JRSSEM 2025, Vol. 05, No. 05
E-ISSN: 2807 - 6311, P-ISSN: 2807 - 6494

# The Effect of Green Innovation and Eco-Efficiency on Financial Performance with Good Corporate Governance as a Moderating Variable

**Komang Cyntia Utami* , Ni Putu Budiadnyani**
Universitas Pendidikan Nasional Denpasar, Indonesia
Email: cyntiautami56@gmail.com*

**Abstract**
The energy sector plays a crucial role in the global economy, yet it is also a significant contributor to environmental degradation. In response, companies are increasingly adopting green innovation and eco-efficiency practices to align with sustainability goals and regulatory pressures. However, the financial implications of these initiatives remain ambiguous, and the moderating role of governance mechanisms is not yet fully understood. This research examines the influence of green innovation and eco-efficiency on financial performance, with Good Corporate Governance (GCG) as a moderating variable in energy sector companies listed on the Indonesia Stock Exchange (IDX) during 2022–2024. The research employs quantitative methods using Partial Least Squares–Structural Equation Modeling (PLS-SEM) analysis with a sample of 180 observations from energy sector companies over three years, selected through purposive sampling. The results indicate that green innovation negatively and significantly affects financial performance, while eco-efficiency positively and significantly impacts financial performance. Furthermore, GCG weakens the influence of green innovation on financial performance but strengthens the positive influence of eco-efficiency on financial performance. These findings provide insights for companies in balancing environmental innovation with operational efficiency under effective corporate governance to optimize financial performance in the energy sector.

**Keywords:** green innovation; eco-efficiency; financial performance; good corporate governance; energy sector

## INTRODUCTION

The rapid advancement in various industrial sectors has become a driver of highly dynamic economic growth worldwide, including in Indonesia (Hendrawan & Suhartini, 2025). This very rapid development creates intense market competition to demonstrate superiority and ability to survive in the never-ending market dynamics (Liu & Wu, 2023). With the hope that company goals can be achieved to maintain and enhance their public image and ensure business sustainability (going concern), industrial productivity must be maximized.

In demonstrating the achievements of company performance, financial performance plays an important role as a measure of how effectively and efficiently operations have been carried out by the company within a certain period (Dewi & Zagladi, 2025). This financial performance not only proves that the company is capable of generating profits or gains but also indicates that the company is competent in managing company resources and mitigating and responding to risks effectively (Affes & Jarboui, 2023). Financial performance has a significant influence, both for internal and external parties of the company. Internally, financial performance becomes a means to assess the success of the company's strategies in managing the company to obtain results and profits (Francis et al., 2025). On the other hand, the company's financial condition can provide confidence and increase public trust that the company is capable of managing and delivering good results from operational activities (Musah et al., 2025).

The company's ambition to achieve success in improving financial performance so that the company does not fade in the future encourages companies to increasingly compete to increase their productivity (Hidayah & Sibarani, 2023). Along with increasing industrial

activities, the consequences caused to nature and the environment tend to be negative. Pollution and waste can no longer be avoided as by-products of energy utilization and various natural resources. Over time, sustainability issues have increasingly become the main focus among the public, including in modern business (Sinaga et al., 2025)

According to data from the Global Carbon Atlas, which is the official platform of the Global Carbon Project, Indonesia ranks eighth as the largest contributor to greenhouse gas emissions in the world in 2023. This high ranking is not separated from various industrial sectors that contribute to emissions, enlarging Indonesia's carbon footprint on the international scope. The data from Global Carbon Atlas shows that Indonesia's average emission increase is 4.2% throughout 1990-2023. This emission increase is dominated by fossil energy sources, especially coal, followed by oil, gas, cement, and gas flaring. This is quite concerning and needs to be addressed immediately in accordance with Indonesia's commitment to achieve Net Zero Emission (NZE) by 2060 as stated in the Enhanced Nationally Determined Contribution (ENDC) document.

In supporting the government's program towards net zero emission, all industrial sectors participate as one of the main contributors to the change towards green transition. The commitment to actualizing sustainability is not only a demand for government regulations in addressing environmental problems (Rizki & Hartanti, 2021). However, this becomes the company's ethical responsibility due to the results of production processes that have burdened the environment(Hasan et al., 2024). This phenomenon requires companies to create strategic solutions in responding to changes to maintain business continuity.

Green innovation has become a company strategy to develop various policies related to environmentally friendly plans. The application of green innovation is a step towards change in creating products that are more environmentally friendly with processes that produce emissions in small amounts (Millenia & Murwaningsari, 2023). Through a relevant company management system, green innovation will be a powerful weapon to suppress the negative impact of operations and products produced by the company on the environment (Amalia, 2023). The response to this sustainability issue can create a new journey for companies towards green transition that forces management to decide on the right steps. Integrating environmental aspects into business decisions becomes a process that tests the company's ability and courage to innovate to ensure long-term business continuity (Cheng et al., 2024).

In implementing green innovation, investment in green technology has two possibilities that impact the company's finances: creating economic benefits or conversely becoming an increase in the company's financial burden (Mukhopadhyay & Nayak, 2024). This becomes a reason for companies' hesitation to transition towards green innovation. The company's need to invest heavily at the beginning to conduct research and development, procure green technology, and adjust the company's system becomes an initial challenge for the company that must be overcome. Government and industry policies that are not yet optimal also become obstacles that cause green innovation to often be viewed as an expensive investment to undertake (Ramadhan et al., 2022).

The high initial costs in investing in the development of green innovation are very likely to encourage the occurrence of green inflation or greenflation in the short term. However, in line with maturity and also equalization in implementing green innovation, it actually becomes

a great weapon that will open opportunities for sustainable economic and environmental challenges (Sukomardojo et al., 2024). Green innovation will lead companies to new opportunities in penetrating new markets with new business models offered (Wilutama & Viverita, 2024). Highlighting novelty through green innovation opens another perspective from consumers and investors. Green innovation will provide added value recognized by external parties, and they tend to be willing to pay dearly for products or services resulting from the implementation of green innovation (Wang & Ahmad, 2024).

During this green transition period, implementing green innovation is not the only strategy that companies can do. Eco-efficiency becomes an important step to suppress resource use and reduce emissions in the production process without sacrificing the productivity that must be produced. Resources used very efficiently will suppress excessive emission expenditure, thereby reducing environmental burden (Sulasminingsih & Hardiningsih, 2022). The efficiency undertaken will reduce the company's operational costs itself. The concept of eco-efficiency combines economic goals and concern for the environment. By implementing efficiency, reducing waste results from operational activities also becomes more optimal (Sulistiyana & Adiati, 2025).

When companies seriously adopt environmental goals into their operational strategies, this creates new efficiencies that can directly impact financial performance. Efficient waste management reduces processing cost burdens and risks related to environmental regulations and policies (Widarti et al., 2024). The effective implementation of environmental values in corporate planning plays a crucial role in determining the extent to which environmental efficiency strategies can contribute to profits. Eco-efficiency not only creates sustainability strategies but also generates value and sustainable profit growth (Alnaim et al., 2023).

In the context of green innovation and eco-efficiency, Good Corporate Governance (GCG) plays an important role in whether the policy is merely an image or is actually implemented. GCG becomes a bridge between the differences in interests of internal parties with external parties. The implementation of GCG will certainly receive a good market response and of course increase profits and company sustainability. The company's ability to identify and manage risks will maximize the implementation of sustainability innovation (Zaikin et al., 2024). In addition, the optimal implementation of GCG will reflect that the company is running effectively and efficiently (Bongsoikrama et al., 2024).

The environmental issues raised in this research are relevant and urgent for energy sector companies. Energy sector companies are the main energy producers that can produce high emissions to the environment. Basic activities that include exploration, management, production, to energy distribution tend to damage the environment, even the products produced will also contribute negative impacts to the environment (Widianingsih, 2025). The commitment to net zero emission will be a major challenge for the energy sector to change direction and strategy from company operations. Commitment to environmental management becomes a form of important responsibility to be carried out. Therefore, industrial companies, especially the energy sector, need to make relevant innovations and strategies, not only to suppress emissions produced but also to be sustainable and competitive in global demands that are beginning to transition green (Rebecca et al., 2023).

Based on previous research, there is a research gap or difference in research results. Research conducted by (Ramadhan et al., 2022) and (Khan et al., 2023) shows that green innovation has a positive effect on financial performance, while research by (Hendrawan & Suhartini, 2025) states that green innovation has no effect or even has a negative effect on financial performance in research by (Sari, 2024). On the other hand, eco-efficiency shows a positive influence in research by (Daud et al., 2023) and (Issa et al., 2025), but has no effect in research by (Widarti et al., 2024). From this research, there are different results from green innovation and eco-efficiency on financial performance. This study adds good corporate governance as a moderating variable to see more deeply and determine the novelty of the research. This research focuses on how green innovation and eco-efficiency can affect financial performance with GCG as the moderating variable used.

Based on this background, the purpose of this study is to analyze the influence of green innovation and eco-efficiency on financial performance with good corporate governance as a moderation variable in energy sector companies listed on the Indonesia Stock Exchange for the 2022-2024 period. Theoretically, this research is expected to enrich the literature in the field of environmental management and financial performance, particularly in the context of the energy sector in developing countries. Meanwhile, practically, the results of the research can be a consideration for company management in formulating effective environmental strategies and providing guidance for regulators and investors in evaluating sustainability and corporate governance practices in Indonesia.

## MATERIALS AND METHOD

This research employs a quantitative research approach using secondary data from energy sector companies listed on the Indonesia Stock Exchange (IDX) during the period 2022-2024. The research location was conducted on the Indonesia Stock Exchange through the official IDX website at www.idx.co.id. This sector was chosen because the energy industry is directly related to the raised phenomenon and experiences business fluctuations related to the company's main activities or focus. Therefore, this transition becomes a challenge for the industry, especially the energy sector, to adapt and formulate strategies to create innovations that can promote sustainability.

Population is the entire unit of elements that have quantity and certain characteristics that will be made a generalization area determined to be studied, studied, and concluded by researchers (Sugiyono, 2023). In this study, the research population is all energy sector companies listed on the Indonesia Stock Exchange (IDX) in 2022-2024. The sample is part of the number and characteristics possessed by that population. The sample in this study was selected using purposive sampling technique, which is a sample determination technique not randomly, but with certain considerations and criteria.

The sample selection criteria used in this study are:

1. Companies that publish financial statements on the Indonesia Stock Exchange (IDX) in 2022-2024.
2. Companies that publish sustainability reports on the Indonesia Stock Exchange (IDX) in 2022-2024.

Based on these criteria, the sample data calculation in this study is explained in Table 1.

**Table 1. Sample Selection Process**

| Criteria | 2022 | 2023 | 2024 |
|---|---|---|---|
| Population: Energy sector companies listed on IDX | 76 | 83 | 87 |
| Companies without complete financial statements | (3) | (9) | (7) |
| Companies without sustainability reports | (33) | (6) | (8) |
| Total Sample | 40 | 68 | 72 |

*Source: Processed data (2025)*

The type of data used in this study is quantitative data through analyzing collected data by counting, analyzing, comparing, and classifying data in the form of numbers used as a basis for presenting results and formulating conclusions. The data source used in this research is secondary data, which is data obtained indirectly or through third parties or intermediaries. The data source in this study was obtained from publications of annual financial reports and sustainability reports of Energy Sector Companies listed on the Indonesia Stock Exchange (IDX) in 2022-2024 accessed through the official website of the Indonesia Stock Exchange (IDX).

In this study, data collection was carried out using documentation technique. Documentation is a method used to obtain data and information in books, archives, documents, writings, numbers, and pictures in the form of reports and information that can support research. In this study, the documentation technique was carried out by collecting financial reports, annual reports, and sustainability reports of Energy Sector Companies listed on the Indonesia Stock Exchange in 2022-2024 taken directly from the official website of the Indonesia Stock Exchange.

This study uses data analysis method using Partial Least Squares-Structural Equation Modeling (PLS-SEM) analysis (Aburumman et al., 2023). PLS-SEM is an analytical approach that can be used to test relationships between latent variables or those that cannot be measured directly with its flexible nature, can be used in small sample sizes and does not require strict assumptions of multivariate normality. The PLS-SEM analysis consists of two main stages: evaluation of the measurement model (outer model) and evaluation of the structural model (inner model). The measurement model evaluation includes convergent validity testing through outer loading values (≥0.60), discriminant validity through cross-loading and Average Variance Extracted (AVE ≥0.50), and composite reliability testing (≥0.70). The structural model evaluation includes R-square testing to assess the model's goodness of fit, and hypothesis testing using path coefficient values and significance levels (p-value <0.05). Data analysis was performed using SmartPLS 4 software.

## RESULTS AND DISCUSSION

### *Descriptive Statistics*

Descriptive statistics in this study aims to provide a general overview of the characteristics of the data used, specifically for all energy sector companies listed on the Indonesia Stock Exchange during 2022-2024. This analysis includes basic statistical measures such as minimum, maximum, mean, and standard deviation values for each research variable. The results of descriptive statistical analysis are presented in Table 2.

**Table 2. Descriptive Statistics**

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---|---|---|---|---|---|
| Green Innovation (X1) | 180 | .00 | 1.00 | .3787 | .22915 |
| Eco-Efficiency (X2) | 180 | .00 | 1.00 | .2000 | .40112 |
| GCG (Z.1) | 180 | 1.00 | 5.00 | 3.0667 | .54517 |
| GCG (Z.2) | 180 | .04 | 1.00 | .4627 | .15999 |
| GCG (Z.3) | 180 | 2.00 | 11.00 | 4.0389 | 2.07772 |
| GCG (Z.4) | 180 | -9.37 | .81 | .0270 | .72738 |
| GCG (Z.5) | 180 | .00 | .98 | .6213 | .26047 |
| Ukuran Perusahaan | 180 | 19.42 | 38.70 | 28.6666 | 2.28178 |
| ROA | 180 | -.73 | 1.00 | .0786 | .20701 |
| ROE | 180 | -3.89 | 1.62 | .0606 | .57169 |

*Source: Processed data (2025)*

Based on Table 2, the descriptive statistical results for each variable are obtained as follows. The green innovation variable has a minimum value of 0.00 and a maximum value of 1.00, with a mean of 0.3787 and standard deviation of 0.22915. This average value indicates that the level of green innovation implementation in energy sector companies listed on the IDX during the study period is moderate, with a relatively moderate level of variation between companies. The eco-efficiency variable shows a minimum value of 0.00 and maximum of 1.00, with a mean of 0.2000 and standard deviation of 0.40112. The low average value indicates that most energy sector companies have not fully implemented environmental efficiency principles optimally in their operational activities. The high standard deviation shows high variation in eco-efficiency implementation among companies.

For good corporate governance variables measured through five indicators, various levels of GCG implementation are shown. Audit committee (GCG Z1) has a minimum value of 1.00 and maximum of 5.00, with a mean of 3.0667 and standard deviation of 0.54517, indicating that the implementation of GCG principles in general is in a fairly good category. Independent commissioners ratio (GCG Z2) shows variation in the level of company compliance with transparency and accountability principles. Board of directors (GCG Z3) indicates a quite significant difference in the number of board members between companies. Company size variable has a minimum value of 19.42 and maximum of 38.70, with a mean of 28.6666 and standard deviation of 2.28178, showing that company size in the energy sector during the study period is diverse. Managerial ownership (GCG Z4) has a minimum value of -9.37 and a maximum value of 0.81 with an average of 0.0270 and a standard deviation of 0.72738, indicating a fairly high variation in the performance ratio that reflects the effectiveness of

corporate governance. Institutional ownership (GCG Z5) has a minimum value of 0.00 and a maximum value of 0.98, with an average value of 0.6213 and a standard deviation of 0.26047, indicating that the level of managerial ownership varies considerably between companies.

For financial performance variables, ROA has a minimum value of -0.73 and maximum of 1.00, with a mean of 0.0786 and standard deviation of 0.20701. The relatively low average value indicates that the ability of energy sector companies to generate profits from total assets owned is still limited. ROE has a minimum value of -3.89 and maximum of 1.62, with a mean of 0.0606 and standard deviation of 0.57169. The low average value and high standard deviation illustrate a quite large difference in the level of profitability generated from equity among companies.

***Measurement Model Evaluation***

Measurement model evaluation (outer model) is basically to detect early the ability of each indicator to give influence to each latent variable in the research. The criteria used as parameters in conducting outer model analysis using SmartPLS 4 include convergent validity, discriminant validity, and composite reliability. Convergent validity testing shows that individual reflective measurements are considered high if they correlate more than 0.70. However, for assessing research at the early stages of measurement scale development, a value of 0.60 is considered sufficient.

**Table 3. Outer Loading Results (After Elimination)**

| No | Variable | Correlation Coefficients | Information |
|---|---|---|---|
| 1 | Eco-Efficiency | 1,000 | Valid |
| 2 | GCG1 | -0,025 | Invalid |
| 3 | GCG2 | -0,007 | Invalid |
| 4 | GCG3 | 0,873 | Valid |
| 5 | GCG4 | -0,028 | Invalid |
| 6 | GCG5 | 0,452 | Invalid |
| 7 | Green_Innovation | 1,000 | Valid |
| 8 | LENGTH | 0,911 | Valid |
| 9 | ROE | 0,851 | Valid |
| 10 | Ukuran_Perusahaan | 1,000 | Valid |

*Source: Processed data (2025)*

Based on Table 3, after eliminating invalid indicators, the research instrument only uses valid indicators. The remaining indicators include Eco-Efficiency, GCG3 (Board of Directors), Green Innovation, ROA, ROE, and Company Size, with correlation coefficient values each above 0.70. This shows that reflective indicators and latent variable scores have good correlation, so the data used in this study meets validity criteria and is ready for further testing. Discriminant validity testing using cross-loading shows that the correlation of constructs with their indicators is greater than the correlation with other constructs, indicating that all constructs or latent variables have good discriminant validity.

**Table 4. Average Variance Extracted (AVE)**

| Variable | AVE |
|---|---|
| Financial Performance | 0.778 |

*Source: Processed data (2025)*

Based on Table 4, all constructs show values more than 0.50. These values have met the requirements according to the minimum AVE value limit determined, which is 0.50. Composite reliability testing shows that Cronbach's Alpha and Composite Reliability values for all constructs are greater than 0.70, so all variables in this study have met the requirements of Composite Reliability. These results indicate that the measurement instruments used have good reliability and consistency in measuring the intended constructs.

***Structural Model Evaluation***

Structural model evaluation (inner model) includes two main things: evaluation of model goodness of fit which includes R-square, F-square, and Q-square predict, and evaluation of the influence of exogenous variables on endogenous variables through hypothesis testing.

**Table 5. R-square**

| | R-square | R-square adjusted |
|---|---|---|
| Y Financial Performances | 0,222 | 0,195 |

Based on Table 5, R-square value for the Financial Performance variable (Y) is 0.222, while the adjusted R-square is 0.195. This shows that the research model is able to explain about 22.2% of variation in the Financial Performance variable, while the remaining 77.8% is influenced by other factors not included in this research model. Although this value is in the weak category, it is still acceptable for exploratory research, especially in the context of complex relationships involving moderation variables.

The $f^2$ value for the predictor variables is in the range of $0.02 < f^2 < 0.15$. This indicates that the Green Innovation (X1) and Eco-Efficiency (X2) variables have a relatively small effect in explaining the endogenous variable of Financial Performance (Y). Meanwhile, Good Corporate Governance (Z) and its interaction with predictor variables (Z × X1 and Z × X2) also have a weak influence in explaining financial performance. Thus, although the effect size contribution of each variable is relatively small, these variables still have a significant influence both directly and through moderating effects.

**Table 6. Q-square Predict**

| | $Q^2$predict | PLS-SEM_RMSE | PLS-SEM_MAE | LM_RMSE | LM_MAE |
|---|---|---|---|---|---|
| **ROA** | 0,052 | 0,202 | 0,136 | 0,209 | 0,135 |
| **ROE** | 0,000 | 0,573 | 0,291 | 0,563 | 0,296 |

Based on the test results in Table 6 $Q^2$ Predict, the model's ability to predict endogenous variables, namely financial performance (Y), can be seen through the $Q^2$ value for each

indicator. For the ROA indicator, the $Q^2$ Predict value of 0.052 shows that the model has positive predictive ability, although it is still relatively weak. The lower RMSE value of the PLS-SEM model compared to the linear model indicates that the PLS-SEM approach provides slightly better predictive performance in estimating ROA. Conversely, for the ROE indicator, the $Q^2$ Predict value is 0.000, which shows that the model has no predictive ability for this aspect of financial performance. The higher RMSE value in PLS-SEM than in the linear model further strengthens this finding. In general, the table illustrates that the predictive ability of the model is in the low category, with better predictive performance on ROA than ROE, so that model specification needs to be improved in order to optimize financial performance predictions.

***Hypothesis Testing Results***

The hypothesis testing in this study was conducted using PLS-SEM analysis with SmartPLS 4 software. Testing was carried out through bootstrapping procedure with 5000 sub-samples to obtain stable and reliable parameter estimates. Hypothesis is considered supported if the p-value is less than 0.05 (significance level 5%) or if the t-statistic value is greater than 1.96 for two-tailed testing. The results of hypothesis testing are presented in Table 5.

**Table 7. Hypothesis Testing Results**

| Hypothesis | Original sample (O) | Sample mean (M) | Standard deviation (STDEV) | T statistics (\|O/STDEV\|) | P values | Decision |
|---|---|---|---|---|---|---|
| **H1: GI → FP** | -0,171 | -0,172 | 0,071 | 2,394 | 0,018 | Rejected |
| **H2: EE → FP** | 0,779 | 0,792 | 0,280 | 2,779 | 0,006 | Supported |
| **H3: GCG*GI → FP** | 0,431 | 0,426 | 0,205 | 2,107 | 0,037 | Rejected |
| **H4: GCG*EE → FP** | -0,256 | -0,256 | 0,080 | 3,181 | 0,002 | Supported |

*Note: GI=Green Innovation, EE=Eco-Efficiency, FP=Financial Performance, GCG=Good Corporate Governance*

*Source: Processed data (2025)*

**The Effect of Green Innovation on Financial Performance**

Based on Table 7, Hypothesis 1 states that green innovation has a negative and significant effect on financial performance with a path coefficient of -0.171 (t-statistic = 2.394, p-value = 0.018 < 0.05). This negative relationship, although counterintuitive at first glance, aligns with legitimacy theory and resource-based view theory. Companies investing heavily in green innovation face substantial upfront costs for research and development, technology adoption, and process transformation (Sari, 2024). These investments may not yield immediate financial returns, particularly in capital-intensive industries like energy. This finding is consistent with research that shows green innovation requires large initial investment that can burden short-term financial performance, although it may provide long-term benefits through improved environmental reputation and regulatory compliance. The energy sector, which is directly related to environmental issues and subject to strict regulations, faces greater pressure to implement green innovation even if it negatively impacts short-term financial performance.

Companies must invest in green technology development, environmentally friendly production processes, and green management systems, all of which require substantial financial resources and may not generate immediate economic returns (Xie et al., 2022).

**The Effect of Eco-Efficiency on Financial Performance**

Hypothesis 2 shows that eco-efficiency demonstrates a positive and significant effect on financial performance with a path coefficient of 0.779 (t-statistic = 2.779, p-value = 0.006 < 0.05). This result indicates that improvements in eco-efficiency lead to enhanced financial performance. This finding supports stakeholder theory, as eco-efficiency practices directly reduce operational costs through improved resource utilization and waste reduction (Daud et al., 2023). Companies that effectively manage resources and minimize environmental impact can achieve immediate cost savings while simultaneously improving their environmental footprint, resulting in better financial outcomes. Eco-efficiency focuses on optimizing resource use and minimizing waste, which directly translates into cost savings. Energy sector companies that implement eco-efficiency practices can reduce energy consumption, optimize water use, and minimize waste production, all of which lead to lower operational costs (Chen & Liu, 2020). Unlike green innovation which requires substantial initial investment, eco-efficiency improvements often have shorter payback periods and more immediate financial benefits. The implementation of eco-efficiency is more operational and incremental in nature compared to green innovation, making it easier for companies to realize financial benefits in the short term.

**The Moderating Effect of GCG on Green Innovation and Financial Performance**

Hypothesis 3 reveals that good corporate governance significantly weakens the negative influence of green innovation on financial performance with a path coefficient of -0.256 (t-statistic = 3.181, p-value = 0.002 < 0.05). This suggests that GCG weakens the influence of Green Innovation on the Financial Performance of energy companies, the implementation of GCG in many energy companies is still formalistic and focuses more on compliance, rather than being directed towards strategically supporting green innovation (Wijayati, 2022). In addition, GCG can reinforce pressure to achieve short-term performance, while the benefits of Green Innovation are long-term and require a longer adaptation period (Keum, 2021). This situation creates a conflict of priorities, preventing green innovation from being implemented aggressively or effectively. On the other hand, the characteristics of the energy industry, which is highly influenced by energy price fluctuations and global market conditions, mean that financial performance is determined more by external factors than by the quality of governance or environmental innovation (Septiani et al., 2024). Thus, even though companies have good GCG, the influence of Green Innovation is still unable to offset these external pressures, making it appear as if GCG weakens the relationship between the two.

**The Moderating Effect of GCG on Eco-Efficiency and Financial Performance**

Hypothesis 4 indicates that good corporate governance significantly strengthens the positive influence of eco-efficiency on financial performance with a path coefficient of 0.431 (t-statistic = 2.107, p-value = 0.037 < 0.05). This indicates that effective governance structures enhance the translation of eco-efficiency practices into financial gains. Strong GCG provides

the framework for systematic implementation, monitoring, and optimization of eco-efficiency initiatives, thereby amplifying their positive financial impact. This finding aligns with agency theory, as strong governance reduces information asymmetry and ensures that eco-efficiency initiatives are implemented strategically to maximize both environmental and financial returns. Companies with robust GCG mechanisms can better identify, implement, and monitor eco-efficiency opportunities, leading to superior financial outcomes. The systematic approach facilitated by strong governance ensures that eco-efficiency improvements are not just ad hoc initiatives but are integrated into the company's overall strategy and operations. This integration, combined with proper monitoring and evaluation, allows companies to fully realize the financial benefits of eco-efficiency practices (Bongsoikrama et al., 2024).

## CONCLUSION

This study examines the influence of green innovation and eco-efficiency on financial performance with good corporate governance as a moderating variable in energy sector companies listed on the Indonesia Stock Exchange during 2022-2024. The research findings indicate several important conclusions. First, green innovation has a negative and significant effect on financial performance, reflecting the substantial initial investments required for environmental innovation that may not yield immediate financial returns. This finding suggests that companies face trade-offs between short-term financial performance and long-term environmental sustainability when implementing green innovation. Second, eco-efficiency demonstrates a positive and significant impact on financial performance, indicating that resource optimization and waste reduction practices directly contribute to cost savings and improved profitability. Third, the moderating role of good corporate governance shows a contrasting effect, namely that good governance weakens the influence of green innovation on financial performance due to its formalistic and short-term performance-oriented implementation. On the other hand, good governance significantly strengthens the positive relationship between ecological efficiency and financial performance by providing a systematic framework for effective implementation and monitoring. These findings contribute to the literature on environmental management and corporate performance by providing empirical evidence from the Indonesian energy sector, highlighting the importance of balancing environmental initiatives with operational efficiency under effective governance structures. For practitioners, this study suggests that companies should prioritize eco-efficiency initiatives for immediate financial benefits while maintaining long-term commitment to green innovation with strong governance mechanisms to ensure sustainable outcomes. Future research should explore these relationships across different industries and extended time periods, investigate the long-term financial impacts of green innovation, examine specific GCG mechanisms that can optimize both green innovation and eco-efficiency outcomes, and analyze how different contextual factors such as company size, ownership structure, and regulatory environment influence these relationships.

**REFERENCES**

Aburumman, O. J., Omar, K., Al Shbail, M., & Aldoghan, M. (2023). How to Deal with the Results of PLS-SEM? *Lecture Notes in Networks and Systems*, *495 LNNS*, 1196–1206. https://doi.org/10.1007/978-3-031-08954-1_101

Affes, W., & Jarboui, A. (2023). The impact of Corporate Governance on Financial Performance: A Cross-Sector Study. *International Journal of Disclosure and Governance*, *20*(4), 374–394. https://doi.org/10.1057/s41310-023-00182-8

Alnaim, M. M. A., Sulong, F., Salleh, Z., & Alsheikh, G. A. A. (2023). Corporate Environmental Performance as a Mediator Between Eco-Efficiency Strategy and Financial Performance in Jordanian Industrial Sectors. *International Journal of Professional Business Review*, *8*(5), e01733. https://doi.org/10.26668/businessreview/2023.v8i5.1733

Amalia, E. (2023). Analisis Pengaruh Pengungkapan Inovasi Hijau terhadap Profitabilitas pada. In *ABIS: Accounting and Business Information Systems Journal* (Vol. 11, Issue 3).

Bongsoikrama, J., Andini, P., Riyadi, S., & Wulandari, A. A. (2024). Kontribusi Penerapan Good Corporate Governance Dan Eco-Efficiency Terhadap Nilai Perusahaan Dengan Kinerja Keuangan Sebagai Pemoderasi. *Jesya*, *7*(1), 1029–1036. https://doi.org/10.36778/jesya.v7i1.1512

Chen, J., & Liu, L. (2020). Eco-Efficiency and Private Firms' Relationships With Heterogeneous Public Stakeholders in China. *International Journal of Environmental Research and Public Health*, *17*(19), 1–18. https://doi.org/10.3390/ijerph17196983

Cheng, Q., Lin, A. P., & Yang, M. (2024). Green innovation and firms' financial and environmental performance: The roles of pollution prevention versus control. *Journal of Accounting and Economics*. https://doi.org/10.1016/j.jacceco.2024.101706

Daud, R., Meutia, I., & Yuniarti, E. (2023). Eco-Efficiency and Financial Performance: An Eco-Efficiency and Financial Performance: An Evidence from Indonesian Listed Company Evidence from Indonesian Listed Company. *Riset Akuntansi Dan Keuangan Indonesia*. http://journals.ums.ac.id/index.php/reaksi/index

Dewi, A. P., & Zagladi, A. N. (2025). Pengaruh Green Innovation dan Keberlangsungan Hidup Terhadap Kinerja Keuangan Umkm (Studi Kasus pada Sentra Industri Tahu Kabupaten Polewali Mandar). *BUDGETING : Journal of Business, Management and Accounting*, *6*(2), 2715–1913. https://doi.org/10.31539/budgeting.v6i1.13350

Francis, Trisnawati, E., & Sriwati. (2025). Influence of Managerial Ownership, Board Independence, and Leverage on Financial Performance in the Financial Sector. *E-Jurnal Akuntansi*, *35*(2). https://doi.org/10.24843/EJA.2025.v35.i02.p07

Hasan, M. B., Verma, R., Sharma, D., & Alaqel, A. (2024). The Synergistic Effect of Corporate Social Responsibility and ESG Disclosure on Green Innovation: Evidence from Least Developed Countries. *Cogent Business and Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2396051

Hendrawan, A. S., & Suhartini, D. (2025). Green Innovation Pada Kinerja Perusahaan Manufaktur di Indonesia? *Jambura Economic Education Journal*, *7*(1). https://ejurnal.ung.ac.id/index.php/jej/index,

Hidayah, F., & Sibarani, N. (2023). Pengaruh Green Product Innovation Dan Green Process Innovation Terhadap Nilai Perusahaan. *JAF (Journal of Accounting and Finance)*, *7*(2), 122–133. https://doi.org/10.25124/jaf.v7i2.6010

Issa, B., Abdallah, S. Ben, & Gabsi, F. B. (2025). Relationship Between Socio-Efficiency, Eco-Efficiency, and Financial Performance of European Companies: A Sector Study. *Journal of Risk and Financial Management*, *18*(4). https://doi.org/10.3390/jrfm18040171

Keum, D. D. (2021). Innovation, Short-Termism, and The Cost of Strong Corporate Governance. *Strategic Management Journal*, *42*(1), 3–29. https://doi.org/10.1002/smj.3216

Khan, P. A., Johl, S. K., Kumar, A., & Luthra, S. (2023). Hope-Hype of Green Innovation, Corporate Governance Index, and Impact on Firm Financial Performance: A Comparative Study of Southeast Asian Countries. *Environmental Science and Pollution Research*, *30*(19), 55237–55254. https://doi.org/10.1007/s11356-023-26262-4

Liu, C., & Wu, S. S. (2023). Green finance, Sustainability Disclosure and Economic Implications. *Fulbright Review of Economics and Policy*, *3*(1), 1–24. https://doi.org/10.1108/frep-03-2022-0021

Millenia, A., & Murwaningsari, E. (2023). Pengaruh Inovasi Produk Hijau dan Inovasi Proses Hijau Terhadap Keunggulan Kompetitif Hijau dengan Modal Intelektual Hijau Sebagai Variabel Moderasi. *Jurnal Ekonomi Trisakti*, *3*(2), 2319–2328. https://doi.org/10.25105/jet.v3i2.17046

Mukhopadhyay, N., & Nayak, N. C. (2024). Examining The Relationship Between Green Innovation Dynamics and Firm Performance: A Comparative Study of BRICS and G7 Countries. *Cogent Business and Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2364836

Musah, A., Padi, A., Wellington Blay, M., Odei Okyere, D., & Siaw Ofori, B. (2025). Corporate Governance, Financial Performance, and Investor Confidence: The Mediating Role of Going Concern among Retail Investors in Ghana. *Scientific African First Look*.

Ramadhan, P., Iranti, R., Dohan, D., Purnama, Y., & Riduan Nazir, W. (2022). COVID-19, Green Innovation and Their Impacts on Financial Performance. *E-Jurnal Akuntansi*, *32*(12), 3658. https://doi.org/10.24843/eja.2022.v32.i12.p13

Rebecca, A. N., Erawan, I. K. P., & Erviantono, T. (2023). Transformasi Energi Berkelanjutan di Indonesia: Kebijakan dan Tantangan Transisi dari Batu Bara ke Energi Terbarukan Selama Dua Periode Kepemimpinan Jokowi. *Triwikrama: Jurnal Ilmu Sosial*, *4*(4).

Rizki, T., & Hartanti, D. (2021). Environmental Responsibility, Green Innovation, Firm Value: Asean-5. *Journal of International Conference Proceedings*, *4*(3). https://doi.org/10.32535/jicp.v4i3.1349

Sari, P. (2024). Green Technology Innovation & Kinerja Keuangan Perusahaan: Mediasi Kinerja Lingkungan. *Berkala Akuntansi Dan Keuangan Indonesia*, *9*(1), 18–48. https://doi.org/10.20473/baki.v9i1.43565

Septiani, D., Saputri, D. A., Wahyuni, P., & Anggaraini, A. D. (2024). Literature Review: Pengaruh Corporate Social Responsibility Terhadap Nilai Perusahaan Pada Perusahaan Pertambangan. *Jurnal Akuntansi, Keuangan, Perpajakan Dan Tata Kelola Perusahaan (JAKPT)*, *1*(4).

Sinaga, K. L., Malau, H., & Hutabarat, F. (2025). The Effect of Green Innovation and Environmental Responsibility on The Value of Oil And Gas Sub-Sector Companies Listed on The Indonesian Stock Exchange 2019-2023 Pengaruh Inovasi Hijau dan Tanggung Jawab Lingkungan Terhadap Nilai Perusahaan Sub Sektor Minyak Dan Gas yang Terdaftar di Bursa Efek Indonesia 2019-2023. *COSTING: Journal of Economic, Business and Accounting*, *8*(2).

Sugiyono. (2023). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D* (Sutopo, Ed.; Kedua). www.cvalfabeta.com

Sukomardojo, T., Patriani, I., Judijanto, L., Pratomo, S., Afrilia, U. A., & Sari, L. (2024). Greenflation in the Era of Energy Transition: New Implications for Sustainable Economic Policy. In *ENDLESS: International Journal of Futures Studies* (Vol. 7, Issue 1). http://endless-journal.com/index.php/endless73

Sulasminingsih, & Hardiningsih, P. (2022). Pengaruh Eco-Efisien, Aktivitas Operasi, Akuntansi Lingkungan Terhadap Kinerja Keuangan. *Jurnal Ilmiah Akuntansi Dan Keuangan*, *5*(3), 2022. https://journal.ikopin.ac.id/index.php/fairvalue

Sulistiyana, F., & Adiati, T. (2025). Pengaruh Green Accounting Melalui Pengelolaan Limbah dan Efisiensi Energi Terhadap Kinerja Keuangan Perusahaan Manufaktur yang Terdaftar di Bursa Efek Indonesia (BEI). *Jurnal Manajemen Dan Bisnis (JMB)*, *25*(1).

Wang, Y. Z., & Ahmad, S. (2024). Green Process Innovation, Green Product Innovation, Leverage, and Corporate Financial Performance; Evidence from System GMM. *Heliyon*, *10*(4). https://doi.org/10.1016/j.heliyon.2024.e25819

Widarti, Ekawarti, Y., & Agustini, T. (2024). *Effect Of Eco-Efficiency, Operating Activities, Environmental Accounting On Financial Performance In Mining Companies Listed On The Indonesia Stock Exchange*. https://pubjournals.com/IJSEFLhttps://pubjournals.com/IJSEFL

Widianingsih, L. P. (2025). Determinants of Carbon Emission Disclosure of Energy Sector Companies in Indonesia. *Jurnal Ekonomi Dan Bisnis*, *28*(1), 21–38.

Wijayati, N. (2022). Form over Substance: The Board Governance Practices in Indonesia. *The Indonesian Journal of Accounting Research*, *25*(01). https://doi.org/10.33312/ijar.563

Wilutama, N. A., & Viverita. (2024). The Effect of Green Innovation on Firm Value at Different Life Cycle: The Role of Sustainable Growth and Debt Financing Cost. *JRAP (Jurnal Riset Akuntansi Dan Perpajakan)*, *11*. https://journal.univpancasila.ac.id/index.php/jrap

Xie, Z., Wang, J., & Zhao, G. (2022). Impact of Green Innovation on Firm Value: Evidence From Listed Companies in China's Heavy Pollution Industries. *Frontiers in Energy Research*, *9*. https://doi.org/10.3389/fenrg.2021.806926

Zaikin, M., Alimuddin, A., Nagu, N., & Afdal, A. (2024). Pengaruh Carbon Emission Disclosure Dan Green Innovation Terhadap Nilai Perusahaan Dengan Good Corporate Governance Sebagai Variabel Pemoderasi. *POINT: Jurnal Ekonomi Dan Manajemen*, *6*(1), 65–78. https://doi.org/10.46918/point.v6i1.2255