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ESG Score and Financial Performance in Indonesian Energy Companies: The Moderating Role of Digital Transformation

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This study examines the influence of ESG Score on the financial performance of Indonesian energy companies, with Digital Transformation as a moderating variable. Theoretically, the study is grounded in Stakeholder Theory and the Resource-Based View (RBV), emphasizing ESG as a strategic element for long-term value creation. Using a causal quantitative design and secondary data, the final sample consists of 8 energy firms (24 firm-year observations) listed on the Indonesia Stock Exchange during 2021–2023. Regression analysis with classical assumption tests was applied. The findings show that ESG Score does not significantly affect Return on Assets (ROA), and Digital Transformation, measured by a dummy proxy, does not strengthen this relationship. While results are statistically insignificant, they highlight that ESG implementation in Indonesian

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remains compliance-driven rather than value-oriented, and that digitalization in the energy sector is still at an early stage without measurable financial outcomes. These insights contribute to the ongoing debate on ESG in emerging markets and stress the need for policy frameworks, stronger regulatory enforcement, and more strategic integration of ESG and digitalization in corporate governance. The study is exploratory in nature due to its limited sample and short observation period. The contribution of this research lies in providing empirical evidence from an emerging market context, showing that ESG in Indonesia remains compliance-driven, and highlighting the role of digital transformation as an early-stage, efficiency-focused practice. This study enriches ESG literature in developing countries and offers implications for policymakers, investors, and corporate managers in designing sustainability strategies.

Keywords: Return on assets; ESG score; digital transformation; energy sector.

1. INTRODUCTION

Sustainability has become a central agenda in corporate governance worldwide, particularly in the energy sector, which contributes significantly to environmental and social impacts. The adoption of Environmental, Social, and Governance (ESG) practices is no longer viewed as an optional responsibility but as a strategic driver of long-term value creation. ESG integration has been shown to enhance corporate reputation, improve operational efficiency, and strengthen relationships with stakeholders, including investors, regulators, and communities (Eccles et al., 2014; Friede et al., 2015). In this context, energy companies are under increasing pressure to align their business strategies with global sustainability standards.

In Indonesia, the energy sector plays a critical role in national economic development while simultaneously facing challenges related to environmental degradation, regulatory compliance, and the global energy transition (Utomo, 2025). ESG disclosure in Indonesian energy firms has been found to significantly influence firm value, enhance transparency, and reduce practices such as tax aggressiveness (Manulang & Soeratin, 2024). These findings emphasize the growing importance of ESG for companies listed on the Indonesia Stock Exchange (IDX). Nevertheless, research has also shown that the effectiveness of ESG disclosure may vary depending on firm size and industry-specific factors (Putri & Paramita, 2025).

Despite the increasing relevance of ESG, the relationship between ESG performance and financial outcomes remains inconclusive. While some studies report positive associations between ESG and indicators such as Return on Assets (ROA) and investment efficiency (Nugroho & Hersugondo, 2022; Inawati & Rahmawati, 2023), others find negative or insignificant effects depending on governance quality, political stability, or industry context (Sekar Sari et al., 2023). This suggests that ESG implementation may create additional costs in the short term, and its financial benefits may only materialize in the long run.

Digital transformation has emerged as a strategic enabler that may strengthen the link between ESG practices and firm performance (Aguilera et al., 2021). Technologies such as big data analytics, artificial intelligence, and cloud computing can enhance ESG reporting, improve monitoring systems, and foster innovation (Peng et al., 2023). Prior studies highlight that digitalization improves operational efficiency, reduces financing constraints, and fosters green innovation, all of which can potentially magnify the impact of ESG on corporate financial outcomes (Zhong et al., 2023). However, the empirical evidence regarding the moderating role of digital transformation in the ESG–performance nexus is still limited, particularly in emerging markets. While research in developed economies suggests that digitalization can amplify the positive effects of ESG, studies in developing countries such as Indonesia often reveal weak or insignificant relationships (Pertiwi et al., 2024; Husada & Handayani, 2021). This indicates that the adoption of ESG and digital initiatives in Indonesian energy companies may remain compliance-oriented, lacking the strategic integration necessary to produce measurable financial outcomes.

Therefore, this study aims to examine the effect of ESG Score on the financial performance of energy companies listed on the IDX and to assess the moderating role of digital transformation. By focusing on the Indonesian energy sector, which is both capital-intensive and highly regulated, this study contributes to the ongoing debate on ESG effectiveness in emerging markets. The findings are expected to enrich the literature by providing empirical evidence from a developing economy, while offering practical insights for policymakers, corporate managers, and investors in designing sustainability strategies that integrate both ESG practices and digital transformation.

2. MATERIALS AND METHODS

2.1 Literature Review

Research on the relationship between ESG and financial performance shows mixed results. (Linawati et al., 2024) found that ESG has a positive effect on ROA, with Woman on Board and Firm Age having a negative effect, and digital transformation moderating Woman on Board. Similarly, (Ningsih et al., 2024) in their study on ESG disclosure and investment efficiency found that the Environmental and Social dimensions had a significant positive effect, but Governance was not significant, with Audit Quality having a negative effect and digital transformation strengthening the Environmental dimension. The findings of Nugroho & Hersugondo (2022) found that ESG Disclosure has a significant positive effect on ROA, but CSR has a significant negative effect, while Environmental and Corporate Governance are not significant. (Nugroho & Hersugondo, 2022) found that ESG has no significant effect in Indonesia and Malaysia, but a significant positive effect in Singapore, with ESG components actually showing a negative direction. Research related to digital transformation shows the important role of digitalization as a moderator, as found by (Pertiwi et al., 2024) that ESG increases operational efficiency by up to 20%, with digital strengthening it by up to 30% and energy sector revenue increasing by up to 35%. In line with this, recent evidence from Bo and Li, (2025) demonstrates that digital transformation significantly enhances ESG performance through the mediating role of technological innovation and the reduction of financing constraints, with stronger effects observed in large private firms and those operating in high-tech and high-pollution industries.

This study is primarily grounded in Stakeholder Theory (Freeman, 1984), which emphasizes that companies are responsible not only to shareholders but also to a wider set of stakeholders, including employees, governments, and the community. Additionally, Legitimacy Theory is relevant, as it stresses that firms adopt ESG practices to gain social acceptance and regulatory approval. Together, these theories provide a foundation for analyzing the effect of ESG Score on financial performance with digitalization as a moderating variable.

The insignificant relationship between Environmental, Social, and Governance (ESG) and financial performance among Indonesian energy firms can be explained through several theoretical perspectives. According to Legitimacy Theory (Suchman, 1995), ESG adoption in developing countries remains symbolic and compliance-oriented, primarily aimed at maintaining social legitimacy and meeting regulatory expectations rather than enhancing profitability (Mohammad & Wasiuzzaman, 2021). From the standpoint of Institutional Theory (DiMaggio & Powell, 1983), ESG practices are often driven by weak institutional pressures and imitation rather than strategic motives (Aguilera et al., 2019). Consequently, ESG disclosure in Indonesia lacks the economic incentives necessary to generate measurable financial outcomes.Meanwhile, the Resource-Based View (RBV) (Hart, 1995) suggests that ESG can improve firm performance only when it becomes a valuable and inimitable strategic capability. However, in Indonesia’s energy sector, ESG remains a cost-oriented initiative rather than a competitive resource. Similarly, Slack Resource Theory (Waddock & Graves, 1997) posits that firms with limited financial resources are less able to translate ESG investments into short-term financial gains.

Empirical studies (Nizam et al., 2019) also confirm that in emerging markets, ESG’s impact on profitability tends to be insignificant due to weak institutional frameworks and the symbolic nature of sustainability practices. Therefore, ESG in Indonesia currently serves more as a tool of legitimacy and reputation than as a source of sustainable competitive advantage.Digitalization is hypothesized to act as a moderating variable that can strengthen the relationship between ESG performance and financial performance, enabling increased transparency, efficiency, and accountability in the management of environmental, social, and governance aspects, as found by (Waskito & Rahayu, 2025)that digitalization strengthens the influence of ESG disclosure on investment efficiency.

Chart 1. Data selection stage

Selection Stage	Number of Companies	Remarks
Initial population: energy companies listed on the IDX (2021–2023)	91	Initial population
Excluding companies without consistent publication of annual and/or sustainability reports	–53	Removed
Excluding companies without ESG disclosure and digitalization data	–30	Removed
Excluding delisted companies	0	Removed
Final sample	8	Eligible for analysis
Total observations (firm-year)	24	Panel data (8 firms × 3 years)

2.2 Research Methods

This study uses a causal research design with a quantitative approach to examine the causal relationship between independent and dependent variables. The research was conducted on energy sector companies listed on the Indonesia Stock Exchange (IDX) for the period 2021–2023. Secondary data were obtained from annual reports, sustainability reports, and financial statements. After applying purposive sampling, only 8 companies met the criteria, resulting in 24 firm-year observations.

While this provides valuable exploratory insights, the small sample size limits the generalizability of the results. Digital Transformation was proxied using a dummy variable (presence/absence of digital initiatives), which simplifies the complexity of digital practices and represents a methodological limitation. The short three-year period also constrains the ability to capture the long-term financial impact of ESG and digitalization. Classical assumption tests (normality, multicollinearity, heteroscedasticity) and regression analysis were performed using SPSS. High multicollinearity was detected in the interaction variable (ESG × Digital Transformation), which is common in moderation models. Future research should consider applying mean-centering or alternative constructs to minimize this issue and adopt richer measures of digital transformation.

3. RESULTS AND DISCUSSION

3.1 Classical Asumption Tests

The regression model passes all of the classical assumption tests, indicating that it is statistically robust and suitable for further analysis.

3.1.1 Normality test

The analysis results show that financial performance measured by ROA varies across each ESG Score group. At an ESG Score of 0.12871, the average ROA is relatively high at 14.87% with a narrow range (13.03%–16.72%), indicating that the financial performance of companies at this level tends to be stable. Conversely, at an ESG Score of 0.29703, the average ROA fell to 4.15% (3.40%–4.91%), while at an ESG Score of 0.33663, the average ROA was even lower at 3.69% with a wider range (0.14%–6.87%). This shows that an increase in ESG Score is not always followed by an increase in profitability.

The normality test (Shapiro-Wilk) produced a significance value above 0.05, for example 0.812 at an ESG Score of 0.33663, so the data was declared to be normally distributed and met the regression assumptions. In general, these results indicate a trade-off between ESG implementation and short-term financial performance. ESG implementation has the potential to increase costs, thereby reducing profits, but in the long term, it is expected to improve reputation, attract investors, and support more sustainable financial performance.

3.1.2 Multicollinearity test

The multicollinearity test shows that the ESG Score variable has a Tolerance value of 0.544 with a VIF < 10, so it can be declared free from multicollinearity issues. Conversely, the Digital Transformation variable and the interaction variable (ESG*Digital Transformation) have a Tolerance value close to 0.09 with a VIF above 10. This indicates high multicollinearity, which is common in regression models with interaction variables because interactions are formed from the multiplication of two variables that tend to be strongly correlated with the original variables.

Table 1. Normality test

Tests of Normality		
	ESG SCORE (X)	**Shapiro-Wilk[b]**
		Sig.
KINERJA KEUANGAN (ROA) (Y)	.12871	
	.29703	
	.33663	.812

Table 2. Multicollinearity test

Coefficients[a]			
Model		**Collinearity Statistics**	
		Tolerance	**VIF**
1	(Constant)		
	ESG SCORE (X)	.544	1.839
	TRANSFORMASI DIGITAL (DUMMY) (Z)	.091	10.940
	Interaksi	.090	11.123

This condition does not render the model invalid, but it can cause the regression coefficients to be less stable and their significance to weaken. Therefore, the interpretation of the moderating role of Digital Transformation needs to be done more carefully. For further research, the mean-centering technique before forming interaction variables can be considered so that the potential for multicollinearity can be suppressed.

3.1.3 Heterokedasticity test

The Residual Statistics test results show that the minimum and maximum residual values are still within a reasonable range with an average close to zero. This indicates that the regression model has no systematic bias, so that the predictions produced tend to be balanced between too high and too low compared to the actual values.

The residual standard deviation is also within normal limits, which means that prediction errors are randomly distributed without showing any particular pattern. Thus, the regression assumption of random and independent errors is satisfied.

Although the F-test and t-test results show that the independent variables do not have a significant effect on ROA, this residual test confirms that the model is consistent with the basic assumptions of regression. However, the large residual variation indicates that changes in ROA are likely to be influenced more by factors outside the research model.

Based on the scatterplot between standard residuals and predicted values, the residual points appear to be randomly scattered around the horizontal line without forming any particular pattern. This indicates that the regression model does not exhibit heteroscedasticity, so that the residual variance can be considered constant across the entire range of predicted values. With this assumption fulfilled, the estimated regression coefficients are considered more reliable and not distorted by variance heterogeneity issues.

However, even though the assumption of heteroscedasticity has been met, the F-test and t-test previously showed that the independent variables did not have a significant effect on ROA. In other words, the regression model is consistent with classical assumptions, but its predictive power regarding financial performance is still limited.

Table 3. Heterokedasticity test

Residuals Statistics[a]					
	Minimum	**Maximum**	**Mean**	**Std. Deviation**	**N**
Predicted Value	44.9451%	483.4468%	231.9003%	134.95607%	24
Residual	-442.60773%	1924.97119%	0.00000%	603.46810%	24
Std. Predicted Value	-1.385	1.864	.000	1.000	24
Std. Residual	-.684	2.975	.000	.933	24

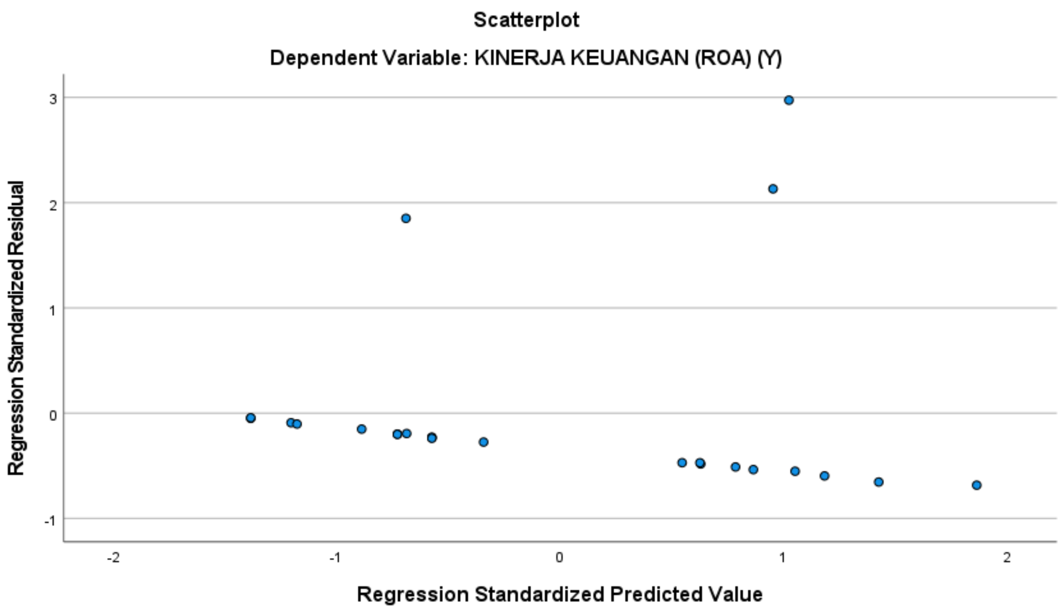

Fig. 1. Scatterplot dependent variable: Financial performance (ROA)

3.2 Hypothesis Testing

3.2.1 Partial and SimultanTest (T-Test)

The partial test results show that all independent variables have no significant effect on financial performance (ROA). ESG Score (X) has a positive coefficient (526.077; sig. 0.810), but its effect is not significant, so that the application of ESG functions more as a form of legitimacy and regulatory compliance than as a strategy for increasing profitability. Digital Transformation (Z) also shows a positive coefficient (640.114; sig. 0.472), but has not had a real impact on profitability, possibly because it is still in the early stages of investment and internal efficiency. Meanwhile, the ESG-Digital Transformation interaction (XZ) has a negative coefficient (-1612.144; sig. 0.621), indicating that digital transformation does not strengthen, but rather tends to weaken the relationship between ESG and ROA, although this is not significant.

3.2.2 Simultaneous Test (F-Test)

The F test results show an F value of 0.333 with a significance of 0.801 (> 0.05). This indicates that the independent variables, namely ESG Score (X), Digital Transformation (Z), and Interaction (X*Z), do not have a significant effect on financial performance (ROA). Thus, the regression model constructed cannot explain the variation in company financial performance simultaneously. These findings show that the combination of ESG and digital transformation, either directly or through interaction, has not been able to make a real contribution to the company's profitability. The implication of these results is that financial performance is likely to be influenced more by factors outside the model, such as business strategy, market conditions, cost structure, and the dynamics of the energy industry under study.

Table 4. Partial test

Coefficientsa						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-22.766	609.241		-.037	.971
	(X)	526.077	2155.166	.072	.244	.810
	(Z)	640.114	873.856	.529	.733	.472
	Interaksi	-1612.144	3214.233	-.365	-.502	.621

Table 5. Simultaneous Test

ANOVA[a]						
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	418902.243	3	139634.081	.333	.801[b]
	Residual	8375996.063	20	418799.803		
	Total	8794898.305	23			

The effect of ESG Score on company financial performance in this study is found to be statistically insignificant. This indicates that ESG practices in Indonesian energy firms are still largely compliance-driven, aimed at meeting regulatory requirements rather than serving as a strategic driver of profitability. This is consistent with the institutional context in Indonesia, where ESG disclosure policies are relatively recent and enforcement remains weak. Energy companies, being highly capital-intensive and dependent on government subsidies and commodity prices, tend to prioritize short-term operational survival over long-term ESG investment. Thus, while ESG can improve reputation and stakeholder legitimacy, its direct translation into financial performance remains limited in the Indonesian context. These results contrast with studies such as Nugroho&Hersugondo (2022) and Linawati et al. (2024), which found positive effects of ESG disclosure on ROA. The inconsistency can be explained by contextual factors, including the regulatory environment, high capital intensity, and commodity dependence in the Indonesian energy sector.

The results of the first hypothesis test show that ESG Score does not have a significant effect on the financial performance of energy companies listed on the Indonesia Stock Exchange. Based on regression analysis, the ESG Score coefficient value obtained was 526.077 with a significance level of 0.810 (> 0.05), thus rejecting the first hypothesis (H1). Although the direction of the relationship shows a positive coefficient, the effect is not statistically significant. This finding indicates that the implementation of Environmental, Social, and Governance (ESG) practices in energy companies in Indonesia still tends to be compliance-oriented or regulatory compliance, rather than a business strategy oriented towards long-term value creation. This condition is in line with the research by (Khairunnisa et al., 2023)and (Era Vivianti Husada, 2021a), which found that in developing countries and industries with large cost structures such as the energy sector, ESG does not always have a significant relationship with short-term financial performance.

The findings reveal that neither *ESG Score* nor *Digital Transformation* significantly affects financial performance (ROA) of Indonesian energy firms. This suggests that ESG implementation in Indonesia remains largely *compliance-driven*, serving as a formal regulatory requirement rather than a value-creating strategy. From the perspective of *Stakeholder Theory*, ESG functions more as symbolic legitimacy to satisfy external demands. Meanwhile, under the *Resource-Based View (RBV)*, ESG has not yet evolved into a unique strategic resource that provides sustainable competitive advantage.

Similarly, digital transformation does not exhibit a significant impact on profitability. This is likely because digital initiatives in the energy sector are still at an early stage, focusing mainly on operational efficiency, automation, and compliance rather than strategic innovation. While RBV posits that digital technology can become a valuable, rare, and inimitable resource, current digitalization efforts in Indonesian energy companies have yet to achieve such characteristics.

These results contrast with international studies that found positive impacts of ESG and digital transformation on firm performance (Wu & Li, 2023). For instance, Wu & Li (2023) showed that digital transformation enhances ESG performance through green innovation in Chinese firms (Wu & Li, 2023). (Heryana & Soeratin, 2025) demonstrated that ESG strengthens the positive relationship between digital transformation and corporate performance. The divergence can be explained by contextual factors. First, ESG regulation in Indonesia is relatively new and weakly enforced, so firms have not integrated ESG into their core strategies. Second, the short observation period (2021–2023) limits the ability to capture long-term benefits of ESG and digitalization. Third, the energy sector is highly capital-intensive and commodity-dependent, making firms prioritize operational stability over long-term risky investments.

Table 6. Descriptive analysis based on ESG score

ESG Score	Mean ROA (%)	Min ROA (%)	Max ROA (%)	Std. Deviation	N
0,12871	14,87	13,03	16,72	2,61	2
0,29703	4,15	3,40	4,91	1,07	2
0,33663	3,69	0,14	6,87	3,37	3

3.2.3 The role of digital transformation on financial performance

The digital transformation variable, measured with a dummy proxy, also shows insignificant results on financial performance. This is likely because digital initiatives in the energy sector are still in early stages, focusing on internal efficiency, data management, and process automation. These investments often require long-term horizons before yielding measurable profitability gains. Consequently, in the short period of analysis (2021–2023), digital transformation appears to reduce costs and enhance efficiency without producing significant improvements in ROA. Previous studies (e.g., Pertiwi et al., 2024) reported that digitalization strengthens ESG’s effect on efficiency and profitability. The insignificant results here highlight that digital adoption in Indonesian energy companies is still in its early stages, focused more on compliance and operational upgrades rather than strategic transformation.

3.3 Multiple Linear Regression Analysis

The moderating effect of digital transformation on the relationship between ESG and financial performance was analyzed based on the following ESG Score categories:

The moderation analysis, in which the interaction variable (ESG Score × Digital Transformation) shows a negative coefficient of -1612.144 with a significance of 0.621 (> 0.05). These results indicate that digital transformation not only fails to strengthen the relationship between ESG Score and financial performance, but actually tends to weaken it, although this effect is not statistically significant. Thus, the second hypothesis (H2) is also rejected. This condition differs from theoretical expectations, which state that digitization can strengthen the impact of ESG through increased transparency, accountability, and efficiency in sustainability data management (Husada & Handayani, 2021). These findings indicate that the integration of ESG practices and digital transformation in Indonesian energy companies is still not optimal, possibly because the implementation of both is carried out separately without clear strategic synergy.

From the perspective of Stakeholder Theory (Freeman, 1984), the results of this study indicate that although energy companies have made efforts to meet the expectations of various stakeholders through ESG practices, their implementation has not been able to create measurable financial value. This indicates that ESG practices are still viewed as a cost center or social obligation, rather than a strategic asset that can increase competitive advantage (Freeman, 1998). Meanwhile, within the Resource-Based View (RBV) framework, digitalization should be a strategic resource that creates competitive advantage, but the results of this study show that digital resources have not been optimally utilized to create significant differentiation or efficiency. These findings indicate the need for a paradigm shift in ESG and digitalization management, from a partial and compliance-oriented approach to an integrated strategy oriented towards long-term value creation.

The F-test results show a value of 0.333 with a significance of 0.801 (> 0.05), indicating that the model as a whole cannot explain the variation in the company's financial performance. The low coefficient of determination (R^2) value indicates that most of the variation in the Return on Assets (ROA) of energy companies is influenced by factors other than those included in the research model. External factors such as fluctuations in energy commodity prices, government policies related to subsidies and tariffs, macroeconomic conditions, and global energy supply-demand dynamics are likely to have a more dominant influence on the profitability of energy companies than ESG practices and digital transformation. Additionally, the capital-intensive nature of the energy industry and its long investment cycles may also explain why the impact of ESG and digitalization has not yet been evident in the relatively short observation period (2021-2023).

In summary, ESG and digital transformation in Indonesia still operate as instruments of legitimacy and internal efficiency rather than strategic levers of profitability. For these practices to generate substantial financial impact, firms need to improve ESG quality as part of their core business strategy and adopt digital transformation initiatives that emphasize innovation rather than mere compliance.

4. CONCLUSION

This study concludes that ESG practices in Indonesian energy companies are largely compliance-oriented or merely formal, and few companies declare ESG components in their annual reports, with limited short-term impact on financial performance. Digital transformation also has not moderated the relationship between ESG and financial performance in Indonesian energy sector companies, reflecting early adoption and a focus on efficiency rather than strategic outcomes. These findings suggest that a stronger regulatory framework, a long-term investment horizon, an integrated ESG strategy, and digital transformation are needed to translate sustainability practices into measurable financial outcomes. Given the small sample size and short observation period, this study is exploratory in nature, and future research should expand the data population with a longer research period and use more accurate measurements of digital transformation.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The authors declare that generative AI technologies were used in the preparation of this manuscript. ChatGPT (GPT-5, OpenAI, 2025 edition) was employed to assist in improving and completing the introduction and abstract, while SciSpace was used to support citation integration. All substantive content, analysis, and conclusions remain the sole responsibility of the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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