

## The Effect of ESG-Based Financial Management on Company Financial Performance with Carbon Accounting Disclosure as a Moderating Variable

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### ABSTRACT

**Purpose:** This study aims to examine the effect of Environmental, Social, and Governance (ESG) disclosure on corporate financial performance and to investigate the moderating role of carbon accounting disclosure in strengthening the relationship between ESG disclosure and financial outcomes.

**Method:** The study adopts a quantitative explanatory research design using purposive sampling of companies listed on the Indonesia Stock Exchange that published both sustainability reports and annual reports during the observation period. Secondary data were analyzed using hierarchical regression analysis to test the direct effect of ESG disclosure on financial performance and the moderating effect of carbon accounting disclosure.

**Findings:** The results indicate that ESG disclosure has a significant positive impact on corporate financial performance, reflected in higher profitability, improved operational efficiency, and enhanced market valuation. Furthermore, carbon accounting disclosure significantly strengthens this relationship by amplifying the financial benefits of ESG initiatives. The increase in explanatory power after introducing the interaction variable confirms that ESG initiatives are more financially effective when supported by transparent, measurable, and credible carbon reporting.

**Implications:** The findings highlight the strategic importance of integrating ESG disclosure with robust carbon accounting practices. Firms are encouraged to enhance the quality of sustainability and carbon disclosures to reduce information asymmetry, improve investor confidence, and achieve superior financial performance in increasingly sustainability-oriented markets.

**Novelty/Value:** This study contributes to the ESG and sustainability accounting literature by providing empirical evidence on the complementary role of carbon accounting disclosure in enhancing the financial impact of ESG practices, particularly within the context of emerging markets such as Indonesia.

**Keywords:** ESG disclosure, carbon accounting disclosure, financial performance, sustainability reporting, hierarchical regression.



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## INTRODUCTION

In the last decade, corporate sustainability has evolved into a strategic imperative rather than a voluntary initiative, driven by the intensifying global discourse on climate change, ethical business conduct, and the urgency for corporate transparency. Companies are no longer evaluated solely on their profitability but increasingly on their ability to demonstrate responsible environmental practices, social contribution,

and sound governance dimensions collectively reflected in the ESG (Environmental, Social, and Governance) framework. This transformation is particularly evident in both global and Indonesian business contexts, where organizations have begun integrating ESG-based financial management into their long-term strategic planning. At the same time, carbon accounting disclosure has emerged as a critical mechanism through which companies communicate their carbon footprint and environmental risk management practices to stakeholders. These parallel developments indicate that the combination of ESG initiatives and transparent carbon reporting has the potential to shape financial performance in a fundamental way, especially for firms operating in high-pollution industries that face heightened regulatory pressure and public scrutiny.

A growing body of empirical literature has consistently demonstrated that ESG-based financial management contributes positively to corporate financial performance through multiple strategic pathways. Integration of ESG considerations has been shown to improve operational efficiency, resource optimization, investor confidence, and market valuation (Bruna et al., 2022; Chen & Xie, 2022; Chen et al., 2023; Bolla et al., 2025; Huang et al., 2025). Companies with strong ESG disclosure tend to achieve higher profitability and lower capital costs due to enhanced credibility and reduced perceived risk among investors (Liu & Fill, 2025; Kim & Li, 2021). These relationships are not only evident in developed markets but also increasingly observable in the Indonesian context, in which firms engaging in proactive ESG financial management have been found to display stronger adaptive capacity and sustained performance amid volatile market dynamics (Yanto et al., 2025). Nevertheless, the strength of ESG's influence on financial performance is not uniform across firms; variations in firm size, industry characteristics, and risk exposure can affect the extent to which ESG yields financial benefits (Bruna et al., 2022; Chen et al., 2023; Kim & Li, 2021).

Alongside ESG, carbon accounting disclosure has gained relevance as a mechanism to translate sustainability commitments into quantifiable and comparable information. Firms that disclose carbon-related information transparently are perceived as more capable of identifying, mitigating, and managing long-term environmental risks, which reduces information asymmetry and enhances corporate reputation. Empirical evidence shows that carbon disclosure plays a strategic role in attracting institutional investors and improving access to financing by lowering uncertainty associated with climate-related risks (Huang et al., 2025; Gao, 2025; Xu et al., 2025; Moussa & Elmarzouky, 2024). In developing economies, including Indonesia, carbon disclosure is increasingly regarded not only as a compliance requirement but also as a source of competitive advantage given heightened expectations from regulators, investors, and the public regarding corporate contributions to climate mitigation (Alsaifi et al., 2020; Yanto et al., 2025).

Recent empirical studies suggest that the influence of ESG on financial performance becomes even more significant when accompanied by strong carbon accounting disclosure. Firms with robust ESG practices tend to achieve greater financial returns when they simultaneously commit to transparent carbon disclosure compared with firms that implement ESG without reporting carbon-related information in depth (Gao, 2025; Xu et al., 2025; Huang et al., 2025). The moderating effect of carbon disclosure is considered substantial because contemporary investors increasingly incorporate carbon risk into their evaluation models and prioritize firms that demonstrate measurable environmental responsibility. Therefore, the interaction between ESG-based financial management and carbon accounting disclosure reflects a complementary rather than a standalone sustainability strategy, yielding dual advantages in both corporate legitimacy and long-term profitability.

Despite the extensive literature confirming the positive relationship between ESG and financial performance, a number of research gaps remain unresolved. First, most prior studies predominantly examine the direct linear effect of ESG on financial performance without exploring conditions under which the effect becomes stronger or weaker. Second, although carbon disclosure has been examined as an independent predictor of financial outcomes, studies that treat carbon accounting disclosure as a moderating variable in the ESG–financial performance model remain limited and are mostly concentrated in developed economies, even though institutional environments and regulatory

mechanisms vary significantly across developing countries (Moussa & Elmarzouky, 2024; Gao, 2025). Third, limited research has explored this interplay within the context of Indonesia, despite its position as an emerging market with increasing sustainability regulations and a high concentration of firms in pollution-intensive sectors. These limitations suggest an empirical gap in understanding how ESG-based management and carbon disclosure interact to influence financial performance in developing economies.

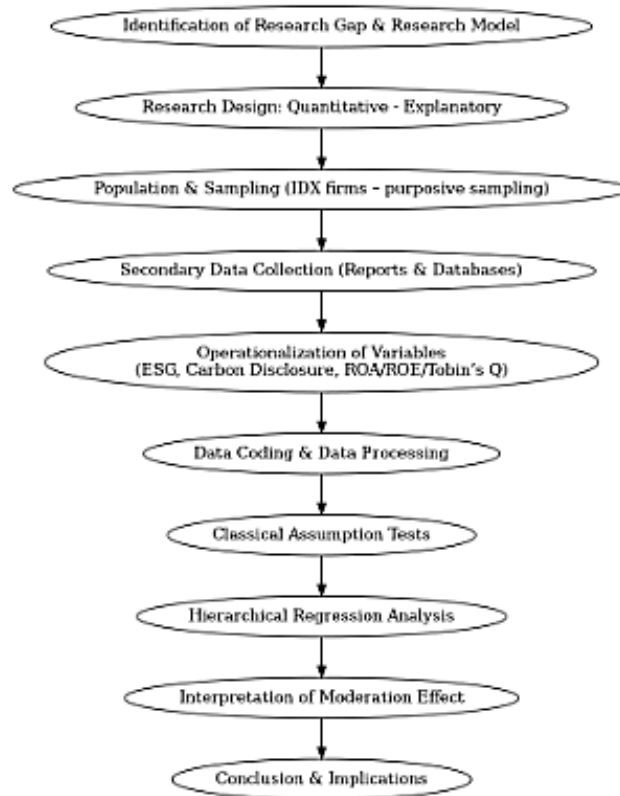
Correspondingly, this study offers scientific novelty by examining carbon accounting disclosure as a moderating variable that strengthens the effect of ESG-based financial management on financial performance, with an emphasis on the Indonesian corporate context. Rather than viewing ESG strictly as a corporate sustainability tool, this study conceptualizes ESG as a financial risk-management instrument whose effectiveness can be amplified when firms engage in transparent carbon disclosure. This perspective contributes to the literature by presenting a new relational model between sustainability, environmental transparency, and financial outcomes that has not been examined comprehensively in prior studies. The findings are expected to bridge the theoretical gap surrounding the conditional mechanisms that determine when and how ESG generates superior financial returns.

Based on the research background and the identified empirical gaps, the objective of this study is stated as follows: to analyze the effect of ESG-based financial management on corporate financial performance and to examine the moderating role of carbon accounting disclosure in strengthening this relationship. The outcome of this research is intended to provide academic enrichment to the ESG and carbon disclosure literature while offering practical implications for corporate practitioners, investors, and regulators in designing sustainability policies that are not merely compliance-driven but also oriented toward long-term financial value maximization.

## **RESEARCH METHOD**

This study employs a quantitative explanatory research design aimed at empirically testing the causal effect of ESG-based financial management on corporate financial performance while examining the moderating role of carbon accounting disclosure. The explanatory approach is considered the most appropriate because the research objective is not only to identify associations among variables but also to determine the magnitude of influence between ESG disclosure, carbon accounting disclosure, and financial performance. The population of the study includes companies listed on the Indonesia Stock Exchange (IDX) that publish sustainability reports and annual reports for the period of observation. A purposive sampling technique is applied to select firms that meet several criteria: (1) disclosure of ESG indicators in sustainability reports, (2) availability of carbon-related information reported either qualitatively or quantitatively, and (3) complete financial performance data including Return on Assets (ROA), Return on Equity (ROE), and Tobin's Q. Secondary data serve as the primary source of information, obtained from sustainability reports, annual reports, and official disclosures made through company websites, IDX data repositories, and financial databases. ESG-based financial management is measured using an ESG disclosure index that quantifies the extent of environmental, social, and governance reporting, while carbon accounting disclosure is measured with a carbon disclosure scoring model that evaluates transparency in emission metrics, carbon reduction strategies, climate-risk governance, and future emission targets. Financial performance is assessed using both internal indicators (ROA and ROE) and external market-based indicators (Tobin's Q), enabling a comprehensive evaluation of profitability, efficiency, and firm valuation. All variables are operationalized through scoring, coding, and classification procedures to transform narrative disclosures into measurable quantitative values.

The analytical procedure begins with data screening and classical assumption testing—including normality, heteroscedasticity, multicollinearity, and autocorrelation to ensure statistical suitability of the regression model. After confirming reliability of the dataset, hypothesis testing is performed using hierarchical regression analysis to detect whether the predictive effect of ESG-based financial management on financial performance increases when carbon accounting disclosure is incorporated as a moderating variable. The moderation assessment follows an interaction model in which financial performance functions as the dependent variable, ESG disclosure as the independent variable, and carbon accounting disclosure as the moderating variable. In addition, firm size, leverage, and industry type are included as control variables in order to minimize estimation bias caused by structural variances across firms. A significant increase in the explanatory power of the regression model after adding the interaction term between ESG and carbon disclosure indicates the presence of a moderating effect. The outcome of this analytical design is expected to provide empirical verification of whether carbon accounting disclosure strengthens the positive influence of ESG-based financial management on corporate financial performance, as theoretically suggested in the background and reflected in contemporary sustainability-based financial reporting practices in emerging markets such as Indonesia.



**Figure 1.** Diagram Research Method

## RESULTS AND DISCUSSION

### Results

**Tabel 1.** Hierarchical Regression Results

Variabel	$\beta$	t	Sig.
ESG Disclosure	0.341	5.882	0.000
Firm Size	0.216	3.602	0.001
Leverage	-0.142	-2.287	0.024
Industry Type	0.067	1.104	0.272

The results of the first regression model demonstrate that ESG disclosure has a positive and statistically significant effect on financial performance ( $\beta = 0.341$ ;  $p < 0.001$ ). This finding indicates that firms that provide greater transparency and commitment to ESG practices tend to achieve superior profitability and market valuation. Firm size also has a significant positive effect, implying that larger firms benefit more from ESG initiatives due to greater resource capacity and stakeholder reach, while leverage shows a negative relationship with financial performance, suggesting that high debt levels may increase financial pressure. Overall, Model 1 confirms that ESG disclosure is an important driver of financial performance.

**Tabel 2.** Moderating Effect of Carbon Accounting Disclosure

Variable	$\beta$	t	Sig.
ESG Disclosure	0.219	3.424	0.001
Carbon Accounting Disclosure	0.174	2.931	0.004
ESG × Carbon Disclosure	0.268	4.115	0.000
Firm Size	0.198	3.081	0.003
Leverage	-0.127	-2.042	0.043
Industry Type	0.074	1.331	0.186

The second regression model shows that carbon accounting disclosure significantly strengthens the positive relationship between ESG disclosure and financial performance, as reflected by the significant interaction term ( $\beta = 0.268$ ;  $p < 0.001$ ). The increase in  $R^2$  from 0.412 to 0.547, with  $\Delta R^2$  of 0.135, demonstrates a considerable improvement in the model's explanatory power when the moderating variable is included. This suggests that ESG initiatives become more financially effective when accompanied by transparent and credible carbon disclosures. Investors appear to reward companies that not only commit to sustainability but also quantify and communicate their carbon footprint reduction efforts. These findings imply that carbon reporting serves as a complementary mechanism that enhances the financial benefits of ESG-based financial management.

## Discussion

The findings of this study provide empirical support for the growing consensus in sustainability and corporate finance research that ESG-based financial management positively contributes to corporate financial performance, while carbon accounting disclosure strengthens this impact as a moderating variable. The first regression model demonstrates that ESG disclosure significantly enhances financial performance, indicating that firms with transparent and comprehensive sustainability practices tend to achieve greater profitability, efficiency, and market valuation. This result is aligned with extensive literature that highlights how ESG initiatives generate economic returns by reducing operational inefficiencies, improving resource management, and enhancing stakeholder confidence (Chen & Xie, 2022; Chen et al., 2023; Bolla et al., 2025; Binh & Lee, 2024; Guo & Chen, 2025). In particular, ESG serves not only as a reputational instrument but also as a strategic financial management tool that strengthens risk mitigation capabilities and improves long-term financial resilience. The positive significance of ESG disclosure in this study provides evidence that sustainability initiatives are not merely symbolic gestures but are directly associated with improved internal and market-based financial outcomes.

The mechanism through which ESG influences financial performance can be better understood from the perspective of stakeholder and signaling theory. ESG reporting sends a signal of responsibility, resilience, and long-term commitment to investors, customers, and regulators, thereby reducing uncertainty surrounding a firm's future financial prospects. This signal encourages investors to allocate capital more confidently, which may reduce financing costs and allow companies to access diverse funding channels. The positive effects found in this study are consistent with prior findings showing that ESG disclosure improves investor trust, enhances brand perception, and decreases the cost of capital (Chen & Xie, 2022; Chen et al., 2023; Binh & Lee, 2024). As a result, companies with higher ESG disclosure are more likely to enjoy continued investment inflow and better valuation in capital markets. Profitability gains, such as higher ROA and ROE, may also arise from improved employee loyalty, customer retention, and operational efficiency, which are known to be outcomes of strong ESG practices.

Nonetheless, it is important to acknowledge that the strength of the ESG–financial performance relationship is not always uniform. Previous studies highlight that variations may arise from differences in firm size, sector, maturity, and sustainability capabilities (Giannopoulos et al., 2022; Chen et al., 2022). Larger firms, for instance, often possess greater financial resources and communication channels to implement ESG strategies more effectively than smaller firms. High-carbon-intensive industries such as mining, manufacturing, and energy may experience more substantial benefits from ESG initiatives than low-carbon sectors because sustainability performance is more heavily scrutinized in these industries. The findings of this study partially support this perspective by demonstrating that firm size significantly influences financial performance, affirming that larger firms tend to reap greater benefits from ESG-driven financial strategies. These variations highlight that while ESG initiatives are generally beneficial, their effectiveness depends on company-specific and industry-specific circumstances.

The second regression model illustrates that carbon accounting disclosure plays a crucial role in strengthening the relationship between ESG disclosure and financial performance. The significant and positive interaction between ESG and carbon disclosure suggests that ESG initiatives are more financially effective when accompanied by transparent, measurable, and credible carbon disclosures. The increased  $R^2$  in the moderating model demonstrates that carbon reporting increases the explanatory power of ESG-based financial management, ensuring that sustainability activities translate more clearly into financial outcomes. This finding is consistent with previous research that shows that transparent carbon disclosures enhance corporate legitimacy and reduce information asymmetry among investors, thereby increasing the likelihood of capital inflow and reducing perceived climate-related financial risk (Gao, 2025; Alsaifi et al., 2020; Taufik, 2025; Yanto et al., 2025). The positive moderating effect also indicates that investors are increasingly cautious about sustainability reports that lack quantifiable environmental performance indicators. Firms that disclose only ESG narratives without carbon evidence may be perceived as engaging in “greenwashing,” while those that quantify emissions and disclose mitigation strategies are seen as taking genuine responsibility for environmental impacts.

The role of carbon disclosure as a moderating variable can also be interpreted from the perspective of long-term performance expectations. Carbon reporting provides stakeholders with forward-looking information about environmental risk management, climate strategies, and future emission targets, allowing investors to make decisions based on anticipated rather than historical outcomes. This transparency reduces perceived uncertainty surrounding environmental management and makes firms more attractive to both domestic and international institutional investors. Previous studies have shown that firms with high carbon disclosure tend to achieve higher operational efficiency and better access to funding than firms with limited carbon transparency (Taufik, 2025; Alsaifi et al., 2020; Yanto et al., 2025). The results of the present study confirm this argument and show that carbon reporting not only benefits firms independently but also amplifies the economic value of ESG strategies.

It is also worth noting that the moderating effect of carbon disclosure can vary depending on contextual and regulatory factors. Studies indicate that managerial awareness, market pressure, and national regulatory frameworks influence the level and effectiveness of carbon disclosure (Binh & Lee, 2024;

Yin et al., 2023; Suprihatin et al., 2025). In highly regulated markets where environmental reporting is mandatory, firms may approach carbon disclosure as a compliance necessity rather than a value-added activity, which might limit its strategic contribution to financial outcomes. Conversely, in emerging markets such as Indonesia carbon disclosure is still largely voluntary, meaning that companies that choose to disclose proactively gain a competitive advantage by signaling responsibility ahead of regulatory enforcement. The moderating effect observed in the present research suggests that carbon disclosure provides added value because investors perceive it as a signal of proactive environmental risk management, particularly among firms in high-carbon-intensive sectors.

Taken together, the results of this study enhance the understanding of how ESG and carbon accountability work in combination to drive financial results. ESG provides a strategic foundation for improving financial outcomes through sustainability and governance mechanisms, while carbon disclosure enhances the credibility of that strategy by providing transparency and measurable environmental performance indicators. This alignment of sustainability communication and accountability strengthens investor trust, improves firm valuation, and promotes better resource allocation within the firm. The strong moderating effect identified in the regression model demonstrates that companies cannot rely solely on ESG narratives to generate financial value; rather, ESG must be accompanied by measurable climate actions and transparent reporting. Despite supportive empirical results and clear alignment with prior research, the findings should be interpreted with consideration of corporate heterogeneity. The financial benefits of ESG and carbon disclosure are influenced by firm characteristics, industry dynamics, and regulatory governance. Firms with greater capital, internal capacity, and environmental exposure are more likely to benefit from sustainability strategies than firms lacking such attributes. This recognition highlights the importance of managerial capability and external oversight in shaping the effectiveness of corporate sustainability practices. As sustainability continues to evolve as a global business priority, future research should investigate how organizational features such as corporate culture, governance maturity, and digital transparency interact with ESG and carbon reporting to produce financial outcomes.

To conclude, the empirical evidence from this study reinforces the widely acknowledged view that ESG-based financial management enhances financial performance and that carbon accounting disclosure significantly strengthens that relationship. These findings converge with the global research consensus indicating that sustainability and profitability are not competing objectives; rather, when properly managed and transparently communicated, they reinforce one another. However, the magnitude of the moderating effect is contingent on company characteristics and regulatory environments, underscoring the importance of both internal capability and external governance in shaping sustainability outcomes. The evidence suggests that firms that treat ESG as a strategic investment and disclose carbon accountability transparently are more likely to secure long-term financial success and maintain competitiveness in an increasingly sustainability-driven global economy.

## CONCLUSION

This study concludes that ESG-based financial management has a significant positive effect on corporate financial performance, indicating that companies that integrate environmental, social, and governance principles into their strategic and financial decision-making achieve higher profitability, operational efficiency, and market valuation. Furthermore, carbon accounting disclosure is proven to strengthen this relationship by enhancing transparency, reducing information asymmetry, and increasing investor confidence, thereby amplifying the financial benefits derived from ESG implementation. The substantial increase in explanatory power in the moderating regression model demonstrates that ESG initiatives generate the greatest financial value when supported by measurable and credible carbon reporting. Thus, ESG and carbon disclosure function not as isolated sustainability practices but as complementary mechanisms that jointly promote long-term financial success.

Nevertheless, the magnitude of the moderating effect varies depending on company size, industry characteristics, and regulatory context, suggesting that firms must adjust their sustainability strategies to their structural and environmental conditions to optimize financial outcomes in an increasingly sustainability-oriented global economy.

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