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THE EFFECT OF ENVIRONMENTAL BUDGETS AND TRANSPORTATION ON CARBON DIOXIDE EMISSIONS IN INDONESIA FROM AN ISLAMIC ECONOMIC PERSPECTIVE, 2004-2023

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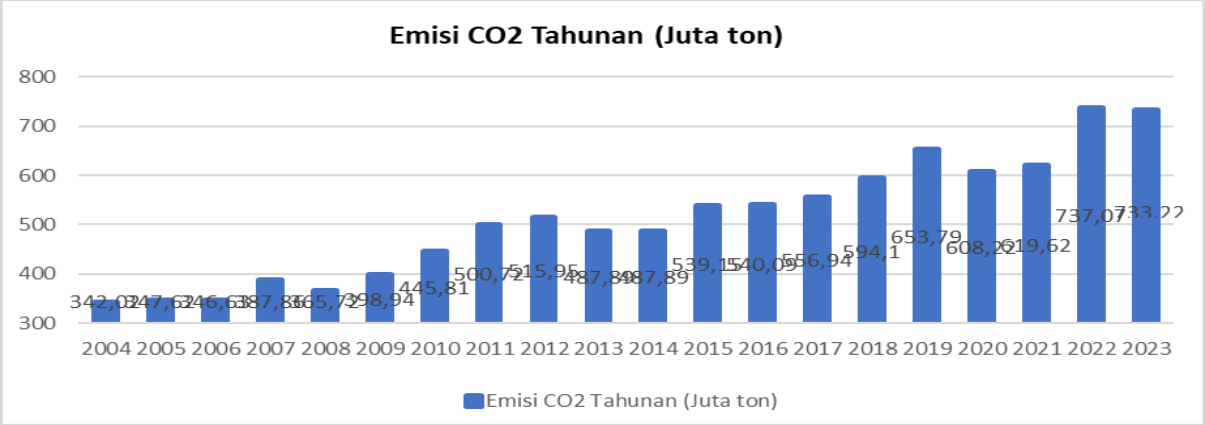
ABSTRACTS

Global warming, caused by the increase of greenhouse gases (GHGs) in the atmosphere, is one of the most pressing issues of the 21st century. Carbon dioxide (CO_2) emissions, one of the main sources of greenhouse gases, are increasing annually. Transportation and environmental budgets are two of the many factors that influence the quantity of carbon dioxide emissions. This study aims to investigate the relationship between carbon dioxide emissions and transportation and environmental budgets. Multiple linear regression analysis is the quantitative tool used in this investigation. The population studied includes Indonesia and covers 20 years, from 2004 to 2023. The results of the analysis indicate that while motorized traffic in particular contributes significantly to the increase in carbon dioxide emissions in Indonesia, environmental budgets have no discernible impact on these emissions. This study is expected to be useful for various stakeholders, including the general public, scientists, and the government as policymakers.

A. INTRODUCTION

Currently, the world is facing various multi-sector challenges ranging from economic, social, political to environmental damage that causes climate crisis problems. Environmental problems caused by the increase in greenhouse gas (GHG) concentrations are becoming a major concern in various countries, including Indonesia. According to research from (Daramola et al., 2021), the largest contributor to greenhouse gas concentrations, accounting for more than 60 percent, is carbon dioxide (CO_2). CO_2 emissions have increased significantly since the pre-industrial era. The CO_2 level in the atmosphere, which was initially around 280 ppm, has now increased to more than 413 ppm (WMO, 2023). This growth is a direct result of human activity, particularly the burning of fossil fuels. As a result, the world is facing various environmental crises such as global warming, climate change, extreme weather, and downstream impacts such as polar ice melt, flash floods, and prolonged droughts (H . In addition, increased carbon emissions also have a direct impact on human health, especially in urban areas that are economic centers with high pollution, which increases the risk of respiratory diseases and various diseases related to extreme temperatures (Sheila Maharani, 2025)

Indonesia has the sixth highest carbon emissions in the world, with 1.98 million tons of emissions per person, according to 2014 WRI statistics. At the regional level, Indonesia even ranks first as the largest carbon emitter in Southeast Asia. This condition has prompted the government to take serious steps to reduce the rate of emissions. One of the efforts made is to ratify the Kyoto Protocol, an international agreement that aims to reduce six types of greenhouse gases (GHG), namely carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulfur hexafluoride (SF_6), chlorofluorocarbons (CFCs), and perfluorocarbons (PFCs) (Madyan et al., 2024).



Based on the annual CO2 emissions graph in Indonesia from 2004 to 2023 obtained from *Our World In Data (OWID)*, there has been a significant upward trend over the past two decades. In 2004, CO2 emissions were recorded at 342.01 million tons and gradually increased to 733.22 million tons in 2023. This increase reflects national economic growth and increased industrial and transportation activities, which still largely rely on fossil-based energy. In 2020, there was a significant decrease in emissions from 653.79 million tons in 2019 to 608.26 million tons, most likely due to reduced economic activity and mobility as a result of the COVID-19 pandemic. However, this

trend did not last long, as emissions rose sharply again in the following years, reaching 737.07 million tons in 2022 and around 733 million tons in 2023.

The concept in environmental economics that describes the relationship between the economy and environmental damage is *the Environmental Kuznets Curve (EKC)* theory developed by Grossman and Krueger in 1995. The inverted U-shaped curve formed by the EKC theory is useful for describing the relationship between various types of environmental damage and economic expansion. According to this hypothesis, environmental damage tends to increase during the early stages of economic expansion due to pollution, urbanization, industrialization, and exploitation of natural resources. However, as income levels rise, environmental damage begins to decline alongside greater economic expansion (Galeotti, 2007). This occurs because people's incomes become higher, enabling them to adopt cleaner technologies and stricter environmental policies. In this study, with increased economic growth, countries can allocate a larger budget to the environmental sector, which includes emission mitigation programs, reforestation, waste management, and the implementation of environmentally friendly policies, thereby encouraging a reduction in carbon emissions. Meanwhile, the transportation sector is one of the main contributors to CO2, especially motor vehicle-based transportation, which is still highly dependent on the use of fossil-based energy such as coal and petroleum. Therefore, the impact of transportation on CO2 can reflect Indonesia's position in the EKC trajectory. If the transportation sector is directed towards the development of lower-carbon transportation (e.g., electric vehicles or clean energy-based public transportation), then this sector can also contribute to reducing emissions, in line with the predictions of the EKC theory (Cahyani & Aminata, 2020).

From an Islamic economic perspective, environmental and natural resource management is viewed as a mandate that must be upheld and utilized in a responsible and sustainable manner. The Qur'an provides clear guidance on the importance of preserving nature and managing resources without damaging them. Humans are assigned by Allah as caliphs on earth, which means they have a role as managers and guardians of His creation, so humans have an obligation to care for and maintain the balance of the environment in a sustainable manner. This responsibility is not only social and ecological, but also spiritual, because humans will be held accountable before Allah SWT for all forms of natural resource utilization (Iqbal, 2020). In this context, the allocation of the state budget should not only be oriented towards economic growth, but also consider its impact on environmental balance and justice for future generations (Aziz et al., 2024). There are many verses in the Qur'an and Hadith related to environmental management and the prohibition of its destruction, one of which is in QS. Al-A'raf verse 56

وَلَا تُفْسِدُوْا فِى الْاَرْضِ بَعْدَ اِصْلَاحِهَا وَادْعُوْهُ خَوْفًا وَّطَمَعًاۗ اِنَّ رَحْمَتَ اللّٰهِ قَرِيْبٌ مِّنَ الْمُحْسِنِيْنَ

Meaning: "*Do not cause corruption on earth after Allah has reformed it, and pray to Him with fear (of not being accepted) and hope (of being granted). Verily, Allah is very close to those who do good."*

Every creation of God has knowledge and virtue, as long as humans practice it in accordance with Islamic principles. This verse emphasizes the importance of avoiding excessive exploitation of natural resources because it can cause damage and extinction, as well as deprive future generations of their livelihoods. Inadequate management of abundant natural resources can have a negative impact on the long-term economic

growth of society. An important lesson about humanity's obligations to the world and the importance of acting morally to preserve the universe is conveyed in Surah Al-A'raf verse 56. This verse instills fundamental values that inspire humans to preserve the environment and support the health of this earth.

Indonesia, as one of the developing countries with rapid economic growth and urbanization, faces major challenges in controlling carbon emissions while maintaining economic stability. The Indonesian government has prioritized various green fiscal policies, including the implementation of carbon taxes and subsidies for environmentally friendly technologies. Environmental fiscal reforms such as these aim to curb polluting activities while encouraging investment in clean technology and energy efficiency (Mehta & Derbeneva, 2024). Budgets for the environment and transportation are two sectoral initiatives that have a major impact on national carbon emissions. A country's overall greenhouse gas emissions are greatly influenced by the dynamics of private and public transportation, as well as the interaction of fiscal policies in the environmental sector. In Indonesia, CO_2 emissions are largely caused by the energy and transportation industries. The majority of the energy used in this country comes from fossil fuels, and the transportation sector alone contributes to nearly 24% of total emissions (BPS, 2023).

One factor that influences carbon emission levels is the environmental budget. An environment-based budget, also known as *green budgeting*, is a concept that prioritizes environmental sustainability when planning, implementing, monitoring, and evaluating government revenue and expenditure (Puspita et al., 2023). Environment-oriented budgeting is a powerful tool in controlling economic actors, so this budget has an important role in efforts to combat environmental damage, including that caused by pollution such as CO_2. Environmental budgeting has a significant influence on CO_2 emissions through the mechanism of state expenditure allocation and fiscal policies aimed at reducing emissions.

The transportation industry also has a significant impact on carbon emissions. The use of mechanical or human means to move people or products from one place to another is called transportation (Karim et al., 2023). The number of motor vehicles continues to show an upward trend every year, which directly impacts the increase in CO_2 volume in the atmosphere. In 2023 alone, the number of motor vehicles was recorded at more than 157 million units, with the majority being motorcycles. One of the main factors contributing to carbon dioxide emissions is the increase in transportation, particularly land transportation via motor vehicles. This increase in traffic has a positive correlation with carbon emissions, with an average increase of 14.65% in emissions caused by traffic congestion (Hussain et al., 2023). Efforts to reduce emissions from the transportation sector have been made through various policies, such as imposing carbon taxes on fuel, developing public transportation, and improving sustainable logistics. Additionally, urban greening initiatives along transportation routes are promoted to absorb pollutants and improve air quality (Purwanto & Lutfiana, 2021).

Based on research conducted by (Tang et al., 2024) in the journal *Sustainability*, it was found that government spending in the environmental sector has a significant effect on reducing CO_2 emissions in developed regions, but the effect is uneven and tends to have no effect on developing regions. Meanwhile, according to research conducted by (Nihayah & Diastuti, 2023), budget allocation for the environmental

sector has a positive but insignificant effect on improving environmental quality. A number of previous studies have shown that the transportation sector, especially those that still use fossil fuels, has a positive effect on increasing CO_2 emissions. However, based on a report by *the Institute for Essential Services Reform (IESR)*, environmentally friendly transportation such as electric vehicles has the potential to reduce CO_2 emissions.

This research gap indicates the need for further study to examine the dynamics of the relationship between environmental and transportation budgets and CO_2 emissions. In addition, there has not been much research discussing the relationship between the three variables, namely environmental budgets, transportation, and CO_2 emissions, simultaneously. Previous studies have also focused more on conventional approaches without considering the Islamic economic perspective. Therefore, the purpose of this study is to examine and better understand GHG issues, particularly CO_2, which are influenced by a number of variables, including transportation and environmental budgets. Multiple linear regression techniques were used to analyze time series data for 20 years, from 2004 to 2023. In addition, studies from an Islamic economic perspective were also included, as this type of research is not only limited to the conventional economic realm but is also enriched by the application of Islamic economics. The findings of this study are expected to advance the development of theory, policy, and real-world applications in related domains, as well as serve as a guide for further research.

B. RESEARCH METHOD

This research uses an explanatory research design and quantitative techniques, making it suitable for testing hypotheses and examining causal relationships between independent and dependent variables. (Fuadi et al., 2025) .

The population in this study consists of all data on environmental budgeting, the transportation sector, and carbon dioxide emissions in Indonesia over the last two decades, from 2004 to 2023. The sampling method used was *purposive sampling*.

The data for this study came from secondary sources. The data sources were the official websites of the Central Statistics Agency (BPS), Our World in Data (OWID), and various other official websites relevant to the research topic.

This study uses descriptive statistics and multiple linear regression analysis to analyze the data. The statistical software used to analyze the research data is SPSS. Several steps were taken in this weather study:

a. multicollinearity test
b. Normality test
c. Autocorrelation test
d. Heteroscedasticity test
e. T test (partial effect)
f. F test (simultaneous effect)
g. Coefficient of Determination

C. RESULTS AND DISCUSSION

1. Results

a. Multicollinearity Test

When independent variables in a multiple regression model have a linear relationship with each other, this is known as multicollinearity or multiple collinearity. We can find this occurrence using the Tolerance Value and Variance Inflation Factor (VIF). When the VIF is below 10.00 and the tolerance is above 0.100, there is no multicollinearity in the model.

Coefficients[a]

Model		Collinearity Statistics	
		Tolerance	VIF
1	AL	.135	7.419
	TR	.135	7.419

a. Dependent Variable: CO2

Based on the results of the "multicollinearity test presented in the previous table, it is known that the *VIF* value for variables X1 and X2 is 7.419 (< 10.00) and the *Tolerance* value is 0.135 (> 0.100)." As a result, it can be said that there are no signs of multicollinearity in the regression model used in this investigation.

b. Normality Test

To ensure that everything is in order, the researchers used the Kolmogorov-Smirnov test. An Asymp 2-tailed value greater than 0.05 was used to determine whether the residual data was normally distributed.

One-Sample Kolmogorov-Smirnov Test

			Unstandardized Residual
N			20
Normal Parameters[a,b]	Mean		.0000000
	Std. Deviation		32.15242336
Most Extreme Differences	Absolute		.097
	Positive		.075
	Negative		-.097
Test Statistic			.097
Asymp. Sig. (2-tailed)[c]			.200[d]
Monte Carlo Sig. (2-tailed)[e]	Sig.		.889
	99% Confidence Interval	Lower Bound	.881
		Upper Bound	.897

a. Test distribution is Normal.
b. Calculated from data.

The data is normally distributed, as indicated by the Asym. (2-tailed) signature value of 0.200 > 0.05, obtained using the normality test in the previous table.

c. Autocorrelation Test

The test technique was used to perform an autocorrelation test in this study. It can be concluded that the residuals do not show signs of autocorrelation if the 2-tailed Asimptomatic value is higher than 0.05.

Runs Test

	Unstandardized Residual
Test Value[a]	.58896
Cases < Test Value	10
Cases >= Test Value	10
Total Cases	20
Number of Runs	7
Z	-1.608
Asymp. Sig. (2-tailed)	.108

a. Median

Based on the autocorrelation test results shown in the table below, the 2-tailed Asimptomatik value is 0.108, exceeding the limit of 0.05. Therefore, it can be said that there is no autocorrelation in the residuals of this model.

d. Heteroscedasticity Test

When the residual variance in a regression model is not the same at various observation levels, this is known as heteroscedasticity. The heteroscedasticity test is performed by regressing *the natural logarithm (LN)* of the residuals against the independent variables included in the regression model.

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.349	1.802		2.413	.027
	AL	-3.364E-5	.000	-.057	-.087	.932
	TR	.013	.047	.181	.276	.786

a. Dependent Variable: LN_RES

If the significance value is above 0.05, it can be concluded that the residuals do not have heteroscedasticity features. The model in this study shows values of X1 (0.932 > 0.05) and X2 (0.786 > 0.05), which indicate no symptoms of heteroscedasticity, thus fulfilling the heteroscedasticity assumption test.

e. T-test or Partial Test

The T-test is used to determine the extent to which each independent variable affects the dependent variable. If the Sig. value is less than 0.05, it can be concluded that the independent and dependent variables have a significant relationship.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	209.862	21.117		9.938	<,001		
	AL	-.005	.005	-.199	-1.158	.263	.135	7.419
	TR	3.662	.549	1.148	6.666	<,001	.135	7.419

a. Dependent Variable: CO2

Based on the table above, it can be concluded that

1. The Environmental Budget variable (X1) "has a significance value of 0.265 (>0.05). This indicates that the Environmental Budget does not have a significant effect on carbon dioxide emissions, so the first hypothesis (H1) is rejected."
2. The Transportation variable (X2) "has a significance value of <0.001 (<0.05). Thus, the Transportation variable is proven to have a significant effect on carbon dioxide emissions, so the second hypothesis (H2) is accepted."

f. Test or Simultaneous Test

In multiple linear regression analysis, the F test is used to determine whether each independent variable affects the dependent variable simultaneously. If the p-value is less than 0.05, it can be said that the independent variables collectively affect the dependent variable significantly.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	269288.001	2	134644.001	116.535	<,001[b]
	Residual	19641.788	17	1155.399		
	Total	288929.790	19			

a. Dependent Variable: CO2

b. Predictors: (Constant), TR, AL

In this study, "the significance value achieved is < 0.001, which is < 0.05. Thus, it can be concluded that variables X1 (environmental budget) and X2 (transportation) simultaneously have a significant effect on variable Y (carbon dioxide emissions)."

g. Coefficient of Determination (R^2)

The coefficient of determination (R^2) is a common way to measure the accuracy of a regression model in predicting the response of the dependent variable to changes. A low R^2 value indicates that the independent variables can only explain a small portion of the dependent variable, and the possible range of values is between 0 and 1.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.965[a]	.932	.924	33.99117

a. Predictors: (Constant), TR, AL

b. Dependent Variable: CO2

The Adjusted R Square value is 0.924, according to the Model Summary table. This indicates that variables X1 (environmental budget) and X2 (transportation) together contribute 92.4% of the variance in variable Y (carbon dioxide emissions), with additional factors not included in this study model contributing the remaining 7.6%.

2. Discussion

a. The Effect of Environmental Budget on Carbon Dioxide Emissions in Indonesia

Based on the t-test results in this study, it shows that "the environmental budget variable (X1) has a significance value of 0.265, which is greater than the significance limit of 5% (0.05)". Thus, it can be concluded that the environmental budget does not have a significant effect on CO_2 emissions in Indonesia during the 2004–2023 period. This finding indicates that even though the government has allocated funds for the environmental sector, the budget has not been able to have a direct impact on reducing CO_2 emissions.

According to the *Environmental Kuznets curve (EKC)* theory, this condition illustrates that Indonesia is still in the early stages of the curve, where economic growth tends to increase environmental degradation before reaching *a turning point*. The low effectiveness of the environmental budget in reducing CO_2 emissions may be due to several factors, such as the relatively small environmental budget, which is only around 0.5-1 percent of the total state budget (Ministry of Finance of the Republic of Indonesia, 2022). The budget for the environmental sector also often focuses more on administrative activities such as education and socialization than on direct mitigation programs such as reforestation or the application of renewable energy (Bappenas, 2021).

From an Islamic economic perspective, environmental management is a mandate from Allah SWT to humans as caliphs on earth. This mandate contains moral and spiritual obligations to preserve nature for the benefit of the people. One of the efforts to preserve nature is by allocating funds to activities that can have a direct impact on the environment. This budget can be directed towards

efforts that are in line with the objectives of sharia, such as protecting life, offspring, and property (Puspita et al., 2023).

The findings in this study are in line with studies conducted by (Nihayah & Diastuti, 2023), which reveal that budget allocation for the environmental sector has a positive effect, but does not show statistical significance in improving environmental quality in Indonesia. Other research results show that environmentally friendly government budgets and investments are very important for climate change mitigation, but it was found that government funding has no real or indirect impact on climate change improvement, indicating the need for more effective fiscal policies (Omodero & Alege, 2022).

b. The Impact of Transportation on Carbon Dioxide Emissions in Indonesia

A significance value of < 0.001, which is below the 5% or 0.05 threshold, indicates that the transportation variable has a positive and substantial effect on CO2 emissions in Indonesia from 2004 to 2023, based on the analysis results. This validates that the transportation sector, particularly motor vehicles that still use fossil fuels, is one of the main contributors to CO2 emissions in Indonesia. The more motor vehicles in operation, especially in urban areas, the higher the carbon emissions produced. According to a report from *the Institute for Essential Services Reform* (IESR, 2024), the transportation sector contributed around 150 million tons of CO_2 in 2022 in Indonesia, with 88% of that coming from land transportation originating from motorized vehicles . Factors that influence the amount of emissions from motor vehicles include fuel type, engine efficiency, vehicle size, road conditions, and traffic density.

Within the framework of the *Environmental Kuznets Curve (EKC)* theory, these findings identify that the transportation sector in Indonesia is still in the early to middle stages of the curve, a phase in which economic growth and urbanization actually cause an increase in CO_2. At this stage, economic expansion triggers an increase in demand for public mobility and logistics, resulting in a sharp increase in the number of vehicles. However, this has not been accompanied by the development of more efficient public transportation or the use of more environmentally friendly vehicles, meaning that Indonesia has not yet reached *the turning point of* the EKC curve.

According to Islamic economics, transportation must be directed towards modes that are more environmentally friendly in order to achieve the objectives of Sharia law, namely protecting life *(hifz al-nafs)* and protecting offspring *(hifz al-nasl).* The principle *of hifz al-nafz* requires the preservation of life by preventing health risks caused by CO2 pollution, while the principle *of hifz al-nasl* demands environmental sustainability for future generations.

The findings of this analysis reinforce a previous study by Alhindawi et al. (2020), which found that motor vehicle transportation is the main source of greenhouse gas emissions in the transportation sector, contributing a significant portion of CO2 emissions. In addition, a study by Kurnia and Sudarti (2021) found that more frequent use of motor vehicles can cause exhaust emissions, especially CO2, to increase rapidly.

c. The Simultaneous Effect of Environmental and Transportation Budgets on Carbon Dioxide Emissions in Indonesia

Based on the analysis findings, Indonesia's carbon dioxide emissions from 2004 to 2023 are significantly and positively influenced by environmental and transportation budget factors. This conclusion is supported by the significance value of the ANOVA table, which shows a sig value <0.01, or below the significance level of 0.05. The Adjusted R Square value in the Model Summary table is 0.924, or 92%, indicating that transportation and environmental budgets can contribute 92% of the CO2 variable, but additional models not discussed in this study affect this dependence. This analysis can be examined using an environmental economics approach, although the findings of this study have not been supported by other studies with a related focus, namely, the combined impact of transportation and environmental budgets on carbon emissions. The main theory relevant in this context is the *Environmental Kuznets Curve (EKC)* theory.

Within the framework of the *Environmental Kuznets Curve (EKC)* theory, the combination of these two variables can accelerate the achievement of a turning point, where economic growth no longer increases CO2. This can be done through several efforts, such as directing the environmental budget to support low-emission transportation infrastructure, thereby minimizing the role of transportation as the largest contributor to emissions, so that CO_2 emission trends can begin to decline even as the economy continues to grow (Cahyani & Aminata, 2020).

d. Environmental Budget, Transportation, and Carbon Dioxide Emissions from an Islamic Economic Perspective

The allocation of budgets for the environmental sector is one of the fiscal instruments in efforts to protect the environment. Public funds directed towards mitigation, reforestation, and waste management programs must be managed efficiently in order to have a real impact on reducing CO_2 emissions. Budget policies oriented towards CO_2 control not only contribute to environmental preservation, but also constitute a tangible form of protection for human life and safety. The allocation of state budgets for the environmental sector in Islamic economics is seen not only as a fiscal decision, but also as part of the sharia obligation to protect Allah's creation (Y . This is in line with Allah SWT's words in *QS. Ar-Rahman verses 7–9, "And the heavens He has left without any pillars, and He has created balance, so that you may not destroy that balance. And uphold that balance with justice and do not destroy that balance."* This surah emphasizes that maintaining *mizan* (balance) is a key principle in development. Therefore, the state's efforts to balance economic development with environmental preservation through the budget is a concrete manifestation of the implementation of the principle of mizan (justice) commanded by Allah. This verse also teaches balance between worldly and spiritual matters, as well as a strict prohibition against causing destruction on earth.

Transportation plays a role as a driver of the distribution of goods and services in the economy, but environmental damage caused by CO2 from transportation

activities is a form of *corruption* that is prohibited. Therefore, from an Islamic economic perspective, transportation development must be designed in a fair and sustainable manner, not only for the sake of efficiency, but also to preserve nature and the lives of future generations. As emphasized by (Hartanto & Sup, 2022), Islam strongly encourages harmonious interaction between humans and nature and rejects all forms of exploitation that can disrupt ecological balance.

Islamic economics is an economic theory that prioritizes moral and spiritual principles derived from the Quran and Hadith, in addition to emphasizing material gains. In this system, welfare is not only measured by economic growth, but also by social justice, the blessings of wealth, and the sustainability of life (Afdhal et al., 2024). From an Islamic economic perspective, environmental and transportation budgets are not merely fiscal policies and economic development techniques, but part of a mandate that demands human responsibility in utilizing resources without damaging the environment. This principle aligns with the Quranic verse Surah Al-A'raf: 56, which prohibits causing corruption on Earth.

D. CONCLUSION

This study aims to examine the effect of budget allocation in the environmental and transportation sectors on carbon emissions in Indonesia within the framework of Islamic economics during the period 2004 to 2023. Based on the results of the analysis and discussion, it can be concluded that:

1. The Environmental Budget has no effect on Carbon Dioxide Emissions in Indonesia from 2004 to 2023 (H1 rejected). Several factors that cause the environmental budget to have no significant effect on carbon emissions are the low proportion of government budgets in the environmental sector, secondly, the budget focus is often more dominant in administrative activities and the rapid increase in emissions so that the impact of the budget is not clearly visible.
2. Transportation has a significant effect on carbon dioxide emissions in Indonesia (H2 accepted). The increase in transportation in Indonesia, especially motor vehicles, is the main contributor to carbon dioxide emissions. This is because most transportation in Indonesia still relies on fossil fuels, traffic density is inefficient, and there are still very few environmentally friendly vehicles.
3. The simultaneous test results also show that the environmental and transportation budget variables together have a significant effect on the carbon dioxide emission variable (H3 accepted).
4. From an Islamic economic perspective, environmental and natural resource management is a mandate that must be upheld and utilized in a sustainable manner. The principles of maslahah (public interest), istikhlaf (human stewardship of the earth), and hisbah (social oversight) teach the importance of collective responsibility for environmental sustainability. In this context, economic activities such as the allocation of state budgets and activities in the transportation sector should not be solely oriented towards economic growth, but should also consider their impact on environmental balance and justice for future generations.

RECOMMENDATIONS

The following are some recommendations that can be presented as the core findings of the research, with reference to the data analysis and conclusions that have been presented:

1. The government is expected to increase the effectiveness of the environmental budget by ensuring that funds are actually directed towards initiatives such as sustainable waste management, renewable energy development, and forest rehabilitation, which directly reduce carbon emissions. In addition, to provide a greater impetus for climate change mitigation, the allocation of the environmental sector budget in the State Budget (APBN) needs to be increased.
2. The government is expected to accelerate the transition to more environmentally friendly transportation systems, including the electrification of cars, the development of clean and effective public transportation, and incentives for the public to switch from fossil fuel-powered private vehicles to low-emission vehicles.
3. As a more sustainable long-term growth approach, the government must strengthen environmental legislation and monitoring. Various measures, including carbon taxes, subsidies, and incentives for low-carbon technologies, can help achieve this.
4. To gain a deeper understanding of the factors that influence carbon dioxide emissions in Indonesia, future researchers are advised to examine additional variables that may affect carbon dioxide emissions beyond those used in this study.

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