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THE IMPACT OF ENVIRONMENTAL MANAGEMENT ACCOUNTING, GREEN INVESTMENT, AND ESG DISCLOSURE ON FIRM VALUE: AN EMPIRICAL STUDY OF THE ENERGY SECTOR ON THE INDONESIA STOCK EXCHANGE 2020-2024 PERIOD

Disya Yuke Farhana[1], Mukhzarudfa[2], Ratih Kusumastuti[3], Wiwik Tiswiyanti[4]
[1.2.3.4]Master of Accounting, Universitas Jambi, Indonesia
Corresponding Author:
disyayukef@gmial.com

Abstract
This study examines the impact of Environmental Management Accounting (EMA), Green Investment (GI), and ESG Disclosure on firm value (Tobin's Q) among 16 energy sector companies listed on the Indonesia Stock Exchange (IDX) from 2020-2024. Using a quantitative approach and multiple linear regression, the study analyzed 80 observations selected through purposive sampling. The results indicate that the model significantly explains 66.4% of the variation in firm value (Adjusted $R^2 = 0.664$). In partial analysis, only EMA was found to have a significant positive effect on firm value ($\beta = 0.997$; $t = 12.482$; $p < 0.001$). Conversely, Green Investment ($\beta = 0.128$; $t = 1.506$; $p = 0.136$) and ESG Disclosure ($\beta = -0.022$; $t = -0.632$; $p = 0.529$) showed no significant impact. These findings suggest that the systematic internalization of environmental costs through EMA is a key driver of market perception in Indonesia's energy sector. Consequently, firms and regulators should prioritize the depth of internal environmental management practices over mere formal disclosure to effectively enhance investor confidence and corporate value.

Keywords: Environmental Management Accounting, Green Investment, ESG Disclosure, Firm Value.

1. Introduction

Global pressure toward economic decarbonization has intensified following the ratification of the Paris Agreement (2015) and the accelerating net-zero emission commitments reached at COP26 and COP28. Amid this dynamic, the energy sector as the world's largest contributor to greenhouse gas emissions faces a dual challenge: the imperative to transition toward clean energy and the capital market's expectation of sustainable financial performance (IEA, 2023). Indonesia, a country whose energy mix remains dominated by coal (approximately 61.8% in 2023), is particularly vulnerable to regulatory shifts, stranded asset risks, and the recompositing of global investor portfolios toward ESG-oriented assets (IESR, 2023; PLN, 2023).

Data from the Indonesia Stock Exchange (IDX) indicate that the IDX ESG Leaders Index grew by 34.2% over the past three years (2021-2024), far surpassing the 18.7% growth of the Composite Stock Price Index (IHSG) during the same period. This phenomenon reflects a shift in preferences among global institutional investors toward companies with strong environmental, social, and governance frameworks (Friede et al., 2015). Nevertheless, Indonesia's energy sector exhibits a paradox: despite mounting ESG pressure, firm value measured by Tobin's Q has remained relatively stagnant at around 0.75-0.85 throughout 2020-2024, indicating a disconnect between communicated sustainability practices and the market's perception of companies' intrinsic value.

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Three sustainability practices that have attracted increasing academic and practitioner attention are Environmental Management Accounting (EMA), Green Investment (GI), and ESG Disclosure. EMA refers to an accounting system that specifically identifies, measures, and manages environmental costs and benefits in managerial decision-making (Burritt et al., 2002). Green Investment is defined as the allocation of capital expenditure toward investments that contribute to energy efficiency, renewable energy, and low-carbon technologies (Zhou et al., 2022). ESG Disclosure, meanwhile, refers to structured reporting of a company's environmental, social, and governance performance to its stakeholders, increasingly conducted using the Global Reporting Initiative (GRI) standards (Gillan et al., 2021).

Although each of these three practices has been studied extensively in isolation, several research gaps remain. First, the majority of EMA-related studies have been conducted in developed countries (Europe, Australia) with distinct regulatory contexts and institutional capacities (Qian & Burritt, 2008; Ferreira et al., 2010), making it difficult to directly generalize their findings to emerging markets such as Indonesia. Second, studies that simultaneously integrate all three variables EMA, GI, and ESG within a single model remain limited, despite the fact that these practices interact with and complement one another in shaping investor perceptions of firm value. Third, empirical research on Indonesia's energy sector in the post-pandemic period (2020-2024), which encompasses economic recovery dynamics, energy transition pressures, and the strengthening of OJK Regulation No. 51/POJK.03/2017 on the implementation of sustainable finance, remains scarce. Fourth, most existing studies employ general CSR disclosure proxies rather than more precise, internationally comparable GRI-based ESG indices.

Based on the identification of these research gaps, this study aims to: (1) analyze the effect of EMA on firm value in the IDX energy sector during 2020-2024; (2) analyze the effect of Green Investment on firm value; (3) analyze the effect of ESG Disclosure on firm value; and (4) analyze the simultaneous effect of EMA, Green Investment, and ESG Disclosure on firm value. This study contributes to the environmental accounting literature by providing empirical evidence in the context of an emerging capital market in the post-pandemic era, using a more comprehensive measurement framework compared to prior studies.

2. Theoretical Background

2.1 Legitimacy Theory

Legitimacy Theory, as developed by Suchman (1995), posits that organizations continuously strive to ensure that their operations are perceived as legitimate by society and surrounding stakeholders. Deegan (2002) asserts that companies use social and environmental disclosures as instruments to acquire, maintain, and restore legitimacy. In the context of this study, energy companies that adopt EMA, undertake green investments, and comprehensively disclose ESG performance signal to the public that their operations align with prevailing environmental norms, thereby strengthening their legitimacy and ultimately enhancing firm value (Deegan, 2002).

2.2 Stakeholder Theory

Freeman (1984) defines stakeholders as groups or individuals who can affect or are affected by the achievement of an organization's objectives. Stakeholder Theory predicts that companies that proactively manage the expectations of diverse stakeholder groups including investors, regulators, communities, and employees will achieve a stronger

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competitive position and greater long-term value (Harrison & Wicks, 2013). Comprehensive ESG Disclosure serves as the primary mechanism for communicating a company's responsiveness to stakeholder expectations (Gillan et al., 2021).

2.3 Signaling Theory

Spence (1973) laid the foundation for Signaling Theory, which explains how parties possessing superior information transmit signals to parties with more limited information in order to reduce information asymmetry. In the context of capital markets, Cho et al. (2013) argue that standardized EMA practices, measurable green investment allocation, and transparent ESG Disclosure function as quality signals to investors, reducing valuation uncertainty and potentially driving up share prices and firm value.

2.4 Environmental Management Accounting (EMA) and Firm Value

Environmental Management Accounting (EMA) is defined as the identification, collection, estimation, analysis, internal reporting, and use of information relating to environmental material and monetary flows (United Nations Division for Sustainable Development, 2001). Burritt et al. (2002) developed a comprehensive framework that distinguishes EMA along two dimensions: Monetary Environmental Management Accounting (MEMA), encompassing waste treatment costs, pollution fines, and remediation expenses; and Physical Environmental Management Accounting (PEMA), covering the measurement of energy and water consumption and greenhouse gas emissions.

Several empirical studies have identified a positive relationship between EMA adoption and corporate financial performance. Ferreira et al. (2010) found that companies integrating EMA into their innovation processes exhibit superior financial performance. Pondeville et al. (2013), in a study of European companies, demonstrated that institutional pressures drive EMA implementation, which in turn contributes to cost efficiency and firm value enhancement. In the Indonesian context, Purnama (2022) found that ECDI-based environmental cost disclosure correlates positively with Tobin's Q among manufacturing firms, consistent with the predictions of Legitimacy Theory. These findings support the argument that standardized EMA reduces information asymmetry regarding a company's environmental risk exposure.

H1: Environmental Management Accounting has a significant positive effect on firm value.

2.6 Green Investment (GI) and Firm Value

Green Investment (GI) refers to the allocation of capital expenditure toward renewable energy, energy efficiency, waste management, and low-carbon technologies (OECD, 2020). Zhou et al. (2022) define GI as the ratio of total green investment to total capital expenditure (CapEx), reflecting a company's genuine financial commitment to environmental sustainability, beyond mere disclosure rhetoric.

The relationship between GI and firm value is context-dependent. In developed markets, Wang et al. (2021) found that GI enhances firm value through reduced regulatory risk and improved long-term operational efficiency. In emerging markets, however, findings are more mixed. He et al. (2023) shows that GI positively impacts firm value only when supported by adequate fiscal incentive policies and a well-established carbon market infrastructure condition that have not yet been fully met in Indonesia. Zhang (2022) argues that in developing countries, GI often has lengthy payback periods and

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lacks independent certification, making it difficult for investors to distinguish genuine green investment from greenwashing, resulting in insignificant value premiums.

H2: Green Investment has a significant positive effect on firm value.

2.7 ESG Disclosure and Firm Value

ESG Disclosure is the reporting practice through which companies communicate their environmental, social, and governance performance to stakeholders (Li et al., 2021). The Global Reporting Initiative (GRI) provides the most widely adopted global disclosure standards, covering material topics ranging from emissions (GRI 305) and energy (GRI 302) to anti-corruption (GRI 205) and employment (GRI 401).

Friede et al. (2015), in a meta-analysis of over 2,000 empirical studies, found that approximately 90% of research shows a non-negative relationship between ESG performance and corporate financial performance, with a predominantly positive direction. At the individual company level, Chen & Xie (2022) found that ESG Disclosure quality significantly enhances company valuation, particularly amid the growing prevalence of ESG-oriented investors. Shakil (2021) adds that strong ESG practices reduce financial risk and enhance investor confidence.

However, some research reveals different outcomes in emerging market contexts. García et al. (2017) found that the value benefits of ESG Disclosure are more limited when weak law enforcement mechanisms prevent investors from verifying the accuracy of disclosures. Zhou et al. (2022) also caution that high disclosure volume without adequate quality can generate ambiguous signals for investors.

H3: ESG Disclosure has a significant positive effect on firm value.

3. Methods

3.1 Research Design and Population

This study employs a quantitative approach with a longitudinal panel data design. The research population consists of all companies in the energy sector listed on the Indonesia Stock Exchange (IDX) during the 2020-2024 period, totaling 93 companies based on the IDX Energy Sector classification. Samples were selected using purposive sampling with the following criteria: (1) consistently listed on the IDX throughout 2020-2024; (2) published annual reports and sustainability reports each year during the study period; (3) used GRI Version 4 (GRI Standards) for reporting, enabling consistent and comparable ESG index measurement; and (4) possessed complete financial data required for the computation of research variables. The final sample comprised 16 companies, yielding 80 firm-year observations (16 companies × 5 years).

3.2 Operational Definitions and Variable Measurement

3.2.1 Dependent Variable: Firm Value (Tobin's Q)

Firm value is proxied by Tobin's Q ratio, which measures a company's market value relative to the book value of its assets. Tobin's Q was selected because it reflects the market's forward-looking expectations regarding a company's intrinsic value, rather than being limited to historical performance (Tobin, 1969). The formula used is:

Tobin's Q = (Market Value of Equity + Total Debt) ÷ Total Assets

The market value of equity is obtained by multiplying the year-end closing share price by the number of shares outstanding. For companies with shares denominated in foreign currencies, conversion is performed using the Bank Indonesia mid-rate as of the balance sheet date.

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3.2.2 Independent Variable 1: Environmental Management Accounting (EMA)

EMA is measured using the Environmental Cost Disclosure Index (ECDI), developed based on the Burritt et al. (2002) framework and the adaptation by Ferreira et al. (2010). The ECDI is a dichotomous index comprising seven disclosure indicators: (1) disclosure of waste and emissions management costs; (2) environmental prevention and protection costs; (3) environmental research and development (R&D) costs; (4) environmental pollution fines and penalties; (5) ISO 14001 certification or equivalent environmental management standard; (6) low-carbon technology investment; and (7) land reclamation/restoration costs for mining operations. Each indicator disclosed in the annual report is scored 1 (disclosed) and 0 (not disclosed). The formula is:

$$ECDI\ (X1) = \Sigma\ Disclosed\ Item\ Scores \div 7$$

ECDI values range from 0 (no disclosure) to 1 (full disclosure).

3.2.3 Independent Variable 2: Green Investment (GI)

Green Investment is measured using the Green Investment Ratio (GIR), defined as the ratio of total green investment to total capital expenditure (CapEx) in a given fiscal period. Green investment encompasses expenditures on renewable energy (EBT), energy efficiency, and the procurement of environmentally friendly equipment, as reported in the annual report or sustainability report (Zhou et al., 2022). The formula is:

$$GIR\ (X2) = Total\ Green\ Investment \div Total\ Capital\ Expenditure$$

3.2.4 Independent Variable 3: ESG Disclosure Index

ESG Disclosure is measured using a GRI Standards-based index encompassing 97 disclosure items from nine thematic GRI standards relevant to the energy sector: GRI 302 (Energy), GRI 303 (Water), GRI 305 (Emissions), GRI 306 (Waste), GRI 401 (Employment), GRI 403 (Occupational Health and Safety), GRI 404 (Training and Education), GRI 102 (General Disclosures/Governance), and GRI 205 (Anti-corruption). Each disclosed item is scored 1, and each undisclosed item is scored 0. The formula is:

$$ESG\ Index\ (X3) = \Sigma\ Disclosed\ GRI\ Items \div 97$$

3.3 Data Analysis Technique

Data analysis employs multiple linear regression with the following equation:

$$Y = \alpha + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \varepsilon$$

Where Y is Tobin's Q, α is the constant, β_1–β_3 are regression coefficients, X1–X3 are independent variables, and ε is the error term. Prior to hypothesis testing, classical assumption tests were conducted, including: (1) normality testing using the Kolmogorov-Smirnov test; (2) multicollinearity testing using the Variance Inflation Factor (VIF); (3) heteroscedasticity testing using the Glejser test; and (4) autocorrelation testing using the Durbin-Watson statistic. All analyses were performed using SPSS version 26.

4. Results and Discussion

4.1 Descriptive Statistics

Table 1 presents the descriptive statistics for all research variables based on 80 firm-year observations from 16 energy companies over the period 2020-2024.

Table 1. Descriptive Statistics of Research Variables

Variable	N	Minimum	Maximum	Mean	Std. Deviation
X1 – EMA	80	0.43	0.86	0.6783	0.1053

DOI: https://doi.org/10.61990/ijeelsc.v2i2.36 e-ISSN 3123-6383

Variable	N	Minimum	Maximum	Mean	Std. Deviation
X2 – Green Investment	80	0.02	0.36	0.2003	0.0979
X3 – ESG Disclosure	80	0.25	1.00	0.6766	0.2432
Y – Tobin's Q	80	0.44	1.00	0.7529	0.1279

Source: Processed data (2026)

The EMA variable (X1) shows a mean value of 0.678 (range: 0.43-0.86), indicating that energy companies in the sample had, on average, disclosed approximately 67.8% of the seven EMA indicators measured. The relatively wide range (max-min = 0.43) signals significant disparity in the depth of EMA practices across companies. The Green Investment variable (X2) has a mean of 0.200 with a standard deviation of 0.098, suggesting that approximately 20% of total company capital expenditure was directed toward green investment a relatively low figure given the ongoing energy transition pressures. The ESG Disclosure variable (X3) has a mean of 0.677 with a very wide range (0.25-1.00), reflecting high heterogeneity in ESG disclosure practices among the sample companies. The dependent variable Tobin's Q (Y) has a mean of 0.753, which generally falls below 1, indicating that the average market value of Indonesian energy companies remains below the book value of their assets a common phenomenon in asset-intensive, high-risk sectors.

4.2 Classical Assumption Test Results

Table 2. Normality Test Results

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		80
Normal Parameters a,b	Mean	0.0000000
	Std. Deviation	0.07270852
Most Extreme Differences	Absolute	0.073
	Positive	0.073
	Negative	-0.056
Test Statistic		0.073
Asymp. Sig. (2-tailed)c		. 200d

a. Test distribution is Normal. b. Calculated from data. c. Lilliefors Significance Correction. d. Lower bound of the true significance.

Source: SPSS 26 output, processed data (2026)

The Kolmogorov-Smirnov normality test yielded an Asymptotic Significance (2-tailed) of 0.200 (> 0.05), indicating that model residuals follow a normal distribution.

Table 3. Multicollinearity Test Results

Model		Collinearity Statistics	
		Tolerance	VIF
1	(Constant)		
	X1 Environmental Management Accounting (EMA)	0.983	1.017
	X2 Green Investment (GIR)	1.000	1.000
	X3 ESG Disclosure Index (GRI-Based)	0.983	1.017

Source: SPSS 26 output, processed data (2026)

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The multicollinearity test shows that all independent variables have Tolerance values above 0.10 and VIF values below 10 (highest VIF: 1.017 for X1 and X3), confirming that multicollinearity is not a concern.

Table 4. Heteroscedasticity Test Results (Glejser Test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.047	0.033		1.417	0.161
	X1 Environmental Management Accounting (EMA)	0.001	0.044	0.003	0.030	0.976
	X2 Green Investment (GIR)	0.014	0.047	0.033	0.291	0.772
	X3 ESG Disclosure Index (GRI-Based)	0.014	0.019	0.084	0.729	0.468

Source: SPSS 26 output, processed data (2026)

The Glejser test for heteroscedasticity produced significance values well above 0.05 for all variables (X1: 0.976; X2: 0.772; X3: 0.468), confirming homoscedasticity of error variance.

Table 5. Autocorrelation Test Results (Durbin-Watson)

Model	Durbin-Watson
1	1.873

Source: SPSS 26 output, processed data (2026)

The Durbin-Watson test yielded a value of 1.873, which falls within the safe zone (1.5-2.5), indicating the absence of serial autocorrelation in the model residuals.

4.3 Multiple Linear Regression Analysis Results

Table 6. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.823 a	0.677	0.664	0.07413

a. Predictors: (Constant), X3 ESG Disclosure Index (GRI-Based), X2 Green Investment (GIR), X1 Environmental Management Accounting (EMA). b. Dependent Variable: Y Tobin's Q

Source: SPSS 26 output, processed data (2026)

The Adjusted R Square value of 0.664 indicates that EMA, Green Investment, and ESG Disclosure collectively explain 66.4% of the variation in Tobin's Q. The remaining 33.6% is attributed to other variables outside the model.

Table 7. Simultaneous Test Results / Model Fit Test (F-Test)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.875	3	0.292	53.061	.000 b
	Residual	0.418	76	0.005		
	Total	1.292	79			

Source: SPSS 26 output, processed data (2026)

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The ANOVA table yields an F-statistic of 53.061 with a significance level (Sig.) of 0.000. Since the significance value is well below 0.05, it can be concluded that Environmental Management Accounting (X1), Green Investment (X2), and ESG Disclosure Index (X3) simultaneously have a significant effect on Tobin's Q (Y). This demonstrates that the regression model is fit for predicting firm value, possessing strong explanatory power (Hair et al., 2014).

Table 8. Partial Test Results (t-Test)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.066	0.059		1.105	0.273
	X1 Environmental Management Accounting (EMA)	0.997	0.080	0.821	12.482	0.000
	X2 Green Investment (GIR)	0.128	0.085	0.098	1.506	0.136
	X3 ESG Disclosure Index (GRI-Based)	-0.022	0.035	-0.042	-0.632	0.529
a. Dependent Variable: Y Tobin's Q						

Source: SPSS 26 output, processed data (2026)

Based on the Coefficients table, Environmental Management Accounting (X1) has a significance value of 0.000, indicating that this variable has a significant positive partial effect on Tobin's Q. In contrast, Green Investment (X2) with a significance of 0.136 and ESG Disclosure (X3) with a significance of 0.529 both exceed the 0.05 threshold, indicating no significant partial effect on Tobin's Q. The resulting regression equation is:

$$Y = 0.066 + 0.997X1 + 0.128X2 - 0.022X3 + 0.07413$$

For every one-unit increase in Environmental Management Accounting, Tobin's Q increases by 0.997 units. The error value of 0.07413 represents the average deviation between the predicted and actual values in the model.

4.4 Hypothesis Testing and Discussion

4.4.1 Effect of EMA on Firm Value (H1)

The t-test results show that EMA has a significant positive effect on firm value, with a coefficient $\beta = 0.997$ ($t = 12.482$; $p = 0.000 < 0.05$). Accordingly, H1 is supported. The coefficient value of approximately 1 implies a nearly proportional relationship: each one-unit increase in ECDI score is associated with a 0.997-unit increase in Tobin's Q, ceteris paribus.

This finding is consistent with the predictions of Legitimacy Theory and Signaling Theory. Companies that systematically disclose environmental costs, obtain ISO 14001 certification, and manage mine restoration programs send credible management quality signals to the capital market. Investors interpret ECDI completeness as evidence that companies proactively internalize environmental externalities, thereby reducing future regulatory and litigation risks risks that are particularly material in natural resource-based energy sectors (Deegan, 2002; Cho et al., 2013).

These results align with Ferreira et al. (2010), who found that integrating EMA into innovation processes positively correlates with financial performance, and with Purnama

(2022), who identified a positive relationship between EMA and Tobin's Q among Indonesian manufacturing firms. Distinct from the manufacturing sector, the adoption of EMA in the energy sector also functions as an operational risk management mechanism, given the sector's greater exposure to emissions regulation changes and social pressure from local communities. Al-Tuwaijri et al. (2004) previously demonstrated that comprehensive environmental disclosure simultaneously correlates with better environmental performance and higher economic performance findings now confirmed in the Indonesian context. From a managerial perspective, this implies that investment in a comprehensive EMA system is not merely a compliance cost, but an investment in legitimacy and risk reduction that ultimately creates shareholder value.

4.4.2 Effect of Green Investment on Firm Value (H2)

Green Investment shows a positive coefficient $\beta = 0.128$ ($t = 1.506$; $p = 0.136 > 0.05$), and H2 is therefore rejected. GI does not have a statistically significant effect on Tobin's Q, although the directional sign is positive as predicted.

This non-significance can be explained through several mechanisms. First, green investments in Indonesia's energy sector are typically long-term in nature, with gestation periods of 5-15 years for renewable energy projects, meaning their economic benefits cannot be fully captured or observed by the market within the five-year research horizon (He et al., 2023). Second, Indonesia lacks a standardized and independent green investment certification mechanism equivalent to the Green Bond Principles or the EU's well-established green taxonomy. Investors therefore face difficulty verifying the authenticity of companies' green investment claims a condition Zhang (2022) identifies as a key barrier to the formation of value premiums for GI in emerging markets.

Third, the average GIR in this sample is only 20.0%, with a standard deviation of 9.8%. This relatively small volume may be insufficient to generate a material differentiation in the perception of institutional investors. Wang et al. (2021) found that the positive effect of GI on firm value only becomes significant when GIR exceeds a certain threshold approximately 25-30% in the context of Chinese energy companies.

This finding is consistent with Li et al. (2021), who concluded that in emerging markets, the effect of GI on firm value remains inconsistent and highly dependent on a country's institutional capacity and the maturity of its domestic carbon market. Therefore, the accelerated implementation of Indonesia's Sustainable Finance Taxonomy (TKHI) by the Financial Services Authority (OJK), which is still in the implementation phase, is a critical factor that must be resolved before the benefits of GI can be fully realized.

4.4.3 Effect of ESG Disclosure on Firm Value (H3)

ESG Disclosure does not significantly affect firm value ($\beta = -0.022$; $t = -0.632$; $p = 0.529 > 0.05$), and H3 is therefore rejected. The negative direction of the coefficient albeit statistically insignificant warrants deeper explanation.

The non-significance of ESG Disclosure in this study can be associated with several phenomena documented in the literature. First, there is potential information overload: Indonesian energy companies tend to disclose large volumes of ESG information (averaging 67.7% of 97 GRI items) that may not necessarily meet high standards of accessibility, third-party verification, and material relevance. Cao et al. (2022) demonstrate that disclosure quantity does not always correlate with the quality of information demanded by investors.

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Second, the institutional framework for interpreting and acting upon ESG Disclosure in Indonesia remains underdeveloped. Independent ESG rating mechanisms are not yet widespread, and a large portion of domestic retail investors who dominate IDX trading do not yet consider ESG as a primary investment criterion (Shakil, 2021). Unlike European markets, where mandatory ESG disclosure has created a more efficient information market, in Indonesia voluntary disclosure tends to generate more ambiguous signals.

Third, the negative direction of the coefficient though insignificant may reflect a cost hypothesis: companies that disclose a greater number of ESG items incur higher expenditures on reporting, auditing, and stakeholder management processes, which in the short term may compress profitability without a proportionate increase in market value (García et al., 2017). Friede et al. (2015), while finding an aggregate positive relationship, also note that in specific contexts particularly extractive industries in emerging markets the ESG-value relationship may be weaker or even negative.

5. Conclusion

This study analyzed the effects of Environmental Management Accounting (EMA), Green Investment (GI), and ESG Disclosure on firm value proxied by Tobin's Q across 16 energy companies listed on the IDX during the 2020-2024 period. Based on multiple linear regression analysis of 80 firm-year observations, three main conclusions are drawn.

First, EMA is confirmed to have a significant positive effect on firm value ($\beta = 0.997$; $p < 0.001$). This is the strongest finding in the study, affirming that the systematic internalization of environmental costs is the primary determinant of energy firm value perception in the Indonesian capital market. Second, Green Investment does not significantly affect firm value ($\beta = 0.128$; $p = 0.136$), potentially due to long payback periods, ambiguous certification, and investment volumes still below a material threshold. Third, ESG Disclosure does not significantly affect firm value ($\beta = -0.022$; $p = 0.529$), reflecting that disclosure quality has not yet reached the threshold capable of generating a value premium in the Indonesian capital market. Simultaneously, the three variables explain 67.7% of the variation in firm value ($F = 53.061$; $p < 0.001$), indicating strong explanatory power of the model.

For corporate management, these findings affirm that the adoption of standardized and comprehensive EMA must be a strategic priority, extending beyond mere formal compliance. For regulators (OJK, IDX), the accelerated implementation of Indonesia's Green Finance Taxonomy and mandatory ESG assurance standards must be intensified to improve the credibility of green investment and ESG disclosure signals. For investors, the quality of energy companies' EMA practices deserves to be a key factor in sustainability-based investment assessments.

This study has several limitations. First, the sample is limited to 16 companies that meet the GRI 4 reporting criteria, meaning the results cannot be generalized to the entire IDX energy sector. Future research may explore the use of non-GRI voluntary disclosures or expand to other industrial sectors. Second, this study does not include control variables such as firm size, leverage, profitability, and firm age, all of which may influence firm value. Future studies should incorporate such control variables. Third, the analysis could be enriched through the application of dynamic panel data approaches (such as the Arellano-Bond GMM) to capture lag effects and endogeneity. Fourth, comparative studies between fossil energy and renewable energy sectors would provide more nuanced insights into differential market responses to sustainability practices.

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