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The Impact of Islamic Finance Development, Economic Growth, Function of Regional Government Budgets on Carbon Emissions in Indonesia

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Abstract

Carbon emissions are a pressing global issue, with international agreements such as the Kyoto Protocol, Paris Agreement, and COP26 aiming to limit temperature rise and achieve net zero emissions. This research investigates the impact of Islamic financial development, economic growth, and government budget functions on carbon emissions in Indonesia, using panel data from 2018 to 2022. The study reveals that Islamic finance, specifically Sharia banking financing, significantly reduces carbon emissions. Conversely, economic growth (GRDP) is positively associated with carbon emissions, while the government's environmental budget shows a negative relationship but lacks statistical significance. These findings highlight the effectiveness of Islamic finance in promoting environmentally sustainable practices and underscore the need for more effective government budgeting and regulatory measures. Future research should explore a broader range of Islamic finance sectors and budgetary functions to provide a more comprehensive understanding of their impact on carbon emissions. This study's insights can guide policymakers in reinforcing successful strategies and developing new approaches to achieve emission reduction goals.

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Introduction

Ecological damage is one of the most pressing problems facing modern society today (Adebayo et al., 2022). The Industrial Revolution has led to significant changes in human activities, increasing greenhouse gas emissions, particularly carbon dioxide (CO2), the primary contributor to climate change (IPCC, 2008). Global efforts such as the Kyoto Protocol (1997) and the Paris Agreement (2015) have been launched to address this. The 2021 United Nations Climate Change Conference (COP26) in Glasgow further updated these agreements, setting a target to limit global temperature rise to below 1.5°C by halving global emissions by 2030 and achieving net-zero emissions by 2050 or 2060 (Karunia et al., 2023).

In line with these global efforts, countries worldwide, including Indonesia, have committed to reducing emissions. Despite its commitment, Indonesia remains one of the top 10 carbon-emitting countries globally, producing an average of 930 million tons of CO2 annually between 2013 and 2022, mainly due to land conversion, deforestation, and fossil fuel use (Annur, 2023). This can be seen from graph 1, which shows the increase in carbon emissions in the last six years from 2018-2023; in 2020-2022, there was a decrease due to the COVID-19 pandemic (KLHK, 2023). This presents a significant challenge for the country as it seeks to balance economic growth with environmental sustainability.

Graph 1, CO2 Emissions from Forest and Land Fires (Ton CO_2e)
Source: Ministry of Environment and Forestry (2023)

The role of economic growth and financial development in carbon emissions is critical. As a key intermediary and source of external capital, the financial sector significantly influences carbon emissions (Kamara et al., 2020). The rapid development of financial markets, such as stock markets and banking activities, can attract investment and enhance economic efficiency (Sadorsky, 2011). However, this can also increase energy consumption and carbon emissions, raising severe environmental concerns.

In this context, the Islamic finance industry, which has proliferated since its inception in the 1970s and now has an accumulated value of $3 trillion globally (Asian Development Bank, 2022), presents an exciting study area. Islamic finance, with its principles of profit, risk-sharing, and ethical considerations, is seen as a more sustainable alternative to conventional finance (Ayub, 2013). Its potential to promote sustainability by supporting environmental and social initiatives and funding infrastructure projects makes it a key player in the global effort to reduce carbon emissions (Hashem, 2019). As one of the largest Muslim-majority countries in the world, Indonesia has significant potential in Islamic finance. The total assets of Indonesia's Islamic finance sector are valued at US$ 119.5 billion, and the country's Islamic capital market has proliferated, earning the title of The Best Islamic Capital Market of The Year for four consecutive years from 2019 to 2022 (Arsyanti & Busaid, 2023).

Furthermore, government intervention through fiscal measures such as carbon taxes, emissions trading schemes, and investments in emission reduction is crucial in combating climate change (Qi et al., 2023; Wu et al., 2023; Xu et al., 2023). Government spending on public services, defense, economy, environmental protection, and infrastructure development, such as efficient public transportation, is a reassuring sign of direct contribution to reducing carbon emissions (Caglar & Yavuz, 2023; Cheng & Xu, 2023).

Previous studies have been conducted in various regions, including OIC countries, ASEAN, and APEC (Setiawati & Salsabila, 2023; Suriani et al., 2024; Zaidi et al., 2019). These studies have yielded different results. For instance, Setiawati and Salsabila (2023) found that GDP per capita and industrial value-added positively affect CO2 emissions, while the development of Islamic finance has a negative impact. Meanwhile, Suriani et al. (2024) showed that global green sukuk could reduce the adverse effects of climate change in the short and long term.

Research on government budget functions has also been extensively conducted outside Indonesia, such as in China. A study by Yang et al. (2021) found that implementing the low-carbon pilot province policy in 2010 significantly impacted emission reduction in Liaoning Province but did not significantly affect emission reduction in Hubei Province. The carbon emission trading system introduced in 2012 further reduced emissions in Hubei, while Liaoning achieved better emission reduction results after implementing the policy. However, while the economic development of Hubei Province improved following the policy's implementation, it did not bring similar benefits to the economic development of Liaoning Province.

Despite the existing literature on the relationship between financial development, economic growth, and carbon emissions, more studies need to focus on the role of Islamic finance in this context, particularly in Indonesia. Additionally, while previous research has examined the impact of government spending on emissions, studies have yet to consider the combined effect of Islamic finance development, GRDP, and government budget functions on carbon emissions at a regional level in Indonesia.

This research aims to fill this gap by analyzing the impact of Islamic finance development, GRDP, and government budget functions on carbon emissions in 30 provinces in Indonesia. This study is of significant importance as it provides a regional perspective, which is rarely explored in previous research, and expands the scope of variables by including both economic and environmental factors in the analysis. The findings of this research are expected to contribute significantly to the formulation of effective carbon emission reduction policies in Indonesia by leveraging the role of Islamic finance and government spending.

Literature Review

The Environmental Kuznets Curve (EKC) hypothesis has become an essential theoretical framework for analyzing the relationship between energy use, economic growth, and CO2 emissions. Developed by Grossman and Krueger (1995), this theory argues that environmental quality initially declines during the early stages of economic development, but after reaching a certain threshold point—a certain level of per capita income—environmental conditions begin to improve (Huang et al., 2021). The EKC hypothesis is better understood through three channels: scale, composition, and technical effects (Grossman & Krueger, 1991). The EKC reflects the conceptual relationship between environmental aspects and economic factors. However, while the EKC has been widely studied, it has also faced criticism for its applicability across different regions and time periods, as economic and environmental conditions vary significantly. For instance, Dkhili (2023) highlights that ecological damage measures tend to worsen with variable growth until real income passes a certain point in the development phase. This suggests that the EKC may not be universally applicable, especially in developing countries where economic growth continues to drive environmental degradation.

Financial development is another critical factor influencing economic growth and environmental outcomes. While well-developed financial markets and medium-sized financial institutions are often seen as drivers of economic efficiency and long-term growth (Levine, 1997), the impact of financial development on the environment is more complex. Ouyang and Li (2018) found that financial developments can sometimes hinder economic growth when measured by both individual and comprehensive indicators. Furthermore, financial developments influence environmental quality, particularly in the context of carbon emissions (Abid, 2017). This complexity highlights the need for more nuanced research that considers both financial development's positive and negative environmental consequences.

When discussing financial development, it is essential to include Islamic finance, which differs from conventional finance in its avoidance of interest, direct connection to the real sector, and principles of risk-sharing through rental and sales-based contracts (Beck et al., 2013; Iqbal & Mirakhor, 2011). However, despite its ethical foundation, Islamic finance has been critiqued for fully realizing its potential in practice. For example, Chong and Liu (2009) argue that equity-based financing, a unique feature of Islamic finance, remains underutilized. Azmat et al. (2015) also criticize the dominance of debt contracts in Islamic banking, which contradicts the risk-sharing principles that Islamic finance advocates. Despite these challenges, there has been some progress in adopting equity financing in countries like Indonesia, where Meslier et al. (2020) report that 30% of total Islamic bank financing is equity-based. This growing trend, while promising, still requires further examination to understand its long-term sustainability and impact on carbon emissions.

Government spending also plays a crucial role in managing emission levels effectively. However, the relationship between fiscal decentralization and environmental outcomes is more complex. Studies such as those by Adewuyi (2016), Cristóbal et al. (2021), and Di Tommaso et al. (2022) emphasize that by allocating resources for education, governments can indirectly promote emissions mitigation. Investments in technology can also foster the development of low-carbon technologies (Garrone & Grilli, 2010; Sun et al., 2023; Wei et al., 2023). Yet, López et al. (2011) and Zhang (2023) show that increased local fiscal autonomy can sometimes lead to higher emissions, as local governments may lack incentives to prioritize global public goods like emissions reduction. This suggests a potential conflict between local economic goals and global environmental responsibilities. Moreover, the political priorities of local officials, often

focused on short-term economic indicators, may further undermine long-term environmental goals (Tian et al., 2023).

Several previous studies have examined the relationship between Islamic finance, economic growth, and government budget functions in the context of carbon emissions. However, these studies often yield inconsistent results, highlighting the need for more critical evaluation and synthesis. For instance, Setiawati and Salsabila (2023) found that Islamic financial development, including the issuance of sukuk and total sharia compliance, negatively impacts CO2 emissions, while GDP per capita and industrial value-added increase emissions in OIC countries. Conversely, Iskandar et al. (2020) reported no short-term dynamic relationship between economic growth, Islamic financial development, and CO2 emissions, although they found a positive long-term relationship between Islamic finance and emissions in Indonesia's transportation sector. These conflicting findings underscore the complexity of the relationship between Islamic finance and environmental outcomes, necessitating further research to clarify these dynamics.

Notably, the impact of GRDP on carbon emissions is a topic of ongoing debate. Utomo and Putro (2022) discovered no significant effect of GRDP on carbon emissions on Java Island from 2012 to 2020. In contrast, Zulaicha et al. (2020) found a positive but insignificant relationship when using a broader sample from 1990 to 2018 in Indonesia. These conflicting findings underscore the complexity of the issue, suggesting that the effect of GRDP on emissions may be influenced by the region, timeframe, and economic context, thereby complicating the policy implications.

In the realm of Islamic finance, Mahmood and Masih (2019) uncovered a significant long-term relationship between the performance of Sharia Banks and CO2 emissions in OIC countries. Al-Silefanee et al. (2022) further noted that while financial market development generally increases CO2 emissions, the expansion of Islamic finance, measured by Islamic banks' total assets and efficiency, may lead to a nonlinear increase in emissions. However, this nonlinear relationship underscores the need for more targeted research to fully understand the potential of Islamic finance as a tool for environmental protection. Similarly, Al Fathan and Arundina (2019) argued that Islamic financial development and economic growth are mainly independent, a finding that complicates Islamic finance's narrative as a sustainable development driver.

The role of government spending in emissions management has also been critically examined. Yang et al. (2021) found that provincial policies in China aimed at reducing carbon emissions had mixed results: significant in Liaoning Province but not in Hubei Province. This variability in outcomes underscores the importance of regional implementation and local economic conditions in the effectiveness of government budget functions in reducing emissions. Mutiara et al. (2021) argued that the apparently substantial regional government budget allocations to achieve climate mitigation goals need more apparent outputs and outcomes that effectively address climate mitigation and carbon emission reduction.

In summary, while previous research has established a causal relationship between Islamic finance development, GRDP, and government budget functions on carbon emissions, the findings often need more consistency. This study seeks to address these gaps by testing the following hypotheses:
H1: *The development of Islamic finance is a game-changer, significantly affecting carbon emissions.*
H2: *GRDP has a significant effect on carbon emissions.*
H3: *The function of the government budget has a significant effect on carbon emissions.*

Research Methods

This research employs panel data analysis techniques, combining time series and cross-sectional data. Panel data allows for a more comprehensive analysis by capturing the dynamics over time and across different observational units, thus reducing issues related to omitted variables (Baltagi & Baltagi, 2008; Gujarati & Porter, 2004).

Panel data has several advantages, including accounting for heterogeneity across observational units, increased variability, reduced multicollinearity, and greater degrees of freedom, contributing to more robust and informative results. Additionally, panel data models can capture complex behavioural dynamics and identify effects that might not be observable through purely cross-sectional or time-series data (Baltagi & Baltagi, 2008).

One potential bias in this study arises from the inherent heterogeneity across the 30 provinces in Indonesia. Economic, social, and environmental conditions vary significantly across regions, which could influence the results. The Fixed Effects (FE) model minimises this bias, which controls for time-invariant characteristics by allowing for different intercepts for each province.

Another limitation is the potential for omitted variable bias, where relevant factors influencing CO2 emissions may not be included in the model. While panel data analysis reduces this risk by accounting for cross-sectional and temporal variations, it cannot eliminate the issue. To address this, the selection of variables was carefully considered, and only those with strong theoretical support and empirical backing were included.

The data used spans five years (2018-2022), which, although providing a decent timeframe, might not capture longer-term trends or cyclical economic patterns. The relatively short timeframe also introduces endogeneity issues if certain variables have a delayed effect on CO2 emissions. To mitigate these issues, lagged variables and robustness checks, such as testing for autocorrelation and multicollinearity, are used. The data for this study was sourced from reliable national databases, including the Indonesian Central Bureau of Statistics (BPS) and the Financial Services Authority (OJK). Data validation involved cross-checking figures with multiple sources where possible and conducting consistency checks for outliers or anomalies.

The decision to use a panel data model, specifically the Fixed Effects (FE) model, was driven by the need to account for unobserved heterogeneity across provinces. The FE model was chosen after conducting the Hausman test, which indicated that it was more appropriate than this dataset's Random Effects (RE) model. The Lagrange Multiplier test also confirmed that the FE model provided a better fit than the Common Effect (Pooled OLS) model.

This methodology aims to provide a more accurate and reliable analysis of the impact of Islamic finance development, GRDP, and government budget functions on carbon emissions across Indonesia by explicitly addressing potential biases and limitations, validating the data, and justifying the model selection.

Result and Discussion

This research intends to be a partial study of only some of the determining factors that cause increases and decreases in carbon emissions in Indonesia. Instead, it examines the nature and relationship between

the development of Islamic finance, the level of GRDP, and the function of the government budget on carbon emissions in Indonesia. It uses a panel data model to find out how the variables are related to provide answers to the increase or decrease in carbon emissions in Indonesia.

The data used in this research, spanning from 2018 to 2022, is derived from reputable sources. These include the Financial Services Authority, Central Statistics Agency, Directorate General of Fiscal Balance, and the Ministry of Environment and Forestry. The data is meticulously converted into variables for the purpose of this study, and the definitions, data used, and sources of these variables are thoroughly detailed.

Table 1. Variable Operational Summary

Variable	Definition	Source	Unit	Period
Carbon Emissions (CO2)	Emission levels from the energy, IPPU (industrial process and production use), Agriculture, Forestry and Waste sectors	Ministry of Environment and Forestry	GgCO2	2018-2022
Development of Sharia Finance (FNC)	Total financing from Sharia Commercial Banks and Sharia Business Units	Sharia Banking Statistics, Financial Services Authority	Rupiah	2018-2022
Economic Growth (GRDP)	The GDP growth rate of each province per capita	Central Statistics Agency	Percent	2018-2022
Environmental Budget (LKH)	The function of the regional government budget for the environment	DJPK, Ministry of Finance	Rupiah	2018-2022

Source: Processed by the author (2024)

The descriptive statistics for CO2, FNC, LKH, and GRDP from 2018 to 2022 reveal significant insights. The average CO2 emissions are 277,981.7 units, with a median of 13,559.91 units. The maximum emission recorded is 18,367,612 units, and the minimum is 45.4. The standard deviation of 1,957,297 units indicates substantial variability in CO2 emissions over the period. The FNC variable's average value is 12,997.41, with a median of 4,592.115. The maximum recorded value is 189,819.3, and the minimum is 185.3198, with a standard deviation of 29,423.97, showing high variability. The LKH variable has an average value of 2.17E+11, a median of 4.41E+10, a maximum of 5.05E+12, and a minimum of 2.70E+08. The standard deviation is 6.98E+11, indicating substantial variability. The GRDP variable shows an average value of 3.522550, a median of 4.61, a maximum of 15.17, and a minimum of -15.72, with a standard deviation of 3.759306, suggesting considerable variability in GRDP values. Each variable comprises 150 observations, providing a robust dataset for analysis.

Table 2. Description Statistics CO2, FNC, LKH, GRDP variables 2018-2022

	CO2	FNC	LKH	GRDP	Obs
Mean	277981.7	12997.41	2.17E+11	3.522550	150
Median	13559.91	4592.115	4.41E+10	4.610000	150
Maximum	18367612	189819.3	5.05E+12	15.17000	150
Minimum	45.40000	185.3198	2.70E+08	-15.72000	150
Std. Dev.	1957297.	29423.97	6.98E+11	3.759306	150

Source: Data processed with Eviews 10

The Chaw test results show that the probability is <0.05, and then in the Hausman test, the probability value is 0.0103 or <0.05, which means that the best model used in this research is the Fixed Effet Model (FEM). There is no need to carry out the Lagrange Multiplier test (Napitupulu et al., 2021).

Table 3. Chow Test Results

Effects Test	Statistics	df	Prob.
Cross-section F	11.646831	(29,117)	0.0000
Chi-square cross-section	203.638757	29	0.0000

Source: Data processed with Eviews 10

After determining the model, the classic assumption test is continued with the classic assumption test, which consists of a normality test, multicollinearity test, and heteroscedasticity test. The normality test can be ignored because the data of 150 samples already meets the minimum sample requirements in the Central Limit Theorem (CLT), namely 30 samples. Thus, the distribution of the sample mean approaches a normal distribution so that the normality test can be ignored (Kwak & Kim, 2017).

Table 4. Hausman Test Results

Test Summary	Chi-Sq. Statistics	Chi-Sq. df	Prob.
Random cross-section	11.271168	3	0.0103

Source: Data processed with Eviews 10

Based on the multicollinearity test that has been carried out, the correlation coefficient between variables between CO2 and FNC is 0.31, CO2 and LKH is 0.06, FNC and LKH is 0.47, and LKH and GRDP is 0.05. The correlation coefficient between variables is <0.85. So, it can be concluded that all variables are accessible from multicollinearity or have passed the multicollinearity test (Napitupulu et al., 2021).

Table 5. Multicollinearity Test

	CO2	FNC	LKH	GRDP
CO2	1,000000	0.317732	0.061939	-0.003063
FNC	0.317732	1,000000	0.470616	-0.039863
LKH	0.061939	0.470616	1,000000	0.050428
GRDP	-0.003063	-0.039863	0.050428	1,000000

Source: Data processed with Eviews 10

After carrying out the multicollinearity test, continue with the heteroscedasticity test. Based on the heteroscedasticity test, it produces a probability number >0.05 for all variables. So, it can be concluded that all variables are accessible from heteroscedasticity (Napitupulu et al., 2021).

Table 6. Heteroscedasticity Test

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	-4.096183	2.020556	-2.027256	0.0449
FNC	0.487222	0.262529	1.855879	0.0660
LKH	0.026780	0.048199	0.555606	0.5795
GRDP	0.018338	0.014862	1.233934	0.2197

Source: Data processed with Eviews 10

Panel Data Regression Equation
Substituted Coefficients:
CO2 = 21.9512114148 – 1.17657663109*FNC – 0.111954530935*LKH + 0.00063897055883*GRDP + [CX=F]
The explanation is as follows:

a. The constant value is 21.95, meaning that without the FNC, LKH, and GRDP variables, the CO2 variable will increase by 21.95 %
b. The FNC variable, with a beta coefficient value of -1.17, plays a pivotal role in our panel data regression equation. If the other variables remain constant and the FNC variable increases by 1%, the CO2 variable will decrease by 117%. Conversely, a 1% decrease in the FNC variable will lead to a 117% increase in CO2 emissions.
c. The LKH variable, with a beta coefficient value of -0.11, is another key player in our panel data regression equation. If the other variables are constant and the LKH variable increases by 1%, the CO2 variable will decrease by 11%. Similarly, a 1% decrease in the LKH variable will result in an 11% increase in CO2 emissions.
d. The beta coefficient value of the GRDP variable is 0.0006. If the other variables are constant and the GRDP variable increases by 1%, then the CO2 variable will increase by 0.06%. Vice versa, if the values of other variables are constant and the GRDP variable decreases by 1%, then the CO2 variable will decrease by 0.06%.Using panel data fixed effect model analysis, regression results were obtained for 30 provinces for five years from 2018-2022. The level of CO2 carbon emissions is used as an endogenous variable in this study with the following results:

Table 7. Panel Data Regression Test

Variables	Coefficient	Std. Error	t-Statistics	Prob.
C	21.95121	3.732419	5.881229	0.0000
FNC	-1.176577	0.484949	-2.426184	0.0168
LKH	-0.111955	0.089034	-1.257435	0.2111
GRDP	0.000639	0.027453	0.023275	0.9815

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.771307	Mean dependent var	9.407205
Adjusted R-squared	0.708759	SD dependent var	2.173262
SE of regression	1.172839	Akaike info criterion	3.348270
Sum squared resid	160.9394	Schwarz criterion	4.010609
Log likelihood	-218.1202	Hannan-Quinn Criter.	3.617357
F-statistic	12.33137	Durbin-Watson stat	1.786363
Prob(F-statistic)	0.000000		

Source: Data processed with Eviews 10

Based on Table 7, the coefficient of determination R or R-square in this study is 0.7087. So, it can be concluded that the FNC, LKH, and GRDP variables can explain 70.87% of the variation in the endogenous variable, namely the level of carbon emissions in provinces in Indonesia in 2018-2022, through this regression model. Meanwhile, 29.13% is explained by other variables not explained in this study.

The panel data regression results of this study revealed a significant finding: the variable Islamic financial development (FNC), represented by financing from Sharia banks and Sharia business units in Indonesia, exhibited a substantial negative relationship with carbon emissions in the provinces. This relationship, supported by a probability value of 0.01 (<0.05) and a coefficient of -1.176577, suggests that the advancement of Islamic finance is linked to a reduction in carbon emissions. This discovery, in line with the research of Mahmood and Masih (2019) and Setiawati and Salsabila (2023), which also reported a negative and significant relationship between Islamic financial development and carbon emissions, confirms the acceptance of H1.

The negative relationship uncovered in this study implies that the more financing Islamic banks provide, the lower the level of carbon emissions. This suggests a positive environmental impact of Islamic bank financing activities, where Islamic banks are inclined to support projects or economic activities that are environmentally friendly or have a lower carbon footprint. For instance, data from BSI (2022) demonstrate an increase in green financing activities by Sharia banks, with financing rising from IDR 46,157.95 billion in 2021 to IDR 51,150.26 billion in 2022. This trend offers hope for a future where financial institutions actively contribute to environmental sustainability.

Several factors might explain this relationship. First, Islamic financial principles, which avoid interest and emphasize risk-sharing, may encourage investments in more sustainable and environmentally friendly projects (Zulhikam et al., 2024). Islamic finance tends to avoid industries that are environmentally damaging or conflict with Sharia principles (Haerunnisa et al., 2023), potentially reducing investment in high-carbon sectors. This suggests that Islamic finance could play a crucial role in promoting sustainability by directing funds toward green projects, inspiring a future where finance and sustainability go hand in hand.

Furthermore, regulations such as the OJK's POJK No. 51/POJK.03/2017 on Sustainable Business Criteria and Categories (KKUB) reinforce this trend. BSI, one of Indonesia's largest Sharia banks, adheres to these guidelines by incorporating green financing criteria when evaluating potential financing projects. These criteria include compliance with environmental impact analysis and regulatory standards, which likely contribute to the observed reduction in carbon emissions.

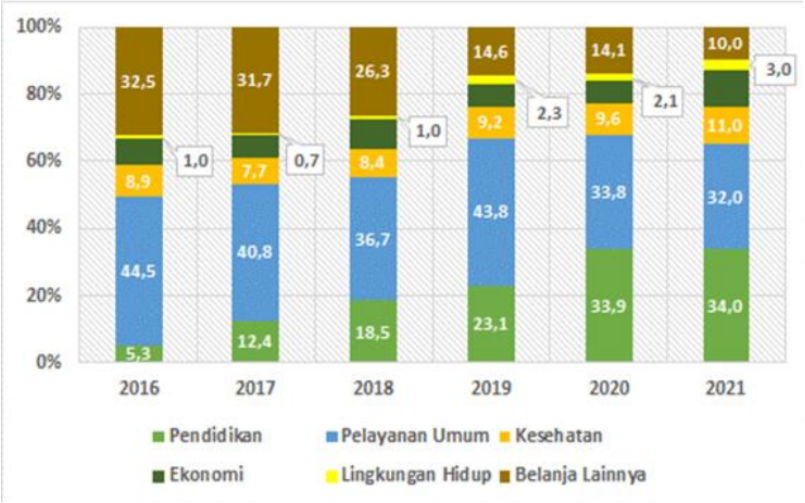
On the other hand, the government budget function variable (LKH) did not show a significant relationship with carbon emissions in Indonesia, as indicated by a probability value of 0.21 (>0.05). Therefore, H2 is rejected. This finding is consistent with the study by Yang et al. (2021), which found that government spending did not significantly impact carbon emissions. Several factors could explain this outcome in the Indonesian context.

First, the allocation for environmental budgets in the Regional Medium Term Development Plan (RPJMD) remains minimal compared to other expenditure areas, limiting the funding for environmentally oriented programs and climate change mitigation efforts. This underfunding hampers regional governments' capacity to address pressing environmental issues such as droughts, floods, and coastal erosion, which directly affect communities.

Additionally, the COVID-19 pandemic significantly impacted budget allocations, with funds being reallocated to health and economic recovery efforts at the expense of environmental programs. This reallocation likely further diminished the effectiveness of government spending on reducing carbon emissions. The limited availability of public funding and loans for environmental projects also reflects a

broader issue of the perceived low profitability of such investments despite their substantial social and economic benefits (BKSJ DPR RI, 2022).

Figure 1.
Expenditure Allocation in the 2016-2021 Regional Government Budget (APBD)



Source: Ministry of Finance, 2021

Figure 1 illustrates the expenditure allocation in the 2016-2021 Regional Government Budget (APBD), highlighting the relatively low prioritization of environmental spending.

Finally, the variable representing economic growth (GRDP) on carbon emissions produced a coefficient of 0.000639 and a probability of 0.98 (>0.05), indicating a positive but insignificant relationship with carbon emissions. Therefore, H3 is rejected. This finding aligns with studies by Utomo and Putro (2022) and Zulaicha et al. (2020), which found no significant impact of GRDP on carbon emissions. Although the relationship is positive, the magnitude is minimal, reflecting the specific economic context of Indonesia.

One possible explanation is the increasing diversification of the Indonesian economy, with growth occurring in sectors with a lower impact on carbon emissions, such as agriculture and services. For instance, information and communication services grew by 7.7% annually, driven by digitalization, while financial and insurance services grew by 1.9%, transportation and warehousing services by 17%, and corporate services by 10.4% (Bappenas, 2023). These sectors are less carbon-intensive than traditional industries, which explains the minimal impact of GRDP on emissions.

Moreover, the COVID-19 pandemic in 2020 led to a significant reduction in economic activities due to lockdown policies, temporarily decreasing high-emission activities. The Indonesian government has also been implementing robust policies aimed at promoting renewable energy, regulating industrial emissions, and supporting conservation programs (BKSJ DPR RI, 2022). These initiatives have effectively mitigated the potential impact of economic growth on carbon emissions, instilling confidence in the role of targeted environmental policies.

In conclusion, while Islamic financial development emerges as a beacon of hope, showing a significant positive impact on reducing carbon emissions, government spending and economic growth did not show

a significant effect. These results underscore the importance of targeted and effective environmental policies and the promising role of Islamic finance in supporting sustainable development.

Conclusion

This study finds that Islamic banking financing in Indonesia significantly negatively impacts carbon emissions, suggesting that Islamic finance can play a crucial role in promoting environmentally friendly investments. However, the regional government budget function does not significantly influence carbon emissions, likely due to centralized budget control and underutilization at the regional level. Economic growth, measured by GRDP, shows a positive but insignificant relationship with carbon emissions, possibly influenced by economic diversification, the COVID-19 pandemic, and government policies on renewable energy.

From a theoretical perspective, this research enhances our understanding of the role of Islamic finance in environmental sustainability. More importantly, it underscores the urgent need for better integration between central and regional government efforts in budget allocation to achieve emission reduction targets.

A broader analysis of Islamic finance, including sectors like the Sharia capital market and insurance, is recommended for future research. Additionally, expanding the scope of budget functions to include education, social services, and technology could provide a more comprehensive view of their impact on carbon emissions.

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