid automobiles. Malaysia has pledged to reduce its emissions intensity by 45% by 2030, with a focus on electric vehicles (EVs), acknowledging the importance of the transportation industry to the country's GDP and carbon emissions.

To further Malaysia's environmental and sustainability objectives, the Malaysian Public Sector Agency initiated an electric vehicle (EV) program in Langkawi at the beginning of 2022, which included an EV bus transit scheme. The purpose of this study is to examine the sustainability, environmental effects, and social welfare of Langkawi's EV bus program. The study intends to offer insightful information to enhance the policies and initiatives of the Malaysian Public Sector Agency through an analysis of the program's impacts.

There are two main goals of this study. Its primary goal is to determine how the EV bus program's environmental impact and sustainability relate to one another. Secondly, it will look at how the EV bus program and community well-being are related. The goal of the project is to add to the increasing amount of research on how well EV initiatives handle sustainability, environmental impact, and community well-being. The results of this study will aid Malaysia's attempts to cut carbon emissions by offering helpful suggestions for enhancing the EV program.

2. Literature Review

The field of sustainability research has gained increasing attention in recent times, both in academic literature and political discourse. This area of study, which is rooted in the concept of sustainable development, emphasizes the need for interdisciplinary, multi-disciplinary, and trans-disciplinary research efforts to find

solutions and design strategies that can support the creation of a better future for communities. The objective of sustainability research is to address the complex societal problems that arise from the interaction between society and the natural world. As such, a significant body of literature has been produced with the aim of addressing the global challenges associated with sustainability.

2.1. Environmental Impact

The increasing adoption of Electric Vehicles (EVs) in Europe has attracted significant attention in recent years. By the end of 2018, there were over one million electric passenger cars on the roads of the European Union, the European Free Trade Association countries, and Turkey. The benefits of transport electrification on climate change mitigation will be greater if the adoption of EVs takes place in parallel with the decarbonization of power networks.

Studies by Hildermeier et.al. (2019) and Buekers et.al. (2020) have emphasized the significance of EVs in creating an ecologically friendly and economically advantageous transportation system. The latter study focused on the health and environmental benefits of EVs in 27 EU countries, and found that the introduction of EVs could result in a reduction of CO_2 emissions and dependence on petroleum products. Additionally, the study highlighted that EVs can help lower greenhouse gas emissions, particularly CO_2, and thus have a positive impact on the environment and public health.

Wright (2012) analyzed the future of EVs in Ireland and found that EVs are emerging as a more viable alternative to gasoline-powered cars. With over 90% of Ireland's domestic fuel needs being imported, the Irish government aims to have 10% of all Irish cars powered by electrical technologies by 2020. This shift is driven by environmental pressures, the threat of global warming, and the desire to reduce dependence on foreign fuels.

In Malaysia, a study by Solaymani (2022) on CO_2 Emissions and the Transport Sector revealed that the transportation industry is one of the primary energy consumers and a significant contributor to greenhouse gas emissions. The study found that the transport sector is the second-largest generator of CO_2 emissions in Malaysia after the production of power and heat, and that road transportation is the subsector that produces the most CO_2. The study concludes that evaluating options for reducing the negative environmental impact of transportation is crucial for advancing social development and environmental improvement.

2.2. Community Well-Being

The transportation sector has become one of the most significant and complex sources of greenhouse gas emissions. E-mobility, or electric vehicles, has been identified as a potential solution to the problem (Omahne et al., 2021). While electric vehicles have a lot of advantages, the perception and acceptance of electric vehicles among the public still requires improvement. Electric buses have the potential to address air quality issues and reduce greenhouse gas emissions in cities, especially if they are powered by a clean energy grid (World Resources Institute, 2019).

In the future, the implementation of electric bus technologies will become widespread, including in Malaysia. Malaysia has already established policies to support the deployment of electric buses and promote the adoption of innovations and technologies in this area (Al-Ogaili et al., 2021).The Global Green Growth Institute (2016) has found that electric buses have the potential to provide numerous benefits, including reduced vibration and noise. They can help to reduce high noise levels in urban areas, increase productivity by decreasing sleep disturbance and noise exposure, and reduce reading compression in schools and communities. Boren (2019) also supports these findings and adds that electric buses are beneficial for society and the community because they produce less noise, use less energy, have no emissions, and are cheaper to operate compared to buses powered by combustion engines.

In general, the adoption of electric vehicles could bring significant changes to society by not only providing transportation services but also by shifting economies away from petroleum and reducing CO_2 emissions from the transportation sector (Junior, 2021). Electric buses can play a positive role by reducing fuel consumption demand and promoting cleaner technologies and fuels (Global Green Growth Institute, 2016). According to Fadaki, Abbasi, and Esmailzadeh (2018), electric buses are superior to other buses for the health of communities and the environment, reducing respiratory diseases and strokes, and producing lower amounts of particulate matter and nitrogen oxide compared to diesel buses and compressed natural gas.

The emissions of greenhouse gases from electric buses are also much lower than from buses powered by compressed natural gas. While the adoption of electric buses has increased in recent years, it has not been happening fast enough to help reach long-term global climate objectives. Climate change experts indicate that investment in electric buses and other low-carbon technologies needs to double over the next two decades to prevent global warming from exceeding a safe threshold of 2 degrees Celsius (Global Environment Facility,

2017; Intergovernmental Panel on Climate Change, 2018). Therefore, the transition to electric buses and other energy-efficient technologies needs to be accelerated (World Resources Institute, 2019).

The literature review suggests that the adoption of electric vehicles, specifically electric buses, can have positive impacts on environmental and community well-being, which is crucial for the sustainability of the Electric Vehicles (EV) Bus Program. Studies have found that EVs can reduce greenhouse gas emissions and dependence on petroleum products, which can improve air quality and public health. The implementation of electric bus technologies has the potential to reduce noise levels, increase productivity, and improve the health of communities. However, the perception and acceptance of EVs among the public still require improvement, and the adoption of low-carbon technologies needs to be accelerated to prevent global warming from exceeding a safe threshold. Therefore, it is important to evaluate options for reducing the negative environmental impact of transportation to advance social development and environmental improvement. The EV Bus Program can contribute to this effort by promoting the adoption of innovations and technologies in this area and accelerating the transition to low-carbon technologies.

2.3. Sustainability

Sustainability refers to the ability to meet the needs of the present generation without compromising the ability of future generations to meet their own needs (United Nations, 1987). In other words, sustainability involves maintaining and preserving natural resources, ecosystems, and human societies for future generations. The sustainability of EVs programs refers to the long-term viability and success of the programs in terms of environmental, social, and economic impacts. Many studies have examined the factors that contribute to the sustainability of EVs programs.

The relationship between environmental and community well-being and the sustainability of EVs programs is complex and interdependent. On the one hand, the environmental benefits of EVs, such as reduced greenhouse gas emissions, are essential for the long-term sustainability of the programs. However, the social benefits of EVs, such as job creation and public health improvement, are also crucial for the programs' sustainability. As such, many studies have focused on identifying the optimal balance between environmental and social benefits in EVs programs. The sustainability of EVs programs is determined by a complex interplay between environmental and community well-being factors. While the environmental benefits of EVs are critical for their long-term sustainability, the social benefits are also crucial. Future research should focus on identifying the optimal balance between environmental and social benefits in EVs programs to ensure their long-term viability and success.
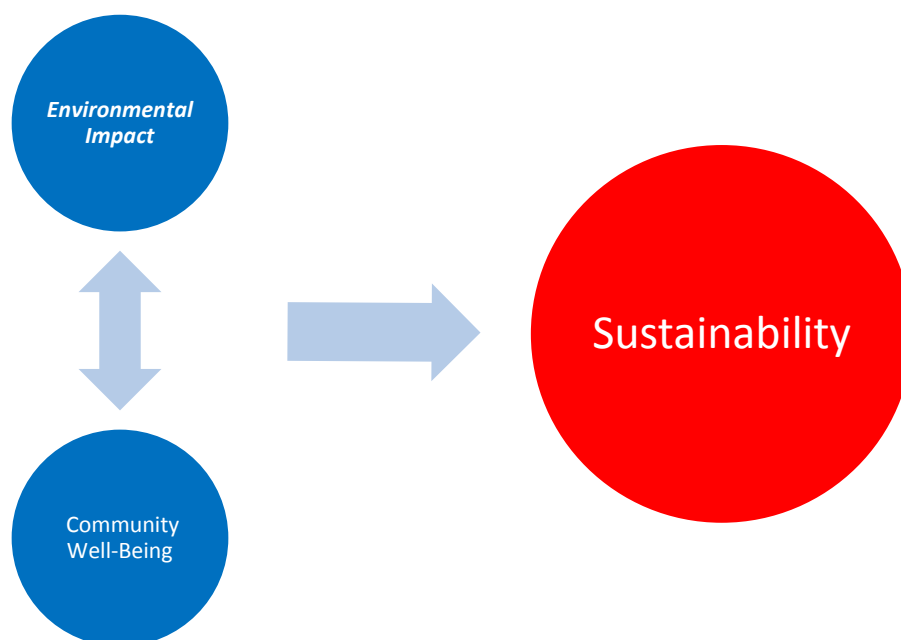

FIGURE 1: The relationship of the variables

3. Methodology

The purpose of this research study is to investigate the impact of the EV bus program on the environment, community well-being, and sustainability. The study will employ a cross-sectional research design to collect data from 50 individuals who have used or have knowledge of the EV bus program. The survey questionnaire will be self-administered, and both closed-ended and open-ended questions will be used to gather quantitative and qualitative data. The study will adhere to ethical principles, and the collected data will be kept confidential to ensure the anonymity of the participants.

A cross-sectional research design will be used to collect data for this study. The participants will be selected using purposive sampling, and the survey questionnaire will be given to 117 individuals who have used or have knowledge of the EV bus program. The survey questionnaire will consist of both closed-ended and open-ended questions to gather both quantitative and qualitative data. The survey questionnaire will be self-administered, and the participants will be fully informed of the purpose of the study and provide informed consent. The data collected will be analyzed using SPSS (Statistical Package for the Social Sciences). Descriptive statistics will be used to summarize demographic information, and Pearson's correlation and regression analysis will be carried out to examine the relationship between environmental and community well-being and the sustainability of the EV bus program. The study will adhere to ethical principles, and the participants will be fully informed of the purpose of the study and provide informed consent. The data collected will be kept confidential, and the participants will remain anonymous.

4. Findings & Discussion

4.1. Descriptive Analysis

TABLE 1: Descriptive Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
SUSTAINABILITY	117	1.00	5.00	3.9520	.83745
ENVIRONMENTAL	117	1.40	5.00	4.2600	.77854
COMMUNITY WELLBEING	117	1.00	5.00	3.8040	.87364
Valid N (listwise)	117				

The study analyzed three key variables - Sustainability, Environmental, and Community Wellbeing - in 117 subjects. Descriptive statistics such as the number of subjects, minimum and maximum values, mean, and standard deviation were presented for each variable. The results showed that the subjects performed well in terms of Environmental responsibility with a mean score of 4.26 and a low standard deviation of .77854, indicating consistent performance. In contrast, the results for Financial showed a lower mean score of 3.4520 and a higher standard deviation of .81997, indicating inconsistent performance. The relatively high standard deviation for the other two variables (Sustainability and Community Wellbeing) highlights the importance of considering the spread of data when evaluating the performance. The study used a five-point internal scale to measure the variables and had a valid N of 50. The mean values can be categorized into low, moderate, and high levels. The study provides valuable insights into the performance of the four key variables and highlights areas for improvement.

TABLE 2: Mean range value

Category level	Mean range value
Low	1.00 to 2.33
Moderate	2.34 to 3.66
High	3.67 to 5.00

Base on table 2 above; the mean score ranges of 1.00 to 2.33 is low, 2.34 to 3.66 is considered moderate, and between 3.67 to 5.00 is high.

TABLE 3: Sustainability

Dependent Variables: Sustainability	Mean	Std. Deviation	Level
A1 Electric vehicle transportation contributes to long-term sustainability.	3.9000	1.03510	High
A2 The utilization of electric public transportation enhances Malaysian economic growth.	3.9000	.99488	High
A3 The adoption of smart technology by electrical public transportation will robust the social demand in the future.	4.1200	.93982	High
A4 The usage of electric public transportation will balance the socioeconomic environment	3.9400	1.01840	High
A5 The unique features of electrical public transportation contribute to a healthy level of competitiveness in the economy.	3.9000	.95298	High

The data collected on the "Sustainability" dependent variable indicates that the respondents have a high level of belief in the positive impact of electric vehicle transportation on long-term sustainability, the Malaysian economy, social demand, the socioeconomic environment, and competitiveness in the economy. The mean scores of all items fall within the high category range (3.67 to 5.00), with a strong belief shown for each individual item, as indicated by their mean scores within the high category range and low standard deviations.

TABLE 4: Environmental

Dependent Variables: Environmental	Mean	Std. Deviation	Level
B1 Electric public transportation improves the environment's air quality.	4.4000	.80812	High
B2 Electric public transportation aids in the preservation of the local environment.	4.2000	.96890	High
B3 The dependence of petrol and diesel utilization of electric public transportation will protect the environment.	4.3400	.89466	High
B4 Electric public transportation reduces noise better than conventional public transportation	4.2400	.82214	High
B5 Electric public transportation generates minimal waste for the environment.	4.1200	.96129	High

The data collected from the respondents shows a positive view towards the environmental benefits of electric public transportation. The mean scores for all five variables are above 3.67, indicating high agreement. The mean scores for various environmental benefits such as improved air quality, preservation of the local environment, reduced dependence on fossil fuels, reduced noise and minimal waste generation are 4.4, 4.2, 4.34, 4.24 and 4.12 respectively, with standard deviations ranging from .80812 to .96129, indicating strong agreement from the respondents. Overall, the data collected demonstrates a high level of agreement among the respondents on the environmental advantages of electric public transportation.

TABLE 5: Community Well Being

Dependent Variables: Community Well Being	Mean	Std. Deviation	Level
C1 Do you believe that electric public transportation contributes to a healthy environment?	4.1400	.94782	High
C2 The electric vehicle public transportation is reliable for daily use.	3.9000	1.09265	High
C3 Electrical public transportation is easily accessible.	3.4800	1.07362	Moderate
C4 The safety of electrical public transportation is guaranteed	3.5800	1.01197	Moderate
C5 Passengers have a comfortable experience on electric public transportation	3.9200	.82906	High

The results of a survey showed that the majority of respondents had a high level of community well-being towards electric public transportation. The majority believed electric transportation contributes to a healthy environment and is reliable for daily use, but felt that accessibility and safety still needed improvement. The passengers had a comfortable experience on electric public transportation. The study suggests that while the overall level of community well-being towards electric public transportation is high, there are still areas for improvement and further research is needed.

4.2. Cronbach's Alpha

Cronbach's alpha is a statistical measure used to determine the reliability and internal consistency of a test or questionnaire. It indicates the extent to which the items in the test measure the same underlying construct. A high value of Cronbach's alpha is desirable as it shows consistency between the items, while a low value suggests inconsistency and raises questions about the reliability and validity of the results. Cronbach's alpha is widely used in various fields such as psychology, education, sociology, and marketing and is especially important in large-scale assessments. In conclusion, Cronbach's alpha is a crucial tool in research to ensure the quality and validity of the results obtained from a test or questionnaire.

TABLE 6: Cronbach's Alpha Analysis

Variables	Items	Cronbach's Alpha (α)
SUSTAINABILITY	5	0.901
ENVIRONMENTAL	5	0.921
COMMUNITY WELL BEING	5	0.925

Table presents the outcome of a reliability evaluation utilizing Cronbach's alpha for four distinct variables - Sustainability, Environmental, Community Wellbeing, and Financial. Each variable was assessed using five items.

The Cronbach's alpha scores for Sustainability, Environmental, and Community Wellbeing were calculated to be 0.901, 0.921, and 0.925, respectively, indicating high reliability and consistency in measuring a common underlying factor. These results support the validity of these scales in research and analysis.

4.3. Correlation

Correlation is a statistical technique used to measure the relationship between two or more variables in data collection. It helps to identify the relationship, make predictions, and understand cause-and-effect relationships between variables. The correlation is measured by a correlation coefficient that ranges from -1 to 1, where 1 indicates a perfect positive correlation, -1 indicates a perfect negative correlation, and 0 indicates no relationship. Correlation is used to test hypotheses about the relationship between variables and to make predictions. It helps researchers to understand the relationships between variables and make informed decisions.

TABLE 7: Correlations between Environmental & Sustainability

	ENVIRONMENTAL	SUSTAINABILITY

ENVIRONMENTAL	Pearson Correlation	1	.780**
	Sig. (2-tailed)		.000
	N	117	50
SUSTAINABILITY	Pearson Correlation	.780**	1
	Sig. (2-tailed)	.000	
	N	117	117
**. Correlation is significant at the 0.01 level (2-tailed).			

The data shows a strong positive correlation between the variables "Environmental" and "Sustainability" with a correlation coefficient of .780. This indicates that as one variable increases, so does the other. The significance level of .000 shows that the correlation is statistically significant at the 0.01 level, meaning there is a less than 1% chance that it's due to chance. The sample size of 117 observations provides a solid basis for making inferences about the relationship between the two variables. Overall, the data suggests that there is a strong association between environmental considerations and sustainability.

TABLE 8: Correlations between Community Well Being & Sustainability

		COMMUNITY WELL BEING	SUSTAINABILITY
COMMUNITY WELL BEING	Pearson Correlation	1	.813**
	Sig. (2-tailed)		.000
	N	117	117
SUSTAINABILITY	Pearson Correlation	.813**	1
	Sig. (2-tailed)	.000	
	N	117	117
**. Correlation is significant at the 0.01 level (2-tailed).			

This data shows the correlation between two variables: "Community Wellbeing" and "Sustainability". The Pearson correlation coefficient is a measure of the linear relationship between two variables and can range from -1 to 1. A coefficient of 1 indicates a perfect positive linear relationship, a coefficient of -1 indicates a perfect negative linear relationship, and a coefficient of 0 indicates no relationship between the two variables.
In this data, the Pearson correlation coefficient between "Community Wellbeing" and "Sustainability" is .813, which is a strong positive relationship. The significance (2-tailed) is .000, which means that the relationship is statistically significant at the 0.01 level. The sample size is 117 for both variables.
In summary, this data suggests that there is a strong positive relationship between "Community Wellbeing" and "Sustainability"

5. Conclusion

The present study examined the relationship between environmental and community well-being with the sustainability of electric vehicles (EV) bus program. The study analyzed three key variables - sustainability, environmental responsibility and community well-being. The results provided valuable insights into the performance of these variables and highlighted areas for improvement.
The data collected on the dependent variable of "sustainability" indicates that the respondents have a high level of belief in the positive impact of electric vehicle transportation on long-term sustainability, the Malaysian economy, social demand, the socioeconomic environment, and competitiveness in the economy. The data suggests a strong positive correlation between environmental considerations and sustainability, where an increase in one variable is likely to result in an increase in the other.
The data also suggests a positive view towards the environmental benefits of electric public transportation. The majority of respondents showed high agreement on the environmental advantages of electric public transportation. The study found a strong positive correlation between the variables of "Environmental" and "Sustainability." The study highlights the importance of considering the spread of data when evaluating the

performance of the variables, with relatively high standard deviations for Sustainability and Community Wellbeing.

Regarding community well-being, the study showed that the majority of respondents had a high level of community well-being towards electric public transportation. The passengers had a comfortable experience on electric public transportation, and the majority believed that electric transportation contributes to a healthy environment and is reliable for daily use. However, respondents felt that accessibility and safety still needed improvement. The data suggests a strong positive relationship between "Community Wellbeing" and "Sustainability."

In conclusion, the findings of this study contribute to a better understanding of the factors that contribute to the sustainability of electric vehicle transportation. The data suggests environmental and community well-being considerations are strongly associated with the sustainability of electric vehicle transportation. Moreover, the results of the study suggest areas for improvement in financial considerations that may have a positive impact on sustainability. Overall, the results of this study provide valuable insights into the performance of the key variables analyzed and highlight the importance of considering the spread of data when evaluating the performance of sustainability programs.

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