INTERNATIONAL JOURNAL ON MANAGEMENT AND EDUCATION HUMAN DEVELOPMENT

J. Management & Education Human Development

ISSN: 2775 - 7765
web link: http://www.ijmehd.com

The Effect of Environmental, Social, and Governance (ESG) Disclosure on Firm Value with Green Innovation as a Mediating Variable (A Study of Energy Sector Companies Listed on the Indonesia Stock Exchange, 2019-2023)

[1]Sitti Fatmawati Wulansari*, [2]Salma Saleh, [3]La Harjoprawiro, [4]Sujono, [5]Wahyuniati Hamid

Department of Management, Universitas Halu Oleo, Kendari, Indonesia

Received: 28/02/2026 Accepted: 16/04/2026 Published: 30/06/2026

***Corresponding Author E-mail:** *zulfikar19345@gmail.com*

ABSTRACT

This study aims to analyze: (1) the effect of ESG disclosure on green innovation; (2) the effect of green innovation on firm value; (3) the direct effect of ESG disclosure on firm value; and (4) the mediating role of green innovation in the relationship between ESG disclosure and firm value. The sample consisted of 23 energy sector companies listed on the Indonesia Stock Exchange during the 2019-2023 period. The data were analyzed using panel data regression with EViews software. The findings show that ESG disclosure has a positive and significant effect on green innovation, with a coefficient of 1.151624 and a probability value of 0.0000 (< 0.05). ESG disclosure also has a positive and significant effect on firm value, with a coefficient of 17.75889 and a probability value of 0.0121 (< 0.05). Green innovation has a significant but negative effect on firm value, with a coefficient of -14.36793 and a probability value of 0.0186 (< 0.05). The control variables indicate that ROA does not significantly affect either green innovation or firm value; firm size has no significant effect on green innovation but has a significant negative effect on firm value; and DER has no significant effect on green innovation but has a significant positive effect on firm value. Furthermore, the Sobel test indicates that green innovation does not significantly mediate the effect of ESG disclosure on firm value. These results suggest that ESG disclosure is responded to more directly by the capital market than green innovation, while green innovation in the energy sector is still perceived as a costly long-term investment during the transition period.

Keywords: *Environmental, Firm Value; Green Innovation; Governance (ESG) Disclosure, Social.*

I. INTRODUCTION

In modern business, firm value is a crucial indicator that reflects market confidence in a company's ability to generate long-term returns. Firm value also represents the extent to which management strategy, operational efficiency, and business sustainability are aligned with investor expectations. For capital market participants, changes in firm value often provide an important signal for investment decision-making. Firm value does not merely describe a company's current financial position; it also reflects expectations regarding its future growth potential.

Bodie, Kane, and Marcus (2014) explain that firm value can be proxied by indicators such as Tobin's Q, Price to Book Value (PBV), and Price to Earnings Ratio (PER). These ratios show how the market values a company's assets or earnings relative to their recorded book values. The higher these ratios are, the more positive the market assessment of the company's performance tends to be. In this context, increasing firm value is a primary managerial objective because it indicates success in creating added value for shareholders and other stakeholders.

Firm value is closely associated with Signaling Theory, as introduced by Spence (1973). This theory explains that firms can send positive signals to the market through the policies and information they disclose. One important signal increasingly considered by investors is sustainability information, particularly Environmental, Social, and Governance (ESG) disclosure. Through ESG disclosure, firms demonstrate their responsibility for environmental, social, and governance issues, which may serve as an important indicator of management quality and long-term prospects.

The implementation of ESG principles has become a key strategy in contemporary business. According to Friede, Busch, and Bassen (2015), ESG functions not only as a measure of corporate social responsibility but also as a strategic approach for improving corporate performance and firm value. ESG consists of three major dimensions: the environmental dimension, which includes efforts to reduce environmental impact; the social dimension, which reflects a company's relationship with employees and communities; and the governance dimension, which assesses transparency and managerial ethics. These three dimensions constitute important pillars that reflect a company's ability to manage business risks and opportunities sustainably.

Liu and Hou (2023) emphasize that firms with strong ESG performance generally have higher market values than firms that disregard these aspects. This occurs because investors tend to perceive sustainability-oriented firms as more stable and less exposed to business risk. Firms with sound ESG practices also tend to obtain financing more easily, attract institutional investors, and maintain consumer loyalty. Thus, ESG implementation is no longer merely a moral obligation; it has become an economic strategy that can enhance competitiveness and firm value.

Nevertheless, empirical findings regarding the effect of ESG on firm value remain inconsistent. Some studies report a significant positive effect, whereas others find insignificant or even negative effects. These differences may be attributed to sectoral characteristics, the quality of ESG disclosure, and the manner in which ESG practices are implemented in business operations. Putra and Budastra (2025), for example, found that ESG disclosure in Indonesia does not directly affect firm value when it is not followed by concrete actions in the field. This suggests that merely disclosing sustainability data is insufficient to build market confidence.

This research gap calls for a new approach to understanding how ESG can generate a meaningful impact on firm value. One approach that has attracted scholarly attention is the role of green innovation as a mediating variable. Chen, Lai, and Wen (2006) define green innovation as innovation that considers the ecological impact of production processes, products, and managerial strategies. It focuses on the development of technologies and solutions that reduce natural resource use, suppress emissions, and improve energy efficiency.

From the perspective of the Resource-Based View (Barney, 1991), green innovation is an internal resource that can be valuable, rare, difficult to imitate, and non-substitutable. Firms that effectively develop green innovation have greater opportunities to create long-term competitive advantages. Such innovation can also strengthen corporate reputation by demonstrating seriousness in implementing sustainability principles. Therefore, green innovation is not only a concrete manifestation of ESG implementation but also a potential bridge linking sustainability practices to higher firm value.

Liu and Hou (2023) show that green innovation partially mediates the relationship between ESG and firm value. Firms with high ESG scores tend to be more proactive in implementing green innovation, both through environmentally friendly product development and increased production-process efficiency. Such innovation can improve market perceptions, enhance operational efficiency, and strengthen competitive position. Zhang et al. (2022) also demonstrate that firms actively engaged in green innovation are more capable of transforming ESG practices into positive financial performance, which subsequently affects market value.

In Indonesia, ESG implementation has developed significantly. The Financial Services Authority (OJK) issued Regulation No. 51/POJK.03/2017, which requires financial institutions and issuers to prepare sustainability reports. The Indonesia Stock Exchange (IDX) has also introduced special indices, such as IDX ESG Leaders and the SRI-KEHATI Index, to encourage listed firms to implement sustainability principles more actively. According to OJK data (2023), the number of companies issuing sustainability reports increased from 47 in 2019 to more than 130 in 2023. This trend indicates a growing awareness of ESG implementation in the Indonesian capital market.

The energy sector is particularly relevant for investigation because it has high exposure to environmental and social issues. The energy industry is a major contributor to carbon emissions and a large user of natural resources. It plays a critical role in supporting the achievement of the Sustainable Development Goals (SDGs), particularly Affordable and Clean Energy (SDG 7) and Climate Action (SDG 13). Through renewable energy development, energy efficiency, and clean-technology innovation, the energy sector has considerable potential to contribute to a low-carbon economic transition. In Indonesia, these efforts align with the national commitment to achieve Net Zero Emissions by 2060. Accordingly, research on ESG and green innovation in the energy sector is highly relevant both academically and in support of sustainable development policy.

The 2019-2023 period was selected because it represents an important transition phase for ESG implementation in Indonesia. The year 2019 marked the beginning of increasing sustainability reporting among public companies, while the post-COVID-19 period highlighted sustainability as a key factor in business recovery strategies. This period also reflects the implementation of national policies on energy transition and emission-reduction targets that have been strengthened by the government.

However, an important question remains unresolved: the mechanism through which ESG disclosure affects firm value is still unclear. Green innovation is presumed to function as a mediating mechanism in this relationship, but its role remains debated. Green innovation may strengthen the effect of ESG disclosure on firm value, yet it may also impose cost burdens that weaken the relationship, especially among energy sector companies in developing countries such as Indonesia.

This study uses Tobin's Q as the proxy for firm value because it captures market assessment and investor expectations regarding a firm's long-term performance. Tobin's Q is considered more relevant than PBV in ESG and green innovation studies because the benefits of these practices are long term and are not always reflected in the company's book value.

Co-responding Author: Sitti Fatmawati Wulansari
Halu Oleo University, Kendari, Indonesia

The energy sector was selected because it is characterized by high environmental impact, high capital intensity, and strict regulation. Energy companies face substantial pressure to manage environmental and social risks while maintaining economic performance and firm value. In recent years, the energy sector has become a primary focus of investors and regulators in relation to ESG implementation and disclosure, given its strategic role in economic development and its contribution to emissions and environmental degradation. Therefore, the energy sector provides a relevant context for examining how ESG disclosure and green innovation are valued by the market.

The study period of 2019-2023 also reflects an important phase in the development of sustainability practices and ESG reporting in Indonesia. During this period, regulatory and investor attention to sustainability transparency increased alongside the strengthening of policies on social and environmental responsibility and the adoption of sustainability reporting by public companies. The period also covers the COVID-19 pandemic and economic recovery phase, both of which influenced investor perceptions of risk, sustainability, and long-term corporate strategy. Therefore, 2019-2023 is considered appropriate for capturing the dynamics among ESG disclosure, green innovation, and firm value in the Indonesian capital market.

The development of ESG implementation among energy companies is presented in the following table:

Table 1. ESG Score Index in the Energy Sector

Company	2019	2020	2021	2022	2023	Average (%)
AKR Corporindo Tbk.	-	24%	38%	38%	37%	34.25%
Energy Indonesia Tbk.	-	22%	19%	25%	37%	25.75%
Elnusa Tbk.	8%	12%	16%	13%	39%	17.60%
Indo Tambangraya Megah Tbk.	35%	63%	55%	69%	96%	63.60%
Bukit Asam Tbk.	21%	51%	66%	91%	95%	64.80%
Petrosea Tbk.	13%	32%	46%	65%	71%	45.40%

Source: bgk.foundation

Based on the conceptual arguments, empirical findings, and current phenomena in the Indonesian capital market, this study is entitled: "The Effect of ESG Disclosure on Firm Value with Green Innovation as a Mediating Variable (A Study of Energy Sector Companies Listed on the Indonesia Stock Exchange, 2019-2023)."

II. LITERATURE REVIEW

2.1 Firm Value

Firm value represents the market's perception of a company's success in managing resources and generating long-term returns. According to Brigham and Houston (2010), firm value reflects the fair market price of a company's shares, which embodies investors' perceptions of its prospects, risks, and management quality. The higher the firm value, the greater the market confidence in the company's ability to create sustainable economic value.

Brigham and Houston (2010) also define firm value as the market value of a company's total assets, whether financed by equity or debt. A higher firm value indicates greater shareholder wealth because it reflects market expectations regarding future earnings.

Common indicators used to measure firm value include Tobin's Q, Price to Book Value (PBV), and Price Earnings Ratio (PER).

2.2 Green Innovation

Chen, Lai, and Wen (2006) broaden the scope of green innovation by stating that "green innovation refers to hardware or software innovations that are related to green products or processes, including innovation in energy saving, pollution prevention, waste recycling, green product design, or corporate environmental management." Thus, green innovation does not only include the development of physical technologies such as energy-saving machinery or waste-treatment systems; it also includes comprehensive environmental management systems that support efficient resource use.

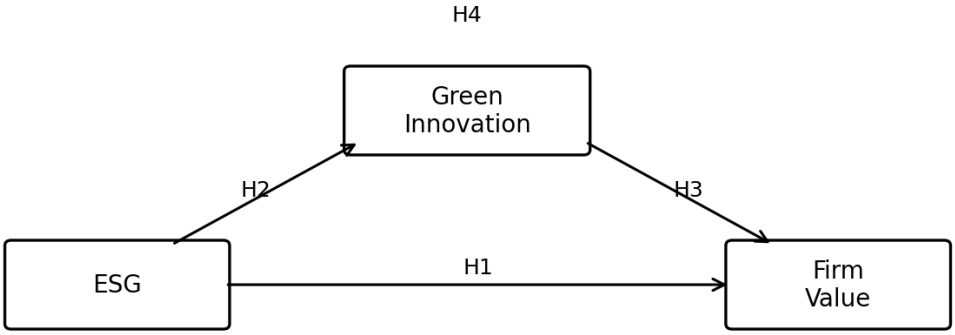
Green innovation is a strategic corporate effort to implement product, process, technological, and managerial-system innovations that actively improve environmental impacts, create resource efficiency, enhance reputation, and strengthen financial performance and firm value in the long term.

2.3 Conceptual Framework

The conceptual framework positions ESG disclosure as the independent variable, green innovation as the mediating variable, and firm value as the dependent variable. The framework is designed to examine both direct and indirect effects among these variables.

Co-responding Author: Sitti Fatmawati Wulansari
Halu Oleo University, Kendari, Indonesia

Figure 1. Conceptual Framewo



2.4 Research Hypotheses

H1: ESG disclosure has a positive effect on firm value.

H2: ESG disclosure has a positive effect on green innovation.

H3: Green innovation has a positive effect on firm value.

H4: Green innovation mediates the effect of ESG disclosure on firm value.

III. RESEARCH METHOD

The population of this study consists of all energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2019-2023 period. The sample was selected using purposive sampling based on the following criteria: (1) energy sector companies continuously listed on the IDX during 2019-2023; (2) companies that consistently published annual reports and sustainability reports during the observation period; (3) companies with accessible ESG disclosure data from secondary sources such as Bloomberg, Refinitiv, or sustainability reports; and (4) companies that explicitly disclosed green innovation activities in their sustainability reports, such as environmentally friendly innovation programs, environmental certification, or the development of green technology. Purposive sampling is a sampling technique in which researchers intentionally select particular elements of the population based on criteria or specific objectives relevant to the study.

Panel data regression analysis was employed because the data combine time-series observations (years) and cross-sectional observations (companies). This model was selected because it can simultaneously accommodate variability across time and across companies, thereby producing more efficient parameter estimates.

IV. RESULTS AND DISCUSSION

4.1 t-Test Results

The t-test is used to determine whether each independent variable contributes significantly to the dependent variable. The following table presents the t-test output processed using EViews.

Table 2. Partial Test Results (t-test)

GI					
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**Decision**
C	0.143424	0.113094	1.268178	0.2081	
ESG	1.151624	0.013282	86.70787	0.0000	Accepted
ROA	-9.97E-07	5.07E-06	-0.19652	0.8447	Rejected
SIZE	-0.005968	0.005101	-1.16987	0.2452	Rejected
DER	-2.62E-06	2.45E-05	-0.10693	0.9151	Rejected
TQ					
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**	**Decision**
C	12.4299	5.4566	2.2780	0.0247	
ESG	17.75889	6.957873	2.552344	0.0121	Accepted
GI	-14.36793	6.011469	-2.39009	0.0186	Accepted
ROA	0.000196	0.000288	0.680304	0.4978	Rejected
SIZE	-0.503792	0.244308	-2.06212	0.0416	Accepted
DER	0.005012	0.001394	3.596459	0.0005	Accepted

Source: Secondary data processed, 2026

4.1.1 The Effect of ESG Disclosure on Green Innovation

Based on the t-test results, the ESG disclosure variable has a probability value of 0.0000 (< 0.05). This indicates that ESG disclosure has a significant effect on green innovation. The coefficient of 1.151624 shows that a

one-unit increase in ESG disclosure increases green innovation by 1.151624. Thus, the hypothesis stating that ESG disclosure has a positive and significant effect on green innovation is accepted.

4.1.2 The Effect of Return on Assets on Green Innovation

Based on the t-test results, Return on Assets (ROA) has a probability value of 0.8447 (> 0.05). This means that ROA does not have a significant effect on green innovation. The coefficient of -9.97E-07 indicates that a one-unit increase in ROA decreases green innovation by only 0.000000997; however, this decrease is not statistically significant. Therefore, the hypothesis stating that ROA affects green innovation is not accepted.

4.1.3 The Effect of Firm Size on Green Innovation

Based on the t-test results, firm size has a probability value of 0.2452 (> 0.05). This means that firm size does not have a significant effect on green innovation. The coefficient of -0.005968 indicates that a one-unit increase in size decreases green innovation by 0.005968; however, this decrease is not statistically significant. Therefore, the hypothesis stating that firm size affects green innovation is not accepted.

4.1.4 The Effect of Debt to Equity Ratio on Green Innovation

Based on the t-test results, the Debt to Equity Ratio (DER) has a probability value of 0.9151 (> 0.05). This means that DER does not have a significant effect on green innovation. The coefficient of -2.62E-06 indicates that a one-unit increase in DER decreases green innovation by only 0.00000262; however, this decrease is not statistically significant. Therefore, the hypothesis stating that DER affects green innovation is not accepted.

4.1.5 The Effect of ESG Disclosure on Firm Value

Based on the t-test results, ESG disclosure has a probability value of 0.0121 (< 0.05). This indicates that ESG disclosure has a significant effect on firm value. The coefficient of 17.75889 shows that a one-unit increase in ESG disclosure increases firm value (Tobin's Q) by 17.75889. Thus, the hypothesis stating that ESG disclosure has a positive and significant effect on firm value is accepted.

4.1.6 The Effect of Green Innovation on Firm Value

Based on the t-test results, green innovation (GI) has a probability value of 0.0186 (< 0.05). This means that GI has a significant effect on firm value (Tobin's Q). The coefficient of -14.36793 indicates that a one-unit increase in green innovation decreases firm value (Tobin's Q) by 14.36793. Therefore, the hypothesis stating that green innovation affects firm value is accepted, although the direction of the effect is negative.

4.1.7 The Effect of Return on Assets on Firm Value

Based on the t-test results, Return on Assets (ROA) has a probability value of 0.4978 (> 0.05). This indicates that ROA does not significantly affect firm value. The coefficient of 0.000196 shows that a one-unit increase in ROA increases firm value by only 0.000196; however, this increase is not statistically significant. Therefore, the hypothesis stating that ROA affects firm value is not accepted.

4.1.8 The Effect of Firm Size on Firm Value

Based on the t-test results, firm size has a probability value of 0.0416 (< 0.05). This means that size has a significant effect on firm value. The coefficient of -0.503792 indicates that a one-unit increase in firm size decreases firm value by 0.503792. Therefore, the hypothesis stating that size affects firm value is accepted, although the direction of the effect is negative.

4.1.9 The Effect of Debt to Equity Ratio on Firm Value

Based on the t-test results, the Debt to Equity Ratio (DER) has a probability value of 0.0005 (< 0.05). This indicates that DER has a significant effect on firm value. The coefficient of 0.005012 shows that a one-unit increase in DER increases firm value by 0.005012. Therefore, the hypothesis stating that DER has a positive and significant effect on firm value is accepted.

4.2 F-Test Results

The F-test in regression analysis is used to examine the overall significance of the model, or whether the independent variables jointly affect the dependent variable. The F-test results were processed using EViews.

Based on the F-test output, the Prob(F-statistic) value is 0.000000 (< 0.05), indicating that ESG disclosure, ROA, size, and DER simultaneously have a significant effect on green innovation (GI). Accordingly, the regression model is feasible, and the four variables jointly explain variation in green innovation.

Based on the second F-test output, the Prob(F-statistic) value is 0.000353 (< 0.05), indicating that ESG disclosure, green innovation (GI), ROA, size, and DER simultaneously have a significant effect on firm value (Tobin's Q). Therefore, the regression model is feasible, and these five variables jointly explain variation in firm value.

4.3 Coefficient of Determination (R^2)

The coefficient of determination (R^2) measures how well the variability of the dependent variable can be explained by the independent variables in the regression model.

The adjusted R-squared value for the green innovation model is 0.993916, or approximately 99%. This indicates that ESG disclosure, ROA, size, and DER explain 99% of the variation in green innovation, while the remaining 1% is explained by factors outside the model. Thus, the regression model has very strong explanatory power for green innovation.

The adjusted R-squared value for the firm value model is 0.149919, or approximately 15%. This means that ESG disclosure, green innovation (GI), ROA, size, and DER explain only 15% of the variation in firm value, while the remaining 85% is explained by other variables outside the model. Therefore, the model's explanatory power for

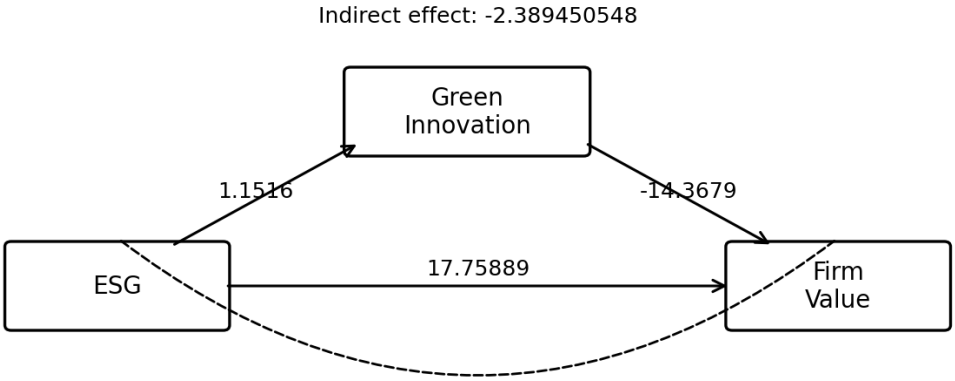
changes in firm value is relatively low, indicating that other external factors play a greater role in determining firm value.

4.4 Path Model Visualization

The path model visualization is intended to clarify the relationships among variables in this study, including both direct and indirect effects. The path diagram is based on regression estimates for each substructure and presents path coefficients and causal relationships among variables. This visualization facilitates a more comprehensive interpretation of the path analysis.

In this study, ESG serves as the independent variable, green innovation functions as the mediating variable, and firm value (Tobin's Q) is the dependent variable. Based on the estimated path model, the visualization is presented below.

Figure 2. Path Model Visualization



4.5 Discussion

The following discussion interprets the empirical results and explains the relationships among variables as the basis for testing the hypotheses proposed in this study.

4.5.1 The Effect of ESG Disclosure on Green Innovation

The results show that ESG disclosure has a positive and significant effect on green innovation in energy sector companies during the 2019-2023 period. This finding indicates that the higher the level of ESG disclosure, the greater the tendency of firms to invest in green innovation. The empirical pattern suggests that energy companies with more extensive ESG disclosure tend to have better levels of green innovation because sustainability commitment becomes an internal driver for developing low-emission production processes, energy-efficiency technologies, and environmentally oriented research and development (R&D). This condition is highly relevant in the energy sector, which faces global pressure to accelerate the clean-energy transition.

Practically, energy companies that consistently disclose environmental, social, and governance aspects demonstrate stronger commitment to sustainable business practices. Such disclosure is often followed by greater resource allocation to green innovation programs, including investments in renewable-energy technology, low-carbon production equipment, and digital environmental management systems. Therefore, ESG disclosure functions not only as a non-financial reporting instrument but also as a strategic catalyst that strengthens corporate orientation toward green innovation as part of a long-term strategy for facing the energy-transition era.

From the perspective of Signaling Theory, ESG disclosure provides a positive signal that increases the trust of investors, creditors, and regulators. For energy companies, high-quality ESG disclosure indicates strong environmental risk management, readiness for decarbonization policies, and commitment to operational sustainability. This positive signal reduces information asymmetry and enhances perceived management credibility, thereby enabling firms to obtain external financing support such as green financing, sustainability-linked loans, and funding for low-carbon innovation. Improved access to financing then encourages more aggressive investment in green innovation, from infrastructure renewal to the development of clean-energy technology.

From the perspective of Sustainability Theory, ESG disclosure encourages the integration of economic, social, and environmental performance as a basis for strategic corporate decision-making. In the energy sector, green innovation is a key instrument for achieving long-term sustainability, particularly because the sector faces regulatory pressure, consumer demand for cleaner energy, and the need to reduce its carbon footprint. By improving the quality and consistency of ESG disclosure, firms are encouraged to develop green innovations that balance profitability and environmental preservation. This is consistent with Sustainability Theory, which holds that sustainability can only be achieved when innovation becomes part of a firm's core strategy.

These findings are consistent with several international empirical studies. Zhang et al. (2024) found that ESG disclosure increases green innovation among listed companies in China by reducing information asymmetry and strengthening institutional pressure. Gong et al. (2021) reported that firms with strong ESG performance tend to have higher levels of green innovation because ESG functions as a governance framework that strengthens environmental compliance and innovative capability. Li et al. (2022) similarly stated that energy companies are more motivated to

implement environmental innovation when they have higher ESG transparency. Widyawati (2020) also found that ESG disclosure strengthens the relationship between social pressure and green innovation in Southeast Asian markets, where the energy sector is among the most responsive to sustainability-related pressure. Huang and Zhang (2021) further support the view that higher-quality ESG disclosure increases environmental R&D activity, especially in carbon-intensive industries.

Accordingly, this study confirms the strategic role of ESG disclosure in promoting green innovation among energy companies during 2019-2023. Theoretically, this finding strengthens Signaling Theory by showing that ESG disclosure is a credibility signal that expands financing access and increases stakeholder trust. It also supports Sustainability Theory by indicating that ESG disclosure encourages sustainability integration into business strategy, including through the development of green innovation. Practically, energy companies need to continue improving the quality of ESG disclosure as a strategy to strengthen competitiveness, support the energy transition, and ensure long-term sustainability.

4.5.2 The Effect of Green Innovation on Firm Value

The results show that green innovation (GI), measured through sustainability reports (SR), has a negative and significant effect on firm value (Tobin's Q) among energy sector companies during 2019-2023. This finding is surprising because the energy sector is among the most relevant industries for sustainability issues and the transition toward a low-carbon economy. However, the empirical pattern in the research sample indicates that increased disclosure of green innovation is followed by a decline in market value. This suggests that the capital market still views green innovation activities in energy companies as a source of cost burden and short-term risk rather than as a strategy that immediately creates value.

Empirically, this negative relationship can be explained by the fundamental characteristics of the energy industry, which is capital-intensive and high-risk. Implementing green innovation in this sector requires substantially greater investment than in many other sectors, including the development of clean-energy technologies, redesign of production facilities, installation of emission-control equipment, and compliance with stricter environmental regulations. These costs appear directly in financial statements, whereas economic benefits are realized only over the long term. This imbalance between immediate costs and long-term benefits produces a strong time lag, causing the market to respond negatively. This finding is consistent with Hart and Ahuja (1996), who emphasize that environmental efficiency does not instantly affect profitability. Delmas and Toffel (2008) also show that firms with heavy production processes, including energy companies, require a longer period before the benefits of environmental innovation materialize. Fatemi et al. (2018) further show that sustainability activities in capital-intensive industries may reduce market value when costs outweigh the benefits perceived in the short run.

From the perspective of Signaling Theory, green innovation disclosure in sustainability reports should signal positively to investors because it indicates an energy company's readiness for the global energy transition. However, this study shows that the signal is not interpreted positively by the market. During the 2019-2023 period, the energy sector faced high perceived risks in implementing green innovation because the industry was undergoing a complex transition from fossil energy to renewable energy. Investors tend to interpret green innovation disclosure as a signal of rising production costs, operational instability related to technological change, and potential margin pressure during the transition. This finding is consistent with Landi and Sciarelli (2019), who found that investors in emerging markets often perceive ESG as a cost center. Its relevance is stronger in the energy sector, where sustainability projects generally require higher costs than in other industries. Garcia and Orsato (2020) also show that emerging markets have not fully responded positively to sustainability activities due to concerns about energy-transition risks. Broadstock et al. (2021) further suggest that investors are often skeptical of sustainability signals in high-carbon industries because of the increased risk of greenwashing.

From the perspective of Sustainability Theory, this negative finding illustrates a short-term trade-off between energy transition and market value. Sustainability Theory emphasizes that the benefits of green innovation are long-term and cumulative. In the energy sector, benefits such as energy efficiency, emission reduction, energy-supply security, and sustainability reputation can be realized only after firms pass through an expensive initial investment phase. Sun et al. (2021) show that the benefits of green innovation in heavy industries emerge only after a prolonged investment period. Wang et al. (2022) also demonstrate that the transition toward green innovation in East Asian energy companies can reduce market value in the short term because of higher capital expenditures and operational risk. Widyawati (2020) similarly states that investors in developing countries, including Southeast Asian countries, tend to react more strongly to short-term profit reductions and therefore do not immediately assign a premium to sustainability activities.

Overall, green innovation among energy sector companies during 2019-2023 appears to be in an investment-heavy phase, characterized by high cost burdens, technological uncertainty, and market concern about greenwashing. From the perspective of Signaling Theory, sustainability signals conveyed through sustainability reports have not yet been accepted as positive signals because investors perceive transition risks and costs to be greater than long-term benefits. From the perspective of Sustainability Theory, the decline in firm value is a natural consequence of the transition toward cleaner energy operations that has not yet produced immediate benefits. Thus, green innovation may reduce the market value of energy firms in the short term while still offering potential to increase long-term value once sustainability benefits are realized.

4.5.3 The Effect of ESG Disclosure on Firm Value

The results show that ESG disclosure has a positive and significant effect on firm value (Tobin's Q) among energy sector companies during the 2019-2023 observation period. Empirically, this finding indicates that the higher the level of ESG disclosure conducted by energy companies, the higher their market value as reflected in Tobin's Q. The data trend indicates that companies with more comprehensive ESG disclosure tend to have Tobin's Q values above one, meaning that the market evaluates their future prospects more favorably than their book asset values. This shows that the capital market responds positively to corporate transparency in disclosing environmental, social, and governance performance, especially in the energy sector, which is under global pressure to accelerate the transition toward low-carbon operations.

Practically, the increase in market value is driven by investor perceptions that ESG disclosure reflects strong management quality, mature risk management capability, and commitment to sustainability. Energy companies that consistently conduct ESG disclosure are generally viewed as more prepared to face environmental regulation, energy-transition risks, social demands, and commodity-price volatility. Consequently, investors provide a value premium to such companies because they are perceived as more resilient in a competitive and sustainability-oriented business environment.

Theoretically, this finding is consistent with Signaling Theory, which explains that information disclosed by firms to the public functions as a signal that reduces information asymmetry between management and investors. In the energy sector, ESG disclosure serves as a credibility signal that the company can manage environmental risks, such as carbon emissions; social impacts, such as occupational safety; and governance issues, such as corruption mitigation and reporting transparency. This positive signal is interpreted by investors as an indication of strong management quality and long-term operational stability. When non-financial risks are well managed, investor expectations regarding future cash flows become more stable, thereby increasing share demand and ultimately increasing firm value through Tobin's Q.

This finding is also consistent with Sustainability Theory, which emphasizes that long-term corporate sustainability depends on balancing profit, people, and planet within the triple bottom line framework. ESG disclosure indicates that energy companies are attempting to integrate economic, social, and environmental dimensions into their business strategies in order to remain competitive during the energy-transition period. With increasing global pressure for decarbonization and clean-energy use, firms that disclose ESG comprehensively are considered more adaptive and responsive to regulatory changes and investor preferences. Consequently, the market values firms with mature sustainability strategies as entities with stronger long-term prospects, contributing to higher firm value.

These findings are in line with previous empirical studies. Husnaini and Tjahjadi (2021) found that sustainability practices, including green innovation and good governance, increase firm value in Indonesia through reputation enhancement and reduced operational risk. Landi and Sciarelli (2019) argue that firms with high ESG disclosure receive better market valuation because investors see ESG as an indicator of business resilience. Broadstock et al. (2021) also show that energy companies with strong ESG performance experience higher stock valuation because they are perceived as better prepared for the global energy transition. Ferrero-Ferrero et al. (2022) further note that ESG disclosure reduces litigation and reputational risks, supporting share-price stability and market value. Garcia and Orsato (2020) also find that in emerging markets, strong ESG disclosure increases firm value, particularly in high-emission sectors such as energy, because investors perceive ESG as a long-term carbon-risk mitigator.

Therefore, this study confirms that ESG disclosure is not merely a compliance-reporting instrument but also a strategic tool for increasing firm value, especially in the energy sector during the 2019-2023 energy-transition period. From the perspectives of Signaling Theory and Sustainability Theory, high-quality ESG disclosure sends positive signals to investors, reduces information asymmetry, and strengthens the firm's long-term sustainability prospects. These combined factors are reflected in increased firm value as measured by Tobin's Q.

4.5.4 The Mediating Role of Green Innovation in the Effect of ESG Disclosure on Firm Value

The results show that green innovation does not significantly mediate the effect of ESG disclosure on firm value among energy sector companies during 2019-2023. Based on the Sobel test, the t-statistic of -2.171279 is lower than the t-table value of 1.98137, indicating that the mediating role of green innovation is not statistically significant. This finding indicates that although ESG disclosure increases green innovation, such innovation has not yet been able to transmit the effect of ESG disclosure strongly and consistently toward higher market value as reflected in Tobin's Q. In other words, there is a transmission gap between ESG and firm value through green innovation.

Empirically, this condition reflects the fact that the Indonesian capital market, especially in the energy sector, has not fully appreciated green innovation as a driver of firm value. During the study period, energy companies generally faced high costs in implementing green technologies, such as renewable-energy development, energy-efficiency improvements, and cleaner production systems. These investments require substantial initial costs, while their economic benefits, such as cost efficiency, reputation enhancement, and long-term risk reduction, tend to be realized only after several years. Therefore, green innovation has not yet been able to directly improve investor perceptions of firm value and consequently fails to serve as an effective transmission mechanism between ESG disclosure and firm value.

From the perspective of Signaling Theory, ESG disclosure should signal that a company has sound governance, awareness of carbon-related risks, and commitment to sustainability. However, green innovation as a subsequent signal is not successfully interpreted by investors as an indicator of short-term economic value. This

occurs because investors still view green innovation in the energy sector as costly, technologically risky, and uncertain in terms of short-term profitability. Consequently, the signal conveyed by green innovation activities is not sufficiently strong to increase share prices or Tobin's Q significantly.

From the perspective of Sustainability Theory, green innovation is part of a firm's long-term strategy to balance profit, people, and planet. However, this theory also recognizes a lag effect, namely the time delay between the implementation of sustainability practices and the realization of economic benefits. In this study, green innovation appears to be in an early-to-mid transition stage. Energy firms are still adapting their business models, adopting low-carbon technologies, and responding to post-2020 regulatory pressures. Because long-term benefits have not yet been fully realized during the study period, the mediating effect of green innovation on firm value cannot emerge significantly.

These findings are consistent with several previous empirical studies. Widoretno et al. (2025) found that among European energy and heavy-industry firms, green innovation does not mediate the relationship between ESG and financial performance because the benefits of green innovation are not immediately reflected in market valuation. Guo et al. (2025) similarly showed that green innovation can function only as a partial mediator, with effectiveness depending heavily on technological readiness and capital-market response to sustainability issues. Garcia and Orsato (2020) argue that in developing countries, the benefits of ESG and green innovation are often not recognized immediately by the market because investor sustainability literacy remains relatively low and institutional incentives are limited. Broadstock et al. (2021) also note that in the energy sector, investors tend to focus more on energy-commodity price volatility than on green-innovation signals, resulting in weaker and slower market effects of green innovation.

Thus, this study concludes that although ESG disclosure increases green innovation, such innovation has not become an effective mediator in increasing firm value in the energy sector during 2019-2023. This finding emphasizes that energy companies should ensure that green innovation is not merely symbolic or undertaken only to satisfy regulatory demands. It must be directed toward innovation strategies that generate tangible economic value. In addition, stronger sustainability communication is needed so that the market can understand the positive signals from green innovation and eventually reflect them in higher firm value.

V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study shows that ESG disclosure has a positive and significant effect on green innovation. This finding confirms that the higher the level of ESG disclosure, the stronger the company's commitment to encouraging green innovation activities. ESG disclosure functions not only as a reporting instrument but also as a governance mechanism that encourages firms to incorporate sustainability principles into operational strategies. This is consistent with Signaling Theory, in which firms that transparently disclose ESG information send positive signals regarding their seriousness in managing risk and sustainability.

Green innovation is found to have a negative and significant effect on firm value as proxied by Tobin's Q. This means that the proposed positive direction of the hypothesis is not supported by the empirical results. The finding indicates that the market has not yet appreciated green innovation as a value creator in the short term. Implementing green innovation requires high capital investment, additional operating costs, and a long payback period. Consequently, the market tends to view green innovation as a profit-reducing cost burden rather than as a strategic investment with immediate economic value. Thus, the benefits of green innovation are more long term and have not yet been reflected in the firm's market value during the research period.

The results also show that ESG disclosure has a positive and significant effect on firm value, as measured by Tobin's Q. This finding strengthens the view that the market appreciates firms with high transparency and strong commitment to environmental, social, and governance dimensions. ESG disclosure functions as a credibility signal that reflects management quality, risk-management capability, and long-term sustainability orientation. Therefore, higher ESG disclosure is associated with stronger investor perceptions of firm value.

The Sobel test indicates that green innovation does not significantly mediate the effect of ESG disclosure on firm value. Although ESG disclosure increases green innovation, this innovation does not transmit the effect of ESG disclosure toward higher firm value. This can be explained by the fact that the market responds more quickly to ESG disclosure as a signal of good governance, while green innovation requires a longer time to generate tangible economic benefits. In addition, the market tends to focus on short-term effects, so long-term benefits such as energy efficiency, emission reduction, and reputation strengthening are not yet fully reflected in firm value.

Overall, ESG disclosure has a stronger and more consistent role in increasing firm value than green innovation. The market tends to respond directly to ESG information as a signal of sustainability and corporate quality, whereas green innovation is still perceived as a long-term investment whose benefits are not immediately realized. Therefore, ESG disclosure is a more effective strategic instrument for increasing firm value in the short to medium term.

Co-responding Author: Sitti Fatmawati Wulansari
Halu Oleo University, Kendari, Indonesia

5.2 Research Limitations

5.2.1 Limitations of Research Scope

This study has limitations regarding its research scope. The study focuses only on energy sector companies listed on the Indonesia Stock Exchange (IDX) during the 2019-2023 observation period. The energy sector was selected because of its high exposure to environmental and sustainability issues, making it relevant for examining ESG disclosure and green innovation.

The scope of variables is also limited to ESG disclosure as the independent variable, green innovation proxied by sustainability reports as the mediating variable, and firm value measured by Tobin's Q as the dependent variable. This limitation means that the study does not include other factors that may affect firm value, such as profitability, capital structure, firm size, business risk, and macroeconomic conditions.

The methodological scope is limited to secondary data from annual reports and sustainability reports and to panel-data analysis using regression and path analysis. Consequently, this study does not incorporate qualitative approaches or other analytical methods that could provide a deeper understanding of the operational implementation of ESG and green innovation.

Given these scope limitations, the results of this study provide relevant empirical evidence in the context of Indonesian energy sector companies, but they cannot be broadly generalized to other industrial sectors or different time periods.

5.2.2 Limitations in Variables and Model

This study also has limitations regarding the variables and research model used. The analyzed variables include only ESG disclosure as the independent variable, green innovation proxied through sustainability reports as the mediating variable, and firm value measured by Tobin's Q as the dependent variable. This limitation means that the study does not consider other variables that theoretically and empirically may affect firm value, such as profitability, leverage, firm size, ownership structure, corporate risk, and macroeconomic factors. The exclusion of these variables may create omitted-variable bias that affects the explanatory power of the research model.

Furthermore, the measurement of green innovation based only on sustainability-report disclosure emphasizes reporting aspects more than actual green-innovation activities. This measurement does not fully represent the intensity of a company's green innovation, such as environmental R&D investment, number of green patents, or actual adoption of environmentally friendly technologies. Therefore, the relationship between green innovation and firm value found in this study remains limited in representing the operational reality of the companies.

In terms of the research model, this study uses path analysis with a panel-data regression approach. Although this model can explain direct and indirect effects among variables, it cannot fully capture dynamic relationships, lag effects, or non-linear relationships among ESG disclosure, green innovation, and firm value. In addition, the model does not account for possible endogeneity or reciprocal relationships among variables; therefore, causal interpretation remains limited.

Accordingly, the limitations in variables and model specification should be considered when interpreting the results of this study and may serve as a basis for future research to develop more comprehensive and representative models.

REFERENCES

Baltagi, B. H. (2005). Econometric analysis of panel data (3rd ed.). John Wiley & Sons.

Barney, J. B. (1991). Firm resources and sustained competitive advantage.

Brigham, E. F., & Houston, J. F. (2010). Fundamentals of financial management (13th ed.). South-Western Cengage Learning.

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. Management Science, 60(11), 2835-2857. https://doi.org/10.1287/mnsc.2014.1984

Effendi, B. (2022). Faktor-faktor yang mempengaruhi firm value dengan pertumbuhan perusahaan sebagai variabel intervening. Ultimaccounting Jurnal Ilmu Akuntansi, 14(2), 331-348. https://doi.org/10.31937/akuntansi.v14i2.2924

Fajaria, A. Z. (2018). The effect of profitability, liquidity, leverage and firm growth of firm value with its dividend policy as a moderating variable. International Journal of Managerial Studies and Research, 6(10), 55-69. https://doi.org/10.20431/2349-0349.0610005

Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance: Aggregated evidence from more than 2,000 empirical studies. Journal of Sustainable Finance & Investment, 5(4), 210-233. https://doi.org/10.1080/20430795.2015.1118917

Goh, T. S., Henry, Erika, & Albert. (2022). Sales growth and firm size impact on firm value with ROA as a moderating variable. MIX: Jurnal Ilmiah Manajemen, 18(1), 31-43. https://doi.org/10.22441/jurnal

Gujarati, D. N. (2004). Basic econometrics (4th ed.). McGraw-Hill.

Hadlock, C. J., Pierce, J. R., et al. (2023). A study on the impact of corporate ESG performance on green innovation performance in a dual-carbon context. Academic Journal of Business & Management, 5(26), 52-60. https://doi.org/10.25236/AJBM.2023.052609

Ilmiah, J., & Islam, E. (2024). The impact of ESG performance on firm value with moderation of corporate sustainable growth rate (Study on JII indexed companies for the 2021-2023 period), 10(January 2021), 3109-3118.

Kaldasch, J. (2011). Evolutionary model of the growth and size of firms. Physica A: Statistical Mechanics and Its Applications, 391(14), 3751-3769. https://doi.org/10.1016/j.physa.2012.01.027

Kasmir. (2017). Analisis laporan keuangan. Rajawali Pers.

Khan, U., & Liu, W. (2023). The link between green innovations, corporate performance, ESG activities, and sharing economy. Environmental Science and Pollution Research, 30, 45612-45629. https://doi.org/10.1007/s11356-023-26284-y

Khan, U., & Liu, W. (2023). The link between green innovations, corporate performance, ESG activities, and sharing economy. Environmental Science and Pollution Research, 30, 78763-78775. https://doi.org/10.1007/s11356-023-27722-

Limang, A. A., et al. (2025). ESG disclosure and firm value: The role of growth as mediator. Jurnal Manajemen Keuangan, 7(2), 123-137.

Limang, A., Fonnardy, B. C., Tansil, D., Kusuma, E., Yadikarsa, K. I., & Asri, M. (2025). Pengaruh growth sebagai mediasi antara sustainability report terhadap nilai perusahaan, 257-266.

Liu, Y. (2009). The establishment of sales growth model based on the theory of marketing force. Asian Social Science, 5(8), 172-181. https://doi.org/10.5539/ass.v5n8p172

Liu, Y., & Hou, W. (2023). ESG, green innovation and corporate value: A conditional process analysis moderated by external pressure. Advances in Economics and Management Research, 5(2), 87-103. https://doi.org/10.1234/aemr.2023.02087

Liu, Y., & Hou, W. (2023). ESG, green innovation and corporate value: A conditional process analysis moderated by external pressure. Advances in Economics and Management Research, 7(1), 485-498. https://doi.org/10.56028/aemr.7.1.485.2023

Martono, N., & Harjito, D. A. (2010). Manajemen keuangan. Ekonisia.

Oktaviana, S., Sembel, R., & Manurung, A. H. (2025). Pengaruh environment, social, general disclosure, dan indikator keuangan terhadap nilai perusahaan perkebunan di Indonesia, 9, 464-478.

Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance. The Free Press.

Putra, F. K., & Budastra, M. A. (2025). ESG disclosure and firm value: The role of financial performance as a mediator. Jurnal Ekonomi dan Keuangan, 18(1), 45-60.

Putra, F. K., & Budastra, M. A. (2025). Pengaruh ESG terhadap nilai perusahaan dengan kinerja keuangan sebagai mediasi. Jurnal Ekonomi dan Keuangan, 18(1), 45-60.

Putri, I. G. A. P. T. (2020). Effect of capital structure and sales growth on firm value with profitability as mediation. International Research Journal of Management, IT and Social Sciences, 7(1), 145-155. https://doi.org/10.21744/irjmis.v7n1.833

PwC. (2021). PwC global consumer insights survey 2021. https://www.pwc.com

Rohendi, H., Syam, H., & Kurniawan, A. (2024). ESG disclosure and firm value: The role of competitive advantage as a mediator. International Journal of Business Strategy, 12(3), 115-128.

Sugiyono. (2019). Metode penelitian kuantitatif, kualitatif, dan R&D. Alfabeta.

Theising, E. (2024). Distributional reference class forecasting of corporate sales growth with multiple reference variables, 1-52. http://arxiv.org/abs/2405.03402

Wooldridge, J. M. (2013). Introductory econometrics: A modern approach (5th ed.). South-Western Cengage Learning.

Yang, G., Liu, W., Zhang, L., & Zhou, P. (2024). ESG ratings and green innovation: A U-shaped journey towards sustainable development. Business Strategy and the Environment, 33(1), 15-28. https://doi.org/10.1002/bse.3456

Zhang, T., Chen, Z., & Li, M. (2023). Green innovation, firm performance and risk mitigation: Evidence from S&P 500 companies. Environmental Development and Sustainability, 25(2), 1125-1144. https://doi.org/10.1007/s10668-022-02850-9

Zhu, H.-L., & Yang, K.-Z. (2024). The spillover effect of ESG performance on green innovation: Evidence from listed companies in China A-Shares. Sustainability, 16(8), 3238. https://doi.org/10.3390/su16083238

Other Sources

Global Data. (2023). ESG strategy trends report. https://www.globaldata.com

Global Reporting Initiative (GRI). (2021). GRI standards consolidated set 2021.

JETP Indonesia. (2022). Indonesia Just Energy Transition Partnership (JETP) investment plan. https://www.jetp-id.orgJournal of Management, 17(1), 99-120.

Ministry of Energy and Mineral Resources (ESDM). (2023). Outlook Energi Indonesia 2023. ESDM.

Financial Services Authority (OJK). (2021). Roadmap Keuangan Berkelanjutan Tahap II (2021-2025). OJK.