

ESG DISCLOSURES AND TECHNOLOGICAL INNOVATION ON THE FINANCIAL PERFORMANCE OF ENERGY COMPANIES LISTED ON THE INDONESIA STOCK EXCHANGE

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ABSTRACT

Energy companies are frequently exposed to price volatility, which significantly impacts their overall performance. This study examines the influence of Environmental, Social, and Governance (ESG) disclosure and technological innovation on the financial performance of energy companies listed on the Indonesia Stock Exchange (IDX) from 2022 to 2025. Using secondary data from annual and sustainability reports, this research employs purposive sampling, yielding 68 firm-year observations from 17 selected companies. Data was analyzed using multiple linear regression. The results indicate that ESG disclosure has a positive and significant effect on financial performance, whereas technological innovation does not have a significant impact. These findings provide sector-specific empirical evidence that refines both legitimacy theory and stakeholder theory. Furthermore, the results offer practical implications for managers and policymakers in formulating more resilient disclosure strategies to enhance corporate financial outcomes.

Keywords: *ESG Disclosure, Technological Innovation, Financial Performance*

1. INTRODUCTION

In the modern corporate landscape, energy companies occupy a highly strategic position within national and global economies. Yet, they face severe scrutiny due to their massive ecological footprints and vulnerability to intense geopolitical instability. Operating in a highly dynamic and uncertain environment shaped by volatile commodity prices, these firms must deploy advanced strategic initiatives to maintain their competitive edge. To mitigate environmental risks and meet shifting global mandates, energy organizations are increasingly forced to integrate environmental, social, and governance (ESG) disclosures while continuously driving technological innovation. These combined initiatives serve as vital strategic mechanisms; ESG reporting directly bridges the information asymmetry between the firm and its stakeholders, while constructive technological advancements optimize internal operational processes.

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To successfully navigate these pressures, management requires solid metrics to evaluate the effectiveness of its sustainability and innovation strategies. Consequently, tracking corporate profitability over specific timeframes provides a critical foundation for guiding managerial decisions and designing future corporate frameworks. Reliable data in financial statements serves as a primary benchmark for corporate success, reflecting the firm's credibility to external investors who make capital allocation decisions based on these metrics (Destianty, 2026; Mohammad & Wasiuzzaman, 2021). In Indonesia, the economic stakes for this transition are exceptionally high; the annual potential investment in the renewable energy sector is estimated at IDR 131.5 trillion (USD 9.4 billion), with projected growth of up to IDR 226.6 trillion (USD 16.2 billion). This immense potential was reflected in the Indonesia Stock Exchange (IDX), where the energy sector recorded a massive 78.72%, securing the best market expansion among all listed sectors (Adhitya, 2023).

To systematically build market credibility, energy firms utilize transparent communication through the three pillars of ESG disclosure. First, environmental disclosure clarifies the impact of a company's activities on the natural environment in its operating area, allowing the public to supervise corporate responsibility without harming nature (Mohammad & Wasiuzzaman, 2021). Second, social disclosure details the firm's contributions to society across multiple dimensions: the economic mandate to generate returns, the legal dimension requiring strict statutory compliance, the ethical framework that aligns with societal norms, and voluntary philanthropic initiatives. Third, governance disclosure demonstrates the company's management structure and commitment to information transparency, which effectively closes the information gap between the firm and its capital providers, reinforcing corporate trust.

The global energy sector has begun demonstrating a real commitment by integrating these ESG aspects into its core operations. A notable benchmark is PT Pertamina Geothermal Energy Tbk (PGE), which was recognized as one of the "2025 ESG Top-Rated Companies" by sustainalytics. PGE achieved a remarkably low ESG risk score of 7.1, indicating successful, deep operational integration

(Iskandarsjah, 2023). Strong sustainability principles, when fully implemented, enhance a company's global reputation, minimize non-financial risks, and contribute positively to long-term profitability.

However, symbolic compliance through transparency is insufficient without structural operational updates; this is where technological innovation becomes essential. Innovation is defined as a constructive change in methods or technology that departs from previously used systems (Sainz et al., 2025). Within the energy sector, technological innovation is a key driver of competitive growth, enabling companies to optimize resources, reduce harmful emissions, and capture new market opportunities (Giraldo et al., 2026). By aggressively pursuing green technological breakthroughs, organizations develop novel products and optimize manufacturing efficiency. Achieving these technological milestones serves as a viable strategy for defending market share, which ultimately attracts favorable investor sentiment and improves bottom-line metrics (Hasibuan & Oktabiana, 2023).

Despite the theoretical benefits of these dual strategies, empirical research regarding their actual impact on ultimate financial outcomes remains highly fragmented and contradictory. On the one hand, some scholars have found that ESG disclosure can have a negative impact on corporate profitability due to increased operational costs (Widyawati, 2024), while others discovered no statistically significant correlation at all (Ciptani & Ampri, 2025). Conversely, a prominent body of literature argues that robust sustainability reporting yields positive financial returns by attracting premium capital and reducing regulatory friction (Aydoğmuş et al., 2022; Dewi et al., 2025; Nurahman et al., 2024).

A similar divergence exists regarding the effects of technological investments. Several studies confirm a strong positive relationship between technological innovation and financial outcomes, noting that advanced technical capabilities directly foster superior market returns (Lee, 2024; Omonijo & Yunsheng, 2022). However, contrasting research indicates that the heavy capital expenditure required for innovation does not always translate into significant financial improvements (Li et al., 2021; Tong & Yang, 2025). These ongoing

empirical inconsistencies highlight a critical research gap that this study addresses by evaluating how ESG disclosure and technological innovation simultaneously influence the financial performance of energy companies on the IDX during the critical 2022–2025 period.

The novelty of this study lies in its comprehensive integration of ESG disclosure and technological innovation as dual strategic drivers of financial performance, specifically within the Indonesian energy sector during the highly volatile 2022–2025 period. While prior literature yields conflicting results regarding the financial returns of ESG (e.g., Ciptani & Ampri, 2025; Dewi et al., 2025; Widyawati, 2024) and innovation (e.g., Lee, 2024; Tong & Yang, 2025), this research addresses these empirical inconsistencies by focusing on a unique sector-specific and temporal context. It captures a critical timeframe marked by the post-2022 energy sector boom on the IDX and heightened global sustainability benchmarks. Consequently, this study fills a crucial empirical gap by demonstrating how emerging market energy firms navigate geopolitical pressures and resource extraction constraints through the joint mechanisms of transparent governance and technological adaptation.

2. LITERATURE REVIEW AND HYPOTHESIS

Legitimacy Theory

Legitimacy theory is anchored in the concept of a social contract between an organization and the community in which it operates. Under this implicit agreement, a firm must secure public acceptance to ensure the continuity of its operations. This legitimacy is achieved when corporate actions remain congruent with the prevailing social norms, values, beliefs, and expectations of the surrounding community. Consequently, managing legitimacy is critical, as societal boundaries obligate organizations to demonstrate explicit respect and consideration for their broader social environment (Dowling & Pfeffer, 1975).

In the modern business landscape, particularly within high-impact sectors like energy, ESG disclosure and technological innovation serve as vital strategic mechanisms for validating this social contract. ESG reporting acts as

a communication tool that bridges the information asymmetry between the firm and society, providing concrete evidence that the company minimizes environmental degradation and upholds social responsibilities. Concurrently, technological innovation demonstrates a proactive, long-term commitment to sustainability through the development of cleaner energy solutions and optimized resource efficiency. By deploying innovative technologies and transparently disclosing ESG performance, energy companies align their operations with evolving public expectations, thereby securing societal approval. Ultimately, this enhanced corporate legitimacy fosters positive stakeholder relations, reduces regulatory friction, and mitigates reputational risks, collectively translating into stronger and more resilient financial performance.

Stakeholder Theory

Stakeholder theory posits that organizations must actively prioritize the welfare of all parties affected by their operations. These actors are divided into internal and external stakeholders, including employees, shareholders, consumers, suppliers, regulators, and the broader public. Consequently, this framework dictates that corporate objectives should extend beyond the singular pursuit of shareholder wealth to encompass comprehensive value creation that benefits the entire stakeholder network (Freeman, 1984). Within this collaborative ecosystem, ESG disclosure and technological innovation function as crucial strategic drivers that satisfy the diverse demands of the stakeholder matrix. For external stakeholders—such as environmental regulators, local communities, and green investors—robust ESG disclosure provides the transparency needed to evaluate how effectively an energy firm manages its ecological and societal impact. Simultaneously, technological innovation serves as an operational response to both internal and external pressures, allowing firms to optimize resource consumption, reduce carbon footprints, and develop renewable energy alternatives. By actively investing in cleaner technologies and transparently communicating these achievements through ESG reporting, companies build strong relationships rooted in mutual trust. Ultimately, addressing stakeholder

concerns through these dual initiatives mitigates non-financial risks, strengthens corporate reputation, and attracts premium capital allocation, thereby driving superior financial performance.

Financial Performance

In essence, financial performance is a systematic step taken by a company to see the level of efficiency and effectiveness of its operational activities in a certain period (Mardiana, et al., 2024). Financial performance can be understood as the process of determining indicators that assess the extent to which a company or organization is able to generate profit. Financial performance reflects whether a company can manage and use its resources as efficiently as possible. Thus, financial performance can be understood as an evaluation mechanism used by companies to determine success in making profits, as well as reflecting future prospects, growth, and development potential (Mohammad & Wasiuzzaman, 2021).

Environmental, Social, and Governance (ESG) Disclosure

ESG disclosure comprises a framework of institutional standards that corporations integrate into their investment and operational strategies, structured around three core pillars: environmental stewardship, social responsibility, and corporate governance (Widyawati, 2024). In the environmental aspect, the assessment includes energy-use efficiency, waste and emissions management, natural resource conservation, and the protection of flora and fauna ecosystems. The social aspect focuses on how the company builds and maintains relationships with external parties, including the community, suppliers, customers, social groups, and legal institutions that are part of its operations. The governance criteria discuss the flow of good and sustainable management within the company's operational realm internally. ESG reporting assesses the extent to which companies convey information about the consequences of corporate sustainability practices (Holly et.al., 2026).

Technological Innovation

During the Industrial Revolution 4.0, technological innovation played an important role in driving economic growth by creating value. For example, the use of artificial intelligence (AI) and Internet of Things (IoT) has been the dominant trend since 2019. In this context, technological innovation also serves as a tool to overcome inequality and accelerate social inclusion. Technological innovation can streamline the use of inputs and produce disruptive products (Hasibuan & Oktabiana, 2023). Technological innovation can be divided into product innovation and process innovation (Choi & Yoo, 2022).

Hypothesis Development

ESG Disclosures affects Financial Performance

From a theoretical perspective, ESG disclosure serves as a strategic mechanism to affirm that a corporation's mandate extends beyond the conventional maximization of shareholder wealth to encompass the welfare of its broader stakeholder network (Freeman, 1984). Through these disclosures, organizations provide comprehensive data regarding initiatives aimed at enhancing environmental stewardship, delivering social benefits, and ensuring internal governance transparency (Widyawati, 2024). This institutional reporting satisfies the shifting expectations of society, illustrating the extent to which the firm is committed to ethical business practices and long-term sustainability (Holly et al., 2026). According to legitimacy theory, aligning corporate actions with societal values secures vital public support and reinforces institutional legitimacy (Dowling & Pfeffer, 1975). When the community recognizes that a company strives to prosper rather than merely pursuing short-term gains, the resulting stakeholder trust and reduced information asymmetry lay a solid foundation for robust operational success.

Empirical literature heavily supports this theoretical alignment, demonstrating that robust ESG reporting yields positive financial returns and drives superior bottom-line metrics. For instance, prominent studies by Dewi et al. (2025), Nurahman, Majid, and Hersugondo (2024), and Aydoğmuş, Gülay, and Ergun (2022) confirm a significant positive relationship between

transparent sustainability disclosures and enhanced corporate financial performance. These scholars argue that high-quality ESG disclosures enable companies to cultivate deep investor confidence, maximize market accountability, and strengthen critical stakeholder relationships. By signaling a lower risk profile to the market, compliant firms successfully encourage operational efficiency and open preferential access to sustainable investment capital, which directly elevates their long-term profitability.

Conversely, the link between sustainability transparency and corporate profitability is not always consistent across empirical research, revealing a notable body of conflicting evidence. On one hand, Widyawati (2024) discovered that ESG disclosure can exert a negative impact on a firm's immediate financial outcomes. This negative effect is often attributed to the substantial capital expenditures and heightened administrative burdens required to compile comprehensive sustainability metrics, which can strain short-term cash flows. On the other hand, research by Ciptani and Ampri (2025) found that ESG disclosures do not yield any statistically significant impact on financial performance, suggesting that market participants in certain contexts may view sustainability reports as purely symbolic gestures that do not influence core economic value.

This empirical divergence typically stems from differences in industry contexts, varying regulatory environments, and how different markets value non-financial criteria. While the high initial costs of implementing robust ESG frameworks can temporarily suppress profitability—leading to the negative or insignificant findings observed by some scholars—these expenditures fundamentally serve as an essential long-term investment. Over time, the transparency gained from comprehensive reporting mitigates severe legal risks, protects the firm from costly social backlash, and insulates it from geopolitical or regulatory shocks. Therefore, the conflicting results in literature reflect a temporary tension between immediate operational costs and the delayed, risk-adjusting economic benefits of corporate accountability.

This study views ESG disclosure as a primary indicator of corporate transparency and accountability in delivering vital sustainability information to the public. Grounded in both stakeholder and legitimacy theories, it is anticipated that enhancing the quality of non-financial reporting offers a significant avenue for corporations to secure investor trust and reinforce institutional legitimacy, which ultimately translates into stronger economic outcomes. Based on these theoretical and empirical insights, the following hypothesis is proposed:

H₁: ESG disclosures exert a positive and significant influence on financial performance.

Technological Innovation Affects Financial Performance

Technological innovation represents a firm's capacity to generate, advance, and execute novel concepts, operational processes, and products aimed at enhancing efficiency, productivity, and market competitiveness (Giraldo et al., 2026; Sainz et al., 2025). Grounded in legitimacy theory, innovations that accord with social norms—such as environmentally friendly technologies and efficient digitalization—strengthen corporate institutional legitimacy among societal and regulatory stakeholders by demonstrating that the firm does not conflict with local culture or ecological preservation (Dowling & Pfeffer, 1975). Concurrently, stakeholder theory emphasizes that technological innovation serves as a vital tool for companies to meet the evolving expectations of consumers, employees, and investors (Freeman, 1984). In an environment characterized by accelerating technological evolution and intensifying market competition, continuous innovation is essential for sustaining a firm's market position. When these innovative capabilities are recognized and accepted by the broader stakeholder network, they increase institutional trust, strengthen strategic relationships, and drive business sustainability, which collectively lay the groundwork for long-term economic outcomes (Hasibuan & Oktabiana, 2023; Omonijo & Yunsheng, 2022).

Empirical literature widely validates this theoretical framework, demonstrating that a commitment to innovative practices expands an organization's ability to optimize operational efficiency, develop products that align with shifting consumer demands, and capture new revenue streams.

Specifically, prominent studies conducted by Lee (2024) and Omonijo and Yunsheng (2022) found a distinct positive relationship between a firm's technological innovation capacity and its economic performance. These scholars argue that achieving key innovation milestones serves as a viable strategy for defending a product's market share and securing favorable investor sentiment, which ultimately elevates corporate profitability and rewards the firm's strategic risk-taking.

Conversely, the relationship between technological investments and corporate financial outcomes is not uniform, as prior research has produced mixed and contradictory results. For instance, empirical studies by Tong and Yang (2025) and Li et al. (2021) found no discernible or statistically significant relationship between technological innovation and short-term financial returns. These findings suggest that in certain market contexts, the heavy capital expenditure and operational disruptions associated with implementing new systems do not immediately translate into tangible economic advantages.

This empirical divergence can be attributed to the long gestation periods and high initial costs inherent in technological breakthroughs, creating a temporary disconnect between R&D spending and actual market returns. While the substantial cash outflows required to pioneer or adopt cutting-edge technologies may suppress short-term bottom-line metrics—leading to the insignificant results observed by some researchers—these efforts fundamentally represent a long-term investment. Over time, the resulting efficiency gains, resource optimization, and disruptive product creation successfully insulate the firm from competitive rivalry and geopolitical pressures. Therefore, the conflicting evidence in the literature merely reflects the temporal gap between the immediate financial burden of innovation and its delayed, growth-fostering economic benefits.

This study posits technological innovation as a pivotal strategic mechanism that simultaneously streamlines internal operations and fosters opportunities for organizational growth. Accordingly, the implementation of such innovative capabilities is anticipated to serve as a significant catalyst for the advancement of

corporate financial outcomes. Based on these theoretical insights and empirical evidence, the following hypothesis is proposed:

H₂: Technological innovation exerts a positive and significant influence on the financial performance of energy companies.

Theoretical Framework

To secure long-term business longevity and operational permanence, companies must continuously align their operations with prevailing societal norms, values, and ethical expectations (Dowling & Pfeffer, 1975). Under legitimacy theory, this alignment functions as an implicit social contract; when an organization's behavior matches public expectations, it gains institutional support and avoids costly social backlash or regulatory penalties. However, modern corporate survival dictates that this mandate extend beyond merely avoiding conflict with the immediate community. According to stakeholder theory, a firm must actively embrace and create comprehensive value for its entire operational network, including investors, consumers, employees, and regulators (Freeman, 1984).

Within this dual theoretical framework, ESG disclosure and technological innovation operate as complementary strategic levers that convert institutional approval into economic success. ESG disclosure serves as the primary communicative mechanism of legitimacy, providing verifiable evidence that the firm operates ethically. Concurrently, technological innovation serves as the operational mechanism of stakeholder satisfaction, demonstrating a proactive commitment to efficiency and environmental stewardship. Together, these strategies eliminate "legitimacy gaps" and directly drive a firm's bottom-line outcomes by transforming societal goodwill into sustainable market advantages (Holly et al., 2026).

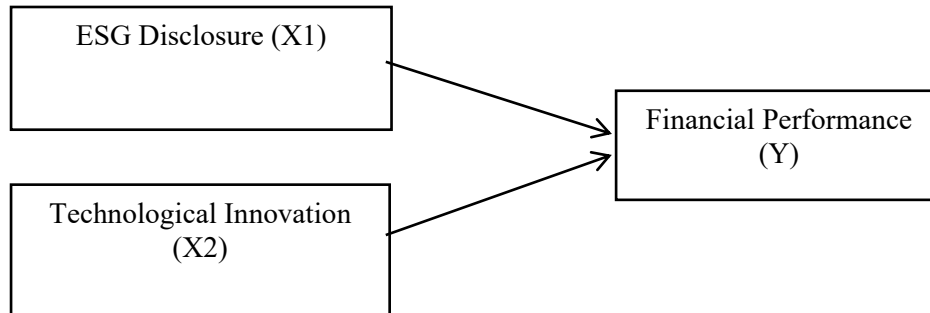
ESG disclosures in sustainability or annual reports reflect a corporation's structural dedication to responsible operations and long-term viability. From a stakeholder perspective, delivering comprehensive ESG reporting significantly minimizes information asymmetry, which in turn cultivates deep investor confidence, heightens operational transparency, and solidifies institutional

relationships. This transparency yields direct financial benefits through two main channels. First, capital providers increasingly use non-financial criteria to evaluate risk, meaning that highly transparent firms gain preferential access to sustainable investment capital at lower cost. Second, modern consumer preferences heavily favor eco-friendly and socially responsible products. By transparently aligning corporate actions with shifting consumer values, firms enhance their brand equity, drive market demand, and generate robust revenue growth, thereby achieving their broader profitability objectives (Ciptani & Ampri, 2025; Dewi, Surasmi, & Saputra, 2025).

While ESG disclosure manages reputation and transparency, technological innovation represents the firm's core operational capacity to create, develop, and implement new ideas, processes, and products that directly enhance productivity and market competitiveness. In high-stakes industries, intensifying market rivalry and rapid technological obsolescence make static products increasingly difficult to differentiate from one another. Therefore, continuous innovation is an absolute prerequisite for preserving competitive market share.

Logically, accelerating the scale of technical innovation advances a firm's financial positioning through a dual mechanism of cost reduction and revenue expansion. On the cost side, process innovations—such as digitalization and energy-efficient systems—streamline internal operations and optimize resource consumption, significantly lowering operational expenditures. On the revenue side, product innovations allow the firm to pioneer novel, eco-friendly solutions that meet unmet consumer needs and unlock entirely new market opportunities. Ultimately, these innovative capabilities generate favorable investor sentiment, secure long-term business sustainability, and serve as a powerful catalyst for the continuous improvement of corporate financial performance (Giraldo et al., 2026; Hasibuan & Oktabiana, 2023; Omonijo & Yunsheng, 2022). The theoretical framework of this study is presented in Figure 1.

Figure 1

Proposed Theoretical Model**3. RESEARCH METHODS****Population and Sample**

The research population comprises energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2022–2025 period, with the final sample determined through purposive sampling. The sample criteria are as follows:

1. IDX-listed energy firms active during the 2022–2025 observation period;
2. energy sector entities maintaining regular annual reports for the period 2022-2025;
3. energy companies that published consecutive sustainability reports for the period 2022-2025. The distribution of the research sample is detailed in Table 1.

Table 1*Distribution of the Research Sample*

No.	Criteria	Quantity
1.	Total IDX-listed energy firms	82
2.	Energy companies excluding annual report publications (2022–2025)	(25)
3.	Energy Companies that do not publish consecutive sustainability reports for the 2022-2025 period	(40)
	Number of samples that met the criteria and were used in the study	17

Source: Data processed (2025)

Data Types and Sources

This research utilizes documentary data extracted primarily from annual reports, sustainability reports, and supplementary corporate disclosures.

Operational Definitions and Variable Measurements

1. Financial Performance

Financial performance describes the extent to which a company achieves expected results in each period and is used to assess the company's stability. A common measure of financial performance is the Return on Assets (ROA) ratio. ROA ratio is used to evaluate the extent to which an organization's profitability is derived from the productive use of its total assets (Nurahman, et al. 2024). The financial performance measured by ROA is as follows: (Inawati & Rahmawati, 2023):

$$ROA = \frac{Net\ Income}{Total\ Assets} \times 100$$

2. ESG Disclosures

Corporate ESG disclosure levels are operationalized and quantified according to the benchmark criteria set by the GRI Standards. For the environmental aspect, the company refers to the GRI 300, which includes 30 indicators, while the social aspect is measured using the GRI 400, which includes 34 indicators, and GRI 2 for the governance aspect with 56 indicators. To ensure measurement validity under the current GRI Standards, indicators from GRI 2 (General Disclosures) that do not exclusively assess corporate governance were excluded. The governance index was strictly refined to focus only on dedicated governance indicators, ensuring a precise and theoretically sound ESG measurement. The level of ESG disclosure is calculated as the ratio of specific indicators disclosed by the firm to the total number of indicators established in each corresponding GRI module for every ESG dimension (Inawati &

Rahmawati, 2023). This metric is quantified through content analysis, in which a binary scoring system is applied: a value of 1 is assigned if a specific item is disclosed, and a value of 0 is recorded if it is omitted. According to Inawati and Rahmawati (2023), ESG disclosure measurement can be calculated using formula:

$$ESG\ Disclosure = \frac{ESG\ Disclosure\ Value}{Maximum\ Possible\ Disclosure\ Value} \times 100$$

3. Technological Innovation

The measurement of technological innovation can be seen by the cost of research and development, and in this study, it is used with a dummy variable, namely, the number 1 is given to entities that have technological innovations, and indigo 0 is given to entities that do not have technological innovations (Masso & Vahter, 2008).

Analysis Method

Data analysis was executed systematically across multiple phases, encompassing descriptive statistical analysis, classical assumption testing, multiple linear regression modeling, and hypothesis testing. To evaluate the multiple regression model, data processing was conducted utilizing SPSS version 27 based on the following structural equation.

$$Y = a + b_1X_1 + b_2X_2 + e$$

Description:

Y	=	Financial Performance
a	=	Contant
X ₁	=	ESG disclosures
X ₂	=	Technological Innovation
b ₁ , b ₂	=	Regression coefficient
e	=	error term

While we acknowledge that the dataset possesses a panel structure (17 firms over 4 years), the use of Pooled OLS via SPSS can be justified under specific

operational conditions. First, given the relatively short time dimension ($T = 4$), the risk of severe serial correlation or significant time-series dependencies within the cross-sectional units is minimized. Second, the sampled energy companies listed on the IDX share highly homogeneous institutional environments, regulatory mandates, and macroeconomic pressures during the 2022–2025 period, suggesting that individual firm-specific unobserved heterogeneity is relatively constrained.

To ensure the validity of the pooled OLS model and mitigate risks associated with violating the independence assumption, strict diagnostic testing was performed. The Durbin-Watson statistics were utilized to verify the absence of critical first-order autocorrelation, and variance inflation factor (VIF) thresholds were applied to rule out multicollinearity. While we recognize that fixed or random effects models provide stricter controls for individual intercepts, the diagnostic stability and the balanced nature of our small-sample panel suggest that pooled OLS remains a parsimonious and statistically adequate approach for capturing the baseline effects of ESG disclosure and technological innovation within this specific timeframe.

4. RESULTS AND DISCUSSION

Descriptive Statistical Analysis

The descriptive statistics are stated in Table 2.

Table 2
Descriptive Statistical Analysis

	Min	Max	Mean	Standard deviation
ESG Disclosures (X1)	0	86	43,81	23,263
Technological Innovation (X2)	0	1	0,82	0,384
Financial Performance (Y)	-0,98	1,000	0,08205	0,150694

Source: Analyzed data (2025)

Drawing from the results of descriptive statistical analysis shown in Table 2, the number of valid research data was recorded as many as 68 observations. The ESG disclosures variable (X_1) has a minimum of 0, a maximum of 86, a mean of

43.81, and a standard deviation of 23.263. These findings show that the level of ESG adoption in the sample companies varied, with the lowest score being 0 and the highest score being 86. The mean value indicates that on average the company has an ESG score of 43.81. Furthermore, because the standard deviation exceeds the mean value, a substantial degree of variation exists across the sampled firms, indicating that the ESG data in this study is highly heterogeneous.

Regarding the technological innovation variable (X_2), the descriptive analysis shows a minimum of 0, a maximum of 1, a mean of 0.82, and a standard deviation of 0.384. These boundaries indicate that while certain sampled firms have not yet adopted technological innovations (scored 0), others have successfully implemented them (scored 1). Specifically, the mean value of 0.82 demonstrates that approximately 82% of the sampled companies have integrated technological innovations into their operations. Furthermore, because the standard deviation is relatively small compared to the mean, the dispersion of data across firms is minimal, suggesting that the technological innovation dataset is highly homogeneous.

For the dependent variable, financial performance (Y), summary statistics reveal wide disparities, with values ranging from -0.98 to $1,000$, alongside a sample mean of 0.08205 and a standard deviation of 0.150694 . This wide interval highlights the contrasting financial health of the sampled entities. While the mean underscores the central tendency of corporate returns, the large magnitude of the standard deviation relative to the mean indicates substantial variance among the firms. This widespread dispersion underscores the heterogeneity of the financial performance data.

The extreme values in the ROA descriptive statistics (ranging from -0.98 to 1.00) reflect the genuine, high-volatility nature of the Indonesian energy sector during the 2022–2025 period, marked by severe geopolitical pressures and massive market surges. No winsorization was applied in order to capture the true operational realities of these firms. However, to ensure these outliers did not distort the regression, robust diagnostic tests—including Cook's distance and

leverage plots—were executed to confirm that no single observation exerted undue influence on the final model.

Normality Test

The outcomes of the data normality test are presented in Table 3.

Table 3

Outcome of Normality Test

Variabel	Value	Asymp Sig.	Remarks
	KolmogorovSmirnov Z	(2-tailed)	
ESG disclosures Technological Innovation Financial Performance	0,100	0,088	Normal Distributed

Source: Analyzed data (2025)

As presented in Table 3, the Kolmogorov–Smirnov normality test yields an asymptotic test statistic of 0.100 with an associated significance value of 0.088 across the ESG, technological innovation, and financial performance variables. Given that the p-value exceeds the critical threshold of 0.05, the null hypothesis of non-normality is rejected, confirming that the dataset utilized in this study is normally distributed.

Multicollinearity Test

The empirical outcomes of the multicollinearity diagnostics are presented in Table 4.

Table 4

Outcomes of Multicollinearity Test

Variabel	Collinearity Statistics		Remarks
	Tolerance	VIF	
ESG disclosures	0,964	1,037	Multicollinearity does not occur
Technological Innovation	0,96	1,037	Multicollinearity does not occur

Source: Analyzed data (2025)

As presented in Table 4, the multicollinearity diagnostic test yielded identical results for both the environmental, social, and governance (ESG) and

technological innovation variables, with each demonstrating a tolerance value of 0.964 and a Variance Inflation Factor (VIF) of 1.037. Because these tolerance values exceed the 0.10 threshold and the VIF values remain well below 10, the model is free of multicollinearity among the independent variables.

Heteroscedasticity Test

The empirical outcomes of the heteroscedasticity test are presented in Table 5.

Table 5
Outcomes of Heteroscedasticity Test

Variabel	t-count	Sig.	Remarks
ESG disclosures	0,707	0,582	Heteroscedasticity does not occur
Technological Innovation	-0,302	0,625	Heteroscedasticity does not occur

Source: Analyzed Data (2025)

Table 5 outlines the heteroscedasticity test results, showing significance values of 0.582 for the ESG variable and 0.625 for technological innovation. Since both values are well above the 0.05 benchmark, the independent variables do not suffer from heteroscedasticity. These findings confirm that the regression model meets the necessary classical assumptions.

Autocorrelation Test

The empirical outcomes of the autocorrelation test are presented in the following Table 6.

Table 6
Outcomes of Autocorrelation Test

Models	Nilai <i>Durbin-Watson</i>	Remarks
1	1.706	No autocorrelation occurs

Source: Analyzed Data (2025)

The results of the autocorrelation test listed in Table 6 show that the Durbin–Watson (DW) value is 1.706. Since these values are between -2 and +2, the regression model can be said to be free of autocorrelation. This means that the model used in this study has met the classical assumptions and can proceed to the next stage of analysis.

F Test

The empirical results of the F-test are presented in Table 7.

Table 7
Outcomes of F Test

	F	Sig
Regression Residual Total	3.541	0,035

Source: Processed Data (2025)

Based on an F-test significance value of 0.035, ESG and technological innovation jointly have a significant impact on financial performance. This outcome indicates that the proposed empirical model is both appropriate and possesses robust predictive power.

Test of Determination Coefficient (*Adjusted R²*)

The empirical result of the test of the determination coefficient (adjusted R²) is presented in Table 8.

Table 8
Determination Coefficient Test

Model	R	R Square	Adjusted R Square
1	0,313	0,098	0,071

Source: Analyzed data (2025)

As illustrated by the coefficient determination results in Table 8, the model yielded an R² value of 0.313. This indicates that the independent variables account for only 9.8% of the variance observed in the dependent variable. Most of the variance, 90.2%, is attributable to external factors omitted from this specific regression model.

Multiple Linear Regression Analysis

The outcomes of the multiple linear regression analysis test are presented in Table 9.

Table 9
Outcomes of T-test

Coefficients a

		<i>Unstandardized Coefficients</i>		<i>Standardized Coefficients</i>		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	10.729	4.650		2.307	0,024
	ESG disclosures	0,133	0,055	0,289	2.413	0,019
	Technological Innovation	-0,586	0,376	-0,187	-1.559	0,124

a. Dependent Variable : Y_Kinerja Keuangan

Source: Analyzed data (2025)

The results detailed in the table above yield the following multiple regression model:

$$Y = 10.729 + 0.133X_1 - 0.586X_2 + e$$

The model's constant of 10.729 represents the baseline level of financial performance (Y) when ESG disclosure (X₁) and technological innovation (X₂) are zero. ESG disclosure (X₁) has a positive coefficient of 0.133, indicating that a one-unit improvement in disclosure quality yields a 0.133 increase in financial performance. This reinforces the idea that better sustainability reporting drives stronger financial results. In contrast, technological innovation (X₂) carries a negative coefficient of -0.586, meaning a one-unit increase reduces financial performance by 0.586. This negative impact is attributable to the intensive initial outlays for research, equipment, and training. Consequently, the heavy short-term expenditures compromise current profitability, even if the long-term outlook for the innovation remains positive.

T-Test

The t-test results detailed in Table 9 evaluate the hypotheses as follows.

1. ESG disclosures: The variable demonstrates a positive t-test of 2.414 with a significance value of 0.024. Because the p-value falls below the 0.05 threshold ($p < 0.05$), ESG disclosures exert a statistically significant positive effect on financial performance, thereby supporting H₁.

2. Technological innovation: This variable yields a negative t-test of -1.559 and a non-significant value of 0.124. Since the p-value exceeds the 0.05 significance level ($p > 0.05$), the negative relationship is not statistically meaningful. Consequently, technological innovation does not significantly influence financial performance in this model, and H_2 is rejected.

The Influence of ESG on Financial Performance

Empirical findings indicate that ESG disclosure exerts a statistically significant positive influence on financial performance ($p = 0.019 < 0.05$). This relationship implies that expanding the scope of a firm's sustainability reporting directly enhances its financial outcomes, thereby supporting the first hypothesis (H_1). From a stakeholder theory perspective, comprehensive ESG reporting meets the information needs of various external parties, thereby reinforcing corporate transparency. This transparency incentivizes management to deploy strategic ESG initiatives that optimize asset management efficiency. Furthermore, inclusive ESG information strengthens stakeholder engagement, motivating consumers and investors to support the firm. This ultimately triggers higher sales volume and drives robust profitability (Aydoğmuş et al., 2022; Dewi et al., 2025; Nurahman et al., 2024).

In addition, company operations that are carried out with social values and norms that are in line with society will gain legitimacy from the community. Companies in the energy sector that are consistent in ESG disclosure are considered more ethical, responsible, and in accordance with social expectations, so that it is easier to gain public legitimacy and attract sustainability-oriented investors, and their existence will be supported by the community, so that the company's sustainability can take place in the long term (Holly, et al., 2026).

Strong ESG disclosures reveal a lot about a company's bottom line. Take the environmental piece: when a business focuses on energy efficiency, waste management, and cutting emissions, it does more than just avoid regulatory fines.

It also runs a much leaner operation. Saving resources means cutting costs, which directly pads the profit margins and boosts overall financial performance.

The social aspect describes the company treating employees, consumers, and the surrounding community. Through social responsibility programs, the protection of employee rights, and involvement in community development, companies can increase employee loyalty and enhance their reputation in the eyes of the public. High employee loyalty has an impact on increased productivity, while a good social reputation strengthens consumer trust. Therefore, the social dimension of ESG positively correlates with financial results, given that elevated workforce productivity and stronger consumer trust directly stimulate revenue growth. The existence of the company is also not opposed by the community because various inclusive company programs also involve the community.

Governance aspects include transparency, accountability, board of director structure, and anti-corruption practices. Robust corporate governance mitigates information asymmetry between management and investors while enhancing executive accountability. By assuring stakeholders of professional and sustainable management, strong governance expands access to capital at a lower cost and bolsters investor confidence. Consequently, transparency and effective risk management directly strengthen corporate stability and profitability, driving superior financial performance by reducing financing costs and enhancing market trust.

The Influence of Technological Innovation on Financial Performance

Technological innovation fails to significantly influence the bottom line of energy corporations. This is due to the high investment costs required for innovation and the time required for the innovation to provide real economic benefits (Giraldo, et al., 2026). So, in the short term, innovation can suppress financial performance due to large expenses without direct financial results. This is evidenced by a p-value of 0.124, which exceeds the standard 0.05 significance threshold, paired with a negative regression coefficient ($b_2 = -0.586$). Consequently, while energy firms have invested in technological innovation, these efforts did not yield a

statistically tangible impact on profitability during the analyzed timeframe. Hypothesis 2 (H₂) is therefore rejected.

Technological innovation is measured through a dummy variable that indicates the presence or absence of the implementation of technological innovation in energy companies. Theoretically, technological innovations are expected to increase operational productivity, reduce production costs, and create new market opportunities, ultimately increasing profitability. Nevertheless, this empirical evidence indicates that technological innovation within Indonesian energy firms has failed to yield a meaningful impact on financial performance. This lack of significance is primarily driven by the prohibitive upfront capital expenditure burden needed in the application of new technologies, so the benefits of these innovations have not been directly reflected in short-term profits. In the energy sector, technological innovations generally take longer to produce real impacts, for example, in the form of resource efficiency, emission reduction, and increased environmental sustainability. Thus, technological innovation provides more long-term strategic value than short-term profitability increases.

Technological innovation can be understood through two dimensions. First, product innovation, namely the development of renewable energy technology, a more environmentally friendly power generation system, or the use of digitalization in energy services. This innovation has the potential to open new markets and increase competitiveness, but in the short term, it burdens the company's finances because it requires substantial research and investment, and implementing the system takes a long time. In addition, creating new products in the energy sector entails high research and development costs and does not yield short-term results. Second, process innovation, namely the use of new technology in operational activities, such as supply chain digitization or distribution system automation. The implementation of an environmentally friendly power generation system will reduce short-term profits. These innovations are expected to increase efficiency and reduce costs, but the benefits are usually only realized after implementation becomes stable in the long term.

Managerial and organizational innovation is the use of information technology in company management, such as the application of *enterprise resource planning* (ERP) systems or *big data analytics* for decision-making. Changes in the use of new technology can cause resistance among the company's employees and management who are not ready for the change. If top management or employees are not ready to implement new technology, the role of new technology in achieving efficiency and cost reduction will be limited. Although these innovations can improve management effectiveness, their impact on profitability is not immediately felt.

The outcomes of this study are consistent with prior research by Tong and Yang (2025) and Li et al. (2021) which demonstrated that technological innovation exhibits no statistically significant direct impact on financial performance. Various adjustments are needed so that technological innovation can run well in energy sector companies, including the support of the top management and employees who run it to optimize financial outcomes.

5. CONCLUSIONS AND SUGGESTIONS

The empirical analysis indicates that robust ESG disclosure leads to significantly stronger corporate financial outcomes. This positive relationship demonstrates that expanding sustainability initiatives and transparent reporting serve as viable mechanisms for energy corporations to optimize internal operational efficiency and cultivate deep investor trust. By prioritizing environmental stewardship and transparent governance, compliant firms can mitigate non-financial risks and secure preferential access to sustainable capital markets. Ultimately, the study concludes that long-term corporate transparency functions as a strategic asset that directly expands profit margins and enhances overall market credibility.

Conversely, the findings reveal an insignificant relationship between technological innovation and immediate financial outcomes, characterized by a negative directional impact. This trend stems from the steep capital requirements and heavy financial outlays associated with deploying cutting-edge technical systems, which inherently create a substantial short-term drain on corporate

resources. Furthermore, a significant time lag is required before new technological advancements can successfully materialize into tangible market returns. Consequently, the study concludes that while innovation is essential for future competitiveness, its heavy initial implementation costs temporarily suppress performance metrics before any structural economic advantages can be realized.

Theoretically, this study advances both legitimacy and stakeholder theories by demonstrating that corporate survival in high-impact sectors requires a strategic dual-track mechanism that balances external perception management with internal operational adaptation. Through the lens of legitimacy theory, it refines the traditional "social license to operate" framework by proving that transparent ESG disclosure acts as an immediate communicative strategy that fulfills the implicit social contract, whereas technological innovation represents a long-term technical restructuring that carries a temporary financial burden. Concurrently, it extends stakeholder theory by highlighting a critical temporal tension within stakeholder management, revealing that capital markets immediately reward non-financial transparency (ESG) due to reduced information asymmetry, while capital-intensive R&D investments face a significant time lag before satisfying the broader stakeholder matrix. Ultimately, this integration proves that comprehensive value creation is not a static mandate, but a dynamic trade-off where communication and technical evolution operate on completely different financial timelines.

Practically, this study underscores that executives in the energy sector must adopt a dual-horizon strategy that treats high-quality ESG reporting as an immediate financial driver and technological innovation as a vital tool for long-term survival. To secure near-term profitability, energy managers should prioritize robust, transparent sustainability disclosures, as the capital markets directly reward non-financial accountability with lower borrowing costs and greater investor confidence. Concurrently, boardrooms must recognize that while transitioning to green technologies and digitalizing energy infrastructure create heavy upfront expenditures that temporarily strain cash flows, continuous R&D cannot be abandoned; instead, these technological investments must be

strategically sustained to protect the firm from future carbon regulations, minimize operational overhead, and future-proof the business against the inevitable pressures of the global energy transition.

These results suggest that investors should integrate ESG metrics into their valuation models to better judge the financial outlook of energy corporations. High ESG scores act as a proxy for corporate health and credibility, making these firms prime targets for patient capital. However, given that technological innovation has no immediate payoff for the bottom line, investors must look past the hype and carefully evaluate the practical, long-term merits of a firm's R&D strategy.

From a policy perspective, this research supports the sustainable finance mandates championed by the OJK. It underscores the necessity for state and regulatory authorities to incentivize or compel energy sector companies to improve their ESG transparency through reinforced regulatory frameworks and standardized reporting criteria.

A key methodological limitation of this study lies in its measurement of technological innovation. By utilizing a binary dummy variable, the research is constrained in its ability to differentiate the scale, classification, or operational quality of the innovations undertaken by the sampled corporations. Others, such as a small sample size, the absence of control variables, the lack of a panel data technique, and a very low R-square.

Moving forward, researchers are encouraged to replace binary metrics with multi-dimensional indicators of innovation. By tracking R&D investments, the number of successful patents, or the depth of new technology adoption, future empirical models can map the financial returns of corporate innovation with far greater accuracy. Future research must include control variables, apply panel data methods, extend the study to other sectors, or use a longer observation period.

REFERENCE

Adhitya. (2023, January 11). *The energy sector's idx recorded the biggest gain last year, the weakest technology*. Retrieved January 08, 2026, from

IPOtnews:

https://www.indopremier.com/ipotnews/newsDetail.php?jdl=IDX_Sektor_Energi_Catat_Penguatan_Terbesar_Tahun_Lalu_Teknologi_Terlemah&news_id=159497&group_news=IPOTNEWS&news_date=&taging_subtype=MARKETOVERVIEW&name=&search=y_general&q=saham,emiten,sektor%20IH

- Aydoğmuş, M., Gülay, G., & Ergun, K. (2022). Impact of esg performance on firm value and profitability. *Borsa Istanbul Review*, 2022(1), 5119-5127. <https://doi.org/10.1016/j.bir.2022.11.006>
- Choi, S., & Yoo, J. (2022). The impact of technological innovation and strategic csr on firm value: Implication for social open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, 1-20. <https://doi.org/10.3390/joitmc8040188>
- Ciptani, M., & Ampri, E. (2025). The impact of esg disclosure on financial performance in manufacturing industry in Indonesia. *Asian Journal of Applied Business and Management*, 1-15. <https://dx.doi.org/10.55927/ajabm.v4i4.582>
- Destianty, A. (2026). The influence of working capital, financial literacy and financial performance on business growth in MSMEs. *Multidisciplinary Advanced Research Opportunity Journal*, 1(2), 43-54.
- Dewi, N., Surasmi, I., & Saputra, K. (2025). The influence of environmental, social, and governance (ESG) disclosure on financial performance. *International Journal of Environmental*, 6(1), 149-161. <https://doi.org/10.38142/ijesss.v6i1.1315>
- Dowling, J., & Pfeffer, J. (1975). Organizational legitimacy: Social values and organizational behavior. *Pacific Sociological Review*, 18(1), 122-136. <https://doi.org/10.2307/1388226>
- Freeman, R. (1984). *Strategic management: A stakeholder approach*. Boston: Pitman. Retrieved from https://books.google.co.id/books/about/Strategic_Management.html?id=4PUJAQAAMAAJ&redir_esc=y
- Giraldo, L., Morales, J., Arias, A., Cardona-Avecedo, S., Patino-Vanegas, J., Franco-Castano, S., & Carvajal, J. (2026). *Impact of Technological Innovation on Financial Results: A Correlational Meta Analysis* (Vol. 12). Scientific Culture. <https://doi.org/0.5281/zenodo.12426176>
- Hasibuan, R., & Oktabiana, U. (2023, March 08). Technological innovation in influencing the financial performance of Sharia banking in Indonesia. *Scientific Journal of Islamic Economics*, 9(1), 283-291. <https://dx.doi.org/10.29040/jiei.v9i1.8147>
- Holly, A., Tank, P., Kampo, K., & Wijaya, R. (2026). *Environmental, social, governance (esg) disclosure and firm value: Role of firm size* (Vol. 9).

- Makassar: Master of Accounting, Atma Jaya University, Makassar.
<https://doi.org/10.35129/s8bfrc02>
- Inawati, W., & Rahmawati, R. (2023). Environmental, social, and governance (esg) impact on financial performance. *Journal of the Academy of Accounting*, 6(2), 225-241.
<https://ejournal.umm.ac.id/index.php/jaa/article/view/26674>
- Iskandarsjah, E. (2023, November 20). *Marketeers*. Retrieved 01 08, 2026, from <https://www.marketeers.com/pertamina-geothermal-energy-raih-rating-tertinggi-dari-sustainalytics/>
- Lee, S. (2024). Technological innovation and profit. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(3), 1-8.
<https://doi.org/10.1016/j.joitmc.2024.100335>
- Li, J., Li, N., & Cheng, X. (2021). The impact of fintech on corporate technology innovation based on driving effects, mechanism identification, and heterogeneity analysis. *Discrete Dynamics in Nature and Society*, 2021(1), 1-12. <https://doi.org/10.1155/2021/7825120>
- Mardiana, A., Holly, A., & Jao, R. (2024). *The role of the board of directors characteristics on financial performance mediated by the corporate reputation* (Vol. 4). Makassar: Contemporary Journal on Business and Accounting. <https://doi.org/10.58792/cjba.v4i2.68>
- Masso, J., & Vahter, P. (2008). Technological innovation and productivity in late-transition Estonia: Econometric evidence from innovation surveys. *The European Journal of Development Research*, 20(1), 240-261.
<https://doi.org/10.1080/09578810802060751>
- Mohammad, W., & Wasiuzzaman, S. (2021). Environmental, social and governance (esg) disclosure, competitive advantage and performance of firms in Malaysia. *Cleaner Environmental Systems*, 2(1), 1-11.
<https://doi.org/10.1016/j.cesys.2021.100015>
- Nurahman, D., Majid, M., & Hersugondo, H. (2024, December 12). ESG disclosure's positive impact on financial performance in Indonesia's growth. *Research Horizon*, 4(6), 25-34.
<https://doi.org/10.54518/rh.v4i6.2144>
- Omonijo, O., & Yunsheng, Z. (2022). Impact mechanism of technological innovation by Chinese companies on CSR in Africa mobile communication industry. *Innovation and Green Development*, 1(2), 1-9.
<https://doi.org/10.1016/j.igd.2022.100005>
- Sainz, A., Dominguez, D., Trujillo, H., & Barraza, L. (2025, September 18). The impact of technological innovation on the financial performance of companies: A logit analysis. *Revista CEA*, 11(27), 1-20.
<https://doi.org/10.22430/24223182.3377>

- Tong, X., & Yang, W. (2025). Empirical analysis of the impact of financial technology on the profitability of listed banks. *International Review of Economics & Finance*, 98(1), 1-14. doi:https://www.researchgate.net/deref/https%3A%2F%2Fdoi.org%2F10.1016%2Fj.iref.2024.103788?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwicG9zaXRpb24iOiJwYWdlQ29udGVudCJ9fQ
- Widyawati, L. (2024). *Understanding the esg and financial performance relationship: Different metrics matters* (Vol. 7). Salatiga: Universitas Kristen Satya Wacana. <https://doi.org/10.24246/persi.v7i3.p298-314>